

## GENDER IN THE ECONOMICS PROFESSION

# Who Are the More Dismal Economists? Gender and Language in Academic Economics Research<sup>†</sup>

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In recent years, there has been an increasing level of attention paid to gender effects in the economics profession, including differences in seminar dynamics, pay, promotion, textbook representation, and more (Dupas et al. 2021; Antecol, Bedard, and Stearns 2018; Stevenson and Zlotnick 2018; Bayer and Rouse 2016). One particular aspect of this gender gap—which often affects these other facets—is in how female-authored publications are evaluated. Evidence has shown that women’s publications are often held to a higher standard, that they require more rigorous rewriting (Hengel 2022), and that more of them are needed to achieve success in the profession (Zacchia 2021; Lundberg and Stearns 2019).

Few would argue that the number and quality of publications is a key determinant of success in academic economics, but how is *quality* in particular determined? Often, this is through a count of citations, but how are those citations garnered? One possibility is that the marketing of research papers themselves affects the degree to which they are cited. Research in other disciplines has found that male-authored articles often exhibit a positivity bias and are more likely to portray their results as “novel” and “progressive” than female-authored articles. Such positively marketed research has also been found to garner more citations over time (Lerchenmueller, Sorenson, and Jena 2019).

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The marketing of research—in terms of writing *style* and how results are portrayed—may have an impact on not just citation rates, but, ultimately, on success in the field. The question this research asks is whether writing style differs by gender in economics and, in particular, whether women tend to market their research less enthusiastically. Perhaps women are the more dismal economists, and as such, their research gets less attention—and fewer cites—than it deserves.

Comprising a database of 16,827 articles over a 50-year time span (1969–2018) from 5 of the top journals in the discipline (the so-called T5: the *American Economic Review*, *Econometrica*, the *Journal of Political Economy*, the *Quarterly Journal of Economics*, and the *Review of Economic Studies*), this research explores positive/negative sentiment differences in writing style by gender and the possible effects of writing style tone on citation rates. Importantly, our dataset utilizes entire articles, not just article titles or abstracts.

As has been found in other disciplines, we find a statistically significant difference in writing style tone not just in women versus men overall, but also in women themselves over time. We also find that this tone does affect citation rates. Interestingly, unlike the results found in Lerchenmueller et al. (2019), in economics there appears to be a return (in terms of increased citation rates) to articles that are written with a more negative tone, perhaps hewing to the disciplines’s dismal reputation.

We are agnostic on any *preferred* writing style. One way to interpret a net positive tone in writing style is to assume that it is positively marketed and that words such as “novel” and “excellent” make the research and its results sound better. However, another way to interpret the same results is that they are being oversold

and that a neutral writing style would be more “straightforward” and “honest.” Whatever the discipline, men do tend to market their research with a more positive writing style than women do. This does not have to mean, however, that doing so is the correct paradigm going forward; what is true is that it may be a paradigm that has hindered women in the past.

### I. Background

The use of text as data (Gentzkow, Kelly, and Taddy 2019) has been growing in the empirical economics literature for a number of years. Text-based analyses of academic research articles themselves, an endeavor most closely linked to what is performed in this paper, has also been garnering increased interest (Kvamsdal et al. 2021; Levy, Meyer, and Raviv 2020; Hengel 2022; Bellas and Kosnik 2018).

A recent paper by Koffi (2021), in particular, investigates citing patterns by academic researchers and finds that on average, papers omit almost half of the related research that they could conceivably cite and that the omitted papers are 15 to 30 percent more likely to be female authored. In other words, there appears to be a distinct gender bias in citation patterns in academic economics research. The research presented here offers a potential *why* for these results. While Koffi (2021) investigates network effects, editor effects, seniority effects, and many other potential causes for the gender bias in citation patterns, she is unable to completely eliminate the gender bias. This research suggests that style differences in academic writing in economics could possibly be a part of the remaining explanation.

### II. Data

The data comprise all research articles published in the T5 from 1969 to 2018. The corpus includes all research-oriented articles that have been published in English,<sup>1</sup> including full-length monographs, full-length book reviews, and comments and replies. Entries not included in the dataset include editor’s notes, conference announcements and programs, auditor’s reports,

<sup>1</sup>Some of these journals, especially in earlier years, included the occasional article in French or German.

TABLE 1—ARTICLE COUNTS WITH AT LEAST ONE FEMALE AUTHOR, BY DECADE

1969–1978	1979–1988	1989–1998	1999–2008	2009–2018	Totals
127 (3.09)	179 (4.62)	316 (11.16)	516 (18.09)	831 (26.28)	1,969 (11.7)

Note: The numbers in parentheses are percentages.

indexes, and other similar non-research-focused entries. Special symposium articles are included.<sup>2</sup>

Table 1 provides descriptive information for articles from the dataset with at least one female author.<sup>3</sup> Of the total, 11.7 percent have at least 1 female author, a liberal definition of “female authored,” as male contributors could still be a part of the research team. Table 1 also highlights the increase over time in the number of female authored papers, from 3 percent in the first decade to 26 percent by the final decade.

An important assumption in all text-based empirical work is that language use is not random but purposefully expressive of conscious thought, and so indicative of ideas and theories meant to be expressed by the author. A companion assumption is that writers have distinct writing styles. It is what has allowed for such path-breaking research as identifying which of the Federalist Papers were written by Alexander Hamilton, James Madison, or John Jay (Mosteller and Wallace 2012) and how many distinct authors there may have been in the Old and New Testaments (Royal 2012; Houk 2002).

That writers have writing styles is not controversial. What is a little less clear is whether genders have distinct writing styles and whether this expresses itself in writing as allegedly dry and neutral as academic writing. Newman et al. (2008) have found evidence of a gender difference in writing style across a large sample of texts (14,000) and in many different contexts (from email to formal essays). Hengel (2022) investigated academic papers by economists and found a significant difference in writing quality by gender.

<sup>2</sup>It is worth noting, however, that the *American Economic Review’s* annual *Papers and Proceedings* issue is not included.

<sup>3</sup>Gender was assigned to the list of authors through a simple application programming interface (genderize.io), which is itself based on a gender identifier database. Names with less than 90 percent certainty of the assigned gender were investigated and certified by hand. An additional spot check was done on particular names that might have been miscoded (including, for example, Tracy Lewis, Chris Shannon, and Leslie Young).

Each of the 16,827 articles in the corpus was entered into a relational database where variables associated with the articles could be independently analyzed—for example, year of publication, journal of publication, and, of course, author gender. The text itself was left unstructured and organized within a vector-space model where each element of the vector indicates the occurrence of a particular word or phrase within the paper. The vector elements were not transformed or weighted in any way and were instead left as raw frequency counts so that if a word such as “excellent” was used more than once in a paper, its degree of emphasis was reflected in a higher count and thus a higher sentiment score.

The sentiment score itself was determined in a traditional manner (Miner et al. 2012), as a net count of all positive ( $P$ ) minus negative ( $N$ ) word or phrase occurrences in a document, divided by the total count found:

$$(1) \quad x_{i1} = \frac{\sum P - \sum N}{\sum(P + N)}.$$

Therefore, if the sentiment score is greater than zero, a document can be interpreted as having an overall positive sentiment, while if it has a score of less than zero, it can be interpreted as reflecting an overall negative sentiment. The degree of positive or negative sentiment is also reflected in the size of the score, with numerical values very close to zero indicating a relatively neutral paper (and perhaps what we would most expect from academic writing) and values further away from zero indicating relatively more sentiment or positive (or negative) marketing.

Key to any sentiment score are the words and phrases that make up the positive and negative counts. It is always important to tailor any sentiment dictionary to the context of the application, and that was of course done in this case (primarily by making econometric-based words neutral). Details on the specifics of the algorithm used to calculate the sentiment scores are available from the author upon request.

### III. Sentiment Analysis

Figure 1 displays a graph of annual sentiment scores by gender.<sup>4</sup> A few things immediately

<sup>4</sup>The “female” category here, and throughout the rest of this section, is the liberal definition of female, meaning at

draw one’s attention. First is the overall negative sentiment, across the entire 50-year time span, of both the female and male sentiment scores. Averages in each year vary, but the range is from  $-0.40$  to  $-0.15$  for the female sentiment score and from  $-0.28$  to  $-0.19$  for the male sentiment score. Both male and female academic authors are, therefore, very much living up to their “dismal” reputations. The second observation that draws one’s attention is the slight upward trend of both female and male sentiment scores over time, particularly since the turn of the twenty-first century. Dividing the data into two groups, 1969–1999 and 2000–2018, and performing a  $t$ -test for difference of the means finds that for both female and male sentiment, there is a significant (at the 5 percent level for female,  $p$ -value 0.023; 1 percent level for male,  $p$ -value 0.00) difference over time. Both female and male economists have gotten slightly less dismal since the turn of the twenty-first century. Why this might be is unclear, but it is interesting that it is a common trend for both genders publishing in academic research journals.<sup>5</sup>

Comparing the female and male sentiment scores more directly, they are rather similar except for the greater variability of the female scores in the early years (likely a result of the relatively small sample sizes in those years) and for the fact that for the majority of the past 50 years, the average sentiment score for female economists has been more negative than that of their male counterparts. A  $t$ -test for a difference of the means by gender finds that there is a significant (at the 5 percent level,  $p$ -value 0.026) difference between female and male sentiment over the years. This trend is also more consistent in the latter half of the 50-year time span under study (significant at the 1 percent level). In other words, similar to patterns found in other disciplines, women write in a more negative style than their male counterparts.

An investigation of the top positive and negative words used by each gender (specific words

least one female author. Results were also calculated with female defined as 100 percent female authorship (i.e., no male coauthors), and the results (including significance levels) changed only imperceptibly.

<sup>5</sup>An interesting extension of this research would be to compare sentiment scores across other platforms, including books, op-ed columns, and other economic writings in the popular press.

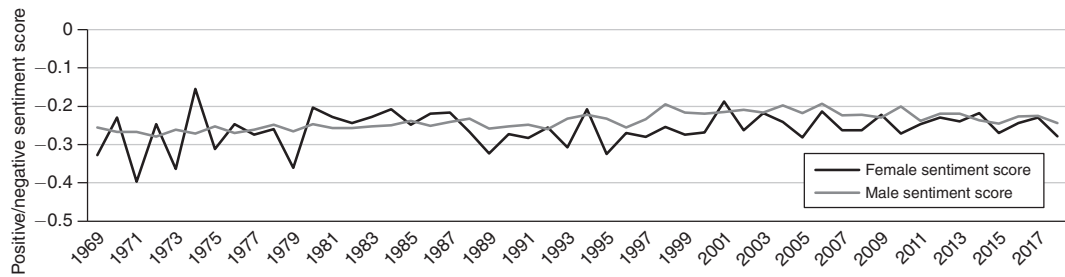


FIGURE 1. ANNUAL POSITIVE/NEGATIVE SENTIMENT SCORES

available from the author upon request) finds that many of the positive and negative words utilized are common across the genders. This implies that the difference in overall sentiment scores (as displayed in Figure 1) isn't a difference of word choices themselves so much as a difference of the overall degree of use of these choices. Female and male economists are speaking the same language, in other words, it's just that female authors are emphasizing the negative to a greater degree than their male colleagues.

Note that sentiment analysis was also performed on the corpus broken down by authorial gender *and* by topic matter, as measured by JEL code. Macroeconomics (JEL Code "D") and Finance (JEL Code "G"), for example, are two subjects that historically have had the least female representation in economics, while Labor (JEL Code "J") has had some of the most. None of the results analyzed by subject matter differed substantially from the aggregate.

#### IV. Regression Analysis

In an effort to determine if the different writing styles have an effect on citation rates, the following Poisson regression was estimated:

$$(2) \quad \ln(y_i) = \alpha_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \beta_1 \beta_2 x_{i3} + \beta \mathbf{x}_i$$

where  $y_i$  is a count of the number of citations per paper  $i$ ;  $x_i$  is the positive/negative sentiment score for paper  $i$ ;  $x_2$  is the percent of authorship that is female for paper  $i$ ;  $x_3$  interacts sentiment score and the female authorship indicator for paper  $i$ ; and  $\mathbf{x}_i$  is a vector of controls, including length of article  $i$  (measured by page length), total number of authors for paper  $i$ , total number of JEL codes listed for paper  $i$  (to give a measure

of the breadth of the paper), year controls, and citation source controls.<sup>6</sup> Results are provided in Table 2.

The first thing to note is the narrowness of the confidence intervals, which gives a high degree of confidence in the meaningfulness of the results. Next, because coefficients can be difficult to interpret in Poisson regressions, we focus on signs and find that the controls all exhibit the signs that would be expected, i.e., longer articles, those with more coauthors, and those that touch on a greater number of topics are all cited more.<sup>7</sup>

Turning to the analysis of sentiment, we find that economists are indeed the dismal scientists, as there appears to be a return to being so. Contrary to results from other disciplines (Lerchenmueller, Sorenson, and Jena 2019), having a more positive writing style in economics leads not to greater citation rates, but lower ones. Economics has always had the reputation of the dismal science, and perhaps leaning into that stereotype gives an author credibility in the field. An article with female authorship leads to lower citation rates (reinforcing the results in Koffi 2021), and the interactive term suggests that articles with female authors that write in a positive style are cited even *less* than otherwise. These results give further evidence of the differential treatment of female-authored publications in the field.

#### V. Conclusions

Writing style in economics appears to differ by gender, with female economists writing in a

<sup>6</sup>Citation count data from either Scopus or Google Scholar was available for 99 percent of the papers in the dataset. Of these, only 1.2 percent had 0 citations.

<sup>7</sup>There are also controls on year and source of citation data (Scopus or Google Scholar) not presented in Table 2 for ease of presentation; full results are available upon request.

TABLE 2—POISSON REGRESSIONS ON CITATION COUNTS

Constant	3.528 [3.5198 3.537]
Sentiment score	-0.018 [-0.023 -0.013]
Percent female	-0.123 [-0.131 -0.144]
Interaction term	-0.140 [-0.166 -0.114]
Total pages	0.048 [0.0479 0.0480]
Total authors	0.143 [0.1418 0.1444]
Total JEL codes	0.059 [0.0581 0.0608]

Note: Ninety-five percent confidence interval in brackets.

distinctly more negative style than male economists for most of the last 50 years. This difference in writing style subsequently affects citation rates, to the detriment of papers with any level of female authorship. The American Economic Association report on climate in the profession recommended making data available on gender-related issues to help reduce bias and inform the profession. This research aids in that goal.

## REFERENCES

- Antecol, Heather, Kelly Bedard, and Jenna Stearns.** 2018. "Equal but Inequitable: Who Benefits from Gender-Neutral Tenure Clock Stopping Policies?" *American Economic Review* 108 (9): 2420–441.
- Bayer, Amanda, and Cecilia Elena Rouse.** 2016. "Diversity in the Economics Profession: A New Attack on an Old Problem." *Journal of Economic Perspectives* 30 (4): 221–42.
- Bellas, Allen, and Lea-Rachel Kosnik.** 2018. "Which Leading Journal Leads? Idea Diffusion in Economics Research Journals." *Empirical Economics* 57 (3): 901–21.
- Dupas, Pascaline, Alicia Sasser Modestino, Muriel Niederle, Justin Wolfers, and the Seminar Dynamics Collective.** 2021. "Gender and the Dynamics of Economic Seminars." NBER Working Paper 28494.
- Genzkow, Matthew, Bryan T. Kelly, and Matt Taddy.** 2019. "Text as Data." *Journal of Economic Literature* 57 (3): 535–74.
- Hengel, Erin.** 2022. "Publishing While Female: Are Women Held to Higher Standards? Evidence from Peer Review." Unpublished.
- Houk, Cornelius B.** 2002. "Statistical Analysis of Genesis Sources." *Journal for the Study of the Old Testament* 27 (1): 75–105.
- Koffi, Marlene.** 2021. "Innovative Ideas and Gender Inequality." Canadian Labour Economics Forum (CLEF) Working Paper 35.
- Kvamsdal, Sturla, Ivan Belik, Arnt Ove Hopland, and Yuanhao Li.** 2021. "A Machine Learning Analysis of the Recent Environmental and Resource Economics Literature." *Environmental and Resource Economics* 79 (1): 93–115.
- Lerchenmueller, Marc, Olav Sorenson, and Anupam Jena.** 2019. "Gender Differences in How Scientists Present the Importance of Their Research: Observational Study." *BMJ* 367: 1–8.
- Levy, Daniel, Tamir Meyer, and Alon Raviv.** 2020. "Academic Scholarship in Light of the 2008 Financial Crisis: Textual Analysis of NBER Working Papers." Bar-Ilan University Working Paper 2020-01.
- Lundberg, Shelley, and Jenna Stearns.** 2019. "Women in Economics: Stalled Progress." *Journal of Economic Perspectives* 33 (1): 3–22.
- Miner, Gary, Dursun Delen, John Elder, Andrew Fast, Thomas Hill, and Robert Nisbet.** 2012. *Practical Text Mining and Statistical Analysis for Non-structured Text Data Applications*. Netherlands: Elsevier Academic Press.
- Mosteller, Frederick, and David L. Wallace.** 2012. *Applied Bayesian and Classical Inference: The Case of the Federalist Papers*. Berlin: Springer Science & Business Media.
- Newman, Matthew L., Carla J. Groom, Lori D. Handelman, and James Pennebaker.** 2008. "Gender Differences in Language Use: An Analysis of 14,000 Text Samples." *Discourse Processes* 45 (3): 211–36.
- Royal, Kenneth.** 2012. "Using Objective Stylo-metric Techniques to Evaluate New Testament Authorship." *Journal of Multidisciplinary Evaluation* 8 (19): 1–7.
- Stevenson, Betsey, and Hannah Zlotnick.** 2018. "Representations of Men and Women in Introductory Economics Textbooks." *AEA Papers and Proceedings* 108: 180–85.
- Zacchia, Giulia.** 2021. "What Does It Take to Be Top Women Economists? An Analysis Using Rankings in RePEc." *Review of Political Economy* 33 (2): 170–93.