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Remote talks: changes to economics seminars during Covid-19

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Abstract

This paper analyzes the consequences of the change in the presentation mode of economics seminars triggered by the COVID-19 pandemic. The composition of seminar speakers changed significantly. The leading economists gained shares. The share of seminars held by women also increased. The geography of knowledge dissemination shifted significantly as the distance between host and speaker institutions increased on average by 32 percent. The growing inequality in presentations among speakers is correlated with an increase in inequality in terms of citations. The results imply that virtual presentations instead of traveling can decrease gender-specific inequality and increase inequality by productivity in the profession.

JEL codes: A14; I23; J16; O33

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1 Introduction

Academics and institutions alike spend a considerable amount of time and financial resources to exchange ideas in regular seminar series. These seminars are a key means for speakers to receive feedback, to make their work more visible, and to build a professional network. Therefore, the possibility to present at seminars can have long-lasting effects for individual career paths, especially for early career researchers. Hosting institutions benefit as they maintain the state of the art in research and seminars provide important input in the knowledge production function. Hence, who is presenting and the topic of the presentation can shape research fields as a whole.

On the 11th of March 2020, the WHO declared a global pandemic after SARS-CoV-2 (“coronavirus”) had spread around the world. Subsequently, most countries issued international travel warnings and international travel seized up.¹

As a consequence, conferences and seminars in research were canceled abruptly by the majority of organizers in the first half of March 2020. Institutions gradually started to change their mode of seminars to online presentations using information and communication technology (ICT) programs such as Zoom. By the 2020 fall term, the vast majority of institutions across the world had adapted to the worldwide spread of COVID-19 through forced experimentation with holding seminars online.

There are good reasons to assume that seminars will remain partially online in the future. Even temporary experimentation can result in lasting changes in consumer behavior (Larcom, Rauch, and Willems 2017). Barrero, Bloom, and Davis (2021) conducted a large scale survey among employees in the US and predicted that 20 percent of full workdays will be performed from home as the pandemic ends. The transition to remote seminars is likely to have a permanent component also in a post-pandemic world.² Therefore, it is important to understand the implications of the forced experimentation with ICT for the distribution of seminars.³ In particular, this study addresses the following three research questions: What are the implications of the covid shock for the inequality between speakers? Do the effects differ by gender? How does ICT change the geography of academic seminars?

This paper builds a rich panel data set of seminars in economics held at 270 institutions across the world between fall 2018 and fall 2021. The data on seminars are complemented by rich characteristics of institutions and speakers. At the institutional level, information

¹For example, the passenger volume for flights from airports in the European Union decreased to 15 percent between 2020/Q2-2020/Q4 in terms of the volume between 2019/Q2-2019/Q4. Source: Eurostat.

²In fall 2022, as most pandemic-related measures had been lifted, virtual online series continued to coexist with in-person seminars and some institutions held occasionally their seminars online. More than half of the seminar series listed on <https://www.aeaweb.org/resources/online-seminars> continued in fall 2022.

³The forced experimentation with ICT will hereafter be referred to as “covid shock”.

was collected on the number of seminars and the institutions' geography. At the speaker level, this study collected information on speaker productivity, gender, academic experience, and citations. The identification presumes that the covid shock was exogenous. The identifying variation comes from the within-seminar series comparison before and after the covid shock. The differential timing of returning to in-person seminars in the fall 2021 across institutions is used as an additional source of identifying variation.

This paper produces four main sets of results. The first set shows that the covid shock had important distributional consequences. Speakers at the top of the productivity distribution gained shares following the covid shock. In particular, top economists in terms of recent output and top young economists held relatively more seminars. Using citations as measure of impact at the speaker level, this study finds that speakers from the top of the distribution crowded out speakers from the bottom middle of the distribution. At the institutional level, speakers from top institutions crowded out speakers from institutions at the bottom of the distribution. The propensity of high productivity speakers to give seminars at lower ranked institutions increased.

The second set of results highlights that the covid shock reduced gender inequality. The share of female speakers increased markedly after the covid shock, partially driven by longer distances between female speakers and host institutions.

The third set of results studies the implications of the covid shock by geography. The covid shock induced institutions to invite speakers from further away and speakers were more likely from abroad.

Finally, this paper finds that changes in presentation shares by speaker gender and productivity, manifested themselves in changes in visibility in terms of citations, which suggests that inequality between speakers decreased by speaker gender and increased by speaker productivity due to the covid shock.

This paper contributes to the literature that examines the gender-inequality in the economics profession. A large literature shows that women are discriminated among a range of factors that determine the professional success in the profession including publication and writing standards: Card et al. (2019); Hengel (2022), citations: Koffi (2021); credit for group work: Sarsons et al. (2021); interactions in seminars: Dupas et al. (2021); discussions in an anonymous economics online forum: Wu (2018) and promotions and tenure decisions: Ginther and Kahn (2004); Ceci et al. (2014); Chen, Liu, and Kim (2022). Women graduating from a PhD program in economics are placed initially at lower ranked schools relative to their male peers and survey evidence suggests that the departmental seminar culture is a relevant factor in determining the relative success of women (Boustan and Langan 2019). This study highlights that reducing the requirement to travel by holding virtual seminars could benefit female speakers thereby potentially narrowing the gender representation gap in seminars. Thereby it contributes to the debate on why women are

underrepresented as faculty members the economics profession (Bayer and Rouse 2016; Lundberg and Stearns 2019; Auriol et al. 2022). The fraction of women decreases each stage along the career path from graduate school to full professor, the so called “leaky pipeline” discussed in Buckles (2019). The results suggest that flexibility could reduce the gender representation gap, as hypothesized by Goldin (2014). More female presenters could also encourage more young female researchers to stay in the profession through role model effects (Porter and Serra 2020).

Doleac, Hengel, and Pancotti (2021) and Minondo (2020) collect data on seminars in 66 and 143 institutions, respectively. This paper contributes to this strand of the literature by expanding their data collection of seminars extending their coverage and moving beyond the collection of US departments by including institutions worldwide. It documents for the first time the concentration of seminar presentations by speaker productivity. It finds that “superstar effects” occurred in line with Rosen (1981), thereby increasing the inequality among researchers in the economics profession. The inequality in access to seminars is relevant as the literature has shown in the context of conferences that they can promote research collaborations (Campos, Lopez de Leon, and McQuillin 2018; Chai and Freeman 2019), increase the likelihood of citing other participants (Head, Li, and Minondo 2019; Lopez de Leon and McQuillin 2020) and of publishing in leading journals (Gorodnichenko, Pham, and Talavera 2021) and are a metric in promotion and tenure committees (Chari and Goldsmith-Pinkham 2017). Research on changes of participant characteristics in conferences of other fields than economics during COVID-19 has found an increase in young researchers and female participants (Skiles et al. 2022) and in ethnic and geographic diversity (Wu et al. 2022). As opposed to these studies, this paper focuses on academic seminars and on presenters. This study contributes by documenting a rise in inequality in access to seminars and by showing a positive association between seminars and career-relevant outcomes such as citations and publication quality.

This paper contributes to the literature on alternative work arrangements. This strand of the literature has shown that women value job flexibility (for example, Mas and Pallais 2017; Wiswall and Zafar 2017) and dislike commuting (Le Barbanchon, Rathelot, and Roulet 2020). The effects of working from home on worker productivity, selection, and satisfaction have so far been primarily analyzed in the context of call center workers, which is a low paying occupation (for example, Bloom et al. 2015; Mas and Pallais 2017; Emanuel and Harrington 2021). This paper contributes by providing novel evidence on the distributional consequences of working from home in a narrowly defined high paying occupation by individual gender and productivity. This study highlights that reducing the requirement to travel by working from home could benefit women in high paying occupations thereby potentially narrowing the gender representation gap in higher ranks of these occupations (Bertrand and Hallock 2001; Azmat and Ferrer 2017).

Finally, many studies examine the knowledge spillover effects of local agglomeration. These spillovers are particularly relevant in research (Waldinger 2016; Iaria, Schwarz, and Waldinger 2018). The knowledge spillovers fall with distance within countries (Jaffe, Trajtenberg, and Henderson 1993; Audretsch and Feldman 1996) and across countries (Comin, Dmitriev, and Rossi-Hansberg 2012) and better travel linkages can increase scientific collaboration (Catalini, Fons-Rosen, and Gaulé 2020). The findings of this paper that the distance between host and speaker institutions increases and that more presentations lead to more citations suggest that the detrimental effect of distance on knowledge spillovers could weaken over time if communication continues to take place remotely in the future.

The remainder of this paper is structured as follows. The next section introduces a conceptual framework to guide the analysis. The third section describes the data. The fourth section presents the results. The final section concludes and indicates directions for future research.

2 Conceptual Framework

When predicting the effects of the covid shock, it is useful to think about potential demand and supply channels, how institutions and speakers will respond to the covid shock. This section also discusses heterogeneous shocks related to the pandemic.

2.A Demand

The hosting institutions will maximize over the quality of knowledge they receive from inviting a seminar speaker and the benefits they gain from personal exchanges with the speaker. The benefits from exchanges with high productivity speakers are on average higher in terms of feedback and learning from the presentations.⁴ At the same time, hosting institutions face budget constraints. The costs for a seminar comprise fixed costs (such as hotel bills) and variable costs (for example, travel costs). Some host institutions may have policies in place that restrict the travel distance of in-person seminars due to budget constraints or even environmental reasons.

How will the covid shock affect the demand for seminar speakers? The budget constraints of institutions will become slack and the hosting institutions will maximize their objectives by changing the set of speakers they invite as they will have to pay only the sunk cost of setting up the technology.⁵ In particular, once set up they will pay less attention to

⁴Another reason to invite a high productivity speaker could be to establish a connection that may result in a future research collaboration.

⁵If institutions' list of potential speakers to invite for a seminar depends on expected supply, who is actually going to accept an invitation, then the set of speakers institutions consider inviting may change after the

distance, as it is no longer a financial constraint, and more attention to the quality of the speakers.

Formally, one would expect institutions to invite more speakers once they have paid the sunk costs. However, if institutional norms exist to hold seminars at regular time intervals, there could be no increase in the overall number of seminars.

2.B Supply

The seminar speakers will allocate themselves leisure time and working time in which they produce research and present at seminars. They will maximize the quality of the feedback they receive while trying to balance the time between producing research and traveling. One reasonable assumption is that the marginal opportunity costs in terms of foregone research output to hold a seminar increase with speaker productivity and that the marginal utility of feedback decreases in productivity. High productivity speakers will receive on average more seminar invitations than they can attend and they will choose to visit the institutions at which they receive more feedback and can better advertise their papers. On average, they decline more invitations from places where they cannot promote their papers as well as elsewhere. How will the covid shock affect the supply of high productivity seminar speakers? High productivity speakers will increase their relative supply as the opportunity costs to give a seminar decrease in terms of foregone research output fall further for them after the covid shock. Furthermore, the time-saving effect from virtual seminars increases along with the number of seminars given by a speaker. Therefore, the effect is greater for high productivity speakers as they gave more seminars before the covid shock.

The requirement to travel may disproportionately prevent women from presenting in-person at seminars, as they tend to bear a higher share of childcare and chores (Barber et al. 2021; Deryugina, Shurchkov, and Stearns 2021). This suggests an additional fixed cost for women that may increase the further they are from the host institution, as it becomes more costly and difficult to substitute their typically greater contributions to childcare and chores for longer trips. However, the pandemic also led to significant disruptions in women's use of their time. Daycare closures and school closures necessitated an increase in child care responsibilities and chores. Alon et al. (2020) hypothesize that the pandemic may lead to an erosion of norms with respect to the allocation of childcare in the long run, but that in the short-run it is likely to fall disproportionately on women. Survey evidence shows that this burden indeed fell disproportionately on women among academics (Barber

covid shock.

The costs of Zoom, for example, were 19.99 dollar per month for a business license in October 2021. Therefore, the sunk costs of setting up the technology are small in comparison to hosting a speaker in person.

et al. 2021; Deryugina, Shurchkov, and Stearns 2021).⁶ Researchers in economics become parents on average for the first time in the first year after their PhD (Krapf, Ursprung, and Zimmermann 2017).⁷ This implies that due to the pandemic, early career researchers may give fewer presentations due to increased family duties for young children, in particular during closures of daycares and schools.

Another dimension of heterogeneity among speakers is related to increases in time spent on administrative duties (for example, as head of a department) and teaching load for most speakers due to the switching costs related to the pandemic. While these variables are generally not observable, the analysis will compare speakers of similar experience and gender to reduce dimensions of unobserved heterogeneity.

2.C Predictions

Taken together, the discussion of demand and supply implies the following three testable predictions for observed changes due to the covid shock:

Hypothesis 1: Speakers with high productivity will give more seminars.

Hypothesis 2: The response of women's supply is ambiguous. If the time-saving effect from traveling dominates, women will increase their relative supply and will do so by more for more distant places. If the pandemic shock to time use dominates the time-saving effect, then women will decrease their relative supply.

Hypothesis 3: The distance between hosting institutions and speakers will increase.

3 Data

This study identifies a balanced panel of 243 universities, 14 central banks, 11 research institutes, and 2 international organizations that recorded economics seminars in the fall of the academic years 2018/19, 2019/20, and 2020/21. The Online Appendix provides further details about the sampling criteria and selection into the sample.⁸ As discussed in the Online Appendix, the data include universities as hosting institutions that are, on average, larger in terms of the number of publications. The departments account for 57.1 percent of all publications and 77.2 percent of all top 5 publications of institutions in the

⁶The American Time Use Survey conducted by the US Bureau of Labor Statistics for the time period between May and December 2020 shows that for the US adult population women spent on average 1.7 hours per day caring for and helping household children relative to an average of 0.77 hours for men. Women spent on average 2.36 hours per day in household activities compared to 1.64 hours for men.

⁷This study finds a median birth of the first child 3.5 years after the PhD award for a sample of 100 speakers who included this information on their CV.

⁸The Online Appendix contains more information on the sample definition. For universities, seminar series are collected from the websites of the respective economics department.

Tilburg Ranking between 2015-2019. While it is challenging to obtain an estimate for the universe of seminars, as some institutions do not publish their seminar schedules regularly on their website, these figures suggest that a significant fraction of seminars is captured in the data as measured by publication counts.

Overall, 12,335 seminars were hand-collected for which the full set of speaker controls is available. Additionally, 175 cancelations across all institutions were recorded.⁹ Finally, 3,468 seminars in the academic year 2021/22 were collected to investigate the staggered return to in-person seminars.

For each institution, the hand-collected data recorded the date on which the talk was given, the speaker, the seminar title, the speaker's institutions, the time at which the seminar was held, the host institution, the seminar series, and the academic year in which the respective talk was given. Throughout the paper, spellings of institutions and speakers across different data sets were harmonized.

The data on seminars are complemented by a rich set of characteristics at both the institutional and at the speaker level.

3.A Speakers

Rich data on speakers were collected for this study, including the year of the PhD award, the gender, whether the speaker was registered on RePEc and among the top economists in its rankings, whether the speaker held an editorial role at a top journal in economics, the position of the speaker institution in the Tilburg ranking, and speaker citations.

This study identified the year in which the PhD was obtained for 98.7 percent of the speakers.¹⁰ This study also determined whether the speaker was a PhD student and, if so, excluded them. Speakers from institutions that are not universities were also included in the sample provided that they held a PhD. This was done to ensure comparability in terms of research experience across speakers.

Speaker gender was determined through a machine learning based algorithm.¹¹ The algorithm provides a probability with which the suggested gender is true. This paper set a cutoff, and trusted the algorithm for a probability greater than or equal to 95 percent when determining the gender based on the algorithm. For the remaining speakers, the proposed gender of the algorithm was hand verified. The gender could be determined for 99.9 percent of the speakers. The full set of speaker controls (experience and gender) is available for 98.44 of all recorded seminars.

⁹All recorded seminars were double-checked to guarantee the accurateness of the collection.

¹⁰The speakers' PhD was identified through speakers' CVs, LinkedIn, the family tree of trade economists, the mathematics genealogy, speakers' PhD theses, and the CVs of supervisors. If a researcher held two PhD degrees, the PhD obtained first is recorded in the data.

¹¹The provider used is <https://gender-api.com>. See Santamaría and Mihaljević (2018) for details on the quality of the algorithm.

Using the RePEc database, this study first pinpointed seminar speakers registered in the database.¹² Approximately 70 percent of speakers were registered in RePEc.¹³ For these speakers, it matched those that are ranked among the top 1 percent based on their overall research output in RePEc, the top 1 percent based on the last 10 years of publications in the RePEc database, and a ranking of 200 top young economists, whose first publication in the RePEc database was not older than 10 years.¹⁴

The data set on editorial roles by Angus et al. (2021) was merged to the speakers. The authors used the journals that received the highest rating in the Australian Business Deans Journal Quality List in 2019 and identified researchers holding editorial roles in these journals between the end of July and the beginning of August in 2020.

The rank of the speakers' institutions in the Tilburg ranking in terms of output between 2015 and 2019 was identified.¹⁵

Finally, the Google Scholar profile of the speakers was identified and the citations for 2018, 2019, 2020, and 2021 were retrieved. A profile could be found for about 78 percent of the speakers.¹⁶ For papers presented in the academic years 2018/19 and 2019/20, this study recorded whether the paper was published and if so in which journal it was published and the impact factor of the journal.¹⁷ Furthermore, citations at the paper level were collected.

3.B Institutions

For universities featured in the Tilburg ranking, their rank in terms of output between 2015 and 2019 was retrieved. For all institutions included in the data, the latitude and longitude of the institutions were determined using Google Maps.¹⁸ Finally, the country in which an institution is located was collected.

¹²The RePEc database was accessed using <https://ideas.repec.org>.

¹³Male and more experienced speakers were more likely to be registered on RePEc.

¹⁴The RePEc rankings were retrieved in March 2021.

¹⁵If a speaker is affiliated with multiple institutions, then the minimum position in the Tilburg ranking is taken.

¹⁶In doing so, profiles that contain erroneously papers from authors with the same name in other subjects among the top cited papers were excluded. One advantage of Google Scholar over Web of Science is that it also contains citations of working papers and not only citations of publications.

¹⁷The information on publications was collected in February 2022. Due to the long publishing lag in economics the publications for presentations in the academic year 2020/21 were not yet collected. The impact factor is identified from <http://scimagojr.com> and refers to 2020. The index estimates the scientific influence of a journal by citations received by a journal and weights the citations by the importance of the journal where citing articles were published.

¹⁸For universities, the location of the economics department was used, if such a department existed.

3.C Summary Statistics

Table 1 shows summary statistics at the seminar series level and the seminar talk level in the fall term of two academic years before the covid shock in 2020/21. Overall, there are 508 seminar series in the data. The average seminar series included 8.68 speakers. The share of cancelations as of all planned seminars was on average 4.5 percent. The share of cancelations for talks with female speakers was on average 1.1 percent.¹⁹

At the seminar level, 1,876 seminars or 21.8 percent of the seminars were held by 1,185 individual female speakers.

The average speaker had about 12.2 years of experience after their PhD award. The median and mode values of speaker experience were 9 and 4 years after their PhD award, respectively.

The top 1 percent of researchers, i.e. 615 economists, in terms of their overall output and in terms of their publication record in the last 10 years in RePEc accounted for 452 seminars (7.1 percent) and 804 seminars (12.6 percent), respectively. The 200 top young economists held 213 seminars, i.e. 3.3 percent of the seminars.²⁰ The number of speakers with editorial roles in top journals excluding the top 5 journals in the population of speakers was 1,762 and their seminar share was about 18.3 percent. Likewise, 244 speakers with editorial roles at top 5 journals gave 6.3 percent of all seminars.²¹ The average position of the speaker institution in the Tilburg ranking was 109. Speakers affiliated with one of the top 20 institutions in the Tilburg ranking accounted for 35 percent of seminars.

4 Results

The following analysis first examines the effects of the covid shock on the number of seminars. Then the effects by speaker characteristics are investigated. Finally, the association between seminar presentations and career-relevant outcomes is analyzed.

4.A The Number of Seminar Series

The first part of the analysis is carried out at the level of the seminar series. Let h denote the host institution, s the seminar series of the institution, and t the academic year in which

¹⁹These figures are upper bounds as they condition on the set of institutions that have recorded at least one cancelation between fall 2018 and fall 2020. The share of cancelations as of all planned seminars across all academic years was 1.39 percent.

²⁰They are a distinct group as they account for only 3.89 percent of the top 1 percent of researchers in terms of research output in the last 10 years.

²¹The top 5 journals are the American Economics Review, Econometrica, the Journal of Political Economy, the Quarterly Journal of Economics, and the Review of Economic Studies.

the seminar was held. The estimating equation at the seminar series level is given by:

$$\text{Outcome}_{hst} = \lambda_{hs} + \beta \times \mathbb{1}(t = \text{Academic year 2020/21}) + \varepsilon_{hst}, \quad (1)$$

where λ_{hs} is a host institution-seminar series specific fixed effect and ε_{hst} is the error term. Larger institutions offer many field-specific seminars, and this specification considers the within-seminar series change by including λ_{hs} . The coefficient estimate for β identifies the time fixed effect in the year of the covid shock relative to the pre-period. Equation (1) identifies the effect of the covid shock, β , on seminar organization through a time fixed effect, as 79 percent of the institutions in the sample reported at least some online seminars in the academic year 2020/21. About 71 percent of hosting department reported only online seminars. This is most likely a conservative lower bound, as the information is missing on most other institutions' websites of the remaining institutions or the websites may not have updated the location of the seminar. The onset of the pandemic was a sudden and unexpected event. Therefore, the necessity to switch seminars from in-person to online presentations, i.e., the covid shock, can be regarded as exogenous to institutions and speakers. Standard errors are clustered at the host institution-seminar series level. The regressions are weighted by the count of seminars to account for the different size of seminar series.

The first outcome in Table 2 is the logarithm of the number of seminars. The results in column (1) show a negative point estimate that is statistically significant at the 1 percent level. The point estimate suggests that during the fall term of the academic year 2020/21, on average 12.5 percent fewer seminars were held compared to before. In fact, a few institutions stopped holding seminars and they are not included in the sample altogether, therefore the intensive margin effect is a lower bound for the reduction in seminars. The number of individual speakers declined correspondingly by 14.6 percent from 3,140 in the pre-covid shock academic year to 2,682 in the academic year 2020/21. One potential explanation for the drop in the number of seminars could be the substitution of institutional seminars with newly established online seminar series.²² Other potential explanations could be the preference for in-person seminars over virtual seminars, or a reduction in the supply of speakers. The following two columns rule out that speakers decreased their supply in the short run by considering cancellations.²³ The outcome in column (2) is the share of cancellations of all planned seminars.

²²Numerous cross-institutional virtual seminars were established as a consequence of the wide-spread use of technology. See, for example, <https://ideas.repec.org/v/> for a selection of virtual seminars. Section 4.E.10 discusses the newly established online seminars.

²³If reasons for cancellations are given, these relate to the supply side more frequently. Common causes for cancellations include family affairs, illness, and weather events.

As the overall share of cancellations is quite low, this outcome is aggregated to the host institution level “h” across all seminar series “s” in equation (1). The point estimate suggests that the share of cancellations decreased by 0.54 percent but it is insignificant. This implies that contemporaneous shocks did not increase short-term cancellations of planned seminars; on the contrary, cancellations decreased. The outcome in column (3) is the share of cancellations by female speakers for all planned seminars. The point estimate is positive but marginally insignificant. This suggests some gender heterogeneity with respect to the short-run supply of speakers, however the share of cancellations by female speakers did not increase statistically significantly due to contemporaneous shocks during the pandemic.

4.B The Changing Composition of Seminar Series by Speaker Productivity

Overall, there are fewer opportunities for speakers to present. This section shows the implications of the covid shock for the composition of seminar series by four proxies of speaker productivity. The proxies are speakers identified as top economists in RePEc, by their impact in terms of citations between 2009 and 2018, the position of speaker institutions in the Tilburg ranking, and speakers holding an editorial role at top journals.

The following analysis is conducted at the level of the seminar talk in order to control for contemporaneous shocks at the speaker level by age and gender. Let i denote a seminar talk held by an individual speaker. Equation (2) introduces additionally a vector X_i of controls that includes speaker experience in years after PhD award as a proxy for age and speaker gender to control for contemporaneous pandemic-related shocks to speakers of different ages and gender as discussed in Section 2.²⁴ The remaining notation is the same as introduced in equation (1) and the clustering remains at the level of the host institution-seminar series.

$$\text{Outcome}_{ihst} = \lambda_{hs} + \gamma \times X_i + \beta \times \mathbb{1}(t = \text{Academic year 2020/21}) + \varepsilon_{ihst}. \quad (2)$$

The results in Table 3 show how the shares of top ranked economists in the RePEc ranking change. The first two columns examine the change in presentations by leading researchers as measured by placement among the top 1 percent in two types of RePEc rankings. The first ranking considers the overall RePEc output of researchers in economics. The coefficient estimate in column (1) is marginally insignificant (p-value 0.1002). Its

²⁴This study only considers seminars with one speaker. About 0.5 percent of the talks were held by multiple speakers. All results are robust, when including talks with multiple speakers. In most cases individual outcomes cannot be uniquely determined when multiple speakers were giving a seminar.

magnitude suggests that the relative likelihood of this group giving a seminar talk increased by 0.96 percentage points, or 13.5 percent of the pre-covid shock mean. The second ranking places economists in terms of their research output in the last 10 years. The results in column (2) show a positive and significant coefficient at the 1 percent level. The point estimate implies an increase of 3.62 percentage points, or 28.8 percent in terms of the pre-covid shock mean. The third outcome is a dummy equal to one if the seminar speaker is among 200 top young economists whose first publication on RePEc is no older than 10 years. The point estimate for the academic year 2020/21 is positive and significant at the 5 percent level. Its magnitude suggests a 0.95 percentage point increase in the relative likelihood of holding a seminar as a top young economist, or 28.4 percent in terms of the pre-covid shock mean. Overall, superstar effects arise at the top of the distribution for all three types of categories. The effects are significant only for rankings based on recent research output.

The outcomes so far have analyzed the changes in shares for speakers at the top of the productivity distribution. Who is losing shares when the top gains? To address this question, the outcomes in Table 4 consider the residual from a regression of citations between 2009 and 2018 on the speaker experience and gender.²⁵ Figure 1 displays the residual by pre-covid shock and after the covid shock occurred. The distribution of the residual is shifted to the right in the academic year 2020/21 relative to the pre-covid shock period. Speakers at the top of the residual distribution gain at the cost of speakers in the bottom middle of the distribution.

The results in Table 4 are in line with the visual impression. The first outcome in column (1) is the residual. The point estimate is positive and significant at the 1 percent level. This implies that speakers had a higher impact in terms of citations after the covid shock. The outcomes in column (2) to (5) examine the reallocation of speakers in terms of the pre-covid shock distribution of the residual. The point estimate for the first quartile is positive and significant at the 1 percent level. It suggests that the likelihood that a speaker in the post-covid shock period was from the first quartile of the distribution increased by 3.6 percentage points. The point estimates for the remaining quartiles are negative. However, only the point estimate in column (4) for the third quartile is statistically significant at the 5 percent level. This implies that speakers from the bottom middle were crowded out by speakers from the top quartile of the residual distribution.

²⁵The results are similar when introducing speaker fields from RePEc as additional control.

How is the inequality between speaker institutions affected? The outcomes in Table 5 use functions of the rank of the speaker institution that is available for speakers employed at universities.

The first outcome in column (1) is the position of the speaker institution in the Tilburg ranking. The point estimate is negative and significant at the 1 percent level. It suggests that the position of the speaker institution decreased modestly about 8 positions after the covid shock, i.e., the quality of the speaker's institution increased. The outcomes in column (2) to (5) show a reallocation of shares from speakers from institutions with the lowest number of publications (third and fourth quartile) to speakers based at institutions that have the highest number of publications (first quartile). The point estimate for the second quartile has a positive sign but is insignificant. In Table A.1, the average position of the host institution in the Tilburg ranking is compared before and after the covid shock by quartiles of the rank of the speaker institution. The average rank of the host institution increased significantly by 10.47 positions for speakers affiliated with an institution in the first quartile. For speakers from institutions in the second to fourth quartile there are no statistically significant differences in the rank of the host institution. This is consistent with a more significant decrease of the opportunity costs to give a seminar or with a lower marginal utility from feedback for high productivity speakers. As the time required to present in a seminar decreases, they are more willing to accept invitations from institutions of lower average quality. Overall, the results in Table 5 suggest a gradient by institutional quality and a crowding out of speakers from institutions with few publications by speakers from institutions with many publications.

The results in Table 6 examine the changing shares of speakers that held editorial roles at top journals in economics and at the top 5 journals. The outcome in column (1) is a dummy equal to one if the speaker held an editorial role at a top journal excluding the top 5.²⁶ The point estimate is positive but small and insignificant. The outcome in column (2) is a dummy equal to one if the speaker held an editorial role at a top 5 journal. The coefficient estimate is positive and significant at the 1 percent level. It suggests a significant increase by 2.13 percentage points, or 33.9 percent in terms of the pre-covid shock mean. Institutions might increase the demand from speakers with editorial roles to receive feedback on their current research. As for the supply side, speakers from these journals may have relatively more time to hold seminars due to the covid shock. The results in this section confirm the prediction of the conceptual framework that high productivity speakers gain shares.

²⁶The data come from Angus et al. (2021). The five most frequent editorial roles include advisory editor, associate editor, co-editor, editorial board member, and editor.

4.C The Changing Composition of Seminar Series by Speaker Gender

The following analysis explores the association between speaker gender and the covid shock.

The first outcome is the likelihood that the seminar speaker is female. The point estimate is positive and significant at the 1 percent level. The coefficient estimate suggests a 7.5 percentage point increase in the relative likelihood that the seminar speaker after the covid shock is female, which is about 34.6 percent in terms of the pre-covid shock mean. This finding is even more surprising considering the fact that previous research suggests a negative effect of the contemporaneous pandemic shock to women's research productivity (Barber et al. 2021; Deryugina, Shurchkov, and Stearns 2021). Furthermore, women are under-represented in the top 1 percent in terms of overall output (women represent 5 percent of the top 1 percent) and in terms of output in the last 10 years (women represent 9.2 percent of the top 1 percent) in the RePEc rankings.²⁷ This indicates that the "superstar effects" documented in the subsection 4.B tend to benefit men disproportionately. Figure 2 shows that the post-covid shock density of distance between host and speaker institution deviates from the pre-covid shock much earlier for women compared to men at around 1,475 km and the densities cross again around 5,000 km. This suggests that there are some gender-related costs of traveling to seminars and the covid shock facilitated presentations for women at medium distances. Column (2) explores this hypothesis by examining heterogeneity by defining a dummy equal to one if the distance is greater than 1,475 km. The interaction term is positive and marginally significant at the 10 percent level. The regression in column (3) considers an alternative dummy equal to one if the distance is greater than 1,475 km and less than 5,000 km. The magnitude of the interactions term increases and it becomes significant at the 1 percent level. This suggests that parts of the increase in the share of female speakers are driven by a supply side response for medium length distances. The requirement to travel a medium distance and to stay overnight may have prevented women from accepting seminar invitations before the covid shock. Column (4) explores heterogeneity by the type of institution at which women held seminars after the covid shock. The point estimate is close to zero and suggests no heterogeneity in the association between the quality of institutions and speaker gender. Female speakers generally gave more seminars, whereas speakers from higher average quality institutions gave more seminars at institutions of lower average quality. Column (5) tests for heterogeneity by speaker experience. The interaction term is negative but small and insignificant,

²⁷The RePEc shares in the top 1 percent were retrieved from <https://ideas.repec.org/top/female.html> in March 2021.

suggesting that the relative likelihood that the speaker is female increased for speakers of all ages.²⁸

4.D The Changing Geography of Seminar Series

Moving from in-person to virtual seminar presentations has led to literally zero travel costs for seminar speakers to participate in a seminar in any location worldwide, apart from potential coordination costs due to time-zone differences. What are the consequences of the covid shock for the geography of seminars?

The results in Table 8 investigate the changing geography of seminar presentation mode during the pandemic by using the log of the geodetic distance as outcome.²⁹ The coefficient estimate in column (1) is positive and significant at the 1 percent level. The magnitude suggests a huge increase by 31.3 percent in geodetic distance relative to the pre-covid shock period.³⁰ Column (2) examines heterogeneity among universities as hosting institutions by the position in the Tilburg ranking. The interaction term is small and insignificant. This suggests that distance was part of the budget constraint for institutions of all kinds. Column (3) examines heterogeneity by the position of the speaker institution in the Tilburg ranking. The rank enters negatively, i.e., speakers from better ranked institutions generally travel to institutions further away. The interaction term between the time fixed effect and the rank of the speaker institution is also negative, suggesting that speakers from better ranked institutions gave seminars virtually at physically more distant institutions after the covid shock. The increase in distance for a speaker affiliated with a top 10 institution is close to 42 percent, whereas the effect dissipates when the speaker comes from an institution in position 350 in the Tilburg ranking. All in all, the results suggest that geographic knowledge dissemination has increased globally, and in particular by speakers affiliated with higher ranked institutions.

What locations are driving the increase in distance between host institution and speaker institution? Table A.2 shows the changes in seminars between the academic years 2018/19, 2019/20, and 2020/21 among the five most frequent continent combinations in the pre-covid shock year. There is only one continent combination for which the number of seminars actually increased in 2020/21. The most significant surge was seen in seminars held

²⁸The association between speaker experience and the covid shock is negative and insignificant. Unreported results available upon request.

²⁹The geodetic distance between institutions is calculated by using the coordinates and the `geodist` command in Stata.

³⁰In unreported results, a gravity equation at the institutional level was estimated and the distance elasticity decreased from 0.514 in 2018/19 to 0.417 in 2020/21.

by speakers from institutions in Europe hosted by institutions in the Americas by 67.2 percent.³¹

Table A.3 examines whether the increase in distance also translated into a relative increase in seminars across borders. For this purpose, the country codes of the host institution and the speaker institution were retrieved. The estimates in column (1) show that there was a positive increase in the share of seminars organized across borders during the pandemic. The point estimate implies a 4.7 percentage point increase, or a modest rise of 10.1 percent in terms of the pre-covid shock mean.³²

4.E Robustness Checks

This section carries out a number of robustness checks beginning with the robustness of superstar effects.

4.E.1 Estimating the “Superstar” Effect using Logit Regression

All regressions concerning the “superstar” effect were estimated using a linear probability model to ease the interpretation of the coefficient estimates. Table A.5 shows the estimates using logit regressions instead of linear regressions. The results are similar to the baseline estimation. The coefficient estimate for the top 1 percent in terms of overall output is positive but marginally insignificant. The point estimates for the top 1 percent in terms of recent output and for top young economists are positive and significant at the 1 percent level. The point estimate in column (2) suggests that the log odds ratio increased by 0.35.

4.E.2 Alternative Definitions of “Superstar” Speakers

The baseline definition of superstar speakers comprised the top 1 percent of speakers registered in the RePEc database. In Table A.4, the top 2 to 5 percent and the top 6 to 10 percent in terms of overall RePEc output and in terms of output in the last 10 years are used as the definition of superstar speakers. Table 1 documents that the seminar presentation share of this group is significantly larger compared to their share in the population. The point estimate in column (1) using the top 2 to 5 percent in terms of overall RePEc output as outcome is negative and insignificant. The coefficient estimate using the top 2 to 5 percent in terms of output in the last 10 years as outcome in column (2) is positive

³¹The number of seminars by speakers from the top 10 US institutions in the Tilburg ranking at European host institutions increased by 16 percent in 2020/2021 compared to 2019/2020.

³²In unreported results, time-zone differences were investigated. There is no change in time zone difference after controlling for the log of distance suggesting that time zone differences are on average no friction. The effects of time zone differences become negative and significant from 9 hours (the 95th percentile of time zone differences). The magnitude, however, suggests a small reduction of 1 percentage point in the likelihood to hold a seminar after the covid shock relative to the pre-period.

and insignificant. This suggests that gains in shares were concentrated among the top 1 percent in terms of recent research output. The result in column (3) for the top 6 to 10 percent in terms of overall RePEc output shows a negative and significant coefficient. The coefficient estimate in column (4) is negative and insignificant. This implies that superstar effects quickly disappear as one considers higher percentiles of the productivity distribution. The specifications in columns (5) and (6) split the 200 top young economists into the ranks 1 to 100 and 101 to 200. The point estimate in column (5) is positive and statistically significant at the 10 percent level, whereas the point estimate in column (6) is positive but insignificant. This suggests that for top young economists, the gains in seminar shares are also concentrated among the top of the distribution.

4.E.3 Excluding Seminars Scheduled Rescheduled from Spring to Autumn

Approximately 9.47 percent of seminars in fall 2020 were rescheduled from spring 2020. These seminars have been included in the analysis so far, as the decision to reschedule is an endogenous choice. In robustness checks, these seminars have been excluded and the conclusions remain the same. The results in Table A.6 are by and large similar to Table 3. This is reassuring as the distribution of speaker characteristics in the spring could be generally different from the distribution in the fall. The magnitude of the coefficient estimate in column (1) increases and it becomes statistically significant at the 5 percent level.

4.E.4 Excluding Seminars with Pandemic-related Titles

Another concern is if the demand for certain topics changed due to the pandemic and that speakers' ability to write a paper on the contemporaneous event correlates with productivity or research interests. As a robustness check, all seminars in the academic year 2020/21 with pandemic-related topics are excluded.³³ About 5.23 percent of seminar titles in the fall of 2020 are pandemic related.³⁴ The results in Table A.7 are robust to excluding pandemic-related titles. The point estimates for the effect in terms in the last 10 years is reduced, which could suggest a quicker shift in the research output of high productivity researchers to pandemic-related research.

4.E.5 Controlling for Speaker Fields

There could be a change in the demand for speakers from certain fields due to the pandemic and the specialization of high productivity economists may correlate with the change. The

³³Pandemic-related topics are broadly defined and include apart from "Covid" many other key words such as "SIR" for SIR models or "epidemic".

³⁴The paper title is available for approximately 85 percent of seminars in the academic year 2020/21.

specifications in Table A.8 control for 97 fields defined by RePEc.³⁵ The results are robust for speakers in the top 1 percent in terms of output in the last 10 years and for top young economists.

4.E.6 Reporting of Virtual Seminars

The estimation so far assumed that the vast majority of seminars were held online and did not take into account the explicit reporting of online seminars. About 79 percent of hosting departments explicitly reported that some of their seminar were held online on their websites. This is likely a lower bound as not all departments updated the location of their seminars during COVID-19. About 71 percent of hosting department reported only online seminars. The results in Table A.9 restrict the sample to inviting departments that reported at least some of their seminars online. The point estimates are similar to the baseline results in terms of sign and significance. The point estimates increase marginally in magnitude.

4.E.7 Ruling Out Selection Effects

The results in Table 2 show a decrease in the number of seminars. Hence, superstar effects could be driven by a selection effect, i.e., those seminar series that reduce their number of seminars invite fewer speakers that are not superstar speakers while keeping the number of superstar speakers constant. One way of testing this argument is to consider only the subset of seminar series where the number of seminars in the academic year 2020/21 is greater than the average of the academic years 2018/19 and 2019/20. Table A.10 shows that when imposing this sample restriction, superstar effects remain robust. The coefficient in column (1) is positive but becomes insignificant. The results are robust for speakers in the top 1 percent in terms of output in the last 10 years and for top young economists. The point estimates are larger compared to Table 3.

4.E.8 Robustness Checks for the Effects on Speaker Gender

In this subsection, the robustness analysis is extended to the effect of the covid shock on speaker gender. The results are presented in Table A.11. The results in column (1) display estimates from a logit regression. The point estimate is significant at the 1 percent level and suggests an increase in the log odds ratio that the speaker was female by 0.44. The regression in column (2) excludes seminars that were rescheduled from spring to fall in

³⁵The RePEc database identifies the specialization of registered authors based on two criteria. First, an author is attached to a field if the author has written at least five papers in the field. Second, authors are classified as specialist if authors have written a minimum of 25 percent of their articles in the respective field.

2020. The point estimate is similar to the baseline estimate in Table 7 and remains statistically significant at the 1 percent level. The specification in column (3) excludes seminars with pandemic-related titles. Again, the point estimate is comparable to the baseline estimate and is statistically significant at the 1 percent level. The regression in the column (4) shows the robustness of the effect of the covid shock on speaker gender when controlling for speaker fields using RePEc data. The regression in column (5) shows that the result is robust to restricting the sample to hosting departments that explicitly reported online seminars on their website. The regression in column (6) excludes speakers from the top 1 percent of women in RePEc in terms of recent research output. The point estimate remains statistically significant at the 1 percent level. This suggests that the increase in female speakers is not entirely driven by a few female superstar speakers.

4.E.9 Using the Return to In-Person Seminars to Account for Time Trends

Another concern for the identification is that preferences for female speakers or more productive speakers change over time. Hence, the estimation of time-fixed effects may not reflect the effect of remote seminars but rather be the continuation of a trend. To address this concern, the seminars in the fall of 2021 were collected for 244 hosting institutions. Overall, 2,881 seminars were collected for which the mode of presentation, i.e. in-person or online, could be determined and 55.6 percent of seminars were held online. A check using the archive suggests that the vast majority of seminars (more than 95 percent) were intentional, i.e. planned as online seminar, and not spontaneously switched to online seminars. There was also no change in the number of cancellations in the fall of 2021. The specification in Table A.12 follows the structure equation (2) and uses a dummy equal to one if the presentation was held online in the fall of 2021 as outcome variable. It additionally controls for the inverse hyperbolic sine of distance. The results in column (1) show that more experienced speakers and female speakers were more likely to present online. Column (2) additionally controls for the rank of the speaker institution to account for the quality of the speaker. The point estimate for female speakers suggests that they were 5.1 percentage points more likely to present online. The point estimate for the rank of the speaker institution suggests that speakers from better ranked institutions were also more likely to present online but it is insignificant. The regression in column (3) controls for the interaction between host country and speaker country fixed effects to account for any bilateral travel restrictions that may still have been in place in the fall of 2021. The effect for female speakers barely changes and remains significant at the 1 percent level.

The results in Table A.13 show that more productive speakers select themselves into online seminars. The results in columns (1) to (3) show that “superstar” speakers were more likely to present online. For example, the results in column (2) suggest that the top

1 percent in terms of recent output were 7 percentage points more likely to present online. The results in column (4) highlight that speaker productivity positively correlates with online presentations. Finally, the findings in columns (5) and (6) suggest that both editors of top journals and of the top 5 journals were more likely to present online.

4.E.10 Comparing the Speakers of Public Seminar Series to Institutional Seminar Series

One further concern is that seminar speakers that are underrepresented in institutional seminars after the covid shock select themselves into the newly established online seminar series open to the public. In order to address this issue, this study accessed the schedules for 31 online seminar series and compared them to the 509 institutional seminar series.³⁶ The distributions of institutional and public seminars look by and large very similar (Table A.14). Overall, there are three significant differences in means. The difference that stands out most is the difference in the rank of institutions of seminar speakers. Speakers in public seminar series were from institutions ranked 51 positions lower on average. In addition to the increased inequality in existing seminars due to the covid shock, this suggests an additional dimension of inequality across institutions due to the introduction of public seminar series.

4.E.11 Conferences

While it is beyond the focus of this study to systematically examine all conferences in economics, the Online Appendix discusses a particular high profile conference, the NBER Summer Institute. The results with respect to geography of participants and the gender of discussants go in the same direction as for seminars.³⁷

4.F The Increasing Inequality by Speakers' Characteristics

Did the changing shares also translate into more seminars given by leading researchers and women, or was the increase only in relative terms? The answer is not obvious, as the intensive margin of seminars decreased by 12.5 percent.

To tackle this question, this study builds a panel data set of all speakers in the sample between the academic year 2018/19 and 2020/2021. It identifies the number of seminars given in the fall of each academic year by seminar speakers. If a seminar speaker does not

³⁶A list of 31 online seminars included in the comparison is available upon request.

³⁷Skiles et al. (2022) document an increase in participants in conferences in sciences and engineering. This study finds an increase in the number of participants at the NBER Summer Institute by 47.6 percent in 2021 relative to 2019.

appear in a given year, the number is replaced as zero. The following equation identifies the effects for different types of individuals.

$$\begin{aligned} \text{Number of seminars}_{it} = & \mu_i + \lambda_t + \gamma_i \times X_i \\ & + \beta \times \mathbb{1}(t = \text{AY 2020/2021}) \times \text{Speaker characteristic}_i + \varepsilon_{it}. \end{aligned} \quad (3)$$

It includes individual fixed effects μ_i and time fixed effects λ_t . Furthermore, it interacts the year in which the PhD was obtained and speaker gender with time fixed effects to control for contemporaneous shocks along these dimensions. The coefficient of interest is β , which identifies the differential effect of the covid shock by speaker characteristics. Standard errors are clustered at the individual level.

The results show that for top economists in terms of overall output, in terms of recent output, editors at top 5 journals, and female speakers, the increase in shares also increased the number of seminars significantly. The magnitudes range from 0.22 additional talks for female speakers to 0.40 additional talks for editors of top 5 journals. The magnitudes do not look quantitatively significant at first sight. However, the average number of seminars given before the covid shock was 0.67 and in relation to this figure this corresponds to a 33 percent and 61 percent increase, respectively.

Table A.16 provides further descriptive evidence on the rising inequality between researchers after the covid shock. The share of seminar speakers with three or more presentations among the set of speakers in the sample increased from 7.4 percent in 2018/19 to 8.5 percent in 2020/21. This suggests that after the covid shock presentations were more concentrated among a few speakers.³⁸

4.G The Relationship between Seminars and Outcomes at the Paper Level

Citations and publications are relevant determinants for economists' salaries (Gibson, Anderson, and Tressler 2017).³⁹ Many departments rank journals in categories when evaluating an assistant professor for tenure. The top 5 journals play a significant role in the tenure process in many departments (Heckman and Moktan 2020). To study the association between seminars and publications, information on the publications status and citations of

³⁸The concentration increases also when studying the distribution of seminar titles. The share of seminar titles presented more than four times increased from 1.90 percent in the fall of 2019 to 2.15 percent in the fall of 2020.

³⁹Hamermesh (2018) surveys the literature on citations and labor market outcomes. Most studies find a positive association between citations and researchers' labor market outcomes and salaries, for example Ellison (2013).

presented papers in the academic years 2018/19 and 2019/20 was collected. About 36.3 percent of papers were published three years after their presentation.

$$\text{Outcome}_p = \gamma \times X_p + \beta \times \text{Number of seminars}_p + \varepsilon_p. \quad (4)$$

The vector X_p contains the number of authors, the share of female authors, and the minimum rank of the host institutions in the Tilburg Ranking at which the paper was presented.⁴⁰ The regressor of interest is the number of seminar presentations in the academic year in which the paper was presented. The log of the impact factor of the journal and a dummy equal to one if the paper was published in a top 5 journal are considered as proxies for publication quality. The logarithm of citations between the year of the presentation and three years later is considered as an additional outcome.

The results in Table 10 in column (1) show a positive and statistically significant correlation between the number of seminars and the impact factor of the publication. The point estimate suggests an increase of 24 log points for each additional seminar presentation. The association between the number of seminars and the impact factor of the publications is reduced significantly in size and turns marginally insignificant when adding author fixed effects. The correlation between publishing in a top 5 journal and the number of seminars is positive and statistically significant at the 1 percent level (column 3). The point estimate in column (3) suggests that one additional seminar increases the relative likelihood of a top 5 publication by 12.9 percent. The minimum rank of the host institution negatively correlates with publication outcomes, i.e., papers presented at better ranked institutions get published in better publication outlets.⁴¹ The association between the number of seminars and a publication in a top 5 journal remains significant at the 5 percent level when adding author fixed effects. The point estimate in column (4) suggests that one additional seminar raises the likelihood of a top 5 publication by 3.1 percentage points. Finally, there is also a positive and significant association between the number of seminars and citations also at the paper level, as shown in column (5). The elasticity estimate suggests that one additional seminar raises citations by approximately 27.2 log points. The specification in column (6) introduces speaker fixed effects and the point estimate of the elasticity falls to 13.5 log points for one additional seminar.

⁴⁰The results are similar when using the average rank of host institutions at which a paper was presented instead of the minimum rank of the host institution at which the paper was presented.

⁴¹The association between the quality of publications and presentations at top ranked institutions could be the effect of the feedback in seminars and of interactions with potential referees and editors. Another potential channel is that presenting a paper at a prestigious institution could be a signal to editors and referees without having a significant effect on the quality of the paper.

5 Conclusion

Understanding the distributional effects of remote seminars on speakers of different gender and productivity is highly relevant for the profession as virtual seminars may remain an integral part in academic knowledge dissemination in a post-pandemic world. This paper uses the transition from in-person presentations of seminars to online presentations as an exogenous shock. Drawing on a novel and unique data set on seminars in economics worldwide, this study documents first evidence on the changing nature of seminars in economics following the covid shock. First, this paper shows that the overall number of seminars declined and that the decline was not driven by the short-run supply of speakers. Then the distributional consequences of the covid shock are traced. The distribution of seminar speakers shifted toward researchers of higher productivity, where productivity was proxied by three different measures. The share of seminars held by women increased and even more so at medium distances, which suggests that the requirement to travel could be a barrier for women in accepting seminar invitations. The geography of knowledge dissemination changed significantly as the average distance between host and speaker institutions increased by 32 percent. Finally, this paper presents preliminary evidence that the inequality in presentation opportunities manifested itself in inequality in citations.

It is an open question whether the rising inequality in terms of presentation opportunities is welfare-increasing due to increased knowledge spillovers from access to frontier level research or welfare-decreasing because of fewer presentation opportunities for speakers not at the top of the productivity distribution. From a normative perspective, the findings suggest that offering to hold a virtual seminar for medium length distances may further reduce gender inequality over time. The ICT capabilities gained during the pandemic may mark the beginning of a new flexibility for all.

The lessons drawn in this paper may be applicable not only to economics, but also to other research fields that experienced a similar transition in the organization of research seminars. The existing literature has argued that inventors and workers gain from personal interactions (Lucas 2009; De La Roca and Puga 2016; Akcigit et al. 2018; Andrews 2020; Battiston, Blanes i Vidal, and Kirchmaier 2020; Atkin, Chen, and Popov 2022). Online seminars change the way in which presenters and the audience interact. Future research could trace the network effects of seminars in terms of collaboration and the publication outcomes of presented work. This would quantify extent to which online seminars are a substitute for in-person seminars in creating ties among researchers and in improving the quality of presented work.

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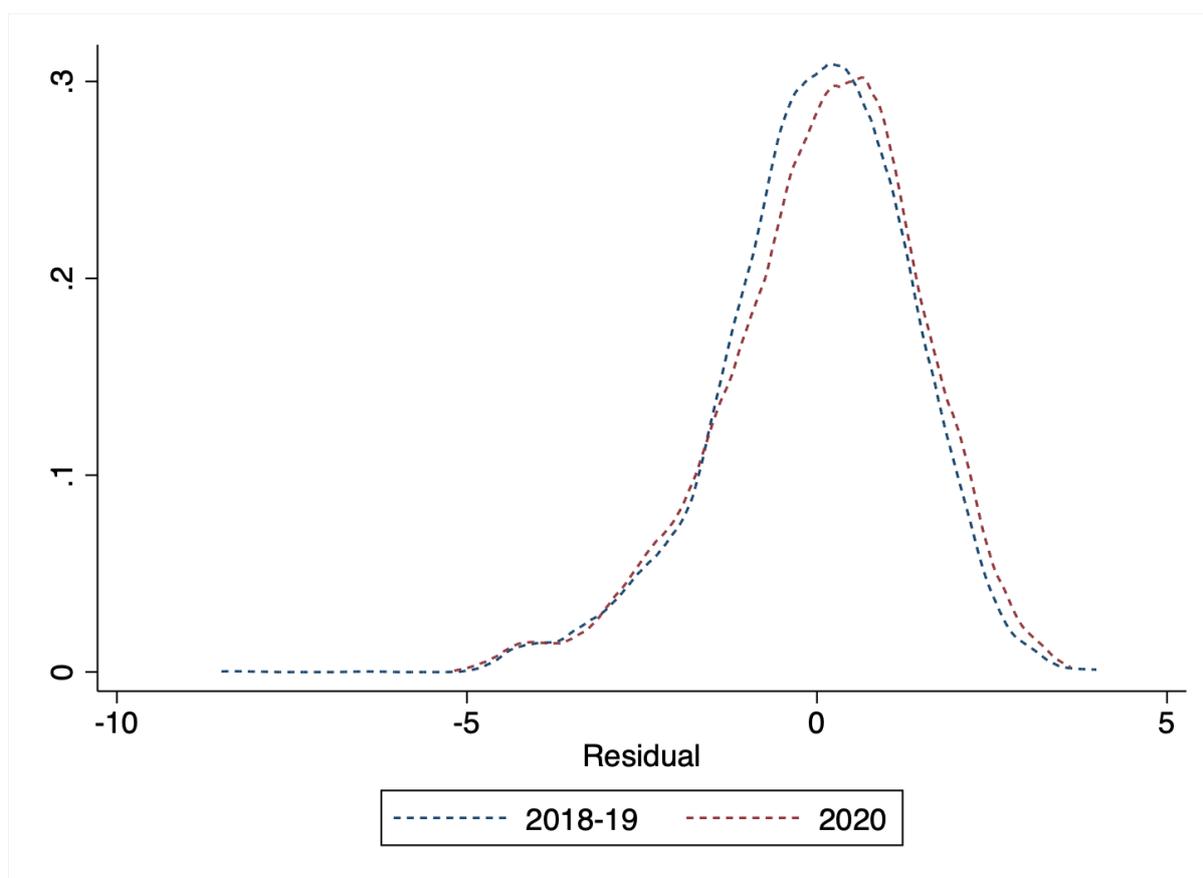
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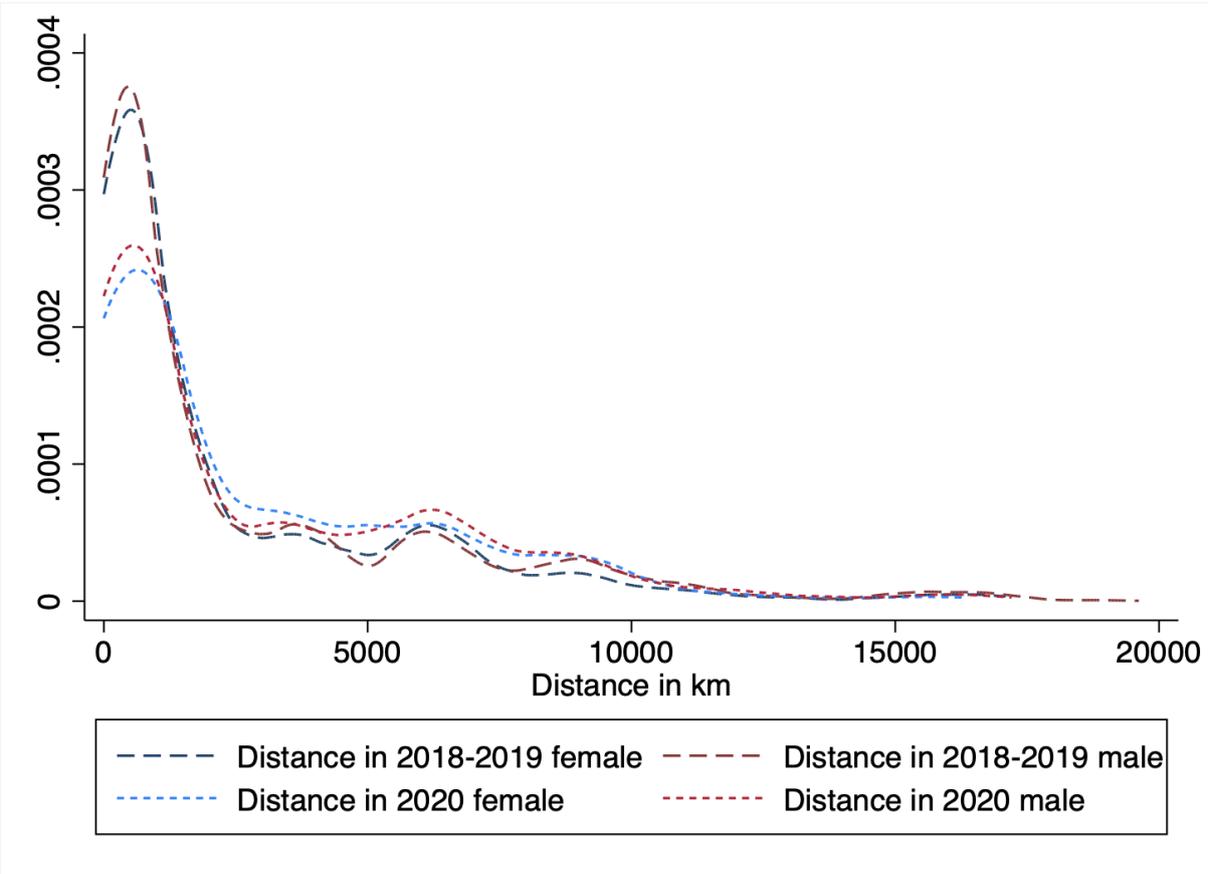
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Figure 1: Density of regression residuals for citations



Notes: The figure plots the density of the residuals from a regression of the inverse hyperbolic sine of citations on speaker gender and the graduation year in the academic years 2018/19 and 2019/20 (before the covid shock) and 2020/21 (after the covid shock).

Figure 2: Density of bilateral distances before and after the covid shock by gender



Notes: The figure plots the density of speakers in the academic years 2018/19 and 2019/20 (before the covid shock) and 2020/21 (after the covid shock) by gender.

Table 1: Summary statistics of dependent variables

		Mean	Std. dev.	Min	Max	Observations
Dependent variables	Description					
Number of seminars $_{ihst}$	Number of seminars at the host institution-seminar series level	8.679	5.077	1	47	1,016
Share of cancellations $_{ht}$	Share of seminars cancelled at the host institution level	0.045	0.063	0	0.375	144
Share of female cancellations $_{ht}$	Share of seminars cancelled by female speakers at the host institution level	0.011	0.039	0	0.333	120
$\mathbb{1}(\text{RePEc top 1 percent})_{ihst}$	Dummy equal to one, if speaker is among top 1 percent in RePEc ranking	0.071	0.256	0	1	6,386
$\mathbb{1}(\text{RePEc top 1 percent last 10 yrs.})_{ihst}$	Dummy equal to one, if speaker is among top 1 percent in RePEc ranking based on publications in last 10 years	0.126	0.332	0	1	6,386
$\mathbb{1}(\text{RePEc top YE})_{ihst}$	Dummy equal to one, if speaker is among top 200 young economists whose first RePEc publication is no older than 10 years	0.033	0.180	0	1	6,386
$\mathbb{1}(\text{RePEc top 2-5 percent})_{ihst}$	Dummy equal to one, if speaker is among top 2-5 percent in RePEc ranking	0.217	0.412	0	1	6,386
$\mathbb{1}(\text{RePEc top 2-5 percent last 10 yrs.})_{ihst}$	Dummy equal to one, if speaker is among top 2-5 percent in RePEc ranking based on publications in last 10 years	0.276	0.447	0	1	6,386
$\mathbb{1}(\text{RePEc top 6-10 percent})_{ihst}$	Dummy equal to one, if speaker is among top 6-10 percent in RePEc ranking	0.184	0.387	0	1	6,386
$\mathbb{1}(\text{RePEc top 6-10 percent last 10 yrs.})_{ihst}$	Dummy equal to one, if speaker is among top 6-10 percent in RePEc ranking based on publications in last 10 years	0.145	0.352	0	1	6,386
Residual $_{ihst}$	Residual from a regression of citations on gender and PhD year	-0.027	1.35	-8.505	3.993	7,150
Rank speaker institution $_{ihst}$	Rank of the speakers' institution in the Tilburg ranking	109.44	151.73	1	910	7,561
$\mathbb{1}(\text{Editorial role at top journal})_{ihst}$	Dummy equal to one, if speaker fulfils editorial role at top journal excluding the top 5	0.183	0.386	0	1	8,071
$\mathbb{1}(\text{Editorial role at top 5})_{ihst}$	Dummy equal to one, if speaker fulfils editorial role at top 5 journal	0.063	0.243	0	1	8,612
$\mathbb{1}(\text{Speaker is female})_{ihst}$	Dummy equal to one, if speaker is female	0.218	0.413	0	1	8,612
Experience $_{ihst}$	Experience in years after PhD award at the time of the seminar talk	12.241	10.237	0	55	8,612
$\ln(\text{distance})_{ihst}$	Log of distance between host institution and speaker institution	6.832	1.958	-8.195	9.884	8,043
$\mathbb{1}(\text{Speaker institution abroad})_{ihst}$	Dummy equal to one, if speaker institution is abroad	0.460	0.498	0	1	8,612
Number of seminars $_{it}$	Number of seminars given by speaker i across 270 institutions in 2018-2019	0.668	0.874	0	8	12,934
IHS(Citations) $_{ihst}$	Inverse hyperbolic sine of citations from Google scholar	5.354	1.647	0	10.385	10,541

Notes: The table shows means, standard deviations, minima, and maxima of the dependent variables. All values are for the academic years 2018/19 and 2019/20.

Table 2: The association between the number of held and cancelled seminars and the covid shock

	(1) ln(Number of seminars _{hst})	(2) Share of cancellations _{ht}	(3) Share of female cancellations _{ht}
$\mathbb{1}(t = \text{Academic year } 2020/21)$	-0.1245*** (0.0180)	-0.0054 (0.0042)	0.0054 (0.0035)
Host institution \times Seminar series FE	Yes	No	No
Host institution FE	No	Yes	Yes
R^2	0.791	0.295	0.310
Observations	1,524	216	180

Notes: Estimates of equation (1). The outcome in column (1) is the log of the number of academic seminars at the host institution-seminar series level. The outcome in column (2) is the share of cancellations of planned seminars and the outcome in column (3) is the share of cancellations by female speakers of planned seminars at the host institution level. The specification in column (1) includes a host institution-seminar series fixed effect and in column (2) and (3) a host institution fixed effect. The independent variable of interest is a time dummy for the academic year 2020/21. The regressions are weighted by the number of seminars in the respective academic year. Standard errors in parentheses, clustered at the clustered at the host institution-seminar series level in column (1) and at the host institution level in columns (2) and (3). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 3: The association between “superstar” speakers and the covid shock

	(1) $\mathbb{1}(\text{RePEc top 1 per.}_{ihst})$	(2) $\mathbb{1}(\text{RePEc top 1 per. 10 yrs. publ.}_{ihst})$	(3) $\mathbb{1}(\text{RePEc top YE}_{ihst})$
$\mathbb{1}(t = \text{Academic year 2020/21})$	0.0096 (0.0058)	0.0362*** (0.0084)	0.0095** (0.0042)
Host institution \times Seminar series FE	Yes	Yes	Yes
Individual-level controls	Yes	Yes	Yes
R^2	0.279	0.166	0.085
Observations	9,087	9,087	9,087

Notes: Estimates of equation (2). The outcome in column (1) is a dummy variable equal to one, if the speaker is ranked among the top 1 percent of researchers in terms of overall output in the RePEc database. The outcome in column (2) is a dummy variable equal to one, if the speaker is ranked among the top 1 percent of researchers based on publications in the last 10 years in the RePEc database. The outcome in column (3) is a dummy variable equal to one, if the speaker is ranked among the top 200 economists whose first publication in the RePEc database is no older than 10 years. The specifications include a host institution-seminar series fixed effect. Individual-level controls are speakers’ gender and experience in years after PhD award. The independent variable of interest is a time dummy for the academic year 2020/21. Standard errors in parentheses, clustered at the host institution-seminar series level.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 4: The association between speaker citation residual and the covid shock

	(1) Residual _{ihst}	(2) $\mathbb{1}(\text{Residual } Q1_{ihst})$	(3) $\mathbb{1}(\text{Residual } Q2_{ihst})$	(4) $\mathbb{1}(\text{Residual } Q3_{ihst})$	(5) $\mathbb{1}(\text{Residual } Q4_{ihst})$
$\mathbb{1}(t = \text{Academic year } 2020/21)$	0.0762*** (0.0262)	0.0363*** (0.0106)	-0.0059 (0.0091)	-0.0211** (0.0093)	-0.0094 (0.0097)
Host institution \times Seminar series FE	Yes	Yes	Yes	Yes	Yes
Individual-level controls	Yes	Yes	Yes	Yes	Yes
R^2	0.167	0.130	0.058	0.067	0.120
Observations	10,205	10,205	10,205	10,205	10,205

Notes: Estimates of equation (2). The outcome in column (1) is the residual from a regression of the inverse hyperbolic sine of citations on speaker gender and the graduation year. The outcomes in columns (2)-(5) are dummies equal to one, if the speaker productivity is in the respective quartile of the cumulative distribution function of the residuals. The specifications include a host institution-seminar series fixed effect. Individual-level controls are speakers' gender and experience in years after PhD award. The independent variables of interest is a time dummy for the academic year 2020/21. Standard errors in parentheses, clustered at the host institution-seminar series level.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: The association between speaker institutions' rank and the covid shock

	(1)	(2)	(3)	(4)	(5)
	Rank speaker inst. $_{ihst}$	$\mathbb{1}(\text{Rank speaker inst. Q1}_{ihst})$	$\mathbb{1}(\text{Rank speaker inst. Q2}_{ihst})$	$\mathbb{1}(\text{Rank speaker inst. Q3}_{ihst})$	$\mathbb{1}(\text{Rank speaker inst. Q4}_{ihst})$
$\mathbb{1}(t = \text{Academic year 2020/21})$	-7.9859*** (3.0687)	0.0215** (0.0109)	0.0146 (0.0099)	-0.0165* (0.0089)	-0.0195** (0.0081)
Host institution \times Seminar series FE	Yes	Yes	Yes	Yes	Yes
Individual-level controls	Yes	Yes	Yes	Yes	Yes
R^2	0.313	0.221	0.069	0.097	0.239
Observations	10,835	10,835	10,835	10,835	10,835

Notes: Estimates of equation (2). The outcome in column (1) is the rank of the speakers' institution in the Tilburg ranking. The outcomes in columns (2)-(5) are dummies equal to one, if the speaker institution is in the respective quartile, with the first quartile comprising the best institutions in the Tilburg ranking. The specifications include a host institution-seminar series fixed effect. Individual-level controls are speakers' gender and experience in years after PhD award. The independent variables of interest is a time dummy for the academic year 2020/21. Standard errors in parentheses, clustered at the host institution-seminar series level.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 6: The association between seminars by editors and the covid shock

	(1)	(2)
	$\mathbb{1}(\text{Editorial role at top journal}_{ihst})$	$\mathbb{1}(\text{Editorial role at top 5}_{ihst})$
$\mathbb{1}(t = \text{Academic year 2020/21})$	0.0034 (0.0072)	0.0213*** (0.0057)
Host institution \times Seminar series FE	Yes	Yes
Individual-level controls	Yes	Yes
R^2	0.151	0.090
Observations	11,473	12,335

Notes: Estimates of equation (2). The outcome in column (1) is a dummy variable equal to one, if the speaker fulfills an editorial role at a top journal excluding the top 5 journals. The outcome in column (2) is a dummy variable equal to one, if the speaker fulfills an editorial role at a top 5 journal. The specifications include a host institution-seminar series fixed effect. Individual-level controls are speakers' gender and experience in years after PhD award. The independent variables of interest is a time dummy for the academic year 2020/21. Standard errors in parentheses, clustered at the host institution-seminar series level.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 7: The association between speakers' gender and the covid shock

	(1)	(2)	(3)	(4)	(5)
	$\mathbb{1}(\text{Speaker is female}_{iht})$				
$\mathbb{1}(t = \text{Academic year 2020/21})$	0.0753*** (0.0087)	0.0566*** (0.0116)	0.0553*** (0.0095)	0.0775*** (0.0117)	0.0818*** (0.0131)
$\mathbb{1}(t = \text{Academic year 2020/21}) \times \mathbb{1}(1,475\text{km} < \text{Distance}_{iht})$		0.0317* (0.0183)			
$\mathbb{1}(t = \text{Academic year 2020/21}) \times \mathbb{1}(1,475\text{km} < \text{Distance}_{iht} < 5,000\text{km})$			0.0741*** (0.0216)		
$\mathbb{1}(t = \text{Academic year 2020/21}) \times \text{Rank host institution}_h$				0.00002 (0.00006)	
$\mathbb{1}(t = \text{Academic year 2020/21}) \times \text{Experience}_i$					-0.0006 (0.0007)
Host institution \times Seminar series FE	Yes	Yes	Yes	Yes	Yes
Experience control	Yes	Yes	Yes	Yes	Yes
Guest institution FE	No	Yes	Yes	No	No
Distance dummy	No	Yes	Yes	No	No
R^2	0.095	0.194	0.195	0.097	0.095
Observations	12,335	12,335	12,335	11,241	12,335

Notes: Estimates of equation (2). The outcome in all columns is a dummy variable equal to one, if the speaker is female. The regression in column (1) estimates the baseline effect. The regression in column (2) examines heterogeneity by a dummy equal to one if the distance between host and speaker institution is more than 1,475 km. The regression in column (3) adds an upper threshold of less than 5,000 km to the distance dummy introduced in column (2). The regressions in columns (4) and (5) investigate heterogeneity by the rank of the hosting department and speakers' experience, respectively. The specifications include a host institution-seminar series fixed effect. The regressions control for speakers' experience. The specifications in columns (2) and (3) additionally control for guest institution fixed effects and the respective distance heterogeneity dummy. The independent variables of interest is a time dummy for the academic year 2020/21. Standard errors in parentheses, clustered at the host institution-seminar series level.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 8: The association of distance between host and speakers' institution and the covid shock

	(1)	(2)	(3)
	ln(Distance _{ihst})		
$\mathbb{1}(t = \text{Academic year 2020/21})$	0.3133*** (0.0493)	0.2993*** (0.0610)	0.4175*** (0.0551)
$\mathbb{1}(t = \text{Academic year 2020/21}) \times \text{Rank host institution}_h$		0.0002 (0.0003)	
Rank speaker institution _{ist}			-0.0009*** (0.0002)
$\mathbb{1}(t = \text{Academic year 2020/21}) \times \text{Rank speaker institution}_{ist}$			-0.0012*** (0.0003)
Host institution \times Seminar series FE	Yes	Yes	Yes
Individual-level controls	Yes	Yes	Yes
R^2	0.201	0.202	0.213
Observations	11,533	10,543	10,128

Notes: Estimates of equation (2). The outcome in column (1) is the physical distance between the speakers' institution and the host institution. Column (2) examines heterogeneity by the rank of the host institution in the Tilburg ranking. Column (3) shows heterogeneity by the rank of the speakers' institution in the Tilburg ranking. The specifications include a host institution-seminar series fixed effect. Individual-level controls are speakers' gender and experience in years after PhD award. Standard errors in parentheses, clustered at the host institution-seminar series level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 9: The association between the number of seminars and the covid shock by speaker characteristics

	(1)	(2)	(3)	(4)	(5)	(6)
	Number of seminars _{it}					
$\mathbb{1}(t = \text{Academic year } 2020/21) \times \mathbb{1}(\text{RePEc top 1 per.}_i)$	0.2323*** (0.0769)					
$\mathbb{1}(t = \text{Academic year } 2020/21) \times \mathbb{1}(\text{RePEc top 1 per. 10 yrs. publ.}_i)$		0.2504*** (0.0765)				
$\mathbb{1}(t = \text{Academic year } 2020/21) \times \mathbb{1}(\text{RePEc top young economist}_i)$			0.1584 (0.1523)			
$\mathbb{1}(t = \text{Academic year } 2020/21) \times \mathbb{1}(\text{Editor at top journal}_i)$				0.0056 (0.0458)		
$\mathbb{1}(t = \text{Academic year } 2020/21) \times \mathbb{1}(\text{Editor at top 5}_i)$					0.4012*** (0.1250)	
$\mathbb{1}(t = \text{Academic year } 2020/21) \times \mathbb{1}(\text{Speaker is female}_i)$						0.2179*** (0.0315)
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Individual-level controls x Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.376	0.377	0.376	0.384	0.386	0.384
Observations	13,922	13,922	13,922	19,509	19,509	19,509

Notes: Estimates of equation (3). The outcome in all columns is the number of seminars for a given speaker in the respective academic year. The regressions are estimated using OLS. The specifications include an individual fixed effect and time fixed effects. In addition, all regressions interact controls for gender and the year in which the PhD was awarded with time fixed effects. The regression in column (6) only controls for the year of PhD award interacted with time fixed effects. The independent variables of interest are speaker characteristics interacted with a time fixed effect for the covid shock. Standard errors in parentheses, clustered at the individual level.* p < 0.1, ** p < 0.05, *** p < 0.01.

Table 10: The association between seminars and outcomes at the paper level

	(1)	(2)	(3)	(4)	(5)	(6)
	$\ln(\text{Impact Factor}_p)$		$\mathbb{1}(\text{Top } 5_p)$		$\ln(\text{Citations}_{p,2018-2021})$	
Number of seminars _p	0.2408*** (0.0251)	0.0274 (0.0194)	0.1294*** (0.0133)	0.0310** (0.0128)	0.2724*** (0.0287)	0.1349*** (0.0370)
Minimum rank host	-0.0025*** (0.0002)	-0.0003 (0.0003)	-0.0007*** (0.0000)	-0.0003* (0.0001)	-0.0014*** (0.0001)	-0.0002 (0.0003)
R^2	0.214	0.856	0.145	0.817	0.080	0.708
Observations	1,945	659	2,021	685	3,380	1,363

Notes: Estimates of equation (4). The outcome in columns (1) and (2) is the log of the impact factor of the journal in which the paper is published. The outcome in columns (3) and (4) is a dummy equal to one if the paper was published in a top 5 journal in February 2022. The outcome in columns (5) and (6) is the log of cumulative citations between 2018 and 2021 for papers presented in the academic year 2018/2019 and the log of cumulative citations between 2019 and 2022 for papers presented in the academic year 2019/20. The data on publications refer to papers presented in the academic years 2018/19 and 2019/20 and publications are measured in February 2022 and February 2023. The regressions are estimated using OLS. The specifications control for the number of authors of the presented paper, the share of female authors, the minimum rank of the host institution at which the paper was presented, and the number of seminar presentations in the respective academic year. The regressions in columns (2), (4), and (6) introduce speaker fixed effects. Standard errors in parentheses, clustered at the paper level for uneven columns and clustered at the speaker level for even columns. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

6 Online Appendix

Extract of host institutions included in the sample⁴²

Universities:

- Arizona State University, Bates College, Bilkent University
- Bocconi University, Bogazici University, Boston College
- Ca Foscari University of Venice, Catholic University of Milan, Central European University
- City University Hong Kong, City University London, City University of New York
- College Carlo Alberto, Columbia University, Cornell University
- Dartmouth College, Deakin University, Del Rosario University
- George Washington University, Georgia State University, Goethe University Frankfurt
- Harvard University, Heidelberg University, Hong Kong University of Science and Technology
- Humboldt University of Berlin, Indiana University, Instituto Tecnologico Autonomo De Mexico
- Keio University, Kings College, London; Kobe University
- Korea University, Lancaster University, Lingnan University
- London School of Economics and Political Science, Louisiana State University, Luiss Guido Carli University
- Maastricht University, McGill University, Monash University
- New University of Lisbon, New York University, Northeastern University
- Osaka University, Pompeu Fabra University, Purdue University
- Radboud University Nijmegen, Rutgers State University, Ryerson University
- Sabanci University, Seoul National University
- Sogang University, Southern Methodist University, Stanford University
- Suny, Stony Brook; Syracuse University, Technical University of Karlsruhe
- Tel Aviv University, Trinity College Dublin, Tsinghua University
- Tulane University, Universite Libre de Bruxelles, University College London

⁴²Extract of 135 out of 270 host institutions chosen for space reasons. Full list available upon request.

- University Complutense Madrid, University Laval, University of Adelaide, University of Bergen
- University of California, Davis; University of California, Los Angeles; University of California, San Diego
- University of California, Santa Cruz; University of Connecticut, University of Edinburgh
- University of Erlangen-Nuremberg, University of Granada
- University of Graz, University of Groningen, University of Haifa
- University of Hamburg, University of Hannover
- University of Hohenheim, University of Innsbruck, University of Kiel
- University of Konstanz, University of Mainz, University of Marburg
- University of Memphis, University of Miami, University of Michigan
- University of Minho, University of Missouri, Columbia; University of Munich
- University of Naples Federico 2, University of Nebraska, Lincoln; University of New South Wales
- University of Notre Dame, University of Nottingham, University of Oklahoma
- University of Oslo, University of Ottawa, University of Oxford, University of Pavia
- University of Pittsburgh, University of Potsdam, University of Quebec, Montreal
- University of Regensburg, University of South Carolina
- University of Surrey, University of Texas, Austin; University of Tokyo
- University of Toulouse, University of Trento, University of Trier
- University of Turin, University of Verona, University of Victoria
- University of Vienna, University of Wyoming, University of York, University of Zurich
- Yale University, York University

Central Banks

- Banco de la Republica de Colombia, Banque de France, de Nederlandsche Bank
- Federal Reserve Bank of Atlanta, Federal Reserve Bank of Dallas, Federal Reserve Bank of St. Louis

Research Institutes

- IAB, IFN, IfW, RWI, VATT, WiiW

Journal list Tilburg Ranking

- American Economic Review; Brookings Papers on Economic Activity; Econometrica
- Economic Journal; Economics Letters; European Economic Review
- Games and Economic Behavior; International Economic Review; Journal of Applied Econometrics
- Journal of Business and Economic Statistics; Journal of Development Economics; Journal of Econometrics
- Journal of Economic Behavior and Organization; Journal of Economic Dynamics and Control; Journal of Economic Growth
- Journal of Economic Literature; Journal of Economic Perspectives; Journal of Economic Theory
- Journal of Financial Economics; Journal of Health Economics; Journal of Human Resources
- Journal of International Economics; Journal of Labor Economics; Journal of Monetary Economics
- Journal of Money, Credit and Banking; Journal of Political Economy; Journal of Public Economics
- Journal of Urban Economics; Journal of the European Economic Association; Quarterly Journal of Economics
- Rand Journal of Economics; Review of Economic Dynamics; Review of Economic Studies
- Review of Economics and Statistics; World Bank Economic Review

Sample definition

This study searched for research seminars in economics worldwide. The websites of four types of institutions that host seminars were accessed: universities, central banks, research institutes, and international organizations. The universities list is taken from the Tilburg Ranking that measures the academic output in economics of universities worldwide. The journals included in the default settings in the ranking include 35 top general interest and top field journals.⁴³ The basis for the ranking are publications in these journals between 2015 and 2019. The ranking comprises 1,099 institutions worldwide.⁴⁴ Additionally, information on seminars held in central banks and research institutes were collected from the RePEc ranking that includes 31 central banks and 55 research institutes.⁴⁵ Furthermore, research institutes were identified through online search. Finally, two international organizations with regular research seminar series in economics were included in the sample.

Sample selection

The mean (median) number of publications in the Tilburg Ranking of matched host institutions that are universities is 58.07 (29), whereas the mean (median) number of publications of institutions included in the sample is 22.32 (6), i.e. better ranked universities are more likely to report their seminar series over the academic years 2018/19, 2019/20, and 2020/21 on their websites. The universities included as hosting institutions in the sample account for 57.07 percent of all publications and for 77.16 percent of the publications in top 5 journals in the Tilburg Ranking. The average rank of matched host institutions that are universities in the Tilburg Ranking is 257.13, whereas the average rank of universities is 550. The average rank of central banks in the sample is 15.18 in the RePEc ranking, and therefore very similar to the average rank of central banks included in the search, which is 15.53.

Seminar selection

This study restricts the set of seminars to those that are open to external speakers and excludes internal work in progress seminar series. It excludes cancelled and postponed seminars, as well as flyouts by job market candidates. When a seminar is held jointly by two series within an institution, it is assigned firstly to the seminar series which usually takes place at the time of the talk to avoid double recording.

Multiple affiliations

If a speaker is affiliated with multiple institutions, the rank of the better ranked institution and the minimum distance between host and speaker institutions are taken.

⁴³See Online Appendix for a full list of journals included in the Tilburg Ranking.

⁴⁴See <https://econtop.uvt.nl/rankingsandbox.php> for a complete list of institutions. For the complete list of institutions, one has to click on show top: "All". The ranking in terms of publications between 2015 and 2019 was accessed in February 2021.

⁴⁵The complete list of central banks can be accessed from <https://ideas.repec.org/top/top.central.html> and the full list of research institutes can be accessed from <https://ideas.repec.org/top/top.ttanks.html>. The rankings were accessed in February 2021.

Participants and Discussants at the NBER Summer Institute

The Summer Institute hosted by the NBER is probably the most prestigious and selective conference that includes a wide range of fields in economics. The conference allows to promote research in front of a large audience and selected papers had a 10% likelihood of being published in a top 4 economics journal (Chari and Goldsmith-Pinkham 2017). The advantages of studying the NBER SI is that it is held in the same location, hence the submissions are unlikely affected by the potential attractiveness of the location. Furthermore, it allows to control for the topic of the presentation as the same groups meet over time.

This study accessed the discussants included in programs that participated in the Summer Institute from 2018 to 2021. It is not straightforwardly feasible to identify which author was the speaker at the NBER SI, therefore the results focus on discussants which allows to study the effects at the individual level. The analysis is parallel to equation (2).

$$\text{Outcome}_{iprt} = \lambda_{pr} + \gamma \times X_i + \beta \times \mathbb{1}(t = \text{Summer 2021}) + \varepsilon_{iprt}. \quad (5)$$

The vector of controls includes the gender for this analysis. The treatment variable is a time fixed-effect for the summer 2021. Even though the NBER Summer Institute 2020 was held online the format of the conference (in-person or online) was uncertain at the time of the submission deadline.⁴⁶

The results presented in Table A.15 show only significant effects for the likelihood that the discussant is female in column (2). The point estimate suggests a 11.30 percentage point increase in the likelihood that the discussant is female which is substantial as the pre-covid shock mean is 27.70%. The magnitude is even larger than the estimate in Table 7, column (1). The results in columns (1) and (3) show that there was no increase significant increase in the distance and no decrease in the rank of institutions of discussants.

⁴⁶The results are weaker in magnitude but similar in terms of significance when grouping 2020 and 2021 together.

Table A.1: The average rank of host institutions by quartiles of speakers' institutions rank

		Mean rank host inst. _{h,18-19}	Mean rank host inst. _{h,20}	Difference
Dependent variables	Description			
$\mathbb{1}(\text{Rank speaker inst. } Q1_{ihst})$	Speaker institution ranked in first quartile before the covid shock	81.82	92.29	10.47**
$\mathbb{1}(\text{Rank speaker inst. } Q2_{ihst})$	Speaker institution ranked in second quartile before the covid shock	125.89	126.34	0.45
$\mathbb{1}(\text{Rank speaker inst. } Q3_{ihst})$	Speaker institution ranked in third quartile before the covid shock	163.56	165.91	2.34
$\mathbb{1}(\text{Rank speaker inst. } Q4_{ihst})$	Speaker institution ranked in fourth quartile before the covid shock	264.50	256.08	-8.42

Notes: The table shows the average rank of the host institution by quartiles of the rank of speakers' institutions in the Tilburg ranking before and after the covid shock. The last column shows the difference between the two. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

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Table A.2: The growth rate of seminars at the continent level

(1)	(2)	(3)	(4)	(5)	(6)
Continent host institution	Continent speaker institution	Seminars in AY 2018/19	GR btw. 2018/19 and 2019/20	Seminars in AY 2019/20	GR btw. 2019/20 and 2020/21
Americas	Americas	1,930	0.83	1,946	-17.86
Europe	Europe	1,252	-1.20	1,237	-20.22
Europe	Americas	404	6.44	430	-2.09
Asia	Asia	241	-12.03	212	-12.97
Americas	Europe	200	-1.50	197	67.18

Notes: The table shows the aggregate number of seminars between continents in columns (3) and (5) for the academic years 2018/19 and 2019/20, respectively. The respective growth rates in percent are calculated in columns (4) and (6). The Americas include North and South America.

Table A.3: The association between cross-border seminars and the covid shock

	(1)
	$\mathbb{1}(\text{Speaker institution abroad}_{ihsst})$
$\mathbb{1}(t = \text{Academic year } 2020/21)$	0.0466*** (0.0113)
Host institution \times Seminar series FE	Yes
Individual-level controls	Yes
R^2	0.405
Observations	12,335

Notes: Estimates of equation (2). The outcome in column (1) is a dummy equal to one, if the speaker institution is located in a different country than the host institution. The specifications include a host institution-seminar series fixed effect. Standard errors in parentheses, clustered at the host institution-seminar series level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.4: The association between “superstar” speakers and the covid shock - examining different definitions of “superstars”

	(1)	(2)	(3)	(4)	(5)	(6)
	$\mathbb{1}(\text{RePEc top 2-5 per.}_{ihst})$	$\mathbb{1}(\text{RePEc top 2-5 per. 10 yrs.}_{ihst})$	$\mathbb{1}(\text{RePEc top 6-10 per.}_{ihst})$	$\mathbb{1}(\text{RePEc top 6-10 per. 10 yrs.}_{ihst})$	$\mathbb{1}(\text{RePEc top 100 YE}_{ihst})$	$\mathbb{1}(\text{RePEc top 200 YE}_{ihst})$
$\mathbb{1}(t = \text{AY 2020/21})$	-0.0100 (0.0093)	0.0013 (0.0111)	-0.0175** (0.0080)	-0.0077 (0.0091)	0.0063* (0.0036)	0.0031 (0.0026)
Host \times Seminar FE	Yes	Yes	Yes	Yes	Yes	Yes
Individual-level controls	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.225	0.104	0.080	0.068	0.077	0.067
Observations	9,087	9,087	9,087	9,087	9,087	9,087

Notes: Estimates of equation (2). The outcome in column (1) is a dummy variable equal to one, if the speaker is ranked among the top 2 to 5 percent of researchers in terms of overall output the RePEc database. The outcome in column (2) is a dummy variable equal to one, if the speaker is ranked among the top 2 to 5 percent of researchers based on publications in the last 10 years in the RePEc database. The outcome in column (3) is a dummy variable equal to one, if the speaker is ranked among the top 6 to 10 percent of researchers in terms of overall output in the RePEc database. The outcome in column (4) is a dummy variable equal to one, if the speaker is ranked among the top 6 to 10 percent of researchers based on publications in the last 10 years in the RePEc database. The outcome in column (5) is a dummy variable equal to one, if the speaker is ranked among the top 100 young economists. The outcome in column (6) is a dummy variable equal to one, if the speaker is ranked between 101 and 200 among the top young economists. The specifications include a host institution-seminar series fixed effect. Individual-level controls are speakers’ gender and experience in years after PhD award. The independent variable of interest is a time dummy for the academic year 2020/21. Standard errors in parentheses, clustered at the host institution-seminar series level.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.5: The association between “superstar” speakers and the covid shock - using logit regressions

	(1) $\mathbb{1}(\text{RePEc top 1 per.}_{ihst})$	(2) $\mathbb{1}(\text{RePEc top 1 per. 10 yrs. publ.}_{ihst})$	(3) $\mathbb{1}(\text{RePEc top YE}_{ihst})$
$\mathbb{1}(t = \text{Academic year 2020/21})$	0.2279 (0.1492)	0.3521*** (0.0839)	0.5132*** (0.1425)
Host institution \times Seminar series FE	Yes	Yes	Yes
Individual-level controls	Yes	Yes	Yes
Log-likelihood	-1130.74	-2779.68	-929.82
Observations	9,087	9,087	9,087

Notes: Estimates of equation (2) using logit regressions. The outcome in column (1) is a dummy variable equal to one, if the speaker is ranked among the top 1 percent of researchers in terms of overall output in the RePEc database. The outcome in column (2) is a dummy variable equal to one, if the speaker is ranked among the top 1 percent of researchers based on publications in the last 10 years in the RePEc database. The outcome in column (3) is a dummy variable equal to one, if the speaker is ranked among the top 200 economists whose first publication in the RePEc database is no older than 10 years. The specifications include a host institution-seminar series fixed effect. Individual-level controls are speakers’ gender and experience in years after PhD award. The independent variable of interest is a time dummy for the academic year 2020/21. The sample excludes seminars that were rescheduled from spring 2020 to fall 2020. Standard errors in parentheses, clustered at the host institution-seminar series level.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.6: The association between “superstar” speakers and the covid shock - excluding rescheduled seminars

	(1) $\mathbb{1}(\text{RePEc top 1 per.}_{ihst})$	(2) $\mathbb{1}(\text{RePEc top 1 per. 10 yrs. publ.}_{ihst})$	(3) $\mathbb{1}(\text{RePEc top YE}_{ihst})$
$\mathbb{1}(t = \text{Academic year 2020/21})$	0.0124** (0.0060)	0.0393*** (0.0091)	0.0094** (0.0044)
Host institution \times Seminar series FE	Yes	Yes	Yes
Individual-level controls	Yes	Yes	Yes
R^2	0.280	0.167	0.084
Observations	8,844	8,844	8,844

Notes: Estimates of equation (2). The outcome in column (1) is a dummy variable equal to one, if the speaker is ranked among the top 1 percent of researchers in terms of overall output in the RePEc database. The outcome in column (2) is a dummy variable equal to one, if the speaker is ranked among the top 1 percent of researchers based on publications in the last 10 years in the RePEc database. The outcome in column (3) is a dummy variable equal to one, if the speaker is ranked among the top 200 economists whose first publication in the RePEc database is no older than 10 years. The specifications include a host institution-seminar series fixed effect. Individual-level controls are speakers’ gender and experience in years after PhD award. The independent variable of interest is a time dummy for the academic year 2020/21. The sample excludes seminars that were rescheduled from spring 2020 to fall 2020. Standard errors in parentheses, clustered at the host institution-seminar series level.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.7: The association between “superstar” speakers and the covid shock - excluding seminars with pandemic-related titles

	(1) $\mathbb{1}(\text{RePEc top 1 per.}_{ihst})$	(2) $\mathbb{1}(\text{RePEc top 1 per. 10 yrs. publ.}_{ihst})$	(3) $\mathbb{1}(\text{RePEc top YE}_{ihst})$
$\mathbb{1}(t = \text{Academic year 2020/21})$	0.0089 (0.0057)	0.0307*** (0.0084)	0.0107** (0.0044)
Host institution \times Seminar series FE	Yes	Yes	Yes
Individual-level controls	Yes	Yes	Yes
R^2	0.281	0.160	0.085
Observations	8,892	8,892	8,892

Notes: Estimates of equation (2). The outcome in column (1) is a dummy variable equal to one, if the speaker is ranked among the top 1 percent of researchers in terms of overall output in the RePEc database. The outcome in column (2) is a dummy variable equal to one, if the speaker is ranked among the top 1 percent of researchers based on publications in the last 10 years in the RePEc database. The outcome in column (3) is a dummy variable equal to one, if the speaker is ranked among the top 200 economists whose first publication in the RePEc database is no older than 10 years. The specifications include a host institution-seminar series fixed effect. Individual-level controls are speakers’ gender and experience in years after PhD award. The independent variable of interest is a time dummy for the academic year 2020/21. The sample excludes seminars with pandemic-related titles. Standard errors in parentheses, clustered at the host institution-seminar series level.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.8: The association between “superstar” speakers and the covid shock - controlling for speakers’ fields

	(1) $\mathbb{1}(\text{RePEc top 1 per.}_{ihst})$	(2) $\mathbb{1}(\text{RePEc top 1 per. 10 yrs. publ.}_{ihst})$	(3) $\mathbb{1}(\text{RePEc top YE}_{ihst})$
$\mathbb{1}(t = \text{Academic year 2020/21})$	0.0016 (0.0059)	0.0224*** (0.0085)	0.0103** (0.0046)
Host institution \times Seminar series FE	Yes	Yes	Yes
Field FE	Yes	Yes	Yes
Individual-level controls	Yes	Yes	Yes
R^2	0.437	0.356	0.145
Observations	7,615	7,615	7,615

Notes: Estimates of equation (2). The outcome in column (1) is a dummy variable equal to one, if the speaker is ranked among the top 1 percent of researchers in terms of overall output in the RePEc database. The outcome in column (2) is a dummy variable equal to one, if the speaker is ranked among the top 1 percent of researchers based on publications in the last 10 years in the RePEc database. The outcome in column (3) is a dummy variable equal to one, if the speaker is ranked among the top 200 economists whose first publication in the RePEc database is no older than 10 years. The specifications include a host institution-seminar series fixed effect and 97 fixed effects for fields in which the speaker is specialized following the definition of RePEc. The independent variable of interest is a time dummy for the academic year 2020/21. Standard errors in parentheses, clustered at the host institution-seminar series level.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.9: The association between “superstar” speakers and the covid shock - reporting of virtual seminars

	(1) $\mathbb{1}(\text{RePEc top 1 per.}_{ihst})$	(2) $\mathbb{1}(\text{RePEc top 1 per. 10 yrs. publ.}_{ihst})$	(3) $\mathbb{1}(\text{RePEc top YE}_{ihst})$
$\mathbb{1}(t = \text{Academic year 2020/21})$	0.0106 (0.0085)	0.0388*** (0.0121)	0.0166** (0.0068)
Host institution \times Seminar series FE	Yes	Yes	Yes
Individual-level controls	Yes	Yes	Yes
R^2	0.288	0.187	0.084
Observations	3,604	3,604	3,604

Notes: Estimates of equation (2). The outcome in column (1) is a dummy variable equal to one, if the speaker is ranked among the top 1 percent of researchers in terms of overall output in the RePEc database. The outcome in column (2) is a dummy variable equal to one, if the speaker is ranked among the top 1 percent of researchers based on publications in the last 10 years in the RePEc database. The outcome in column (3) is a dummy variable equal to one, if the speaker is ranked among the top 200 economists whose first publication in the RePEc database is no older than 10 years. The specifications include a host institution-seminar series fixed effect. Individual-level controls are speakers’ gender and experience in years after PhD award. The independent variable of interest is a time dummy for the academic year 2020/21. The sample excludes seminars series for which the number of seminars in the academic year 2020/2021 is smaller than the average of the academic years 2018/19 and 2019/20. Standard errors in parentheses, clustered at the host institution-seminar series level.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.10: The association between “superstar” speakers and the covid shock - ruling out selection effects

	(1) $\mathbb{1}(\text{RePEc top 1 per.}_{ihst})$	(2) $\mathbb{1}(\text{RePEc top 1 per. 10 yrs. publ.}_{ihst})$	(3) $\mathbb{1}(\text{RePEc top YE}_{ihst})$
$\mathbb{1}(t = \text{Academic year 2020/21})$	0.0106 (0.0085)	0.0388*** (0.0121)	0.0166** (0.0068)
Host institution \times Seminar series FE	Yes	Yes	Yes
Individual-level controls	Yes	Yes	Yes
R^2	0.288	0.187	0.084
Observations	3,604	3,604	3,604

Notes: Estimates of equation (2). The outcome in column (1) is a dummy variable equal to one, if the speaker is ranked among the top 1 percent of researchers in terms of overall output in the RePEc database. The outcome in column (2) is a dummy variable equal to one, if the speaker is ranked among the top 1 percent of researchers based on publications in the last 10 years in the RePEc database. The outcome in column (3) is a dummy variable equal to one, if the speaker is ranked among the top 200 economists whose first publication in the RePEc database is no older than 10 years. The specifications include a host institution-seminar series fixed effect. Individual-level controls are speakers’ gender and experience in years after PhD award. The independent variable of interest is a time dummy for the academic year 2020/21. The sample is restricted to hosting departments that reported online seminars in the academic year 2020/21 on their websites. Standard errors in parentheses, clustered at the host institution-seminar series level.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.11: The association between speakers' gender and the covid shock - robustness checks

	(1)	(2)	(3)	(4)	(5)	(6)
	$\mathbb{1}(\text{Speaker is female}_{i\text{host}})$					
$\mathbb{1}(t = \text{Academic year 2020/21})$	0.4415*** (0.0482)	0.0723*** (0.0091)	0.0718*** (0.0089)	0.0751*** (0.0105)	0.0715*** (0.0093)	0.0650*** (0.0098)
Host institution \times Seminar series FE	Yes	Yes	Yes	Yes	Yes	Yes
Field FE	No	No	No	No	Yes	No
Experience control	Yes	Yes	Yes	Yes	Yes	Yes
R^2		0.095	0.095	0.190	0.097	0.104
Log-likelihood	-6190.09					
Observations	12,152	11,982	12,108	7,615	10,155	8,800

Notes: Estimates of equation (2). The outcome in all columns is a dummy variable equal to one, if the speaker is female. The regression in column (1) is specified as logit regression. All other regressions are estimated using OLS. The regression in column (2) excludes seminars that were rescheduled from spring 2020 to fall 2020. The regression in column (3) excludes seminars with titles related to pandemics. The regression in column (4) controls for speakers' fields using data from RePEc. The regression in column (5) restricts the sample to hosting departments that reported online seminars in the academic year 2020/21 on their websites. The regression in column (6) excludes speakers from the top 1 percent of women in RePEc in terms of recent research output. The specifications include a host institution-seminar series fixed effect. The regressions control for speakers' experience. The independent variables of interest is a time dummy for the academic year 2020/21. Standard errors in parentheses, clustered at the host institution-seminar series level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.12: The association between online presentations in fall 2021 and speaker gender

	(1)	(2)	(3)
	$\mathbb{1}(\text{Online presentation}_{ihst})$		
$\mathbb{1}(\text{Speaker is female}_{ihst})$	0.0461*** (0.0163)	0.0511*** (0.0174)	0.0478*** (0.0182)
Experience _{ihst}	0.0017** (0.0008)	0.0018* (0.0009)	0.0015 (0.0010)
IHS(Distance _{ihst})	0.0339*** (0.0037)	0.0330*** (0.0040)	0.0201*** (0.0047)
Rank speaker institution _{ist}		-0.00014 (0.00091)	-0.00011 (0.00011)
Host institution \times Seminar series FE	Yes	Yes	Yes
Host country \times Speaker country FE	No	No	Yes
R^2	0.558	0.552	0.601
Observations	2,841	2,504	2,312

Notes: Estimates of equation (2). The outcome all columns is a dummy variable equal to one, if the presentation was held online and equal to zero if the presentation was in-person. The regression in column (1) controls for the speaker experience, speaker gender and the inverse hyperbolic sine of the geodetic distance between host and speaker institutions. The regression in column (2) adds the rank of the speaker institution as control. The regression in column (3) further controls for the interaction between host-country and speaker-country fixed effects. The specifications include a host institution-seminar series fixed effect. The sample is restricted to seminars in the fall of the academic year 2021/22. Standard errors in parentheses, clustered at the host institution-seminar series level.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.13: The association between online presentations in fall 2021 and speaker productivity

	(1)	(2)	(3)	(4)	(5)	(6)
	$\mathbb{1}(\text{Online presentation}_{ihst})$					
$\mathbb{1}(\text{RePEc top 1 per.}_i)$	0.0555 (0.0455)					
$\mathbb{1}(\text{RePEc top 1 per. 10 yrs. publ.}_i)$		0.0702** (0.0317)				
$\mathbb{1}(\text{RePEc top young economist}_i)$			0.0868* (0.0461)			
Residual _{ihst}				0.0411*** (0.0078)		
$\mathbb{1}(\text{Editor at top journal}_i)$					0.0932*** (0.0227)	
$\mathbb{1}(\text{Editor at top 5}_i)$						0.0660** (0.0301)
Host institution \times Seminar series FE	Yes	Yes	Yes	Yes	Yes	Yes
Host country \times Speaker country FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.616	0.617	0.616	0.616	0.622	0.610
Observations	1,683	1,683	1,683	2,223	2,420	2,633

Notes: Estimates of equation (2). The outcome all columns is a dummy variable equal to one, if the presentation was held online and equal to zero if the presentation was in-person. All regressions control for the speaker experience and gender, the inverse hyperbolic sine of the geodetic distance between host and speaker institution, host institution-seminar series fixed effects, and the interaction between host-country and speaker-country fixed effects. The sample is restricted to seminars in the fall of the academic year 2021/22. Standard errors in parentheses, clustered at the host institution-seminar series level.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.14: Summary statistics by institutional and public seminars

		Mean _{inst.}	Mean _{public}	Difference
Dependent variables	Description			
Number of seminars _{ihst}	Number of seminars at the seminar series level	7.441	9.065	-1.624**
$\mathbb{1}(\text{RePEc top 1 percent}_{ihst})$	Dummy equal to one, if speaker is among top 1 percent in RePEc ranking	0.074	0.060	0.014
$\mathbb{1}(\text{RePEc top 1 percent last 10 yrs.}_{ihst})$	Dummy equal to one, if speaker is among top 1 percent in RePEc ranking based on publications in last 10 years	0.154	0.110	0.044
$\mathbb{1}(\text{RePEc top YE}_{ihst})$	Dummy equal to one, if speaker is among top 200 young economists whose first RePEc publication is no older than 10 years	0.042	0.044	-0.002
$\mathbb{1}(\text{Editorial role at top journal}_{ihst})$	Dummy equal to one, if speaker fulfils editorial role at top journal excluding the top 5	0.178	0.225	-0.047*
$\mathbb{1}(\text{Editorial role at top 5}_{ihst})$	Dummy equal to one, if speaker fulfils editorial role at top 5 journal	0.085	0.093	-0.008
Rank speaker institution _{ist}	Rank of the speakers' institution in the Tilburg ranking	104.581	52.931	51.650***
$\mathbb{1}(\text{Speaker is female}_{ihst})$	Dummy equal to one, if speaker is female	0.297	0.344	-0.047
Experience _{ihst}	Experience after PhD graduation at the time of the seminar talk in years	11.654	11.219	0.434

Notes: The table shows mean of seminars in institutional and public seminars. The data for institutions comprise 509 seminar series and 3,794 seminars. The data on public seminars include 31 seminar series and up to 281 seminar speakers. All values are for the academic year 2020/21. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.15: The association between discussants' characteristics at the NBER SI and the covid shock

	Rank discussant inst. $_{iprt}$	$\mathbb{1}(\text{Discussant is female}_{iprt})$	$\ln(\text{Distance}_{iprt})$
$\mathbb{1}(t = \text{Summer 2021})$	6.8449 (6.8847)	0.1130*** (0.0390)	0.1728 (0.2229)
Program FE	Yes	Yes	Yes
Individual-level control	Yes	Yes	No
R^2	0.052	0.065	0.084
Observations	864	942	942

Notes: Estimates of equation (5). The outcome in column (1) is the rank of the discussants' institution in the Tilburg ranking. The outcome in column (2) is a dummy variable equal to one, if the discussant is female. The outcome in column (3) is the physical distance between the discussants' institution and the location of the Summer Institute, the Royal Sonesta Hotel in Cambridge, Massachusetts. The specifications include a program fixed effect. Individual-level control is the discussants' gender. The independent variable of interest is a time dummy for the summer 2021. The sample includes an unbalanced panel of programs included in 2021 and in at least one year before. Robust standard errors in parentheses.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.16: Distribution of the number of seminars per speaker

	(1)	(2)	(3)
Number of seminar presentations	2018/19	2019/20	2020/21
1	75.06	75.10	75.12
2	17.54	16.62	16.34
3	4.48	5.61	5.37
≥ 4	2.92	2.68	3.17

Notes: The table shows the distribution of seminars given by individual speakers, aggregated across 270 institutions in the sample.

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1753	Niklas Gohl Peter Haan Elisabeth Kurz Felix Weinhardt	Working life and human capital investment
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1751	Bernardo Guimaraes João Paulo Pessoa Vladimir Ponczek	Non-compete agreements, wages and efficiency: theory and evidence from Brazilian football
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