Don't Stop Me Now: Gender Attitudes in Academic Seminars Through Machine Learning*

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January 2023

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Abstract

This study examines the interactions between peers by building upon a widely cited finding in the gender literature that men interrupt women more often than women interrupt men. The analysis is based on a new dataset derived from audio recordings of economic seminars, in which the gender of all speakers is identified. The results indicate that (i) women are interrupted more frequently and earlier during presentations, (ii) this is largely due to interruptions by women in the audience rather than men, (iii) female presenters with less seniority receive more interruptions from women in the audience, (iv) men ask fewer questions and make more comments to female presenters, with differences in both the manner and content of their interruptions, and (v) having a female chair does not significantly alter these findings, except by reducing the number of interruptions made by men. The seminar series and presentation topic are used as control variables, along with factors such as the presenter's affiliation, seniority, and department ranking.

Keywords: gender, academic environment, machine learning, audio processing

JEL-code: A1, C8, C45, J4, J7

* I am grateful to my advisor Koen Decancq as well as to Ruben Durante, Libertad Gonzalez and Suncica Vujic for their guidance and support. I am also grateful to Andrea Salvanti, Ayah Bohsali, Elliot Motte, Francesco Amodio, Giulia Malevolti, Ignacio Crespo, Justin Wolfers, Maddalena Grignani, Marta Morazzoni, Pascaline Dupas, Paula Pereda, Raquel Lorenzo, Simone Zanella and Valeria Gargiulo for their helpful discussions and comments. I would also like to thank participants of UPF Applied Micro Seminar, CSB Internal Seminar (UA), Institute of Economics internal seminar (UdelaR), Latin American and Caribbean Economic Association 2022 Annual Meeting, the Italian Association of Development Economists 2022 meeting and the Winter School on Social Welfare 2022 (Canazei). Usual disclaimers apply.

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1 Introduction

It has been well-established that men and women differ in their attitudes toward various dimensions of life, such as work, education, family arrangements, and financial decisions (Bursztyn and Jensen 2017). This is particularly relevant in highly skilled and demanding professions with uncertain career prospects, such as academia, where women are still underrepresented (Harris and Jenkins (2006); Sattari and Sandefur (2019)). One manifestation of these attitudes is through interactions between peers, particularly through conversational dynamics. One of the most widely accepted findings in this field is that men interrupt women more often than women interrupt men (Tannen 1993). However, in this paper, I present evidence that challenges this conclusion.

This study is based on 2,131 economic seminars, with the goal of investigating whether female presenters are interrupted and receive questions more than their male counterparts do. This question seems particularly pressing, given the under-representation of women in the profession and the distinctively aggressive culture of economics seminars (Boustan and Langan 2019).

This article presents evidence on how female presenters are interrupted more than male presenters are during seminars. Building on this result, it contributes with four key findings to the literature on how the behavior of individuals is affected by the presence of peers. First, it shows that those extra interruptions received by female presenters are not entirely due to men in the audience but also to females. In particular, the proportion of interruptions by women does not play a significant role in explaining the overall number of interruptions in a seminar unless the presenter is a woman.

A second key finding is that although being a female presenter is linked to an increase in the number of female interruptions, a decrease in the latter is observed as more senior is the presenter.

The third key finding has to do with the role played by the gender of the presenter on the proportion of interruptions identified as questions and the ones that by contrast, were only identified as comments. Being a female presenter is related with an increase in the number of questions from females in the audience and with a decrease in the ones made by males. Furthermore, while men in the audience make more comments on average when the presenter is female, the gender of the presenter has no effect on the number of comments made by women.

Finally, this paper documents how the number of interruptions received by a presenter varies according to the gender of the seminar's chair: the presence of a female chair reduces on average

the number of interruptions made by men, but it does not affect the number of interruptions made by women.

This analysis was made possible due the virtualization of most academic activity during the COVID-19 outbreak of 2020. Among those activities, academic seminars—one of the main instances for researchers to present their findings, as well as a place for socializing among faculty members—were not only moved to a virtual setting, but also made publicly available later. In particular, the database used for this study consists of talks that were web-streamed between 2020 and 2022, involving speakers from the 320 highest-ranked universities worldwide . The information gathered from these recordings was assembled in two steps. First, using an audio processing technique known as "speaker diarization," which consists of estimating the number of speakers in an audio stream, I associated each speech segment with a speaker (Dadvar 2011). After determining "who spoke when," I identified the gender of the speakers based on their voices. Although such techniques are commonly applied with various devices used in daily life (e.g., mobile phones), their use in the domain of social science is rare and a novel feature of this paper.[1] Data on interruptions and the gender of the speakers are complemented by information on the length of the seminar and the presenter's university, number of citations, seniority, academic interests, and other relevant information available in Google Scholar and the Research Papers in Economics (RePEc) database. The text transcripts of each seminar were used to identify the topic of the presentation and to extract information about the content of each interruption.

As the dependent variable, referred to as "interruptions," is operationalized as every change of speaker in a given talk I supplement the previously reported results, variations of this concept are examined. Specifically, interruptions are further classified into two subcategories: questions and comments. Questions are defined as interruptions made in an interrogative manner, while interruptions that are not in this form are labeled as comments. In addition, the source of the interruption is also analyzed, specifically whether it is made by the chair of the seminar or by someone else in the audience.

In practice, the implications of an interruption or a question are not straightforward. The absence of interruptions could imply an audience either captivated or uninterested. Moreover, the same interruption can be perceived differently according to the age, position, or gender

[1]Examples of the use of these techniques in common life activities include interacting with the virtual assistant on a smartphone or distinguishing between a doctor's questions and a patient's responses in an online medical consultation.

of the receiver, even if it is possible to distinguish the tone of the interruption.[2] However, conversational interaction may also be related to enduring problems of power and dominance in social life (Zimmermann and West 1996). To address these issues, I analyze both the "how" and the "what" of an interruption. The "how" refers to whether the interruption occurs through a smooth transition between the interrupting speaker and the interrupted speaker or, in contrast, through a speech overlap between the two speakers. I find that men made fewer overlapping interruptions, on average, when the presenter was a woman, while women made more such interruptions with a female speaker. The greater legitimacy that women may feel to attempt to take the floor from other women and an intention of providing support and sense of cooperation are normally pointed out by the literature to explain this type of female-to-female interruption (Yuan et al. (2007); Dindia (1987)). To address the "what" of the interruptions, I examined the similarity between what it is said in the interruption and what it was being said prior the interruption. The analysis reveals that men exhibited less speech similarity in their interruptions when the presenter was female. Even if modest, this negative effect indicates that interruptions by men are slightly less related to the content of the stream that is being interrupted when the speaker is a woman.

These results also contribute an additional perspective to the rapidly growing body of evidence documenting gender discrimination at virtually every stage of the academic profession within the field of economics.[3] In addition, it seeks to expand the available literature documenting how women and men are treated differently when presenting their research. Within the field of economics, Dupas et al. (2021) use a hand-coded dataset from 420 seminars (mostly in the applied micro field) held in the 30 highest-ranking universities in the United States. The two main findings of their work are that women are asked more questions during seminars than men are (in line with the results reported in this paper) and that the questions posed to women presenters are more likely to be patronizing or hostile. Using transcribed audio recordings from medical conferences, Salem et al. (2021) demonstrate that women are less likely than men are to interrupt the presenter. Hand-coding videotaped conferences (mostly medical and psycholog-

[2]Recent work by Hilton and Jeong (2019) and by Hilton (2018) presents a discussion of systematic disparities on how individuals from different groups perceive interruptions.

[3]See Lundberg and Stearns (2019) for an overview. Paredes et al. (2020) provide evidence that undergraduate students exhibit more gender bias after studying economics. Wu (2018) documents an unwelcoming and stereotypical culture using online economic forums. Card et al. (2020) and Hengel (2022) provides evidence on how women are held to higher standards of writing and research than men are. Even if this can be seen as part of a larger problem, the disparities exhibited in academic economics are greater than those observed in other scientific areas (e.g., engineering), as well as those in other fields of the social sciences (Ginther and Kahn 2004).

ical), Jarvis et al. (2022) report that women are less likely than men are to ask questions, and they are likely to feel more anxious about asking questions. Finally, in a study of gender balance at the American Astronomical Society, Davenport et al. (2014) observe that women were asked slightly more questions than men were, interpreting this as an age effect, as senior scientists may be more likely to ask questions, and they are more commonly men.

This paper is composed of six sections. In the following section, I present the data used in this work and in Section 3, I introduce the machine-learning algorithms used for speaker diarization and gender recognition. Section 4 presents the econometric model and the text-analysis tools used for the seminar transcripts. Section 5 present the main results and Section 6 formulates conclusions and avenues for further research.

2 Dataset

The data used in this study was collected from web-streamed economic seminars that were held between 2020 and 2022 and were available on YouTube. With a few exceptions, these seminars can still be accessed on the platform.[4] In order to be included in the dataset, the seminar had to be part of a seminar series and the seminar series had to be organized or sponsored by the economics department of a university based in the United States or Europe. Seminars held by leading research institutions such as the National Bureau of Economic Research (NBER), the American Economic Association (AEA), and the Centre for Economic Policy Research (CEPR) were also considered.

In addition to YouTube metadata, such as the seminar's title and description, comments, the number of likes the video received, and the date it was posted, natural language processing tools developed in Qi et al. (2020) were used to identify the presenter's name from the video's title or description. This information was used to query Google Scholar for the presenter's affiliation, number of citations, academic interests, and the year in which their first paper was published. The latter is used as proxy for level of seniority.

Table 1 presents summary statistics for the database in four panels. The upper-left panel shows that the mean seminar duration is 62.3 minutes, with over 80% of seminars lasting between 45 and 90 minutes. Only 3.5% of the seminars are longer than 90 minutes. The upper-right panel indicates that seminars have an average of 11 interruptions, with the majority (6.6 interruptions)

[4]These exceptions refer to seminars that were streamed on YouTube but were subsequently deleted.

lasting less than 30 seconds. The bottom-left panel reveals that a large proportion of presenters are affiliated with top economics departments, with around two-thirds coming from the top ten departments and less than 10% coming from departments ranked in the first 100 positions. The bottom-right panel shows miscellaneous indicators, including the fact that in 8.3% of seminars, no interruptions were recorded, and in 10.1% of seminars, the only interrupter was the chair. The percentage of seminars with a female presenter is 35.3% of the dataset.

Figure 4 shows that the distribution of interruptions made during seminars presented by women is slightly shifted to the right compared to the distribution for males suggesting that outliers are unlikely to significantly influence the number of interruptions in seminars.

Table 2 and Figure 3 show the locations of the economics departments to which the presenters are affiliated. Approximately two-thirds of the presenters are affiliated with economics departments in the US, while 14% are affiliated with departments in European countries (excluding the UK), 11% are affiliated with departments in the UK, and the remaining are affiliated with departments in other locations around the world.

When video audio transcripts were available, they were downloaded. For cases in which this was not possible, audio was transcribed to text using speech recognition, following the procedure described in Ravanelli et al. (2021). These transcripts were pre-processed for text analysis by removing punctuation and "stop words" that do not carry intrinsic meaning, such as "and" or "the". The remaining words were lemmatized to group all inflected forms of a word, and only nouns, adjectives, verbs, and adverbs were retained.[5]

2.1 Topics' identification

the topics of the seminars were identified by utilizing a topic modeling approach on the audio transcripts. Once the topics were extracted, each seminar was assigned to one of the identified topics.

As an alternative method for identifying the topic of a seminar, information from RePEc was also employed, where papers are grouped by their corresponding JEL-code. By using the author's name as a query term, the JEL-code that was most frequently used by the author when publishing was obtained. This "most representative JEL-code" was used as a robustness check, in addition to the topics identified through the topic extraction process.

The following sections provide more detail on both of these approaches.

[5]For example, "policies" becomes "policy," and "were" becomes "be".

2.1.1 Topic identification based on seminar's transcripts

Topic modeling is an unsupervised learning technique that is used to extract distinguishing concepts or topics from a large corpus of documents. For the extraction, the pre-processed transcripts described in Section 2 were used as the corpus data. A "topic" is a cluster of words that frequently occur together. In this study, I used Mallet, a topic modeling toolkit that contains sampling-based implementations of Latent Dirichlet Allocation (McCallum 2002). Figure 9 in Appendix III shows the coherence score for models trained with a different number of topics. I selected the model with 15 topics, which gives the highest value before the curve starts to flatten out (Röder et al. 2015), although the score appears to continue increasing even when the model is trained with 40 topics.

The most probable words for each topic are shown in the word clouds of Figure 5. Once the topics are generated, the specific topic of a given seminar is determined by finding the topic number with the highest percentage contribution in the seminar transcript.

The words generated in each of the topics can also be associated with words in the different categories of the JEL classification system. To do this, I compared the 15 topics that emerged from the topic analysis with the 17 JEL categories and determined which category was most similar to each topic.[6] The distance between two vectors, each coming from a different set of documents, was computed using the cosine similarity score. Once the distance of each topic to all the JEL categories was calculated, I assigned each topic the JEL-code of the category with the shortest distance. Table 3 summarizes the results of the topic modeling.

2.1.2 Topic identification based on speaker's JEL-code

An alternative method for assigning a topic to a seminar is based on the identification of the JEL-codes that were most frequently used by the speaker in their previous publications. This information was obtained by matching the speaker's name with a database of 714,702 classified papers from RePEc that included the author's name and corresponding JEL-code. A total of 2,131names were matched, which resulted in the assignment of a JEL-code to 58.2% of the seminars.[7] The bar plot in Figure 6 shows the number of seminars matched by the different

[6]The JEL classification includes 20 different categories, but the categories "A. General Economics and Teaching," "Y. Miscellaneous Categories," and "Z. Other Special Topics" were not considered.

[7]The RePEc database is created based on information provided by publishers, so the JEL code classification may not be available for all papers indexed in RePEc. In addition, as for this work only seminars from 2020-2022 were used, many of the papers presented in these seminars are likely to have not yet been published. However, future research could consider this as a more precise robustness check.

JEL-codes.

3 Machine learning algorithms for audio processing

The processing of the audio data involves two main steps. First, a map of all the speakers in the audio signal is constructed, process known as speaker diarization. Second, the gender of each of the identified speakers is predicted using their voice.

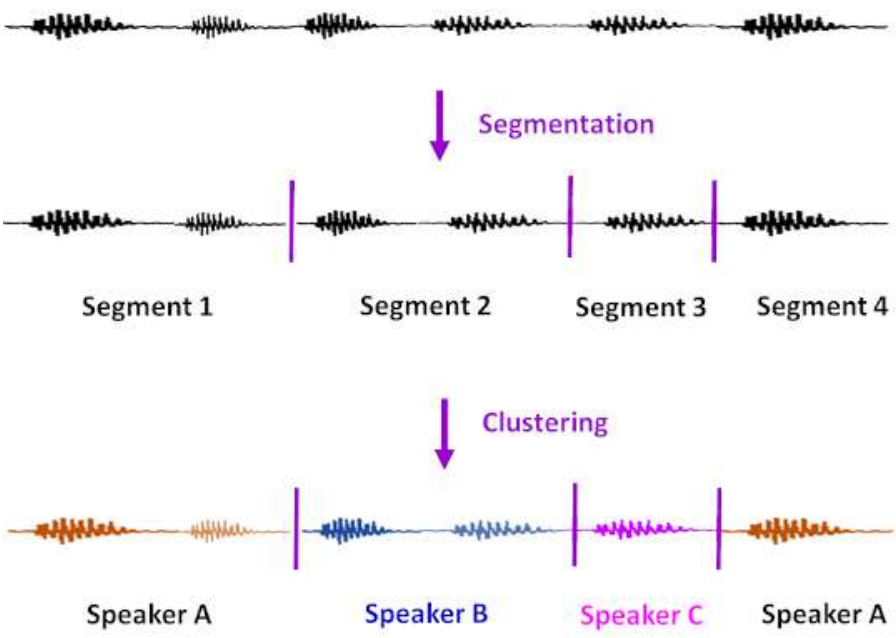
Both the speaker diarization and gender prediction make use of Mel Frequency Cepstral Coefficients (MFCC), which are short-term acoustic signal features commonly used to obtain information about a speaker's vocal tract characteristics (Müller 2021; Anguera et al. 2012). More information on how this feature is constructed can be found in the Appendix III.

3.1 Speaker diarization

Speaker diarization is the process of detecting the turns and then clustering the speech from the same speaker together.

The diarization system used here is divided into three steps. First, it discriminates speech segments from non-speech ones. Second, it detects speaker change points to segment the audio data. Finally, it groups these segmented regions into speaker homogeneous clusters (Pulkki et al. 2017). Figure 1 below provides a visual representation of this process.

Figure 1: Speaker diarization



Voice activity detection (VAD) is used to infer which segments of audio contain speech, while excluding background noise and silence.[8] This improves the quality of the output by masking silent frames and noise, and speeds up signal processing by avoiding extra runs on uninformative frames. To detect and remove non-speech segments, I rely on the assumption that voiced frames have more energy than silent ones. High-energy regions of the signal can be associated with voice activity. A visual representation of this process can be found in the appendix.

To determine the change points in the audio signal, a Gaussian Mixture Model (GMM) is used (Moattar and Homayounpour 2012; Cettolo et al. 2005) where the Bayesian Information Criterion (BIC) determines the number of segments in the signal. This technique segments the audio signal within a window by using a penalized likelihood ratio test to determine whether the data in the window is better modeled by a single distribution or by two different distributions. The null hypothesis is that there is no speaker change point at time t_j. The data, $Z = X + Y$, is modeled by a multivariate Gaussian probability density function with a set of parameters θ_Z and a log-likelihood L_0 as follows:

$$L_0 = \sum_{i=1}^{n_X} logN(x_i|\theta_Z) + \sum_{i=1}^{n_X} logN(y_i|\theta_Z), \tag{1}$$

being n_X and n_Y the numbers of data samples in analysis windows X and Y respectively. Under the alternative hypothesis, a speaker change point exists at t_j, and the windows X and Y are modeled by two multivariate Gaussian densities. In this case, each density has its own set of parameters, θ_X and θ_Y. The log-likelihood L_1 is obtained by

$$L_1 = \sum_{i=1}^{n_X} logN(x_i|\theta_X) + \sum_{i=1}^{n_X} logN(y_i|\theta_Y). \tag{2}$$

In this study, we estimate the set of parameters Θ using the Expectation Maximization (EM) algorithm. This algorithm operates by comparing two adjacent sliding windows of audio data, calculating the distance between them, and determining whether the two windows originate from the same speaker. The dissimilarity between the two windows is measured using the ΔBIC metric, which is defined as

$$\Delta BIC = L_1 - L_0 - \lambda R, \tag{3}$$

[8] In signal processing, noise is any unwanted (and generally unknown) modification that a signal may suffer during capture, storage, transmission, processing, or conversion (Vyacheslav 2010). Noise sources may include background noise such as traffic or construction, which are unusual in these types of recordings.

The penalty term R is included in the ΔBIC calculation to adjust for the excess of parameters in the alternative hypothesis model compared to the null hypothesis model. The fine-tuning factor λ is also used in this calculation. When the ΔBIC is positive, a local maximum is identified and the time point t_j is considered a speaker change point. If the ΔBIC is not positive, there is no speaker change point at time t_j. This process is repeated for multiple samples within the analysis window to identify potential boundary points.

In this process, I group the identified audio segments by speaker identity by comparing speaker similarity between all clusters. As the audio signals analyzed in this study are relatively homogeneous, with one main speaker typically followed by a small number of interruptions, new speakers are assigned new identification numbers and similar speakers are assigned the same identification number. This study follows the approach described in Ravanelli et al. (2021) and Desplanques et al. (2020), which involves using an ECAPA-TDNN model to compute voice similarities. ECAPA-TDNN, or "Efficient Convolutional Attention with Pooled Aggregation Time Delay Neural Network," is a neural network architecture to process sequences of data, such as audio signals or natural language text. The architecture uses convolutional blocks and attentive statistical pooling to better capture important information from the input data and improve performance. It is also based on the Time Delay Neural Network (TDNN) model, which is designed to process sequences of data using a series of hidden layers with time delay units. ECAPA-TDNN models are commonly used for speech recognition or speaker identification. The model was trained using data from Nagrani et al. (2020), which consists of short audio clips of human speech extracted from interview videos on YouTube. The similarity between speakers was calculated using the cosine distance between speaker embeddings.

3.2 Gender recognition

To predict gender, I used Mozilla's Common Voice Dataset (Ardila et al. 2020), a large, publicly available corpus of speech data that includes annotations for the gender of each speaker. After cleaning and filtering the audio files, I found 6,995 male audio files and 5,662 female audio files in the dataset.

As is common in the literature (Alnuaim et al. 2022; Chachadi and Nirmala 2022), I employed a deep feed-forward neural network with five hidden layers using the MFCC and the Mel Spectrogram Frequency as features. I also used a dropout rate of 30% as a regularization technique, which has been shown to be effective in improving model performance (Chollet 2021). The pre-

trained model achieved an accuracy of 90.95%, similar to the results reported in previous works using the same dataset (Chachadi and Nirmala 2022).

To evaluate robustness, gender predictions of presenters based on their voices were compared with predictions of their gender using a dictionary of names. This comparison was performed using the speaker's name obtained from YouTube. The appendix presents the results of this comparison.

4 Econometric model

The baseline relationship to examine is the one between the number of interruptions received by presenters in a seminar and their gender. To analyze this, I used the following linear specification:

$$Y_i = \beta_0 + \beta_1 \text{FemalePresenting}_i + X\gamma + Z\lambda + \epsilon_i, \tag{4}$$

in which the variable Y_i is the number of interruptions in a given seminar, and β_1 shows the effect of being a female presenter on the number of interruptions. A positive value of β_1 would indicate that being a female presenter leads to a higher number of interruptions. The vector X includes presenter-related characteristics such as citations, the ranking of the affiliated university, research interests, and the year of the presenter's first publication. The vector Z includes seminar-related variables such as duration, the gender of the interrupters, the seminar series, and the topic of the presentation. The stochastic error term is ϵ_i.

Standard errors were primarily clustered at the seminar series level. To ensure robustness, alternative cluster variables were also used, such as the presenter's economic department, the country where the department is located, and the presenter's name.

This same specification was used to explain the number of questions and comments received by a presenter, as well as the amount of time that passes before the first interruption in a given seminar takes place. In the latter case, the variable Y_i is the number of minutes from the moment the presenter starts speaking until the first interruption. In this case, a negative value of β_1 would imply that being a female presenter is associated with a shorter time in minutes before the first interruption. In the case of questions and comments, a positive value of $\hat{\beta}_1$ would imply that being a female presenter is associated with an increase in the number of questions or comments received.

4.1 Inferring type of interruption by audio transcripts

As explained in Section 3, the procedure used does not identify the nature of interruptions during a seminar. This means that different types of interactions, such as questions, clarifications, criticisms, or suggestions, are pooled together under the label of "interruption." However, by using the audio transcripts of the seminars, it is possible to predict which of the interruptions are interrogatives. To do this, I ran a gradient boosting algorithm that was trained using a corpus of more than 10,000 human-annotated posts made in online forums, available in Forsythand and Martell (2007). These posts include dialogue-act tagged information about whether a sentence is interrogative or not.[9]

On average, a presenter receives 6.1 questions per seminar (56.6% of the interruptions) and 4.7 comments (44.2% of the interruptions). Comments are all the other interruptions that were not identified as questions. Interruptions were considered questions if at any point during the interruption, a question was identified, regardless of whether it appeared at the beginning or the end of the interruption.

5 Results

The results of this study are organized into three parts. The first part presents the relationship between being a female presenter and the number of interruptions received during a seminar. The second part discusses the role of women in the audience in the contribution to the difference in interruptions received by male and female presenters. The final part presents additional results and robustness checks. Overall, the results provide insights into gender-based disparities in academic settings and how they can be addressed.

5.1 The effect of being a female presenter on seminar interruptions

The baselines results of this paper are presented in Table 4. There Equation 4 is estimated by OLS with the number of interruptions as dependent variable.

In all the specifications, the variable of interest, gender of the presenter, is significantly positive. This implies that female presenters receive on average between 0.9 and 1.5 more interruptions in seminars compared to males. As expected, seminar duration has a significant and

[9]The tags include “Wh” questions (questions that begin with “what,” “when,” “where,” “who,” “whom,” “which,” “whose,” “why,” and “how”) and closed questions, which can only be answered with “yes” or “no.”

positive effect on the number of interruptions and its inclusion in the model also increases the effect of female presenter on the number of interruptions. The effect of being a female presenter on the number of interruptions does not have a significant variation when seniority and citations are added as controls. A presenter with more citations (column 3) or more senior (column 4), receives on average fewer interruptions in a seminar. Similar situation is observed in Column 5, where both variables considered together as controls and when the topic of the seminar is used as a control (Column 6). The most complete specification considers also the location of the speaker's department and the seminar series and shows that on average, a female speaker receives 1.5 extra interruptions during a presentation than a male presenter.

In all the specifications the standard errors were clustered at the seminar series level. However they remain unchanged when the cluster variable is the economic department to which the presenter belongs, the country of location of the department, and the presenter's name are also used for robustness as cluster variables. see these results in the online appendix.

At the same time that meaningful by their own, the 14.1% extra interruptions received by female presenters found in this paper are remarkably similar to the 12% of extra interruptions found in Dupas et al. (2021). Two The difference between the 1.5 interruptions received on average by female presenters found here and the 3.8 that they find can be explained at least by two reasons. First, the different type of seminars covered in each analysis. Dupas et al. (2021) focuses mostly on applied micro seminars while this work considers a broader set of economic fields. When only seminars more connected to apply micro topics are considered (topics 2, 5, 10, 12 and 14), female presenters receive an average of 3.1 extra interruptions which indeed is more similar to what is found in Dupas et al. (2021). However with the available data it is possible to shed light on what drives this behavior. This is done by combining the gender of the individuals that makes the interruptions and the topic of the presentation. The next section discuses this.

5.2 Who is behind those interruptions?

There is abundant literature on conversation dynamics stating that men have frequently been found to interrupt women more than women interrupt men.[10] Given the previous results is relevant to question until which extent this is verified here. Table 5 gives a first glimpse on whether the seminar's interruptions are made by males or females in the audience. As the share

[10]See for example the works of Rosenblum (1986) or Holmes (1992) and more recently the one of Hancock and Rubin (2015). Also Tannen (1993) provides a review of the literature.

of men attending to economic seminars is normally higher should not be surprising that it is observed around three more time questions from them than from women. However is worthy of notice that while men attending to seminars make an average of 0.2 extra interruptions to female presenters in comparison to male presenters, women make almost one extra interruption to female than to male presenters.

In that sense, the Table 6 presents results when the Equation 4 is estimated considering interacting the gender of the presenter with the proportion of interruptions made by women from the audience. The inclusion of this term implies that female presents is not longer significant to explain the number of interruptions. By contrast, the proportion of female interruptions is significant to explain the overall number of interruptions in a seminar only when the presenter is a woman. This implies that having more women in the audience is related with a decrease in the number of interruptions while being a female presenter in an audience with a high share of women is associated with an increase of it.

As long as used only as control variable, the topic of the presentation masks an important heterogeneity in terms of number of interruptions. Table 7 shows the variation in the number of interruptions according to the topic of the presentation. Excluding Topics 3, 9 and 15 in which it was not possible to identify a clear JEL topic, the table shows that females presenters receive at least one more extra interruption in 4 of the 15 topics while males receive one or more interruptions than females in 3 topics.

In addition Table 8 differentiates the interruptions by the gender of who makes it. For example, in Topic 1 (Math and Quant) and Topic 10 (Int Econ) males in the audience do more than one extra interruption to female presenters than males. However while women reduces the number of interruptions that make to females in Topic 1 (by 0.3), they increase it in Topic 10 (also by 0.3). Instead, for example Topic 6 (Labor) shows that the extra interruptions received by female presenters are driven mostly by women in the audience (men make 0.9 extra interruptions while women make 2.4 extra interruptions to female presenters). Women also make a large amount of extra interruptions to female presenters than to males in Topic 8 (Dev & Growth), Topic 12 (Labor) and Topic 13 (Pub. Economics). However this is not reflected in Table 7 due to males attendees reducing the number of interruptions made to female presenters.

This situation should not be surprising given the wide variation in the share of females across topics in economics (Card et al. 2020; Chari and Goldsmith-Pinkham 2017). To reinforce the results presented in Table 8, the next step is to explore whether female presenters are more

interrupted in seminars with a higher share of females in the audience. This is not straightforward as the available data only contains information of the gender of those that intervened in the seminars, but not of the attendees that did not speak on it. In order to overcome this, two proxy variables are used as a measure of the presence of females in a seminar. The first one is the percentage of female presenters by field. The logic behind this is that topics with higher percentage of females presenters are likely to also have a larger composition of females attending to it. As a second proxy I use Card et al. (2020) data, who computes the fraction females in EconLit.[11] The bi-variate correlation between these two proxy variables and the number of interruptions made by males and females in the audience is presented in Figure 7.

The first 6 columns of Table 9 re-estimates the Equation 4 interacting the share of female presenters by topic with female presenter. Additionally in Column 7, it is used the share of females in EconLit as measure of presence of females in the field. As the values of this variables are computed by topic, to avoid multicollinearity I re-grouped topic of the presentation in four groups: microeconomics, macroeconomics, quantitative methods and others.[12] Overall, being a female presenter significantly increases the number of interruptions in a seminar only in seminars with a high share of females in the audience.

5.3 Additional results and robustness checks

This last part of the Results section present several additional results as well as some key robustness checks.

Interruptions and seniority of the presenter: Table 10 presents results when Equation 4 is estimated interacting seniority of the presenter with their gender. While the sign of being a female presenter on the overall number of interruptions is still positive, its effect is not longer significant for the overall number of interruptions. Similar conclusion applies when the variable to explain is the number of male's interruptions. By contrast, being a female presenter is significant to explain the number of interruptions made by females in the audience. Further, in the interaction of the latter with seniority, the effect, while still significant, is negative. This result

[11] EconLit is an academic literature abstracting database service published by the American Economic Association. The service focuses on literature in the field of economics covering articles and other materials dating back to 1969.

[12] Group 1: Topic 2 (IO), Topic 5 (Micro) and Topic 14 (Micro). Group 2: Topic 4 (Macro), Topic 10 (Int. Economics), Topic 11 (Pub. Economics) and Topic 13 (Pub. Economics), Group 3: Topic 6 (Labor), Topic 7 (Environmental Economics), Topic 8 (Development and Growth) and Topic 12 (Labor). Group 4: Topic 1 (Math and Quantitative Methods).

indicates that while being a female presenter is related with an increase in interruptions from women, as more senior the female presenter, she receives on average fewer interruptions.

Questions and comments: Table 11 presents results when Equation 4 is estimated using the number of proper questions, which were identified following the procedure described in Section 4.1. Panel A show results when questions made by males in the audience is the explained variable and Panel B when questions made by females is the variable to explain. In both panels being a female is significant in order to explain the number of questions received by males and females respectively. Interestingly, they do it with opposite signs: being a female presenter leads to fewer questions by males and to more questions by females in the audience. In contrast to the previous results, for both set of specifications gender of the presenter is significant also when topic of the presentation is included as control variable. Results are less conclusive when interrogative interruptions are used as dependent variable. Even if the effect is positive, Table 11 shows how in only two, out of six specifications, being a female presenter has a significant effect on the number of questions received. While for the overall population of seminar presenters, being a female has a positive and significant effect on the number of interruptions received, this effect can not be established when only interrogative interruptions are considered.

The residual category is "comments", which as explained in Section 4.1 is defined as all the interruptions that were not classified as questions. Table 12 shows the results when Equation 4 is estimated with all the interruptions that were not identified as questions as dependent variable. As reflected in Panel A, in four out of the seven proposed specifications being a female presenter is significant to explain the overall number of non interrogative interruptions. Panel B shows a positive and significant effect of being a female presenter in the increase of the non-interrogative interruptions made by males in the audience while Panel C shows a non significant effect of this on the ones made by the females attendees.

Interruptions by voice overlapping: normally two ways of taking the floor in a conversation are distinguished in the conversation dynamics literature. One in which the change of speaker takes place by a smooth voice transition and the other in which the speaker that interrupts overlaps their voice to the one that is talking before the interruption (Tannen 1993). As stated in the introduction of this work, the literature has found this a common practice among female speakers explained by the higher legitimacy that they may feel to attempt to take the floor from other women but also as a rapport building function and signal of support. This seems to be confirmed in Table 14 where being a female presenter is related with an increase in the

number of overlapping interruptions made by females in the audience and with a -more modest- decrease in the number of interruptions made by males.

Extensive margin: different unique interrupters In Table 15 the same specifications are proposed but in this case the dependent variable is the number of different seminar attendees that make an interruption. This implies that an attendant asking several questions will contribute to the dependent variable in the same way that an attendant asking a single one. In Panel A, only three out of the seven proposed specifications exhibits a significant coefficient in being a female presenter. This weak evidence contrasts with the one presented in Panel C, when only female interrupters are considered. The positive and significant coefficient associated to female presenter suggests that, even if in a small magnitude, more different females engage to participate in a seminar when the presenter is a woman.

Time before the first interruption: In Table 16 results are presented but now on the left hand side of Equation 4 it is measured the time that happens before the presenter receives the first interruption. The negative sign in all the specifications indicates that female presenters receive the first interruption between 3 and 4 minutes before male presenters. Being more senior or having more citations retards the moment of the first interruption. However Table 17 shows little evidence on whether being a female presenter is linked to a male's first interruption or a female's one.

Chair of the seminar: In many seminar series there is a chair that moderates the seminar and introduces the speaker. Additionally in some cases this moderator organizes and reads questions posted in the chat of the seminar. Several rules were used to identify the moderator of a seminar in case there was. For example a moderator has to be the individual who speaks at the beginning of the seminar and at the same time do it for a short time period. The results presented above does not change substantially when the interruptions of the moderator are not considered. However the gender of this chair plays a significant role in order to explain the number of interruptions received by the presenter.

Interruptions excluding the chair:

6 Conclusions and Avenues for Future Research

Female presenters in economic seminars are interrupted more often than male presenters are. On average, they receive between one and two more interruptions (approximately 15% more) than

their male counterparts do. In addition, they are interrupted earlier in their presentations.

The results of this study nevertheless provide evidence of a less widespread idea: those extra interruptions received by female presenters are not entirely due to men in the audience but to female attendees. In particular, the proportion of interruptions by women does not play a significant role in explaining the overall number of interruptions in a seminar unless the presenter is a woman.

Two theories in the literature on conversational dynamics could potentially explain this pattern of female-to-female interruptions (Coates (2015); Palonen 2019). One theory concerns interruption behavior as a measure of dominance, disruption, or obstruction. Even if commonly associated with male-to-female interaction,[13] evidence suggests that the balance of power between participants—and not the gender of the participants—is the main driver of these type of interruptions (Kollock et al. (1985), Hancock and Rubin (2015)). Given both the aggressive culture of economics seminars and the under-representation of women in the professional field of economics (Boustan and Langan 2019), it is plausible that women may feel greater legitimacy to take the floor from other women (of less senior status) than they do to take the floor from men. The negative relationship found when female presenter interacted with seniority was used to explain the number of interruptions made by females in the audience supports this hypothesis. Similar to minority students who adapt their behavior by "acting white," thereby improving their standing with peers (Austen-Smith and Fryer Jr 2005), female attendees might try to improve their acceptance within the academic community by behaving as their males peers (i.e., "acting male").

A second function of interruption is to provide support, adding positively to what is being said in a cooperative way. In this context, women in the audience may feel more comfortable and eager to take the floor when interacting with female peers or within environments characterized by a high proportion of women (e.g., Dasgupta et al. (2015); Ford et al. (2017)). This may be due to lower levels of intimidation and anxiety about participating (Wey 2009). Given that seminars are opportunities that researchers use to improve their work, however, it could also reflect a desire to help in this regard. This effect could be reinforced by the fact that women are more likely to share common research interests and to work together (Card et al. (2020); Ductor et al. (2018)) suggesting that some interruptions could be made by coauthors or colleagues from

[13] In an article in Times, Bennett (2015) coined the term "manterruption" to refer to the unnecessary interruption of women by men in order to silence them and discredit their expertise.

the same research group. This is consistent with the additional finding that women presenters receive more interruptions from other women through overlapping speech. This behavior has been identified as more a means of "working together to produce shared meanings" (Coates 2015) than as an attempt to take the floor from another speaker.

These hypothetical explanations should nevertheless be approached with caution. It does not necessarily follow that interruptions intended to express agreement or ask for clarification always constitute attempts to seize the floor. As noted by Dindia (1987)), agreement with what is being said can be a precursor to taking over the floor. Conversely, interrupting to disagree is not necessarily disruptive. Even in collaborative, rapport-building simultaneous talk, one speaker gently express disagreement with another (Tannen 1993).

A similar complexity could arise in the interpretation of questions and comments in seminars. The results are nevertheless in line with considerable evidence that women are more likely to express interest in the opinions of others through such means as asking questions (Fishman 1983, Holmes 1984, Cameron, McAlinden, and O'Lcary 1989).

When the chair of the seminar was a woman, men in the audience made fewer interruptions, thus significantly reducing the overall number of interruptions. At the same time, the gender of the seminar's chair did not seems to have an impact in the number of interruptions made by women in the audience.

As a final remark, the results reported in studies of interruptions are inconsistent, due to differences in the methodologies employed. For example, studies differ in the way in which interruptions are counted. As is the case with previous studies, the definition of interruption employed in the present study is open to debate. It is nevertheless tractable, and it provides a clear way to identify and count interruptions, thereby allowing for an easy extension of this work to other domains. Other inconsistencies among previous studies have to do with unrepresentative subject samples, the absence of statistical testing, and faulty statistical methods, which call the reliability of the results of some studies into question. The present study has resulted in the creation of a relatively large dataset that is representative of the various sub-fields of economics, while also including dialogues between individuals who were not affected by any external observer coding or analyzing their interactions.

To the best of my knowledge, this is the one of the broadest studies of audience participation and academic interactions. In recent years, various academic actors have begun to take steps to enhance understanding of the problem and to facilitate changes that will make the profession of

economics more welcoming to women. Understanding the documented differences in the participation of women in these types of events is a necessary step toward designing interventions that could positively affect the participation of under-represented groups. For example, differences in the behavior patterns of men and women (e.g., female- to-female interruption vs. female-to-male interruption) or the lower visibility of women in academic activities might affect the role that women play as role models that reinforce this cycle.

The current study is also one of the first to apply algorithmic techniques for audio processing within the domain of the social sciences. Particularly within the context of academia, the recent and increasing availability of publications, video and audio recordings, and similar materials suggests that such techniques are likely to be applied again in future studies aimed at explaining the attitudes of individuals. This method is also easy to replicate and extend to other areas in which it is important to understand individual behavior, as interviews or political discussions.

References

Alnuaim, Abeer Ali, Mohammed Zakariah, Chitra Shashidhar, Wesam Atef Hatamleh, Hussam Tarazi, Prashant Kumar Shukla, and Rajnish Ratna (2022). "Speaker Gender Recognition Based on Deep Neural Networks and ResNet50". In: *Wireless Communications and Mobile Computing* 2022.

Anguera, Xavier, Simon Bozonnet, Nicholas Evans, Corinne Fredouille, Gerald Friedland, and Oriol Vinyals (2012). "Speaker diarization: A review of recent research". In: *IEEE Transactions on audio, speech, and language processing* 20.2, pp. 356–370.

Ardila, R., M. Branson, K. Davis, M. Henretty, M. Kohler, J. Meyer, R. Morais, L. Saunders, F. M. Tyers, and G. Weber (2020). "Common Voice: A Massively-Multilingual Speech Corpus". In: *Proceedings of the 12th Conference on Language Resources and Evaluation (LREC 2020)*, pp. 4211–4215.

Austen-Smith, David and Roland G Fryer Jr (2005). "An economic analysis of "acting white"". In: *The Quarterly Journal of Economics* 120.2, pp. 551–583.

Boustan, Leah and Andrew Langan (2019). "Variation in women's success across PhD programs in economics". In: *Journal of Economic Perspectives* 33.1, pp. 23–42.

Bursztyn, Leonardo and Robert Jensen (2017). "Social image and economic behavior in the field: Identifying, understanding, and shaping social pressure". In: *Annual Review of Economics* 9, pp. 131–153.

Card, David, Stefano DellaVigna, Patricia Funk, and Nagore Iriberri (2020). "Are referees and editors in economics gender neutral?" In: *The Quarterly Journal of Economics* 135.1, pp. 269–327.

Cettolo, Mauro, Michele Vescovi, and Romeo Rizzi (2005). "Evaluation of BIC-based algorithms for audio segmentation". In: *Computer Speech & Language* 19.2, pp. 147–170.

Chachadi, Kavita and SR Nirmala (2022). "Voice-based gender recognition using neural network". In: *Information and Communication Technology for Competitive Strategies (ICTCS 2020)*. Springer, pp. 741–749.

Chari, Anusha and Paul Goldsmith-Pinkham (2017). *Gender representation in economics across topics and time: Evidence from the NBER summer institute*. Tech. rep. National Bureau of Economic Research.

Chollet, Francois (2021). *Deep learning with Python*. Simon and Schuster.

Coates, Jennifer (2015). *Women, men and language: A sociolinguistic account of gender differences in language*. Routledge.

Dadvar, Maral (2011). *Who spoke when? Audio-based speaker location estimation for diarization*. LAP LAMBERT Academic Publishing.

Dasgupta, Nilanjana, Melissa McManus Scircle, and Matthew Hunsinger (2015). "Female peers in small work groups enhance women's motivation, verbal participation, and career aspirations in engineering". In: *Proceedings of the National Academy of Sciences* 112.16, pp. 4988–4993.

Davenport, James RA, Morgan Fouesneau, Erin Grand, Alex Hagen, Katja Poppenhaeger, and Laura L Watkins (2014). "Studying Gender in Conference Talks–data from the 223rd meeting of the American Astronomical Society". In: *arXiv preprint arXiv:1403.3091*.

Desplanques, Brecht, Jenthe Thienpondt, and Kris Demuynck (2020). "Ecapa-tdnn: Emphasized channel attention, propagation and aggregation in tdnn based speaker verification". In: *arXiv preprint arXiv:2005.07143*.

Dindia, Kathryn (1987). "The effects of sex of subject and sex of partner on interruptions". In: *Human Communication Research* 13.3, pp. 345–371.

Ductor, Lorenzo, Sanjeev Goyal, and Anja Prummer (2018). "Gender and collaboration". In: *The Review of Economics and Statistics*, pp. 1–40.

Dupas, Pascaline, Alicia Sasser Modestino, Muriel Niederle, Justin Wolfers, et al. (2021). *Gender and the dynamics of economics seminars*. Tech. rep. National Bureau of Economic Research.

Ford, Denae, Alisse Harkins, and Chris Parnin (2017). "Someone like me: How does peer parity influence participation of women on stack overflow?" In: *2017 IEEE symposium on visual languages and human-centric computing (VL/HCC)*. IEEE, pp. 239–243.

Forsythand, Eric N and Craig H Martell (2007). "Lexical and discourse analysis of online chat dialog". In: *International Conference on Semantic Computing (ICSC 2007)*. IEEE, pp. 19–26.

Ginther, Donna K and Shulamit Kahn (2004). "Women in economics: moving up or falling off the academic career ladder?" In: *Journal of Economic perspectives* 18.3, pp. 193–214.

Hancock, Adrienne B and Benjamin A Rubin (2015). "Influence of communication partner's gender on language". In: *Journal of Language and Social Psychology* 34.1, pp. 46–64.

Harris, Christine R and Michael Jenkins (2006). "Gender differences in risk assessment: why do women take fewer risks than men?" In.

Hengel, Erin (2022). "Publishing while Female. Are women held to higher standards? Evidence from peer review." In.

Hilton, Katherine (2018). "Social meaning in a shifting grammatical landscape: The perception of nonagreement in existential there constructions". In: *Journal of Sociolinguistics* 22.2, pp. 233–249.

Hilton, Katherine and Sunwoo Jeong (2019). "The role of context in sociolinguistic perception". In: *Linguistics Vanguard* 5.s1.

Holmes, Janet (1992). "Women's talk in public contexts". In: *Discourse & Society* 3.2, pp. 131–150.

Jarvis, Shoshana N, Charles R Ebersole, Christine Q Nguyen, Minwan Zhu, and Laura J Kray (2022). "Stepping up to the mic: Gender gaps in participation in live question-and-answer sessions at academic conferences". In: *Psychological Science*, p. 09567976221094036.

Kollock, Peter, Philip Blumstein, and Pepper Schwartz (1985). "Sex and power in interaction: Conversational privileges and duties". In: *American sociological review*, pp. 34–46.

Lundberg, Shelly and Jenna Stearns (2019). "Women in economics: Stalled progress". In: *Journal of Economic Perspectives* 33.1, pp. 3–22.

McCallum, Andrew (2002). "MALLET: A Machine Learning for Language Toolkit". http://mallet.cs.umass.edu.

Moattar, Mohammad Hossein and Mohammad M Homayounpour (2012). "A review on speaker diarization systems and approaches". In: *Speech Communication* 54.10, pp. 1065–1103.

Müller, Meinard (2021). *Fundamentals of Music Processing: Using Python and Jupyter Notebooks*. Springer Nature.

Nagrani, Arsha, Joon Son Chung, Weidi Xie, and Andrew Zisserman (2020). "Voxceleb: Large-scale speaker verification in the wild". In: *Computer Speech & Language* 60, p. 101027.

Paredes, Valentina A, M Daniele Paserman, and Francisco Pino (2020). *Does Economics Make You Sexist?* Tech. rep. National Bureau of Economic Research.

Pulkki, Ville, Symeon Delikaris-Manias, and Archontis Politis (2017). *Parametric time-frequency domain spatial audio*. John Wiley & Sons.

Qi, Peng, Yuhao Zhang, Yuhui Zhang, Jason Bolton, and Christopher D Manning (2020). "Stanza: A Python natural language processing toolkit for many human languages". In: *arXiv preprint arXiv:2003.07082*.

Ravanelli, Mirco, Titouan Parcollet, Peter Plantinga, Aku Rouhe, Samuele Cornell, Loren Lugosch, Cem Subakan, Nauman Dawalatabad, Abdelwahab Heba, Jianyuan Zhong, Ju-Chieh Chou, Sung-Lin Yeh, Szu-Wei Fu, Chien-Feng Liao, Elena Rastorgueva, François Grondin,

William Aris, Hwidong Na, Yan Gao, Renato De Mori, and Yoshua Bengio (2021). *Speech-Brain: A General-Purpose Speech Toolkit*. arXiv: 2106.04624 [eess.AS].

Röder, Michael, Andreas Both, and Alexander Hinneburg (2015). "Exploring the space of topic coherence measures". In: *Proceedings of the eighth ACM international conference on Web search and data mining*, pp. 399–408.

Rosenblum, Karen E (1986). "The conflict between and within genders: An appraisal of contemporary American femininity and masculinity". In: *Sociological inquiry* 56.1, pp. 93–104.

Salem, Victoria, Jordan McDonagh, Elizabeth Avis, Pei Chia Eng, Sue Smith, and Kevin G Murphy (2021). "Scientific medical conferences can be easily modified to improve female inclusion: a prospective study". In: *The Lancet Diabetes & Endocrinology* 9.9, pp. 556–559.

Sattari, Negin and Rebecca L Sandefur (2019). "Gender in academic STEM: A focus on men faculty". In: *Gender, Work & Organization* 26.2, pp. 158–179.

Tannen, Deborah (1993). *Gender and conversational interaction*. Oxford University Press.

Vyacheslav, Tuzlukov (2010). *Signal Processing Noise, Electrical Engineering and Applied Signal Processing Series*.

Wey, Rebecca (2009). "'Women speaking up: Getting and using turns in workplace meetings'. Cecilia E. Ford. New York: Palgrave Macmillan. 2008. pp. 256." In: *Gender and Language* 3.1, pp. 121–125.

Wu, Alice H (2018). "Gendered language on the economics job market rumors forum". In: *AEA Papers and Proceedings*. Vol. 108, pp. 175–79.

Yuan, Jiahong, Mark Liberman, and Christopher Cieri (2007). "Towards an integrated understanding of speech overlaps in conversation". In: *ICPhS XVI, Saarbrücken, Germany*.

Zimmermann, Don H and Candace West (1996). "Sex roles, interruptions and silences in conversation". In: *Amsterdam Studies in the Theory and History of Linguistic Science Series 4*. John Benjamins, pp. 211–236.

Appendix I

Table 1: Sample characteristics (standard error in parenthesis)

Duration		**Interruptions**	
Duration (mean, in min)	62.3	Interruptions (mean)	10.8
Less than 45 min	14.2%	Inter. 30 sec or less (mean)	6.6
Between 45min and 70 min	56.5%	Inter. between 30 and 60 sec (mean)	2.6
Between 70min and 90 min	25.8%	Inter. between 60 and 120 sec (mean)	1.2
More than 90 min	3.5%	Inter longer than 120 sec (mean)	0.4
Ranking		**Other**	
Dept. ranking <10	68.2%	Sem. without inter.	8.3%
Dept. ranking between 10 and 20	7.4%	Sem. only w/host inter.	10.1%
Dept. ranking between 20 and 50	10.5%	Sem. w/inter. from one pers.	22.0%
Dept. ranking between 50 and 100	5.2%	Female presenters	35.3%
Dept. ranking >100	8.6%	Female hosts	28.2%
Presenters	1,547	Seminars	2,131

Table 2: Location of the department of seminar presenters

Australia	2.5%	France	3.1%	Japan	0.4%	Singapore	0.7%
Austria	0.2%	Germany	1.6%	Luxembourg	0.9%	South Korea	0.4%
Belgium	1.1%	Hong Kong	0.2%	Netherlands	1.4%	Spain	1.3%
Brazil	0.2%	Ireland	0.7%	New Zealand	0.2%	Sweden	0.7%
Canada	2.7%	Israel	0.5%	Norway	0.2%	USA	66.2%
Colombia	0.2%	Italy	2.0%	Portugal	0.4%	United Kingdom	12.3%

Figure 2: Location of the department of seminar presenters

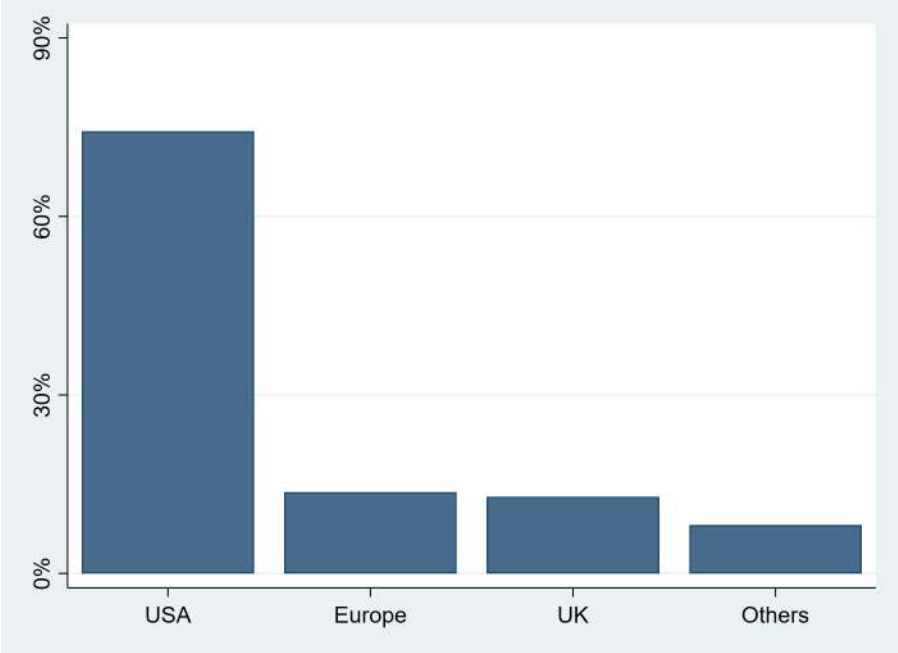


Figure 3: Ranking of the department of seminar presenters

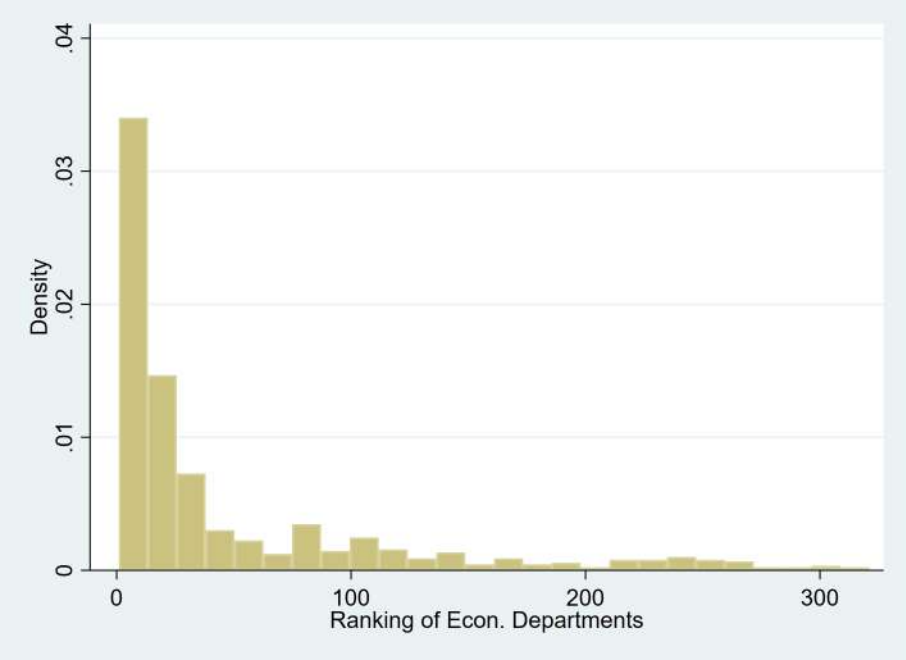


Figure 4: Density of number of interruptions by gender of the presenter

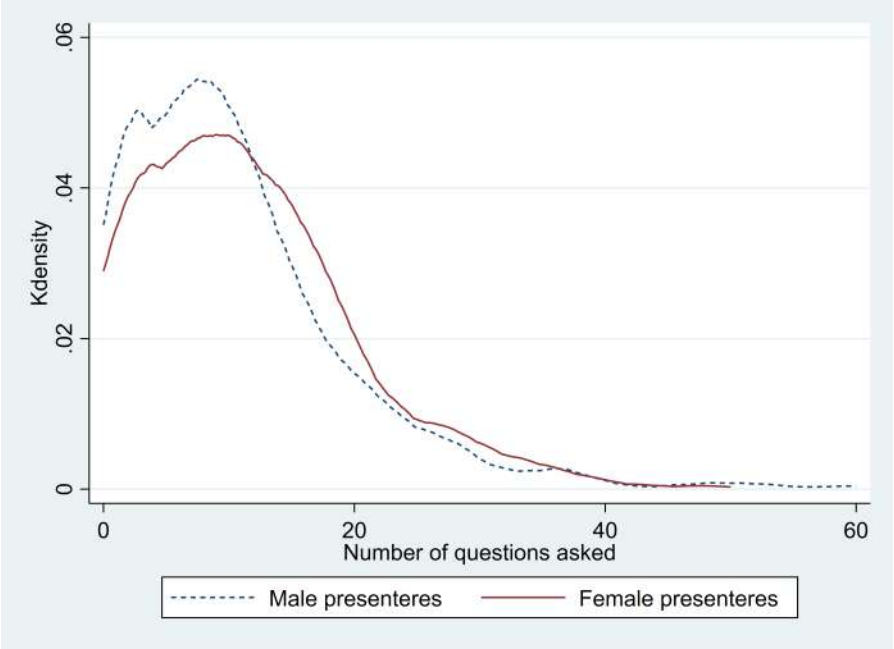


Figure 5: Topic analysis results

Table 3: Interruptions by topic

Topic	Share of topics	Female presenters	First 5 words of the topic	JEL - Category
1	5.0%	23.7%	model, estimate, datum, variable, sample	C - Math & Quant. Methods
2	6.5%	30.3%	price, market, platform, consumer, pay	L - Industrial Organization
3	6.2%	43.1%	effect, datum, year, paper, find	Z - Not Assigned
4	9.2%	29.6%	market, bank, asset, price, risk	E - Macro. and Monet. Eco.
5	4.9%	22.8%	model, rate, cost, low, policy	D - Microeconomics
6	7.9%	40.9%	country, political, immigrant, state, migration	J - Labor and Demog. Economics
7	6.4%	28.0%	change, climate, technology, world, policy	Q - Enviromental & Ecological Econ.
8	7.7%	43.3%	group, experiment, treatment, social, study	O - Dev. & Growth.
9	5.5%	46.9%	datum, research, system, information, patient	Z - Not Assigned
10	9.8%	39.1%	firm, trade, country, sector, market	F - International Econ.
11	5.8%	27.9%	policy, number, crisis, pandemic, year	H - Public Economics
12	7.9%	44.6%	worker, job, labor, child, high	J - Labor and Demog. Economics
13	5.5%	28.1%	income, household, tax, city, datum	H - Public Economics
14	8.2%	35.4%	agent, information, set, game, state	D - Microeconomics
15	3.5%	31.7%	kind, thing, sort, lot, talk	Z - Not Assigned

Figure 6: Number of speakers by JEL-code

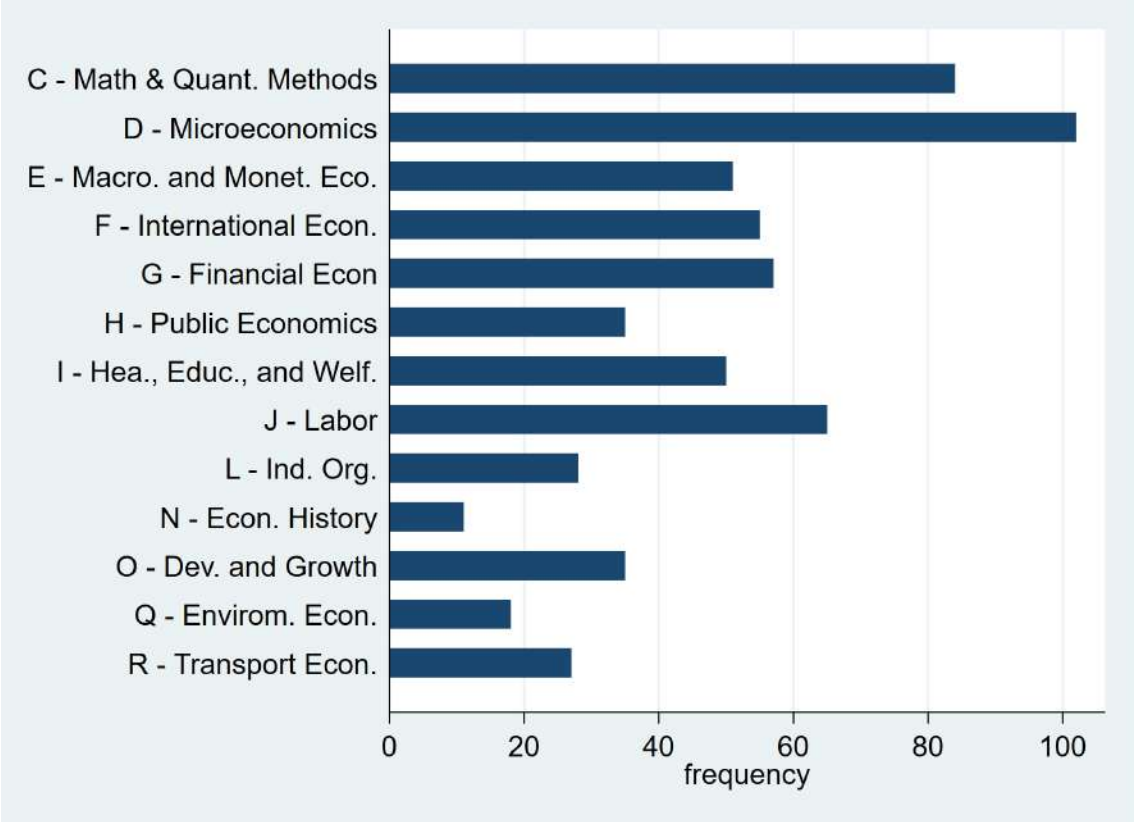


Table 4: Interruptions in a seminar

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Female presenter	0.90**	1.39***	1.18**	1.22**	1.05*	1.06*	1.53**
	(0.43)	(0.39)	(0.55)	(0.52)	(0.56)	(0.53)	(0.60)
Duration (in hs)		0.21***	0.22***	0.22***	0.22***	0.21***	0.17***
		(0.05)	(0.05)	(0.06)	(0.05)	(0.05)	(0.05)
Citations			-0.25***		-0.19***	-0.28***	-0.32***
			(0.06)		(0.06)	(0.07)	(0.10)
Seniority				-0.11***	-0.08**	-0.09**	-0.07*
				(0.03)	(0.03)	(0.03)	(0.04)
Topic						Yes	Yes
Speaker's Dept. Locat.							Yes
Seminar Series							Yes
Constant	10.48***	-2.92	-2.33	-1.66	-1.54	-1.60	1.06
	(1.11)	(2.21)	(2.80)	(2.86)	(2.84)	(3.24)	(3.68)
R^2	0.00	0.17	0.17	0.16	0.17	0.22	0.23
Observations	2,131	2,131	2,131	2,131	2,131	2,131	2,131

Note: Standard errors in parentheses and clustered at the seminar series level. * p<0.05, ** p<0.01, ***p<0.001.

Table 5: Interruptions in total numbers and by gender of the interrupter

	Interruptions by males	Interruptions by females	Total Interruptions
Male Presenters	7.9	2.3	10.3
Female Presenters	8.1	3.2	11.3

Table 6: Interruptions in a seminar

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Female presenter	0.50	0.90	0.36	0.50	0.30	0.20	0.67
	(0.63)	(0.59)	(0.78)	(0.77)	(0.78)	(0.99)	(1.09)
Prop. female inter.	-3.17***	-3.20***	-3.65***	-3.71***	-3.67***	-3.68***	-3.50**
	(0.87)	(0.81)	(1.05)	(1.05)	(1.05)	(1.37)	(1.53)
Fem. present x Prop. fem. inter.	1.72	2.31*	3.78**	3.45*	3.64**	4.93**	4.23*
	(1.42)	(1.33)	(1.83)	(1.83)	(1.83)	(2.33)	(2.57)
Duration (in hs)		0.19***	0.19***	0.19***	0.19***	0.18***	0.15***
		(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Citations			-0.22***		-0.18**	-0.30***	-0.31***
			(0.07)		(0.08)	(0.10)	(0.12)
Seniority				-0.08**	-0.05	-0.05	-0.05
				(0.03)	(0.04)	(0.04)	(0.05)
Topic						Yes	Yes
Speaker's Dept. Locat.							Yes
Seminar Series							Yes
Constant	12.30***	0.14	0.90	1.48	1.44	1.48	3.57*
	(0.37)	(0.96)	(1.27)	(1.33)	(1.32)	(1.72)	(2.02)
R^2	0.01	0.13	0.14	0.13	0.14	0.19	0.19
Observations	2,131	2,131	2,131	2,131	2,131	2,131	2,131

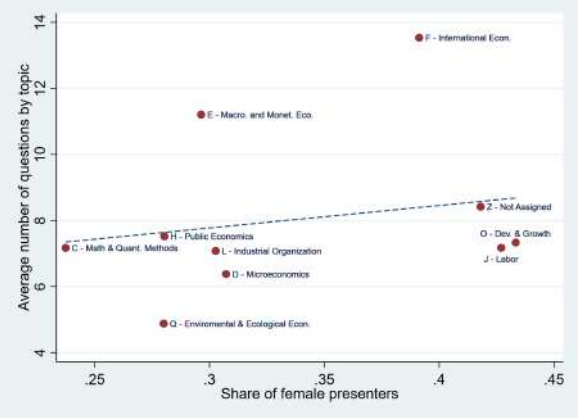
Table 7: Total interruptions to male and female presenters

	Topic 1: **Math & Quant**	Topic 2: **IO**	Topic 3: N/A	Topic 4: **Macro**	Topic 5: **Micro**
Male presenter	8.0	9.4	12.9	13.9	10.3
Female presenter	9.6	7.3	15.6	12.1	10.8
	Topic 6: **Labor**	Topic 7: **Envirom.**	Topic 8: **Dev.&Grow.**	Topic 9: N/A	Topic 10: **Int. Econ.**
Male presenter	9.0	7.1	9.6	8.8	16.9
Female presenter	12.4	6.8	10.1	9.6	18.7
	Topic 11: **Pub. Econ**	Topic 12: **Labor**	Topic 13: **Pub. Econ**	Topic 14: **Micro**	Topic 15: N/A
Male presenter	9.8	11.5	10.6	6.2	14.3
Female presenter	10.2	10.9	9.5	8.0	10.2

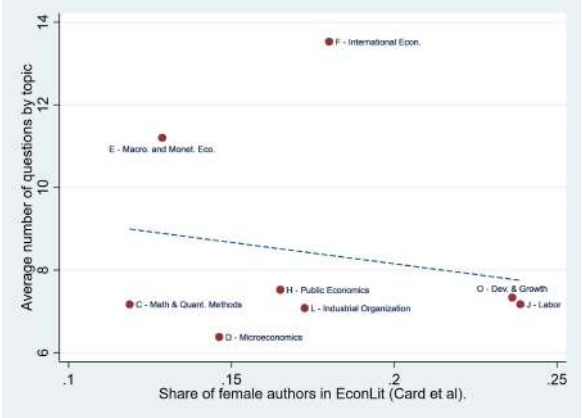
Table 8: Total interruptions to male and female presenters (by gender of the interrupter)

	Topic 1: **Math & Quant**		**Topic 2**: **IO**		**Topic 3**: N/A		**Topic 4**: **Macro**		**Topic 5**: **Micro**	
	Int. by males	Int. by females	Int. by males	Int. by females	Int. by males	Int. by females	Int. by males	Int. by females	Int. by males	Int. by females
Male pres.	6.7	1.2	7.7	1.7	8.0	4.9	11.3	2.5	8.0	2.3
Female pres.	8.6	0.9	5.7	1.7	10.5	5.1	10.9	1.2	8.5	2.3
	Topic 6: **Labor**		**Topic 7**: **Enviorm.**		**Topic 8**: **Dev & Growth**		**Topic 9**: N/A		**Topic 10**: **Int. Econ**	
	Int. by males	Int. by females	Int. by males	Int. by females	Int. by males	Int. by females	Int. by males	Int. by females	Int. by males	Int. by females
Male pres.	7.0	1.9	5.2	1.9	7.5	2.1	6.6	2.3	13.0	4.0
Female pres.	8.1	4.3	4.1	2.7	7.1	3.0	7.7	1.9	14.4	4.3
	Topic 11: **Pub. Econ**		**Topic 12**: **Labor**		**Topic 13**: **Pub. Econ**		**Topic 14**: **Micro**		**Topic 15**: N/A	
	Int. by males	Int. by females	Int. by males	Int. by females	Int. by males	Int. by females	Int. by males	Int. by females	Int. by males	Int. by females
Male pres.	7.7	2.1	7.7	3.7	8.0	2.7	5.0	1.2	10.3	4.0
Female pres.	8.0	2.2	5.8	5.1	5.4	4.1	6.0	2.0	7.4	2.8

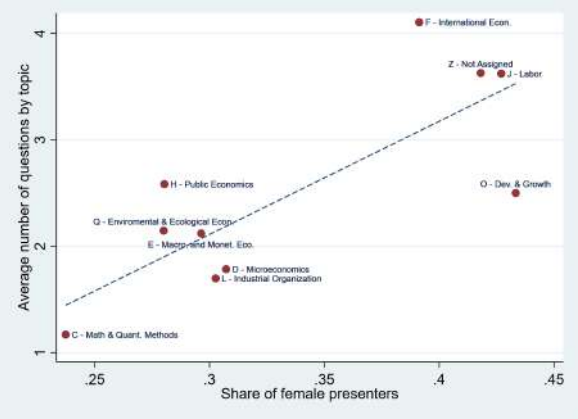
Figure 7: Presence of females by topic and interruptions



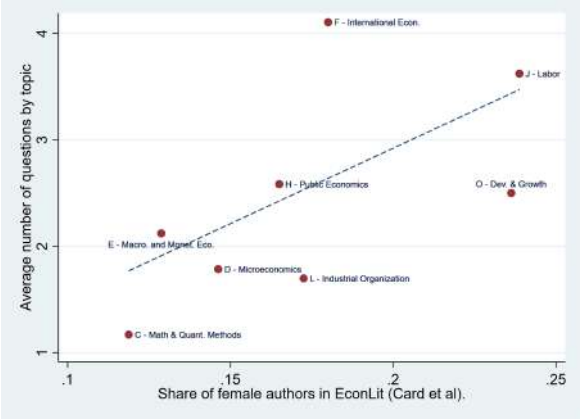
(a) Male's interruptions and share of female presenters



(b) Male's interruptions and EconLit (Card et al. 2020)



(c) Female's interruptions and share of female presenters



(d) Female's interruptions and EconLit (Card et al. 2020)

Table 9: Interruptions in a seminar (controlling by presence of females)

	(1)	(2)	(3)	(4)	(5)	(6)	(7*)
	Panel A: All Interruptions						
Presence of females	6.70	9.48*	9.15	7.62	7.78	24.40**	48.75
	(6.06)	(5.22)	(6.01)	(5.82)	(5.82)	(10.04)	(68.24)
Female presenter	-2.14	-1.59	-2.03	-1.93	-2.25	-4.87	-0.26
	(2.63)	(2.42)	(2.97)	(2.87)	(2.96)	(3.17)	(3.64)
Presence of fem x Fem. Present	7.96*	7.66*	8.40*	8.37**	8.77*	16.10*	8.68*
	(4.70)	(4.24)	(4.22)	(3.99)	(4.19)	(8.67)	(5.33)
Duration (in hs)		Yes	Yes	Yes	Yes	Yes	Yes
Citations			Yes		Yes	Yes	Yes
Seniority				Yes	Yes	Yes	Yes
Topic (mod)					Yes	Yes	Yes
Speaker's Dept. Locat.						Yes	Yes
Seminar Series						Yes	Yes
Observations	2,131	2,131	2,131	2,131	2,131	2,131	2,131

Note 1: Standard errors in parentheses and clustered at the seminar series level. *p<0.05, **p<0.01, ***p<0.001. Specification (7*) uses Card et al. 2020 data for computing presence of females.

Additional results

Table 10: Interruptions and seniority of the presenter

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Total interruptions							
Female presenter	0.69	0.92	1.02	0.92	1.02	1.10	1.57
	(1.03)	(1.00)	(0.99)	(1.00)	(0.99)	(1.26)	(1.04)
Seniority	-0.11***	-0.12***	-0.08**	-0.12***	-0.08**	-0.08**	-0.07**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.03)
Fem. presenter x Seniority	0.02	0.03	0.00	0.03	0.00	-0.00	-0.00
	(0.07)	(0.06)	(0.06)	(0.06)	(0.06)	(0.09)	(0.09)
Panel B: Interruptions made by males							
Female presenter	-0.71	-0.52	-0.45	-0.52	-0.45	-1.14	-0.38
	(0.75)	(0.72)	(0.71)	(0.72)	(0.71)	(1.06)	(0.90)
Seniority	-0.07**	-0.08***	-0.05	-0.08***	-0.05	-0.08**	-0.06**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Fem. presenter x Seniority	0.10*	0.11*	0.09	0.11*	0.09	0.12	0.10
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.08)	(0.08)
Panel C: Interruptions made by females							
Female presenter	1.40**	1.44**	1.47**	1.44**	1.47**	2.25***	1.95**
	(0.60)	(0.59)	(0.59)	(0.59)	(0.59)	(0.77)	(0.80)
Seniority	-0.03*	-0.03**	-0.03*	-0.03**	-0.03*	-0.00	-0.01
	(0.02)	(0.02)	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)
Fem. presenter x Seniority	-0.08**	-0.08**	-0.09***	-0.08**	-0.09***	-0.12***	-0.10**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.05)
Duration (in hs)		Yes	Yes	Yes	Yes	Yes	Yes
Citations			Yes		Yes	Yes	Yes
Seniority				Yes	Yes	Yes	Yes
Topic						Yes	Yes
Speaker's Dept. Locat.							Yes
Seminar Series							Yes
Observations	2,131	2,131	2,131	2,131	2,131	2,131	2,131

Note 1: Standard errors in parentheses and clustered at the seminar series level.
* p<0.05, ** p<0.01, ***p<0.001.

Table 11: Number of questions

	Panel A: All Questions						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Female presenter	0.29	0.40**	0.33	0.37*	0.29	0.35	0.52**
	(0.18)	(0.18)	(0.21)	(0.21)	(0.22)	(0.23)	(0.20)
	Panel B: Males' Questions						
Female presenter	-0.93***	-0.84***	-0.99***	-0.94***	-1.01***	-1.04***	-0.91***
	(0.14)	(0.14)	(0.21)	(0.21)	(0.22)	(0.24)	(0.21)
	Panel C: Females' Questions						
Female presenter	1.21***	1.24***	1.31***	1.30***	1.30***	1.39***	1.43***
	(0.19)	(0.19)	(0.19)	(0.19)	(0.19)	(0.19)	(0.20)
Duration (in hs)		Yes	Yes	Yes	Yes	Yes	Yes
Citations			Yes		Yes	Yes	Yes
Seniority				Yes	Yes	Yes	Yes
Topic						Yes	Yes
Speaker's Dept. Rank.							Yes
Seminar Series							Yes
Observations	2,131	2,131	2,131	2,131	2,131	2,131	2,131

Note 1: Standard errors in parentheses and clustered at the seminar series level.
* p<0.05, ** p<0.01, ***p<0.001.

Table 12: Number of comments

	Panel A: All comments						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Female presenter	0.63	1.05**	0.72	0.94*	0.66	1.10**	1.71***
	(0.40)	(0.41)	(0.50)	(0.48)	(0.51)	(0.51)	(0.50)
	Panel B: Males' comments						
Female presenter	1.84***	2.29***	2.03***	2.24***	1.96***	2.49***	3.14***
	(0.50)	(0.50)	(0.54)	(0.53)	(0.55)	(0.53)	(0.58)
	Panel C: Females' comments						
Female presenter	-0.30	0.20	-0.27	-0.00	-0.35	0.05	0.80
	(0.47)	(0.46)	(0.65)	(0.62)	(0.66)	(0.67)	(0.60)
Duration (in hs)		Yes	Yes	Yes	Yes	Yes	Yes
Citations			Yes		Yes	Yes	Yes
Seniority				Yes	Yes	Yes	Yes
Topic						Yes	Yes
Speaker's Dept. Rank.							Yes
Seminar Series							Yes
Observations	2,131	2,131	2,131	2,131	2,131	2,131	2,131

Note 1: Standard errors in parentheses and clustered at the seminar series level.
* p<0.05, ** p<0.01, ***p<0.001.

Table 13: Text Similarity between presentation and interruption

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: All Interruptions							
Female presenter	0.007	0.008	0.000	0.000	0.000	-0.001	-0.002
	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)
Panel B: Males' Interruptions							
Female presenter	-0.005	-0.004	-0.013***	-0.014***	-0.014***	-0.013**	-0.013*
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.007)
Panel C: Females' Interruptions							
Female presenter	0.000	0.001	-0.005	-0.005	-0.006	-0.009	-0.013
	(0.007)	(0.007)	(0.008)	(0.008)	(0.008)	(0.010)	(0.011)
Duration (in hs)		Yes	Yes	Yes	Yes	Yes	Yes
Citations			Yes		Yes	Yes	Yes
Seniority				Yes	Yes	Yes	Yes
Topic						Yes	Yes
Speaker's Dept. Rank.							Yes
Seminar Series							Yes
Observations	2,131	2,131	2,131	2,131	2,131	2,131	2,131

Note 1: Standard errors in parentheses and clustered at the seminar series level.
* p<0.05, ** p<0.01, ***p<0.001.

Table 14: Interruption made by overlapping voices

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: All overlapping interruptions							
Female presenter	0.07	0.11**	0.12	0.12	0.11	0.11	0.13
	(0.05)	(0.06)	(0.07)	(0.08)	(0.08)	(0.09)	(0.09)
Panel B: Overlapping interruptions made by males							
Female presenter	-0.24***	-0.20***	-0.16**	-0.16**	-0.17**	-0.18**	-0.14*
	(0.05)	(0.05)	(0.07)	(0.07)	(0.07)	(0.07)	(0.08)
Panel C: Overlapping interruptions made by females							
Female presenter	0.64***	0.67***	0.67***	0.67***	0.67***	0.68***	0.65***
	(0.06)	(0.06)	(0.09)	(0.09)	(0.09)	(0.10)	(0.11)
Duration (in hs)		Yes	Yes	Yes	Yes	Yes	Yes
Citations			Yes		Yes	Yes	Yes
Seniority				Yes	Yes	Yes	Yes
Topic						Yes	Yes
Speaker's Dept. Rank.							Yes
Seminar Series							Yes
Observations	2,131	2,131	2,131	2,131	2,131	2,131	2,131

Note 1: Standard errors in parentheses and clustered at the seminar series level.
* p<0.05, ** p<0.01, ***p<0.001.

Table 15: Extensive margin: different unique interrupters

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: All Interruptions							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Female presenter	0.03	0.14	0.22*	0.23*	0.21	0.27	0.37*
	(0.12)	(0.11)	(0.13)	(0.14)	(0.14)	(0.18)	(0.21)
Panel B: Males' Interruptions							
Female presenter	-0.09	-0.00	0.10	0.13	0.10	0.06	0.22
	(0.10)	(0.09)	(0.12)	(0.12)	(0.12)	(0.15)	(0.18)
Panel C: Females' Interruptions							
Female presenter	0.11**	0.14***	0.12*	0.10*	0.10*	0.20**	0.15*
	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)	(0.08)	(0.09)
Duration (in hs)		Yes	Yes	Yes	Yes	Yes	Yes
Citations			Yes		Yes	Yes	Yes
Seniority				Yes	Yes	Yes	Yes
Topic						Yes	Yes
Speaker's Dept. Rank.							Yes
Seminar Series							Yes
Observations	2,131	2,131	2,131	2,131	2,131	2,131	2,131

Note 1: Standard errors in parentheses and clustered at the seminar series level.
* p<0.05, ** p<0.01, ***p<0.001.

Table 16: Number of interruptions excluding the ones made by the seminar's chair

Panel A: All Interruptions							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Female presenter	0.40	0.73*	0.42	0.43	0.29	0.48	1.01*
	(0.40)	(0.37)	(0.52)	(0.51)	(0.53)	(0.61)	(0.57)
Panel B: Males' Interruptions							
Female presenter	-0.28	-0.02	-0.34	-0.23	-0.37	-0.52	-0.03
	(0.34)	(0.31)	(0.43)	(0.42)	(0.44)	(0.57)	(0.54)
Panel C: Females' Interruptions							
Female presenter	0.67***	0.75***	0.76***	0.66***	0.67***	1.00***	1.04***
	(0.22)	(0.22)	(0.24)	(0.23)	(0.24)	(0.36)	(0.32)
Duration (in hs)		Yes	Yes	Yes	Yes	Yes	Yes
Citations			Yes		Yes	Yes	Yes
Seniority				Yes	Yes	Yes	Yes
Topic						Yes	Yes
Speaker's Dept. Rank.							Yes
Seminar Series							Yes
Observations	2,131	2,131	2,131	2,131	2,131	2,131	2,131

Note 1: Standard errors in parentheses and clustered at the seminar series level. * $p<0.05$, ** $p<0.01$, ***$p<0.001$.

Table 17: Number of interruptions controlling by chair's gender

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				Total interruptions			
Female presenter	0.63	0.85	0.80	0.75	0.70	0.79	0.96
	(0.59)	(0.56)	(0.69)	(0.69)	(0.69)	(0.91)	(1.07)
Female chair	-1.17*	-1.05	-1.55*	-1.52*	-1.54*	-1.87*	-3.40**
	(0.71)	(0.66)	(0.84)	(0.83)	(0.83)	(1.09)	(1.32)
Fem. presenter x Fem. chair	0.04	0.40	1.31	1.34	1.35	1.85	3.14
	(1.22)	(1.15)	(1.47)	(1.47)	(1.47)	(1.92)	(2.26)
				Interruptions made by males			
Female presenter	0.03	0.21	-0.03	0.02	-0.04	0.14	0.57
	(0.51)	(0.48)	(0.61)	(0.61)	(0.62)	(0.80)	(0.93)
Female chair	-1.08*	-0.99*	-1.44*	-1.44*	-1.43*	-1.58*	-2.78**
	(0.60)	(0.57)	(0.74)	(0.74)	(0.74)	(0.96)	(1.16)
Fem. presenter x Fem. chair	-0.00	0.28	1.10	1.14	1.11	1.63	1.96
	(1.04)	(0.99)	(1.31)	(1.30)	(1.31)	(1.69)	(1.98)
				Interruptions made by females			
Female presenter	0.60**	0.65***	0.82***	0.72**	0.74**	0.64*	0.39
	(0.25)	(0.25)	(0.29)	(0.29)	(0.29)	(0.38)	(0.45)
Female chair	-0.09	-0.07	-0.11	-0.08	-0.11	-0.29	-0.62
	(0.30)	(0.30)	(0.35)	(0.35)	(0.35)	(0.46)	(0.55)
Fem. presenter x Fem. chair	0.04	0.12	0.21	0.20	0.24	0.22	1.18
	(0.52)	(0.51)	(0.62)	(0.61)	(0.61)	(0.81)	(0.95)
Duration (in hs)		Yes	Yes	Yes	Yes	Yes	Yes
Citations			Yes		Yes	Yes	Yes
Seniority				Yes	Yes	Yes	Yes
Topic						Yes	Yes
Speaker's Dept. Locat.							Yes
Seminar Series							Yes
Observations	2,131	2,131	2,131	2,131	2,131	2,131	2,131

Note 1: Standard errors in parentheses and clustered at the seminar series level. * p<0.05, ** p<0.01, ***p<0.001.

Note 2: These results are computed without considering the interruptions made by the chair of the seminar.

Table 18: Time at which occurs the first interruption

	(1)	(2)	(3)	(4)	(5)	(6)	
Female presenter	-4.02***	-3.49***	-3.23**	-3.22***	-2.90**	-3.79**	-4.00**
	(0.94)	(0.91)	(1.21)	(1.11)	(1.18)	(1.47)	(1.72)
Duration (in hs)		0.17*	0.10	0.10	0.09	0.09	0.10
		(0.09)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)
Citations			0.53***		0.38*	0.41*	0.42
			(0.18)		(0.19)	(0.24)	(0.36)
Seniority				0.25***	0.19*	0.23**	0.25**
				(0.09)	(0.10)	(0.10)	(0.10)
Topic						Yes	Yes
Speaker's Dept. Locat.							Yes
Seminar Series							Yes
Constant	26.16***	14.87***	17.52***	15.68***	15.66***	19.57***	18.15**
	(1.82)	(5.12)	(5.66)	(5.68)	(5.66)	(6.10)	(6.90)
R2	0.01	0.04	0.04	0.04	0.05	0.08	0.09
Observations	2,131	2,131	2,131	2,131	2,131	2,131	2,131

Note 1: Standard errors in parentheses and clustered at the seminar series level.
* p<0.05, ** p<0.01, ***p<0.001.

Appendix II

List of all speakers identified (in parenthesis the number of seminars in which they took part).

Markus Brunnermeier (5), Volker Wieland (4), Luigi Zingales (4), Stephen Redding (4), Simone Bertoli (4), Daron Acemoglu (4), Esteban Rossi-Hansberg (3), Melissa Dell (3), Harald Uhlig (3), Jean Tirole (3), Christian Krekel (3), Stefanie Stantcheva (3), Oleg Itskhoki (3), Michel Beine (3), Matthew Gentzkow (3), Shengwu Li (3), Susan Athey (3), Beata Javorcik (3), Dave Donaldson (2), Guido Imbens (2), Edward Glaeser (2), Janet Currie (2), Luis Cabral (2), Swati Dhingra (2), Douglas Bernheim (2), Jesse Schreger (2), Brett Falk (2), Avi Goldfarb (2), Jonathan Athow (2), Doireann Fitzgerald (2), Dmitry Taubinsky (2), Ricardo Reis (2), Maria Cotofan (2), Branko Milanovic (2), Olivier Blanchard (2), Stefano DellaVigna (2), Ruslan Salakhutdinov (2), Sarah Flèche (2), Esther Duflo (2), Adrien Auclert (2), Piotr Dworczak (2), Leah Boustan (2), Ying Nian Wu (2), Hillel Rapoport (2), Juliet Schor (2), Monica Morlacco (2), Leonard Wantchekon (2), Raj Chetty (2), Ana Maria Santacreu (2), Elhanan Helpman (2), Kevin Fox (2), Yuliy Sannikov (2), Mike Waugh (1), Neil Thompson (1), Mikkel Plagborg-Møller (1), Navin Kartik - Improving (1), Nellie Liang (1), Mo Salah (1), Nicholas Ashford (1), Mike Brewer (1), Monica Bell (1), Nachi Subramanian (1), Nava Ashraf (1), Nathaniel Hendren (1), Monica de Bolle (1), Natalie Lee (1), Myrna Wooders - Non-Cooperative (1), Moshe Tennenholtz (1), Natalia Ramondo (1), Motohiro Yogo (1), Mushfiq Mobarak (1), Natalia Fabra (1), Mushtaq Khan (1), Nash (1), Nancy Qian (1), Nicholas Z. Muller (1), Myra Samuels (1), Morgan Frank (1), Abhijit Banerjee (1), Nicola Fuchs-Schundeln (1), P. Koundouri (1), Pamela Medina Quispe (1), Paola Giuliano (1), Paola Manzini (1), Paolina Medina (1), Parag Pathak (1), Paschal Donohoe (1), Patricia Cortes (1), Paul Collier (1), Paul Ekins (1), Paul Elhorst (1), Paul Krugman (1), Paul Milgrom (1), Paul Novostad (1), Paul Romer (1), Pawel Adrjan (1), Pedro Souza (1), Pengpeng Xiao (1), Pete Klenow (1), Peter Buhlmann (1), Peter Cramton - Lessons (1), Peter Feldhutter (1), Pablo D'Erasmo (1), Ovanes Petrosian (1), Nicolas Morales (1), Otmar Issing (1), Nicolas Vieille (1), Nicolas Ziebarth (1), Nicole Immorlica (1), Nicolás Ajzenman (1), Nikhil Vellodi (1), Nikita Gaponiuk (1), Nikolay A. Krasovskii (1), Michela Giorcelli (1), Nina Balcan (1), Nina Pavcnik (1), Nora Lustig (1), Oded Galor (1), Odilon Câmara (1), Ole (1), Oleksiy Kryvstov (1), Oliver Hart - Prosocial (1), Olivier Darmouni (1), Olle Hammar (1), Omer Tamuz (1), Ori Heffetz (1), Oster (1), Nimmi Patel (1), Michael Greenstone (1), Micheala Giorcelli (1), Luisa Hammer (1), Linda Goldberg (1), Linda Schilling (1), Ling Zhou (1), Lingfei Wu (1), Lloyd Dean (1), Lones Smith (1), Lorenzo Caliendo: (1), Luciano Pomatto (1), Lucie Gadenne (1), Lukas Delgado-Prieto (1), Li (1), M. Clemens (1), M. Spence (1), Maarten Lindeboom (1), Madhuparna Ganguly (1), Maggie Jones (1), Majid M. Al-Sadoon (1), Manoj Pradhan (1), Manuel Adelino (1), Manuel Tong (1), Lin Tian (1), Lester T. Chan (1), Marc Meryon (1), Laura Parisi (1), Kyungmin Kim (1), L. Christensen (1), Larry Katz (1), Larry Summers (1), Lars Vilhuber (1), Laszlo Tetenyi (1), Laura Castillo Martinez (1), Laura Doval (1), Laura Gati (1), Laura Pilossoph (1), Leslie Marx (1), Laurent Clerc (1), Lawrence Carin (1), Leah Platt Boustan (1), Leandro Navarro (1), Leeat Yariv (1), Leigh Shaw-Taylor (1), Leon Musolff (1), Leonardo Bursztyn (1), Leonhard Lades (1), Marc Melitz (1), Marcel Fratzscher (1), Michaela Kreyenfeld (1), Michael Barnett (1), Matthew Gentzkow - Ideological (1), Matthieu Gomez (1), Mattia Fochesato (1), Maureen O'Hara (1), Max Winkler (1), Maximilian Kasy (1), Maya Rossin-Slater (1), Meredith Crowley (2), Peter Ingram (1), Matteo Gamalerio (1), Michael Grubb (1), Michael Hallsworth (1), Michael Jordan (1), Michael Kearns (1), Michael Keen (1), Michael Kremer (1), Michael Marder Upheaval (1), Michael Richards (1), Michael Woodford (1), Matthew Clair (1), Matt Lasmanis (1), Marcin Pęski (1), Martin Eichenbaum (1), Marco González-Navarro (1), Margaret Meyer (1), Maria Balgova (1), Maria Sole Pagliari (1), Mariana Mazzucato (1), Marie Claire Villeval (1), Mark Lowcock (1), Marshall Burke (1), Martha Justus (1), Martin Ravallion (1), Matilde Bombardini (1), Martin Weale (1), Martina Björkman Nyqvist (1), Martina Kirchberger (1), Martín Fernández-Sánchez (1), Mary Amiti (1), Mary Barra (1), Marzena Rostek - Decentralized (1), Masao Fukui (1), Massimo Anelli (1), Peter Hull (1), Rachel Cummings (1), Peter Taylor-Gooby (1), Stefan G. Hofmann (1), Tayfun Sonmez (1), Ted Miguel (1), Thies Lindenthal (1), Thomas Crossley (1), Thomas Philippon (1), Thomas Rivera (1), Thomas Schmitz (1), Thomas Thévenin (1), Thomas de Haan (1), Tianyi Wang (1), Tijan Bah (1), Tilman Börgers (1), Tim Roughgarden (1), Tito Boeri (1), Tobias Klein – 09/09/20 (1), Tobias Salz

(1), Tony Cookson (1), Trang Hoang (1), Trish Greenhalgh (1), Tyler Muir (1), Ulrich Laitenberger (1), Tarun Ramadorai- (1), Tarun Kabiraj (1), Tamer Başar (1), Steve Callander (1), Stefania Albanesi (1), Stefania Garetto (1), Stefano Caria (1), Stefano Giglio (1), Steffan Mau (1), Stephan Meier (1), Stephane Hallegatte (1), Stephen Machin (1), Stephen Morris (1), Steve Redding (1), Tamar Oostrom (1), Steven Ruggles (1), Steven Stillman (1), Suanna Oh (1), Sukwoong Choi (1), Sumit Agarwal (1), Sven Rady - Overcoming Free-Riding (1), Swapnika Rachapalli (1), Sydney Ludvigson (1), Syngjoo Choi (1), Ulrich Volz (1), Ulrike Malmendier (1), Utsav Sadana - Nash Equilibria (1), Yuen Yuen Ang (1), Yang Zhou (1), Yannay Spitzer (1), Yeon-Koo Che (1), Yeon-Koo Che - Weak (1), Yiling Chen - Cursed (1), Yingni Guo (1), Yingni Guo - Project (1), Yoram Halevy (1), Yossef Rapoport (1), Yuhei Miyauchi (1), Yajna Govind (1), Yvonne Giesing (1), Zhijun Chen (1), Zhou Yu (1), Ziad Obermeyer (1), Zlatko Bodrozic (1), Zoe Cullen (1), Éva Tardos (1), Éva Tardos - Virtues (1), Ömer Karaduman (1), Yan Chen (1), Xiaotie Deng - A (1), VMACS Jr. - Victoria Gregory (1), Vincent Meisner (1), Vadim Elenev (1), Van der Ploeg (1), Vasco Carvalho (1), Vassilis Zikas (1), Verena Weber (1), Vernon Henderson (1), Veronica Guerrieri (1), Victor Chernozhukov (1), Vili Lehdonvirta (1), Vivian Lee (1), Xiaosheng Mu - Privacy (1), Viviane Sanfelice (1), Vladimir Smirnyagin (1), W. Nordhaus (1), Wagner F. Oliveira (1), Warwick McKibbin (1), Willemien Kets (1), Willi Mutschler (1), Xiang Ding (1), Xiaolan Fu (1), Stefan Nagel (1), Sonia Jaffe (1), Peter Wendell (1), Sonia Bhalotra (1), Rebecca Henderson (1), Rebecca Myerson (1), Rebecca Sachs (1), Rema Hanna (1), Renato Faccini (1), Renato Gomes (1), Renato Paes Leme (1), Ricardo Reyes-Heroles (1), Richard Blundell (1), Richard S.J. Tol (1), Rick van del Ploeg (1), Robert Hill (1), Robert Inklaar (1), Robert J. Aumann (1), Robert Mendelsohn (1), Robert Pindyck (1), Robert Pollin (1), Robert Reich (1), Robert Stavins (1), Robert Wilson (1), Robert Zymek (1), Rebecca Dizon-Ross (1), Raymond Fisman (1), Raoul van Maarseveen (1), Rabah Amir - Profit- (1), Petra Moser (1), Petra Todd (1), Philip Lane (1), Pierre Yared (1), Pierre-François Weber (1), Pol Antras (1), Pol Antràs (1), Ponce Del Castillo (1), R. Gerlagh (1), Krusell (1), Rann Smorodinsky - Reaping (1), Rachel E. Kranton (1), Rachel Griffith (1), Rachid Laajaj (1), Rahul Deb (1), Raissa Fabregas (1), Ramon Faulí Oller - Fee (1), Ran Spiegler (1), Ran Spiegler - Cheating (1), Randall Akee (1), Roberto Weber (1), Robin Allen (1), Rod Garrat (1), Sharon Traiberman (1), Sebastian Heise (1), Seema Jayachandran (1), Sergei Guriev (1), Sergiu Hart (1), Seth Benzell (1), Sevgi Yuksel (1), Sharad Goel (1), Sharada Davidson (1), Sharat Ganapati (1), Sheri Berman (1), Schumpeter (1), Shota Ichihashi (1), Siddharth Suri (1), Silvia Peracchi (1), Silvio Micali (1), Simon Deakin (1), Simon Grant (1), Simon Loertscher (1), Sinan Aral (1), Soeren Henn (1), Sean Higgins (1), Schoar (1), Romer (1), Sabrina Howell (1), Rosemarie Nagel (1), Rotman School (1), Russell Cooper (1), Rutger Hoekstra (1), Ruth (1), Ryan Monarch (1), Ryan Oprea (1), Ryland Thomas (1), S. Nageeb Ali - Reselling (1), Saleemul Huq (1), Sascha Becker (1), Saleh (1), Salvatore Carrozzo (1), Samina Raja (1), Sandra Sequeira (1), Sanna Ojanpera (1), Sara Giunti (1), Sara Signorelli (1), Sarah Eichmeyer (1), Sarah Hawkes (1), Kwabena Baah Donkor (1), Katherine Eriksson (1), Kose John (1), Colin Green (1), Conor Walsh (1), Constantin Charles (1), Costas Arkolakis (1), Costas Meghir (1), Cristina Arellano (1), Cristina Bicchieri (1), Cristina Cattaneo (1), Cynthia Osborne (1), Cynthia Zhang - A (1), Damon Centola (1), Damon Silvers (1), Dani Rodrik (1), Danial Lashkari (1), Daniel Reck (1), Daniel Rock (1), Daniel Yi Xu (1), Daniela Saban (1), Daniele Nosenzo (1), Danny Dorling (1), Danny Quah (1), Darrell Duffie (1), Conor Lennon (1), Clément Bellet (1), Eric Bettinger (1), Clodomiro Ferreira (1), Charly Porcher (1), Chenuyan Liu (1), Chistoph Boehm (1), Chris Knittel (1), Chris Roth (1), Chris Warhurst (1), Christian Catalini (1), Christina Gathmann (1), Christoph Rothe (1), Christoph Trebesch (1), Christopher Giancarlo (1), Christopher James (1), Christopher Pissarides (1), Cian Ruane (1), Claire Celerier (1), Clare Short (1), Claudia Custodio (1), Claudia Steinwender (1), Claudio Mezzetti (1), Clemens Hetschko (1), Cliff Robb (1), Dashun Wang (1), Dave Rand (1), David Atkin (1), David Delacrétaz (1), Donald Rubin (1), Dorothea Kuebler (1), Drew Fudenberg (1), Duncan Gallie (1), Duncan Thomas (1), Duo Qin (1), EHEC Finkelstein (1), Edoardo Cefalà (1), Edoardo Gallo (1), Edward Miguel (1), Ekaterina Gromova (1), Ekaterina Oparina (1), Ekaterina Smetanina (1), Elena Manresa (1), Elina Ribakova (1), Elizabeth Stuart (1), Elliot Lipnowski (1), Elliott Ash (1), Emi Nakamura (1), Enrico Spolaore (1), Eran Shmaya - Disentangling (1), Dmitry Mukhin (1), Dirk Bergemann - Search (1), Dirk Bergemann (1), Davide Furceri (1), David F. Hendry (1), David Hesmondhalgh (1), David Kohn (1), David Lagakos (1), David Laibson (1), David Rand (1), David Thesmar (1), David Yanagizawa-Drott (1), David Yermack (1), Dean Eckles (1), Dimitra Petrakaki (1), Dean Yang (1), Debra Howcroft (1), Denis Tkachenko (1), Dennis Novy - Trade (1), Derya Guer-Seker (1), Devaki Ghose (1), Diane Coyle (1), Diego Aycinena (1), Diego Känzig (1), Charles Manski (1), Charles Calomiris (1), Catia Batista (1), Anke Hassel (1), Amy O'Hara (1), Ana Beatriz Galvao (1), Ana Cecilia Fieler (1), Anatole Cheysson (1), Andrea Civelli (1), Andreas Blume (1), Andreas Kleiner (1), Andreas Moxnes

(1), Andreas Veneris (1), Andrei Hagiu (1), Andrei Levchenko (1), Andrei Simonov (1), Andres Rodriguez Clare (1), Andrew Atkeson (1), Andrew Caplin (1), Andrew Clark (1), Andrew Foster (1), Andrew Hinkes (1), Andrew Patton (1), Andrew Rhodes (1), Andy Charlwood (1), Amit Seru- (1), Alyson Plumb (1), Alexey Onatskiy (1), Akosua Adomako Ampofo (1), Abi Adams-Prassl (1), Abigail Adams Prassl (1), Abigail Marks (1), Adam Dutton (1), Adam Posen (1), Adam Spencer (1), Adi Sunderam (1), Adrien Bilal (1), Ahmad Lashkaripour (1), Alan Blinder (1), Alexandra Mousavizadeh (1), Alan Davidson (1), Alan Manning (1), Alessandro Ferrari (1), Alessandro Pavan (1), Alessandro Ruggieri (1), Alessandro Sforza (1), Alex Hollingsworth (1), Alex Teytelboym (1), Alexander Frankel - Information Hierarchies (1), Angus Deaton (1), Anna Gassman-Pines (1), Catherine Eckel (1), Anna Maria Mayda (1), Bengt Holmstrom (1), Benjamin A. Olken (1), Benjamin Bernard (1), Benjamin Brooks - A (1), Benjamin Golub (1), Benoit Mojon (1), Bergemann (1), Bhramar Mukherjee (1), Bo Cowgill (1), Britta Rude (1), Bruce D. Meyer (1), Bruno Biais (1), Bruno Strulovici (1), Campbell Harvey (1), Carmen Jacqueline Ho (1), Carol Graham (1), Caroline Le Pennec (1), Carolyn Barnes (1), Caspar Kaiser (1), Catalina Amuedo Dorantes (1), Catalina Franco Buitrago (1), Ben Olken (1), Ben Moll (1), Ben Bridgeman (1), Arnar Buason (1), Anna Rettieva (1), Anna Tur (1), Annie Liang - Data (1), Anthony Lepinteur (1), Antoinette Schoar (1), Antoinette Schoar- (1), Anton Kolotilin (1), Ariel Burstein (1), Arman Sabbaghi (1), Arvind Krishnamurthy (1), Barton Lee (1), Ashvin Gandhi (1), Atheendar Venkataramani (1), Atul Gupta (1), Aviad Heifetz - Liberal Parentalism (1), Avinandan Chakraborty (1), Barbara Petrongolo (1), Barbora Šedová (1), Barry Eichengreen (1), Barry Ritholtz (1), Eran Shmaya - Project (1), Eric Ghysels (1), Kosali Simon (1), Jesús Fernández-Huertas Moraga (1), Jiangtao Li (1), Jie Cai (1), Jimi Adesina (1), Jing Cai (1), Jing Chen - Maximal (1), Jishnu Das (1), Joachim de Weerdt (1), Joan Llull (1), Joe Bergera (1), Joe Kaboski (1), Joe Perkins - 4th (1), Joe Steinberg (1), Johanna Mollerstrom (1), Johannes Boehm (1), Johannes Matschke (1), Johannes Spinnewijn (1), John Asker (1), John Beshears (1), John Cawley (1), John Geanakoplos - Money (1), John Ifcher (1), Jesús Marín Solano (1), Jessica Simes (1), Eric Melander (1), Jessica Hug (1), Itai Arieli - Persuasion (1), Itay Goldstein (1), Ivan Canay (1), Ivan Petrella (1), Ivan Werning (1), J. Aislinn Bohren (1), Jacek Barszczewski (1), Jacob Engwerda - Mini-max (1), Jacob Leshno (1), James Mitchell (1), James Robins (1), James Stock (1), Janelle Scott (1), Janine Berg (1), Jared Gars (1), Jeff Larrimore (1), Jeff MacKie-Mason (1), Jeff Small (1), Jens Ludwig (1), Jens van 't Klooster (1), Jeremy Lebow (1), John Quiggin (1), John Van Reenen (1), John Vickers (1), John Y Campbell (1), Jules Gazeaud (1), Julia Seither (1), Jérôme Valette (1), Kareen Rozen (1), Karen (1), Karlis Kanders (1), Kartik Hosanagar (1), Kate Casey (1), Kate Ho (1), Kate Laffan (1), Katherine A Eriksson (1), Abi Adams Prassl (1), Kathryn Spier (1), Katrin Millock (1), Katy Milkman (1), Kelly Shue (1), Ken Benoit (1), Kenji Wada (1), Kenneth Ahern (1), Kim Ruhl (1), Kirsten Slungaard Mumma (1), Judy Chevalier (1), Juan Ortner (1), Juan Mateos (1), Joop Adema (1), Johns Hopkins (1), Jon Gruber (1), Jon Kleinberg - Algorithmic (1), Jonathan Coslet (1), Jonathan Dingel (1), Jonathan Levy (1), Jonathan Libgober (1), Jonathan Wright (1), Jonathan de Quidt (1), Jordi Gali (1), Juan Diego Luksic (1), Jorge Guzman (1), Jorge Tamayo (1), Jose Marquez Merino (1), Jose Vasquez (1), Joseph-Simon Görlach (1), Josh Blumenstock (1), Josh Martin (1), Josh Ryan-Collins (1), José Daniel López Barrientos (1), Ismael Gálvez Iniesta (1), Isabelle Mejean (1), Isabela Manelici (1), Gianluca De Nard (1), Francesca Caselli (1), Francesca Sobande (1), Francesco D'Acunto (1), Francesco Giovanardi (1), Francisco Buera (1), François Libois (1), Friederike Mengel (1), Fuhito Kojima (1), G. Metcalf (1), Gabriel Ahlfeldt (1), Gabriela Mundaca (1), Gaelle Simard-Duplain (1), Gary Lyn (1), Gautam Rao (1), Geoffrey Heal (1), Geoffroy de Clippel (1), George J. Mailath (1), George Karystianis (1), George Marios Angeletos (1), Georgios Piliouras (1), Gerardo Ceballos (1), Florian Zimmerman (1), Flavio Cunha (1), Filippo Santi (1), Fabio Galeotti (1), Esther Arenas-Arroyo (1), Esther Delesalle (1), Eugenio Proto (1), Eunhee Lee (1), Evan Calford (1), Evgenii Monastyrenko (1), F. Capie (1), Fabian Waldinger (1), Fabien Accominotti (1), Fabrizio Zilibotti (1), Fernando Leibovici (1), Facundo Piguillem (1), Federico Echenique (1), Federico Esposito (1), Federico Etro (1), Federico Huneeus (1), Felipe Brugues (1), Felipe Schwartzmann (1), Felix Tintlenot (1), Fernanda Cross (1), Giancarlo Corsetti (1), Gianluca Violante (1), Isabel Treviño (1), Gijsbert Zwart (1), Haris Aziz (1), Hashem Pesaran (1), Hector Chade - Screening (1), Heiwai Tang (1), Helene Rey (1), Heng Huang (1), Herakles Polemarchakis (1), Horacio Larreguy (1), Hundanol Kebede: (1), Hunt Allcott (1), Hyun Song Shin (1), Hélène Rey (1), Hülya K.K. Eraslan (1), Ignacio Esponda - Asymptotic (1), Immanuel Kant (1), Imran Rasul (1), Ina Simonovska (1), Ina Taneva (1), Ingela Alger (1), Irene Lo - Simple (1), Isa Hafalir (1), Hari Govindan (1), Hans Werner Sinn (1), Hannes Ullrich (1), Gregor Jarosch (1), Gilles Duranton (1), Giorgia Menta (1), Giorgos Stamatopoulos (1), Giselle Montamat (1), Giuseppe Moscelli (1), Glen Weyl (1), Glenn Rudebusch (1), Gloria H.Y. Wong (1), Gollier (1), Gregor Semieniuk (1), Hanna Halaburda (1), Gregory Acs (1),

Gregory Mankiw (1), Gregory Thwaites (1), Guillaume Blanc (1), Guillaume Gueguen (1), Ha-Joon Chang (1), Haifeng Xu (1), Haishi Li (1), Hamid Firooz (1), Özlem Bedre-Defolie (1).

List of all university's affiliation identified (in parhentesis the number of seminars in which they took part).

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State University (1), Gordon Lang School of Business and Economics, University of Guelph (1), Institut d'Économie Appliquée, HEC Montréal (École des Hautes Études Commerciales) (1), Institutt for Økonomi, Universitetet i Bergen (1), Nationalekonomiska Institutionen, Uppsala Universitet (1), Department Volkswirtschaft, WU Wirtschaftsuniversität Wien (1), Staatswissenschaftliches Seminar, Wirtschafts- und Sozialwissenschaftliche Fakultät, Universität zu Köln (1), Department of Economics, George Washington University (1), School of Business and Economics, Universidade Nova de Lisboa (1), School of Business and Economics, Vrije Universiteit Amsterdam (1), School of Economics and Management, Universiteit van Tilburg (1), School of Economics, Faculty of Arts and Social Sciences, University of Sydney (1), Department of Economics, Maxwell School, Syracuse University (1), Department of Economics, Faculty of Business and Economics, University of Melbourne (1), School of Economics, Universiteit Utrecht (1), Department of Economics, Emory University (1), School of Economics, University of East Anglia (1), School of Economics, University of Edinburgh (1), School of Economics, University of Surrey (1), Department of Economics, Carleton University (1), Department of Economics, Business School, University of Auckland (1), Department of Economics, University of Texas-Austin (1), Facoltà di Economia, "Sapienza" Università di Roma (1), Facultad de Economía, Universidad de los Andes (1), Department of Economics, University of California-Merced (1), Department of Economics, University of Notre Dame (1), Department of Economics, W.P. Carey School of Business, Arizona State University (1), Department of Economics, University of North Carolina-Chapel-Hill (1), Argyros School of Business and Economics, Chapman University (1), Department of Economics, University of Minnesota (1), Dipartimento di Scienze Economiche, Alma Mater Studiorum - Università di Bologna (1), Department of Economics, University of Massachusetts-Amherst (1), Department of Economics, University of Illinois at Urbana-Champaign (1), Département de Sciences Économiques, Université de Montréal (1), EPGE Escola Brasileira de Economia e Finanças, Fundação Getúlio Vargas (FGV) (1), Department of Economics, University of California-San Diego (UCSD) (1), Economics Department, Eller College of Management, University of Arizona (1), Economics Department, George Mason University (1), Department of Economics, Tulane University (1), Facultad de Economía, Universidad de València (1), Economics Department, Michigan State University (1), Economics Department, Queen's University (1), Department of Economics, Texas Aandamp;M University (1), Economics Department, University of California-Santa Cruz (UCSC) (1), Economics Department, University of Essex (1), Economics Department, University of Florida (1), Economics Department, University of Strathclyde (1), Department of Economics, Stockholm School of Economics (1), Economics Department, Williams College (1), Department of Economics, Rice University (1), Economics Discipline Group, Business School, University of Technology Sydney (1), Department of Economics, Ohio State University (1), Facoltà di Economia / Wirtschaftswissenschaftliche Fakutät, Libera Università di Bolzano / Freie Universität Bozen (1), Abteilung für Volkswirtschaftslehre, Universität Mannheim (1).

7 Appendix III

Figure 8: VAD example using an energy based criterion

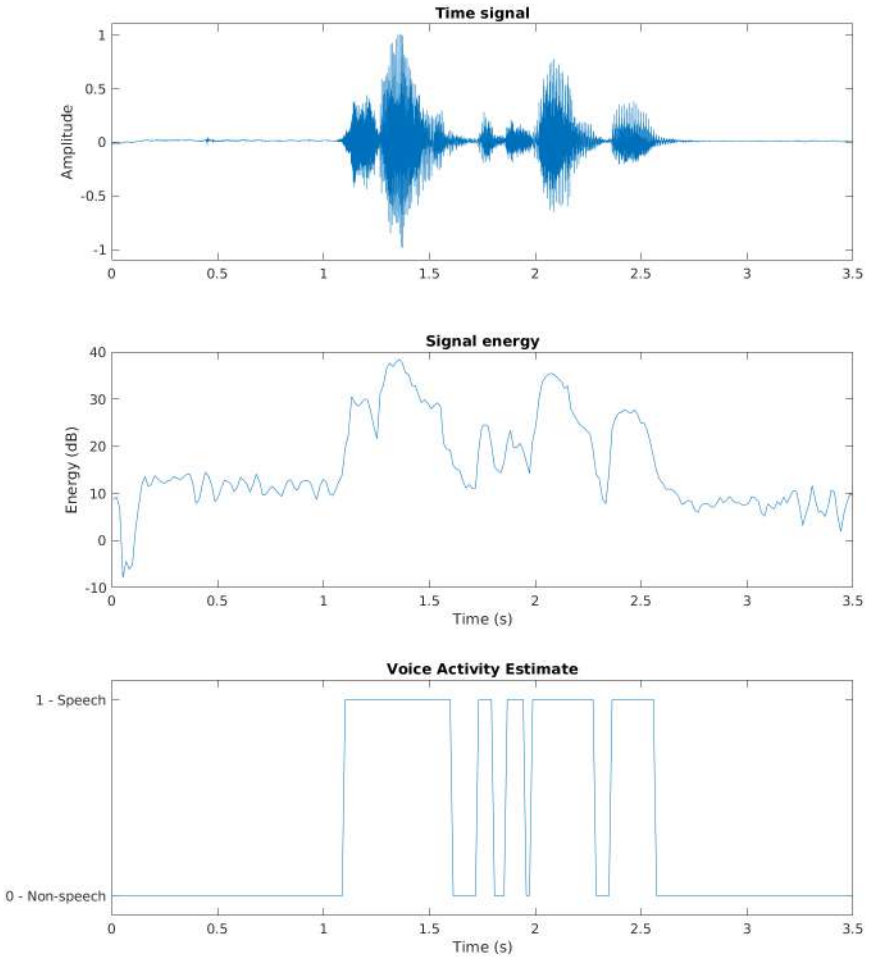

Figure 9: Choosing optimal model with coherence score

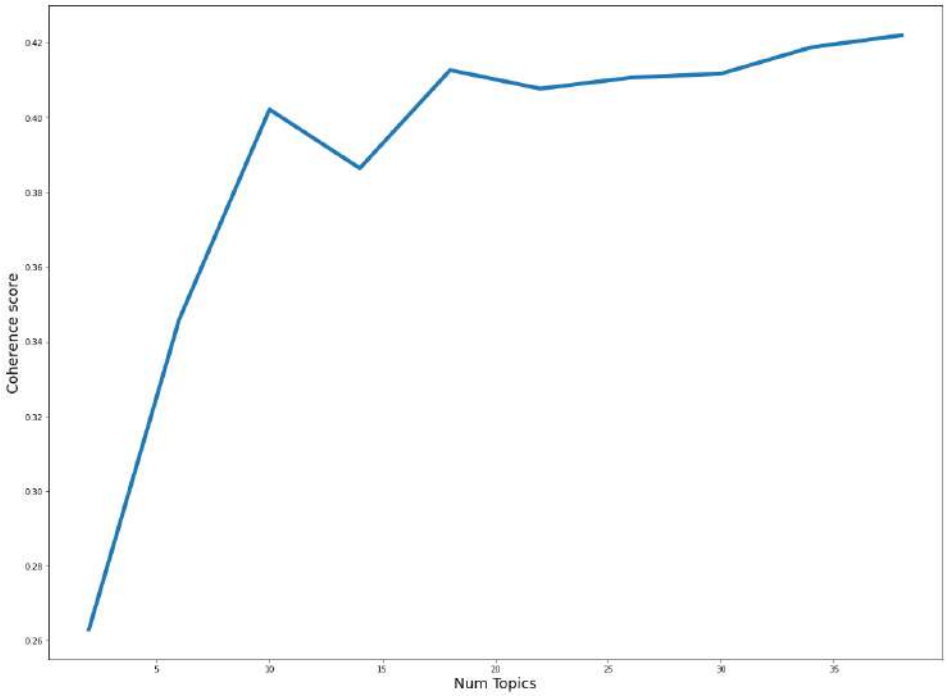

Figure 10: Example of Mel Frequency Cepstral Coefficients

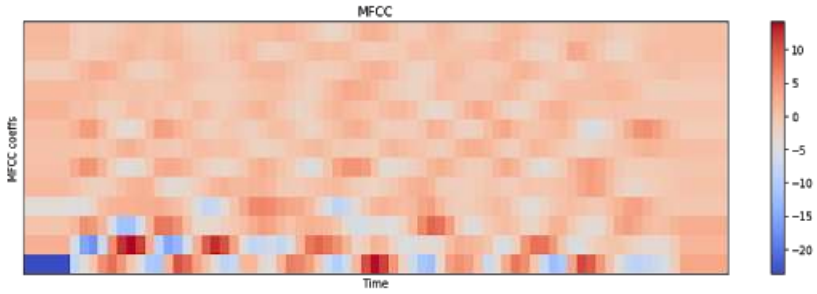

Figure 11: Example of MEL Spectogram