Subadditivity and the Unpacking Effect in Political Opinions

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Abstract
To explain subadditivity in judgments of probabilities, support theory (Tversky and Koehler 1994) emphasizes the increased availability of information about component events. This paper demonstrates that similar processes occur in responses to public opinion questions. When a broad description of a policy is “unpacked” into more specific component policies, support for the component policies exceeds support for the original, broad policy. This effect is especially strong when one or more of the unpacked policies make information available to the decision-maker that was not accessible when the broad description was provided. This behavior violates Luce’s (1959) axiom of independence of irrelevant alternatives, and demonstrates that there are circumstances when applying a nested choice model may be inappropriate in public opinion research.
1. Introduction

When survey researchers pose public opinion questions about policies, they can ask vague, general questions like “do you favor more education spending?” Alternatively they can unpack this choice into separate component parts, and ask respondents to indicate whether they support “more spending on elementary school education,” “more spending on university education” and other specific proposals. If respondents are consistent, every one who would choose one of the specific “unpacked” categories should select the broader category.

“Subadditivity” results whenever support for a broad policy, like a [generic] tax increase, is less than the cumulative support for all of the component policies, such as a property tax increase, an income tax increase, a sales tax increase, and support for a sin tax increase. Subadditivity may cause respondents to appear to be irrational, since their answers may violate Luce’s (1959) axiom of independence of irrelevant alternatives. This creates problems for survey researchers attempting to ascertain the true distribution of an issue. This also creates a quandary for politicians like John McCain who in 2008 had to choose between backing a popular tax on carbon emissions or the ability to make a blanket campaign pledge not to raise taxes.

Similar puzzles confront scholars who examine how people make forecasts and estimate the probability of uncertain future events. To explain subadditivity in judgments of probabilities, “support theory” (Tversky and Kochler 1994; Rottenstreich and Tversky 1997) argues that when events are partitioned or unpacked into constituent events, the assessed probabilities of the constituent events exceeds the assessed probabilities of the unpartitioned broad event. For example, the odds of an Eastern Conference team winning the NBA championship are often seen as less than the cumulative odds of the Boston Celtics, New York Knicks, Toronto Raptors, and twelve other teams winning the same championship (Fox and Tversky 1995).
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According to support theory, partitioning the event makes available information that may not have been accessible before partitioning. In this paper, I extend support theory to public opinion by demonstrating that when several broad descriptions of policies are unpacked into constituting component policies, support for the component policies exceeds support for the original, broad policy. The presence of similar patterns of behavior in public opinion research suggests that the causal mechanism is the same in forecasting and public opinion.

2. Rationale and Hypothesis

Microeconomic utility maximization theories assume enlarging the choice set cannot increase the desirability of one of the options in the original choice set if the decision-makers preferences are complete and transitive. Luce’s (1959) axiom of independence of irrelevant alternatives assumes that the relative odds of choosing one option should be independent of the presence or absence of alternatives in the choice set that are not chosen.1 In the aggregate, this means that the number of supporters for each of the original alternatives should be the same or less when the choice set is enlarged by dividing one alternative into separate components (Sen 1997; Hinich and Munger 1994; Denzau and Parks 1979).

Nobel prize-winning economist Daniel McFadden (1974) explained that the problem with this axiom is that there cannot be differential substitutions and complements among the alternatives. In a famous example, the number of people choosing to take a bus to work should be unaffected by whether there are both red and blue busses. By imposing a nested design on the choice process, McFadden solved the problem caused by the addition of one or more alternatives similar to an alternative in the original choice set. With a nested model of

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1 This should not be confused with the question of whether the third alternative influences the social choice. One of Kenneth Arrow’s conditions for social decision rules is often referred to using the same name as Luce’s axiom. Arrow’s irrelevance of independent alternatives refers to violations of ordinal choices or rankings of options.
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decision-making, similar alternatives (red and blue buses) are grouped together. A choice is
selected after first choosing a group, and then selecting an alternative from within the group.
Alternatives outside of the unpacked group like buses are unaffected by introduction of the
new alternatives.

McFadden’s nested of decision-making is appropriately applied when similar options can be
combined into groups or categories distinct from other options or groups of options. Luce’s
assumption is best applied when the alternatives are distinct and independent. The problem I
identify in this paper is that even survey respondents may not recognize the grouped options
even when Luce’s assumptions do not apply. Instead, the explicit presence of some specific
policy may attract supporters who might not otherwise choose as their preference a vague
policy that subsumes the specific policy. As a result, one cannot apply a nested or conditional
decision-making model to the observed pattern of choices.

Hypothesis: Information provided by specific policies in the choice set of an opinion question will cause the policies
to jointly attract more supporters than a vague, broad policy that subsumes the specific policies.

I hypothesized that the specific policies attracts more support because multiple specific policy
options contains more information that may not be accessible when the broad, vague policy is
considered. Without this new information, thinking about the broader policy might be
dominated by constituent policies that the respondents do not support, and must be reminded
of a constituent policy they do support.

I test whether the specific policies are jointly more attractive than the broad policy through a
between-subject analysis of survey responses. For example, on a question about how to best
reduce crime, I will test whether support for increasing jail time for criminals increases if,
instead of such a broad policy, respondents can choose between longer mandatory jail sentences and making repeat offenders ineligible for parole. If support for the pair of lengthening jail time options exceeds supports for the general policy, then we would have evidence of subadditivity when one policy (or policy proposal) is unpacked into constituent components.

The null hypothesis is that adding specific policy options that are constituent components of a broad class of policies will not increase support for that class of policies other than that which may be the result of random variation. In such a scenario, McFadden’s conditional or nested model would be appropriately applied. I will reject the null hypothesis if the combination of the specific policy options attracts more supporters than the broader alternative in a between-subject test.

3. Theory

I base my hypothesis on research that has predominantly focused on probability judgments. Support theory was first proposed by Amos Tversky and Derek Koehler (Tversky and Koehler 1994) to explain systematic violations of “additivity,” one of the axioms of probability theory. If there are two disjoint events, A, B, then the probability of A occurring plus the probability of B occurring should equal the probability of their union, C, occurring. Formally, we can write this as: \( \text{Pr}(A) + \text{Pr}(B) = \text{Pr}(C) \) where \( C = A \cup B \). However, in many circumstances (see Rottenstreich and Tversky 1997, Sloman et al. 2004, and Fox, Bardolet and Lieb 2004), scholars have observed that people’s judged probabilities of the disjoint (“unpacked”) events exceed the judged probability of their union so that \( \text{Pr}(A) + \text{Pr}(B) > \text{Pr}(C) \).
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According to support theory, non-random violations of additivity can be primarily attributed to memory limitations or difficulties in memory retrieval. Unable to readily remember all constituent elements of an event, decision-makers will use the availability heuristic (Tversky and Kahneman 1973) and emphasize readily accessible pieces of information that can be easily brought to mind. Unpacking an event into more specific components may remind decision-makers of one or more components that had not been available when they considered the broad event (Fischoff et al. 1978; Van Boven and Epley 2003).

Zaller and Feldman (1992) argue that differences in what information is available is a common source of choice inconsistency in public opinions. According to their theory of survey responses, most people are ambivalent and could choose more than one of the possible policy options, depending on what considerations are most accessible or salient. Zaller and Feldman (1992) and others (Iyengar and Kinder 1987; Tourangeau and Rasinski 1988; Schuman and Scott 1987) have examined how question wording, question order and other stimuli before the question is posed prime certain considerations to become more salient. In this study, I shift attention to the answers in the choice set rather than the questions and the question order in the questionnaire as a source of new information that affects the survey respondent’s opinion.

There are other possible explanations for subadditivity. Uncertainty about what specific policies will result if one chooses a broad category may also affect responses (Alvarez and Franklin 1994). If this category includes policies that the respondent favors and policies that the respondent does not favor, then another category may be more appealing. More specific options may reduce this uncertainty.

Another possible explanation is suggested by the tendency for people to use ignorance priors that allocates the probabilities equally among all events. For example, predictions of events and
allocations of resources tend to be biased towards $1/n$, when $n$ is the number of events or categories. As a result, collapsing the number of options may cause probabilities to be subadditive without any change in availability (see review in Fox, Bardolet and Lieb 2004). This may also happen in opinion survey research if respondents are randomly selecting answers, causing an even distribution of responses (Bishop 1990). Alvarez and Brehm (2002) argue that citizen opinions can be represented by probability distributions around a central tendency. Those who are well informed give answers to policy questions that are closely arrayed around the central tendency. However, those who are not well-informed would have a flat and diffuse distribution across issue space and may fail to recognize that a nested structure is appropriate for constructing opinions over the alternatives.

Scholars have identified several other ways in which the choice set may influence observed decision-making behavior. Studies of consumer behavior have found that decision-makers become more likely to choose options that make the decision easier to justify (Shafir et al. 1993) or reduce the level of anxiety associated with the choice (Pettibone and Wedell 2000). These options include alternatives that are clearly more desirable to most decision-makers than some, but not all, of the other options (asymmetric dominance), alternatives that appear as compromises and minimize difficult trade-offs (compromise effect), and alternatives whose attributes attracts decision makers to similar alternatives (attraction effect). This last possibility is perhaps the most likely alternative cause of subadditivity since it suggests that when one option is unpacked, the presence of a group of similar proposals may attract the decision-makers to that category. Such a grouping of similar alternatives may also cause dissimilar options to appear less desirable (a “range-frequency” effect, Parducci 1965). According to these explanations, support for the unpacked alternatives is (at least in part) a function of how different the unpacked group is from the other options, and/or how difficult expressing a
specific preference is. These explanations, though, are not inconsistent with support theory’s explanation. I return to an evaluation of their possible influences in the discussion.

4. Experimental Design and Data Collection

I test my hypotheses using a between-subjects experiment implemented as a pen-and-paper questionnaire. There were two distinct versions of the questionnaire. One questionnaire contained five questions about political issues particular to the state of the principal investigator’s residence, such as a proposed tax increase and the establishment of a state lottery. The questions were asked in a fixed order. The first four questions never changed. There were two versions of the very last question. Otherwise, only the set of possible answers varied between subjects.

The second questionnaire contained five questions on a range of national or common [generic] state policies. The questions were asked in a fixed order and only the set of possible answers varied across the conditions.

Table 1 Summary of Research Design

<table>
<thead>
<tr>
<th>Question</th>
<th>How unpacked categories vary</th>
<th>Questionnaire State</th>
<th>Questionnaire National</th>
<th>Results Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crime Solutions</td>
<td>Substantive</td>
<td>X</td>
<td></td>
<td>2A</td>
</tr>
<tr>
<td>School Funding: Lottery or Taxes</td>
<td>Substantive</td>
<td>X</td>
<td></td>
<td>2B</td>
</tr>
<tr>
<td>Drought Response</td>
<td>Substantive</td>
<td>X</td>
<td>X</td>
<td>2C</td>
</tr>
<tr>
<td>Cigarette Tax Bill</td>
<td>Substantive</td>
<td>X</td>
<td></td>
<td>2D</td>
</tr>
<tr>
<td>Cigarette Tax Increase</td>
<td>Magnitude</td>
<td>X</td>
<td></td>
<td>2E</td>
</tr>
<tr>
<td>Aid to Israel</td>
<td>Magnitude</td>
<td>X</td>
<td></td>
<td>2F</td>
</tr>
</tbody>
</table>

Two questions were asked on both versions, so there were a total of eleven different policy questions. Six of these questions included versions that tested subadditivity (see Table 1). The other questions in the survey did not test what happens when a broad policy is “unpacked.”
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Each of these questions had a treatment which took one of the possible answers in the control and unpacked it into several, specific constituent parts. Since the response data is nominal, I test the differences between the treatments and the control using a $X^2$ goodness of fit test.

Both questionnaires were administered to a diverse adult population. Subjects were randomly placed in conditions. Across the different treatments, though, there was no significant variation in any of the demographic or attitudinal measures that I collected. Participants were recruited in a variety of locations and were given a small snack or soft drink as compensation. Respondents to the state questionnaire were primarily recruited on six visits to the jury pool room and to traffic court in the Durham County Courthouse. I also personally invited subjects to participate at the largest mall in the “Triangle” area of the North Carolina (Durham, Chapel Hill and Raleigh) on a weekday afternoon, and through personal contacts at workplaces (less than ten percent of the sample). I recruited national subjects on my host campus during alumni weekend, in the stands prior to college baseball games, in the waiting areas of three airports, the train station in Chicago, and in downtown Philadelphia. Some national surveys were completed by in-state residents while the state subject recruitment was taking place. Largely as a result of the different recruitment tactics, the state sample has a greater percentage of minority respondents, while the national sample, on average, was better educated and knowledgeable about politics (see Appendix).

5. Results

The six questions that test subadditivity when unpacking a broad policy can be grouped into two different varieties. I first present three questions that unpack the broad category into policies that vary substantively from the other policies in the subcategory (see list in Table 1). These questions include one asking what the respondent feels is the best response to crime
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and one measuring opinions toward funding increased expenditures for education. The last two questions, about the ideal size of a cigarette tax increase and a question about aid given to Israel, unpack the broad policy into ordinal constituent parts that vary by magnitude. One question about the appropriate response to a drought includes a treatment of each variety. I expect that the former variety should provide the strongest test of the hypothesized causal mechanism since the unpacked proposals that differ only in order of magnitude do not prime an otherwise unavailable proposal.

<<Table 2A-2F About Here>>

A. Crime Solutions

Questionnaire: National; first question.

Control set of answers (three categories): community programs, more police officers or lengthen jail time.

Treatments:

1) Replace “community programs” with “After school programs…” and “Increase… neighborhood watch.”

2) Replace “more police officers” with “hire more local officers” and “hire more FBI agents.”

3) Replace “lengthen jail time” with “longer mandatory sentences” and “make repeat offenders ineligible for parole.”

Results: In two out of three treatments, support for proposals exceeded support for category. See Table 2A.

Fighting crime is a familiar topic. While the broad categories of crime prevention and enforcement are well-known, specific proposals are not very salient. In the control, prevention
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programs got support from 77% of the sample, more police was chosen by 8.7% and longer jail sentences by 14.3% of the sample.

Two of the three treatments provided evidence in favor of the hypothesis. When “lengthen jail time” was unpacked into “longer mandatory jail sentences” and “making repeat offenders ineligible for parole,” the two options were chosen by 31.2% of the sample, more than double the support of the broad category (Pearson $X^2 = 29.0, P < 0.01$). When “more police officers” was replaced by “hire more local police officers” and “hire more federal officers,” 14.2% of the sample chose one of the two specific options, a 75% increase over the control category ($X^2 = 5.1, P < 0.1$). However, when two different community programs were presented, “after school programs” and “an increase in neighborhood watch,” the sum of the two prevention programs was 74%, less than the broad category of 77%.

B. School funding: Lottery or taxes

Questionnaire: State; first question.

Control set of answers (two categories): establish a state lottery or raise taxes.

Treatment: Replace “raising taxes” with “raising the state sales tax,” “raising the state income tax” or “raising the state cigarette tax.” Three other conditions provided only one of these specific tax increases.

Results: Support for three specific tax proposals exceeded support for category. See Table 2B.

The survey question told respondents that advocates for increased spending on education have proposed “several different ways raising money” for education, but did not specify what those different alternatives were. The respondent was asked to identify which one he or she liked the most.
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In the control, with a dichotomous choice, 22.2% of the sample chose to raise taxes over a lottery. Consistent with my expectations, when three possible tax increases were presented, 41.1% chose one of the three taxes over the establishment of a lottery. The difference was significant at \( P < 0.01 \) (\( \chi^2 = 15.27 \)). Most of the supporters of increased taxes, 27.4% of the sample, chose cigarette taxes.

Some respondents saw a version of this question that replaced the broad category with only one of the specific tax increases. When only raising the cigarette tax was proposed, 29.6% supported this tax increase, about the same amount as supported the tax in the unpacked choice set with all three taxes. When just a sales tax increase and just an income tax increase were presented to randomly selected respondents, the percent of the sample choosing to increase taxes rather than establish a lottery were slightly smaller than the broad category, “raising taxes.” The distribution of smokers (measured by a question asking how often the respondent purchases cigarettes) did not vary across the conditions so we can be confident that the differences are not driven by more smokers in one condition.

C. Drought Response

Questionnaire: Both; third question to state respondents, last question to national respondents.

Control set of answers (two categories): Increase taxes on high levels of water use; set guidelines for when people can use water and/or what they can use the water for.

Alternative version replaced “guidelines” with “stop people from watering their lawns more than three times a week.”

Treatments:

1) Replace “guidelines for water use” with “stop people from watering their lawns more than three times a week” and “stop people from watering... in the middle of the day.”
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2) Replace “guidelines for water use” with “stop people from watering lawns more than three times a week” and “stop people from watering more than once a week.”

Results: Sum of support for two specific restrictions exceeds support for broad category. See Table 2C.

The drought response question asked respondents to identify the best way to reduce water consumption next summer to avoid the drought conditions of the previous summer. In the control, about 65% of both the national and the state respondents chose “guidelines” over a tax increase. A similar percentage, 69%, preferred a restriction on the frequency of watering lawns over a tax increase in a dichotomous choice, suggesting that there was little difference between describing the option as “guidelines” or “restrictions.”

When the restrictions were unpacked in the treatments, between 69.5% and 81.3% of respondents chose a restriction. In the first treatment, with a restriction on frequency and a restriction on the timing of watering, 77.4% of the national respondents chose one of the two restrictions. 81.3% of the respondents in the state sample chose one of the two restrictions. Both of these responses were statistically significantly different than the control at P < 0.01. In the treatment with two sets of restrictions on the frequency of watering, 69.5% of state respondents and 75.2% of national respondents chose one of the restrictions as the best way to reduce water consumption. The differences between the treatment and the control on the state survey were not significant, but the differences on the national survey were significant at P < 0.05 (X² =4.3).

Another condition replaced the broad “set guidelines” option with the specific restriction on watering lawns more than three times a week. Responses in this condition were almost
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identical to responses to the control. Marginally more of the national and state respondents, 69% and 66.7% respectively, chose the specific option of stopping people from watering their lawn. Because the packed, broad category has almost the same level of support as one specific policy, it is telling that the effect of unpacking is very similar to the effect of adding another, similar policy option.

D. Cigarette Tax Bill
Questionnaire: State; last question to half of respondents.
Control set of answers (four categories): Support for a bill calling for an increase in the state cigarette tax by 35 cents, support for a bill increasing the tax by 70 cents; neither bill and either bill.
Treatment: Replace “neither bill” into “neither one, the state should not increase the cigarette tax by as much as 35 cents,” and “neither one, the state should increase the cigarette tax by more than 70 cents.”
Results: Support for two “neither” options exceeded support for vague “neither” in the control. See Table 2D.

The question about cigarette taxes explained that the current tax was a nickel and the state legislature was considering two new taxes, one that would raise the tax by 35 cents, and a second that would raise the tax by 70 cents.

In the control, 21.1% of the respondents chose “neither.” In the treatment, 16.7% of the respondents thought that the state should not increase the tax by as much as 35 cents. 18.8% of the respondents in the same treatment thought that the state should increase the cigarette tax by more than 70 cents. Put together, 35.4% chose “neither,” about two-thirds more
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responses than in the control condition. The difference between the two sets of answers was significant at $P < 0.1$ ($X^2 = 6.71$).

**E. Cigarette Tax Increase**

Questionnaire: State; last question to half of respondents.

Control set of answers: No tax increase, 10 cent increase, 35 cent increase, more than 35 cent increase.

Treatments:

1) Replace “more than 35 cents…” with “50 cents,” “70 cents,” and “more than 70 cents”

2) Replace “more than 35 cents…” with “70 cents” and “more than 70 cents.”

Results: Small, insignificant increase in support for a large tax increase in Treatment 2 (with three options). A decrease in support for a large tax increase in Treatment 1 (with only a pair of options). See Table 2E.

Instead of the cigarette bill question, half of the state sample saw a different question on the same topic of cigarette taxes. This question did not specifically mention the bills pending in front of the North Carolina General Assembly. Respondents could indicate how much of an increase in tax that they might favor from a list of different increases, ranging from “no increase” to more than 70 cents. Instead of “more than 35 cents a pack,” two treatments allowed respondents to choose from more specific options, ranging from a 50 cent increase to an increase of “more than 70 cents a pack.”

In every treatment, the modal response was support for the largest possible increase. In the control, 54.7% of all respondents indicated they supported an increase of more than 35 cents. In the treatments, 57.7% supported a tax increase of greater than 35 cents when offered
options of 50, 70 and more than 70 cent increases. Support for a large increase in cigarette
taxes was lower, only 51.9%, when respondents could choose from just two options, “70
cents” and “more than 70 cents”. Not surprisingly, these small three percentage point
differences are not statistically significant.

F. Aid to Israel

Questionnaire: National; appeared as third out of five questions.

Controls

A) (three categories) Reduce aid to Israel, keep it the same, increase amount of aid.

B) Replace “increase aid” with “increase aid by less than $4 billion,” or “increase amount
of aid by requested $4 billion.”

Treatment: Replace “increase aid by less than $4 billion” with “increase aid by $1 billion or
less”, “increase aid by $1-3 billion.”

Results: Sum of support for increasing aid exceeded broad category in Control A. However,
the level of support for increasing aid by less than $4 billion declined in the treatment
when compared to Control B. See Table 2F.

This question item asked respondents to provide their opinions about a request from the
Israeli government on the eve of the invasion of Iraq for $4 billion in additional aid in case
Saddam Hussein attacked Israel. The question explained to respondents that this would be in
addition to $3 billion in aid already given, but some critics advocated ceasing aid until Israel
withdraws from its occupied territories. In one control set of answers (Control A),
respondents could choose to reduce the amount of aid given to Israel, keep it the same or

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2 Each treatment pooled together two similar answer sets that also varied the number of tax increase options ranging from five
to ten cents a pack. I find similar effects without pooling together the treatments. Support for a large tax increase was
supported by 65.2% in one treatment with seven options (including 50 cents, 70 cents and more than 70 cents), and by 56.6%
in one treatment with six options (including 70 cents and more than 70 cents). There differences were insignificant ($X^2 = 3.2
and 3.3, respectively).
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increase aid. In Control B, the options of increasing the amount of aid to Israel were unpacked into two more specific levels: “increasing the amount of aid given to Israel by $4 billion,” and “increase the amount of aid to Israel by less than $4 billion.” In the treatment, the answer “increase support by less than $4 billion” is unpacked with two specific levels of aid increases.

In Control A, 13.8% of the respondents chose increasing aid to Israel. 49.1% supported decreasing aid, and 37.1% supported maintaining current aid levels. In Control B, increasing aid by less than $4 billion was nearly as popular as the original, unpacked category, “increase aid.” 11.3% of the respondents chose to partially fulfill Israel’s request. 9.6% chose to increase the aid by the full amount. The difference between Control A and Control B was significant at P < 0.01 ($X^2 = 11.3$).

Table 3 Summary of Results

<table>
<thead>
<tr>
<th>Question</th>
<th>Total Treatments</th>
<th># of treatments where support for unpacked policies exceeded support for packed policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crime Solutions</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>School Funding:</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Lottery or taxes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drought response</td>
<td>2 on each survey</td>
<td>4^</td>
</tr>
<tr>
<td>Cigarette tax bill</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Cigarette tax increase</td>
<td>2</td>
<td>1^</td>
</tr>
<tr>
<td>Aid to Israel</td>
<td>1*</td>
<td>0</td>
</tr>
</tbody>
</table>

*Two control conditions in Aid to Israel. Treatment did not exceed support for packed category in Control B.
^On the drought and cigarette tax increase questions, one treatment where support for unpacked policies exceeded support for packed policy (subadditivity), the proportion was not significantly different than the control.

Contrary to my expectations, in the treatment, support for increasing aid (14.8%) increased by only one percentage point compared to the Control A. 2.3% of the respondents chose the

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^Surprisingly, the increased support for the option of partially fulfilling Israel’s request cannot be explained solely through a substitution effect. Support for the full amount of the request is less than support for increasing aid in the control, but support for maintaining the current levels of aid was virtually unchanged. Instead, support for reducing aid dropped.
smallest increase, 5.1% chose the intermediate increase and 7.4% chose the full amount. Support for the two specific levels of partially fulfilling the Israeli request, 7.4%, was less than support for the broader category (11.3%) found in Control B.

6. Discussion: Information Effect
Neither McFadden’s (1974) nested choice models nor Luce’s (1959) axiom allow for the possibility that the substitution of the constituting components for the broad category should cause these components, in the aggregate, to be more popular than the broad category. These policy questions demonstrate the presence of subadditivity in public opinion questions across a range of different topics.

In Table 3, I provide a summary of results. There is a stark difference in response patterns between the questions that unpacked answers into varying levels of magnitude such as the size of a tax increase or the size of an increase in aid to Israel, and those whose unpacked categories varied substantively from other options within the same category. Unpacking the category with such substantively different options were expected to increase the number of responses by increasing the availability of one or more of the unpacked options. Consistent with our hypothesis, the data indicate that subadditivity occurred when the subcategories varied substantively. The only exception was one treatment on the crime solution item where two community programs failed to increase support for the broad category of community prevention programs. This exception is likely due to the distribution of opinions towards the idea of community programs generally and the relative popularity of after-school programs.

The responses to the cigarette tax bill and tax increase for education questions are important reminders that making information more available is not the same as providing new information. On the cigarette tax bill question, the two “neither” answers reminded
respondents that a choice of “neither” could mean that the increases are too much or too little. It is implausible to think that a respondent was unaware that “neither” could mean too much and too little. It is much more likely that some respondents simply didn’t consider both possible angles of “neither.”

Without making information more available, thinking about the broader policy might be dominated by constituent policies that the respondents does not support. When I substituted “raise the income tax” for “raise taxes,” 20.3% of respondents chose income tax over a lottery, almost the same percentage of those who selected the broad category. When I substituted “raise the sales tax” for “raise taxes,” 16.7% preferred the tax increase over instituting a lottery. The similarity in responses between these conditions and the control suggest that people were thinking about sales and income taxes when answering in the control condition. The possibility of a cigarette tax did not appear to be widely considered by those who chose between the broad “raise taxes” and a lottery. The large increase in support for a tax rather than a lottery occurred when people were reminded of a policy in that category, a cigarette tax increase, that they supported more than a lottery.

The results of the answers to the drought response question are particularly illustrative because the options provided were not exhaustive of the broad category. Other possible guidelines or restrictions can be imagined, but both sets of proposals still exceeded support for the broad category. This is similar to what Schuman and Scott (1987) found when comparing open-ended questions to questions that included some closed-ended responses. In that study, closed-ended questions sharply focused attention on the alternatives explicitly offered to the respondents, even when they had an option of choosing to volunteer a different answer.
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The unpacking effect was less strong (or absent) when the unpacked categories only varied by magnitude or extended the range of possible options (Parducci 1995), on questions like the appropriate size of a cigarette tax increase, an increase in aid to Israel or how often people should be restricted from watering their lawns. This does not rule out the possibility that extending the range might make more extreme options more available, or that changing the category range might affect responses by influencing which category appears to be the middle response category (Asher 2007). However, these theories were not supported by the data from this experiment.

I also collected data to see if the array of options reduced the difficulty of making a choice (Pettibone and Wedell 2000), which may have made certain options more desirable. There was no evidence that this was the case as the level of difficulty rarely varied across conditions. If difficulty is related to uncertainty over which option is actually preferred, then this is no evidence that there was much uncertainty associated with the broad, packed categories or with the task of choosing from the many unpacked possibilities.

7. Conclusion

The results of this between-subject analysis allow me to reject the null hypothesis. Unpacking a broad political category into specific policy proposals leads to subadditivity when those proposals make available new information. These results are similar to those found by scholars who study how people make predictions. The causal mechanism, a change in what information is available to the decision-maker at the time of the choice, is consistent with Zaller and Feldman’s (Zaller and Feldman 1992) accessibility axiom. It is also the same as the one identified in support theory (Tversky and Koehler 1994) to explain partitioning effects.
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In many ways, the problem of unavailable information is similar to a lack of information for survey researchers, but the symptoms of unavailable information may be less readily identifiable. When there is a lack of information, researchers must grapple with door-step opinions and other symptoms of non-attitudes. When information is unavailable, there is little reason to doubt the validity of the articulated response, but this study highlights that making different information available could lead to a choice inconsistency. This has already been documented in studies of question order, question wording and priming effects (Tourangeau and Rasinski 1988). This study should also remind researchers to also be attentive to how the set of possible answers influences choice behavior. These results are further evidence that even if the respondents are treating the question items as a mechanism for revealing their true preferences, their answers are very much dependent on what alternatives are provided to them (see also Schuman and Scott 1987).

These findings create challenges for survey designers hoping to measure public opinion. Unpacking broad policy options will likely cause surveys to be longer and potentially take more time for respondents to answer, an undesirable scenario for many survey researchers. However, caution is required because omitting specific possibilities will underestimate support for the broad category, and therefore could overestimate support for other options. By making more information available, these detailed answer sets could also decrease the uncertainty surrounding some answers.

These findings have important implications for politicians, and campaign strategists. Politicians must decide how vague (or how specific) to make their positions. Talking about multiple, specific proposals to increase the number of police officers may attract more supporters than just vague promises to hire more police. The cigarette tax bill results are particularly interesting
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for opponents of proposals and legislation. The number of people dissatisfied with all competing proposals may be underestimated if people are just asked if they do not like any of the proposals. Being more specific about what is disliked would better estimate the size of the population that would prefer a novel proposal to any of the ones on the table. Opponents of the existing proposals could use this information to show the unpopularity of the governing parties’ proposals. Conversely, those who desire any action over inaction would be best to keep the opposition category as vague and as ill-defined as possible.

These results demonstrate that on certain policy questions, people do not behave as if they were using a nested model of decision-making and grouping similar proposals together. Their answers are guided by whatever is the set of possible answers to the opinion question. More research should be done into the circumstances under which people might first group options when articulating their policy preferences, and when all of the options are considered together.

All of the questions in this study asked respondents to choose their favorite or the best option. Future research might consider a design that allows respondents to identify which proposals they would support and allow multiple responses. Gaining the opinion of other options in the choice set would enable researchers to gauge whether all of the unpacked options are more popular than the packed options, or whether just one component (like the cigarette tax) is more popular.
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Reference List


Subadditivity and the Unpacking Effect in Political Opinions


Table 2A: Crime Solutions

These days, many people are talking about how to reduce crime in our communities. Some think we should focus on preventing crimes before they occur through community programs. Some think that we need to do a better job of enforcing the laws by hiring more police officers. Others think that we need to keep criminals off the street by imposing longer and tougher jail sentences. What do you think should be your community’s priority?

<table>
<thead>
<tr>
<th>Control</th>
<th>%</th>
<th>Unpacked “Community Programs”</th>
<th>%</th>
<th>Unpacked “Hire Police”</th>
<th>%</th>
<th>Unpacked “Jail Time”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community programs aimed at preventing crime.</td>
<td>77.0</td>
<td>After school programs to keep kids out of trouble. (62.0%)</td>
<td>74.4</td>
<td>Community programs aimed at preventing crime.</td>
<td>73.8</td>
<td>Community programs aimed at preventing crime.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increase the number of neighborhood watch programs (12.4%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hire more police officers.</td>
<td>8.7</td>
<td>Hire more police officers.</td>
<td>9.3</td>
<td>Hire more local police officers. (11.9%)</td>
<td>14.3</td>
<td>Hire more police officers.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Hire more federal officers, such as FBI agents. (2.4%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lengthen jail time to keep criminals off the street.</td>
<td>14.3</td>
<td>Lengthen jail time to keep criminals off the street.</td>
<td>16.3</td>
<td>Lengthen jail time to keep criminals off the street.</td>
<td>11.9</td>
<td>Longer mandatory jail sentences for criminals. (16.0%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Make repeat offenders ineligible for parole. (15.2%)</td>
</tr>
</tbody>
</table>

N = 126, df = 2

N = 129, X² = 0.6, P = 0.75

N=126, X² = 5.1, P =0.08

N = 125, X² = 29.04 , P =0.00

Table 2B: School funding: Lottery or taxes

Advocates for increased spending on education in North Carolina have proposed raising more money for schools by creating a lottery or by raising taxes. Several different ways of raising more money have been suggested. Which of these ways do you like the most?

<table>
<thead>
<tr>
<th>Control</th>
<th>%</th>
<th>Unpacked “Raising Taxes”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Establishing a state lottery.</td>
<td>77.8</td>
<td>Establishing a state lottery.</td>
</tr>
<tr>
<td>Raising taxes.*</td>
<td>22.2</td>
<td>Raising the state sales tax. (5.5%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Raising the state cigarette tax. (27.4%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Raising the state income tax. (8.2%)</td>
</tr>
</tbody>
</table>

N = 72, df = 1

N = 73, X² = 15.27 , P = 0.00

* Three other conditions replaced this category with one of the three “unpacked” tax increases. A sales tax increase was supported over a lottery by 16.7%, an income tax increase was supported by 20.3%, and a cigarette tax increase was supported by 29.6%.
Table 2C: Drought Response

During the summer, many parts of our country suffered a severe drought, leaving many sources of safe drinking water at dangerously low levels. Of the following options, what would be the best way to reduce water consumption next summer to ensure the problem will not happen again?

<table>
<thead>
<tr>
<th>Control</th>
<th>Nat'l %</th>
<th>State %</th>
<th>Unpacked “Restrictions” A</th>
<th>Nat'l %</th>
<th>State %</th>
<th>Unpacked “Restrictions” B</th>
<th>Nat'l %</th>
<th>State %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase taxes on high levels of water use to make using lots of water very expensive.</td>
<td>34.6</td>
<td>35.0</td>
<td>Increase taxes on high levels of water use to make using lots of water very expensive.</td>
<td>22.7</td>
<td>18.8</td>
<td>Increase taxes on high levels of water use to make using lots of water very expensive.</td>
<td>24.8</td>
<td>30.5</td>
</tr>
<tr>
<td>Set guidelines for when people can use water and/or what they can use the water for.*</td>
<td>65.4</td>
<td>65.0</td>
<td>Stop people from watering their lawns more than three times a week. (51.6%, 63.8%)</td>
<td>77.4</td>
<td>81.3</td>
<td>Stop people from watering their lawns more than three times a week. (39.6%, 39.0%)</td>
<td>75.2</td>
<td>69.5</td>
</tr>
</tbody>
</table>

* Presented as the last option in the answer set (after “either bill”).

$X^2_n$ Calculated using actual N’s, $X^2_p$ calculated using percentages (as if N of control=N of conditions [80, 82]).

Table 2D: Cigarette Tax Bill

The state tax on cigarettes in North Carolina is currently five cents per pack. The average state tax on cigarettes is about 45 cents per pack. Some states have cigarette taxes as high as $1.50 per pack. There are currently two bills in the North Carolina state legislature proposing cigarette tax increases. One suggests raising the tax by 35 cents per pack, the other calls for raising the tax by 70 cents per pack. Which proposal would you support?

<table>
<thead>
<tr>
<th>Control</th>
<th>%</th>
<th>Unpacked “Neither one”</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neither one.</td>
<td>21.1</td>
<td>Neither one: the state should not increase the cigarette tax by as much as 35 cents. (16.7%)</td>
<td>35.4</td>
</tr>
<tr>
<td>35 cents per pack increase.</td>
<td>22.8</td>
<td>35 cents per pack increase.</td>
<td>20.8</td>
</tr>
<tr>
<td>70 cents per pack increase.</td>
<td>42.1</td>
<td>70 cents per pack increase.</td>
<td>29.2</td>
</tr>
<tr>
<td>Either bill.</td>
<td>14.0</td>
<td>Either bill.</td>
<td>14.6</td>
</tr>
</tbody>
</table>

*N = 57, df = 3  
$X^2_n$ Calculated using actual N’s, $X^2_p$ calculated using percentages (as if N of control=48).
### Table 2E: Cigarette Tax Increase

The state tax on cigarettes in North Carolina is currently five cents per pack. The average state tax on cigarettes is about 45 cents per pack. Some states have cigarette taxes as high as $1.50 per pack. There has been talk of increasing the tax on cigarettes in North Carolina to help balance the state budget. How much of an increase would you favor?

<table>
<thead>
<tr>
<th>Control</th>
<th>%</th>
<th>Unpacked “More than 35 cents”</th>
<th>A</th>
<th>%</th>
<th>Unpacked “More than 35 cents”</th>
<th>B</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No increase.</td>
<td>15.1</td>
<td>No increase.</td>
<td>27.3</td>
<td>No increase.</td>
<td>16.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 cents more per pack.</td>
<td>11.3</td>
<td>5 / 10 cents more per pack</td>
<td>6.6</td>
<td>5 / 10 cents more per pack</td>
<td>16.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35 cents more per pack.</td>
<td>18.9</td>
<td>35 cents more per pack</td>
<td>14.1</td>
<td>35 cents more per pack</td>
<td>9.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than 35 cents per pack.</td>
<td>54.7</td>
<td>70 cents more per pack (3.8%)</td>
<td>51.8</td>
<td>50 cents more per pack (6.2%)</td>
<td>57.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>More than 70 cents per pack (48.1%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

N = 53

* Separate conditions pooled, one condition included a 5 cent and 10 cent option, the other answer set only included 10 cent option.

### Table 2F: Aid to Israel

Israel recently asked the U.S. government for loan guarantees and an extra $4 billion in aid to help pay for the cost of preparing Israel’s defenses in case Saddam Hussein attacked Israel during the War on Iraq. This money is in addition to the $3 billion the U.S. government already gives Israel each year. Some critics think that the U.S. government should stop aiding Israel until Israel withdraws from the occupied territories in the West Bank and the Gaza Strip. What do you think the U.S. government should do?

<table>
<thead>
<tr>
<th>Control A</th>
<th>%</th>
<th>Control B (“Less than amount requested” added)</th>
<th>%</th>
<th>Unpacked “Increase amount of aid”</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce the amount of aid given to Israel.</td>
<td>49.1</td>
<td>Reduce the amount of aid given to Israel</td>
<td>41.8</td>
<td>Reduce the amount of aid given to Israel</td>
<td>43.8</td>
</tr>
<tr>
<td>Keep the amount of aid given to Israel the same as it has been.</td>
<td>37.1</td>
<td>Keep the amount of aid given to Israel the same as it has been.</td>
<td>37.3</td>
<td>Keep the amount of aid given to Israel the same as it has been.</td>
<td>41.5</td>
</tr>
<tr>
<td>Increase the amount of aid given to Israel.</td>
<td>13.8</td>
<td>Increase aid to Israel, but by less than the $4 billion requested by Israel.</td>
<td>11.3</td>
<td>Increase the amount of aid given to Israel by $1 billion or less (2.3%)</td>
<td>7.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increase the amount of aid given to Israel by $1 billion – $3 billion (5.1%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increase the amount of aid given to Israel by $4 billion.</td>
<td>9.6</td>
<td>Increase the amount of aid given to Israel by $4 billion.</td>
<td>7.4</td>
</tr>
</tbody>
</table>

N = 159

N = 177, Compared to Control A: $X^2_p = 8.28$, P = 0.02

N = 176, Compared to Control A, df=2: $X^2_p = 2.03$, P = 0.36; Control B, df=3: $X^2_p = 4.26$, P = 0.24

* Calculated using percentages (as if N=100) with one degree of freedom, not actual N’s. Large differences in N’s between conditions and some large between-condition differences in the number of responses in categories that did not vary across the conditions caused misleading results when using full set of responses and actual N’s.
## Appendix: Description of Sample

### How closely do you follow the news about state government budget and tax increases?

<table>
<thead>
<tr>
<th></th>
<th>National Sample</th>
<th>State Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Obs.</td>
<td>Percent</td>
</tr>
<tr>
<td>Not closely</td>
<td>34</td>
<td>6.56</td>
</tr>
<tr>
<td>Not very</td>
<td>150</td>
<td>28.96</td>
</tr>
<tr>
<td>Somewhat</td>
<td>223</td>
<td>43.05</td>
</tr>
<tr>
<td>Very</td>
<td>111</td>
<td>21.43</td>
</tr>
<tr>
<td>D/K</td>
<td>2</td>
<td>0.55</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>518</td>
<td></td>
</tr>
</tbody>
</table>

### Political Knowledge (Objective Measure)

<table>
<thead>
<tr>
<th># of correct answers</th>
<th>Obs.</th>
<th>Percent</th>
<th>Obs.</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Correct</td>
<td>78</td>
<td>14.94</td>
<td>92</td>
<td>25.41</td>
</tr>
<tr>
<td>1 Correct</td>
<td>101</td>
<td>19.35</td>
<td>57</td>
<td>15.75</td>
</tr>
<tr>
<td>2 Correct</td>
<td>176</td>
<td>33.72</td>
<td>140</td>
<td>38.67</td>
</tr>
<tr>
<td>3 Correct</td>
<td>167</td>
<td>31.99</td>
<td>73</td>
<td>20.17</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>522</td>
<td></td>
<td>362</td>
<td></td>
</tr>
</tbody>
</table>

### Party Identification

<table>
<thead>
<tr>
<th></th>
<th>Obs.</th>
<th>Percent</th>
<th>Obs.</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Democrat</td>
<td>193</td>
<td>36.97</td>
<td>164</td>
<td>44.93</td>
</tr>
<tr>
<td>Lean Democrat</td>
<td>66</td>
<td>12.64</td>
<td>34</td>
<td>9.32</td>
</tr>
<tr>
<td>Independent</td>
<td>76</td>
<td>14.56</td>
<td>54</td>
<td>14.79</td>
</tr>
<tr>
<td>Lean GOP</td>
<td>31</td>
<td>5.94</td>
<td>17</td>
<td>4.66</td>
</tr>
<tr>
<td>Republican</td>
<td>156</td>
<td>29.89</td>
<td>96</td>
<td>26.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>522</td>
<td></td>
<td>365</td>
<td></td>
</tr>
</tbody>
</table>

### Education

<table>
<thead>
<tr>
<th></th>
<th>Obs.</th>
<th>Percent</th>
<th>Obs.</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No high school</td>
<td>7</td>
<td>1.36</td>
<td>7</td>
<td>1.96</td>
</tr>
<tr>
<td>High School</td>
<td>27</td>
<td>5.26</td>
<td>36</td>
<td>10.08</td>
</tr>
<tr>
<td>Some college</td>
<td>58</td>
<td>11.31</td>
<td>100</td>
<td>28.01</td>
</tr>
<tr>
<td>2-year College</td>
<td>25</td>
<td>4.87</td>
<td>27</td>
<td>7.56</td>
</tr>
<tr>
<td>4-year College</td>
<td>142</td>
<td>27.68</td>
<td>87</td>
<td>24.37</td>
</tr>
<tr>
<td>Advanced Ed.</td>
<td>254</td>
<td>49.51</td>
<td>100</td>
<td>28.01</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>513</td>
<td></td>
<td>357</td>
<td></td>
</tr>
<tr>
<td></td>
<td>National Sample</td>
<td>State Sample</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------</td>
<td>--------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>250 48.64</td>
<td>160 44.32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>264 51.36</td>
<td>201 55.68</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>514</td>
<td>361</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>413 80.19</td>
<td>251 69.92</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>57 11.07</td>
<td>80 22.28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>27 5.24</td>
<td>19 5.29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latino</td>
<td>18 3.50</td>
<td>9 2.51</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>515</td>
<td>359</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Income</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; $20,000</td>
<td>43 8.83</td>
<td>47 13.62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$20-39,999</td>
<td>55 11.29</td>
<td>39 11.30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$40-59,999</td>
<td>60 12.32</td>
<td>58 16.81</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$60-79,999</td>
<td>52 10.68</td>
<td>56 16.23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$80-99,999</td>
<td>75 15.40</td>
<td>56 16.23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; $100,000</td>
<td>202 41.48</td>
<td>89 25.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>487</td>
<td>345</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Geographic Breakdown</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>National Sample</td>
<td></td>
<td>State Sample</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Obs. Percent</td>
<td>Freq. Percent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NC</td>
<td>96 18.6</td>
<td>NC 313 90.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IL</td>
<td>61 11.8</td>
<td>Others 34 0.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PA</td>
<td>56 10.9</td>
<td>Total 347</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OH</td>
<td>44 8.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NY</td>
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