Foreign Television, Language Proficiency and Brain Drain: Evidence from a Natural Experiment *

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Abstract

We study how foreign language proficiency affects brain drain by exploiting the exposure of parts of Albania to Italian television in the second half of the twentieth century. At that time, Albania was isolated from the rest of the world, with controlled internal migration and prohibited international migration. As the Italian TV transmitter accidentally reached Albania, Albanians' exposure to the signal was as good as random conditional on geographical variables. We find that exposure to Italian TV led to a considerable increase in Italian proficiency rates. It also strongly increased the probability of emigration of highly skilled individuals, but did not affect other skill groups. We rule out other channels through which TV might affect migration and interpret our findings as the effect of foreign language proficiency on brain drain.

Keywords: Media & Economics; Migration; Albania; Media & Society.

JEL codes: O15; L82; F22; Z13.

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1 Introduction

Linguistic distance between countries' languages is a key determinant of migratory flows (Belot and Ederveen, 2012; Adserà and Pytliková, 2015): migrants suffer worse labour market outcomes when this distance increases (Adsera and Ferrer, 2015), rendering emigration towards countries with languages far away from their own less attractive. The penalty imposed by linguistic differences is especially hard on high-skill individuals for whom communication skills are more valuable (Chiswick, 1995; Berman, Lang, and Siniver, 2003). As a consequence, linguistic distance is an important driver of migrants self-selection into emigration (Borjas, 1987; Belot and Hatton, 2012): the higher the proximity between two countries' languages, the more migratory flows are composed of educated individuals. Although the relationship between language and migration has received much attention, empirical research has remained observational in nature, unable to quantify and inform the causal effect of foreign language proficiency on migration decisions. To this day, we have little evidence on the effects of policies that promote multilingualism on emigration patterns, and in particular on the emigration decisions of the educated. Yet, the considerable impact of the migration of high-skill individuals, i.e. brain drain, on the economy of origin countries is the object of continuous interest in the literature (Docquier and Rapoport, 2012; Shrestha, 2017; Anelli et al., forthcoming).

We fill this gap in the literature by bringing novel causal evidence of the relationship between foreign language proficiency and emigration, and in particular on the emigration of high-skill individuals. To do so, we exploit a natural experiment. In 1957, the Italian public broadcasting company (RAI) constructed an antenna in Puglia (southeast Italy), its signal unintentionally reached some parts of neighboring Albania. At the time, and until 1990, Albania was a communist dictatorship isolated from the rest of the world, both physically and culturally. Conditional on geographical characteristics, we show that individual's exposure to Italian television was quasi-random; the specificity of this historical episode allows to dispel

common endogeneity concerns: signal access was unintentional, and internal movement in Albania was controlled, preventing Albanians to move where signal was available. These features solve the problem of endogenous location choice for both the transmitter and the individuals which usually leads to biased estimates of media exposure on observed outcomes. After 1990, the regime collapsed; massive emigration waves and a brain drain ensued (Gërmenji and Milo, 2011; Gëdeshi and King, 2019). We exploit this unique setting, devoid of selection issues, to study the effects of Italian television access on Italian language proficiency, and on migration probabilities of Albanians.

We rely on three datasets for this study: (i) a geo-referenced dataset of signal availability and power provided by RAI (*RAI dataset*, henceforth); (ii) a geo-referenced dataset of terrain characteristics aggregated at the municipality level (*Terrain* dataset); (iii) the 2005 Living Standard Measurement Survey of the World Bank and Albanian statistical agency (*LSMS*, henceforth). For each municipality in Albania, we use the *RAI* dataset to measure the average exposure to Italian television, with the *Terrain* dataset, we measure the distance of each municipality to the television transmitter, to Italy, and to the nearest port, additionally, we compute measures of average elevation and terrain ruggedness. We exploit three sections of the LSMS: the internal migration folder to relocate individuals to their municipality of residence in 1990 to deduce whether they had access to Italian television before the fall of the dictatorship; the questionnaire on foreign language proficiency (Italian, English, Greek and other languages) in 1990; since, by construction, the LSMS includes only individuals who never migrated or who migrated but returned to Albania, we use the questionnaire on where siblings of LSMS respondents lived to create a dataset where Albanians can be either in Albania or abroad. The LSMS sample is composed of 11,040 adults and the siblings dataset of 27,666 individuals, they are distributed in 322 municipalities.

First, we investigate the effect of Italian television access on foreign language proficiency in 1990. The LSMS base sample comprises only non-migrants, we are thus unable to estimate the average treatment effect of television on language proficiency. However, in line with

the literature, we assume that non-migrants have a lower propensity to learn a foreign language than migrants (Bütikofer and Peri, 2021), hence, estimation on the sample of non-migrant yields a lower bound of the effect of Italian TV access on language skills. Between municipalities fully exposed to Italian television and those without any exposure, we estimate a lower-bound positive increase of 7 percentage points in rates of Italian proficiency: more than twice the average Italian language proficiency rate of 5.3% in 1990. We successfully conduct placebo tests for other foreign languages.

Second, using the sample of siblings of the LSMS respondents, we estimate the causal effect of Italian TV exposure on the probability of emigrating, and in particular towards Italy. We find no effect on the probability of migrating when estimating on the full sample, but a strong positive effect of around 20 percentage points on the probability of emigrating abroad for high-skilled individuals, it is paralleled by an effect of similar magnitude on the probability of emigrating to Italy. To move from this reduced-form estimate to the effect of language proficiency on emigration probability, we would need to perform an instrumental variable regression. However, we do not have information on the Italian language proficiency for siblings, and would thus need to rely for the first-stage on the results of the regressions of foreign language proficiency on the sample of non-migrants. It would underestimate the effect of TV on language proficiency, inducing an overestimation of effects in the second stage. Nonetheless, since the effect of TV exposure on Italian proficiency is necessarily bounded between 0 and 1, we do know that the reduced form estimate is necessarily a lower bound of the effect of language proficiency on the migration probabilities of the highly skilled. Since the reduced form estimate already reaches a sizeable 20p.p., we can confidently claim that foreign language proficiency strongly increases the probability to migrate of high-skilled individuals

We then discuss the exclusion restrictions: namely, that exposure to Italian TV only affects migration behaviour through knowledge of Italian. Competing channels are the effects of television as an information provider and its effect on beliefs (Farré and Fasani, 2013;

Pesando et al., 2021; Adema, Aksoy, and Poutvaara, 2022). We exploits interviews of Albanian migrants conducted in 1991 to show that Albanians were mostly watching entertainment programs from which relevant information for migration, such as job advertisements, regional economic conditions, mobility and housing information, was completely absent. Additionally, we use the LSMS to show that Albanians that migrated internationally and returned did not use TV as a source of information to organize their emigration. We then address the concern that Italian TV caused Albanians to overestimate their return to migrate to Italy (Mai, 2004), it would imply a homogeneous effect across skill categories, instead we observe an effect only for high-skilled individuals only, consistent with the complementarity between language and skills for migrants (Chiswick, 1995; Berman, Lang, and Siniver, 2003) and the Borjas model (Borjas, 1987).[1]

First, our research contributes to the literature on linguistic and cultural determinants of migration. We bring the first causal evidence of the effect of language proficiency on emigration patterns, and in particular on how it contributed to the brain drain in the Albanian context. Our findings complement previous research on linguistic distance and migratory patterns (Belot and Ederveen, 2012; Adsera and Ferrer, 2015). They also contribute to the literature on the causes of brain drain, which identified cultural distance as a key predictor of such phenomenon (Belot and Hatton, 2012).

Second, our research relates to the literature on the impact of mass media on societal outcomes from which we draw both our identification strategy and theoretical framework (Olken, 2009; La Ferrara, 2016; Durante, Pinotti, and Tesei, 2019).[2] In this literature, the works of Braga (2007), Farré and Fasani (2013), and Adema, Aksoy, and Poutvaara (2022) are particularly relevant to this research. Farré and Fasani (2013) shows how TV

[1] In the online Appendix 10.2, we show that the Borjas model predicts an increase in migration probabilities for above-average productive individuals as a consequence of a positive exogenous shock to the correlation parameters for a wide range of parameters.

[2] This literature includes a wide range of possible outcomes: political outcomes (Gentzkow and Shapiro, 2008; Olken, 2009; Enikolopov, Petrova, and Zhuravskaya, 2011), gender norms (Jensen and Oster, 2009; Chong and La Ferrara, 2009; Ferrara, Chong, and Duryea, 2012; Kearney and Levine, 2015)), and consumption choices (Bursztyn and Cantoni, 2016).

exposure in rural Indonesia reduced internal migration by helping to correct overestimated returns to internal mobility; Adema, Aksoy, and Poutvaara (2022) shows how internet access increases desire to migrate and actual migration by reducing the cost of information, trust in government and perceived well-being. Braga (2007) investigates the role of Italian television in fostering seasonal migration in Albania, but does not propose a channel for the impact of TV, nor does it examine the role of Italian television for international migration or consider the heterogeneous impact of TV across skill groups. Our findings complement this research in providing evidence of the effect of media exposure on migration through language skill acquisition, a form of human capital accumulation, rather than information.

We also relate to research focusing on the effect of media on educational outcomes: Gentzkow and Shapiro (2008) shows how television exposure in the US had a positive effect on the test scores of children raised in non-English speaking households. Kearney and Levine (2019) finds the edutainment program *Sesame Street* to have been beneficial for children's educational attainment. Durante, Pinotti, and Tesei (2019) demonstrates how children exposed to Berlusconi's television became less cognitively sophisticated and civically minded. Our research complements these findings by showing how exposure to foreign media increased foreign language proficiency.

Finally, this article relates to the research on language proficiency and migrants integration. Causal studies have documented how proficiency in the host country's language increases migrants earnings (Sarvimäki and Hämäläinen, 2016), labour force participation (Lochmann, Rapoport, and Speciale, 2019) and employment (Lang, 2022; Schmid, forthcoming). Our findings suggest that potential migrants anticipate those improved outcomes when they already are proficient in a foreign country's language.

The paper is organized as follows: in Section 2 we summarise the historical background, Section 3 describes the data, Section 4 then discusses our identification strategy, in section 5 we show the results. Section 6 discusses the exclusion restriction, Section 7 presents

robustness tests. Finally, Section 8 concludes.

2 Historical Background

Enver Hoxha came to power in Albania in 1944 in the immediate aftermath of the war.[3] He rapidly seized absolute power and organized the complete isolation of the country from the outside world: internal migration was controlled and limited, and emigration to foreign countries was forbidden.[4] This isolation also extended to culture: no foreign books, movies, nor newspapers were allowed to circulate. Hoxha's communist regime lasted until 1990.

Despite Enver Hoxha's best efforts, there was *a tear in the wall*. In 1957, the RAI[5] built a television transmitter in Martina Franca (Italy, Puglia- the Italian region closest to Albania, on the other side of the sea). Thanks to its power and the short distance between Italy and Albania, the transmitter unintentionally reached parts of Albania, it still broadcasts to this day, and did so without interruption since 1957. Since the 70s, when TV sets began to be widespread in Albanian homes, Albanians have regularly watched Italian television.[6] Italian programs provided entertainment shows that Albanian television did not feature at the time: it only had one channel broadcasting four hours each day, alternating between propaganda and few Albanians films repeated continuously. It is the entertainment content of Italian programming that proved attractive to Albanians.[7]

In 1990, following pressure for reform from the population, the communist structures began to be dismantled, and in 1992 the first democratically elected government took power.

[3] This section owes much to Dorfles and Gatteschi (1991), Abrahams (2016), and Fevziu et al. (2018)

[4] Only around 6000 Albanians managed to escape to foreign countries between 1944 and 1990. While foreign emigration boomed right at the fall of the regime.

[5] Radiotelevisione italiana - Italian State Television

[6] Historical evidence on Italian television watching in Albania are manifold: Dorfles and Gatteschi (1991), Mai (2004), Abrahams (2016), and Fevziu et al. (2018) among others. Although in 1973 Italian television watching was forbidden in Albania, people continued to do so regularly. Using World Bank data we compute that around 61% of Albanian household had a TV set in 1990. Data on distribution of TV sets by district in Albania in 1990 can be found in the Online Apppendix 10.1.

[7] Interviews of Albanians arriving in Italy in 1990 were conducted, they revealed the extent to which Albanians were familiar with Italian television. More details is available in Appendix 9.1.

From June 1990 onward, Albanians recovered their ability to emigrate. During the 1990s decade, around 800 thousands Albanians migrated abroad, about one fourth of the entire Albanian population at the time. It is estimated that about 600,000 Albanians emigrated to Greece and 200,000 to Italy.[8] This emigration wave has been coined repeatedly as a brain drain in the literature: by 2000, an estimated 20% of high-skilled Albanians had left the country (Docquier and Marfouk, 2006; Gërmenji and Milo, 2011; Gëdeshi and King, 2019). Although migration began immediately after the fall of the regime in 1990, its intensity varied with economic and political events: it picked up pace after the economic crisis of 1997,[9] and reached a peak with the Kosovo crisis.[10]

3 Data Description

Our analysis builds upon the creation of a novel dataset. We collected information on the Italian TV signal coverage in Albania obtained from RAI along with information about terrain elevation from NASA's Shuttle Radar Topography Mission. For each Albanian municipality, we computed distance measurements and a terrain ruggedness indicator. We then aggregated these datasets at the municipality level, and merged them with the 2005 World Bank Living Standard Measurement Survey for Albania that contains individuals information. Finally, we construct an urban area dataset for Albania for 1986 by classifying NASA satellite images using machine learning techniques.

3.1 RAI and Terrain Datasets for Albania

We obtained from RAI geographically referenced data on Italian TV signal strength in Albania. The Italian town of Martina Franca is home to the oldest and most powerful Italian

[8] See Galanxhi et al. (2004). See also Figure 3 in appendix 9.2 which plots yearly emigration flows by destination.

[9] In 1997 a nationwide pyramid scheme collapsed in Albania inducing a strong economic crisis in the country.

[10] Kosovo is home to a large Albanian community, the crisis of 1998-1999 created much unrest in Albania as well.

TV transmitter able to broadcast all the way into Albania, all other transmitters powerful enough to reach Albania have their signals contained in it. Therefore, we only collected and processed the signal emitted from this antenna. Operative since 1957, no modifications were made to the transmitter that changed its power nor reception. To compute its signal propagation across the terrain, the RAI uses a standardized forecasting model[11]. We re-classified the dataset of signal quality provided by RAI in two steps. First, following RAI's guidelines, we re-categorized signal propagation into a binary dataset that describes whether Italian TV is accessible for each 100x100 meters cell of the Albanian map.[12] Second, we computed for each municipality the share of its area where radio signal is available. Figure 1 displays the re-coded TV signal availability across Albanian municipalities.

We collect topographic characteristics of the terrain from the Shuttle Radar Topography Mission of the NASA which contains information on elevation at a 30x30 meters resolution. From this data we compute the terrain ruggedness index following Riley, DeGloria, and Elliot (1999). We then aggregated both elevation and ruggedness at the municipality level by taking the average over municipality area. We complement this topographic data with distance data, by computing for each municipality the average distance of each of its 30x30 meters cells to Italy, to Greece, to the closest port,[13] and to the antenna in Martina Franca.[14]

3.2 2005 Living Standards Measurement Survey Albania

Administered to each household member of 3840 households[15] in 480 primary sample units (geographical census area), the 2005 Living Standards Measurement Survey (LSMS) contains

[11] Prescribed by the International Telecommunication Union, See in particular Recommendation P.526. The model takes into account the diffraction due to the orography of the terrain which reinforces or blocks propagation.

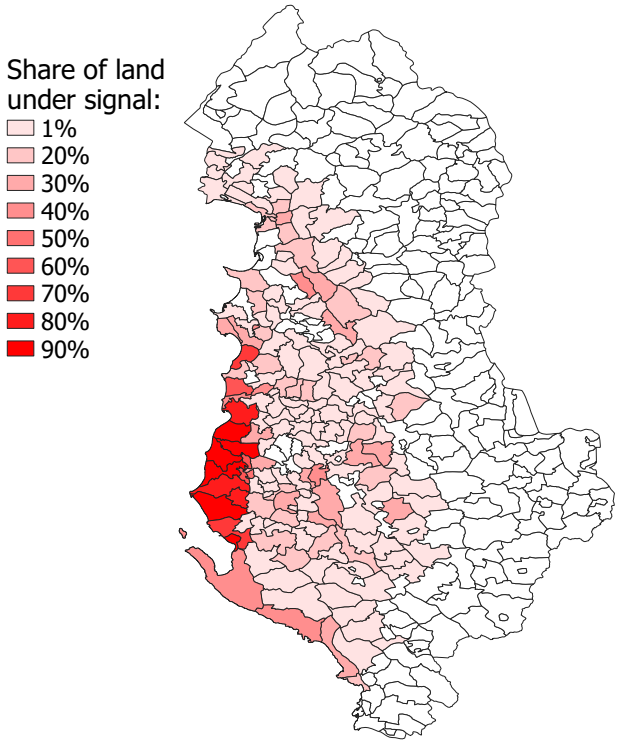
[12] We coded as Italian television as accessible when signal quality reaches the threshold of 55 dBμV/m.

[13] We consider the four most important ports in Albania : Saranda and Vlorë in the south, Durrës in the center, and Shëngjin in the north.

[14] More details is available in the Appendix 9.3

[15] Household membership is defined as having been away from the household for less than 6 months during the year preceding the survey.

Figure 1: RAI Signal Coverage



Notes: Representation of Albania at the municipality division unit. Signal radio is aggregated at the municipality level to compute the share of area with Italian television access.

information on 17302 individuals.[16] Restricting the sample to those who were at least 18 years old in 2005, we retain 11040 individuals living across 322 of the 383 Albanian municipalities.[17] As the survey was conducted in 2005, it provides direct information only on non-migrants, however, household heads and spouses are asked to list all their siblings (henceforth, we refer to household heads and spouses that list their siblings as *listing sibling*) and report for each one their demographics, country of living, and year of departure if they migrated.[18] Household members also list their children and spouse living out of the household. We derive two datasets from these sets of questions: (i) one in which each sibling

[16]Data collection ran between May and early July in 2005. Data and all the material are available at https://microdata.worldbank.org/index.php/catalog/64.

[17]For underage individuals information is missing.

[18]They are asked to list at maximum 7 siblings, however individuals that have more than 7 siblings only make up 2% of the sample.

is an observation (27666 obs.); (ii) another in which each child or spouse out of the household is an observation (4714 obs.). Unlike the respondents of the *LSMS*, individuals in these two additional datasets can either reside in Albania or abroad. We thus derive three datasets from the LSMS, the first about the respondents themselves (hereafter, *base dataset*), the second about the household heads and spouses' siblings (hereafter, *siblings dataset*), and the third about household members' children and spouses out of the household (hereafter, *children / spouses dataset*).

Table 1: 2005 LSMS, Selected Statistics

	Base			Siblings			Children/Spouses		
Variable	All	Men	Women	All	Men	Women	All	Men	Women
Observations	11040	5226	5814	27666	14421	13245	4714	2236	2478
Age Distribution									
25 percentile	24	24	24	37	37	37	27	27	27
50 percentile	40	41	39	45	45	45	33	34	33
75 percentile	53	54	53	55	55	55	40	41	40
Mean	41	41	40	46	46	46	34	34	34
Education									
Primary	54%	49%	58%	.	.	.	52%	53%	51%
Secondary	21%	22%	20%	.	.	.	52%	53%	51%
Vocational	16%	19%	13%	.	.	.	13%	14%	12%
University	9%	10%	9%	.	.	.	9%	8%	10%
Proficiency in 1990									
Italian	5.3%	5.2%	5.3%	.	.	.	7.9%	8.1%	7.7%
Greek	1.9%	2.5%	1.5%	.	.	.	3.1%	4.2%	2.1%
English	4.4%	3.9%	5.0%	.	.	.	3.1%	4.2%	2.1%
Internal Migration									
Before 1990	7.9%	4.7%	11.2%	.	.	.	.	.	.
After 1990	20.6%	16.3%	24.7%	.	.	.	.	.	.
International									
Share migrated	.	.	.	17%	21%	12%	44%	61.3%	28.9%
Before 1990	.	.	.	0.8%	0.6%	1.1%	0.2%	0.2%	0.3 %
Destination									
Italy	.	.	.	32%	32%	33%	39%	41%	36%
Greece	.	.	.	50%	51%	46%	40%	40%	42%
UK	.	.	.	5%	5%	3%	7%	9%	3%
USA	.	.	.	7%	6%	9%	5%	4%	8%
Television									
Ownership rate	62%	.	.	.	.	.	.	.	.

Regarding the base dataset, we concentrate our analysis on three types of information: (i) internal migration history since birth; (ii) foreign language proficiency in 1990; (iii) individual education.[19] Using the internal migration history of respondents, we relocate individuals to their municipality of residence in 1990 and thus to their exposure to Italian television signal before the fall of the regime. Respondents reported their foreign language proficiency in 1990 in Italian, Greek, English or if they had knowledge of "another foreign language". They can answer either 1) Yes, fluently, 2) Yes, some or 3) No. We generate a dummy variable for foreign language proficiency that we code 1 if individuals answer Yes, fluently or Yes, some and 0 if they answer No. Finally, the LSMS records individual's highest education levels, we code a dummy variable equal to 1 if an individual attended university for at least one year. For each individual in the siblings dataset and in the children/spouses dataset, the LSMS includes the country of residence and the date of emigration. The children/spouses dataset also contains information on foreign language skills in 1990. Where necessary, we attribute the characteristics of their relatives to the individuals in these datasets, in particular their location in 1990 and the highest level of education of the listing sibling to the individuals in the siblings dataset. Note that only children are missing from the siblings dataset and that the children/spouses dataset contains information on a specific sub-population of individuals, namely those who have left the household.[20] Neither contains individuals from families that have completely emigrated.

Table 1 presents descriptive statistics for each dataset. All three datasets are balanced in terms of their sex-ratio, they contain between 49.5% and 53.4% men. The bulk of individuals are between thirty and fifty years old, with more than 50% of individuals in all sample. Almost 10% of the household members in the base dataset attended university. With 5.3% of respondents self-declaring their proficiency in Italian, Italian stands as the most widely spoken foreign language in Albania in 1990. English is a close second with 4.4%, and

[19]The exact phrasing of all questions relevant to the analysis of this paper can be found in Appendix 9.4.

[20]However, only children represent a small share of the population, 6% of the sampled household heads and 3% of the spouses.

Greek stands third with 1.9% of individuals. In the children/spouses dataset, 28.1% of the sample could speak Italian in 1990, 22.6% could speak Greek, and 15.1% English. Finally, international migration represents 44.2% of the sample of children/spouses out of the household and 16.9% of the sample of siblings. Within the samples, Italy and Greece are somewhat equally represented as destination countries, with 32% of siblings that migrated living in Italy, 50% in Greece; around 39% of children/spouses living abroad are in Italy with an equal share in Greece. In 1990, The LSMS reports that 62% of households were endowed with a TV set.

3.3 City-Level Dataset for Albania

We build an urban land cover dataset for Albania for 1986. At a resolution of 30x30 meters, we record for each year and each cell whether it contains urban land or not, and we calculate the proportion of the city that is covered by the Italian TV signal. With this dataset we can calculate the proportion of the urban area of a municipality exposed to the signal in 1986, which we call *Signal II*. This alternative measure has the advantage of estimating exposure only in urban areas, thus avoiding the definition of an exposed municipality when it is mainly exposed in the inhabited area.

4 Identification Strategy

A common difficulty in the estimation of a causal effect of signal availability on societal outcomes is the placement of the transmitter. Transmitters are typically placed in strategic locations in order to target specific populations such as densely populated urban areas. In parallel viewers might self-select by relocating to areas where the signal is accessible. This simultaneous selection can substantially bias estimations of causal effects, making the treated population different from the untreated population on unobservables characteristics. The treatment effect on the treated thus differs from the average treatment effect. The

Albanian setting suffers none of these two issues. First the transmitter was placed to satisfy the needs of the Italian population, and no attention was paid to the possibility that the signal might reach Albania, it accidentally did so. Second, emigration was forbidden and internal migration was restricted and centrally managed under the Communist regime, preventing any selection on the Albanian side.[21] Table 1 reports that only 0.2% of migrants in the siblings dataset and 0.7% of the migrants in the children/spouses dataset emigrated abroad before 1990. Internal migration tripled from 7.9% of the sample that internally migrated between 1975 and 1990 to 20.6% between 1990 and 2005. Once controlling for geographic and topographic variables that correlate both with the radio signal exposure and the outcome variables, the exposure to radio signal can be considered as good as random. The controls we consider are: (i) distances to Italy, the transmitter and the nearest port; (ii) topographic data on elevation and ruggedness; (iii) district fixed effects. These controls are potentially correlated with both signal decay and other variables related to our outcomes: migration cost and cultural proximity. Once included, we thus can estimate the effects of residual variations in signal reception due to the topography of the terrain within districts' areas on each outcome variable. We estimate the following specification:

$$y_{i,m,d} = \alpha_0 + \beta \times Sig_m + \gamma \times Dist_m + \theta \times Geo_m + \sum_{d=1}^{36} \alpha_d \times \text{Distr}_d + \epsilon_{i,m,d} \quad (1)$$

Where Sig_m is the share of a municipality's area reached by the TV signal. $Dist_m$ is a vector containing the distances of municipalities to Italy, the nearest port, and the transmitter in Martina Franca. Some specifications also include distance to Greece in $Dist_m$. Geo_m controls for the elevation and ruggedness of municipality m. $Distr_d$ are district fixed-effects, such that we measure within a district the differences created between municipalities by the radio signal.[22] $\epsilon_{i,m,d}$ is the error term. In this specification, β identifies the causal effect of exposure to Italian television on outcome $y_{i,m,d}$. Importantly, it identifies an intent-to-

[21] See Galanxhi et al. (2004) page 9.

[22] Albania is divided in 36 districts, each district contains 8.6 municipalities on average.

treat effect as we only estimate the effect of exposure to the television signal rather than the one of actually watching Italian television. We study 2 sets of outcomes: (i) Language proficiency as measured by the self-declared language proficiency in 1990 of individual i living in municipality m of district d in the *base* dataset; (ii) Migration outcome, as measured by whether an individual in either the *siblings* or the *children*/*spouses* datasets is living abroad in 2005 or not. To compute the heterogeneity of the effects we restrict the samples to specific subsets of the population of interest. Finally, we cluster standard errors at the municipality of residency in 1990 level (i.e. the treatment level) in all regression exercises.

One concern is that municipalities close to the Albanian coastline both concentrate the most TV exposure in the sample and have the lowest distance to either Italy or the transmitter, making it hard to disentangle the effects of distance and TV exposure. If results happen to be sensitive to the exclusion of the municipalities that are the closest to Italy, this might cast doubts on the identification strategy. We address this concern in a number of ways. First, the inclusion of district fixed effects ensures we compare the effect of Italian TV signal between municipalities of the same district, where the distances to Italy are relatively similar. Second, Figure 2 in Section 7 plots the mean TV signal coverage at different deciles of the distribution of distance to Italy, distance to the closest port and elevation. Although TV signal is concentrated in the first deciles of each distribution, there is considerable variation within and beyond those deciles that allows for meaningful comparisons. Third, in Section 7 we go further by showing that results are robust to the exclusion from the sample of the municipalities that are the closest to the ports and the closest to the Greek border. Appendix 9.5 proposes balance tests on age and sex ratios using the siblings dataset, confirming that the treated and untreated samples are comparable on observables.

5 Results

In the following section we present the results of regressions of the effects of Italian television exposure on Italian language proficiency in the 1990 and on the migration probability of individuals between 1990 and 2005. We show that Italian TV exposure had a sizeable and significant effect on the probability to know Italian in 1990, no effect on the probability to migrate on the Albanian population, but a significant and sizeable effect on the probability to migrate for high skilled individuals, and in particular on the probability to migrate to Italy. Results are paired with placebo tests.

5.1 Italian Television and Language Proficiency

This section considers the effect of Italian television on the probability of knowing Italian in 1990. Empirical work highlights the effects of television watching on cognitive outcomes: whether through educational (Kearney and Levine, 2019) or entertainment content (Durante, Pinotti, and Tesei, 2019), television has been found to have an influence on human capital accumulation. In our context, we test whether exposure to the Italian language through television pushed Albanians into developing language skills in Italian.

The LSMS is a survey of non-migrants as only individuals who did not migrate until 2005 are eligible to take the survey, hence on this sample we estimate the effect of television access on the acquisition of language skills of individuals that did not emigrate. In line with the literature, if we assume that non-migrants have a lower propensity to learn a foreign language than migrants (Bütikofer and Peri, 2021), then the estimate of the effect of Italian television access on the language proficiency of the non-migrants is a lower bound of the average treatment effect on the full population. We later test this assumption using the children/spouses dataset which contains information on language proficiency and includes migrants and non-migrants, it allows to estimate the effect of Italian television access given

migration decisions.

Table 2: Italian television effect on foreign language proficiency in 1990

	Base				*Children / Spouse* Abroad	*Children / Spouse* Albania
	Italian (1)	English (2)	Other (3)	Greek (4)	Italian (5)	Italian (6)
Signal	0.070**	0.020	0.006	0.013	0.133**	0.041
	(0.033)	(0.018)	(0.023)	(0.010)	(0.064)	(0.046)
Observations	11040	11040	11040	11040	2088	2626
Controls:						
Common: District F.E., Distance to Italy, Distance to transmitter, Distance to port, Elevation, Ruggedness						
Greek Community	N	N	N	Y	N	N

Notes: The table reports OLS estimates of the effect of exposure to Italian TV on foreign language proficiency in 1990. (1)-(4) use the base dataset, (5)-(6) the children / spouse dataset, in specification (5) the ones living abroad and in (6) the ones living in Albania. The dependent variable is the reported capability of speaking Italian, English, Other (category any other language), and Greek in 1990 coded as a dummy. The main explanatory variable, Signal, is the share of a municipality's area with access to Italian TV. All specifications include district fixed effects, distances to Italy, to the transmitter, and to the nearest port and topographic (elevation and ruggedness) controls. Controls for Greek community in specification (4) include distance to Greece and dummies for: (i) Greek ethnicity, (ii) orthodox religion; (iii) Greek as maternal language; (iv) speaks Greek daily at home; (v) speaks Greek in the community. Clustered standard errors in parentheses. Standard errors are clustered at the municipality of residency in 1990 level (322 clusters for specifications (1)-(4), 232 for (5) and 228 for (6). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

We estimate Equation 1 with foreign language proficiency in 1990 as a dummy outcome variable. Table 2 columns (1)-(4) present the results of the regression of Italian proficiency on TV signal exposure and three placebo test, using individuals from the base dataset of the LSMS as the sample. In municipalities fully exposed to Italian television, estimated effect in column (1) indicates that the rate of Italian proficiency increased by 7 percentage points, more than double the proportion of Italian speakers in Albania. The estimate is significant at the 5% level and economically sizeable. As explained above, since the sample only include non-migrants, this estimate is a lower bound of the average treatment effect. Additionally, as we can only measure television exposure, not television watching, we can only estimate an intention-to-treat effect, lower than the average treatment effect.

Columns (2) to (4) of Table 2 report the results of placebo tests, we check that Italian television exposure did not cause an increase in proficiency of other languages. As expected, the coefficients are small and insignificant. In the case of Greek language proficiency, we added controls related to whether individuals in the sample belong to the Greek diaspora present in Albania, additional controls include dummies for Greek ethnicity, Orthodox religion, and Greek spoken daily at home. We also included a distance variable that measures for each municipality its distance to the Greek border.[23]

To overcome the limitation of the base LSMS sample, which only contains non-migrants, we exploit the dataset of children/spouses which contains household members' spouses and children that no longer live in the households, and can either be international migrants or still in Albania. Regressions (5) and (6) present the estimates of regressions on the sub-sample of children/spouses that respectively live abroad and in Albania. We find a sizeable effect of exposure on Italian proficiency on the sub-sample that lives abroad of 13 additional percentage points in fully exposed municipalities, triple the estimate on the sample of non-migrants. This result approximates the intent-to-treat effect of Italian television exposure on migrants, it confirms that migrants have a higher propensity to learn a foreign language than non-migrants (Bütikofer and Peri, 2021).

The lower bound of 7 percentage points increase we estimate indicates that the impact of television access on rates of Italian proficiency in Albania was considerable, more than doubling the rate of Italian proficiency. We thus find that exposure to foreign media can be used as an effective tool to foster foreign language proficiency. Given empirical results that link linguistic proximity and emigration (Belot and Ederveen, 2012; Adsera and Ferrer, 2015), we expect television access to have impacted patterns of emigration to Italy through its impact on language proficiency.

[23]The case of Greek, owing to the particular history between the two countries, is further discussed in Appendix 9.6.

5.2 Italian Television and Brain Drain

In this section, we investigate the effect of Italian television on the emigration decisions of Albanians between 1990 to 2005. Existing empirical research showed that media exposure can profoundly impact migratory patterns in many different settings (Farré and Fasani, 2013; Kotyrlo, 2020; Pesando et al., 2021; Adema, Aksoy, and Poutvaara, 2022), in the Albanian setting too, as Italian television access raised rates of Italian proficiency, we expect television to have had an effect on emigration patterns. The literature underlined the penalty that linguistic differences represent for highly-skilled migrants (Adsera and Ferrer, 2015) owing to the complementarity between language and skill (Chiswick, 1995; Berman, Lang, and Siniver, 2003). The seminal paper of Borjas (1987) already underlined the importance of such mechanisms in driving the self-selection of migrants. As a consequence, we expect the effect of Italian television to have differed across skill groups.

To conduct this investigation, we resort to the siblings dataset. As discussed in Section 3, the LSMS respondents are all non-migrants, we thus exploited a sample composed of their siblings, that can either be migrants or non-migrants. We assume that siblings of respondents were living in the same municipality as respondents in 1990, consistent with the low internal migration rates characterizing Albania before 1990. As international migration was forbidden prior to 1990 (see Section 2) individuals residing in a foreign country in 2005 migrated between 1990 and 2005. We attribute to siblings the human capital of their listing siblings: we assume that education levels of siblings were highly correlated. Specifically, we define a sibling as high skilled if her listing sibling attended university for at least one year. We exploit the identification strategy described in Section 4. Standard errors are clustered at the municipality of residency in 1990 level (treatment level).

Table 3 column (1) reports the estimate for the effect of TV signal exposure on individuals' probability to migrate abroad, we do not find evidence of an effect. In column (2) we subset for the population for those individuals whose listing sibling attended university for at

Table 3: Effect of Italian Television exposure on migration decisions

	Siblings dataset			
	Abroad (1)	Abroad (2)	Italy (3)	Greece (4)
Signal	-0.002	0.244***	0.131**	0.0518
	(0.031)	(0.074)	(0.059)	(0.074)
Sample	Full	High Skill	High Skill	High Skill
Observations	27666	2153	2153	2153
Common Controls: District F.E., Distance to Italy, to transmitter, to Port, Elevation, Ruggedness				

Notes: The table reports OLS estimates of the effect of exposure to Italian television on the probability to reside abroad. The outcome variable is a dummy taking value 1 if abroad for columns (1) and (2), 1 if in Italy for column (3) and 1 if in Greece for column (4), and 0 otherwise. All specifications use the siblings dataset (see Data Section 3). Specification (1) exploits the full sample of individuals, while specifications (2)-(4) restrict the sample to siblings of individuals that attended university for at least one year. Signal is the share of a municipality's area exposed to Italian television signal. Controls include district fixed effects, distances (to Italy, the transmitter, and the nearest port) and topographic characteristics (elevation, ruggedness). Standard errors are clustered at the municipality of residency in 1990 level (310 clusters for specification (1) and 128 for (2)-(3)-(4)). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

least one year and repeat the estimation of Equation 1. We find an economically and statistically significant effect: Italian television signal increased the migration probabilities of fully exposed individuals by 24 percentage points. We stress that the sample of high-skill individuals represents only 10% of the total sample in specification (1), implying that the effect is "drowned" in the full sample. The positive effect we estimate on high-skill individuals is not paralleled by a significant negative effect on individuals with other education levels.[24] Finally, we test whether the destination of the emigration of the high-skilled is Italy, columns (3) and (4) test for emigration by destination and confirm that the destination of the increase in the emigration probability is Italy. Although reduced in magnitude, Italian television signal access significantly increased emigration towards Italy, and left emigration rates towards Greece unchanged. In Section 7 we successfully test our results with alternative specifications of TV signal and human capital measures.

[24]Results on the rest of the sample are available in Appendix 9.7.

Taken together, results imply that Italian television accentuated the brain drain towards Italy. Television access pushed many educated people into emigration towards Italy, thus increasing the positive selection of emigrants and contributing to the brain drain. Previous research investigating the impact of the media on migration behaviour emphasized the role of the media as a source of information (Farré and Fasani, 2013; Pesando et al., 2021; Adema, Aksoy, and Poutvaara, 2022). In this setting, given results on language proficiency, we expect the language-skill complementarity characterizing highly-skilled individuals to have played an important role in raising their returns to emigration (Chiswick, 1995; Berman, Lang, and Siniver, 2003). We posit that language proficiency is the main mechanism through which Italian television exposure increased the emigration of the educated. In the next section, we discuss the exclusion restriction to our identification strategy.

6 Exclusion Restrictions

6.1 Italian Television, Competing Channels to Language Proficiency

The most widely discussed channel in the literature is the one of information: migrants' expectations about income abroad can be biased (McKenzie, Gibson, and Stillman, 2013), television and media might correct these expectations by providing valuable information about life abroad (Farré and Fasani, 2013; Adema, Aksoy, and Poutvaara, 2022). Applied to the Albanian context, Italian television would have provided high-skill individuals with information about economic opportunities in Italy. In this section, we provide evidence to rule out the role of this competing channel.

Historical sources emphasize that Albanians were watching entertainment programs on Italian television, and data confirms that picture. Dorfles and Gatteschi (1991) reports results of interviews conducted in March 1991 on 311 Italian speaking Albanian migrants just arrived in Italy. Of the people interviewed, 301 declared they were watching Italian

television in Albania, they were further asked which Italian television programs they would usually watch. The overwhelming majority of programs listed, 93%, are entertainment programs, only 7% of listed programs were news shows. In Farré and Fasani (2013), it is precisely news content which induced potential migrants to revise their beliefs. As interviews reveal, Albanians mainly watched entertainment programs: they were not being provided with useful information thanks to Italian television.[25]

We dispel further concerns about the contribution of the informational channel by exploiting the migration questionnaire of the LSMS. Members of surveyed households are all asked whether they migrated for at least one month since the age of 16 (since respondents are all in Albania, they would by definition be temporary migration episodes). Those who responded positively were subsequently asked "*who provided information on where to go and/or how to find work during this first migration episode*". Respondents can choose their answer from a list including the item *TV, radio, newspaper or book*. Table 4 presents the distribution of answers: only 1% of individuals chose this item. Even though the sample interviewed is one of return migrants, it is informative of what migrants themselves would have answered, and indicates further that television was not used as a source of information.

Beside information, watching entertainment television could have led Albanians to form an idealized view of life in Italy as suggested in Mai (2004). We would expect such an effect to have been homogeneous across skill groups, it could nonetheless turn heterogeneous in our sample if low-skilled individuals faced liquidity constraint preventing them from financing migration project. Alternatively, it could also be that TV ownership was correlated across skill-groups. Table 4 addresses these concerns. First, it shows that individuals migrated across all education groups with only small differences in emigration rates, indicating that individuals with lower education levels were not necessarily liquidity constrained. The same is true for television ownership: although its rate increases with education, TV sets were

[25]A detailed presentation of the results of these interviews in available in Appendix 9.1.

widespread across education groups.[26] This evidence suggests that how Italian television shaped beliefs did not impact migration patterns.

Table 4: 2005 LSMS, Selected Statistics

	Base Dataset
Variable	Share
Information provider:	
Family/relatives in Albania	0.03
Family/relatives abroad	0.30
Friends in Albania	0.14
Friends abroad	0.41
Previous personal experience	0.08
Neighbours	0.02
TV, radio, newspapers	0.01
Internet	0
Others	0.01
Owns a TV in 1990 by education:	
Primary or less	0.57
Secondary	0.68
Vocational	0.68
University	0.78
Emigrated by education:	
Primary or less	0.14
Secondary	0.20
Vocational	0.20
University	0.21

6.2 Italian Television and Returns to Education

Another competing mechanism is that television watching raised the return to education. Shrestha (2017) shows that the possibility to migrate can in some context raise returns to education, thus increasing the average education of the population. If this is the case

[26] In addition, historical sources report that group viewing of Italian television were regular and frequent, people did not need to own a TV to watch Italian television regularly.

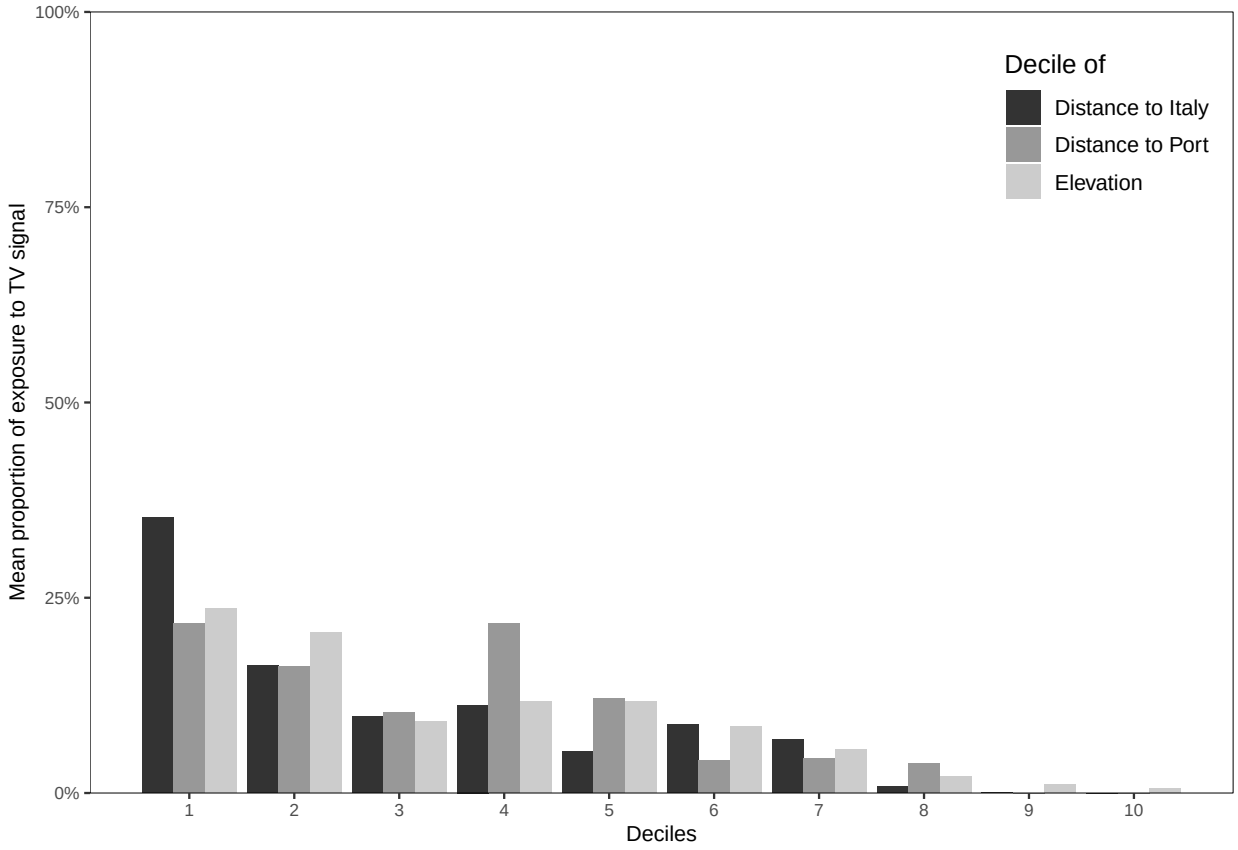
in the Albanian context, university educated individuals in municipalities with Italian TV access might differ on unobservables from university educated individuals who lived in municipalities without such access because they were pushed into accumulating more human capital by TV access, and these unobservables may drive our results. To remove these unobservables from the sample, we restrict it to individuals that completed their education prior to the fall of the regime in 1990. The only way in which Italian TV might have increased education returns is by raising the returns on emigration, as migration was forbidden before 1990, this effect must have been absent. We thus impute siblings' theoretical age of graduation and filter out from the sample individuals with theoretical year of graduation posterior to 1990. Specification (5) of Table 6 confirms our baseline results on this subsample, hence, even among individuals that accumulated human capital before 1990, when Italian television could not have raised the returns to education, we find the same effect on the emigration of the educated.

The results presented thus far suggest that neither the informational channel nor the belief channel played any role in fostering emigration towards Italy of the highly-skilled Albanians. We conclude this section by underlining the role played by language proficiency which, given the language-skill complementarity (Chiswick, 1995; Berman, Lang, and Siniver, 2003), raised the returns to migration of high skilled individuals.

7 Robustness

This section presents robustness tests of our results. First, we show that our results do not depend on the higher exposure of the Albanian coastal areas to the Italian television signal. Second, we show that our results are not sensitive to the exclusion from the sample municipalities closest to ports and closest to Greece, where migration costs were low. Finally we test that results are robust to alternative identifications of high-skilled individuals, and to different definitions of signal exposures.

Figure 2: Radio Signal and topographic data



Notes: Each bar represents the mean radio signal of municipalities that can be found in the decile of the relevant topographic variable considered.

Since television access is concentrated in the coastal areas, a concern surrounding the identification strategy is the high correlation between signal power and distance measurements. As the latter are directly related to migration costs (the further away from Italy, the more complicated to migrate), high levels of correlations might result in spurrious estimations. Figure 2 comes to alleviate this concern: although most of TV exposure is concentrated in municipalities within the first deciles of the distances to the closest port and to Italy, there is significant variation in signal exposure between municipalities in all deciles up to the 7^{th}.

Another concern is that the inclusion of municipalities of coastal areas and bordering Greece puts in the sample individuals unlikely to be impacted by Italian television: their

migration costs might be so low that there is little role left for television. In Table 5, we limit the sample to highly-skilled individuals that lived more than 30km from a port (1st quartile of distance to ports) and more than 48km for the Greek border (1st decile of distance to Greece). Results dispel all doubts related to spurrious estimation: the coefficients of interests are still precisely estimated, significant at the 5% level for migration abroad, and at the 1% level for migration to Italy. It is worth noting that in this regression exercise, the effect of the signal on migration and the effect on migration to Italy collapse to the same point estimate. It suggests that the difference between the two coefficients we observed in Table 3 is due to the presence of *always-takers* who would have migrated even if they had not been exposed to the signal.

Table 5: Effect of Italian Television Exposure on Migration Decision. Sensitivity to Coastal Areas and the Greek Border.

	Siblings dataset		
	Abroad	Italy	Greece
	(1)	(2)	(3)
Signal	0.168**	0.168***	-0.0334
	(0.0675)	(0.0519)	(0.0792)
Sample	High Skill	High Skill	High Skill
Observations	1476	1476	1476
Controls: District F.E., Distance to Italy, Distance to transmitter, Distance to port, Elevation, Ruggedness			

Notes: The table reports OLS estimates of the effect of exposure to Italian Television on the probability to be abroad. The outcome variable is a dummy taking value 1 if an individual resides abroad in specification (1), resides in Italy in specification (2), and resides in Greece in specification (3). All specifications exploit the siblings dataset, composed of the siblings of the LSMS respondents (Data Section 3); they all restrict the sample to high-skill individuals, that is individuals whose listing sibling attended university for at least one year. Specifications (2) and (3) assess the probability to be respectively in Italy and Greece against any alternatives, including Albania. The main explanatory variable, Signal, is the share of the municipality area (where an individual i was living in 1990) exposed to Italian television signal in 1990. District fixed effects, distance to Italy, distance to the transmitter, distance to the nearest port, elevation and ruggedness are included as controls in all specifications. Municipalities that are less than 30 Km of distance (1st quartile of distance to ports) and less than 48 km from the Greek border are removed from the sample. Clustered standard errors in parentheses. Standard errors are clustered at the Municipality level (72 clusters)). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 6: The effect of Italian Television exposure on migration decision: alternative variables definition

	Siblings Dataset						
	Abroad	Italy	Abroad	Italy	Abroad	Italy	Abroad
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Signal II	0.148**	0.139**					
	(0.0742)	(0.0638)					
Signal			0.154**	0.0819*	0.177***	0.104**	0.221**
			(0.0690)	(0.0472)	(0.0592)	(0.0450)	(0.0958)
Sample	High Skill	High Skill	Small Fam.	Small Fam.	Wealthy	Wealthy	H. Skill prior 1990
Observations	2153	2153	2449	2449	4043	4043	1510
Common Controls: District F.E., Distance to Italy, Distance to transmitter, Distance to port, Elevation, Ruggedness							

Notes: The table reports OLS estimates of the effect of exposure to Italian TV on the probability to be abroad and in Italy. It replicates specifications and results of Table 3 with alternative definitions of signal exposure and human capital using the siblings dataset. In particular, specifications (1) and (2) repeat specifications (2) and (3) of Table 3, but use 1986 municipalities' share of urban area exposed to the signal as explanatory variable instead of the usual signal definition. Specifications (3)-(6) exploit the usual signal variable but change the definitions of high skilled individuals. (3)-(4) subset the sample by for family with less than 4 children, while (5) and (6) subsets for individuals that lived in an apartment in thev 4th quartile of the distribution of the number of rooms per person in 1990. Controls are as defined in notes Table 3. Specification (7) identifies an individuals as high skilled individuals if she attended university and completed her education prior to 1990. Clustered standard errors in parentheses. Standard errors are clustered at the municipality of residency in 1990 level (# of clusters: (1) and (2) 128; (3) and (4) 243; (5) and (6) 240; (7) 107. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

As an additional robustness check, we test whether our results depends on the specifications of either TV signal exposure or the measures of human capital. We first vary the measure of TV signal exposure, while we previously used the share of a municipality's land exposed to the signal, we here use the share of the municipality's urban area (in 1986) ex-

posed to the signal. This avoids accounting for signal reaching inhabited rural areas. Results of this exercise are presented in table 6 columns (1) and (2). With this refined measure, using as dependent variable migration abroad or specifically to Italy yield the same results of 14 percentage points, thereby confirming earlier results.

In the main specification, we identify an individual as highly skilled if her listing sibling attended university at least one year. In this robustness check, we use alternatively family and dwelling dimension, characteristics we can measure for the sibling herself, as a proxy for education. Large families are more likely to come from agrarian backgrounds, where it is less likely that children can be sent to university. We thus split the sample according to family size, identifying a family as small if it is composed of less than four children. Columns (3) and (4) implement this sample split, repeating main specification (1). Results are qualitatively similar, although less precise. In Appendix 9.7 we show that the effect of TV exposure decreases in the family dimension. We define the dwelling dimension as the ratio of the number of rooms to the family dimension, yielding the number of rooms per person. Much like for family dimension, we assume that housing size is correlated with education. In (5) and (6), we subset the siblings sample for the fourth quartile of the distribution of housing dimension and confirm our baseline results. Appendix 9.7 shows the alternative regressions for smaller dwellings. These robustness exercises confirm that our results do not hinge on the definition of either TV signal access or on human capital.

8 Conclusion

How much does foreign language proficiency affect the migration probabilities of highly skilled people? Answering this question is relevant for policy makers deciding whether to promote multilingualism in society. It is also relevant for understanding the causes of brain drain. So far, this question has only been addressed by observational studies, unable to address the inherent self-selection issues that characterizing these settings.

In this paper, we exploit a natural experiment that occurred in Albania in the second half of the twentieth century to assess the causal effect of foreign language proficiency on high-skilled migration. While Albania was completely isolated from the rest of the world during the communist dictatorship part of the country was unintentionally exposed to Italian television signal, these features create the conditions in which the causal effect of exposure to Italian television on foreign language proficiency and migration probabilities can be estimated.

Using data on RAI's actual signal, geographical and topographical data for Albanian municipalities, and the World Bank's 2005 Living Standard Measurement Survey for Albania, we show that exposure to Italian television significantly increased Italian language proficiency at the end of the regime and the probability of migration of high-skilled individuals after the regime's fall. We interpret the effect of signal exposure on foreign migration as the effect of higher language proficiency and rule out competing channels.

We found that the effect of Italian TV on Italian language proficiency is at least 7 p.p. (150% of the average Italian proficiency at the time), and that the effect on the probability of migration for high skills individuals is about 20 percentage points. Since we could only estimate a lower bound for the effect of Italian TV exposure on language, we cannot use exposure as an instrument for language, as we would overestimate the effect on migration. Therefore, we report the intention-to-treat effect of television on migration probabilities for high-skilled individuals.

Our findings are the first to document the effects of foreign media on language proficiency, and the first to offer a causal estimate of the impact of foreign language proficiency on migration flows of the highly-educated. The economic literature still presents diverging results as to the effects of brain drain on the economy (Shrestha, 2017; Anelli et al., forthcoming), we leave for further research the evaluation of the impact of the Albanian brain drain on Albania's economic development.

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9 Appendix

9.1 Italian TV Shows Watched by Albanian Migrants

In this section we report the distribution of TV shows watched by Albanians migrants. In 1991, Dorfles and Gatteschi (1991) interviewed 311 Italian speaking Albanian migrants just arrived in Italy, 301 declared watching Italian television back home in Albania. They were asked to list all Italian shows they usually watched in Albania. Figure 7 (extracted from Dorfles and Gatteschi (1991)) reports the results. We report a brief description and a Wikipedia link for the TV shows that count at least 4% of answer: they are all entertainment shows. *TG1*, the main Italian news show, appears in less than 3% of answers.

Domenica In: "Domenica in is an entertainment Italian TV show on air on Rai 1 since 1976.." (Wikipedia:https://it.wikipedia.org/wiki/Domenica_in)

Fantastico: "Fantastico was an Italian TV variety show broadcast saturday prime time on Rai 1 from 1979 to 1980 and from 1981 to 1992.."(Wikipedia: https://it.wikipedia.org/wiki/Fantastico_(programma_televisivo)

Piacere RaiUno:"During the show there were prank calls, dance, music and interview to popular TV characters. There were also some time dedicated to information about issues of different Italian city" (Wikipedia: https://it.wikipedia.org/wiki/Piacere_Raiuno)

La Domenica Sportiva:"La Domenica Sportiva is the oldest sport show of Italian television." (Wikipedia:https://it.wikipedia.org/wiki/La_Domenica_Sportiva)

Crème Caramel: variety and Vaudeville Tv show (Wikipedia: https://it.wikipedia.org/wiki/Cr%C3%A8me_Caramel_(programma_televisivo)

Quark: TV show to popularize science (Wikipedia: https://it.wikipedia.org/wiki/Quark_(programma_televisivo))

Sanremo: Broacasted music festival (Wikipedia: https://it.wikipedia.org/wiki/

Table 7: Italian TV Shows Preferences of Albanians Migrants

Show	Obs.	Share	Type
Domenica In	183	25%	Entertainment
Fantastico	92	13%	Entertainment
Piacere Raiuno	86	12%	Entertainment
Domenica sportiva	84	11%	Entertainment
Creme Caramel	35	5%	Entertainment
Quark	34	5%	Entertainment
Sanremo	30	4%	Entertainment
La Piovra	25	3%	Entertainment
Lunedi film	23	3%	Entertainment
Tg1	21	3%	Information
Mercoledì sport	19	3%	Entertainment
Big	17	2%	Entertainment
Tg1 7	13	2%	Information
Discoring	13	2%	Entertainment
Speciale Tg1	12	2%	Information
Linea Verde	12	2%	Entertainment
Viaggio intorno all uomo	10	1%	Entertainment
Colpo Grosso	10	1%	Entertainment
Telemike	9	1%	Entertainment
Notte Rock	7	1%	Entertainment

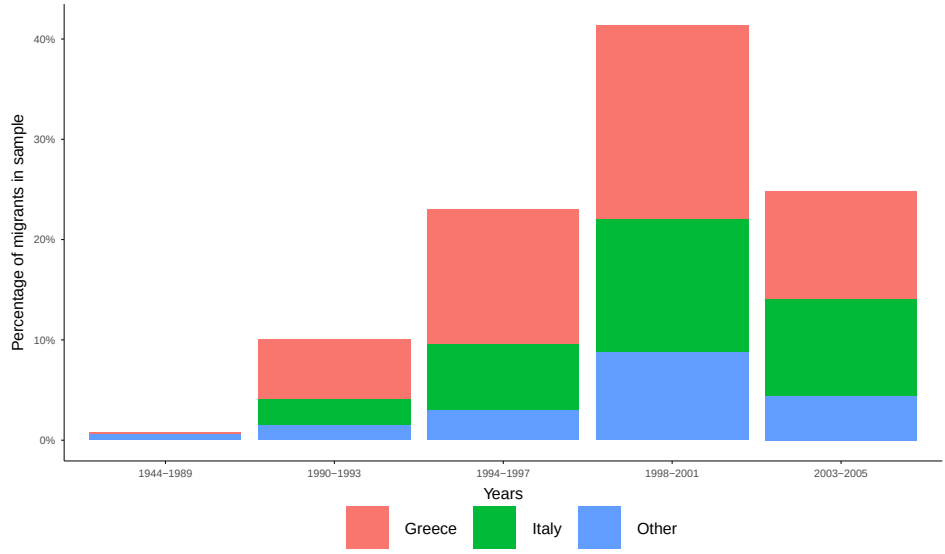
Festival_di_Sanremo)

9.2 Emigration Patterns of Albanians 1990-2005

Figure 3 reports the distribution of migrants over time and over destination country in the sample. For each 4 years bracket, we compute the share of the migrants in the sample and their destination country choice. We can see that the share of migrants prior to 1990 (end of the regime) is almost null, and that it increasing until 1998-2001, when it peaks before

decreasing afterwards.

Figure 3: Emigration Patterns of Albanians 1990-2005. Source: *Siblings sample* from 2005 Living Standard Measurement Survey Albania



Notes: Numerator is the numer of migrants in a given period, denominator the number of migrants in the sample.

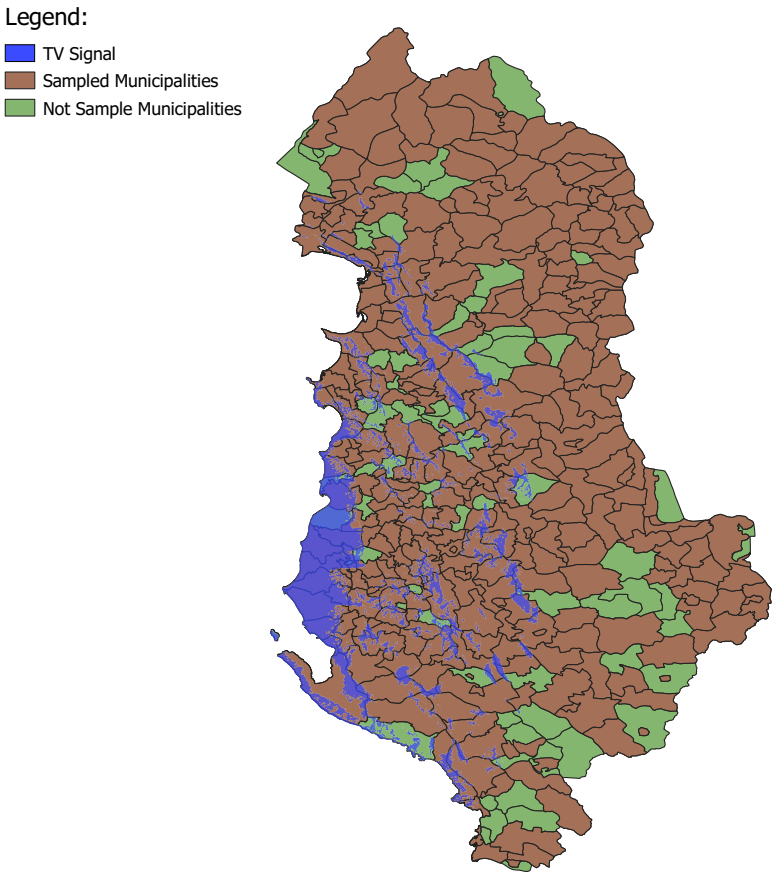
9.3 GIS Data for Municipality

All distance indicators are computed in kilometers with the same method: rather than selecting an arbitrary center for each municipality from where to compute distance, we transformed each municipality into rasters with a 30x30 meters grid size.[27] Then, for each cell of each municipality, we computed the straight line distance from the center of the cell to each of the considered geographical points. For each municipality, we then computed the mean distance of all the raster cells it encompasses.

Figure 4 presents the administrative map of Albania, overlapped with the sampling of the Albania 2005 Living Standards Measurement Survey and signal coverage. Online Appendix 10.1, we report the number of observations in the LSMS by district.

[27]A raster is a geographical object that subdivides a geographical area into cells of equal size.

Figure 4: Albanian municipalities and Italian Television signal



9.4 LSMS Questions

1. **Foreign language proficiency**

   - Did [NAME] speak English in 1990? (1) YES, FLUENTLY , (2) YES, SOME, (3) NO
   - Did [NAME] speak Italian in 1990? (1) YES, FLUENTLY , (2) YES, SOME, (3) NO
   - Did [NAME] speak Greek in 1990? (1) YES, FLUENTLY , (2) YES, SOME, (3) NO
   - Did [NAME] speak another foreign language in 1990? (1) YES, FLUENTLY , (2) YES, SOME, (3) NO

2. **Internal migration**

- Prior to the current residence, has [NAME] ever lived in a different municipality in Albania? 1 YES, 2 NO
- Which district and municipality/comuna did [NAME] move from?
- In what year did [NAME] move to the current residence?
- Prior to this residence in [MUNICIPALITY/ COMUNA], did [NAME] live in a different municipality/ comuna in Albania? (the loop start over until they track all internal migration history)

3. **Spouse/children away from home**

- Please list your spouse, if he or she is no longer living in the household, and all the children 15 years old and over who are no longer living in this household. (Include all children of head and/or spouse.)
- Did [NAME] speak English in 1990? (1) YES, FLUENTLY , (2) YES, SOME, (3) NO
- Did [NAME] speak Italian in 1990? (1) YES, FLUENTLY , (2) YES, SOME, (3) NO
- Did [NAME] speak Greek in 1990? (1) YES, FLUENTLY , (2) YES, SOME, (3) NO
- Where does [NAME] currently live? If in Albania, then ask for district and municipality/comuna. If abroad, country and place.
- In what year did [NAME] move abroad to [COUNTRY]?

4. **Siblings**

- Ask all the questions to the household head, and then to the spouse of the household head. If no spouse, leave the second section blank.
- Please list the first name of up to SEVEN brothers and sisters for both the head of the household and the spouse. Begin with those brothers and sisters living abroad.

- In which country does [NAME] currently live? Indicate the country in which [NAME] spent the most time during the past year
- How many years has [NAME] lived in [COUNTRY]?

5. **TV ownership in 1990**

- Did your household own any of the following items in January 1990?Colour TV, Black & White TV, Tape player/CD player, Refrigerator, Washing machine, Sewing/knitting machine , Satellite dish, Bicycle.

6. **Education**

- What is the highest grade you have completed in school? None 0; "8 or 9 years" school 1; Secondary general 2; Vocational 2-3 years 3; vocational 4/5 years 4; University- Albania 5; University- abroad 6; Post-graduate- Albania 7; Post-graduate- abroad 8.

7. **Past migration**

- Who provided information on where to go and/or how to find work during this most recent migration episode? (MAIN SOURCE) Family/Relatives in Albania; Family/Relatives Abroad; Friends in Albania; Friends Abroad; Previous Personal Experience; Neighbours; TV, Radio, Newspaper or Book; Internet; Other

8. **Financial Situation in 1990**

- Imagine a 10-step ladder where on the bottom, the FIRST step, stand the poorest people, and on the highest step, the TENTH, stand the rich. On which step of the ladder were you in 1990?

9.5 Balance Test

Table 9 reports the results of regressions of age and sex ratio on Italian TV signal using the identification strategy specified in Equation (1) and the siblings dataset. We expect to see no effects on age and sex as in our specification being exposed is as good as random. Columns (1) to (4) report results using two measures of signal: share of the municipality exposed to the signal (Signal) and share of urban territory of the municipality exposed in 1986. Concerning the sex ratio we can see there is no effect of signal on the probability of being a man (Sex ratio). There is, however, an effect on age of two point half year, significant at the 10% level, when using Signal as treatment, while there is no significant effect when using Signal II as treatment. Although an older sample would bias down results (negative correlation between age and migration), we want to rule out the possibility that it is a symptom of issues in our identification strategy. In particular, we show that this result comes from the fact that sets of siblings who have all migrated are absent from the dataset.

Table 8 shows that in close to a port and to the Greek border areas individuals have significantly higher migration rate and are on average older. As age and migration probability are negatively correlated (-0.2 in our sample) and as the correlation of age between the *listing sibling* and the siblings is extremely high (0.72 in our sample), very low migration migration cost that characterized these areas caused young individuals to be excluded from the sample, via migration of entire set of siblings. Indeed, as we discuss in Data Section 3, the siblings dataset contains a sample of Albanians that can be either in Albania or abroad, thus containing migrants, but sets of siblings that all migrated, and only children cannot be a part of the sample. Thus, as close to the port/Greek border areas are differently than average exposed to the signal (Figure 1, Table 8), we observe that Signal affects age although there can not be an effect of our treatment on age. Table 9 specifications (5)-(6), we show that when we subset for individuals living in 1990 in area farther away from the first quartile of distance to the port (31 km) and first decile of the Greek border (49 km) there is no effect of

signal exposure on age.

Table 8: Distance to Ports and Greek Border: Signal, Migration and Age

	Distance to Ports		Distance to Greece	
Variable	≤ 31km	> 31km	≤ 49km	> 49km
Migration	0.210	0.150	0.210	0.160
Age	49.4	46.9	49.2	47.6
Signal	0.180	0.060	0.020	0.110

Notes: we display the average share of individuals being abroad, the average age, the average signal exposure for individuals in/outside the first quartile of distance to the nearest port (30.461 km) and in/outside the first decile of distance to the Greek border (48.834 Km). Data: *Siblings sample* of *2005 LSMS survey*

9.6 Greek Community in Albania

Albania in 1990 was populated by Greek minorities, for many individuals in the survey, Greek is not exactly a foreign language.[28] According to the 1989 Albanian census there were 60 000 Greeks in Albania in 1990, while according to the Greek government they were 300 000. The Communist government recognized 99 villages as *minority zones* in the southern districts of Gjirokastër, Sarandë and Delvina and authorized schooling in both Greek and Albanian for the whole dictatorship period. However, aside from the official recognized minority zones, Greek communities were scattered in many other areas of the country. This is why in Table 2 we control for the Greek community indicators: i) Greek ethnicity ii) Greek maternal language iii) Use Greek language daily at home iv) Use Greek language with extended family members v) Orthodox religion. In Table 10, we show that Greek language proficiency in 1990 is correlated with all the Greek community indicators. While language proficiency in Greek is measured in 1990 and the Greek community indicators are available solely for 2005, these indicators are all stables condition that can be assumed to be equal in 1990 and in 2005.

There would be no issue if there were no correlation between signal exposure and Greek

[28]This section is based on the Wikipedia page *Greeks in Albania*: https://en.wikipedia.org/wiki/Greeks_in_Albania

Table 9: Balance test: Age and Sex Ratio

	Full Sample				Restricted Sample	
	(1)	(2)	(3)	(4)	(5)	(6)
	Age	Sex ratio	Age	Sex ratio	Age	Sex ratio
Signal	2.434*	-0.0253			0.441	-0.0573
	(1.254)	(0.0232)			(2.531)	(0.0450)
Signal II			1.497	-0.0208		
			(1.175)	(0.0197)		
N	27666	27666	27666	27666	18985	18985
Controls: District F.E., Distance to Italy, Distance to transmitter, Distance to port, Elevation, Ruggedness						

Notes: The table reports OLS estimates of the effect of exposure to Italian Television on probability of being a man (Sex ratio) and individual's age. All specifications exploit the siblings dataset. Specifications (1) to (4) exploit the full sample, while specifications (5) and (6) restrict the sample to individuals that lived in 1990 farther away of 30.461 km from the closest port (first quartile of distance to port) and farther away of 48.834 Km form the Greek border (first decile of distance to Greece). Signal is the share of the municipality area (where an individual i was living in 1990) exposed to Italian television signal in 1990. Signal II is the share of urban area in the municipality exposed in 1986. Clustered standard errors in parentheses. Controls include district fixed effects, distances (to Italy, the transmitter, and the nearest port) and topographic (elevation, ruggedness) characteristics. Standard errors are clustered at the Municipality level: (1)-(4) (310 clusters); (5)-(6) 180 clusters). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

settlements in Albania but unfortunately it is not the case. Indeed all *minority zones* are located in districts where signal is available: Delvine (share of signal= .08, share of Greek speaker in 1990=.04), Gjirokastër (share of signal= .01, share of Greek speaker in 1990=.47), Sarande (share of signal= .17, share of Greek speaker in 1990=.22). District F.E. are unable to account for this accidental correlation as the 99 villages could be located precisely in the municipalities exposed to the signal. We consider that finding these 99 villages where both Albanian and Greek was taught would not add much to the research, as Greek community were also scattered across Albania, and it is beyond the scope of the paper.

In Table 11 we present the regressions (1)-(2)-(3) of Table 2 adding as controls Greek community indicators: results are not affected.

Table 10: Correlation between Greek Proficiency in 1990 and Greek Community Indicator

	Proficient in Greek in 1990
Variable	Correlation coefficient
Greek Ethnic Group	0.51
Greek Maternal Language	0.52
Greek spoken daily at home	0.47
Greek spoken with extended family	0.36
Orthodox religion	0.22

Table 11: Italian television effect on foreign language proficiency: controlling for Greek community indicators

	Italian	English	Other
	(1)	(2)	(3)
Signal	0.0635*	0.0118	0.00191
	(0.0334)	(0.0181)	(0.0231)
N	11040	11040	11040
Controls: District F.E., Distance to Italy, Distance to transmitter, Distance to port, Elevation, Ruggedness, Distance to Greece, Greek community indicators			

Notes: The table reports OLS estimates of the effect of exposure to Italian television on foreign language proficiency in 1990. (1)-(4) exploit the sample of the LSMS surveyed individuals.(5)-(6) exploit the Children/spouses out of the household sample: in specification (5) the ones living abroad, in (6) the ones living in Albania. The dependent variable is the reported capability of speaking Italian, English, Other (category any other language), and Greek in 1990. The main explanatory variable, Signal, is the share of the municipality area (where an individual i was living in 1990) exposed to Italian television signal in 1990. District fixed effects, distance to Italy, distance to the transmitter, distance to the nearest port, elevation and ruggedness, and Greek Community indicators are included as controls in all specifications. Clustered standard errors in parentheses. Standard errors are clustered at the municipality level (322 clusters for specification (1)-(4) and 232 for (5) and 228 for (6). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

9.7 Additional Results

In this section we present additional results absent from the main body of the paper. In particular, we show the null effect of signal exposure on presumably low skill individuals and the heterogeneity of the effect over the family dimension and the housing dimension. (1)-(2) show the absence of an effect on migration of low skilled individuals. (3) to (5) confirm that the effect on migration is decreasing in family size.[29] (6)-(7) show that there are no effects of signal exposure for individuals who were living in smaller housing in 1990 (2nd and 3rd quartile for specification (6) and 4th quartile for specification (7)). We confirm that there is no effect for *low skilled* individuals as proxy by sibling education, family and housing dimension.

[29] For sake of brevity we do not show family dimension higher than 5. The coefficient steadily decline with family dimension.

Table 12: The effect of Italian Television exposure on migration decision: Other Results

	Low Skilled		Family Dimension: # Children			Housing Dimension	
			2	Less than 5	Less than 6	2nd & 3rd quart	4th quart
	Abroad	Italy	Abroad	Abroad	Abroad	Abroad	Abroad
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Signal	-0.0103	0.0157	0.248**	0.0502	0.0435	-0.0140	0.0343
	(0.0307)	(0.0172)	(0.111)	(0.0459)	(0.0354)	(0.0414)	(0.0787)
N	25513	25513	517	5926	10986	5922	2442
Controls: District F.E., Distance to Italy, Distance to transmitter, Distance to port, Elevation, Ruggedness, Distance to Greece, Greek community indicators							

Notes: The table reports OLS estimates of the effect of exposure to Italian television on: (1) probability to be abroad and (2) probability to be in Italy on low skilled individuals (listing brother education less equal than secondary education), (3)-(4)-(5) probability to be abroad given the number of children of the family an individual was raised in, (6)-(7) probability to be abroad given housing dimension. All specification use subset of the siblings dataset. The main explanatory variable, Signal, is the share of the municipality area (where an individual i was living in 1990) exposed to Italian television signal in 1990. District fixed effects, distance to Italy, distance to the transmitter, distance to the nearest port, elevation and ruggedness are included as controls in all specifications. Clustered standard errors in parentheses. Standard errors are clustered at the municipality level (# of clusters: 302 (1)-(2), 172 (3), 268 (4), 287 (5), 259 (6), 143 (7)). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

10 Online Appendix

10.1 Average TV ownership by district in 1990

District	Mean Tel.	Mean Tel. weighted	Obs	signal
Berat	0.34	0.25	145	0.17
Bulqize	0.13	0.17	119	0
Delvine	0.29	0.28	17	0.07
Devoll	0.32	0.23	28	0
Diber	0.64	0.62	289	0
Durres	0.14	0.14	131	0.29
Elbasan	0.45	0.41	157	0.09
Fier	0.58	0.57	215	.57
Gjirokaster	0.88	0.89	40	0.025
Gramsh	0.89	0.81	124	0.04
Has	0.80	0.81	71	0
Kavaje	0.68	0.67	87	0.37
Kolonje	0.80	0.80	25	0
Korce	0.85	0.85	144	0
Kruje	0.23	0.15	47	0.18
Kucove	0.96	0.95	23	0.02
Kukes	0.80		241	0
Kurbin	0.73	0.71	62	0.14
Lezhe	0.63	0.61	63	0.11
Librazhd	0.82	0.80	208	0
Lushnje	0.40	0.39	155	0.30
Malesi e madhe	0.21	0.15	29	0
Mallakaster	0.43	0.40	51	0.21
Mat	0.40	0.22	65	0.04
Mirdite	0.79	0.79	29	0.02
Peqin	0.05	0.03	20	0.14
Permet	0.73	0.81	26	0.03
Pogradec	0.66	0.60	41	0
Puke	0.81	0.82	54	0
Sarande	0.88	0.86	33	0.08
Shkoder	0.06	0.03	143	0.02
Skrapar	0.71	0.70	48	0.07
Tepelene	0.73	0.75	41	0.12
Tirane	0.77	0.78	541	0.14
Tropoje	0.77	0.83	117	0
Vlore	0.95	0.96	155	0.37
Average	0.62	0.56	3840	

Environment:

- 0 is country of origin
- 1 is destination country
- $\epsilon_0 \sim N(0,\sigma_0^2)$, $\epsilon_1 \sim N(0,\sigma_1^2)$, corr($\epsilon_0,\epsilon_1$)=$\rho$ and $\sigma_{01} = cov(\epsilon_0,\epsilon_1)$
- π is the time equivalent cost of migration
- Earnings of origin country residents: $lnw_0 = \mu_0 + \epsilon_0$
- Earnings of the individuals of origin countris if they were to migrate to country of destination: $lnw_1 = \mu_1 + \epsilon_1$

Migration Decision:

The migration decision is determined by the sign of the index function:

$$I = lnw_1 - lnw_0 - \pi = (\mu_1 - \mu_0 - \pi) + (\epsilon_1 - \epsilon_0)$$

So the migration rate from 0 to 1 is given by :

$$\text{P=Pr(v}> -(\mu_1 - \mu_0 - \pi)) = 1 - \Phi(z)$$

Where v=$\epsilon_1 - \epsilon_0$ and z=$-(\mu_1 - \mu_0 - \pi)$ and Φ is the standard normal distribution function.

Now we want to compute $E(lnw_0|I > 0$ and $E(lnw_1|I > 0)$.[30]

[30]Remember that if two random variables u_1 and u_2 are jointly normal distributed with 0 mean, unit variance and covariance σ_{12}, then: $E(u_1|u_2 > k) = \sigma_{12}\frac{\phi(c)}{1-\Phi(c)}$ where ϕ is the density of the standard normal. So: $E(lnw_0|I > 0) = E(\mu_0 + \epsilon_0|v > z) = \mu_0 + \sigma_0 E(\frac{\epsilon_0}{\sigma_0}|\frac{v}{\sigma_v} > \frac{z}{\sigma_v}) = \mu_0 + \sigma_0\frac{1}{\sigma_0\sigma_v}\sigma_{0v}\frac{\phi(z)}{1-\Phi(z)}$ We rearrange:
Note $\sigma_{0v} = \rho_{0v}\sigma_0\sigma_v$ and that $\rho_{0v} = \frac{\sigma_{0v}}{\sigma_0\sigma_v}$, and $\sigma_{0v} = E(\epsilon_0(\epsilon_1 - \epsilon_0)) = E\epsilon_0\epsilon_1 - E(\epsilon_0^2) = \sigma_{01} - \sigma_0^2$,

$E(lnw_0|I>0) = E(\mu_0 + \epsilon_0|v>z) = \mu_0 + \sigma_0 \frac{(\sigma_{01}-\sigma_0^2)}{\sigma_0\sigma_v} \frac{\phi(z)}{1-\Phi(z)} = \mu_0 + \frac{\sigma_0\sigma_1}{\sigma_v}(\rho - \frac{\sigma_0}{\sigma_1}) \frac{\phi(z)}{1-\Phi(z)}$

By the same line of reasoning: $E(lnw_1|I>0) = \mu_1 + \frac{\sigma_0\sigma_1}{\sigma_v}(\frac{\sigma_1}{\sigma_0} - \rho) \frac{\phi(z)}{1-\Phi(z)}$

We do observe "brain drain " between Albania and Italy if $\rho > \frac{\sigma_0}{\sigma_1}$, that is, by definition, if at least $\sigma_1 > \sigma_0$, that is if "inequalities" in Italy are higher than in Albania back in the time.

However, we are interest in what happens if ρ, the correlation coefficient between ability in Albania and in Italy, is exogenously positively shocked, as our Italian television signal can be naturally interpreted as an increase in that parameter. So, we look at the derivative of $Q_0 = E(lnw_0|I>0) - E(lnw_0) = \frac{\sigma_0\sigma_1}{\sigma_v}(\rho - \frac{\sigma_0}{\sigma_1}) \frac{\phi(z)}{1-\Phi(z)}$ with respect to ρ. Call, $\frac{\phi(z)}{1-\Phi(z)} = \lambda$

Note the following derivatives:

$\frac{\partial\lambda}{\partial\rho} = \frac{\sigma_0\sigma_1}{\sigma_v^2} \frac{\partial\lambda}{\partial z} z$

$\frac{\partial(\frac{\sigma_1}{\sigma_0} - \rho)}{\partial\rho} = -1$

$\frac{\partial\sigma_v}{\partial\rho} = -\frac{\sigma_0\sigma_1}{\sigma_v}$

$\frac{\partial\frac{1}{\sigma_v}}{\partial\rho} = \frac{\sigma_0\sigma_1}{\sigma_v^3}$

Compute: $\frac{\partial Q_0}{\partial\rho} =$

$(\sigma_0\sigma_1)((\frac{\sigma_0\sigma_1}{\sigma_v^3})(\rho - \frac{\sigma_0}{\sigma_1})\lambda + (\frac{1}{\sigma_v})(\lambda + (\rho - \frac{\sigma_0}{\sigma_1})\frac{\sigma_0\sigma_1}{\sigma_v^2}\frac{\partial\lambda}{\partial z} z)) = \frac{\sigma_0^2\sigma_1^2}{\sigma_v^3}(\rho - \frac{\sigma_0}{\sigma_1})\lambda + \frac{\sigma_0\sigma_1}{\sigma_v}\lambda + \frac{\sigma_0^2\sigma_1^2}{\sigma_v^3}(\rho - \frac{\sigma_0}{\sigma_1})\frac{\partial\lambda}{\partial z} z =$

$(\lambda)(\frac{\sigma_0^3\sigma_1}{\sigma_v^3})(\frac{\sigma_1}{\sigma_0}(\rho - \frac{\sigma_0}{\sigma_1}) + \frac{\sigma_v^2}{\sigma_0^2}) + \frac{\sigma_0^2\sigma_1^2}{\sigma_v^3}(\rho - \frac{\sigma_0}{\sigma_1})\frac{\partial\lambda}{\partial z} z = (\lambda)(\frac{\sigma_0^3\sigma_1}{\sigma_v^3})(\frac{\sigma_1}{\sigma_0}\rho - 1 + \frac{\sigma_1^2+\sigma_0^2-2\sigma_{01}}{\sigma_0^2}) + \frac{\sigma_0^2\sigma_1^2}{\sigma_v^3}(\rho - \frac{\sigma_0}{\sigma_1})\frac{\partial\lambda}{\partial z} z =$

$(\lambda)(\frac{\sigma_0^3\sigma_1}{\sigma_v^3})(\frac{\sigma_1}{\sigma_0}\rho + \frac{\sigma_1^2-2\rho\sigma_0\sigma_1}{\sigma_0^2}) + \frac{\sigma_0^2\sigma_1^2}{\sigma_v^3}(\rho - \frac{\sigma_0}{\sigma_1})\frac{\partial\lambda}{\partial z} z =$

$-(\lambda)(\frac{\sigma_0^3\sigma_1}{\sigma_v^3})(\frac{\sigma_1}{\sigma_0}(\rho - \frac{\sigma_1}{\sigma_0})) + \frac{\sigma_0^2\sigma_1^2}{\sigma_v^3}(\rho - \frac{\sigma_0}{\sigma_1})\frac{\partial\lambda}{\partial z} z$

Divide in 2 components:

- 1) $-(\lambda)(\frac{\sigma_0^3\sigma_1}{\sigma_v^3})(\frac{\sigma_1}{\sigma_0}(\rho-\frac{\sigma_1}{\sigma_0}))$
- 2) $\frac{\sigma_0^2\sigma_1^2}{\sigma_v^3}(\rho-\frac{\sigma_0}{\sigma_1})\frac{\partial\lambda}{\partial z}z$

1)Is positive iff $\rho<\frac{\sigma_1}{\sigma_0}$

2) Is positive iff $\rho<\frac{\sigma_0}{\sigma_1}$ as $z<0$ and $\frac{\partial\lambda}{\partial z}>0$ So if 1) and 2) are positive then $\frac{\partial Q_0}{\partial\rho}$ is positive

If $\sigma_0>\sigma_1$, then 2) is always positive, and 1) is positive conditional on ρ be small enough. In case $\rho>\frac{\sigma_1}{\sigma_0}$ still, under parameters value of z and λ, 2)>(1) the effect is still positive. Same apply to the case $\sigma_0<\sigma_1$ ((1)always positive while depending on ρ). Our finding can be rationalise by Borjas model under a wide set of parameters.