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TV or not TV?

The impact of subtitling on English skills*†

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Abstract

We study the influence of television translation techniques on the quality of English spoken worldwide. We identify a large positive effect for subtitled original version broadcasts, as opposed to dubbed television, on English proficiency scores. We analyze the historical circumstances under which countries opted for one of the translation modes and use it to account for the possible endogeneity of the subtitling indicator. We disaggregate the results by type of skills and find that television works especially for listening comprehension. Our paper suggests that governments could promote subtitling as a means to improve foreign language proficiency and therefore economic performance.

JEL codes: I21, Z11

Keywords: Television, subtitling, foreign language skills

I Introduction

English is the language of the globalized world, and the lingua franca for the international communities in, among others, science, finance, advertising, culture, tourism, and technology. Sixty-eight percent of citizens in the EU rate English as the most useful foreign language – far above the second position of French with 25 percent (European Commission, 2006). English is also the dominant business language and the working language of many multinationals based in non-English-speaking countries, such as Arcelor Mittal [India], Cemex [Mexico], Nestlé [Switzerland], and Nokia [Finland].

Not surprisingly, English is the most widely learned foreign language, and is expected to continue growing fast in the coming decades (Graddol, 1997 and 2006). Graddol (1997) estimates that about one billion people are currently learning English worldwide, with 200 million in China alone.[1] More than 80 percent of the EU's pupils learn English. The duration of foreign language as a compulsory subject ranges between six and 13 years in the non-English-speaking EU (Eurydice, 2005).[2] In comparison, pupils in England and Wales have foreign languages for five and three years, respectively, and there are no requirements in Ireland and Scotland.[3]

Despite the huge amounts of time and money spent, disparities in the quality of English across countries are very large. In places such as the Netherlands, Denmark, and Sweden, more than 80 percent of citizens state that they are able to hold a conversation in English, but the proportion is below 60 percent in some of their neighboring countries like Belgium, Austria, and Finland (European Commission, 2006). Spanish TOEFL internet-exam takers score less than 90 (out of 120) on average, compared to more than 95 by their Portuguese counterparts. The reasons for these disparities between seemingly similar countries do not seem straightforward.

In this paper, we show that the method used to translate foreign films and programs on television is an important driver of the quality of English spoken in non-English-speaking countries. Subtitled original version programs provide continuous exposure to foreign languages as spoken by natives, which, we argue, is bound to improve the listeners' English skills. The US controls about 85 percent of the world market for fiction (Crystal, 1997), so that with the most-watched

[1] Japan has created one hundred "super English high schools" where classes are taught exclusively in that language (Newsweek, 2007).

[2] The minimum is in the region of Flanders in Belgium and the maximum in the Netherlands, Norway, and Luxembourg.

[3] In 2004 a British survey discussed by the BBC showed that only one in 10 UK workers could speak a foreign language and less than 5 percent could count to 20 in a second language (http://news.bbc.co.uk/2/hi/uk_news/3930963.stm).

television shows, the source language is very likely to be English. Thus, the citizens of countries where television is broadcast in the original version would have better vocabulary, grammar and, in particular, listening comprehension, than those where programs are dubbed. Surprisingly, only 12 percent of Europeans think that television is useful for learning foreign languages (European Commission, 2006).[4]

We divide our analysis into three parts. We first ask: "Why are there subtitles in some countries and dubbing in others?" Following the history of cinema literature, we identify and systematically analyze the historical circumstances under which countries opted for one of the alternatives in the years around World War II (WWII). According to the standard historical account, the use of subtitles was not due to a higher ability to understand the English language, nor to the idea that it would be beneficial for people to hear the actors speak foreign languages (Crystal, 1997). Rather, limited box office receipts and a significant number of imported films induced small countries or, more precisely, countries with "small" languages, to choose the low-cost subtitling option. Second, authoritarian regimes would have felt that using their own language in films strengthened national pride. In any case, national media markets coordinated around different translation technologies at that time (Gottlieb, 1997), and have not deviated since then. Using historical data, we show empirically that, indeed, dubbing tended to be adopted in countries whose national languages were more widely used internationally. But, in our estimations, democratic countries do not appear to adopt subtitling significantly more often than dictatorial regimes.

The second question we ask is: "What is the influence of the translation mode on English skills?" We find that the quality of English in a country is positively associated with the country's expenditures in the education system and negatively on the size of its language. But, one of the most important significant explanatory factors is the television translation mode. We use the insights from the first part of the paper to account for the possible endogeneity of the translation mode, instrumenting it with language size at the time of the choice of translation technology. Our results provide empirical evidence that, ceteris paribus, English is better in countries where television films and programs are subtitled.[5] The magnitude of the effect is large, equivalent to

[4]Europeans think that the best way to learn English is either at school (57% of the interviewed) or through lessons with a teacher, either one-to-one or in groups (40 and 42%, respectively). Other ways in which they think they can learn the language is by visiting the country, either as a tourist or while taking a language course (50 and 44%), or through conversation with native speakers, both through language exchanges and informally (36 and 33%).

[5]Our paper thus forms part of an emerging literature on the effects of television on educational and social phenomena. Gentzkow and Shapiro (2008), for example, find a positive effect of television on verbal skills in

28.4 percent of the average level of English skills, or to two standard deviations from the average level. We disaggregate the results by types of skills – listening comprehension, speaking, reading and writing – and find that television is an especially beneficial tool for listening comprehension. Our paper thus suggests that governments could promote subtitling as a means to improve language proficiency and, in turn, economic outcomes.

Indeed, the quality of the English spoken in a given country has important economic consequences. Sharing a common language has traditionally been found to be a key determinant of foreign trade flows (Frankel and Rose, 2002; Egger and Lassmann, 2015), cross-border activity (Coeurdacier et al., 2008), and cross-listings (Pagano et al., 2002). But the widespread knowledge of foreign languages, particularly English, has also been recently linked to improvements in trade (Fidrmuc and Fidrmuc, 2009; Ku and Zussman, 2010; Melitz and Toubal, 2014) and migration flows (Aparicio and Kuehn, 2016).[6] More generally, foreign language proficiency has been related to income per capita (Ufier, 2015). Of course, proficiency in foreign languages also has a direct impact on business. 11% of respondents in a European Commission survey among nearly 2,000 small and medium European enterprises (European Commission, 2007) had lost a contract as a result of lack of language skills.[7]

In the third part of the paper, we review the recent literature on the impact of language proficiency (particularly English) on several economic variables, including trade and migration, and explain how our paper can help in understanding that link. We highlight the argument that the translation mode can be used as an instrument to assess the impact of English proficiency at the macro level. In this sense, it may serve as a replacement to linguistic distance, which has traditionally been used in the literature (e.g., Ku and Zussman, 2010; Ufier, 2015). The translation mode may be less likely to affect other aspects of cultural distance that impact on trade. In fact, in most of our regressions, the effect of linguistic proximity becomes insignificant in the presence of the subtitling variable.

the US, which is particularly strong for those children whose mother tongue is not English. Television also influences violent crime (Dahl and DellaVigna, 2006), voting turnout (Gentzkow, 2006), democratic/republican patterns (DellaVigna and Kaplan, 2007) and international policy (Eisensee and Stromberg, 2007). There is further research on television and social capital in rural communities (Olken, 2006), anti-Americanism (Shapiro and Gentzkow, 2004) and even on the effect of soap operas on women's fertility (Chong et al., 2008).

[6] At the micro level, the literature has shown that better English skills allow immigrant populations in the US to earn more (Bleakley and Chin, 2004 and 2008; McManus, 1985; McManus et al., 1983). The ability to speak foreign languages has also been found to generate positive returns for non-immigrants, in the EU (Ginsburgh and Prieto-Rodriguez, 2006), the US (Saiz and Zoido, 2005), and South Africa (Levinshon, 2004).

[7] As a recommendation, the report (European Commission, 2007) states that: "Strong views were expressed about the need for work experience in other countries for employees to improve not only linguistic skills but also awareness of different business cultures."

As an illustration of our mechanism, consider the cases of Austria and the Netherlands and Spain and Portugal. Austria and the Netherlands are two relatively small countries (less than 20 million inhabitants) that have extremely similar GDP per capita (around 50,000 dollars) and employment rates (52%). But Austria shares a common language with Germany whereas Dutch is only spoken in the Netherlands and part of Belgium. Probably because of this, we argue in the first part of the paper, Austria broadcasts films dubbed in German while the Netherlands adds subtitles. As a consequence, we argue in the second part, 87 percent of the Dutch are able to hold a conversation in English while only 53 percent of the Austrians can do so (European Commission, 2006). Similarly, Spain and Portugal share many geographical and cultural traits. But the number of Spanish speakers is double that of Portuguese speakers. Again, probably because of this, Portugal uses subtitling while in Spain films are dubbed. And, as a result, our paper claims that there is a 5-point difference in the TOEFL scores between the two countries and 6 percent more people declaring themselves to be able to hold a conversation in English in Portugal. Better English skills serve to increase, in turn, the respective trade flows in both the Netherlands and Portugal.

The rest of the paper proceeds as follows. In the next section we provide an overview of the existing translation modes and a brief history of the choice of dubbing and subtitling across countries. The data is introduced in section III. Section IV provides a description of the empirical strategy. In section V we empirically analyze why are there subtitles in some countries and dubbing in others. In section VI, we present our main results on the influence of the translation mode on English skills. A description of the literature on the impact of English on economic performance can be found in section VII. In section VIII we conclude.

II Television, subtitling and dubbing

English is the original language of most films, made-for-TV movies, and series around the world, and particularly of the most widely watched ones. In 1995, the EU imported US audiovisual products for 6.8 billion dollars. In comparison, US television imports amounted to 532 million (Ávila, 1997). On commercial channels, the percentage of US fiction programs ranges from 60.7 percent of the total in France to 79.5 percent in the Belgian region of Flanders. On public channels, US fiction productions range from 19.6 percent in Germany to 52.9 percent in France (De Bens and de Smaele, 2001). To these numbers one would have to add a significant number

of British series and films.

A Film translation modes

There are three main foreign film translation traditions: subtitling, dubbing and voice-over. Subtitling consists of supplying a translation of the spoken source language dialogue into the target language in the form of synchronized captions, usually at the bottom of the screen, while the sound is in the original version. Hence, we use the terms "subtitled" and "original version" interchangeably. Dubbing is the method by which the foreign dialogue is translated, adjusting to the mouth movements of the actors in the film so that the audience feels as if they are listening to actors speaking the target language. Finally, in voice-over, the translation is provided by a single person who does not imitate the action. For the purpose of this paper, we consider voice-over to have the same effects as dubbing because the viewer mainly hears his own language.

B History of subtitling and dubbing

The film history literature provides a detailed account of the introduction of dubbing and subtitling in the cinema. In the times of silent cinema, inter-titles interrupted the course of a film to provide additional explanations to the audience. It was then easy to replace the original language titles with local-language text. But, with the introduction of sound, language became a serious problem for the cinema.[8] The Hollywood studios rapidly understood that one could not force audiences to watch films in a language they did not understand.[9] Therefore, they quickly started to promote dubbing around the world. In the 1930s, Paramount Pictures, for example, dubbed films into 14 European languages, including not only French and Spanish, but also Dutch and Swedish. A few years later, some countries ended up moving on to subtitling while others continued with dubbing.

The film history literature discusses two reasons for this shift. First, there are economies of scale arguments. Countries with small languages, like the Netherlands, Sweden or Greece, moved to subtitling as the major translation mode. "The [dubbing] process was difficult, cumbersome,

[8] In those times, those few in Europe with access to education overwhelmingly chose to learn either French or German. Widespread English language learning did not start taking place until the 1960s (Crystal, 2007).

[9] Hollywood was afraid of losing its leading position in the world market. "Only 5% of the world's population speak English," D.W. Griffith, one of the founders of the Academy of Motion Picture Arts and Sciences, said in 1923. "Why should I lose 95% of my audience?" Film had developed into a universal language which all of a sudden would be shattered into a thousand dialects when sound was added (cited by Gottlieb, 1997).

and far too expensive to be worthwhile in a small country" (Gottlieb, 1997). Limited box office receipts, combined with the relative low cost of subtitling, and a significant number of imported films, meant that "the production of movies started to require much higher budgets than most of these countries could afford" (Danan, 1991). Note that some small countries who share large languages (e.g., Austria, Switzerland or the French-speaking Wallonia region in Belgium) adopted dubbing.[10]

Second, there seem to be political motives related to the emergence of totalitarianism.[11] During the 1930s, countries like Germany, Italy, Japan, and Spain were taken over by authoritarian regimes with a strong sense of national identity. Dictators often felt that the usage of the local language in films would strengthen national pride and they therefore tended to opt in favor of dubbing. For example, the Spanish dictator Franco ruled against any non-dubbed version and published many ministerial guidelines (*órdenes*) to make showing films in a foreign language difficult "because of the evil effects that film release can produce on society" (Szarkowska, 2005). In Italy, Mussolini introduced a law which ruled that all imported films had to be dubbed into standard Italian, with the idea of using cinema as a means of creating a common language (Szarkowska, 2005).

In sum, according to the standard account provided by film historians, the combination of these two factors would have resulted in the development of either dubbing or subtitling industries in the 1930 - 1950 period. The introduction of sound was parallel to the expansion of US cinema around the world. Television followed the cinema translation choice in each country upon its introduction in the 1950s (Ávila, 1999). In particular, US "telefilms" and series became very popular and seem to have created the demand necessary for the growth of national translation industries.

C The costs of changing the translation technology

The choice of the (prevalent) translation mode in each country, either dubbing or subtitling, has persisted to the present day (Szarkowska, 2005).[12] None of the countries of the OECD has moved from one to the other since WWII. This even applies to countries that later endured

[10] This is consistent with Bridgman's (2013) findings that movie exporters use more intensive modes, i.e., those that require them to pay a higher share of distribution costs, in larger markets.

[11] Abramitzky and Sin (2014) show that authoritarian regimes can shape knowledge diffusion through language policies.

[12] This classification is, of course, a simplification. Children's programs, for example, are dubbed in most countries and some late-night, less commercial films are broadcast in the original version in France or Spain.

dictatorships, such as Greece. This persistence in the translation technology, which will be at the core of our identification strategy, can be explained by sunk costs and coordination on the supply side, and habit formation on the demand side (Blinn, 2008).[13]

Indeed, on the demand side, viewers now have strong preferences for the translation method used in their country. According to a European Commission (2006) survey, more than 90 percent of the respondents in Sweden, Finland, Norway, Denmark, and the Netherlands agree with the following statement: "I prefer to watch foreign films and programs with subtitles, rather than dubbed." Around 30 percent of the French, Spanish and Italian and less than 20 percent of the Germans agree with this statement. A change from voice-over to the original version in one of the public television channels in Poland in 2008 was met with strong opposition.[14]

On the supply side, the existence of a consolidated industry also makes the change difficult. Countries have created and organized their local translation industries. In total, the turnover of the EU film translation market is estimated to range between 372 and 464 million euros. The subtitling costs are double the European average in France, Germany, Spain, and Italy, where dubbing is prevalent. In contrast, dubbing costs are 66 percent more expensive than the European average in subtitling Scandinavia and the Netherlands (MCG, 2007).

III Data

We use panel data combining measures of English skills, translation mode, and demographic, economic, and educational variables for the period 2008 - 2014, as well as historical data of the time of sound cinema diffusion. Our data set includes all the countries worldwide for which: (i) there is information on TOEFL score measures of English proficiency and language size at the time of sound cinema diffusion, and (ii) English is not the local language (i.e., we exclude countries such as Australia, Canada, Ireland, New Zealand, the UK, and the USA). Table 1 shows the country list used in our preferred econometric specification, together with the average measurements of English quality and the prevalent television translation modes.

<<TABLE 1: TV TRANSLATION MODE AND TOEFL SCORES BY COUNTRY>>

[13] New digital technology has started to produce a slow convergence process and it is now possible both to watch original version films in traditionally dubbing countries and dubbed versions in countries where subtitling is prevalent.

[14] See http://www.wirtualnemedia.pl/artykul/dwojka-z-pasmem-z-napisami-zamiast-lektora.

A English skills

We measure the quality of English using yearly national score averages of the Test of English as a Foreign Language (TOEFL) exams, designed and administered by the Educational Testing Service (ETS), a private non-profit organization.[15] The TOEFL is an English-as-a-foreign-language exam accepted by most colleges and universities in the world. Its standardization means that it is relatively fair and accurate. The fact that everybody takes a similar test eliminates the inconsistency of interviews and other softer methods. There are two versions of the test: paper-based and internet-based. The paper-based test is the traditional version of the test, used since 1995, which aggregates three scores (reading, understanding, and writing). The internet-based test is, according to ETS itself, an "improved" version of the paper-based test, which is more reflective of communicative competence models, and it also includes a speaking category. We shall use both the aggregated and disaggregated scores of both, the internet and paper-based versions. All measures are on a scale of 0 to 120 with the exception of the four disaggregated internet-based measures (speaking, reading, writing, and listening) which go from 0 to 30.[16]

As we can observe at the bottom of Table 1, there are striking differences between subtitling and dubbing countries. Subtitling countries score 1.5 points higher in the paper-based TOEFL, and obtain 6.1 points more in the internet-based TOEFL. At the disaggregated level (not reported in the table), the differences are most pronounced for the listening comprehension tasks (2.9 points for paper-based and 2.5 for internet-based). All performance differences are statistically different from zero (p-value < 0.1) with the exception of paper-based writing.

Our measures of English quality are, of course, not perfect. A potential concern is that they might suffer from self-selection issues. TOEFL takers may be those in each country who are more interested in pursuing studies abroad. Hence, our measure may not reflect the quality of the English of the population as a whole but of a subsample of those with sufficient educational attainment or income to study overseas. However, to our knowledge, this is the most widely available comparable measure of English skills, both over time and across countries.

Our TOEFL measures, and especially the internet version of the test, are also highly correlated with the other measure used in the literature: the percentage of people who declare

[15] Ideally, one would like to work with individual-level data to account for personal variables that are likely to influence English level such as gender, age, education attainment level, etc. Unfortunately, we are not aware of any data set with these characteristics.

[16] As a result, the internet-based aggregate score is the result of adding up all the disaggregated measures while the paper-based aggregate score is the average of the disaggregated measures.

themselves able to hold a conversation in English in one of the three Eurobarometer surveys (see e.g., Melitz and Toubal, 2014). The correlation between our aggregated TOEFL measures and the 2006 Eurobarometer measure (European Commission, 2006) are 0.25 and 0.5 for the paper-based and internet-based tests, respectively (statistically different from zero with a p-value < 0.1). The correlations with the Eurobarometer conducted in 2012 (European Commission, 2012) are 0.1 and 0.44, respectively. Consistent with the nature of the question in the Eurobarometer, the highest correlation is with the score of the speaking part (0.56). The correlations with the writing, listening, and reading tests are 0.45, 0.44, and 0.06, respectively.[17]

B Translation mode

Our main explanatory variable of English proficiency is dichotomous, taking the value of one if foreign television programs are mainly in the subtitled original version, and a value of zero if they are dubbed or voice-overed. As shown in Table 1, 36 of the 68 countries use subtitling as the preferential translation method. Belgium is an interesting case as dubbing is used in the French-speaking Wallonia region but subtitling in the Dutch-speaking Flanders. We excluded it from the regressions presented here but we checked that all results are robust to the inclusion of Belgium as a subtitling country. We gave it a value of one because the population in the subtitling region (Flanders) is larger than in the dubbing region (Wallonia).

A priori, the overall list is suggestive of some patterns. French- and German-speaking countries in Europe (France, Switzerland, Austria, Germany) all use dubbing. Eastern and, to a lesser extent, South European countries use dubbing or voice-over. Small language (e.g., Finnish, Dutch, Greek) and Northern European countries mainly subtitle. Many Arab-speaking countries in Africa use dubbing (e.g., Morocco, Tunisia, Turkey).

C Other explanatory variables

The remaining explanatory variables of English proficiency, and their descriptive statistics, are shown in Table 2 (where, we include all the country/year observations used in our preferred econometric specification). As main variables, we include demographic indicators (language size and country population, in millions), linguistic proximity and a proxy for the quality of the

[17] This measure also has shortcomings. It has been collected only on three occasions for at most 28 countries, and it is clearly subjective. In a previous version of the paper (Ruperez-Micola et al., 2015), we show that the results of the paper are qualitatively the same if one uses the Eurobarometer survey measures.

education system (public expenditure in education per pupil as a percentage of GDP per capita). Language size is measured as the sum of the populations of countries speaking the same language. Population data and variables on the quality of the education system are provided by the IMD world competitiveness yearbook data set. We also include Melitz and Toubal's (2014) index of linguistic proximity between English and the local language. The index is re-scaled so that its average is one. In our sample, the maximum is 0.5, the value that corresponds to languages that belong to the same branch as English (German and Dutch). It is 0.25 for Spanish, French, and Portuguese and 0 for Chinese. As shown at the bottom of the table, dubbing countries are more populated and have languages more different from English than subtitling countries but do not differ significantly in terms of language size and differ very little in terms of expenditures in education.

<<TABLE 2: EXPLANATORY VARIABLES>>

The table also shows the other "education controls" (staff/student ratios in primary and secondary school) as well as the "economic controls" (GDP per capita, measured in thousands of dollars, the exchange rate with respect to the US dollar and the employment rate). Economic indicators are obtained from the Penn World Tables. In the regressions, we also include dummies for the most widely spoken languages in the world (French, German, Spanish, Italian, Portuguese, Russian, Arabic, and Chinese) as well as continent and year dummies.

We also test for the heterogeneous impact of subtitling, depending on the degree of television penetration. Information on the number of TV sets per thousand inhabitants is available at www.nationmaster.com.

D Historical variables

We instrument the translation mode using the arguments provided by the history of the cinematic literature. Prior to our main analysis, we also offer an exploratory analysis of these arguments. As explained earlier, the cinematic literature points at language size and political situation at the time of sound cinema diffusion as the most important factors behind the adoption of the translation mode. We use language size and the Polity IV index (a measure of democracy that ranges from -10 to +10) in 1950, as the most recent year in the period considered of the time of sound cinema diffusion. This choice maximizes the number of countries in the sample.

IV The empirical strategy

In our main specification, we estimate the effect of subtitling on English proficiency using the following linear specification:

$$TOEFL_{it} = \beta_0 + \beta_1 S_i + \beta_2 Lansize_{it} + \beta_3 Pop_{it} + \beta_4 Edex_{it} + \beta_5 Linsim_i + \beta_6 C_{it} + \varepsilon_{it} \quad (1)$$

where $TOEFL_{it}$ represents the English proficiency in country i at time t, as measured by one of the TOEFL scores (paper or internet-based, aggregated or disaggregated by skill), S_i is a dummy variable equal to one if country i uses subtitles, $Lansize_{it}$ represents the size of its language at time t, Pop_{it} its country population, $Edex_{it}$ its education expenditures, and $Linsim_i$ its linguistic similarity index. C_{it} includes time-variant education and economic controls, time-invariant dummies for major language and continents, as well as year dummies. Finally, ε_{it} is the residual.

We estimate this model using both Ordinary Least Squares (OLS) and two-stage least squares (2SLS). The OLS estimation may be biased if countries decide to use subtitling depending on their level of English proficiency (reverse causality) or if countries with open cultures are more likely to have citizens that know English and prefer subtitles (omitted variables). The instrument for the variable S_i is language size at the time of sound cinema diffusion. The validity of this variable as an instrument for subtitling relies on the assumption that it affects English proficiency only through the decision to subtitle movies (conditional on the controls). For this condition to hold it is crucial that we control for the contemporaneous language size. It is also helpful to control for measures of population, economic prosperity, quality of the education system as well as for language and continent. As the subtitling dummy is constant for each country over time, we also adjust standard errors to take into account that the regressor of interest varies only across countries by clustering them at the country level (Bertrand et al., 2004).

Before our main analysis, we explore the role of the two historical determinants of translation mode highlighted by the cinematic literature using a simple linear probability model:

$$S_i = \beta_0 + \beta_1 HistLansize_i + \beta_2 HistPolit_i + \beta_3 Lansize_i + \beta_4 Pop_i + \beta_5 Edex_{it} + \beta_6 Linsim_i + \beta_7 C_i + \varepsilon_i \quad (2)$$

where $HistLansize_i$ and $HistPolit_i$ are the language size and the Polity IV index at the time of sound cinema diffusion of country i and $Lansize_i$, Pop_i and C_i are the time-average of $Lansize_{it}$,

Pop_{it} and C_{it}. Finally, ε_i is the residual.

V The determinants of the translation mode

Table 3 contains the results of the empirical examination of the historical account of the dubbing/subtitling decision, as specified in Equation (2). We jointly test whether the type of political regime and language size, both measured at the time of sound cinema diffusion, can explain the adoption of a certain translation mode. We include all the variables described in the previous section, including the contemporaneous counterpart of language size, as controls. As neither the dependent variable nor the two main regressors vary over time we average all these variables by country over time. We depart from a specification that includes demographic and education controls, to which we subsequently add economic controls, language, and continent dummies.

<<TABLE 3: LANGUAGE SIZE AND POLITICAL REGIME AS SUBTITLING DETERMINANTS>>

Positive parameter estimates indicate that the variable is more conducive to subtitling, while negative estimates suggest a propensity for dubbing. The coefficient of the political regime at the time of cinema diffusion has the expected sign, indicating that higher levels of democracy imply a higher probability of adopting subtitles as the predominant translation mode. Unfortunately, this coefficient is not significant. If anything, one extra point in the democracy scale at the time of sound cinema diffusion is associated with an increase of 0.001 in the probability of using subtitles. In contrast, language size at the time of sound cinema diffusion has a negative and very significant correlation with the probability of adopting subtitles. In particular, an increase of one million in the number of speakers of a particular language at the time of sound cinema diffusion is associated with a reduction of 0.008 in the probability of using subtitles in the countries where the language is spoken. This explains why we focus on language size at the time of sound cinema diffusion as the main shifter of the translation mode and use it as an instrument in the regressions that explain English proficiency.[18]

[18] Exclusively using language size at the time of cinema diffusion as an instrument minimizes the number of assumptions needed for the exclusion restriction to hold. Moreover, its validity holds even if the political regime influences the translation mode because language size is uncorrelated with political regime.

VI The determinants of English proficiency

A Main results

Table 4 reports the results of panel regressions on several factors that could plausibly influence the level of English proficiency in a country, as specified in Equation (1). The dependent variables are the aggregate paper-based (first four columns) and internet-based TOEFL scores (next four columns). The first column for each dependent variable corresponds to the OLS regressions. The second to fourth columns contain the IV regressions. For both dependent variables, we depart from a specification that controls for demographic, economic, education, and language variables, to which we subsequently add year dummies and finally, we include dummies for continent.

<<TABLE 4: THE IMPACT OF SUBTITLING ON ENGLISH PROFICIENCY>>

Panel A shows that the OLS coefficients for subtitles are positive and significantly different from zero for the paper-based score. IV coefficients of subtitling are also positive and significant in all the regressions. Magnitudes stay stable as we control for year dummies and increase after adding continent dummies. In all the regressions, (contemporaneous) language size presents a negative (and generally significant) correlation with English proficiency while the correlations with population and especially with education expenditures are positive and significant.[19]

In our preferred specification, the one based on internet-based scores (as they provide a better measure of effective communication skills) including all the controls, the estimated effect of subtitling of 22.6 points equals 28.4 percent of the average English proficiency score. This magnitude is also equivalent to two standard deviations of the scores. The effect is large in comparison to the coefficient of education expenditures (22.6 vs. 0.5). If we were to interpret the education expenditures coefficient as a causal estimate, it would imply that governments in dubbing countries need to increase their education expenditures per pupil over GDP per capita by 47.6 in order to get the same level of English skills as an otherwise equivalent subtitling country. However, one must take into account that only a small part of the education expenditure is devoted to aspects that improve English skills.

Panel B of Table 4 shows the results of the first-stage regressions, i.e., those of subtitling on language size at the time of sound cinema diffusion and all the controls listed in section IV.

[19] In terms of controls, GDP per capita has a small negative effect whereas the effect of the employment rate is positive. Presumably, the latter is better at capturing the relevant aspects of economic performance.

The coefficient associated with language size at the time of cinema diffusion has the expected negative sign and it is highly significant in all specifications, which rules out the possibility of a weak instrument. Moreover, the coefficient for contemporaneous language size is positive and significant, which reassures us that our instrument is capturing the desired variation, i.e., at the time of sound cinema diffusion in larger markets it was found to be more profitable to introduce dubbing, but the contemporaneous size of the markets is capturing other factors.

B Types of language skills

Table 5 reports IV regressions of the four parts of the TOEFL exam: speaking (only for internet-based test), listening, reading, and writing. The first three columns display the paper-based test scores associated with listening, reading, and writing and the next four columns show the speaking, listening, reading, and writing parts of the internet-based test. All coefficients are positive and significant, with the exception of paper-based writing which is positive but insignificant. The highest effect is found for listening as measured by the internet-based test (37.6%), followed by reading (27.5%) and writing (27%). In the case of the paper based-test, the highest effect is also found for listening (14.3%) while the effects for writing and reading have the same magnitude (11%). Overall, the effects are stronger for the internet-based version of the test, which is meant to be more reflective of communicative competence models, than the paper-based version.

<<TABLE 5: THE IMPACT OF SUBTITLING ON ENGLISH PROFICIENCY BY SKILL>>

C Exposure to subtitling

We also examine the mediating role of television penetration.[20] We interact the number of TV sets per capita with the subtitles dummy to derive the differential effect of subtitling across different levels of television penetration. We report the 2SLS specifications of the aggregate TOEFL scores. As can be seen in Table 6, the interaction between subtitles and television penetration is positive in all cases and significant for most of the regressions of the internet-based test. The uninteracted subtitling dummy becomes negative, indicating that the effect of subtitling is operating through TV exposure. The highest significant effect is again found for listening (38.7%), followed by reading (37%), and writing (31.7%). This can be interpreted as

[20] We also explored the potential interaction effects of subtitling with internet users, cinema attendance, and radio receivers per capita. However, the number of countries for which this information is available is insufficient to provide reliable inference (note that we cluster standard errors by country).

the increase in the score as a result of one additional TV set per capita in subtitling countries (the effect in dubbing countries is null or even negative).

<<TABLE 6: EXPOSURE TO SUBTITLING AND TELEVISION PENETRATION>>

VII The economic impact of English skills

This section reviews the recent literature on the impact of language proficiency on several economic variables, including trade and migration, and explains how our paper can help in understanding that link. Since the seminal paper of Tinbergen (1962), gravity models are the standard tool used in the literature to explain the intensity of trade between pairs of countries. These models include several widely understood measures of distance, ranging from geographical to cultural distance. Early trade literature acknowledged the importance of language as a potential determinant of trade and including a dummy for common official language became standard (Anderson and Wincoop, 2003). Some papers substituted this variable with the probability that two randomly chosen individuals from the two countries would share a common native language (Anderson, 2011). But, the interpretation of the coefficient associated with language could not be causal, as sharing a common language could be the consequence rather than the cause of trade.

Recently, Egger and Lassmann (2015) made use of the linguistic characteristics of Switzerland to construct a spatial regression model. They exploit that there are three well-defined areas in terms of native language and that these three native languages are shared with three important international trade partners. This peculiarity generates discontinuities in terms of native language around internal historical language borders. Otherwise, areas on both sides of the border are extremely similar in terms of economic, legal and political institutions, and religious orientation. By comparing trade with each trade partner on both sides of the native language border, they conclude that sharing a language has a causal effect on trade.

Recent work has also analyzed the influence of language on trade beyond common native language. Isphording and Otten (2013) include the Levenshtein measure of linguistic distance, which we also use, in a gravity model on international trade flows covering 178 countries and 52 years. They conclude that linguistic distance has a strong negative influence on bilateral trade volumes. They claim that linguistic distance imposes hurdles for second language acquisition, which is consistent with the effect of this variable in our regressions. In addition to linguistic

proximity, Melitz and Toubal (2014) use several language measures provided by the Eurobarometer survey (European Commission 2006): common native language, common spoken language, and common official language. They find that the combined impact of these four factors is at least twice as great as that of the usual dummy variable for common official language. They also find that the ease of communication measured by common spoken language plays a distinct role, in addition to the common official language, and apart from ethnicity and trust.

Fidrmuc and Fidrmuc (2009) and Ku and Zussman (2010) test the hypothesis that trade partners with no common native language will overcome the language barrier by communicating in English. They augment the standard gravity equation with a variable that proxies for the effectiveness of bilateral communication in English. Fidrmuc and Fidrmuc (2009) measure foreign language proficiency using Eurobarometer data for 2006 and find that English is a more important determinant of international trade than French, German or Russian. Ku and Zussman (2010) use TOEFL test scores, instrument English proficiency by linguistic distance, and find that English proficiency has a strong and statistically significant effect on bilateral trade flows. The validity of the instrument relies on the assumption that linguistic distance does not affect other aspects of cultural distance that would impact trade.

Our paper suggests that, with the appropriate controls, subtitling could be used as an alternative instrument to address the impact of English proficiency on trade. In contrast to previous instruments, ours is valid even if language affects culture. The translation mode may be less likely to affect aspects of cultural distance - other than linguistic - that impact trade. Moreover, in our regressions subtitling seems to have a stronger effect on English skills than linguistic proximity (in fact, linguistic similarity becomes insignificant in most of our regressions).

Of course our instrument could also be used to study the effects of English proficiency in other economic variables. Recently, Ufier (2015) found a positive impact of English proficiency on income per capita using linguistic proximity as an instrument for English proficiency. But the literature on the impact of foreign language proficiency is still at a very early stage. The migration literature, for example, has just started to analyze the impact of language on migration flows. Adsera and Pytlikova (2015) explain migration flows to different OECD countries using linguistic distance to measure the ease of learning a host country's language. Aparicio and Kuehn (2016) test whether introducing foreign languages into compulsory school curricula, influences the migration of affected cohorts across European countries. They find that introducing a foreign language into compulsory school curricula almost doubles the number of migrants from affected

cohorts who move to the country where the language is spoken, and it increases the overall number of migrants from these cohorts by 23 percent.

VIII Conclusions

The general message in this paper is simple. Media contents that are broadcast in the original version help people learn English and, thus, the citizens of countries where films are shown in the original version speak, on average, better English than those where television is dubbed. In turn, better English language skills shall improve economic performance.

Dubbing countries in our sample invest slightly more in education than the subtitling countries. Yet subtitling countries obtain 1.5 points more in the paper-based version of the TOEFL test and 6.1 points more in the internet-based version. We show in panel regressions that the film translation methods can explain part of the skills gap. We identify a subtitling effect of 13.7 percent of the paper-based TOEFL score and 28.4 percent of internet-based TOEFL score. We also analyze the differential impact of subtitling by type of English skill (listening, speaking, reading, and writing). We find that the strongest effect is for listening (14.3% in paper-based and 37.6% in internet-based). Our results are robust to the inclusion of other determinants of language skill including language similarity, demographic indicators, proxies for the quality of the education system, and economic controls.

We obtained robust estimates thanks to the use of language size at the time of sound cinema diffusion as an instrument for the subtitles variable. We analyzed the reasons why some countries use subtitling and others dubbing, and have found that countries with more widely spoken languages were more prone to adopt dubbing. We also found some evidence that democratic countries were more likely to adopt subtitling, although estimates are not significantly different from zero. Our findings corroborate the account of film history scholars, but, to our knowledge, this is the first time that such findings have been checked econometrically.

Our results have policy implications. In order to foster foreign language proficiency, authorities could incentivize the use of subtitles as a film translation mode, instead of (or in addition to) supporting costly education programs. In 2008, the government of Poland introduced subtitling in one of the public television channels. Unfortunately, this policy was met with strong opposition. A poll had found that only 19 percent of Poles would welcome subtitled films, but this percentage reached 32 percent among educated young individuals. Probably because of this,

subtitling was introduced in the channel TVP2 which targets young audiences, who may be less reluctant to change from voice-over to subtitling and more prone to learn English. The prevailing translation mode, though, is still voice-over. However, our results can help to overcome this resistance in a context of raising understanding of the importance of English for labor market success.[21]

Our paper is a first attempt to measure the impact of translation mode on English, but there is still a lot of ground to cover. For instance, we have taken an aggregated national view. Some analyses (e.g., European Commission, 2005) find substantial foreign language skill differences between men and women (52% to 47%), the young and the old (69% versus 35%), city and countryside residents (55% and 47%), and across education attainment levels (20% of those that finished their studies at the age of 15 are conversational in a foreign language, compared to 79% of those who are still studying). We believe that the analysis of the causes and the consequences of English proficiency at the micro level could be a fruitful area for future research.

[21] In Asia this phenomenon is particularly accurate to the extent that experts have coined the term "English fever" (Park, 2009).

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Table 1: Television translation mode and TOEFL scores by country

DUBBING			SUBTITLING		
Country	Paper-Based score	Internet-Based score	Country	Paper-Based score	Internet-Based score
Algeria	50.3	71.6	Angola	49.9	65.6
Austria	49.1	98.9	Argentina	55.4	92.7
Bangladesh	51.2	83.1	Bahrain	46.7	78.7
Benin	49.7	64.3	Brazil	53.6	84.6
Burkina Faso	48.8	65.4	Colombia	51.5	80.9
Chad	49.5	66.1	Costa Rica	56.6	92.7
Chile	54.5	84	Denmark	60.8	99
China	52	76.7	Finland	61	96
Congo	46.7	63.6	Gabon	49	69.1
Dominican Rep	55	81.1	Greece	52.3	90.1
Ecuador	51.9	78.1	Guatemala	54.3	81.1
Egypt	50.9	81.3	Haiti	50.2	63.1
El Salvador	49.6	84.9	Honduras	50.9	84.7
France	53.8	87.7	Indonesia	51.8	79.9
Germany	54.7	96.1	Iraq	48.4	69.7
Guinea	48.7	63	Israel	54.7	93.7
Italy	53.6	89	Jordan	51.3	76.4
Japan	51.5	68.9	Kuwait	44.3	68.7
Madagascar	52.2	78.3	Lebanon	51.7	84.3
Mali	47.5	60.1	Malaysia	53.6	88.6
Morocco	51.3	77.7	Mauritania	49.7	65.1
Mozambique	51.1	69.4	Mexico	54.5	85.6
Nepal	50.6	78.9	Netherlands	61.1	100.6
Niger	52.6	69	Nicaragua	49.6	84.4
Senegal	50	65.6	Norway	56.9	93
Spain	54.6	89.1	Oman	48.8	65.9
Sri Lanka	53.2	83.1	Panama	55.2	82.7
Switzerland	56.4	96.9	Paraguay	54.3	85
Thailand	48.4	74.6	Peru	51.6	85.4
Togo	49	66	Portugal	54.9	95.3
Tunisia	52.1	78	Qatar	46.2	70.7
Turkey	50.1	76.4	Romania	58.1	91.6
			Saudi Arabia	47	61.3
			Sweden	57.2	92.3
			Uruguay	57.8	93.9
			Yemen	50.2	68.6
Mean	51.3	76.2	Mean	52.8	82.4

Two sample t test	Paper based score	Internet based score
Diff means (dubbing-subtitling)	-1.491***	-6.13***
Standard errors	(0.463)	(1.013)

The TOEFL scores are overall averages for test-takers resident in each country in the sample period (2008-14). We use the observations of our preferred estimation, i.e., the regression of internet-based scores on subtitles including all the controls.

Table 2: Explanatory variables

	Main variables				Education controls		Economic controls			Mechanism	Historical variables	
	Language size	Population	Linguistic proximity	Education expenditures	Staff/student in primary	Staff/student in secondary	GDP per capita	Employment rate	Exchange rate	TV sets per capita	Historical language size	Historical Polity IV
Dubbing												
Obs.	203	203	203	203	203	203	203	203	203	196	203	203
Mean	308.708	80.593	0.117	21.97	15.868	12.859	13712.42	0.408	468.365	0.191	93.606	2.618
Median	346.56	20.201	0	21.798	15.664	12.501	3366.792	0.403	79.807	0.087	90.882	4.667
St. Dev.	242.433	242.865	0.174	2.793	2.11	2.083	20248.4	0.09	1156.597	0.222	93.81	6.336
Min	19.95	1.474	0	7.486	10.6	9.35	366.45	0.236	0.683	0.001	8.607	-7
Max	1405.603	1369.436	0.5	29.82	24.64	24.8	87849.5	0.611	7014.119	0.677	557.982	10
Subtitling												
Obs.	271	271	271	271	271	271	271	271	271	271	271	271
Mean	302.358	28.474	0.172	21.418	15.892	12.777	19011.32	0.418	526.305	0.23	75.623	-.421
Median	369.651	9.768	0.25	21.798	15.664	12.501	8768.568	0.425	5.605	0.201	40.199	-1.333
St. Dev.	152.802	51.158	0.159	4.244	3.346	2.904	23569.72	0.099	1743.972	0.174	53.969	6.918
Min	4.772	1.116	0	8.241	9.266	7.258	698.2068	0.189	.269	0.004	3.424	-10
Max	434.234	254.455	0.5	37.18	29.396	30.3	103818.8	0.748	11865.21	0.67	141.726	10
Diff means	6.351	52.118***	-0.055***	0.553*	-0.025	.082	-5298.903***	-0.010	-57.94	-0.039**	217.983**	0.362***
Standard errors	19.382	17.327	.016	.324	0.251	0.229	2017.331	0.008	133.465	0.019	7.355	.398

Descriptive statistics are computed for the sample used in our preferred specification, i.e., the regression of internet based scores which includes all the controls. Language size and population are in millions of inhabitants. The data on language size is obtained by computing the sum of the populations of the countries in which each language is spoken. Language proximity is based on Melitz and Toubal's (2014) index. Education expenditures are equal to public expenditures per pupil over GDP per capita. GDP per capita is in thousands of dollars. Exchange rates are those with respect to the US dollar.

Table 3: Language size and political regime as subtitling determinants

	(1)	(2)	(3)	(4)
Language size at	-.005	-.005	-.007	-.008
sound cinema diffusion	(0.002)***	(0.002)***	(0.004)*	(0.004)**
Polity IV at	-.012	-.012	0.001	0.001
sound cinema diffusion	(0.011)	(0.012)	(0.012)	(0.011)
Language size	0.002	0.002	0.001	0.001
	(0.0006)**	(0.0007)***	(0.0009)	(0.0008)
Population	-.0002	-.0002	-.0001	-.0009
	(0.0004)	(0.0004)	(0.0004)	(0.001)
Education expenditures	-.016	-.003	-.015	-.029
	(0.023)	(0.026)	(0.026)	(0.023)
Linguistic proximity	0.542	0.671	0.423	-.239
	(0.366)	(0.403)*	(0.5)	(0.45)
Education controls	Y	Y	Y	Y
Economic controls	N	Y	Y	Y
Language dummies	N	N	Y	Y
Continent dummies	N	N	N	Y
Obs.	79	79	71	70
R-squared	0.441	0.453	0.636	0.769

*** p<0.01, ** p<0.05, * p<0.1 The dependent variable equals one for countries that use subtitling and zero otherwise. Estimation is done by Ordinary Least Squares. For the contemporaneous control variables, we use average data for the sample period.

Table 4: The impact of subtitling on English proficiency

Panel A: OLS and IV estimates

	Paper-based test				Internet-based test			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Subtitles (instrumented)		5.658	5.391	7.115		14.533	13.757	22.634
		(1.924)***	(1.761)***	(3.566)**		(5.874)**	(6.092)**	(8.672)***
Subtitles	1.054				2.604			
	(0.635)*				(1.666)			
Language size	-.011	-.015	-.008	-.005	-.029	-.041	-.048	-.040
	(0.005)**	(0.007)**	(0.007)	(0.007)	(0.014)**	(0.021)**	(0.021)**	(0.02)*
Population	0.003	0.003	0.003	0.015	0.005	0.005	0.005	0.067
	(0.0008)***	(0.001)***	(0.001)***	(0.016)	(0.003)**	(0.003)	(0.003)	(0.04)*
Education expenditures	0.222	0.224	0.2	0.211	0.347	0.413	0.42	0.475
	(0.07)***	(0.077)***	(0.074)***	(0.095)**	(0.16)**	(0.196)**	(0.193)**	(0.278)*
Linguistic proximity	0.542	1.366	3.244	5.749	17.759	9.895	9.240	13.952
	(0.366)	(4.818)	(4.563)	(4.556)	(6.367)***	(12.144)	(11.775)	(11.017)
Education controls	Y	Y	Y	Y	Y	Y	Y	Y
Economic controls	Y	Y	Y	Y	Y	Y	Y	Y
Language dummies	Y	Y	Y	Y	Y	Y	Y	Y
Year dummies	N	N	Y	Y	N	N	Y	Y
Continent dummies	N	N	N	Y	N	N	N	Y
Obs.	475	333	333	328	621	481	481	474
R-squared	0.376	0.364	0.491	0.477	0.643	0.533	0.571	0.499

*** p<0.01, ** p<0.05, * p<0.1 Estimations are done by Ordinary Least Squares and Instrumental Variables. Subtitles is instrumented by language size at the time of sound cinema diffusion.

Panel B: First stage

	Paper-based test			Internet-based test		
	(2)	(3)	(4)	(6)	(7)	(8)
Language size at	-.009	-.009	-.007	-.010	-.010	-.008
sound cinema diffusion	(0.002)***	(0.002)***	(0.002)***	(0.001)***	(0.001)***	(0.001)***
Language size	0.002	0.002	0.001	0.002	0.002	0.001
	(0.0004)***	(0.0004)***	(0.0004)***	(0.0004)***	(0.0004)***	(0.0003)***
Population	-.00009	-.00009	-.002	-4.86e-06	-6.51e-06	-.001
	(0.0002)	(0.0002)	(0.0005)***	(0.0001)	(0.0001)	(0.0004)**
Education expenditures	-.008	-.008	-.011	-.008	-.008	-.015
	(0.007)	(0.007)	(0.005)**	(0.005)	(0.006)	(0.004)***
Linguistic proximity	1.005	1.008	-.038	0.73	0.743	-.205
	(0.217)***	(0.221)***	(0.21)	(0.165)***	(0.167)***	(0.15)
Education controls	Y	Y	Y	Y	Y	Y
Economic controls	Y	Y	Y	Y	Y	Y
Language dummies	Y	Y	Y	Y	Y	Y
Year dummies	N	Y	Y	N	Y	Y
Continent dummies	N	N	Y	N	N	Y
Obs.	333	333	328	481	481	474
R-squared	0.578	0.58	0.727	0.583	0.584	0.738

*** p<0.01, ** p<0.05, * p<0.1 Estimation is done by Ordinary Least Squares.

Table 5: The impact of subtitling on English proficiency by skill

	Paper-based test			Internet-based test			
	Listening	Reading	Writing	Speaking	Listening	Reading	Writing
Subtitles (instrumented)	7.607	7.960	5.650	4.486	7.493	5.050	5.541
	(3.091)**	(3.862)**	(3.931)	(2.032)**	(2.954)**	(2.110)**	(1.949)***
EFFECT (%)	14.293	10.953	10.994	21.569	37.552	26.958	27.496
Language size	-.006	-.005	-.005	-.006	-.012	-.011	-.010
	(0.006)	(0.008)	(0.008)	(0.004)	(0.007)*	(0.005)**	(0.005)**
Population	0.013	0.023	0.008	0.006	0.021	0.024	0.018
	(0.015)	(0.018)	(0.016)	(0.007)	(0.013)	(0.011)**	(0.009)*
Education expenditures	0.189	0.207	0.227	0.082	0.153	0.138	0.102
	(0.094)**	(0.101)**	(0.1)**	(0.05)	(0.091)*	(0.08)*	(0.062)*
Linguistic proximity	7.297	4.823	5.003	5.591	3.679	2.045	2.399
	(4.272)*	(5.485)	(4.212)	(2.041)***	(3.560)	(3.075)	(2.551)
Education controls	Y	Y	Y	Y	Y	Y	Y
Economic controls	Y	Y	Y	Y	Y	Y	Y
Language dummies	Y	Y	Y	Y	Y	Y	Y
Year dummies	Y	Y	Y	Y	Y	Y	Y
Continent dummies	Y	Y	Y	Y	Y	Y	Y
Obs.	328	328	328	474	474	474	474
R-squared	0.518	0.409	0.5	0.582	0.469	0.58	0.414

*** p<0.01, ** p<0.05, * p<0.1. Estimations are done by Instrumental Variables. Subtitles is instrumented by language size at the time of sound cinema diffusion.

Table 6: Exposure to subtitling and television penetration

	Paper based test				Internet based test				
	Total	Listen	Read	Write	Total	Speak	Listen	Read	Write
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Subtitles*TV	9.825	7.313	12.668	9.205	24.720	3.050	7.741	7.112	6.433
	(6.522)	(5.009)	(7.597)*	(7.413)	(12.048)**	(2.249)	(3.622)**	(3.815)*	(3.054)**
EFFECT (%)	18.824	13.7	24.479	17.863	30.908	14.553	38.664	37.953	31.747
Subtitles	-4.746	-1.304	-7.276	-5.463	-5.277	1.074	-1.279	-3.030	-1.681
	(4.621)	(3.867)	(5.164)	(5.339)	(11.147)	(1.952)	(3.420)	(3.268)	(2.736)
TVs per capita	-7.751	-5.656	-10.071	-7.230	-18.104	-2.408	-5.450	-4.862	-4.989
	(5.942)	(4.475)	(6.942)	(6.818)	(11.145)	(2.067)	(3.279)*	(3.464)	(2.864)*
Language size	0.006	0.003	0.009	0.006	-.012	-.003	-.003	-.003	-.003
	(0.008)	(0.007)	(0.01)	(0.009)	(0.021)	(0.004)	(0.007)	(0.006)	(0.005)
Population	-.0007	0.001	0.004	-.007	0.044	0.003	0.014	0.017	0.012
	(0.012)	(0.01)	(0.016)	(0.011)	(0.025)*	(0.004)	(0.008)*	(0.008)**	(0.006)*
Education exp.	0.093	0.1	0.056	0.117	0.166	0.045	0.055	0.046	0.023
	(0.079)	(0.074)	(0.082)	(0.095)	(0.214)	(0.041)	(0.068)	(0.063)	(0.048)
Linguistic prox.	-.094	3.082	-2.814	-.381	4.275	4.131	0.993	-.190	-.556
	(6.048)	(4.751)	(7.425)	(6.803)	(9.156)	(1.929)**	(2.773)	(2.958)	(2.268)
Education	Y	Y	Y	Y	Y	Y	Y	Y	Y
Economy	Y	Y	Y	Y	Y	Y	Y	Y	Y
Language	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year	Y	Y	Y	Y	Y	Y	Y	Y	Y
Continent	Y	Y	Y	Y	Y	Y	Y	Y	Y
Obs.	322	322	322	322	467	467	467	467	467
R-squared	0.553	0.613	0.466	0.536	0.681	0.715	0.675	0.698	0.612

*** p<0.01, ** p<0.05, * p<0.1. Estimation is done by instrumental variables. Subtitles is instrumented by language size at the time of sound cinema diffusion.

Appendix (not intended for publication)

In Table 4 of the paper, we do not report the coefficients associated to all the control variables. We report all of the coefficients of the regressions of Panel A of Table 4 here.

The impact of subtitling on English proficiency. All controls displayed

	Paper-based test				Internet-based test			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Subtitles (inst.)		5.658	5.391	7.115		14.533	13.757	22.634
		(1.924)***	(1.761)***	(3.566)**		(5.874)**	(6.092)**	(8.672)***
Subtitles	1.054				2.604			
	(0.635)*				(1.666)			
Language size	-.011	-.015	-.008	-.005	-.029	-.041	-.048	-.040
	(0.005)**	(0.007)**	(0.007)	(0.007)	(0.014)**	(0.021)**	(0.021)**	(0.02)*
Population	0.003	0.003	0.003	0.015	0.005	0.005	0.005	0.067
	(0.0008)***	(0.001)***	(0.001)***	(0.016)	(0.003)**	(0.003)	(0.003)	(0.04)*
Education exp.	0.222	0.224	0.2	0.211	0.347	0.413	0.42	0.475
	(0.07)***	(0.077)***	(0.074)***	(0.095)**	(0.16)**	(0.196)**	(0.193)**	(0.278)*
Linguistic proximity	0.542	1.366	3.244	5.749	17.759	9.895	9.240	13.952
	(0.366)	(4.818)	(4.563)	(4.556)	(6.367)***	(12.144)	(11.775)	(11.017)
Primary educated	0.161	0.154	0.047	0.127	-.149	0.087	0.145	0.247
	(0.076)**	(0.09)*	(0.076)	(0.099)	(0.224)	(0.244)	(0.251)	(0.378)
Secondary educated	-.325	-.299	-.171	-.142	-.312	-.295	-.426	-.092
	(0.09)***	(0.136)**	(0.135)	(0.152)	(0.186)*	(0.361)	(0.363)	(0.452)
GDP per capita	0.00002	-.00002	-.00003	-.00005	9.73e-06	-.00008	-.00008	-.0002
	(0.00002)	(0.00002)	(0.00002)	(0.00003)*	(0.00006)	(0.00007)	(0.00007)	(0.00009)**
Employment rate	-4.696	-5.040	-.776	6.150	3.955	9.031	6.905	32.480
	(3.471)	(4.259)	(4.271)	(4.560)	(9.826)	(12.921)	(12.624)	(15.952)**
Exchange rate	0.0001	-.0002	-.0002	-.0004	0.0002	-.0002	-.0001	-.001
	(0.0001)	(0.0002)	(0.0002)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0009)

	Paper-based test				Internet-based test			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
French	1.816	4.028	2.198	1.214	0.631	6.359	7.780	9.869
	(1.678)	(1.683)**	(1.653)	(2.713)	(4.021)	(5.252)	(5.546)	(7.508)
German	-.790	2.760	2.085	1.713	8.471	17.152	17.001	18.589
	(1.529)	(2.128)	(2.040)	(2.326)	(2.740)***	(6.391)***	(6.366)***	(6.477)***
Spanish	4.744	4.283	2.364	4.407	13.973	12.152	14.916	28.976
	(2.166)**	(2.797)	(2.697)	(3.358)	(5.556)**	(8.216)	(8.204)*	(9.879)***
Italian	1.573	2.714	2.968	4.038	4.951	9.201	8.782	11.407
	(1.660)	(0.997)***	(0.944)***	(1.709)**	(2.422)**	(2.732)***	(2.587)***	(5.373)**
Portuguese	0.415	-1.128	-2.188	-4.121	0.983	-1.608	-.222	-3.624
	(1.403)	(2.028)	(2.016)	(3.115)	(5.049)	(6.833)	(6.657)	(8.962)
Russian	1.421				5.022			
	(1.506)				(2.797)*			
Arabic	1.354	-.099	-1.116	-1.596	4.656	2.430	4.461	2.835
	(1.692)	(1.962)	(1.886)	(1.759)	(4.132)	(5.164)	(4.992)	(4.472)
Chinese	13.209	18.638	9.986	-9.012	33.589	52.935	61.230	-31.750
	(7.232)*	(8.867)**	(8.905)	(19.916)	(18.676)*	(27.239)*	(27.661)**	(52.629)
Year dummies	N	N	Y	Y	N	N	Y	Y
Continent dummies	N	N	N	Y	N	N	N	Y
Obs.	412	333	333	328	621	481	481	474
R^2	0.417	0.364	0.491	0.477	0.643	0.533	0.571	0.499

*** p<0.01, ** p<0.05, * p<0.1 Estimations are done by Ordinary Least Squares and Instrumental Variables. Subtitles is instrumented by language size at the time of sound cinema diffusion.