THE FLYING-RELATED CARBON IMPACT OF ACADEMIC CONFERENCES*

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ABSTRACT

How large is the carbon footprint of academic conferences? This paper presents and analyses newly assembled data from a sample of 263 economics conferences. Speakers traveled around 417 million kilometres to get to these conferences. The paper calibrates that this, even under very conservative assumptions, amounts to around 50,000 metric tonnes of CO2 emission. It is a staggering figure, given that this is only a tiny fraction of all academic conferences. In pursuit of a potential response, the paper looks at how the distance traveled to conferences, and the number of trips made by each speaker are related to the number of citations researchers get on their presented papers. From this, the paper offers evidence that the number of trips matters for more citations but longer distances are not associated with higher citation numbers, with the exception of speakers from EU institutions. This evidence supports the argument that in most cases a preference for localised conferences, rather than long-distance trips can deliver the same benefits of conferences but at lower social costs.

Keywords carbon-impact · flying · academic conferences · economics

1 Introduction

Universities have been active in reducing the carbon impact of academia. However, conference travelling has so far largely escaped serious changes in attitude, especially in social sciences.[2] The scarcity of action is not surprising, conferences are a defining part of academic research. Flying to conferences offers the opportunity to present ongoing work to peers and receive valuable feedback for further improvement. Conferences also help with networking, putting faces behind the often familiar names, share ideas, and foster new collaborations. Solutions that help reduce carbon emissions without jeopardising these benefits have been proposed, such as virtual conferences [1], or presenting papers at local rather than far-away venues [2].

Academics from various disciplines have been writing about the carbon impact of conferences, drawing attention to the potential magnitude of carbon emissions [3], [4], and [5]. These earlier papers have been followed by more detailed, and

[2]Although some universities started flagship initiatives, such as 'Flying Less Policy' at the Concordia University in Montreal, https://www.concordia.ca/content/dam/artsci/geography-planning-environment/docs/Flying_Less_Policy_GPE_June1_2019.pdf

data driven research, for example looking at the impact of researchers' seniority, or flight preferences (first or second class) on their carbon footprint [6], the non-flying related carbon impact of conferences [7], or the impact of specific conferences [8], and [9]. From a different perspective, other research looked at the credibility of climate researchers with large carbon footprints, using survey evidence [10].

The main contribution of this paper to the existing literature is that it looks at a larger sample of travel data related to conferences in the social science domain. The paper looks at a sample of economics conferences and calculates their carbon impact to help us get a grasp of the magnitude of the social costs of these events. Moreover, the paper also offers evidence to support the argument that the academic goals of conference presentations can be equally achieved by localised conferencing, rather than long distance trips. Although this paper focuses on carbon dioxide (CO2) emission, it acknowledges the other harmful effects of flying (for example nitrogen oxide and nitrogen dioxide emission), and as such it only provides conservative estimates of the true scale of harmful effects.

2 Materials and Methods

The paper assembles (and makes available) a novel dataset on a sample of economics conferences and the trips made by their participants. The data was scraped from the conference maker function of *editorialexpress.com*, which is a frequently used, although by no means exclusive platform for booking conferences in economics. The website contains details of historical conferences, going back to 2001. Not all conferences archived on editorialexpress.com make all speaker-related information publicly available (and the data becomes patchier for older years). The data contains the list of speakers, the name of their home institution, and the title of their presentations, for 263 conferences from 2001 to the end of 2018. 99 of these conferences were in the US, 107 in the EU, and 57 in other countries. This included 55,008 presentations by 26,312 distinct speakers. The sample is not uniformly distributed over the analysed 18 years. In fact for some years (2011/12) speaker-level information was only made publicly available for a small number of conferences.

The longitude and latitude coordinates of the speaker's home institution and the conference venue were acquired using Google's geocoding API. This gave an approximation for the distance traveled to get to a conference. Of course not everyone goes to conferences from their home institution but in this paper I assumed that the majority of speakers do. This distance is then multiplied by two to account for return trips (which, again, is probably not always accurate, but a good enough working approximation).

Altogether, researchers traveled approximately 414 million kilometres (around 259 million miles) to present their research papers at these 263 conferences. Table 1 shows the split by region of the conference and the speaker's home institution, where the *US* includes Canada and the USA, the *EU* are the EU member states, and *other* stands for all other countries. The table shows some interesting patterns. Most travel mileage by speakers from the US and Canada were associated with flying to Europe, and vice versa, most travel mileage by EU speakers are linked to US and Canadian conferences. Presenters from *other* countries traveled more in total to European than to North American conferences.

Table 1: Total distance (millions of km) traveled to present a paper

	venue_US	venue_EU	venue_other	total
speaker_US	37.22	89.93	54.16	181.30
speaker_EU	50.97	21.66	26.63	99.27
speaker_other	45.77	54.84	32.42	133.03
total	133.96	166.43	113.21	413.60

There are some interesting patterns if one looks at the mileage covered by the speakers (Figure 3 in the Appendix). For example it appears that there has been a drop in the average mileage covered by EU speakers. Whereas in the previous decade EU speakers seemed to have covered more average mileage than their US counterparts, this comparison flipped in the current decade. Figure 3 also shows that at the same time the proportion of EU speakers at US conferences remains stable, which suggests that the drop in the average miles traveled is likely to be due to the increasing preference of EU speakers to present at EU conferences. Finally, Figure 2 in the Appendix presents the geographical distribution of the presentations by venue country and by the country of the speaker's home institution. The maps reveal significant geographical inequality regarding conference activities.

2.1 Data on carbon emission

To calculate the carbon impact (or at least the flying related part of it) of these trips, one would need more detail on each trip (similarly to studies such as [6]). For example, take-off and landing are the most fuel intensive (and therefore emission intensive) portions of the flight. For this reason, knowing the exact itinerary of the researchers would be required to calibrate the relative weight of take-off and landing (many shorter trips would have a per/mile larger impact than a single longer trip of the same distance as the sum of the shorter trips). The per-passenger (grams/passenger km) emission also depends on whether one flies business or economy (per passenger emission is higher when one travels on business because of the space allocated to these passengers).[3] Finally, per-passenger emission also depends on how full the plane is.

Without detailed data on each trip I used average benchmark figures. These figures were acquired from a study by the Transition Pathway Initiative, which reports carbon emissions levels for 19 airlines.[4] I assumed three scenarios, an optimistic one, based on the best performing airline in the study (75g per passenger km expected by 2020), a pessimistic one, based on the worst performing airline (172g per passenger km expected by 2020), and an average one at 107.75g, which was calculated as an average of the 19 airlines. These emission figures were adjusted for how fuel efficiency changed over the period of the study. For this I assumed a 1.5 percent annual increase in fuel efficiency, which is a common target by airlines, and adjusted the emission figures for each year as: $e_i = \frac{e_{2020}}{0.985^{2020-i}}$, where e_i denotes emission for year i. Finally, I took out all trips that were shorter than 300 miles (just under 500km) one way. For these trips I assumed zero emission.[5]

Table 2 shows the emission figures for the whole sample, broken down by the geographical region of the venue. Using the average scenario, these 263 conferences were equivalent to around 50,000 metric tonnes of CO2 emission. The optimistic and pessimistic cases would mean around 35,000 and 80,000 tonnes of CO2 emission respectively. When looking at the per-conference and per-presentation figures, it appears that US venues contribute the lowest amount of CO2 emission - presumably because a larger proportion of the speakers at US+Canada conferences are from US or Canadian institutions - closely followed by the EU. Conferences in other countries have higher CO2 emission figures. These conferences, which are often held at venues that are distant to most participants, suggest more travelling for almost all participants.

Looking at the average figures, and comparing them with previous estimates, highlights an important characteristic of the above emission-related assumptions. Even in the pessimistic scenario, the average (per conference) emission is around 300 metric tonnes. This is much smaller than the figures presented in [2], ranging between 600-1200. One explanation is that in [2] they used the guidelines set by the USA's Environmental Protection Agency in 2008. US airlines tend to be associated with higher emission on average, and emission efficiency has much improved since 2008. Moreover, my other assumptions (for example that all flights are direct flights, or that trips under 300 miles are associated with zero emission) also make my figures much more conservative. This reinforces the caution that the emission figures presented in this paper are very likely to be only a lower bound of the true figures.

Table 3 presents the sample broken down by the geographical location of the speaker's home institution. The table suggests that EU speakers are associated with the lowest average CO2 emission figures, followed by US and finally

[3]The difference can be four-fold, see for example here: https://www.clevel.co.uk/flight-carbon-calculator/.

[4]`http://www.lse.ac.uk/GranthamInstitute/tpi/wpcontent/uploads/2019/03/Management-quality-and-carbon-performance-pdf`

[5]This implies that the calibrated emission figures are likely to err on the somewhat conservative side.

Table 2: Flying-related CO2 emission figures (metric tonnes) - broken down by venue

		All venues	US venues	EU venues	Other venue
Total CO2 emission	Average	**49406.6**	16228.69	19275.72	13902.19
	Optimistic	**34389.75**	11296.07	13416.97	9676.7
	Pessimistic	**78867.15**	25905.66	30769.59	22191.9
Per conference CO2	Average	187.86	163.93	180.15	243.9
		(196.53)	(165.16)	(209.11)	(214.18)
	Optimistic	130.76	114.1	125.39	169.77
		(136.8)	(114.96)	(145.55)	(149.08)
	Pessimistic	299.88	261.67	287.57	389.33
		(313.72)	(263.64)	(333.8)	(341.9)
Per presentation	Average	0.9	0.75	0.78	1.6
		(0.98)	(0.83)	(0.86)	(1.29)
	Optimistic	0.63	0.52	0.54	1.11
		(0.68)	(0.58)	(0.6)	(0.9)
	Pessimistic	1.43	1.2	1.24	2.55
		(1.56)	(1.32)	(1.37)	(2.06)

Standard deviation in parentheses.

speakers from other countries. Figure 3 in the Appendix also shows that EU speakers are most likely to do short trips with low emission. This is also confirmed by Figure 4, which plots the kernel density curves of the per presentation emission figures.

Table 3: Flying-related CO2 emission figures (metric tonnes) - broken down by speaker's home institution

		US speaker	EU speaker	Other speaker
Total CO2 emission	Average	21764.95	11723.38	15918.28
	Optimistic	15149.62	8160.12	11080.01
	Pessimistic	34743.12	18713.88	25410.15
Per presentation	Average	0.95	0.58	1.34
		(0.92)	(0.81)	(1.15)
	Optimistic	0.66	0.4	0.93
		(0.64)	(0.57)	(0.8)
	Pessimistic	1.51	0.93	2.14
		(1.46)	(1.3)	(1.83)

Standard deviation in parentheses.

2.2 How to reduce emission figures?

The above descriptive numbers have drawn some light to the magnitude of carbon emission from economics conferences. The question is: are these sizable social costs worth it? Do the benefits from these conferences outweigh their costs? And most importantly: how could we reduce the negative effects whilst preserving the benefits? One of the main benefits of conferences is improved research papers (for example through networking one can establish new collaborations, which can lead to better papers; similarly, feedback at conferences can enhance the quality of research). If conferences add value to research papers, and if the value of research papers is measured by its citations, then the most obvious measurement would be the number of corresponding citations (although it is a potentially endogenous measure, as higher academic stature can equally trigger more citations without telling us anything about the actual quality of the work).

I looked at citation data for the papers that were presented at the sampled conferences. I used Microsoft Academic for this purpose but it meant that only around a third of the presentations were matched to a paper with citation figures.[6] This left me with a reduced sample of 16,760 presentations (trips) by 10,080 distinct speakers. For this sample I

[6] Google Scholar would have provided a much better coverage in this respect, however it has no public API and scraping from their web interface proved to be prohibitive.

collected the number of citations and added this to the conference presentation data. The data was grouped by each speaker.[7] In grouping the data by speakers, the following variables were assembled:

- **Citations:** The total number of citations that each speaker received for papers that were presented in the sample of conferences.
- **Distance:** The average distance (thousand km) covered by each speaker to each of their presentations.
- **CO2 emission:** The average (per presentation) CO2 emission (metric tonnes). This is highly correlated with *distance*, with the exception that for trips to places within 300 miles from the home institution of the presenter, I assumed zero flying related emission.
- **Number of trips:** The number of presentations a speaker delivered in the sample.
- **Year:** The year of the presentations - averaged over all presentations if a speaker had more than one presentations.
- **Conference size:** The number of participants at the conference where the speaker gave their presentation - averaged over all presentations if a speaker had more than one presentations.
- **US, EU, Other speaker:** The region of the speakers home institution as explained above.

In order to extrapolate any findings from the smaller sample with citation data on the rest of the sample, one would need to show that sampling happened in random. The four observed features are compared in Table 4. The two samples look similar as far as *distance* and *number of trips* is concerned.[8] As these are the two variables of interest (shown below), I concluded that the main findings from the smaller sample are likely to hold for the total sample:

Table 4: Comparing the speaker-level averages with and without citation data

		Citation available	**Citation not available**
distance (1000 km)	mean	7.537	7.423
	sd	(7.340)	(7.480)
co2 - metric tonne	mean	0.927	0.891
	sd	(0.917)	(0.913)
number of trips	mean	1.66	1.73
	sd	(1.27)	(1.34)
year	mean	2011.81	2013.5
	sd	(4.41)	(4.04)
conference size	mean	348.9	401.21
	sd	(220.61)	(331.2)

Standard deviations in parentheses

The number of citations by the region of the venue and the region of the speaker's home institution is displayed in Table 5 below. It appears that US venues and US based speakers tend to be associated with more citations. This suggest that any analysis on how other factors affected citation numbers must take into consideration these geographic differences.

Table 5: Citation/paper for EU speakers and venues v US speakers and venues

	venue_US	venue_EU	venue_other
speaker_US	42.133	28.587	27.799
speaker_EU	23.964	12.935	17.227
speaker_other	20.697	12.936	14.008

[7]As speaker names often appear in different forms (e.g. with or without middle names), I used fuzzy string matching to find the same names.

[8]Although the paper was more likely to be found on MS Academic if it was a less recent one.

The data allowed the testing of the following simple hypothesis. Starting from the premise that conferences are useful, the hypothesis is that we should not need long trips to get to them, because presenting research locally might be just as beneficial. This is an argument similar to [2], and [11].

Hypothesis 1: *It is the number of presentations at conferences, but not the distance traveled that matters for citation numbers.*

Let us assume - given our data - that the number of citations to a paper presented at a conference is defined by the following linear relationship:

$$citations_i = \beta_0 + \beta_1 dist_i + \beta_2 trips_i + \vec{\gamma}\vec{X} + \varepsilon_i \tag{1}$$

Where $dist_i$ stands for the per-presentation distance traveled by speaker i. $trips_i$ denotes the number of trips by the same speaker i. $\vec{X}$ is an $(i \times k)$ matrix of k observed covariates for each speaker i, with the corresponding $(1 \times k)$ coefficient vector $\vec{\gamma}$. Finally, β_0 is the intercept, and ϵ_i is the idiosyncratic error term. Hypothesis 1 implies that $\beta_1 = 0$ and $\beta_2 > 0$.

The observed covariate matrix $\vec{X}$ contains the following variables. Two dummy variables for two groups of speakers, based on their home institution (US+Canada, EU) as introduced in Table 5. This implies that presentations by speakers from the third group (other countries) are used as benchmark (or base) group in the estimates, against which the coefficients can be compared. $\vec{X}$ also includes a set of four variables, where the US+Canada and the EU speaker dummy variables are each interacted with the distance covered ($dist$), and the number of trips ($trips$). Finally, we also control for the year of the presentation, and the number of attendants at the conference where the presentation was held.

3 Results

Table 6 below shows the results of estimating the parameters in Equation (1). The table has 4 columns. Model 1 controls for all observed features as listed above. Model 1 is potentially problematic inasmuch as the included features (especially *year* and the *number of trips*) are likely to be correlated. The suspiciously high Intercept coefficient seems to suggest that this is the case. For this reason *year* was removed from the other models. Models 2 and 3 use the same specification but without *year*. Model 2 uses non-standardised values, Model 3 is estimated on standardised variables. Finally, Model 4 only keeps the two main variables of interest.

In general, all model specifications support Hypothesis 1, whereby the effect of the average distance traveled is not significant ($\beta_1 = 0$), and the effect of the number of trips is positive and very significant ($\beta_2 > 0$).[9] There also appears to be some difference between researchers from different regions. Researchers from regions other than US+Canada and the EU are the benchmark category, therefore the coefficients for *distance* - β_1 and *number of trips* - β_2 can be interpreted for this subgroup. The results suggest that for these speakers the number of trips matters for citations numbers but not the distance covered. This is an important finding as these speakers are more likely to be from remote regions, for whom, travelling long distances to conferences might have seemed like an inevitable condition of getting more citations. In comparison, for US speakers the number of trips adds even more citations (β_7), but distance still does not matter (β_5). This is more intuitive, as US speakers are more likely to have access to many local opportunities to present their papers (i.e. doing cross-Atlantic trips is not correlated with more citations). Finally, for EU speakers, the picture seems more nuanced. The number of trips matters just as much as for 'other' speakers (β_8), but for EU speakers, longer trips do seem to add slightly more citations (β_6), although the effect size is very small, around a fifth of the effect of the number of trips (see the standardised coefficients in model 3). One interpretation is that EU speakers do get some value out of presenting at US conferences, although, in magnitude, doing more local presentations matters much more.

[9] The paper puts less emphasis on interpreting the exact magnitude of the coefficients. The low R^2 figures imply that the estimated model is not a very good one for prediction, but our interest is not in prediction but in the relationship between 3 variables to test Hypothesis 1.

Table 6: Main results

coefficient	description	model1	model2	model3	model4
β_1	distance (1000km)	-0.163	-0.287	-0.016	-0.176
		(0.480)	(0.492)	(0.017)	(0.265)
β_2	number of trips	23.21***	25.16***	0.243***	38.877***
		(2.698)	(2.764)	(0.027)	(0.958)
β_3	speaker eu	12.137*	-2.513	0.004	
		(6.993)	(7.138)	(0.028)	
β_4	speaker us	-2.515	0.006	0.244***	
		(6.619)	(6.783)	(0.027)	
β_5	distance x speaker us	-0.226	-0.236	-0.013	
		(0.639)	(0.655)	(0.023)	
β_6	distance x speaker eu	-0.247	1.046**	0.058**	
		(0.688)	(0.699)	(0.024)	
β_7	number of trips x speaker us	21.397***	20.365***	0.197***	
		(3.016)	(3.091)	(0.03)	
β_8	number of trips x speaker eu	-1.336	-2.933	-0.028	
		(3.483)	(3.57)	(0.034)	
β_9	year of presentation	-6.323***			
		(0.28)			
β_{10}	attendance	0.002	-0.024***	-0.04***	
		(0.005)	(0.005)	(0.009)	
β_0	Intercept	12708.175***	-2.944	-0.12***	-19.0612***
		(561.999)	(6.013)	(0.023)	(2.3355)
N		10080	10080	10080	10080
R^2		0.20	0.16	0.16	0.14

Standard errors in parentheses
$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

These results hold when we replace the *distance* variable with the average (per presentation) CO2 emission, as reported in Table 7 in the Appendix.

To offer a brief interpretation of the remaining variables, year (β_9) only appears in model 1, as explained above, and its coefficient is negative, confirming the intuition that, on average, older presentation have accumulated more citations. Interestingly, the attendance coefficient (β_{10}) is negative and significant, suggesting that larger conferences might contribute less to citations. The intuition to this would be that the chances of an individual presentation to attract interest are smaller when there are many other papers presented at the same conference.

As a final verification, I also run a ridge regression using the model reported under Model 3 (standardised values).[10] Ridge regressions are often utilised with data that is likely to suffer from multicollinearity, which was likely the case in Model 1 above. The ridge regression adds a regularisation term to the conventional OLS minimalisation of the sum of squared residual. This term penalises large coefficients. As the regularisation parameter tends to zero, the ridge coefficients converge to the OLS coefficients. The idea is: if multicollinearity caused biased OLS estimates, then the ridge estimates (with non-zero regularisation parameter) will be different from the OLS estimates. Figure 1 shows the estimated coefficients for the OLS and two ridge regressions using two different levels of regularisation ($\alpha \approx 0$ and $\alpha = 100$) on Model 3. The figure suggests some bias in the speaker dummy variable coefficients but not in our main coefficients of interest (distance and number of trips).

Before concluding, an important caveat is necessary regarding the above results. It is likely that more famous speakers get invited to more conferences, and that these people also have more citations (endogeneity problem in the regressions). This would imply that it is not more trips that lead to more citations but the other way around (reverse causality). From the available data there is nothing I can do to resolve this issue. As a suggestion for future work, one could collect the total (lifetime) number of citations for each speaker to control for the academic standing of the speaker, which would be a good first step to address this problem.

[10]Ridge regressions assume that the predictors in the estimated model are standardised

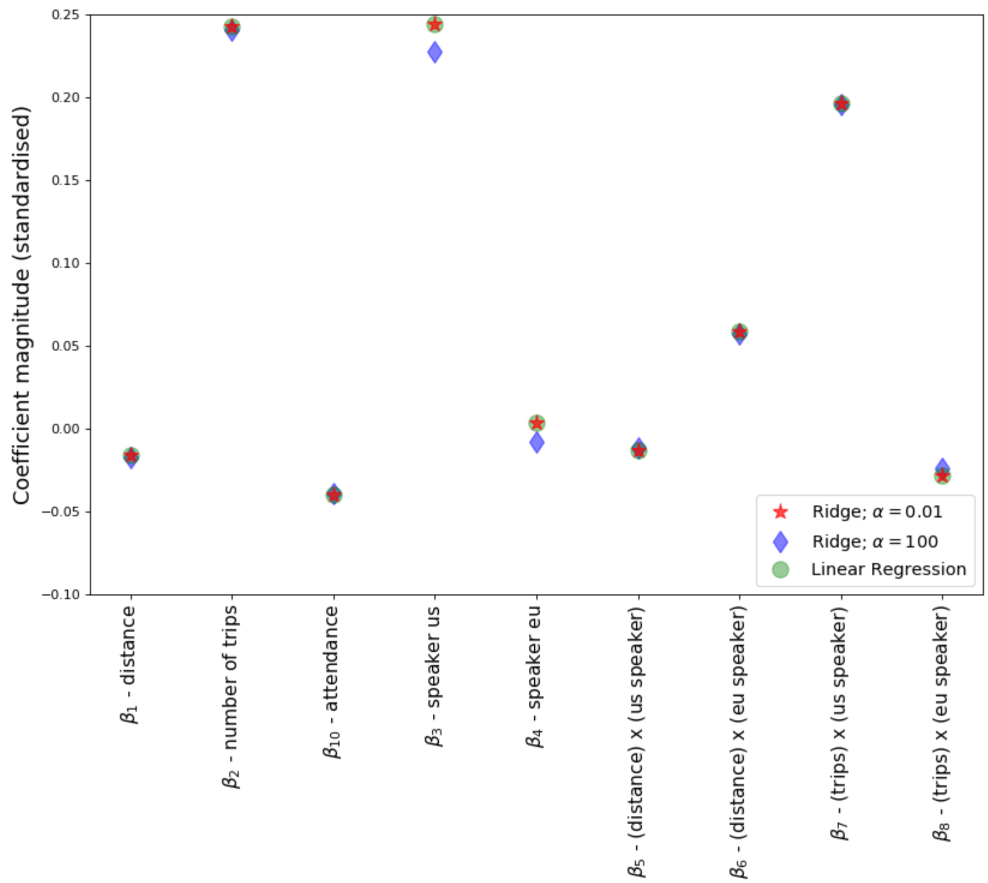


Figure 1: Ridge regressions with different α levels and the linear regression coefficients

4 Discussion

The paper provided evidence of the magnitude of carbon emission for 263 economics conferences, and that travelling to more conferences helps citation numbers but travelling long distances only matters (to a very small extent) for EU speakers. Although universities are already engaging in carbon reduction policies, the results of this research lead to the following further recommendations.

- *Researchers could be encouraged to focus on local conference presentations instead of long distance ones.* This could help reduce carbon emissions without much hindrance to the beneficial impact of these conferences. If the total distance traveled had been halved by cutting out long-distance trips, it could have lead to a 25,000 metric tonne reduction in carbon emission just from these 263 conferences (using average emission figures, as presented above). Of course, doing mainly local/regional presentations might lead to inequalities: for example, someone in the northeast of the US, or in California might not suffer from doing only local presentations, but someone in New Zealand might. Although our results, regarding speakers from regions other than US+Canada and the EU, do not suggest that this would be a big problem - at least when the number of citations is used as a quality benchmark.
- *More consideration could be given to virtual conferences.* Online conferences can be thought of as very short-trip conferences (with zero mileage). Although online conferences had been predicted an important role in academia, this is yet to assume the same stature as physical conferences in social sciences. Organising virtual conferences are not without any challenge [12]. A detailed comparison of the pros and cons of

virtual conferences for different conference models is given in [1]. Regarding the relative advantages, virtual conferences can facilitate participation, and reduce inequalities [13] and provide access for remote, resource-limited researchers, particularly those from developing countries [14]. Also, learning, one of the main objectives of academic conferences can be equally (and in some cases more efficiently) achieved in a virtual setting [15]. On the other hand, there are larger challenges in other aspects. For example the networking function of conferences is still perceived by many to be more efficiently delivered in physical settings. However, the more inclusive nature of virtual conferences can raise other aspects of networking, provided that well-designed virtual interaction rooms are set up and participants are able to use them.

- *Conference organisers could publish the estimated total carbon impact of travelling to the conference.* This information is easily accessible for the organisers when the speakers register. At the very minimum conferences should disclose rough estimates based on the home institution of the speaker. This paper demonstrated an easily executable way to gather evidence on conference carbon footprints.
- *Universities could keep track of the conference related carbon footprint of their staff.* This could include simply disclosing staff-mileage, but also initiatives such as preference for travel-free meetings, ground-travel, or extensive stays.
- *Academic associations could change the way their annual conferences are organised.* This could include biannual (instead of annual) conferences. Another potential solution could be to introduce localised annual conferences of each association in order to reduce the striking inequality shown on Figure 2.

Although the above recommendations flow directly from the results of this paper, for real change, academia in general needs a complete shift in their own conventions regarding conferences. This is a much harder objective but a number of roadmaps have been proposed [16]. Moreover, it is also hoped that papers, similar to this current one can contribute to raising awareness of the importance of change.

5 Appendix

Tables and figures, that are referenced but not displayed in the main text are show below. Table 7 estimates another variant of Equation (1), where instead of distance, CO2 emission is used:

Table 7: Main results - using CO2 emission as a covariant

coefficient	description	model1	model2	model3	model4
β_1	co2	-2.248	-1.331	-0.009	0.516
		(2.419)	(2.478)	(0.017)	(1.314)
β_2	number of trips	23.251***	25.065***	0.242***	38.835***
		(2.699)	(2.765)	(0.027)	(0.958)
β_3	speaker_us	-4.347	-1.478	0.248***	
		(6.569)	(6.733)	(0.027)	
β_4	speaker eu	11.414	-1.753	0.008	
		(6.932)	(7.081)	(0.028)	
β_5	co2 x speaker us	-0.141	0.121	0.001	
		(3.199)	(3.280)	(0.023)	
β_6	co2 x speaker eu	-1.649	8.362**	0.059**	
		(3.403)	(3.460)	(0.024)	
β_7	number of trips x speaker us	21.344***	20.440***	0.197***	
		(3.016)	(3.092)	(0.03)	
β_8	number of trips x speaker eu	-1.362	-2.883	-0.028	
		(3.483)	(3.570)	(0.034)	
β_9	year	-6.376***			
		(0.281)			
β_{10}	conference size	0.002	-0.024***	-0.04***	
		(0.005)	(0.005)	(0.009)	
β_0	Intercept	12816.72***	-4.261	-0.124***	-20.791***
		(565.699)	(5.985)	(0.023)	(2.311)

Standard errors in parentheses
$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Figure 2: Geographical distribution of the conference venues and the home institutions of speakers

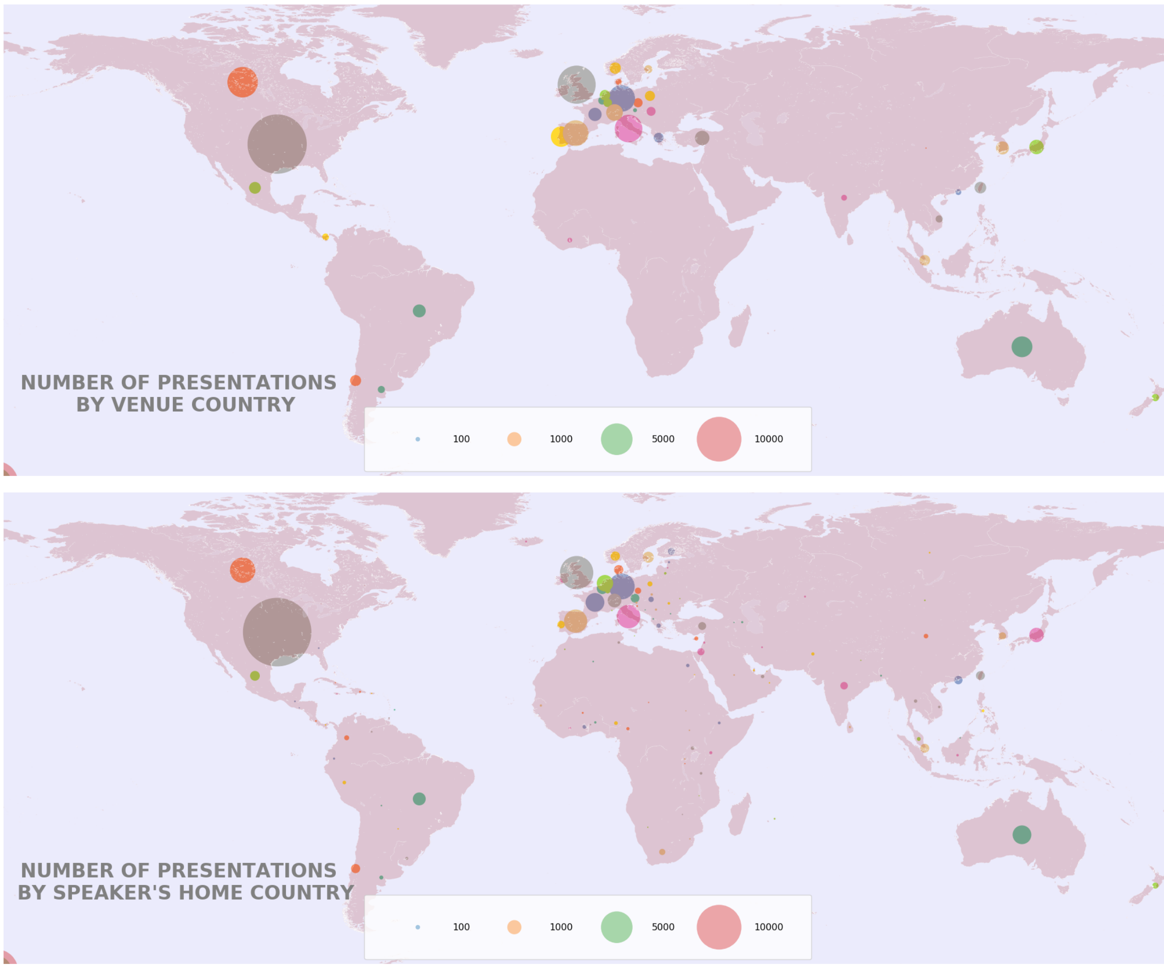


Figure 3: Average (per presentation) mileage traveled by speakers and proportion of transatlantic speakers (3-year moving averages)

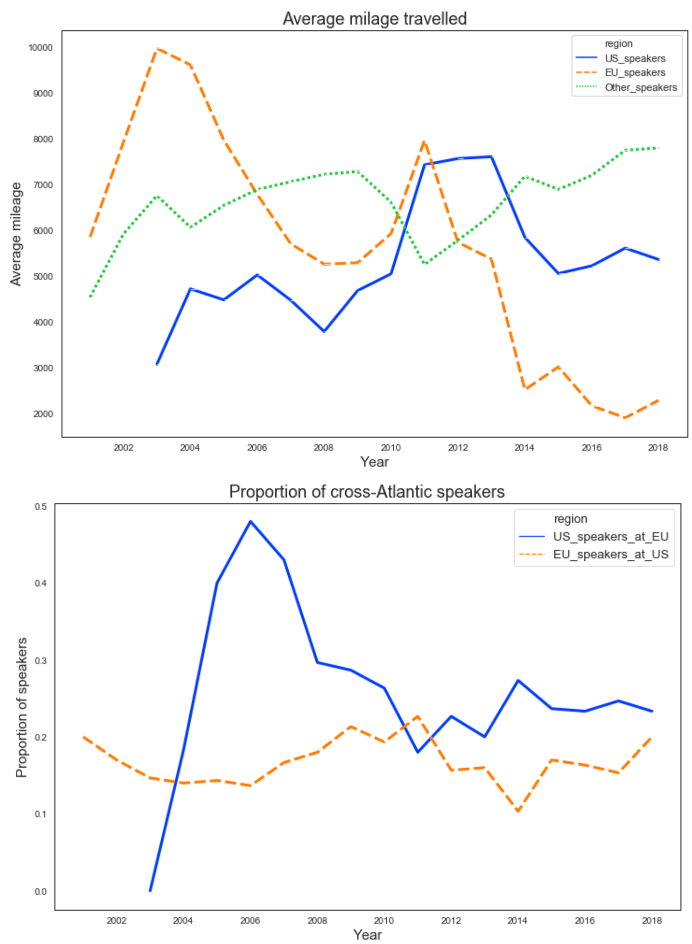
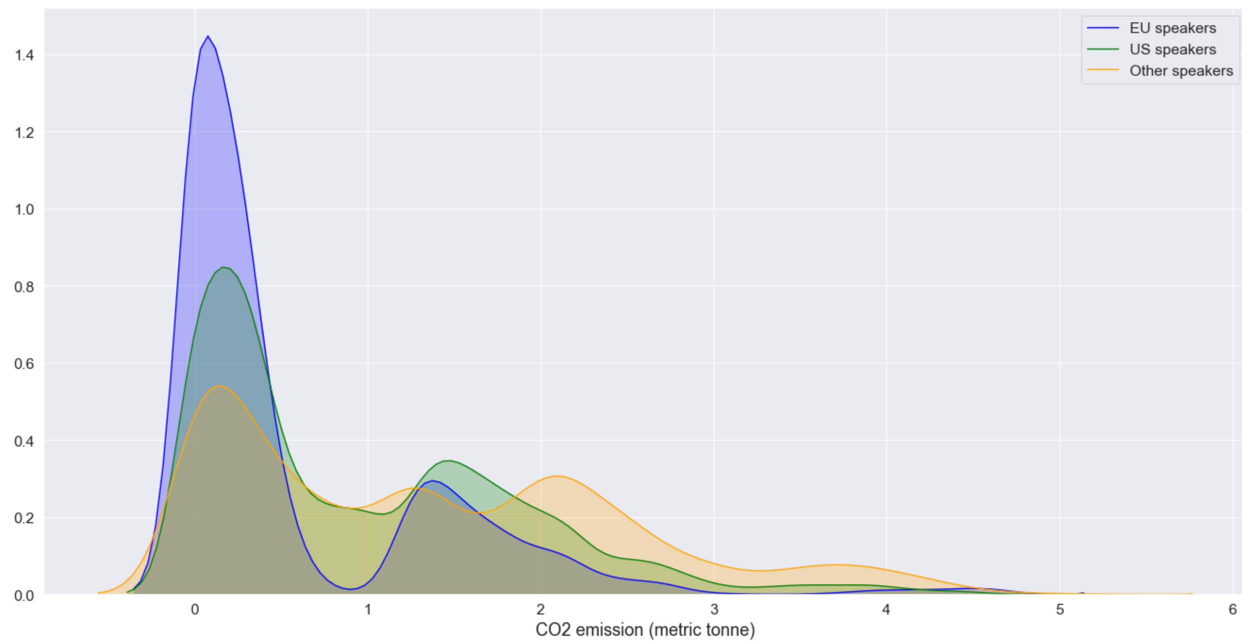


Figure 4: Density curves of emission/presentation (kernel density estimates)



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