Climate Change, Migration and Voice: An Explanation for the Immobility Paradox *

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Abstract

This paper sheds light on the apparent paradox, wherein populations adversely affected by climatic conditions fail to migrate as much as would otherwise be expected. Drawing on Hirschman's treatise on Exit, Voice and Loyalty, we develop a simple model, which highlights the theoretical case for a substitution effect between voicing and emigration. We subsequently provide causal evidence of voicing representing a new mechanism through which countries adapt to climate change, implementing wage differentials and changes in visa policies at destination as instruments. More intense voicing, as captured by greater numbers of press reports, is associated with lower emigration rates. This substitution effect holds for both internal and international voicing. Our results suggest that restrictions on mobility could result in increasing voicing, both within and between countries.

Keywords: Emigration, Climate Change, Voicing, Trapped Populations
JEL codes: F22, O15, P16, 057

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1 Introduction

Climate change is arguably the most threatening phenomenon that humanity faces.[1] Of all the associated costs, the resulting migration flows are predicted to be one of the most challenging, as large swathes of land across the world become increasingly inhabitable. Headline estimates of the numbers of 'environmental refugees' or 'climate migrants' in 2050 range from 200 million Myers (2002) to as many as one billion as reported by the International Organisation for Migration.[2] Paradoxically however, few people migrate from those countries most affected by climate change.

We contribute to the understanding of this 'immobility paradox', the so-called phenomenon of 'trapped populations', by documenting a complementary adaptation mechanism, namely 'voicing against climate change'. By 'voicing' we mean the attempt by a population affected by climate change to voice their concerns to their governments (internal voicing), or else by their government externally to the rest of the world (international voicing). In this context, undergirding voicing may be the hope of averting climatic change through changing the intensity of mitigation; to convince others to pursue mitigation more aggressively. Affected populations may also hope to receive funding for adaptation, or compensation, from their government; in which case voicing is similar to any other lobbying by a domestic interest group.

Individuals and governments, may also attempt to create or generate momentum for the development of other multi-national compensation mechanisms for climate change damages. These can take the form of international agreements (such as the UNFCCC's Warsaw International Mechanism for Loss and Damage) or legal judgements; for example through class-action cases that are targeted at major emitters (such as multinational oil companies). All these voicing activities should be viewed as attempting to strengthen the bargaining power of affected populations in any future negotiations. What we ultimately provide is evidence for the substitution of voicing (about climate change) and emigrating internationally in a large sample of countries exposed to climate change and constrained in terms of the international mobility of their citizens.

Climatic change manifests in various guises, ranging from the increased frequency of

[1] In 2019, both the World Health Organisation (https://www.who.int/emergencies/ten-threats-to-global-health-in-2019) and the World Economic Forum (https://www.weforum.org/reports/the-global-risks-report-2019) cited climate change and its effects as one of the most significant threats to humanity. The latter report suggests that extreme weather and climate-change policy failures constitute the gravest threat to humanity over a ten-year time horizon.

[2] https://www.iom.int/migration-and-climate-change-0.

rapid-onset disasters to more intense slow-onset change, including sea-level rises, higher temperatures and waning rainfalls. There is broad consensus that low-income countries will broadly bear the brunt of the adverse effects of climate change. The extensive empirical literature fails to provide compelling evidence of a clear-cut connection between climatic shocks and the international displacement of people however. Adopting a plethora of alternative empirical specifications, with a particular emphasis on identifying the channels and mechanisms at play, some papers uncover evidence of a direct link (e.g. Cattaneo and Peri (2016)), while others expose the existence of indirect links between climate change and emigration (e.g. Mueller et al. (2014), Beine and Parsons (2015)). A significant number of papers however, fail to uncover *any* emigration response to adverse climatic conditions whatsoever.[3] A UK Government publication, the 2011 Foresight Report (The Government Office For Science, 2011) introduced the concept of 'trapped populations'; noting that environmental change is as likely to decrease migration as it is to foster future flows.

Across the world, we continue to observe far fewer emigrants than we would otherwise expect from countries most exposed to climate change. As originally conceptualised, 'trapped populations' are portrayed as comprising individuals with lower social/economic/political capital. Those most exposed to the onset of climate change and less able to migrate away from its consequences. Unable to surmount migration costs, both financial and policy driven, they are thereby rendered doubly disadvantaged. Since the publication of the Foresight Report, numerous articles have reinforced its original arguments in a variety of contexts.[4]

Individuals and households, those unable to migrate internationally have little choice but to adapt i.e. to become more climate resilient (Carling (2002)). Since migration costs in the absence of crossing an international border are considerably lower, one adaptation strategy is for households, or some of their members, to migrate internally. In many large developing countries, when climatic conditions are heterogenous across different parts of the country, this option remains attractive.[5]Alternatively, households and firms may implement adaptation strategies to better cope with adverse climatic shocks, the clearest evidence of which can be found in the agricultural sector. As detailed by Fankhauser (2017), farmers may respond

[3]Please refer to Berlemann and Steinhardt (2017), Millock (2015) and Piguet et al. (2011) for recent literature reviews as well as the meta-analysis of Beine and Jeusette (2018).

[4]See among others Black et al. (2011), Black et al. (2013), Penning-Rowsell et al. (2013), Adger et al. (2015), Gray and Wise (2016), Cattaneo and Peri (2016) and Nawrotzki and DeWaard (2018). Interested readers are also directed to Ayeb-Karlsson et al. (2018) for a discursive review of the literature on 'trapped populations'.

[5]See for instance Dallmann and Millock (2017) or Mastrorillo et al. (2016) for recent evidence in India and South Africa.

by moving into non-farm activities (e.g. Kazianga and Udry (2006)), while Mueller et al. (2018) find evidence that agricultural wages are either allowed to fall, else agents become self-employed in the agricultural sector thereby decreasing their labour market participation rates in urban areas. These observations contribute to our understanding of relatively lower observed internal migration rates and contrast against the traditional narrative of a rural-urban migration in response to adverse climatic conditions.

In some countries however, voicing likely represents one of the few available responses to adverse climatic developments. This is the case in some developing countries with homogenous climatic conditions, with few economic adjustment mechanisms and with restrictions on international mobility, not least if they are geographically remote. Small Pacific islands threatened by sea level rises represent clear examples. Noy (2017) details the specific case of Tuvalu and argues that the preferred response to climate change of the residents and authorities is to voice in order to be compensated for their losses by those countries that have contributed most to climate change or those they perceived as responsible for their predicament.

Building on Hirschman's treatise on Exit, Voice and Loyalty (Hirschman (1970a)), we proffer a complimentary explanation for the observed interaction between voicing and international emigration in the presence of adverse climatic conditions. First, we introduce a simple theoretical framework, which captures the emigration and voicing decisions of individuals adversely affected by climatic shocks. According to our set up, voicing is a substitute for emigration, since it mitigates adverse climatic shocks on income. We subsequently test the relationship between voicing about climate change and emigration, using cross-country panel data comprising the countries most exposed to climate change. Our voicing data derive from press reports drawn from the online global news *Factiva* database. To alleviate concerns of endogeneity, we instrument the emigration rate, with instruments that capture the expected foreign income of origin country emigrants, in tandem with the degree to which origin countries are subject to restrictive emigration policies imposed on them by the rest of the world. Our IV results, suggest a causal and negative relationship, which holds across a broad range of specifications.

Our paper nestles at the intersection of three distinct literatures. First, is the literature that examines the direct and indirect links between climate change and international migration and the mechanisms that underpin the climate change-migration nexus.[6] We

[6]This burgeoning literature is growing rapidly, resulting in more than 100 papers on the subject. Interested readers are directed to the surveys of Berlemann and Steinhardt (2017), Millock (2015) and Piguet et al. (2011).

contribute to this literature by providing an additional explanation as to why populations remain immobile in the face of adverse climatic conditions.

The second strand of literature the paper speaks to is that of climate change adaptation and/or mitigation.[7] This literature tends to challenge the traditional view of a direct relationship between climate change and mobility. According to this viewpoint, mobility, especially when it involves crossing international borders, is often deemed the solution of last resort. We contribute to this literature by documenting voicing activity against climate change as an alternative adaptation mechanism for individuals and authorities in vulnerable countries.

Our paper also speaks to the literature devoted to voicing and emigration in alternative settings. Docquier et al. (2016) for example, show that the interaction between voicing and emigration is important for individuals from countries with weak economic and political institutions. In that context, emigration promotes democracy, while the interaction between exiting through emigration and voicing against the domestic regime helps rationalise the positive association between exiting and voicing that those authors document. More recently, Karadja and Prawitz (2019) examine the role of exit and voice in the context of historical mass migration from Sweden to the US and find causal evidence that out-migration resulted in stronger demand for political change, better political organization, increased bargaining power with respect to local elites and ultimately to more inclusive political institutions resulting in more redistribution and inclusivity. Related papers include Spilimbergo (2009), which documents the links between student migration and the spread of democracy, Batista and Vicente (2011), who document the links between accountability and emigration in the context of Cape Verde, Chauvet and Mercier (2014) that highlights the links between return migration and participation rates and electoral competitiveness in Mali and Barsbai et al. (2017), which documents the links between emigration from Moldova and votes for and against the local communist party.[8]

The paper is organized as follows. Section 2 presents the case for voicing as a potential mitigation mechanism for climate change. Section 3 introduces a simple model that makes

[7]See among others the papers quoted before, Fankhauser (2017) and Mueller et al. (2018) among others. Bennonier et al. (2019) looks for instance at the mitigation effect of irrigation on the mobility adjustment mechanism. They show that access to irrigation can mitigate the adverse effects of temperature on agricultural productivity. In turn, this might alleviate the negative impact of temperatures on emigration in low income countries, an effect that had been documented by Cattaneo and Peri (2016).

[8]For a recent literature review on the subject, readers are referred to Baudassé et al. (2018). Our paper contributes to the voicing literature by showing that the exit-voice trade-off contributes to the understanding of the climate-migration nexus.

explicit the mechanisms that underpin the links between climate change, emigration and voicing. Section 4 describes our data sources and tests the links identified in our model empirically. In Section 5 we conclude.

2 Voicing as a Mitigation Mechanism for Climate Change

Black et al. (2011) developed a framework for understanding environmentally induced migration, or its absence (the trapped population phenomenon). In their framework, a decision to migrate is a function of macro considerations (such as the environmental conditions in the country of origin), micro considerations (such as the social identity and ties of the prospective migrant, and her specific exposure to environmental stressors) and a set of prevailing circumstances (such as legal, logistical, or financial barriers to migration). Climate change can affect all three groups of considerations - macro, micro, and circumstantial. Following Hirschman (1970b), the ability and willingness to voice is an intermediating phenomenon that affects the dichotomous choice as to whether to migrate or stay. We focus on this choice and examine the conditions that affect it.

Hirschman asks when the Exit option would prevail over the Voice option and when the choice would be reversed. Because international migration is costly, we propose a modification to this basic choice framework, according to which the choice is sequential: whether to migrate or stay, and if migration is not possible, since it is too costly (when costs are broadly conceived), agents then choose whether to voice. Of course, even in this sequential choice, whether people choose to migrate still depends on their ability to voice and on their perceptions regarding the efficacy of voicing.

In Hirschman's analysis, voicing is costly, as it can lead to potential adverse social or political repercussions. This is less relevant in the case of voicing 'against climate change', especially when considering that significant voicing is directed to the international community (the potential source of compensation). But who voices, and whether they have the cachet to have influence over any decisions clearly matters. In this case, it seems plausible to hypothesize that there is a clear correlation between the degree to which countries are exposed to climate change and their ability to generate a response to their voicing. The small atoll island countries (especially the largest one, the Maldives) have actually been quite successful in influencing the international conversation through voicing. The insertion of the aspirational 1.5 degrees as a safety 'guardrail' target for warming into the Paris Agreement and the follow-up IPCC report on 1.5 degrees (on Climate Change (2018)) were both partially a result of the voicing efforts of the Maldives.

Overall, our argument is that voicing should be viewed as a component of the menu of actions people can take when faced with climatic change. Voicing, it is hoped, will result in more stringent mitigation actions, for example higher carbon taxes, or for compensation through various channels, for example through the Warsaw International Mechanism (WIM). Ultimately, the WIM is targeted at developing a mechanism that will "address loss and damage that are associated with climate change". While compensation, as a legal term, is specifically excluded from the WIM discussion, ultimately the WIM is envisioned as a mechanism to assist lower-income countries with the loss and damage that they will experience and that cannot be mitigated.

3 A Model of Exit and Voice

Building upon Hirschman's Treatise on Exit, Voice and Loyalty (Hirschman, 1970a), we develop a formal model that captures the main mechanisms through which the population in a developing country, one is exposed to adverse climatic shocks, decides whether to migrate or voice.

Suppose there is a continuum of individuals i, in a given developing country, subject to adverse climatic shocks. We assume that individuals maximize their indirect utility by maximizing their expected income $E(y_i)$ that can be earned at home or abroad. At home, each individual earns a domestic income y_i^d, which is affected by an adverse climatic shock ϵ_i. This shock is heterogenous across individuals and its adverse impact on income depends upon the specific occupation of the individual i, among other things. ϵ_i follows a distribution with $E(\epsilon_i) = \mu_i$, defined on the support $[0, 1]$.

Each individual makes two decisions before the realization of the shock ϵ_i. The first is whether to migrate abroad else stay at home. If individual i migrates, they are able to earn foreign income y_m but are subject to a migration cost c_m. For the sake of simplicity, we ignore the issue of transferability of skills Borjas (1987) and assume that y_m and c_m are identical across individuals. If individual i remains at home and in absence of any voicing activity, $y_i^d = \overline{y}(1 - \epsilon_i)$, where $\overline{y}$ is the baseline income affected by the climatic shock.

If individual i remains at home, they have the additional option of voicing about climate change with an intensity V_i. V_i represents the share of time devoted to voicing as opposed to work, i.e. $0 \leq V_i \leq 1$. Voicing is specific to domestic residents and has no value from abroad, from where migrants possess little claim to local resources. Voicing results in a dampening of any adverse shock to income, possibly through the compensation mechanisms outlined in Section 2.

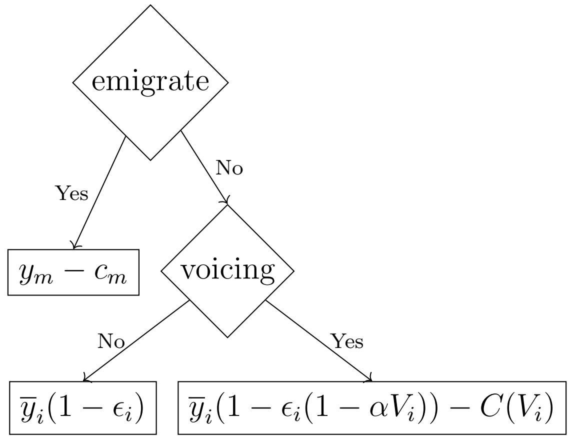

Figure 1: Decision tree for individuals

For a given level of intensity of voicing V_i, domestic income is given by:

$$y_i^d = \overline{y}_i(1-\epsilon_i(1-\alpha V_i)) - C(V_i) \tag{1}$$

where α captures the capacity of voicing to obtain compensation or some other means of offsetting the adverse impact of the shock, with $0 \leq \alpha \leq 1$. While it can yield benefits, voicing is costly since it decreases the amount of time devoted to work. We assume quadratic costs:

$$C(V_i) = \overline{y}\lambda V_i^2 \tag{2}$$

with $\lambda > 1$ being a scale parameter in the cost function. Based on the expected climatic shock, individual i makes two decisions. First whether to migrate or not. Second, the optimal value of voicing if they decide to stay. Figure 1 depicts the decision tree detailing the sequence of choices.

The model can be solved through backward induction. If individual i chooses to stay and given $E(\epsilon_i) = \mu_i$, the optimal level of voicing is given by:

$$V_i^* = \frac{\alpha\mu_i}{2\lambda} \tag{3}$$

Voicing intensity increases with the efficiency of voicing and the size of the expected adverse climatic shock and decreases with the cost of voicing. Individual i chooses to migrate if $y_m - c_m > E(y_i^d)$. Using the optimal value of voicing, one can derive the level of the expected shock μ_i^* at which individual i is indifferent between emigrating or staying:

$$\mu_i^* = \frac{c_m - y_m + \overline{y}_i}{\overline{y}(1-\psi_i)} \tag{4}$$

with $\psi_i = \frac{\alpha^2 \mu_i}{2\lambda} > 0$. With no possibility of voicing or ineffectual voicing ($\alpha = 0$), this threshold is given by μ_0. Individuals with $\mu_i > \mu_0$ will emigrate, while those for which $\mu_i < \mu_0$ will have no incentive to move. The condition shows, for a given level of migration costs and foreign income, that those who move will be those most affected by the climatic shock. An increase in c_m or a decrease in foreign income, leads to an increase in the threshold and therefore less emigration. Part of those who had an incentive to migrate will no longer move and this leads to a decrease in the global emigration rate. By mitigating the expected loss of income, voicing increases the threshold over which people have an incentive to emigrate. The condition for emigration, equation 4 becomes $\mu_i(1 - \psi_i) = \eta_i > \mu_0$. For admissible values of the efficiency and cost parameters α and λ, $\eta_i < \mu_i$. In simple terms, voicing leads to a decrease in the total adverse effect of the climatic shock μ_i and to a decrease in global emigration.

Figure 2 summarises the mechanisms of the model. The 45 degrees line represents the locus of points between which individuals are indifferent between emigrating and remaining at home. If voicing is not possible ($\alpha = 0$), for given values of $c_m = c_m^0$ and $y_m = y_m^0$ the cut-off value is given by μ_0. Individuals with $\mu_i > \mu_0$ migrate and those with $\mu_i < \mu_0$ remain at home. If voicing becomes a viable alternative, for the same values of c_m and y_m, the cut-off value increases to μ_1. This leads to an outward rotation of the curve capturing the emigration condition (the bold line). As a result, fewer individuals migrate. Voicing increases, along both the extensive and the intensive margins. At the extensive margin, the number of individuals who stay increases. Those who stay, while they would have migrated in the absence of being able to voice, are those affected by a mean shock of between μ_1 and μ_0. At the intensive margin, since voicing is proportional to μ_i, average intensity of voicing also increases. Finally, supposing an exogenous increase in migration costs c_m or a decrease in the rest-of-the-world income y_m (c_m^1 instead of c_m^0 and y_m^1 instead of y_m^1), the cut-off value shifts to μ_2, which implies that emigration further decreases, while voicing further increases.

There are other ways in which we can consider what the impact of evolving circumstances on the migration choices made (as modelled here) will be. If an effective action that manages to keep global warming within the 1.5°C target set in the Paris Agreement proves beyond the world's political capacities, as almost everyone predicts, this may change the dynamics of the choice between voice and migration. There are several channels through which this nexus can be affected.

If residents of climate-change-vulnerable countries decide that voicing is no longer a viable option to avert climate change or receive timely compensation, migration will constitute more attractive alternative. In this view, migration is a 'last resort' so the flow of migrating climate ‘refugees’ that until now have not materialized, will start to increase (maybe dramatically and irrespective of any legal barriers).

In contrast, if the monetary or non-monetary costs of migration start to decrease, for example with the UN recognizing ‘climate refugee’ status and its associated entitlements, then voicing ‘against climate change’ may, ironically, decrease. On the other hand, equally plausible is a hardening of views against, for example, the granting of ‘climate-refugee status’. This may increase the likelihood and intensity of future voicing and even to an increased potency to that voicing.

There are also potential distributional considerations tied to this interplay between voicing and emigration. Although not modelled here, it is usually those in the upper echelons of society that are able to migrate and so too is it likely that this group will voice more effectively. Hirschman (1978) discusses these kinds of dynamics with an examination of the tensions between private and public schooling in many American cities and also in relation to citizens and their government. In his telling of the schooling decision, the flight of more educated elites to the suburbs led to dynamics in which the quality of education deteriorated. This happened as the people who moved were also those that had the ability to advocate for stronger public actions. These dynamics thus lead to a ‘voice drain’ that is analogous to the brain-drain that afflicts many lower income countries. If elites migrate, the voicing from vulnerable countries may be lost, as the disadvantaged and trapped communities that remain are less likely to have their concerns heard.

Our theoretical model generates two testable propositions. First, voicing about climate change should be positively correlated with countries’ exposure to climate change. Secondly, emigration and voicing should be substitutes for one another. Voicing should be indicative of both higher exposure to adverse climatic shocks and greater observed levels of immobility. In the next section, we develop an empirical strategy to test these propositions using original data on voicing and climate change exposure.

4 Data and Empirical Analysis

To empirically examine the relationship between voicing, emigration and exposure to climate change, we estimate a voicing function for a sample of developing countries that have been identified as being most affected by adverse climatic conditions, (see equation 5).

$$V_{it} = \alpha + \alpha_t + \beta m_{it} + \gamma' C_{it} + \lambda' X_{it} + u_{it} \tag{5}$$

where V_{it} is a measure of voicing intensity, either internally or internationally, in country

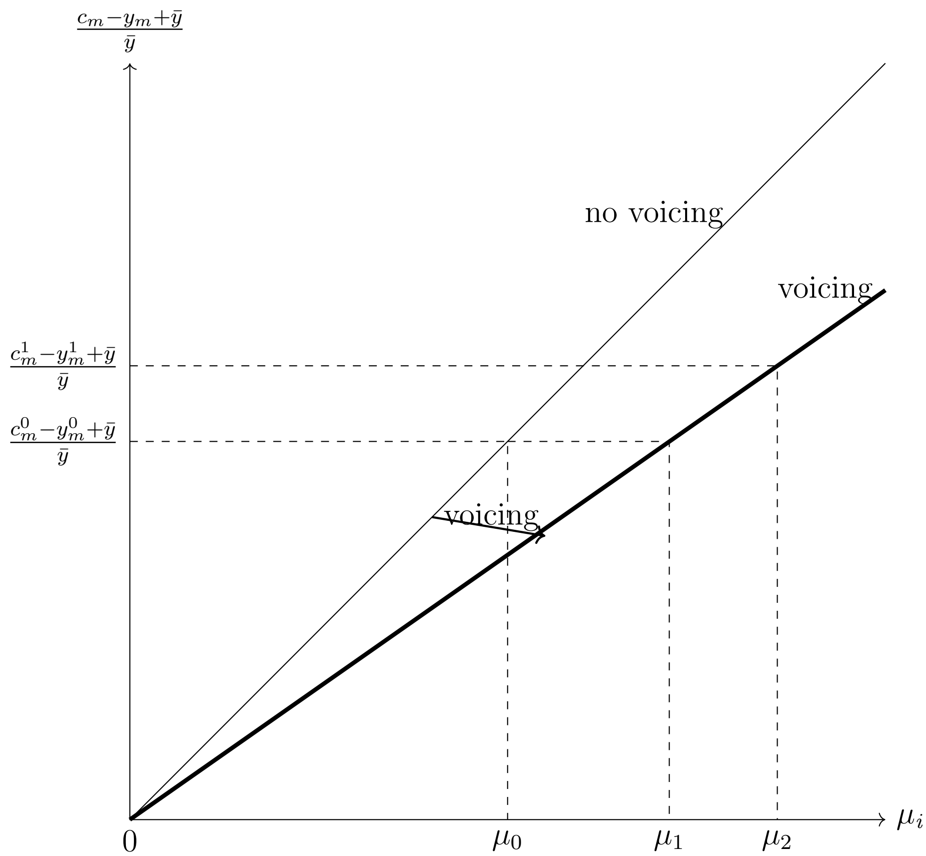

Figure 2: Voicing, Climatic shock and Emigration bis

i at time t. m_{it} is the emigration rate of country i to the rest of the world. C_{it} is a vector of various measures, which capture exposure to adverse climatic shocks (i.e. natural disasters, sea level rises and temperatures). X_{it} is a vector of voicing controls. α_t are time fixed effects.[9] This equation is estimated on a panel of 87 selected countries, from 2000 to 2015, at five year intervals.

[9]We could also consider including country fixed-effects in our specifications. Due to our limited time frame however, much of our identifying variation in voicing is between countries as opposed to within countries over time. We therefore aim to identify the reasons for the observed cross-country differences in voicing. In our preferred estimations, we only control for some time-invariant country characteristics in our benchmark specifications, as opposed to including country fixed effects. Nevertheless, in our benchmark estimations, we address the problem of unobserved heterogeneity in three different ways. First we show our results are robust to the inclusion of additional controls such as income or island dummies. Secondly, the main qualitative effect is robust to the inclusion of country fixed effects although the estimated quantitative effect is too large. Thirdly, we run IV regressions.

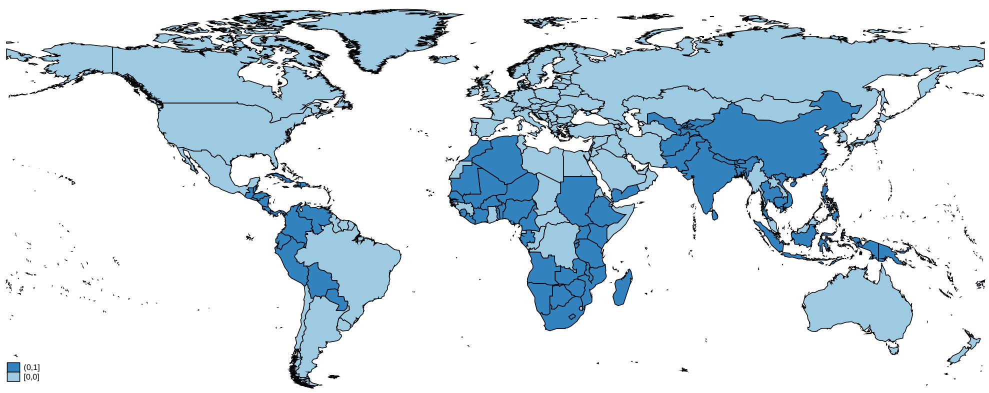

Figure 3: Countries included in sample of analysis

The choice of countries is based on the Climate Change Vulnerability Index (CCVI).[10] This composite index uses several dimensions to measure climate change and is widely used by organisations to identify areas of risk associated with the climate. We use the latest version from 2011 and rank countries based on the mean index, provided the mean involves at least two sub-indexes. Appendix A provides further details. We include the 100 most exposed countries in our sample according to this index. To that list we append a set of small island developing countries that do not feature in the database, or for which there is only one sub-index of the CCVI due to their small size. A large number of these countries are obviously highly exposed to climate change, especially to sea level rises.[11] Due to data availability constraints, our final sample comprises 87 countries that are currently the most exposed to the direct and indirect adverse effect of climate change. Figure 3 provides a map of the countries included in our analysis.

Before discussing econometric issues relative to the estimation of equation (5), we first present the data used to measure V_{it}, X_{it}, m_{it} and C_{it}.

4.1 Data

4.1.1 Voicing

We capture the extensive and intensive margins of voicing about climate change using press reports retrieved from the Dow Jones *Factiva* Online database. The database comprises

[10]This index has been computed by the firm Maplecroft. See https://maplecroft.com/about/news/ccvi.html.

[11]These countries are: Cape Verde, Comoros, Dominica, Fiji, Grenada, Jamaica, Kiribati, Maldives, Marshall Islands, Mauritius, Micronesia Fed. States, Nauru, Palau, Samoa, Sao Tome and Principe, Seychelles, Solomon Islands, Timor Leste, Tonga, Tuvalu and Vanuatu.

approximately 33,000 primary sources from 200 countries including newspapers, journals, magazines, television and radio transcripts, 74% of which are gated. Material is searchable by publication, language and date range. Importantly for our purposes, the *Factiva* database can be used to provide both local and global insights on the same issues, such that we can use the information contained therein to distinguish between internal and international voicing.[12] Press reports on voicing are identified using a set of keywords associated with climate change or climatic shocks. Any press report containing one or more of those key words or phrases is flagged. Each press report is then filtered in order to attribute each act of voicing to particular actors, individuals or governments, an approach that also serves to avoid double counting.

Searches for press reports in the *Factiva* database are conducted in three international languages: English, French and Spanish.[13] In each language, we search for the same combination of keywords associated with climate change (with only minor adjustments made to account for the specificities of each language). Appendix A provides an example of the code used to retrieve press reports from *Factiva.* Press reports are retrieved for each year from 1995 to 2015. Data are then aggregated over five year periods. Since these data are based on historical internet data, the quality of the reports and the efficiency of tracking them increases over time. In particular, the reports after 2000 tend to be far more precise and less subject to spurious reporting (see Table 1).

We recognise that alternatives to *Factiva* are available (e.g. *Lexis Nexus* and *Thomson One*), although we have no reason to believe alternatives will yield differing or superior material. *Factiva* was chosen due to its ease of use, especially in relation to honing our various searches. While we could have expanded our search in terms of the number of languages we rely upon, without knowledge of all specific differences of additional languages in relation to the three we rely upon, such an approach could have introduced additional bias when comparing reports from across languages. In the absence of news reports in other languages however, we recognise that our results serve as lower bounds.[14]

We also distinguish between two main types of voicing. First, we capture domestic or internal Voicing, voicing from residents about climatic change to their governments, else voicing from NGOs located in affected countries. Second, we capture Official or International

[12] Given the fact that *Factiva* relies not only on a select set of newspapers but also other sources like information agencies, an article published in a local newspaper is likely to be captured through referencing by other sources.

[13] In our samples, out of the 87 countries, 15 (resp. 19) have Spanish (resp. French) as their official language.

[14] Google Trends is unsuitable for our purposes due to the patchy coverage in developing countries.

Voicing, voicing by governments to the rest of the world. Appendix A details the key word searches relied upon and the samples of reports retrieved by *Factiva* for each type of voicing. Ultimately, our voicing measure captures, after filtering, the number of press reports of each type, for each country, over five-year periods. Aggregating both measures of voicing, we obtain our overall filtered measure of voicing intensity, in country i at time t. Table 1 reports the average value by period for the three categories.[15]

Table 1: Voicing about climate: descriptive statistics

	All years	2000	2005	2010	2015
Total voicing (filtered)	3.80	0.28	0.63	8.63	5.65
	(14.47)	(0.90)	(2.10)	(25.83)	(11.08)
Official	2.71	0.275	0.551	7.76	4.89
	(0.465)	(0.84)	(1.95)	(24.01)	(10.14)
Domestic	2.45	0.241	0.517	6.62	4.80
	(9.99)	(0.82)	(1.95)	(19.37)	(9.21)

Notes: Average value by country and period. Standard error in parentheses.

4.1.2 Emigration

The emigration rates for all countries in our sample are calculated using the estimates at five year intervals of total emigrants and total populations as provided for by the United Nations' Population Division.[16] Emigration rates are calculated as:

$$m_{it} = \frac{Emig_{it}}{Emig_{it} + Pop_{it}} \tag{6}$$

such that the emigration rates are bounded between 0 and 1. Our emigration rates are therefore calculated using official data of long-run stocks, as opposed to short-run flows, for two reasons. First, it is unclear over what time horizon agents might respond to the onset of climate change through migrating. Second, no comprehensive data set exists of observable migration flows. The existing datasets rather focus on the countries of the OECD as destinations.[17] If instead we were to rely on such a restricted database, we would therefore omit many important destination countries, especially given our sample of origin countries

[15] Note that a given press report can be classified at the same time as a report on Official and Domestic voicing. This explains why the average filtered voicing reports are not the sum of Official and Domestic voicing reports.

[16] See: https://www.un.org/en/development/desa/population/migration/data/estimates2/estimates15.asp.

[17] See for example the DEMIG C2C data set: https://www.imi-n.org/data/demig-data/demig-c2c-data.

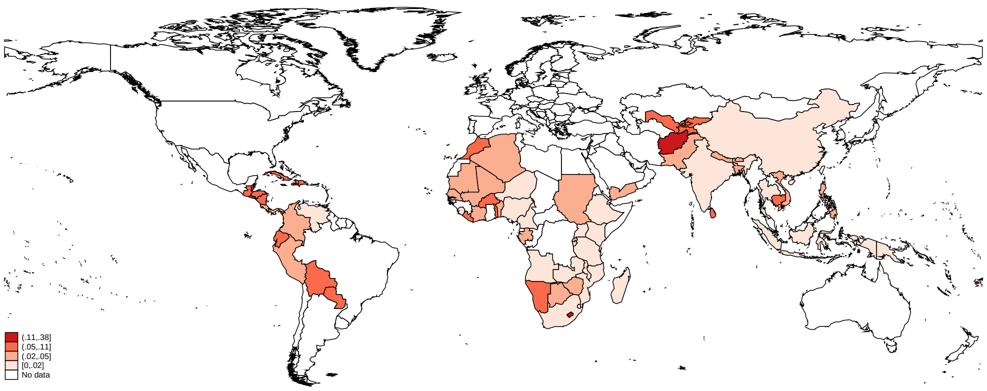

Figure 4: Emigration rates (year 2015)

who will likely send a large proportion of emigrants to developing countries (the so-called South-South mobility phenomenon). As a robustness check, we conduct our analysis on a dataset of *imputed* flow data however (see section 4.4).

Emigration rates vary significantly across the countries included in our sample. This reflects a set of different factors such as the size (internal alternative option), preferences for remaining sedentary, income at origin, natural emigration costs such as isolation, policy and emigration costs etc. Figure 4 depicts the variation in emigration rates of countries in our sample.

4.1.3 Exposure to Climate Change

We rely upon three different measures of exposure to climate change. Our first, captures fast-onset change as captured by natural disasters. The remaining two measures capture slow-onset exposure to climate change as measured by sea level rises and warming temperatures.

Disasters. We capture exposure to fast onset climatic events using a recent version of the EMDAT database using a count variable for the number of events recorded in the database. EMDAT is the only available database of disasters associated with natural hazards with a global coverage. Data in EMDAT have been collected for disasters going back many decades, but is widely perceived to be reliable from the early to mid 1990s. It has been used in many research projects examining various aspects of disasters, and is also used by the international multilateral organisations (e.g., World Bank) when they assess disaster risk.

We implement one particular measure, which captures the average proportion of people affected by natural disasters. This variable captures the magnitude of the consequences of these events and allows to better capture the exposure risk, compared to alternative measures such as the raw number of disasters over a particular period. Figure 5 provides a map of

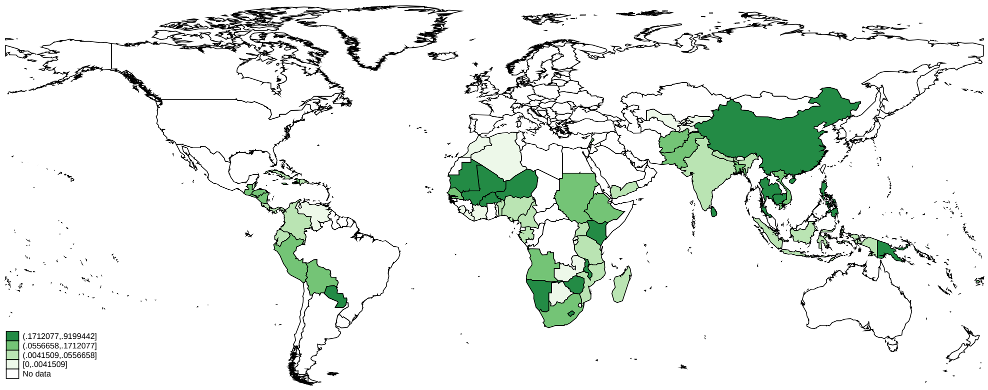

Figure 5: Exposure to disasters (year 2015)

this measure for the countries of our sample for the year 2015.

Sea level rises. Sea levels rises are often considered one of the most detrimental consequences of climate change, especially in relation to climate-induced migration. Projections of sea level rises are particularly apposite for small island nations, some of which are already experiencing significant challenges. Tuvalu and Kiribati, both atoll nations, may completely disappear underwater in the coming decades. Populations located near to the coast are particularly exposed to such risks.

To capture exposure to sea level rise, we compute for each country and time period, the share of the population living in a low elevation coastal zone (LECZ) using data from the SEDAC Center from NASA's Earth Observing System. These data provide estimates of urban and rural populations (as well as land areas) for 202 countries across three years (1990, 2000, 2010) in contiguous coastal elevation levels. LECZ's are defined using different levels of elevations, ranging from 1 to 20 metres above sea level. For our measure, we use an elevation of 1 metre above sea level.[18] We interpolate the data for the years 1995 and 2005. For 2015, we replicate the value observed in 2010.

Our measure of exposure to sea level rises reveals important heterogeneity across countries. The distribution of the share of populations at risk is highly skewed. Over the period 1995-2015, the mean proportion of exposed populations is 1.46% (standard deviation equal to 3.44%), with a median equal to 0.28%. The 10th, 20th, 30th, 40th, 50th, 60th, 70th, 80th and 90th percentiles are respectively equal to 0, 0, 0.08, 0.18, 0,28, 0.50, 0.87, 1.46 and

[18] see www.sediac.ciesin.columbia.edu/data/set/lecz-urban-rural-population-land-area-estimates-v2. This measure has been used, for example, by Burznski et al. (2019) to compute the share of the population that would be forced to leave under several scenarios of sea level rise in a quantitative model, which predicts the total displacement of populations affected by climate change. We are grateful to Michal Burzynski for providing access to these data.

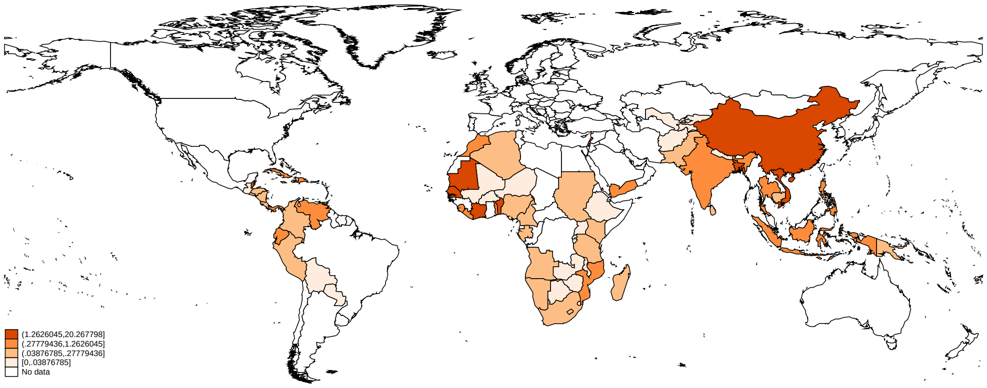

Figure 6: Exposure to sea level rise (year 2015)

3.83%. The maximum proportion of people leaving in a coastal zone under 1 metre above sea level is 20.26% in the case of Tuvalu.

Warming. For temperature data, we use the World Banks Climate Data API, which provides access to historical temperature data at the country level. These data are based on gridded climatologies from their Climate Research Unit, averaged over the grid cells in each country. The data are proxies for temperature, as only some parts of the world have continuous and reliable measurements of temperature over the whole of the past century. Modelling has been used to extrapolate estimates where weather-station data were unavailable else unreliable. We use the five-year (weighted) average temperature for each country.[19]

4.1.4 Additional Controls and Instruments

We control for additional covariates of voicing X_{it} in equation (5). We first control for population size, using population data from the United Nations. We also control for freedom of speech. This is captured by the freedom of the Press index which is drawn from the annual Freedom of the Press survey conducted by the Freedom house. This index is composed of sub-indices, which capture freedom of printing and broadcasting and includes values ranging from 0 (free press) to 100 (no press freedom). This covariate should account for mobility restrictions imposed by authoritarian governments. In particular, we expect it to explain part of the domestic/internal component of voicing.

Given that press articles are retrieved in three international languages, we account for the official language used in the country. The reference level is English and we capture the fact that the official languages can be either French (19 countries in our sample) or Spanish (16

[19]More details are available at: https://datahelpdesk.worldbank.org/knowledgebase/articles/902061-climate-data-api.

countries in our sample) to account for the fact that these languages are less international and can potentially lead to fewer press reports in the *Factiva* database.

Finally, to account for unobserved heterogeneity in the panel of countries and as an alternative to the inclusion of country fixed effects, we introduce income dummies based on the World Bank Classification of countries. Countries are ranked in four different group: low income (22 countries), lower middle income (32 countries), upper middle income (28 countries) and high income (5 countries). We also include a dummy, which captures if a country is an island.

4.2 Estimation Issues

Count data model

Our dependent variable, our measure of voicing, captures the number of press reports concerning climate change in each origin country over five year periods; which is therefore suited to count data models. As emphasized by Cameron and Trivedi (2013), OLS is clearly inappropriate in this context since the OLS estimator specifies a conditional mean function that can take negative values. Exponential regression models are better suited to the nonnegative and integer-values of our voicing variable. Model (5) is therefore estimated by maximum likelihood estimation using the PPML estimator.

Endogeneity

The estimation the interaction between emigration and voicing in specification (5) is likely to be confounded by issues of endogeneity. There are two major sources of threat. First, as suggested by the model in section 3, specification (5) is the result of a two-equation system. In the model, exogenous variations of emigration (voicing) will lead to a variation in voicing (emigration). Reverse causality is therefore a natural ingredient of the empirical analysis and has to be accounted for. This issue is tackled through instrumental variable estimation.[20]

Secondly, beyond reverse causality, it is possible that a correlation exists between emigration and an unobserved determinant of voicing. While our specification comprises a rich set of measures capturing exposure to climate change, one could proffer candidates of some unobserved climatic condition at origin, which could potentially result in both increased emigration and voicing concurrently, thereby inducing a correlation between the error term of equation (5) and our emigration variable. In this case, the bias in the estimation of γ would

[20]Related to that point, our IV estimations can be regarded as the estimation of the underlying 2-equation system of section 3, with exogenous variations in the emigration rates.

be positive, biasing our results toward a complementarity between emigration and voicing, in other words diametrically opposed to our hypothesis.

To address the issues related to endogeneity, we therefore adopt an instrumental variable approach, exploiting exogenous variations in emigration rates, which are uncorrelated with climatic conditions at origin. Our theoretical framework provides a useful guide in that respect: variations in y_m and c_m in equation (4) directly impact the emigration rate, but since they are destination specific, will be uncorrelated with climatic conditions at origin. Our first instrument mimics y_m in section 3 and is the income earned abroad of emigrants of country i weighted by the proportion of each origin country's diaspora in country i. Data on GDP per capita were obtained from the World Bank Development Indicators. Our approach captures the idea that higher incomes at destination likely prove valuable to potential emigrants either on immediately on arrival, else prior to emigrating by reducing the migration costs of prospective emigrants.

The second instrument is based on variations in migration costs c_m, as captured by immigration policy restrictions imposed on origin countries by migrant destinations. We construct a general index of visa restrictions faced by residents of country i and imposed by all other countries worldwide. The index is constructed using data on bilateral visa restrictions collected by the DEMIG project, which capture the existence or absence of visa requirements for people traveling between all countries worldwide, on an annual basis.[21] Our instrument is computed as the proportion of visa requirements faced by each origin country with respect to all the other countries of the world, over each five year period.[22]

Figure 7 provides the proportion of visas restrictions for each origin country for the year 2013. Unsurprisingly, developing countries are subject far greater restrictions when compared to developed nations.[23]

[21]The visa restrictions have been collected within the DEMIG project at Oxford University. They are drawn manually from the International Air Transport Association manuals capturing each year the bilateral requirements in terms of tourist visas within any pair of countries in the World. The data span the period 1995-2013. These data have been recently used by Czaika and de Haas (2017) and Czaika and Neumayer (2017). An earlier version of the data specific to the year 2004 has been also used by Neumayer (2006) and Bertoli and Fernández-Huertas Moraga (2015) among others. Since the original data are annual, we average the restrictions over five years. For the last sub-period (2010-2015), we assume no changes between 2013 and 2015.

[22]Given missing data, this index computes the proportion of visa requirements with respect to all destinations for which data are available. In other terms, the proportion is adjusted for missing data and we treat missing data agnostically.

[23]As an illustration, in 2013, about 40% of all destinations request a visa for people to Luxembourg to be admitted. This proportion was more than double for countries like Tuvalu (78%) and Kiribati (81%).

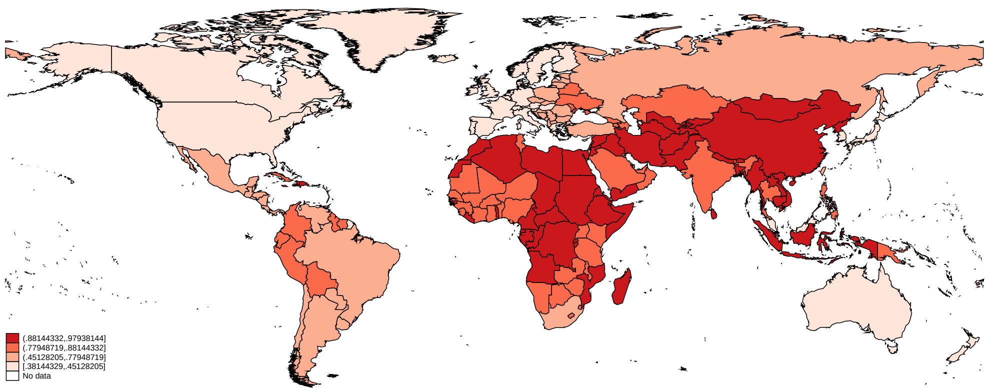

Figure 7: Proportion of visa restrictions (year 2013)

The Control Function approach is used to estimate equation (5), allowing us to combine a Poisson approach with instrumentation. The Control Function approach usefully provides information on the first stage and the respective contributions of the two instruments to the prediction of emigration rates. To the best of our knowledge, there are no corresponding statistics to the F-stat in the linear case, the coefficients and their significance of the two instruments in the first stage allow to assess whether these exogenous variations generate some predictive power of emigration rates. Finally, as a complementary strategy, we also use one-period lagged emigration rates (five-year lagged rates). We also combine this lagging procedure with the IV approach described above.

4.3 Results

Total Voicing

Tables 2-5 report the results for total voicing. Table 2 reports the results obtained with PPML and use contemporaneous emigration. Table 3 includes the results obtained with our IV strategy. Table 4 reports comparable results, although those implementing one-period lagged emigration rates to further mitigate the possible remaining concern of reverse causality. Finally, Table 5 reports the results obtained with IV estimates and lagged emigration together.

Voicing activity is related to climate change exposure. In particular, exposure to natural disasters and to sea level rises results in more voicing. The evidence is much less clear in regards to the absolute level of temperature. This is not totally surprising given the uncertainty around the ability of this measure to capture slow onset climatic change.[24] In contrast,

[24] The literature typically lacks some clear agreement about how to capture slow onset climatic change,

the two other variables provide more straightforward measures of climatic conditions.

Secondly, we find consistent evidence of a substitution effect between emigration and voicing. Lower emigration rates result in higher levels of voicing against adverse climatic conditions. Our PPML estimates imply that a 1 percent decrease in the total emigration rate leads to an increase of about five press reports reflecting concerns about climate change in a period of 5 years. This result is stable across specifications, including one with income dummies that capture differing levels of economic development across countries (col.5).

The PPML IV estimates however, are far larger in magnitude as when compared to our baseline results. The estimated number of press reports in response to a 1 percent decrease in the total emigration rate lies between 7 and 19.[25] This could imply that our baseline PPML regression estimates are significantly upward biased. The correction of the IV estimates towards more negative values of the impact of emigration, is in line with the omission in the voicing equations of a measure of climatic conditions that is positively (or negatively) correlated both with voicing and emigration. These results hold both with contemporaneous and lagged values of the emigration rate.

Our IV estimates suggest that (average) foreign income and visa restrictions are strong instruments. The first stage equations of Tables 3 and 5 show that both instruments have predictive power for emigration rates, and with the expected sign. Higher foreign income is associated with increased volumes of emigration, while visa restrictions conversely deter emigration.[26]

The estimated values for the coefficient of the controls are in line with the expected signs. Voicing is proportional to population. Voicing in French is significantly lower than voicing in English. This is less clear for Spanish, although the IV estimations support a negative effect of the Spanish language, too. Freedom of speech tends to affect positively voicing as evidenced by the IV regressions of Tables 3 and 5.

Internal and International Voicing

Total voicing comprises two distinct categories: (i) Official or International voicing, i.e.

such as gradual warming.

[25]Note that in the PPML IV estimations, income dummies are no longer significant such that they are omitted in the final specification (col. 5 of Table 3). In contrast, the island dummy becomes significant and is included in the final specification.

[26]It should be emphasized that this relationship would likely be stronger in a larger sample of countries. Our selection of countries based on the CCV index lead to a sample of mostly developing countries. Most of our included countries are therefore subject to higher visa restrictions compared to developed countries. The coefficients of visa restriction in the first stage regressions of Tables 3 and 5 are therefore estimated on a sample with limited variability along this dimension.

voicing done by the local authorities of the country in question, and (ii) Domestic or Internal voicing, i.e. voicing done by residents or by private organisations such as NGOs or commercial entities. Tables 6 and 7 report the results regarding Official voicing. Voicing about climate change is also found to substitute for emigration, both by authorities and by residents adversely affected by climatic conditions. The degree of substitution of private voicing is found to be slightly higher than that of official voicing. In line with our expectations, private voicing depends on freedom of speech, while it is less the case for official voicing, at least in the benchmark estimations. Our results therefore demonstrate that even in authoritarian regimes, voicing by the authorities can be an option to offset the pressure from a low emigration rate.

Table 2: Total Voicing, Climate and Emigration: benchmark estimations

Dependent Variable: Total Voicing about Climate					
	(1)	(2)	(3)	(4)	(5)
Emigration	-5.301***	-4.892***	-4.856***	-5.148***	-5.295***
	(1.448)	(1.168)	(1.120)	(1.239)	(1.410)
Nat. Disasters	1.653***	1.617***	1.610***	1.254**	1.356**
	(0.465)	(0.477)	(0.471)	(0.493)	(0.455)
Sea level rise	0.080***	0.082***	0.081***	0.086***	0.048**
	(0.013)	(0.013)	(0.013)	(0.013)	(0.024)
Temp	0.022	0.026**	0.026**	-	0.029
	(0.017)	(0.012)	(0.012)		(0.023)
Population	0.0023***	0.0023***	0.0023***	0.0021***	0.0021***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0002)
Freedom	-0.002	-	-	-	0.001
	(0.005)				(0.006)
French	-0.992***	-0.992***	-1.000***	-0.996***	-0.808***
	(0.230)	(0.235)	(0.224)	(0.236)	(0.232)
Spanish	0.046	0.040	-	-	-0.276
	(0.258)	(0.259)			(0.401)
Island	-	-	-	-	0.238
					(0.302)
Constant	0.899	0.691*	0.702*	1.387***	-0.829
	(0.769)	(0.392)	(0.381)	(0.175)	(0.901)
Time Fixed Effects	YES	YES	YES	YES	YES
Income dummies	NO	NO	NO	NO	YES
Observations	344	346	346	348	344
Number of countries	87	87	87	87	87
Pseudo-R^2	0.893	0.893	0.893	0.870	0.899

Notes: PPML estimation. Estimation period: 2000-2015

In column (5), regional dummies are based on the World Bank classification.

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Total Voicing, Climate and Emigration: PPML IV estimations

	Dependent Variable: Total Voicing about Climate									
	(1)		(2)		(3)		(4)		(5)	
	(Emig)	(IV)	(Emig)	(Emig)	(1st St)	(IV)	(1st St)	(IV)	(1st St)	(IV)
Emigration		-42.38**	-	-11.87**	-	-12.02**	-	-7.49*		-19.38**
		(20.20)		(5.13)		(4.894)		(4.064)		(7.827)
Nat. Disasters	-0.024	0.142	-0.034	1.603**	-0.039	1.624**	-0.040*	1.739***	-0.040*	0.753
	(0.023)	(1.06)	(0.024)	(0.672)	(0.025)	(0.660)	(0.024)	(0.657)	(0.025)	(0.896)
Sea level rise	-0.001	0.038	0.0021	0.141***	0.0015	0.139***	0.003**	0.159***	0.0006	0.114**
	(0.001)	(0.084)	(0.0014)	(0.037)	(0.0014)	(0.034)	(0.001)	(0.032)	(0.001)	(0.045)
Temp	-0.0016***	-0.065	-0.0013**	-0.007	-	-	-	-	-	-
	(0.0005)	(0.051)	(0.0005)	(0.026)						
Population	-0.0001***	0.0002	-0.0002***	0.0019***	-0.0002***	0.0019***	-0.0002***	0.0020***	-0.0002***	0.0018***
	(0.00005)	(0.001)	(0.0000)	(0.0005)	(0.0000)	(0.0004)	(0.0000)	(0.0004)	(0.0000)	(0.0004)
Freedom	-0.0006***	-0.029*	-0.0011***	-0.017*	-0.0011***	-0.017*	-	-	-	-
	(0.0001)	(0.017)	(0.0002)	(0.010)	(0.0002)	(0.009)				
French	-0.021***	-2.40***	-0.023***	-1.567***	-0.028***	-1.591***	-0.029***	-1.429***	-0.026***	-2.05***
	(0.007)	(0.576)	(0.007)	(0.415)	(0.007)	(0.419)	(0.007)	(0.429)	(0.007)	(0.363)
Spanish	-0.020	-1.927***	-0.015	-0.808**	-0.017*	-0.818*	-0.022**	-0.802*	-0.018*	-1.072***
	(0.014)	(0.714)	(0.010)	(0.365)	(0.009)	(0.368)	(0.010)	(0.321)	(0.009)	(0.341)
Island	0.044***	3.089***	-	-	-	-	-	-	0.054***	2.115***
	(0.013)	(1.341)							(0.012)	(0.713)
Foreign income	0.187**	-	0.359***	-	0.381***	-	0.359***	-	0.262***	-
	(0.094)		(0.092)		(0.094)		(0.094)		(0.107)	
Visa restrictions	-0.006	-	-0.054**	-	-0.043*	-	-0.054**	-	-0.100***	
	(0.036)		(0.02)		(0.025)		(0.025)		(0.028)	
Constant	0.191***	7.878*	0.214***	3.32**	0.177***	2.717***	0.187***	1.817***	0.155***	2.666***
	(0.028)	(4.21)	(0.029)	(1.278)	(0.027)	(1.363)	(0.027)	(0.398)	(0.027)	(0.609)
Time Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	344	344	344	344	346	346	348	348	348	348
Number of countries			87	87	87	87	87	87		
Income dummies	YES	YES	NO	NO	NO	NO	NO	NO	NO	NO

Notes: PPML IV estimation, Control function approach. Estimation period: 2000-2015

Instruments:Average Income abroad and Proportion of destinations with visa restrictions

LHS column: first-stage estimation results. RHS column: PPML IV results

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Total Voicing, Climate and Emigration: lagged emigration

	Dependent Variable: Total Voicing about Climate				
	(1)	(2)	(3)	(4)	(5)
Lagged Emigration	-5.465***	-5.033***	-5.014***	-5.328***	-5.128***
	(1.456)	(1.185)	(1.217)	(1.253)	(1.265)
Nat. Disasters	1.613***	1.581***	1.577***	1.218**	1.317***
	(0.476)	(0.487)	(0.471)	(0.497)	(0.470)
Sea level rise	0.079***	0.082***	0.081***	0.086***	0.052**
	(0.013)	(0.013)	(0.013)	(0.013)	(0.023)
Temp	0.022	0.026**	0.026**	-	0.028
	(0.018)	(0.012)	(0.012)		(0.018)
Population	0.0023***	0.0023***	0.0023***	0.0021***	0.0022***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0002)
Freedom	-0.002	-	-	-	-
	(0.005)				
French	-0.979***	-0.981***	-0.985***	-0.947***	-0.797***
	(0.232)	(0.237)	(0.225)	(0.238)	(0.237)
Spanish	0.029	0.022	-	-	0.287
	(0.260)	(0.259)			(0.399)
Island	-	-	-	-+	0.206
					(0.284)
Constant	0.914	0.705*	0.711*	1.393***	-0.747
	(0.769)	(0.399)	(0.388)	(0.176)	(0.546)
Time Fixed Effects	YES	YES	YES	YES	YES
Income dummies	NO	NO	NO	NO	YES
Observations	343	345	345	347	345
Number of countries	87	87	87	87	87
Pseudo-R^2	0.893	0.892	0.893	0.870	0.897

Notes: PPML estimation. Estimation period: 2000-2015. One-period lagged Emigration rate.
Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Total Voicing: PPML IV estimations and lagged emigration

	Dependent Variable: Total Voicing about Climate					
	(1)		(2)		(2)	
	(L.Emig)	(IV)	(L.Emig)	(IV)	(L.Emig)	(IV)
Lagged Emigration	-	-10.31**	-	-11.38**	-	-17.15**
		(5.11)		(4.788)		(8.060)
Nat. Disasters	-0.037	1.533**	-0.040	1.534**	-0.040*	0.719
	(0.024)	(0.652)	(0.024)	(0.644)	(0.025)	(0.887)
Sea level rise	0.0021	0.139***	0.0015	0.138***	0.0012	0.124***
	(0.0014)	(0.036)	(0.0014)	(0.034)	(0.0016)	(0.043)
Temp	-0.0016***	-0.009	-	-	-0.0016***	-0.024
	(0.0006)	(0.026)			(0.0006)	(0.026)
Population	-0.0002***	0.0019***	-0.0002***	0.0019***	-0.0002***	0.0018***
	(0.0000)	(0.0005)	(0.0000)	(0.0004)	(0.0000)	(0.0006)
Freedom	-0.0010***	-0.014	-0.0009***	-0.015*	-	-
	(0.0002)	(0.010)	(0.0002)	(0.009)		
French	-0.018**	-1.513***	-0.023***	-1.550***	-0.015*	-1.904***
	(0.009)	(0.392)	(0.008)	(0.398)	(0.008)	(0.343)
Spanish	-0.018*	-0.802**	-0.022***	-0.830**	-0.019**	-1.130**
	(0.010)	(0.356)	(0.009)	(0.363)	(0.009)	(0.340)
Island	-	-	-	-	0.052***	1.903***
					(0.012)	(0.673)
Foreign income	0.373***	-	0.396***	-	0.215**	-
	(0.092)		(0.094)		(0.103)	
Visa restrictions	-0.071**	-	-0.055*	-	-0.108***	-
	(0.030)		(0.025)	(0.024)		
Constant	0.223***	3.082**	0.174***	2.983***	0.195***	3.097***
	(0.030)	(1.282)	(0.029)	(1.363)	(0.023)	(0.975)
Time Fixed Effects	YES	YES	YES	YES	YES	YES
Observations	343	343	345	345	345	345
Number of countries	87	87	87	87	87	87

Notes: PPML IV estimation, Control function approach. Estimation period: 2000-2015.
One-period lagged emigration.

Instruments:Average Income abroad and Proportion of destinations with visa restrictions.

LHS column: first-stage estimation results. RHS column: PPML IV results.

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Official Voicing, Climate and Emigration

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent Variable: Official Voicing about Climate					
	(Emigration)			(Lagged Emigration)		
Emigration	-4.774***	-4.703***	-5.153***	-4.878***	-4.839***	-5.264***
	(1.476)	(1.186)	(1.178)	(1.566)	(1.189)	(1.202)
Nat. Disasters	1.631***	1.251***	1.504***	1.596***	1.219**	1.469***
	(0.487)	(0.474)	(0.424)	(0.527)	(0.477)	(0.435)
Sea level rise	0.087***	0.092***	0.074***	0.087***	0.091***	0.074***
	(0.013)	(0.013)	(0.015)	(0.011)	(0.013)	(0.015)
Temp	0.023	-	0.019*	0.022	-	0.019
	(0.019)		(0.011)	(0.022)		(0.018)
Population	0.0024***	0.0022***	0.0024***	0.0024***	0.0022***	0.0024***
	(0.0001)	(0.0001)	(0.0002)	(0.0001)	(0.0001)	(0.0002)
Freedom	-0.0002	-	-	-0.0002	-	-
	(0.005)			(0.006)		
French	-1.034***	-1.024***	-1.040***	-1.024***	-1.011***	-1.029***
	(0.243)	(0.246)	(0.236)	(0.263)	(0.247)	(0.239)
Spanish	0.128	-	0.124	0.110	-	0.106
	(0.264)		(0.264)	(0.335)		(0.264)
island	-	-	0.368	-	-	0.365
			(0.242)			(0.242)
Constant	0.586	1.180***	0.609	0.594	1.183***	0.621
	(0.831)	(0.170)	(0.389)	(0.999)	(0.170)	(0.395)
Time Fixed Effects	YES	YES	YES	YES	YES	YES
Observations	344	348	346	343	347	345
Number of countries	87	87	87	87	87	87
Pseudo-R^2	0.909	0.891	0.909	0.908	0.892	0.908

Notes: PPML estimation. Estimation period: 2000-2015.

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Official Voicing, Climate and Emigration: PPML IV estimations

	Dependent Variable: Official Voicing about Climate									
	(Emigration)						(Lagged Emigration)			
	(1)		(2)		(3)		(4)		(5)	
	(Emig)	(IV)	(Emig)	(IV)	(Emig)	(IV)	(L.Emig)	(IV)	(L.Emig)	(IV)
Emigration	-	-10.16*	-	-10.38**		-15.91**	-	-10.15*	-	-16.51**
		(5.553)		(5.270)		(8.91)		(5.237)		(8.43)
Nat. Disasters	-0.034	1.680**	-0.039	1.682**	-0.040	0.915	-0.040*	1.601**	-0.045*	0.790
	(0.024)	(0.677)	(0.025)	(0.666)	(0.025)	(0.931)	(0.024)	(0.656)	(0.025)	(0.941)
Sea level rise	0.0021	0.149***	0.0015	0.145***	0.0006	0.112***	0.001	0.145***	0.0008	0.118***
	(0.0014)	(0.036)	(0.0014)	(0.033)	(0.0016)	(0.040)	(0.001)	(0.034)	(0.0016)	(0.041)
Temp	-0.0013**	-0.012	-	-	-	-	-	-	-	-
	(0.0005)	(0.028)								
Population	-0.0002***	0.0021***	-0.0002***	0.0021***	-0.0002***	0.0011***	-0.0001***	0.0020***	-0.0001***	0.0020***
	(0.0000)	(0.0005)	(0.0000)	(0.0004)	(0.0000)	(0.0004)	(0.0000)	(0.0004)	(0.0000)	(0.0005)
Freedom	-0.0011***	-0.016*	-0.0011***	-0.016*	-	-	-0.0009***	-0.015*	-	-
	(0.0002)	(0.010)	(0.0002)	(0.010)				(0.009)		
French	-0.023***	-1.509***	-0.028***	-1.535***	-0.020***	-1.900***	-0.023***	-1.509***	-0.020***	-1.900***
	(0.007)	(0.425)	(0.007)	(0.432)	(0.007)	(0.358)	(0.008)	(0.414)	(0.008)	(0.349)
Spanish	-0.015	-0.640*	-0.017*	-0.659*	-0.018*	-0.954*	-0.020**	-0.674*	-0.021**	-1.046***
	(0.010)	(0.367)	(0.009)	(0.371)	(0.009)	(0.337)	(0.009)	(0.369)	(0.009)	(0.345)
Island	-	-	-	-	0.054***	1.958***	-	-	0.045***	1.864***
					(0.013)	(0.707)			(0.012)	(0.664)
Foreign income	0.359***	-	0.381***	-	0.262**	-	0.396***		0.260**	
	(0.092)		(0.094)		(0.107)		(0.094)		(0.102)	
Visa restrictions	-0.054**	-	-0.043*	-	-0.101***	-	-0.055*		-0.094***	
	(0.02)		(0.025)		(0.028)		(0.029)		(0.027)	
Constant	0.215***	3.014**	0.177***	2.718***	0.156***	2.161***	0.174***	2.622***	0.151***	2.253***
	(0.029)	(1.363)	(0.027)	(1.363)	(0.027)	(0.619)	(0.029)	(0.891)	(0.026)	(0.658)
Time Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	344	344	346	346	348	348	345	345	347	347
Number of countries	87	87	87	87	87	87	87	87	87	87

Notes: PPML IV estimation, Control function approach. Estimation period: 2000-2015

Instruments:Average Income abroad and Proportion of destinations with visa restrictions

LHS column: first-stage estimation results. RHS column: PPML IV results. Cols (1)-(3): contemporaneous emigration. Cols (4)-(6): One-period lagged emigration.

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8: Domestic Voicing, Climate and Emigration

	Dependent Variable: Domestic Voicing about Climate					
	(Emigration)			(Lagged Emigration)		
	(1)	(2)	(3)	(4)	(5)	(6)
Emigration	-5.309***	-5.900***	-5.587***	-5.430***	-6.035***	-5.725***
	(1.353)	(1.284)	(1.337)	(1.351)	(1.283)	(1.349)
Nat. Disasters	1.602***	1.468***	1.522***	1.561***	1.419***	1.482***
	(0.436)	(0.424)	(0.401)	(0.447)	(0.433)	(0.413)
Sea level rise	0.082***	0.085***	0.071***	0.081***	0.084***	0.071***
	(0.013)	(0.013)	(0.014)	(0.013)	(0.013)	(0.014)
Temp	0.019	-	0.019	0.019	-	0.019
	(0.016)		(0.017)	(0.017)		(0.017)
Population	0.0022***	0.0021***	0.0023***	0.0022***	0.0021***	0.0023***
	(0.0002)	(0.0001)	(0.0002)	(0.0001)	(0.0001)	(0.0002)
Freedom	-0.0048	- 0.0082**	-0.0035	-0.0002	- 0.0082**	-0.0035
	(0.0044)	(0.0033)	(0.0044)	(0.006)	(0.0033)	(0.0044)
French	-0.945***	-0.911***	-0.954***	-0.933***	-0.898***	-0.942***
	(0.232)	(0.230)	(0.226)	(0.234)	(0.233)	(0.228)
Spanish	-0.522**	-0.515**	-0.523**	-0.541**	-0.535**	-0.542**
	(0.234)	(0.234)	(0.235)	(0.234)	(0.232)	(0.235)
Island	-	-	0.251	-	-	0.249
			(0.231)			(0.231)
Constant	1.045	1.734***	0.950	1.049	1.183***	0.960
	(0.700)	(0.254)	(0.707)	(0.700)	(0.170)	(0.710)
Time Fixed Effects	YES	YES	YES	YES	YES	YES
Observations	344	346	344	343	345	343
Number of countries	87	87	87	87	87	87
Pseudo-R^2	0.867	0.862	0.866	0.866	0.862	0.867

Notes: PPML estimation. Estimation period: 2000-2015.

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

4.4 Robustness: Alternative Measure of Emigration

For our benchmark results we computed emigration rates based on migration stock data provided by the United Nations Statistical Division, since these data are comprehensive and because of the uncertainty in the timing of any emigration response to climate change. Nevertheless, the computed emigration rates might fail to capture short- run variations in

Table 9: Domestic Voicing, Climate and Emigration: PPML IV estimations

	Dependent Variable: Domestic Voicing about Climate											
	(Emigration)						(Lagged Emigration)					
	(1)		(2)		(3)		(4)		(5)		(6)	
	(Emig)	(IV)	(Emig)	(IV)	(Emig)	(IV)	(L.Emig)	(IV)	(L.Emig)	(IV)	(L.Emig)	(IV)
Emigration	-	-12.13**	-	-12.11**	-	-28.50**	-	-11.37**	-	-12.32**	-	-28.83**
		(5.893)		(5.579)		(12.51)		(6.040)		(5.509)		(12.836)
Nat. Disasters	-0.034	2.183**	-0.039	2.123**	-0.037	2.129**	-0.039	0.880	-0.040*	2.045**	-0.044*	0.719
	(0.024)	(0.867)	(0.024)	(0.855)	(0.024)	(1.148)	(0.024)	(0.855)	(0.024)	(0.829)	(0.025)	(0.719)
Sea level rise	0.0021	0.162***	0.0015	0.151***	0.0000	0.082	0.0021	0.160***	0.0015	0.151***	0.0000	0.089
	(0.0015)	(0.036)	0.0015)	(0.033)	(0.0010)	(0.057)	(0.0014)	(0.036)	(0.0014)	(0.033)	(0.0015)	(0.056)
Temp	-0.0013**	-0.027	-	-	-	-	-0.0016***	-0.030	-	-	-	-
	(0.0006)	(0.030)					(0.0006)	(0.030)				
Population	-0.0002***	0.0020***	-0.0002***	0.0021***	-0.0002***	0.0019***	-0.0002***	0.0018***	-0.0002***	0.0020***	-0.0002***	0.0018***
	(0.0000)	(0.0006)	(0.0000)	(0.0004)	(0.0001)	(0.0007)	(0.0000)	(0.0005)	(0.0000)	(0.0005)	(0.0001)	(0.0006)
Freedom	-0.0011***	-0.027*	-0.0011***	-0.025**	-0.0010***	-0.028**	-0.0010***	-0.025*	-0.0009***	-0.023**	-0.0007**	-0.026*
	(0.0002)	(0.011)	(0.0002)	(0.010)	(0.0002)	(0.014)	(0.0002)	(0.011)	(0.0002)	(0.010)	(0.0002)	(0.014)
French	-0.024***	-1.314***	-0.028***	-1.355***	-0.026***	-2.122***	-0.018**	-1.276***	-0.023***	-1.336***	-0.021***	-2.010***
	(0.008)	(0.426)	(0.007)	(0.430)	(0.007)	(0.455)	(0.008)	(0.404)	(0.008)	(0.410)	(0.008)	(0.430)
Spanish	-0.015	-1.168***	-0.017*	-1.211***	-0.016*	-1.616***	-0.015	-1.179***	-0.020**	-1.247***	-0.019**	-1.741***
	(0.010)	(0.349)	(0.009)	(0.350)	(0.009)	(0.389)	(0.009)	(0.342)	(0.009)	(0.349)	(0.009)	(0.405)
Island	-	-	-	-	0.041***	2.532***	-	-	-	-	0.033**	2.338***
					(0.014)	(0.921)					(0.013)	(0.838)
Foreign income	0.359***	-	0.381***	-	0.269***	-	0.373***	-	0.396***	0.266***	-	
	(0.092)		(0.094)		(0.104)		(0.092)		(0.094)		(0.100)	
Visa restrictions	-0.054**	-	-0.043*	-	-0.049*	-	-0.071**	-	-0.055*		-0.047*	
	(0.02)		(0.025)		(0.026)		(0.030)		(0.029)		(0.025)	
Constant	0.215***	4.153**	0.177***	3.417***	0.157***	4.788***	0.222***	4.030***	0.174***	3.357***	0.153***	4.762***
	(0.029)	(1.392)	(0.027)	(0.974)	(0.029)	(1.648)	(0.030)	(1.427)	(0.029)	(0.936)	(0.027)	(1.664)
Time Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	344	344	346	346	345	345	343	343	345	345	345	345
Number of countries	87	87	87	87	87	87	87	87	87	87	87	87

Notes: PPML IV estimation, Control function approach. Estimation period: 2000-2015

Instruments:Average Income abroad and Proportion of destinations with visa restrictions

LHS column: first-stage estimation results. RHS column: PPML IV results. Cols (1)-(3): contemporaneous emigration. Cols (4)-(6): One-period lagged emigration.

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

emigration.[27]

An obvious alternative to using migrant stocks is to use migrant flows. Comprehensive datasets of observable migrant flows comprising all destinations in the world are unavailable however. Therefore, for the sake of robustness, we instead compute emigration rates on the basis of a comprehensive data base of migrant flows as presented in Abel (2018), which are imputed from two sources of migrant stock data, either Özden et al. (2011) else the United Nations Population Division, in other words from the stock data that we otherwise rely upon in our baseline regressions.

We implement two alternative measures. The first is based on the average dyadic migration flow, based on all non missing observations. This measure includes zero migration flows when calculating the averages. Our second measure implicitly assumes that zero reported migration flows constitute missing data, such that the computed migration flows are the averages across all positive values.[28] For both measures, we compute the global emigration flow for each origin country in each time period and calculate the emigration rate as a ratio of this computed emigration flow to the population at origin. Computing the correlation of the two measures with the emigration rate used in the benchmark analysis, we find correlations of 55% and 52% respectively.

Table 10 presents the results of our estimations using our two alternative measures of emigration rates. Results are reported for total voicing, using PPML and PPML-IV, again using similar instruments as in our benchmark analysis. Our two key findings, namely the positive influence of climatic change on voicing, as captured by natural disasters and sea level rises and the substitution between emigration and voicing still hold. The IV results however, are more negative by an order of magnitude. Our main result is qualitatively robust to the use of another measure of migration.

[27]Neither do we attempt to proxy bilateral migrant flows based on the differences in bilateral migrant stocks, due to the high proportion of negative values that result.

[28]If for a given dyad and a given period there is no positive values but well reported zero values, we ascribe a zero value to this observation.

Table 10: Robustness check using emigration flows

	Dependent Variable: Total Voicing about Climate					
	(1)	(2)		(3)	(4)	
		(Definition 1)			(Definition 2)	
	(PPML)	(Emig)	(IV)	(PPML)	(Emig)	(IV)
Emigration	-14.21**	-	-94.02*	-12.53**	-	-94.43*
	(6.08)		(50.44)	(5.825)		(51.41)
Nat. Disasters	1.703***	-0.0010	2.262**	1.686***	-0.0030	2.110**
	(0.510)	(1.06)	(0.0046)	(0.528)	(0.0051)	(0.899)
Sea level rise	0.088***	0.0006*	0.182***	0.088***	0.0005	0.177***
	(0.017)	(0.003)	(0.058)	(0.017)	(0.0004)	(0.055)
Temp	0.031***	0.0000	0.0084	0.0031***	0.0001	0.007
	(0.011)	(0.0002)	(0.029)	(0.011)	(0.0001)	(0.030)
Population	0.0024***	-0.0002***	0.0016**	0.0024***	-0.0003***	0.0016*
	(0.0001)	(0.000)	(0.0008)	(0.0001)	(0.0000)	(0.0008)
French	-1.022***	-0.004**	-1.517***	-1.017***	-0.005***	-1.585***
	(0.226)	(0.002)	(0.543)	(0.230)	(0.002)	(0.565)
Foreign income	-	0.359***		-	0.371**	-
		(0.128)			(0.148)	
Visa restrictions	0.128	-0.020**	-	-	-0.020*	-
			(0.010)		(0.011)	
Constant	0.354	0.020*	1.228***	0.326**	0.018	1.036
	(0.375)	(0.010)	(0.711)	(0.375)	(0.011)	(0.722)
Time Fixed Effects	YES	YES	YES	YES	YES	YES
Observations	332	332	332	332	332	332
Number of countries	87	87	87	87	87	87
Pseudo-R^2	0.899	-	-	0.899	-	-

Notes: cols (2), (3), (5) and (6) :PPML IV estimation, Control function approach. Estimation period: 2000-2015

Instruments:Average Income abroad and Proportion of destinations with visa restrictions

LHS column: first-stage estimation results. RHS column: PPML IV results

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5 Conclusion

Paradoxically, we observe far less emigration, than we would otherwise expect, from those countries most affected by climate change. In this paper, we highlight a new mechanism through which developing countries adapt to climate change, namely through 'voicing about climate change'.

Drawing on Hirschman's treatise on Exit, Voice and Loyalty, we provide plausibly causal evidence of a substitution effect between emigrating internationally and 'voicing' concerns about climate change, in an attempt to strengthen the bargaining power of affected populations in any future negotiations. We find that when populations tend to emigrate less when confronted with the adverse consequences of climate change, for example because they are prevented to do so by migration restrictions imposed by destinations countries, they tend to voice more. We show that this is the case for two different components of voicing. Less emigration implies more private voicing, i.e. voicing done by private agents such as the residents or NGOs who voice towards their government. Less emigration also means more official voicing, i.e. voicing from the governments of affected countries abroad, in order to get help or claim compensation.

The implications of our analysis are manyfold. First, in the presence of restrictive immigration policies imposed by high income countries, one can expect more protests in countries subject to adverse consequences of climate change. Residents of these countries will inevitably put more pressure on their governments to find alternative adaptation solutions to climate change. In the extreme, this pressure will lead to civil strife. In turn, this might lead to future polemics between countries regarding compensation mechanisms. In other words, emigration from affected countries to high income countries may be viewed as a safety valve to decrease pressures at origin. The failure of high income countries to issue visas permitting climatic refugees to find opportunities elsewhere will therefore tend to feed political disagreements at the international level. The proposed experimental visa for climate change refugees from Pacific Islands for example, considered by the New Zealand authorities in 2017, was eventually put on hold. Our work implies that the decision to decline granting refugee status on the basis of climate change will increase the protest from families living on Pacific Islands and their governments to countries such as New Zealand and will potentially undermine the diplomatic relationships in that part of the world. Needless to say, these dynamics are by no means unique to Oceania.

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Appendices

A Data: additional information

A.1 Sample of Countries

Our sample of countries is first selected on the basis of their high exposition to climate change as captured by the Climate Change Risk Index (CCRI). This index is a composite index reflecting different kinds of environmental risks and is computed by Mapplecroft Company. The CCRI evaluates the vulnerability of human populations to extreme climate events and slow-onset changes in climate in climate over the next 30 years. The global index summarizes in a single figure climate change exposure, sensitivity and adaptative capacity.

We take the first 100 countries ranked using this index provided their score includes at least two sub-indexes. We use the value of the CCRI computed in 2011.

The following table (see Figure A.1.) gives the list of initially selected countries.

The issue is that the CCRI index is not accurately measured for small insular states due to data unavailability. In particular, while some of them are highly exposed to threats associated to sea level rise, they are not included in this selection because their score is based only on one sub-indicator. Therefore, the selection is supplemented with the following set of small state islands: Cabo Verde, Comoros, Dominica, Fiji, Grenada, Jamaica, Kiribati, Maldives, Marshall Islands, Mauritius, Fed. States of Micronesia, Nauru, Palau, Samoa, Sao Tome and Principe, Seychelles, Solomon Islands, Timor Leste, Tonga, Tuvalu and Vanuatu.

Rank	country	IndexM	Rank	country	IndexM
1	Burundi	66.779	51	China	47.638
2	Vanuatu	66.677	52	Honduras	47.381
3	Chad	66.294	53	Guyana	46.397
4	Sudan	65.680	54	Iraq	46.028
5	Papua New Guinea	64.825	55	Laos	45.842
6	Bangladesh	64.248	56	Djibouti	45.747
7	Niger	64.126	57	Vietnam	45.546
8	India	62.946	58	Bolivia	45.384
9	Haiti	62.861	59	Ghana	45.156
10	Madagascar	62.554	60	El Salvador	44.375
11	Afghanistan	61.781	61	Dominican Republic	44.338
12	Yemen	60.750	62	Namibia	44.323
13	Sierra Leone	60.514	63	Indonesia	43.705
14	Senegal	59.796	64	Trinidad & Tobago	42.535
15	Mali	59.659	65	Comoros	42.443
16	Mauritania	59.304	66	Sri Lanka	42.304
17	Cambodia	58.814	67	Angola	41.148
18	Myanmar	58.788	68	Jamaica	40.883
19	Zimbabwe	58.470	69	Morocco	40.608
20	Philippines	58.344	70	Costa Rica	39.856
21	Liberia	58.333	71	Fiji	39.419
22	Tonga	58.081	72	Tajikistan	39.338
23	Benin	58.027	73	South Africa	39.024
24	Mozambique	57.677	74	Paraguay	38.702
25	Rwanda	57.233	75	Algeria	38.580
26	Congo	57.004	76	Uzbekistan	38.543
27	Ethiopia	56.601	77	Cape Verde	37.841
28	Togo	55.983	78	Lebanon	36.940
29	Guinea-Bissau	55.830	79	Belize	36.483
30	Zambia	55.602	80	Ecuador	36.329
31	Solomon Islands	54.983	81	Peru	36.252
32	Malawi	54.866	82	Bhutan	36.130
33	Uganda	53.985	83	Azerbaijan	35.593
34	Guatemala	52.710	84	Botswana	35.484
35	Burkina Faso	52.558	85	Gabon	35.385
36	Cote d'Ivoire	52.010	86	Venezuela	34.985
37	Tanzania	51.897	87	Mauritius	34.962
38	Nigeria	50.952	88	Turkmenistan	34.803
39	Guinea	49.965	89	Brunei Darussalam	34.669
40	Eritrea	49.950	90	Syrian Arab Republic	34.538
41	Equatorial Guinea	49.858	91	Suriname	34.464
42	Timor-Leste	49.821	92	Colombia	34.405
43	Nicaragua	49.688	93	Tunisia	34.141
44	Pakistan	49.643	94	Cuba	34.078
45	Nepal	49.454	95	Thailand	34.029
46	Kenya	48.862	96	Bahamas	33.768
47	Cameroon	48.797	97	Serbia	33.751
48	Swaziland	48.631	98	Kyrgyz Republic	33.595
49	Lesotho	48.251	99	Panama	33.554
50	Gambia	47.936	100	Libya	33.279

Figure A.1: List of countries in the initial sample ranked by value of vulnerability index

A.2 Voicing

We extract reports about voicing activity in each country and period from the online Global news *Factiva* database (www.factiva.com). Our measure of voicing activity is the number of reports drawn from a search in the *Factiva* database in each country. The search is based on a code that look for reports including words that are equivalent or close to a set of keywords capturing voicing activity about climate change. The following code is an example of the search code for Bangladesh:

[Bangladesh Near10 ((president* or leader* or people or minister* or government* or resident* or inhabitant* or authorit* or ngo or chief or governor* or (head of) or premier or official* or mayor or "PM" or commander or ruler* or director* or officer* or executive* or judge or ambassador* or consul or CEO) near8 (voic* or protest* or accus* or panic* or warn* or blam* or denounc* or denunciate* or attribut* or complain* or sue* or condemn* or disapprov* or frustrat* or concern* or critici* or vocali?e* or enunciat* or verbali?e* or declare* or mention* or riot or dissent or outcry or revolt or disagree))] AND [Bangladesh* same ((((president* or leader* or people or minister* or government* or resident* or inhabitant* or authorit* or ngo or chief or governor* or (head of) or premier or official* or mayor or "PM" or commander or ruler* or director* or officer* or executive* or judge or ambassador* or consul or CEO) near8 (voic* or protest* or accus* or panic* or warn* or blam* or denounc* or denunciate* or attribut* or complain* or sue* or condemn* or disapprov* or frustrat* or concern* or critici* or vocali?e* or enunciat* or verbali?e* or declare* or mention* or riot or dissent or outcry or revolt or disagree)) Near10 ((climat* near5 (chang* OR catastroph* OR disaster* OR transform* OR adjust* OR trend* OR warm* OR heat or heating OR cool* OR variab*)) OR (environmental near5 (change or transformation)) OR (greenhouse* W/3 (effect* or gas*)) OR ((global* OR earth* OR world* OR international* OR hemisphere*) near5 (warm* OR heat or heating OR cool* OR chill*)) OR (temperature* near5 (increas* OR rising* OR rise* OR decreas*)) OR ((sea near2 level*) near5 (rise* OR rising OR increas*)) OR (climate change near10 (drought* OR flood* OR storm* OR (extreme temperature*)))))))]*