Who Are the More Dismal Economists?
Gender and Language in Academic Economics Research

By LEA-RACHEL KOSNIK*

* Kosnik: University of Missouri-St. Louis, One University Blvd., St. Louis, MO, 63121 (e-mail: kosnikl@umsl.edu). Acknowledgments. Many thanks to Daniel S. Hamermesh, Allen Bellas, Angel Hernando-Veciana, Gianni De Fraja and participants in Durham University's DREAM Workshop, as well as participants at the annual Midwest Economic Association meetings. Excellent research assistance provided by Meagan Burwell.

In recent years there has been an increasing level of attention paid to gender effects in the economics profession, from differences in seminar dynamics, pay, promotion, textbook representation, and more (Dupas et al., 2021; Antecol et al., 2018; Stevenson and Zlotnick, 20018; 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, 2019), and that more of them are needed to achieve success in the profession (Zacchia, 2020; 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 disciples 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 et al, 2019). The marketing of research – in terms of writing *style* and how results are portrayed – may not just have an impact on 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, if women tend to market their research less enthusiastically. Perhaps women are the more dismal economists, and as such, their research gets less attention – and cites - than it deserves.

Comprising a database of 16,827 articles, over a fifty year time span (1969-2018), from five of the top journals in the

discipline (the so-called T5: *American Economic Review (AER), Econometrica (E), Journal of Political Economy (JPE), Quarterly Journal of Economics (QJE), and Review of Economic Studies (RES)*), 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, and 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 of women versus men overall, but also of 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. 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, et al., 2017) 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, et al., 2020; Hengel, 2019; 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 related research that they could conceivably cite, and that the omitted papers are 15% to 30% 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

investigates network effects, editor effects, seniority effects, and many other potential causes for the gender bias in citation patters, she is unable to completely eliminate the gender bias. This research suggests style differences of 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 1969-2018. The corpus includes all research-oriented articles that have been published in English,[1] 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, indexes, and other similar non-research focused entries. Special symposium articles are included.[2]

Table 1 provides descriptive information for articles from the dataset with at least one female author.[3] 11.7% of the total have at least one 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% in the first decade, to 26% by the final decade.

[Insert Table 1 Here – The style is named Table Placeholder]

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 Hamilton, Madison, or 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,

[1] Some of these journals, especially in earlier years, included the occasional article in French or German.

[2] It is worth noting, however, that the *American Economic Review*'s annual *Papers and Proceedings* issue is not included.

[3] Gender was assigned to the list of authors through a simple API (genderize.io), which is based itself on a Gender Identifier Database. Names with less than 90% 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).

and if 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 (2019) investigated academic papers by economists and found a significant difference in writing quality by gender.

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 (VSM) 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 minus negative word or phrase occurrences in a document. 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.[4] A few things

[4] The 'female' category here, and throughout the rest of this section, is the liberal definition of female, meaning at least one female author. Results were also calculated with female defined as

immediately draw one's attention. First is the overall negative sentiment, across the entire fifty-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 -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, and 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% level for female; p-value 0.023, 1% 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.[5]

[Insert Figure 1 Here – The style is named Figure Placeholder]

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 fifty 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% 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 fifty-year time span under study (significant at the 1% 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 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 in a difference of

100% female authorship (i.e. no male co-authors), and the results (including significance levels) changed only imperceptibly.

[5] 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.

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 one 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 has an effect on citation rates, the following Poisson regression was estimated:

(1) $$ln(y_i) = \alpha_o + \beta_1 x_1 + \beta_2 x_2 + \beta_1\beta_2 x_3 + \boldsymbol{\beta_i x_i}$$

where y_i is a count of the number of citations per paper *i*; x_1 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 $\boldsymbol{x_i}$ 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[6]. Results are provided in Table 2.

[Insert Table 2 Here – The style is named Table Placeholder]

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, with more co-authors, that touch on a greater number of topics, are all cited more.[7]

[6] Citation count data from either Scopus or Google Scholar was available for 99% of the papers in the dataset. Of these, only 1.2% had zero citations.

[7] 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.

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 et al., 2019), having a more positive writing style in economics does not lead 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 distinctly more negative style than male economists, for most of the last fifty years. This difference subsequently affects citation rates, to the detriment of papers with any level of female authorship. The AEA 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.

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Note: This is a “Figure”, but if it could be formatted as a “Table”, across the width of the paper, that would make much more sense. This is really too difficult to see legibly shrunk to just one column width.

FIGURE 1. ANNUAL POSITIVE/NEGATIVE SENTIMENT SCORES

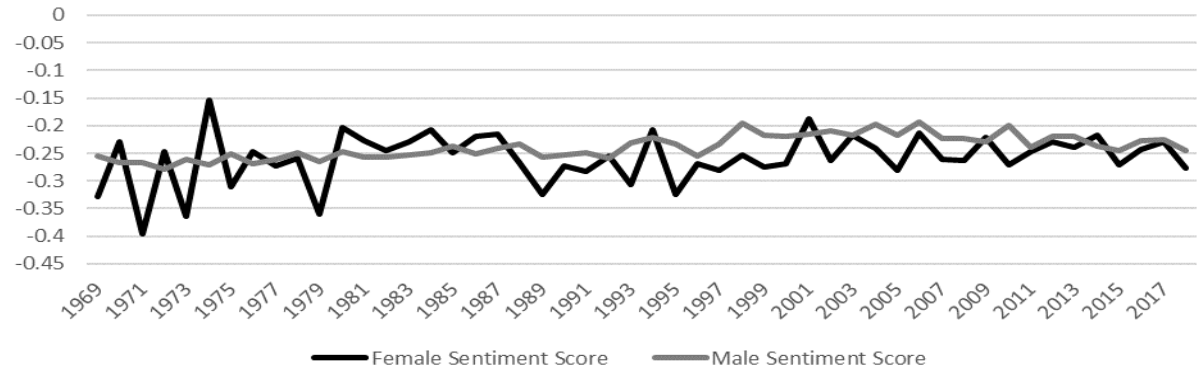

TABLE 1— ARTICLE COUNTS
WITH AT LEAST ONE FEMALE AUTHOR, BY DECADE

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

TABLE 2— POISSON REGRESSIONS ON CITATION COUNTS

	Positive/Negative Sentiment Score
Constant	3.528
	[3.5198 3.537]
Sentiment Score	-0.018
	[-0.023 -0.013]
Percent Female	-0.123
	[-0.131 -0.114]
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: 95% Confidence Interval in parentheses