

IT'S GOOD TO BE FIRST: ORDER BIAS IN READING AND CITING NBER WORKING PAPERS

Daniel Feenberg, Ina Ganguli, Patrick Gaulé, and Jonathan Gruber*

Abstract—When choices are made from ordered lists, individuals can exhibit biases toward selecting certain options as a result of the ordering. We examine this phenomenon in the context of consumer response to the ordering of economics papers in an e-mail announcement issued by the NBER. We show that despite the effectively random list placement, papers listed first each week are about 30% more likely to be viewed, downloaded, and subsequently cited. We suggest that a model of “skimming” behavior, where individuals focus on the first few papers in the list due to time constraints, would be most consistent with our findings.

I. Introduction

IN the canonical economic model, choices are made from sets. However, as emphasized by Rubinstein and Salant (2006), choices are often instead made from lists. This appears to be increasingly true as individuals search for information and goods online where choices are naturally presented as a list. Consumers make fewer and fewer choices in brick-and-mortar establishments where pairs of goods are naturally compared, and instead turn to online marketplaces where they are presented with a list of choices from which to pick. Similarly, the practice of going through physical libraries to browse through stacks of books and journals arranged by topic has largely been replaced by searching databases or the web with keywords, and typically selecting from a list of results.

The fact that individuals are choosing from a list raises the distinct possibility that list ordering matters. In some settings there may be a primacy effect, where individuals are biased toward selecting items listed early, which can arise because of cognitive fatigue, serial position effects on memory, or satisficing behavior when options are considered similar and continued search is at all costly. Or, there may be a recency effect biasing toward items later in the list due to biased processing of earlier versus later information. Evidence of order effects has been found in a variety of areas ranging from multiple-choice testing, to elections, judging contests, school admissions, asset trading, and pension fund investments (see Miller & Krosnick, 1998; Jurajda & Münich, 2010; Hartzmark, 2014; Danziger, Levav, & Avnaim-Pesso, 2011; Karlsson, Massa, & Simonov, 2006).

In this paper, we investigate list ordering effects in a particularly interesting context: search for research papers. We

focus on measures of consumer response to the ordering of economics papers in an e-mail announcement issued by the NBER. The NBER disseminates cutting-edge economics research through its working papers series. Each Monday morning, the NBER issues a New This Week (NTW) e-mail that lists all of the working papers that have been issued in the past week. This e-mail goes to more than 23,000 subscribers, both inside and outside academia. Papers are listed based on the order in which they were received and processed through the various filters that are required of authors. Since the order of receipt and the extent of delay is impossible to predict ex ante, this is a process that is essentially impossible to game. Indeed, the employees responsible for constructing this e-mail view themselves as generating these lists randomly, and, as we document, paper ranking in this e-mail is effectively random with respect to most observable characteristics.

We build a database that matches each week's NTW ranking of papers with information on paper abstract views (we refer to them as “hits”), PDF downloads, and forward citations. The first two are available over the 2013–2014 period, while for citations, we use the 2012–2013 period (to allow citations to accrue).

Our findings are striking: despite the effectively random allocation of papers to the NTW ranking, we find much higher hits, downloads, and citations of papers presented earlier in the list. The effects are particularly meaningful for the first paper listed, with a 33% increase in views, a 29% increase in downloads, and a 27% increase in citations from being listed first. For measures of downloads and hits, although not for citations, there are further declines as papers slide down the list. However, the last position is associated with a boost in views and downloads. The results are robust to a wide variety of specification checks and are present for all subscribers, as well as those from academic institutions. We also find some evidence that the effect of being first is stronger when the list is longer but weaker during the summer, when subscribers may be less busy.

We interpret our results in light of several potential models of readership behavior, including satisficing behavior and rising marginal costs of reading due to cognitive fatigue or time constraints. We suggest that a model of skimming, where individuals focus on the first few papers in the list due to time constraints, is most consistent with the empirical evidence.

This paper builds on prior research on order effects in scientists' citation behavior, such as Huang (2015) for ordering in science journal reference lists based on the primary author's surname initials; Haque and Ginsparg (2009) for astrophysics and high energy physics papers disseminated on arXiv; and Berger (2016) for articles appearing

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* Feenberg: NBER; Ganguli: University of Massachusetts Amherst; Gaulé: CERGE-EI; Gruber: MIT and NBER.

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earlier in a social psychology journal. But these papers suffer from potential manipulation by authors or editors.¹ Most related to our work is a paper by Novarese and Wilson (2013) that looks at order effects in research paper downloads (but not citations). They find that papers randomly listed first in lists of new papers from Research Papers in Economics (RePEc) receive more downloads and that the effect is stronger when the lists are longer. However, the interpretation of their results is complicated by the fact that papers in these announcements are normally presented in descending order of estimated value, so there is a natural bias toward primacy effects. We also note that these announcements are not widely read: the average number of downloads in their sample is 5, while in our sample, mean downloads is 195. For these reasons, the effect of list placement on paper visibility remains an open question.

The paper proceeds as follows. Section II discusses the NBER working paper process. Section III describes our data and empirical strategy. Section IV discusses models of NBER readership behavior. Section V presents the results. Section VI concludes.

II. The NBER Working Paper Process

Each Monday morning (EST), the more than 23,000 subscribers to the New This Week (NTW) e-mail receive that week's paper listings.² Appendix B lists the format for a typical week. Papers are listed in order of working paper number.³ The top of the e-mail lists the paper titles and links to a web page for that working paper (as shown in appendix B), while the remainder of the e-mail provides full abstracts and the web links for each paper. The link leads directly to the web page specific to that working paper, which includes the abstract and a link to a PDF of the fulltext of the paper and other summary information. While everyone can view the web page, free full-text PDF downloads are restricted to individual and institutional subscribers to the series, corporate associates, journalists, federal government employees and military personnel, and residents of developing countries.⁴ The number of papers per week varied from 7 to 45 during the 2013–2014 period, with a mean of 20.3 and a median of 19.5.

The working paper process proceeds as follows. After a paper is submitted to the NBER publications department,

¹ We review this order effects literature more extensively in the working paper version of this paper (Feenberg, Ganguli, Gaulé, & Gruber, 2015).

² One restriction to our data is that only about half the subscribers to NTW get the full list of papers, while the other half select the topics or keywords for which they want notification (see <http://www.nber.org/prefs/notify>). A paper may therefore be ranked higher on a selected list than it is on the general list, but not lower. Unfortunately, we cannot match our outcomes of interest to the rank on the selected list. But the ability to create specialized lists should bias our results downward by creating noise in the true ranking.

³ As of September 2015, the order of appearance was changed to be randomized in each individual announcement.

⁴ Details available at <http://www.nber.org/help/wp/free.html>.

the NBER staff check whether a number of criteria are met, including that the paper has not been published elsewhere, that the NBER's disclosure policy has been read by all authors and they have accordingly disclosed sources of research funding and financial relationships that bear on their research, and that the paper does not "make policy recommendations or offer normative judgment about policies." Once the staff member indicates in the database that these checks have been completed, the paper is automatically assigned the next available working paper number. Papers are processed in batches between Tuesday and Thursday each week, and working papers published by Friday are then included in the e-mail announcement sent out on the following Monday.

As a result of these checks, working papers are not necessarily assigned numbers in the order in which they are submitted. In particular, delays between submission and number assignment have grown in recent years due to a more rigorous disclosure policy. In addition, in some cases, the announcement of a working paper is delayed to a subsequent week after a working paper number has been assigned.⁵

Paper ranking is correlated with submission day and with delays from submission. The former is due to the process described above, while the latter is due to the fact that if papers are delayed, they are placed earlier in the queue when they are listed. But there is no evidence that either submission date or delay is in any way chosen strategically by either the NBER or authors. We have the advantage of being able to talk directly with the NBER employee responsible for creating the working paper list. She reports no effort by the NBER to influence placement on the NTW list, and she has never received a single author inquiry about the ranking process or request for list placement.⁶

III. Data and Empirical Specification

For this project, we collected information on the rank of papers in the NTW e-mail lists over the past three years.⁷ We match papers to three outcome variables.⁸ The first two

⁵ This occurs, for instance, when authors send a revised file after a number has been assigned but before the e-mail announcement is sent out. A small number of working papers have excessive delays, of more than fifty days, presumably due to issues such as the difficulty of obtaining author permissions. We exclude these cases. Including these papers does not weaken our results.

⁶ A handful of targeted decisions were made about which working papers would receive particularly notable numbers (e.g., 15,000 or 20,000). But even in these cases, there was no effort to influence placement in the NTW list.

⁷ For about 25 papers out of the 1,800 that we use for our downloads and click-through results, they either did not appear in NTW or we do not have information on where they placed. They are excluded from the analysis.

⁸ One restriction to our data is that only about half the subscribers to NTW get the full list of papers; the other half select the topics or keywords for which they want notification (see <http://www.nber.org/prefs/notify>). A paper may therefore be ranked higher on a selected list than it is on the general list, but not lower. The ability to create specialized lists should bias our results downward by creating noise in the true ranking.

are the number of clicks from the link in the NTW e-mail to the paper’s web page (hits) and the number of downloads of the PDF file. Data on these come from 2013 and 2014 only.

The third dependent variable is the number of citations to the working paper and subsequent versions of the paper. The citations counts were collected from Google Scholar because other sources, such as Web of Science and Scopus, do not index working papers. Google Scholar aggregates citations across different versions of the same paper. We use the set of working papers announced in 2012 and 2013 for the citations analysis, as we observe only relatively few citations (yet) for papers listed in the 2014 NTW e-mails.

Using these data, we run ordinary least squares regressions of the form⁹

$$\ln(VIEW_{it}) = \alpha + \beta \times RANK_{it} + X_{it}\delta + \rho_t + \varepsilon_{it}, \quad (1)$$

where i indexes papers and t indexes weeks; $VIEW$ is some measure of the attention paid to the paper, using the three dimensions denoted above; $RANK$ is one of several measures of the paper’s ranking in the NTW e-mail; X is a set of paper-specific control variables; and ρ is a set of fixed effects for each calendar week. This specification allows us to ask, among all papers submitted in the same week, how does the placement in the NTW e-mail influence the attention that is paid to that paper?

For controls, we include the number of authors on the paper; log of the number of working paper publications from the most (working paper) published coauthor on the paper; the presence of a “star” coauthor, which is defined as having an author with a previous NBER working paper that was in the top 5% in terms of forward citations (relative to other working papers published in the same year); the number of NBER programs in which the paper is listed;¹⁰ and a set of dummies for each NBER program in which the paper is listed. In order to control for any potential concerns over endogenous placement, we also include seven daily dummies for the day of the week on which the paper was submitted (in case authors were trying to find the day of the week that generated highest placement) and the number of days delay (in case authors were hoping to use more delay to generate higher placement).¹¹

The means of our data are presented in table 1 for the 2013–2014 sample (except for citations, which come from

⁹ As a robustness check, we ran Poisson quasi-maximum likelihood regressions with similar results.

¹⁰ More information about the NBER research programs is available at <http://www.nber.org/programs/>: “The research activities of the NBER are organized into a series of twenty research programs and fifteen working groups. . . . [which] correspond loosely to traditional fields of study within the field of economics.” Each paper is assigned a program primarily based on the affiliation of the authors (for those with an NBER affiliation).

¹¹ Yogatama et al. (2011) examine how text features of NBER working papers can improve predictions about the number of downloads a paper will receive. While they find that text features improve prediction, our primary interest is the effect rank variable, so we did not pursue including text variables in our specifications.

TABLE 1.—MEANS AND STANDARD DEVIATIONS

| | Mean | Standard Deviation |
|--|--------|--------------------|
| Abstract views (“hits”) | 921.18 | 724.00 |
| Paper downloads | 195.40 | 645.01 |
| Citations ^a | 13.58 | 27.34 |
| Number of previous WPs (maximum) | 18.31 | 19.21 |
| Author count | 2.51 | 1.01 |
| Star author | 0.049 | 0.216 |
| Days of delay | 11.97 | 5.06 |
| Number of NBER programs | 2.11 | 1.22 |
| <i>Submission day</i> | | |
| Submitted Monday | 0.19 | 0.39 |
| Submitted Tuesday | 0.20 | 0.40 |
| Submitted Wednesday | 0.18 | 0.38 |
| Submitted Thursday | 0.17 | 0.37 |
| Submitted Friday | 0.15 | 0.36 |
| Submitted Saturday | 0.06 | 0.24 |
| Submitted Sunday | 0.06 | 0.24 |
| <i>NBER program</i> | | |
| Aging | 0.06 | 0.24 |
| Asset pricing | 0.11 | 0.31 |
| Corporate finance | 0.10 | 0.30 |
| Children | 0.08 | 0.26 |
| Development of the American economy | 0.07 | 0.25 |
| Development in Education | 0.13 | 0.33 |
| Environmental and Energy Economics | 0.07 | 0.26 |
| Economic Fluctuations and Growth | 0.22 | 0.41 |
| Health Care | 0.07 | 0.26 |
| Health Economics | 0.11 | 0.31 |
| International Finance and Macroeconomics | 0.10 | 0.30 |
| Industrial Organization | 0.09 | 0.28 |
| International Trade and Investment | 0.07 | 0.25 |
| Law and Economics | 0.05 | 0.22 |
| Labor Studies | 0.22 | 0.41 |
| Monetary Economics | 0.11 | 0.31 |
| Public Economics | 0.21 | 0.41 |
| Political Economy | 0.07 | 0.26 |
| Productivity, Innovation, and Entrepreneurship | 0.09 | 0.29 |
| Number of observations | 2110 | |

The sample is the set of working papers appearing in the New This Week e-mail bulletin from January 2013 to December 2014.

^aFor citations, the figure is for papers in the New This Week e-mail bulletin from January 2012 to December 2013.

the 2012–2013 sample). Appendix table A1 shows that there are no significant correlations between the rank measures and various proxies for the quality of the working paper, such as having a highly cited author or the number of programs listed. Day of submissions and the delay from submission to announcement are correlated with rank measures. However, we show in the working paper version of this paper (Feenberg et al., 2015) that day of submissions and the delay are themselves not correlated with citations. Feenberg et al. (2015) also includes a series of specification checks, including evidence that our results on being ranked first are robust to controlling for hits and downloads not originating from the NTW e-mail, as well as to restricting the sample to papers submitted on the same day as the paper listed first and restricting to the first- and second-ranked papers on the list.

IV. Models of NTW Readership

In this section, we discuss possible ways that list placement could influence the choice of which papers readers

give their attention to. We note, however, that there need not be one model for everyone: different readers may have different approaches to reading the list, with total readership reflecting a population mix.

A first possibility is that NTW subscribers inspect the titles (or abstracts) of all papers in the list and decide to examine further the subset of papers where the expected benefit of doing so exceeds a (constant) marginal cost. If the order on the list is effectively random and subscribers do not mistakenly infer quality from list placement, we would then not observe order effects.

A second possibility is that readers' behavior is satisficing. Here, readers are looking for 1 (or n) articles to select from the list to view or read. They make this choice without a full examination of available options and stop when they reach the desired number of articles to view. If readers also start from the beginning of the list and proceed down it, this will generate order effects with a gradual decline in readership as the rank in list placement increases.

A third possibility is that readers are again selecting 1 (or n) articles to view without examining all options, but the marginal cost may be increasing as readers move down the list. This could arise, for instance, from cognitive fatigue or short-term memory congestion. If readers are evaluating papers on the list with a confirmation bias (searching for reasons to pay attention to a paper), this would lead to primacy effects, while if they search for reasons to reject a paper, this would lead to recency effects. This would also generate a gradual decline (or gradual increase) in attention with increasing rank.

Another possibility is that the marginal cost of reading may be increasing not because of fatigue but because the opportunity cost of reading in terms of time is increasing. This could arise when a new activity—for instance, the arrival of a new e-mail or a colleague knocking on the door—suddenly demands attention. If readers are faced with such interruptions, we may observe skimming behavior, where certain prominent positions on the list receive disproportionate attention relative to the remaining items. Prominent positions would include the first, second, and possibly last rank on the list.¹²

A related possibility is that interruptions lead to delay in when readers view the paper. If there are serial position effects in memory, readers will be more likely to return to prominent positions in the list, and as Berger (2016) shows, order biases are likely to be greater after delay.

Finally, we note that these models may predict different behavior regarding the intensity of the attention given to a paper, which represent different marginal costs to readers (e.g., viewing an abstract is relatively cheap, but downloading and especially reading the whole paper is costly). This

may lead to stronger order effects for some of our outcomes depending on the mechanism driving the behavior.¹³

IV. Results

The behavioral models discussed in the previous section suggest that papers listed in prominent positions (first few or last) may receive more attention or that there may be a decline (or increase) in attention due to a fatigue factor if order effects are present. To test for this, we estimate equation (1) with dummies for papers in rank 1, rank 2, or the last position and a linear rank term.

Table 2 shows our basic results for hits, paper downloads, and citations.¹⁴ The most striking finding is a sizable positive effect of being ranked first across all outcomes. Specifically, we find that being ranked first leads to 33% more hits, 30% more downloads, and 27% more citations (column 1). We also find positive coefficients for being ranked second or last, though the magnitudes are smaller, and the coefficients are significant only for last rank on hits and downloads. The linear effect of rank is negative and significant (column 4 and 5) for both hits and downloads, though not for cites. In terms of goodness of fit, specifications that have indicator variables for ranks 1, 2, and last, as well as a linear term for rank, have higher adjusted R^2 .

As discussed in the preceding section, a model of satisficing behavior or increasing cognitive costs would predict a gradual decline over the list. We find some evidence of such a decline. However, our more salient finding is about the effect of the first position, which is not readily explained by existing theory models but is consistent with empirical evidence from other settings, such as computer science eye-tracking studies or studies documenting serial position effects of memory.

To shed further light on the mechanisms at play, we reproduce our main specification separately for different subsamples (in table 3). We take as the main specification the one with both linear rank and indicator variables for first, second and last, since this specification has the highest adjusted R^2 among the alternatives considered in table 2. First, we can assess whether the finding is due to a lack of attention among nonexperts. To address this point, we restrict the analysis solely to those who have the higher education-based .edu extensions in their e-mail addresses. This allows us to have a subset on a more expert set of readers who should on average have more professional interest in the working paper series. As shown in

¹³ For example, Lorigo et al. (2008) and Granka et al. (2004) report from eye-tracking studies that while participants viewed the first two item abstracts on a list for equal time, they gave the first disproportionate attention thereafter.

¹⁴ We do not discuss the control variables here, but a discussion can be found in Feenberg et al. (2015). That working paper also includes a number of tests to show the robustness of the findings, as well as further evidence of randomization in list placement and that unobserved paper quality is not driving the results.

¹² Evidence from eye-tracking studies show that individuals usually focus on the first two items on a list. See Granka, Joachims, and Gay (2004) and <http://googleblog.blogspot.cz/2009/02/eye-tracking-studies-more-than-meets.html>.

TABLE 2.—BASIC RESULTS

| | (1) | (2) | (3) | (4) | (5) |
|------------------------|---------------------|--------------------|---------------------|----------------------|----------------------|
| Hits | | | | | |
| Rank 1 | 0.328*** (0.066) | | 0.350*** (0.068) | | 0.337*** (0.067) |
| Rank 2 | | | 0.090 (0.063) | | 0.055 (0.063) |
| Last rank | | 0.100** (0.043) | 0.089** (0.043) | | 0.164*** (0.047) |
| Rank | | | | -0.010*** | -0.012*** |
| Controls | Yes | Yes | Yes | Yes | Yes |
| Adjusted R^2 | 0.236 | 0.226 | 0.238 | 0.232 | 0.247 |
| Number of observations | 2,110 | 2,110 | 2,110 | 2,110 | 2,110 |
| Number of weeks | 104 | 104 | 104 | 104 | 104 |
| Downloads | | | | | |
| Rank 1 | 0.294*** (0.083) | | 0.322*** (0.088) | | 0.311*** (0.089) |
| Rank 2 | | | 0.120 (0.082) | | 0.088 (0.083) |
| Last rank | | 0.168** (0.079) | 0.157* (0.080) | | 0.226** (0.081) |
| Rank | | | | -0.009*** (0.003) | -0.011*** (0.003) |
| Controls | Yes | Yes | Yes | Yes | Yes |
| Adjusted R^2 | 0.140 | 0.137 | 0.142 | 0.137 | 0.146 |
| Number of observations | 2,110 | 2,110 | 2,110 | 2,110 | 2,110 |
| Number of weeks | 104 | 104 | 104 | 104 | 104 |
| Cites | | | | | |
| Rank 1 | 0.269** (0.130) | | 0.289** (0.134) | | 0.298** (0.133) |
| Rank 2 | | | 0.083 (0.130) | | 0.106 (0.129) |
| Last rank | | 0.102 (0.107) | 0.092 (0.107) | | 0.049 (0.114) |
| Rank | | | | 0.007* (0.004) | 0.007 (0.005) |
| Controls | Yes | Yes | Yes | Yes | Yes |
| Adjusted R^2 | 0.096 | 0.095 | 0.096 | 0.095 | 0.097 |
| Number of observations | 2,018 | 2,018 | 2,018 | 2,018 | 2,018 |
| Number of weeks | 104 | 104 | 104 | 104 | 104 |

The "hits" and "downloads" sections list working papers appearing in the New This Week e-mail bulletin from January 2013 to December 2014 and the "basic results" sections for papers appearing from January 2012 to December 2013. Estimation is by OLS, and robust standard errors are in parentheses. The dependent variables are $\log(1 + \text{hits})$, $\log(1 + \text{views})$, and $\log(1 + \text{downloads})$, respectively. All regressions include as control variables the number of coauthors, the number of NBER programs in which the paper is listed, the log of the number of previous working papers (maximum among the coauthors), the delay between submission to the NBER and announcement as well as day-of-submission fixed effects, week fixed effects, and NBER program fixed effects. * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

column 2, the results for the .edu subscribers are only slightly moderated relative to the baseline specification (column 1).

Second, we check whether the rank effects are stronger when lists are above median in length (more than 20 papers, column 3) versus lists below median in length (column 4). We find some evidence that inattention is driven by longer lists. For instance, the effect of the first rank on hits and cites is noticeably larger in the longer lists. This evidence is compatible with the models, suggesting a gradual decline in attention.

Third, we investigate whether limited attention is driven by the attractiveness of the first options. We rate the "quality" of the first option on the NTW list by whether it has a star author (as defined previously). While the sample size is limited, we find some evidence that the second paper receives fewer downloads and hits when the first paper is by a star (columns 5 and 6). This evidence is compatible with satisficing behavior, as perusing would be more likely to stop if the first option is satisfactory.

Finally, we examine whether the rank effects are weaker during periods when individuals are busier and thus more likely to skim or face interruptions. We do observe smaller point estimates for the effect of rank 1 in July and August, when subscribers, especially academics with .edu e-mail addresses, may be less busy (columns 7 and 8).

To summarize, we find large effects for the first paper and somewhat smaller ones for the last paper for low-cost attention activities (hits and downloads). We also find some evidence of a fatigue factor. Moreover, the bias is greater the longer the list, there is greater attention for star papers, and rank effects are smaller during summer months.

In our view, these results may arise through a variety of the mechanisms discussed in section II and are likely to reflect different approaches to reading the list among subscribers. For hits and downloads in particular, we suggest that the results are most consistent with skimming, where individuals focus on the first few papers in the list due to time constraints or interruptions. This can then also lead to the large disproportionate effect for rank 1 for citations,

TABLE 3.—RESULTS FOR DIFFERENT SUBSAMPLES

| | (1) All Users | (2) .edu Users | (3) Long List | (4) Short List | (5) Paper 1 = Star | (6) Paper 1 \neq Star | (7) Summer | (8) Not Summer |
|------------------------|----------------------|----------------------|----------------------|---------------------|-----------------------|----------------------------|---------------------|----------------------|
| Hits | | | | | | | | |
| Rank 1 | 0.337*** (0.067) | 0.275*** (0.077) | 0.390*** (0.101) | 0.295*** (0.083) | 0.564 (0.292) | 0.346*** (0.069) | 0.254* (0.123) | 0.372*** (0.079) |
| Rank 2 | 0.055 (0.063) | 0.084 (0.067) | 0.097 (0.085) | 0.038 (0.099) | -0.350 (0.198) | 0.072 (0.065) | 0.144 (0.172) | 0.047 (0.067) |
| Last rank | 0.164*** (0.047) | 0.189*** (0.056) | 0.161** (0.062) | 0.147** (0.070) | -0.036 (0.305) | 0.174*** (0.049) | 0.033 (0.132) | 0.182*** (0.052) |
| Rank | -0.012*** (0.002) | -0.009*** (0.003) | -0.012*** (0.003) | -0.011* (0.006) | -0.020 (0.022) | -0.013*** (0.002) | -0.009* (0.005) | -0.012*** (0.003) |
| Adjusted R^2 | 0.263 | 0.263 | 0.235 | 0.265 | 0.428 | 0.249 | 0.204 | 0.253 |
| Number of observations | 2,110 | 1,959 | 1,378 | 732 | 75 | 2,035 | 349 | 1,761 |
| Weeks | 97 | 97 | 56 | 48 | 5 | 99 | 17 | 87 |
| Downloads | | | | | | | | |
| Rank 1 | 0.311*** (0.089) | 0.256*** (0.086) | 0.362*** (0.131) | 0.337*** (0.117) | -0.006 (0.249) | 0.316*** (0.092) | 0.116 (0.218) | 0.380*** (0.103) |
| Rank 2 | 0.088 (0.083) | 0.118 (0.076) | 0.148 (0.118) | 0.106 (0.138) | -0.961* (0.382) | 0.100 (0.085) | 0.186 (0.180) | 0.097 (0.092) |
| Last rank | 0.226*** (0.081) | 0.224** (0.100) | 0.168* (0.093) | 0.265*** (0.125) | 0.484 (0.456) | 0.234*** (0.084) | 0.391 (0.353) | 0.183** (0.075) |
| Rank | -0.011*** (0.003) | -0.010*** (0.004) | -0.009*** (0.003) | -0.009 (0.011) | -0.047 (0.071) | -0.011*** (0.003) | -0.013** (0.006) | -0.009*** (0.003) |
| Adjusted R^2 | 0.146 | 0.198 | 0.137 | 0.182 | 0.155 | 0.153 | 0.103 | 0.153 |
| Number of observations | 2,110 | 1,959 | 1,378 | 732 | 75 | 2,035 | 349 | 1,761 |
| Weeks | 104 | 97 | 56 | 48 | 5 | 99 | 17 | 87 |
| Cites | | | | | | | | |
| Rank 1 | 0.298** (0.133) | NA | 0.396** (0.194) | 0.246 (0.197) | 0.955 (1.817) | 0.298** (0.138) | 0.224 (0.334) | 0.288* (0.148) |
| Rank 2 | 0.106 (0.129) | NA | -0.039 (0.204) | 0.256 (0.181) | 0.079 (0.485) | 0.109 (0.134) | 0.309 (0.335) | 0.051 (0.145) |
| Last rank | 0.049 (0.114) | NA | 0.145 (0.164) | -0.087 (0.171) | -0.828 (0.480) | 0.067 (0.118) | -0.018 (0.212) | 0.068 (0.134) |
| Rank | 0.007 (0.005) | NA | 0.007 (0.005) | 0.016 (0.011) | 0.053 (0.096) | 0.007 (0.005) | 0.017 (0.010) | 0.004 (0.006) |
| Adjusted R^2 | 0.097 | | 0.090 | 0.097 | -0.271 | 0.095 | 0.098 | 0.097 |
| Number of observations | 2,018 | | 1,171 | 847 | 76 | 1,942 | 352 | 1,666 |
| Weeks | 104 | | 47 | 57 | 5 | 99 | 18 | 86 |

The "hits" and "downloads" sections list working papers appearing in the New This Week e-mail bulletin from January 2013 to December 2014 and the "cites" sections from January 2012 to December 2013. Estimation is by OLS, and robust standard errors are in parentheses. The dependent variables are $\log(1 + \text{hits})$, $\log(1 + \text{downloads})$, and $\log(1 + \text{cites})$, respectively. All regressions include as control variables the number of coauthors, the number of NBER programs in which the paper is listed, the log of the number of previous working papers (maximum among the coauthors), the delay between submission to the NBER and announcement as well as day-of-submission fixed effects, week fixed effects, and NBER program fixed effects. Column 1 reproduces our main specification, the last column of table 2. Column 2 uses hits by .edu subscribers and downloads by .edu subscribers as dependent variables. Column 3 and 4 restrict the sample to papers announced in the list above median length (20 papers) and below median length, respectively. Column 5 restricts the sample to lists where the first paper was by a star author. Column 7 restricts the samples to papers announced in July and August. * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

particularly since reading (and citing) a paper represents a high marginal cost activity. The large effect of rank 1 in particular for citations would also be consistent with evidence from eye-tracking studies and evidence of serial position effects in memory, particularly after delay.

VI. Conclusion

The NBER New This Week e-mail list represents a canonical example of choice from lists of the type that is prevalent in online search. We find that search from this list shows strong primacy effects, whereby papers displayed earlier on the list are viewed, downloaded, and cited more often than are other papers, as well as some recency effects, with the last paper also being more frequently viewed and downloaded. We argue that this is independent of paper quality and employ a variety of tests to demonstrate this case.

Order effects can arise through a variety of mechanisms. Some of our evidence can be interpreted as consistent with

models of satisficing behavior or cognitive fatigue. Our results appear most consistent with skimming behavior, where a few prominent positions on the list get disproportionate cognitive attention. Given that a similar empirical pattern has also been found in other settings, formal modeling of why such skimming behavior may arise could be a fruitful area of future inquiry. But an important limitation of all work to date in list-based choices, including our own, is a lack of clear discriminatory tests across these models.

To summarize, our findings suggest that presentation order can be a powerful determinant of choice in a list-based environment more generally and that this can have strong downstream effects, such as through paper citations in our sample. These results, and in particular the findings for citations, have potentially important implications for the economics profession. Citation counts are often thought to be a good proxy for reputation and impact (Hamermesh & Pfann, 2012). As such, they are increasingly used by educational units in evaluating candidates for promotion and tenure, as well as to rank departments and individual

researchers (Coupé, 2003; Zimmermann, 2013). If these counts can be affected by factors as minor as random placement on a working paper list, it raises important questions about their limitations and their discriminatory power between higher- and lower-quality work. Fortunately, in the wake of the findings reported in this paper, the NBER has recently moved to a randomization process for the presentation of working papers in the NTW e-mail, which will at least remove this potential source of bias toward evaluating paper quality.

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APPENDIX A

Observable Determinants of Ranking

| | (1) | (2) |
|--|-------------------------------|----------------------|
| | Rank 1 | Linear Rank |
| Previous working papers (maximum) | –0.000 (0.000) | 0.007 (0.008) |
| Star author (top 5% cites) | 0.008 (0.022) | 0.050 (0.604) |
| Number of authors | –0.004 (0.004) | –0.029 (0.139) |
| Number of programs | –0.008 (0.010) | 0.373 (0.288) |
| Delay (days) | 0.022*** (0.001) | –0.901*** (0.074) |
| <i>Submission day (Sunday omitted)</i> | | |
| Monday | 0.026* (0.015) | 0.124 (0.528) |
| Tuesday | –0.026 (0.016) | –2.649*** (0.678) |
| Wednesday | –0.047** (0.019) | –3.118*** (0.557) |
| Thursday | –0.041** (0.017) | –1.881*** (0.606) |
| Friday | –0.022 (0.017) | –0.162 (0.488) |
| Saturday | –0.033* (0.020) | 0.243 (0.572) |
| <i>NBER program (Public Economics omitted)</i> | | |
| Aging | –0.005 (0.019) | –1.286** (0.548) |
| Asset Pricing | 0.017 (0.017) | –0.161 (0.410) |
| Children | 0.037 (0.025) | –0.559 (0.566) |
| Corporate Finance | 0.004 (0.017) | –0.944** (0.412) |
| Development | 0.032 ⁺ (0.016) | –0.476 (0.427) |
| Development of the American Economy | 0.013 (0.018) | 0.209 (0.536) |
| Education | 0.037* (0.021) | 0.283 (0.552) |
| Economic Fluctuations and Growth | 0.001 (0.015) | –0.502 (0.430) |
| Environmental and Energy Economics | 0.031 (0.019) | –0.241 (0.459) |
| Health Care | –0.014 (0.020) | –0.439 (0.507) |
| Health Economics | 0.014 (0.019) | –0.655 (0.588) |
| Industrial Organization | 0.044** (0.020) | 0.251 (0.545) |
| International Finance and Macroeconomics | –0.014 (0.014) | –0.689* (0.380) |
| International Trade and Investment | –0.013 (0.013) | –0.362 (0.449) |
| Labor Studies | 0.008 (0.018) | –1.011*** (0.371) |
| Law and Economics | 0.013 (0.022) | –0.365 (0.561) |
| Monetary Economics | 0.004 (0.018) | –0.321 (0.500) |
| Political Economy | 0.016 (0.020) | –0.210 (0.481) |
| Productivity, Innovation, and Entrepreneurship | 0.017 (0.018) | 0.146 (0.442) |
| Constant | –0.188*** (0.021) | 23.990*** (0.803) |

APPENDIX A (CONTINUED)

| | (1) | (2) |
|------------------------|--------|-------------|
| | Rank 1 | Linear Rank |
| Number of observations | 2,110 | 2,110 |
| Number of weeks | 104 | 104 |

Regressions include working papers appearing in the New This Week e-mail bulletin from January 2013 to December 2014. Estimation is by OLS, and robust standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

APPENDIX B

Sample NTW E-mail from February 9, 2015

THE LATEST WORKING PAPERS
National Bureau of Economic Research
February 9, 2015

The following NBER working papers that match your selections were released in electronic format during the last week.

1. "The Maturity and Payment Schedule of Sovereign Debt," by Yan Bai, Seon Tae Kim, and Gabriel P. Mihalache, WP20896 (IFM) http://papers.nber.org/papers/W20896?utm_campaign=ntw&utm_medium=email&utm_source=ntw
2. "The Power of Transparency: Information, Identification Cards and Food Subsidy Programs in Indonesia," by Abhijit Banerjee, Rema Hanna, Jordan C. Kyle, Benjamin A. Olken, and Sudarno Sumarto, WP20923 (DEV PE POL), http://papers.nber.org/papers/W20923?utm_campaign=ntw&utm_medium=email&utm_source=ntw.
3. "Voting on Prices vs. Voting on Quantities in a World Climate Assembly," by Martin L. Weitzman, WP20925 (EEE), http://papers.nber.org/papers/W20925?utm_campaign=ntw&utm_medium=email&utm_source=ntw.
4. "Disaster Risk and Its Implications for Asset Pricing," by Jerry Tsai and Jessica A. Wachter, WP20926 (AP EFG), http://papers.nber.org/papers/W20926?utm_campaign=ntw&utm_medium=email&utm_source=ntw.
5. "Patient Responses to Incentives in Consumer-Directed Health Plans: Evidence from Pharmaceuticals," by Peter J. Huckfeldt, Amelia Haviland, Ateev Mehrotra, Zachary Wagner, and Neeraj Sood, WP20927 (HC HE), http://papers.nber.org/papers/W20927?utm_campaign=ntw&utm_medium=email&utm_source=ntw.
6. "Behavioral Economics and Public Policy: A Pragmatic Perspective," by Raj Chetty, WP20928 (AG LE LS PE), http://papers.nber.org/papers/W20928?utm_campaign=ntw&utm_medium=email&utm_source=ntw.
7. "Childhood Medicaid Coverage and Later Life Health Care Utilization" by Laura R. Wherry, Sarah Miller, Robert Kaestner, and Bruce D. Meyer, WP20929 (CH HC HE PE), http://papers.nber.org/papers/W20929?utm_campaign=ntw&utm_medium=email&utm_source=ntw.
8. "State Capitalism vs. Private Enterprise," by Donghua Chen, Dequan Jiang, Alexander Ljungqvist, Haitian Lu, and Mingming Zhou, WP20930 (CF LE), http://papers.nber.org/papers/W20930?utm_campaign=ntw&utm_medium=email&utm_source=ntw.
9. "Networks, Shocks, and Systemic Risk," by Daron Acemoglu, Asuman Ozdaglar, and Alireza Tahbaz-Salehi, WP20931 (EFG), http://papers.nber.org/papers/W20931?utm_campaign=ntw&utm_medium=email&utm_source=ntw.
10. "Veterans' Labor Force Participation: What Role Does the VA's Disability Compensation Program Play?" by Courtney Coile, Mark Duggan, and Audrey Guo, WP20932 (AG HE LS PE), http://papers.nber.org/papers/W20932?utm_campaign=ntw&utm_medium=email&utm_source=ntw.
11. "The International Transmission of Credit Bubbles: Theory and Policy," by Jaume Ventura, and Alberto Martin, WP20933 (EFG), http://papers.nber.org/papers/W20933?utm_campaign=ntw&utm_medium=email&utm_source=ntw.
12. "The National Rise in Residential Segregation," by Trevon Logan, and John Parman, WP20934 (DAE), http://papers.nber.org/papers/W20934?utm_campaign=ntw&utm_medium=email&utm_source=ntw.
13. "Premature Deindustrialization," by Dani Rodrik, WP20935 (DEV EFG ITI PR), http://papers.nber.org/papers/W20935?utm_campaign=ntw&utm_medium=email&utm_source=ntw.
14. "Collective Action: Experimental Evidence," by Maria Victoria Anauati, Sebastian Galiani, Gustavo Torrens, and Brian Feld, WP20936 (DEV), http://papers.nber.org/papers/W20936?utm_campaign=ntw&utm_medium=email&utm_source=ntw.
15. "Racial Disparities in Savings Behavior for a Continuously Employed Cohort," by Kai Yuan Kuan, Mark R. Cullen, and Sepideh Modrek, WP20937 (AG PE), http://papers.nber.org/papers/W20937?utm_campaign=ntw&utm_medium=email&utm_source=ntw.
16. "Age, Cohort and Co-Authorship," by Daniel S. Hamermesh, WP20938 (LS), http://papers.nber.org/papers/W20938?utm_campaign=ntw&utm_medium=email&utm_source=ntw.
17. "Measuring Job-Finding Rates and Matching Efficiency with Heterogeneous Jobseekers," by Robert E. Hall, and Sam Schulhofer-Wohl, WP20939 (EFG LS), http://papers.nber.org/papers/W20939?utm_campaign=ntw&utm_medium=email&utm_source=ntw.
18. "The Impact of Intergroup Contact on Racial Attitudes and Revealed Preferences" by Scott E. Carrell, Mark Hoekstra, and James E. West, WP20940 (ED LS PE), http://papers.nber.org/papers/W20940?utm_campaign=ntw&utm_medium=email&utm_source=ntw.
19. "Is Sniping a Problem for Online Auction Markets?" by Matthew Backus, Tom Blake, Dimitriy V. Masterov, and Steven Tadelis, WP20942 (IO), http://papers.nber.org/papers/W20942?utm_campaign=ntw&utm_medium=email&utm_source=ntw.
20. "The Internationalization of the RMB, Capital Market Openness, and Financial Reforms in China," by Joshua Aizenman, WP20943 (IFM), http://papers.nber.org/papers/W20943?utm_campaign=ntw&utm_medium=email&utm_source=ntw.
21. "The Impact of War on Resource Allocation: 'Creative Destruction' and the American Civil War," by B. Zorina Khan, WP20944 (DAE POL PR), http://papers.nber.org/papers/W20944?utm_campaign=ntw&utm_medium=email&utm_source=ntw.
22. "'To Have and Have Not': Are Rich Litigious Plaintiffs Favored in Court?" by B. Zorina Khan, WP20945 (DAE DEV LE POL), http://papers.nber.org/papers/W20945?utm_campaign=ntw&utm_medium=email&utm_source=ntw.
23. "Facilitating Savings for Agriculture: Field Experimental Evidence from Malawi," by Lasse Brune, Xavier Gine, Jessica Goldberg, and Dean Yang, WP20946 (DEV), http://papers.nber.org/papers/W20946?utm_campaign=ntw&utm_medium=email&utm_source=ntw.
24. "Fraudulent Income Overstatement on Mortgage Applications during the Credit Expansion of 2002 to 2005," by Atif R. Mian, and Amir Sufi, WP20947 (AP CF EFG ME), http://papers.nber.org/papers/W20947?utm_campaign=ntw&utm_medium=email&utm_source=ntw.