English skills and labor market outcomes in Mexico*

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Abstract

In this paper I provide one of the first causal estimates of the returns to English skills in the context of a non-English-speaking country. I use the exogenous variation caused by policy interventions in several Mexican states, which introduced English instruction in public primary schools, as an instrument for the endogenous English skills regressor in an instrumental variables approach. Difference in differences estimates from the first stage equation suggest that exposure to English instruction could lead to the acquisition of English abilities in Mexico. I document that this effect is driven by women, who also see a significant increase in wages. However, I show that this positive effect on wages is not due to the acquisition of English abilities. It is likely that this lack of effect of English skills on wages is due to these skills provoking changes in occupational decisions. Indeed, I provide evidence that individuals who acquire English skills are better off because they are moving from occupations that require more physical effort to more cognitive demanding jobs. This is particularly true for women who increase their labor participation in professional and technical occupations.

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Introduction

In the context of a globalizing world in which English is the lingua franca, there has been an unprecedented expansion of English programs to offer English instruction in the public education system of non-English speaking countries. This expansion has been usually motivated by the assumption that English instruction will increase English-language skills and, ultimately, improve labor market outcomes. The existing literature has traditionally studied the effect of English skills on earnings in English-speaking countries, while there is very little research in contexts where English is not the main language of communication. Probably, the first evidence was provided by Azam, Chin and Prakash (2013) in the context of India and Eriksson (2014) in South Africa.

Nevertheless, we do not know much about the effectiveness of the exposure to English instruction on the acquisition of English abilities. Angrist, Chin and Godoy (2008) offered the first evidence that changing the medium of instruction (from English to Spanish) would not affect the English proficiency of Puerto Ricans. While Eriksson (2014) finds a positive effect on English proficiency when the medium of instruction changed from Afrikaans to English. However, most of the non-English speaking countries introduced English language as a subject not as the medium of instruction. For example, in the first research that exploits a policy change in the exposure to English instruction (as a subject), Chakraborty and Bakshi (2016) work with the probability of exposure to evaluate its effect on wages. However, they do not actually measure if this exposure lead to the acquisition of English skills. Likewise, although Gálvez-Soriano (2023) have a better measure of exposure (as weekly hours of English instruction), they cannot provide causal evidence that exposure leads to the formation of English abilities because of the lack of data needed for this purpose. Instead, these authors offer evidence that exposure does not affect other cognitive skills, suggesting that their findings are consistent with the acquisition of English abilities.

On the other hand, the evidence on the returns to English skills is still scarce in the context of non-English speaking countries and very rare in Latin American economies. In particular, most of the existing research points out that that English language skills are positively associated with immigrants' earnings in English-speaking countries (see Isphording (2014) and Chiswick and Miller (2015) for a review). This literature provides evidence that immigrants with English skills in the US have higher wages, better educational attainment. Similar results on wages have been found in the context of immigrants to Australia and European countries (Dustmann, 1994; Chiswick and Miller, 1995; Dustmann and Soest, 2001; Hayfron, 2001; Shields and Price, 2002; Williams, 2011). Likewise, it has been found that the English premium among immigrants could vary depending on the workers' age and education, i.e. younger and more educated immigrants have greater returns to English at work (Lang and Siniver, 2009; Azam, Chin and Prakash, 2013). Nevertheless, our understanding on the effects of English instruction on the acquisition of English abilities and the returns of these skills in non-English speaking countries is still limited.

To fill these gaps in the literature, I propose to answer the following research questions:

Does exposure to English instruction increase the acquisition of English abilities in a non-English speaking country? What are the returns to English skills in a non-English speaking country? The context I study is Mexico, an economy whose main language of communication is Spanish, but also one for which the value of English could be even more pronounced than in any other developing country because of its close relationship to the United States (US) in terms of trade and migration. Besides, the external validity of my context is potentially wider than in the case of India or South Africa, which are particularly different from most of the developing countries because of their status of former British colonies, where the upper-social class and government workers usually have English abilities.

To answer my research questions, I exploit the implementation/expansion of seven state English programs in Mexico. In my identification strategy, I use state by cohort variation in exposure to English instruction (which was driven by the implementation of the different state policies since the early 90's) in a Difference in Differences (DD) strategy. Then, I work with a more representative sample to perform an analysis of heterogeneous effects and to study occupational decisions. To accomplish this latter, I offer estimates from a staggered DD (SDD) model, which pools the aforementioned Mexican states. Finally, I offer a causal estimate of the returns to English skills using an instrumental variables approach using the exogenous variation caused by the interventions as an instrument of the endogenous variable (English skills).

Hence, in this paper, I provide the first empirical evidence that exposure to English instruction leads to the formation of English skills in Mexico. In fact, I exploit the implementation of the seven state English programs as an exogenous variation to the exposure to English instruction, which may affect the acquisition of English skills. The SDD estimate from the first stage equation suggests that this type of interventions increase the acquisition of English abilities by almost 2 percent. The average size of the intervention I study is relatively small. It increased exposure to English instruction, on average, by 18 minutes per week. However, my results suggest that exposure to English instruction does actually increase the number of English speakers in Mexico by 6 percent. I also find that after the intervention, women acquired more English skills than men. This same finding is also true for non-indigenous people with respect to the indigenous ones, and for individuals living in urban areas with respect to those living in a rural context.

Furthermore, I offer some of the first causal estimate on the returns to English skills and the effect of English programs on labor market outcomes in the context of a non-English-speaking country. The set of labor market outcomes I examine include labor force participation, wages and occupations. I find that the average intervention does not effect labor force participation, but increases wages by 43%. This latter effect is driven by women, who are also the ones more positively affected by the intervention in terms of English abilities.

There are three related papers in the context of Mexico. Delgado Helleseter (2020) offered the first estimate of the returns to English abilities in the market of jobs posted online. He finds that the wages of Mexican English speakers is approximately 28 percent higher than those of non-English speakers. However, his sample is composed only by online advertise-

ments from a single online job board, which implies concerns about the selection bias and the external validity of his results. Second, Charles-Leija and Torres (2022) claimed offering an estimate of the returns to English skills in Mexico. However, their model has serious problems of identification because they do not solve the selection problem associated to differences between individuals who report being English speakers and those who do not. Instead, they propose to solve the selection into the sample due to more men participating on the labor market than women, which produced a remaining bias in their estimates. Finally, Gálvez-Soriano (2023) provides the first empirical evidence that exposure to English instruction does not affect wages of the mean worker in the Mexican formal sector. However, he does find a significant and positive effect of individuals with high abilities.

Although the existing literature in Mexico have offered a reliable estimate of the exposure to English instruction on labor market outcomes (Gálvez-Soriano, 2023), no one has yet provided a causal evidence on the returns to English skills (Delgado Helleseter, 2020; Charles-Leija and Torres, 2022). Furthermore, this paper offers the first empirical evidence that exposure to English instruction improves the acquisition of English abilities, in the context of a Latin American economy. Similarly, I am the first to estimate the causal effect of English skills in a Latin American economy and among the first in the context of a non-English-speaking country.

The remaining of this paper proceeds as follows. In the first section I offer a comprehensive description of the English abilities in Mexico. Then, in section 2 I explain the background of the policy changes I exploit in this paper. In section 3, I describe the database I use. In section 4, I explain the empirical strategy I propose. In section 5, I first show the results of a naive estimate on the returns to English skills, then I offer an estimate of the effect of English programs on the acquisition of English abilities and a causal evidence on the returns to this abilities. Section 6 provides robustness checks of mi DD models. Finally, section 7 summarizes with a discussion of my findings and a brief conclusion.

1 English language skills in Mexico

1.1 Five facts about the English skills of the Mexican population

In this subsection I provide an overview of the Mexican population in relation to their ability to speak English. I document five important facts. First, there is a gender-English gap in Mexico, with more men declaring to speak English. Second, more exposure to English instruction is associated with more English skills. Third, the ability to speak English increases with educational attainment. Fourth, indigenous people are way behind in the process of learning English. Similarly, rural areas are falling behind in this learning process. The data I use in this descriptive analysis come from the 2014 Mexican Subjective Well-being Survey (BIARE, for its acronym in Spanish). BIARE surveys only adults ages 18 and older, but I

concentrate on the range 18-65 to capture mostly individuals that participate in the labor market (excluding retired workers). Additionally, I offer a comparison between Mexican states that implemented English programs in public primary school and states that did not. Hence, this overview shows two important dimensions of heterogeneity in English abilities: among types of individuals and among regions.

The most spoken language in Mexico is Spanish and with all official documents written in this language. By the year 2014, only 2.8% of the Mexican adult population knew how to speak English (see Table 1), while about 7% declared knowing how to speak an indigenous language. On the other hand, in this first descriptive analysis, I document a positive correlation between English instruction and English abilities in Mexico. Indeed, using a comparison of regions I find that states which have implemented English programs (to offer English instruction in primary schools) have more proportion of individuals with English skills than the other states.[1] Hence, it could be inferred that exposure to English instruction may improve the acquisition of English skills.[2]

I document the existence of a gender-English gap in Mexico, with more men declaring to speak English than women. About 3.4% of the male population in Mexico speaks English, while 2.1% of female population does. Notice, however, that since the English skills variable is self reported, it could potentially overstate the gender-English gap, with less women reporting having English abilities. On the other hand, as in the former finding (for the overall Mexican population), there are more men (and women) with English abilities in states that have offered English instruction in primary schools than in those that did not. This latter result motivates the research question of whether exposure to English instruction improves the acquisition of English abilities in the context of a non-English speaking country.

Young adults who have had more exposure to English instruction report more English skills than the older ones. This fact is supported in two dimensions. First, young individuals (18-35 years old) are more likely to know English than elderly (51-65 years old). This could be a result of the recent English programs implemented in the early 90's and in the early 2000's in Mexico that affected only the young cohorts (as I explain in section 2). Second, particularly among the young cohorts there are significant differences in English abilities when we compare individuals living in states with English programs and individuals living in the other states (without English programs). Once again, this finding supports the idea of English programs increasing the acquisition of English abilities.

The ability to speak English increases with educational attainment. The proportion of college graduates (and higher) with English speaking skills in Mexico is more than three times the corresponding proportion for all Mexican adults. While this proportion is about

[1] States with English programs are: Aguascalientes, Coahuila, Durango, Nuevo Leon, Sinaloa, Sonora and Tamaulipas. There are other Mexican states that have offered English instruction in public primary schools, but at an irregular basis, with a few beneficiary schools and/or with no expansion over time.

[2] Later in this paper, I formally prove this claim.

Table 1: Adult English speaking ability in Mexico

Variable	Full Sample	States w/ English (a)	States wo/ English (b)	Diff. (a-b)
All individuals ages 18-65	2.75	3.38	2.63	0.75***
	(16.36)	(18.08)	(15.99)	(0.17)
By gender				
Male	3.44	4.03	3.32	0.71**
	(18.22)	(19.66)	(17.91)	(0.26)
Female	2.13	2.77	2.01	0.76***
	(14.45)	(16.42)	(14.03)	(0.21)
By age				
18-35	3.07	4.09	2.87	1.22***
	(17.25)	(19.81)	(16.71)	(0.27)
36-50	2.94	3.51	2.82	0.69**
	(16.88)	(18.39)	(16.55)	(0.30)
51-65	1.80	1.79	1.81	-0.02
	(13.31)	(13.26)	(13.32)	(0.27)
By educational attainment				
Incomplete primary (0-5 years)	0.33	0.20	0.35	-0.15
	(5.73)	(4.46)	(5.87)	(0.10)
Primary school (6 years)	0.59	0.72	0.57	0.14
	(7.68)	(8.44)	(7.55)	(0.18)
Lower secondary (7-9 years)	0.96	1.10	0.92	0.18
	(9.74)	(10.43)	(9.57)	(0.17)
Upper secondary (10-12 years)	2.79	2.65	2.82	-0.17
	(16.46)	(16.05)	(16.54)	(0.31)
College or higher (13-24 years)	8.67	10.10	8.33	1.77***
	(28.14)	(30.13)	(27.63)	(0.64)
By ethnicity				
Indigenous	0.99	2.23	0.94	1.29
	(9.88)	(14.76)	(9.67)	(0.91)
Non-indigenous	2.87	3.40	2.75	0.64***
	(16.69)	(18.11)	(16.37)	(0.18)
By geography				
Urban	3.24	3.74	3.13	0.60***
	(17.71)	(18.96)	(17.42)	(0.20)
Rural	0.92	1.20	0.88	0.31
	(9.53)	(10.87)	(9.35)	(0.19)

Note: The sample consist of Mexicans ages 18–65 who self-reported their ability to speak English, using the 2014 Mexican Subjective Well-being Survey (BIARE). The full sample is composed by 83,630 observations. Standard deviations are shown in parentheses below the mean percent of a given subpopulation with English ability, while standard errors are shown in parentheses below the difference in means. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

the same between individuals with upper secondary and the national figure. On the other hand, less than one percent of the individuals with lower secondary or less speak English. These results suggest that either most of the acquisition of English skills is held during the higher education or that mostly individuals that can afford a higher education are likely to learn English. Furthermore, this also points out the importance to include education in my empirical analysis as a non-linear variable. Indeed, in all models shown in section 4 I control for education fixed effects in order to capture the non-linear relationship among education, English skills and wages.

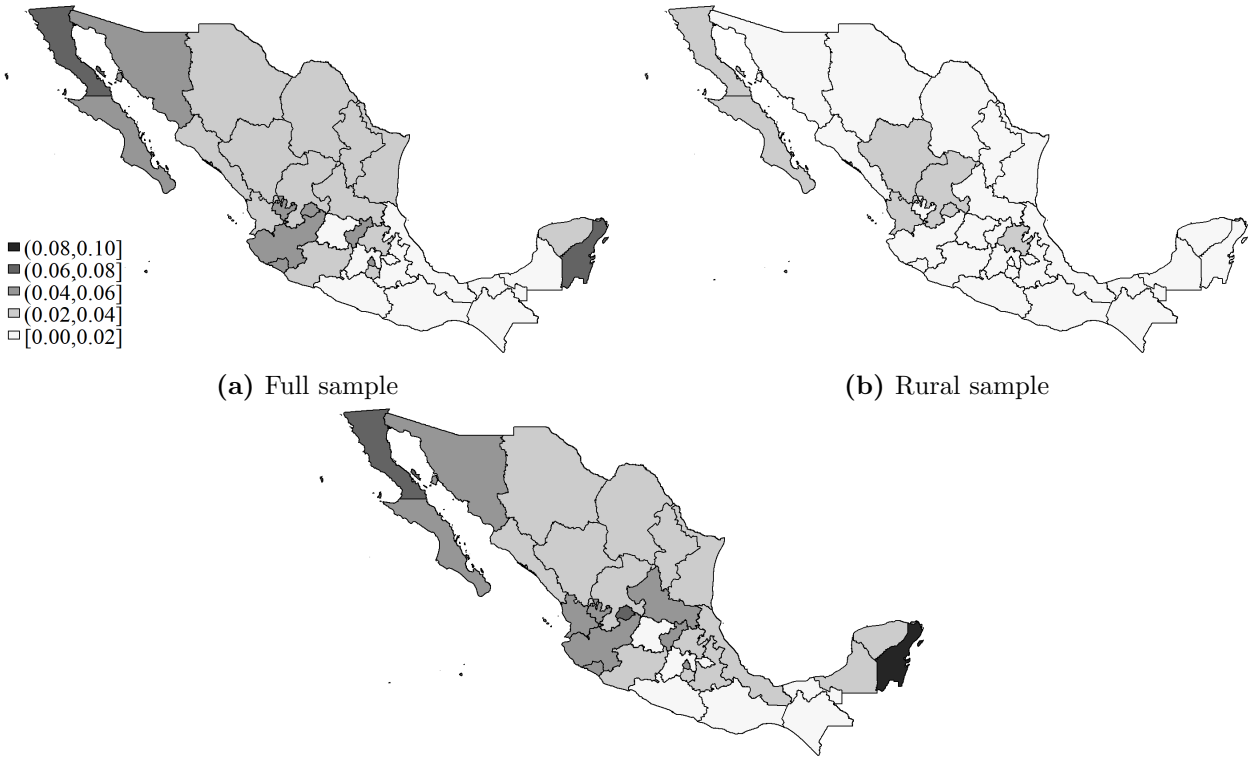
I also document the existence of an ethnicity-English gap in Mexico, with nearly 2.9% percent of non-indigenous people with English skills and almost 1% of indigenous people who speak English. I claim that this is a result of the lack of English education in marginalized areas where indigenous people have settled. In fact, most of the efforts to teach indigenous people a second language is for them to learn Spanish than to learn a foreign language. Another piece of evidence is the fact that I do not find differences in English abilities between indigenous people living in states that have implemented English programs and indigenous people living in states without these programs, which may suggest that the state English programs have not reached the marginalized villages where indigenous people live.

Similarly, there is a considerable geographical variation in the prevalence of English skills in Mexico. In particular, I find an important difference in English ability between urban and rural areas, with the former showing a 3.2% of English speakers, while the latter have only 0.9%. Previous estimates by CIDAC (2008) suggested that this number was 6% for the urban adult population in Mexico. The story behind this difference between the urban and rural contexts is similar to the indigenous people case. Indeed, the state governments that have implemented English programs relegated rural and marginalized areas preventing their schools from implementing English programs. The reason is that most of the first English programs consisted of virtual courses because of the lack of English teachers, which means that schools without the equipment needed (computers, access to Internet, projector, etc.) could not benefit from these programs. This has been the case of rural schools in Mexico.

1.2 Geographical heterogeneity of English skills

This subsection contributes with five facts regarding the English geographical heterogeneity in Mexico. First, English abilities are concentrated in four Mexican states: Quintana Roo, Baja California, Aguascalientes and Baja California Sur. Second, the less industrialized Mexican states (South and Southeast region) have a low proportion of English speakers. Third, English speaking individuals are mainly present in urban areas with a few exceptions in rural contexts. Four, the states with more exposure to English instruction are not necessarily those with more English speakers. Finally, administrative records suggest that seven out of 32 Mexican states have consistently offered English instruction in public primary schools during the early 90's.

Figure 1: Proportion of Mexicans who declared having English abilities



(a) Full sample **(b)** Rural sample

(c) Urban sample

Note: These maps represent the proportion of individuals aged 16–65 who self-reported their ability to speak English, using data from the 2014 Mexican Subjective Well-being Survey (BIARE).

Half of the Mexican states have proportions of English speaking individuals higher than the figure for the national level (2.75%), from which four states more than double this proportion (Quintana Roo, Baja California, Aguascalientes and Baja California Sur). It is likely that Quintana Roo and Baja California Sur have more English speakers than the mean Mexican state because they are located in touristic regions with the two most famous destinations: Cancún and Los Cabos, respectively. On the other hand, Aguascalientes hosts international companies from automotive assembly, auto parts manufacturing, industrial robotics and electronics manufacturing, which are suppliers of Nissan, Mazda, Mercedes-Benz, GM, Honda, Infiniti, Volkswagen, among others. Likewise, Baja California manufactures for international companies in the industries of aerospace, automotive, electronics and medical devices manufacturing. But also, because of its closeness with the US, some Mexican workers living in Tijuana commute every day to work in American companies located in Chula Vista and San Diego.

The South and Southeast region of Mexico has a low proportion of English speakers except for the states of Quintana Roo and Yucatan. This region is well known for its high proportion of people in poverty condition. In fact, the 10 states in white from panel (a) of Figure 1 coincide with the 10 poorest Mexican states according to the biannual report

of CONEVAL (2020), except for the State of Mexico and Guanajuato, which are ranked in the place 12 and 17, respectively. Two potential reasons could explain the lack of English speakers in this region. First, the poor quality of education, with these states having the lowest average grades in the ENLACE test. And, second, the lack of incentives due to a poor economic activity, with this region contributing the least to the national economic activity (except for Tabasco, which contributes substantially to the sector with oil extraction).

Table 2: Exposure and English language abilities by states

	Prop. of indv. with Eng ability		Exposure to Eng instruction	
Rank	State	%	State	Hours
1	Quintana Roo	7.92	Aguascalientes	0.224
2	Baja California	7.24	Coahuila	0.206
3	Aguascalientes	5.74	Morelos	0.193
4	Baja California Sur	5.51	Nuevo Leon	0.179
5	Jalisco	4.54	State of Mexico	0.168
6	Colima	4.40	Tamaulipas	0.130
7	Sonora	4.38	Queretaro	0.100
8	Queretaro	4.34	Sonora	0.098
9	Mexico City	4.21	Jalisco	0.092
10	Nayarit	3.67	Mexico City	0.086
11	Nuevo Leon	3.60	Hidalgo	0.074
12	Chihuahua	3.36	Colima	0.070
13	Tamaulipas	3.36	Puebla	0.059
14	San Luis Potosi	3.27	Yucatan	0.059
15	Morelos	3.15	Baja California Sur	0.058

Note: These statistics were built using the 2014 BIARE database. The proportion of individuals with English abilities refers to the percentage of the population in a given state that speaks English. Exposure to English instruction is measured in weekly hours of English instruction per class. This later data was imputed from the Mexican school census using variation by cohort and by locality.

Mexican rural areas have the lowest proportions of English speakers. There are seven exceptions: Aguascalientes, Baja California, Baja California Sur, Durango, Hidalgo, Nayarit and Zacatecas. The first three states have a relatively higher proportion of English speakers for the aforementioned reasons (fact number one). Durango and Zacatecas are international migrant sender states (especially to the US) and the proportion of migrants is relatively greater in rural areas compared to the urban ones. Finally, the state of Hidalgo is host of international companies of automotive, auto parts, technology, telecommunications and transportation such as: GEMI International, Motorola Solutions, Grupo Marpa, Transtell, among others, which are located in rural regions of the state; while Nayarit is known for exporting agricultural products (figs, pineapples, avocados, guava, mangoes, cantaloupes,

watermelons and papayas) to the US, which may explain why a relatively high proportion of English speakers in the rural context.

Mexican states with more exposure to English instruction are not necessarily those with more English speakers. Indeed, most of the states listed in Table 2 for its high proportion of English speakers are touristic, migrant senders and/or hosts of international companies, as explained before. However, other states not listed before, such as: Coahuila, State of Mexico, Hidalgo, Durango, Puebla and Yucatan will probably catch up because of their efforts to offer English instruction at school. For the states that coincide in terms of exposure and proportion of English speakers (Aguascalientes, Jalisco, Colima, Sonora, Queretaro, Mexico City, Nuevo Leon, Tamaulipas and Morelos) it is difficult to disentangle the reason of this high proportion, but I will explore some of them later in this paper. For the remaining states (Quintana Roo, Baja California, Baja California Sur, Nayarit, Chihuahua and San Luis Potosi) we could conclude that the formation of English abilities is not directly explained by the exposure to English instruction.

Finally, administrative records suggest that seven out of 32 Mexican states have consistently offered English instruction in public primary schools during the early 90's. Indeed, using historical administrative data from the Mexican school census, I find that the states of Aguascalientes, Coahuila, Durango, Nuevo Leon, Sinaloa, Sonora and Tamaulipas have implemented a state English program, which increased substantially and/or consistently the weekly hours of English instruction in Mexican public schools (see section A.2). However, later in this paper I document that only Aguascalientes, Coahuila, and Tamaulipas had a significant increase in terms of hours of English instruction as a result of their respective English programs implementation.

1.3 Occupations and English skills in Mexico

In this subsection I provide a description of the economic occupations in which the Mexican English speakers concentrate. I document four main facts. First, elementary and manual unskilled occupations do not "require" English abilities in Mexico. Second, clerical support, professionals and managerial occupations concentrate most of the English speakers in Mexico. Third, occupations with more English speakers pay more to their workers, have a more even proportion of female and these workers are more educated. And, fourth, the rank of occupations by English abilities does not change significantly when considering only low-educated workers.

The occupations that do not require English abilities in Mexico are: farming, elementary occupations, machine operators and crafts (see the first four rows of Table 3, column (1)).[3] This finding is not surprising because these type of occupations do not require a high level of communication skills and, instead, they are more manual-intensive. Thus, on average,

[3]Notice, however, that it is strong to claim anything about English requirement because the proportion of English speakers is not the same as English requirement, but there should be a high correspondence.

in these occupations, only one out of a hundred workers speaks English. It is likely that the English speakers in these occupations acquired their English abilities either in school or through a migration network. On the other hand, these occupations are the worst paid and with the lowest proportion of women. This may suggests a negative correlation between English skills and earnings.

On the other hand, clerical support, professionals and managerial occupations concentrate most of the English speakers in Mexico (see the last four rows of Table 3, column (1)). In the case of clerical support, it is natural to have more English speakers since these types of occupations are intensive in communication skills. However, it is also true that most of these occupations, for example assistants and secretariats are not required to have English abilities, except for executive positions or in touristic and international companies. On the other hand, professionals and technicians are more likely to have English abilities because in upper secondary and professional education, English language subject is compulsory and required to graduate in some degrees. Managerial occupations are the most likely to require English skills, with three times the national average proportion of English speakers. This is consistent with tasks requiring communication skills and public relations, specially in medium and large companies. Finally, 16% of the individuals working abroad have English skills, being consistent with Mexicans who cross the US border everyday to work in American companies. The remaining occupations (customer service and sales occupations) are close to the average English skills in Mexico.

Table 3: English abilities by occupations

Occupation	(1) Speak English	(2) Wages (pesos/month)	(3) Female	(4) Education (years)	(5) Shares
Farming	0.009	2,798.57	0.18	5.46	0.072
Elementary occupations	0.011	3,129.83	0.41	7.50	0.242
Machine operators	0.014	5,733.63	0.16	9.05	0.093
Crafts	0.016	4,207.19	0.28	7.67	0.095
Customer service	0.021	4,883.57	0.48	9.24	0.076
Sales	0.022	5,057.22	0.56	9.81	0.124
Clerical support	0.040	6,446.08	0.60	12.39	0.066
Professionals/Technicians	0.077	9,916.23	0.41	14.18	0.152
Managerial	0.084	13,995.02	0.37	13.29	0.077
Abroad	0.156	12,686.43	0.22	10.09	0.003

Note: This table shows the percentage of individuals who have English speaking abilities, mean wages, percentage of women and their mean schooling, by aggregates of occupations in Mexico. The occupations were determined using the International Standard Classification of Occupations (ISCO-08) from the International Labor Organization (ILO) at one digit code level. The managerial category includes supervisors from other occupations. The abroad category contains individuals who reported working abroad, but it is a mix of all other categories. The sample contains Mexicans ages 18–65 who self-reported their ability to speak in English. Mean English ability for this sample is 0.028 (2.8%).

Among these occupations with more English speakers, workers are better paid, they are more educated, and there is a more even proportion of female. Indeed, average monthly wage in Mexico is 4,211 pesos (for adults 18-65 years old), while monthly wage in clerical support occupations is about 1.5 times higher, professionals and technicians earn more than double the mean wage in Mexico, while the wage of managerial occupations is 3.3 times higher. This result suggests a positive correlation between English abilities and wages. Likewise, as previously noted in subsection 1.1, I find a positive correlation between English abilities and education. Finally, Customer service, sales and clerical support occupations have the most even proportion of female workers.

Using a sub-sample of low-educated individuals I find that there are not significant changes in the rank of occupations according to their proportion of English speakers (see Table A.1). However, occupations in sales (which previously were close to the national mean proportion of English speakers) are now below the average. I defined the sub-sample of low-educated individuals considering nine or less years of education. This sub-sample intends to capture Mexicans who, if exposed to English instruction in primary school will see an effect, which could potentially be directly attributable to exposure and not to spillover effects of the program. Hence, it is likely that the rank shown in Table A.1 was directly affected by exposure to English instruction in primary school. In that sense, we could say that occupations requiring English skills among low-educated individuals are: customer service, clerical support, professionals and managerial. Finally, for this sub-sample of low-educated individuals, the schooling is more homogeneous among occupations, which suggests that differences in wages are more likely to be attributed to English abilities.

1.4 Economic industries and English skills in Mexico

This subsection offers a characterization of the economic industries and their composition of English speakers. There are three aspects to highlight in this part of the analysis (which derived from findings of Table 4). First, the economic industry with less English speakers is agriculture, with the worst paid jobs and less educated workers. Second, the economic industries with more English speakers are professionals and telecommunications, with better paid jobs, more educated workers and a more even proportion of women. Third, if we only consider low-educated workers, the rank of economic industries by proportion of English speakers changes substantially, with transportation, hospitality and entertainment having more English speakers.

The economic industry with less English speakers is agriculture, with the worst paid jobs and less educated workers. Then, with more than double the proportion of English speakers than in agriculture, the following industries are below the national average proportion: other services, construction, and commerce. This may be explained by the low proportion of international companies operating in those industries in Mexico. All these first four economic industries contain about half of the Mexican workers, from with about one half earn less than the national average and the other half earn more. Again, low earners are also those with

less English skills (consistent with the aforementioned positive correlation).

Table 4: English ability by economic industries

Industry	(1) Speak English	(2) Wages (pesos/month)	(3) Female	(4) Education (years)	(5) Shares
Agriculture	0.009	2,679.65	0.17	5.89	0.126
Other Services	0.020	3,737.28	0.60	8.35	0.102
Construction	0.022	6,348.22	0.05	8.58	0.085
Commerce	0.023	5,311.52	0.50	9.83	0.189
Manufactures	0.029	6,093.23	0.37	9.60	0.159
Hospitality and Entertainment	0.030	4,451.74	0.57	9.17	0.079
Transportation	0.031	6,570.69	0.07	9.68	0.044
Administrative and Support	0.035	6,072.09	0.36	10.18	0.029
Government	0.048	10,278.91	0.36	12.59	0.048
Professional/Technical	0.073	9,707.05	0.58	14.45	0.112
Telecom/Finance	0.084	11,266.33	0.38	13.24	0.025
Abroad	0.157	12,763.20	0.22	10.12	0.003

Note: This table shows the percentage of individuals who have English speaking abilities, mean wages, percentage of women and their mean schooling, by aggregates of economic industries in Mexico. The economic industries were determined using the North American Industry Classification System (NAICS) at two digit code level. The 'Construction' category includes mining, utilities and construction industries. The 'Telecom/Finance' category includes telecommunications, finance and real state industries. Finally, the 'Professional/Technical' category includes professional, technical and management industries. The abroad category contains individuals who reported working abroad, but it is a mix of all economic industries. The sample contains Mexicans ages 18–65 who self-reported their ability to speak in English. Mean English ability for this sample is 0.028 (2.8%).

On the other hand, the economic industries with more English speakers are: professionals, technical, management, telecommunications, finance and real state. These industries are among the better paid and with workers having the highest educational levels (showing again the positive correlation among English, wages and education). The remaining industries (manufactures, hospitality, entertainment, transportation, administrative and government) have also more English speakers than the national average, but significantly less than the aforementioned industries.

Using a sub-sample of low-educated individuals I find the rank of economic industries (by proportion of English speakers) changes substantially, with transportation, hospitality and entertainment having now more English speakers. Hence, as explained in subsection 1.3, this may suggests that low-educated individuals are changing their decisions on the economic industry they will work in, after the exposure to English instruction in primary school. Nevertheless, this is something I will formally show in section 5. Even in this sub-sample, individuals working in economic industries with more English speakers are better paid and more educated than those working in low-English intensive industries.

2 Policy background in Mexican states

Starting in the early 90's, a few Mexican states implemented English programs to offer English instruction in public primary schools. The main motivation to these states were the recently signed North American Free Trade Agreement (NAFTA) in December 1992, which came into force on January 1, 1994. The English instruction in public primary schools meant to improve the acquisition of English skills to facilitate labor mobility from Mexico to the United States and Canada. Indeed, before launching these state English programs, only private schools offered English instruction, but not the public ones, which used to have unattended an important fraction of the population that potentially may benefit from NAFTA. As previously noted in subsection 1.3, using administrative data from the Mexican school census, I identified seven states that have implemented/expanded English programs in public primary schools, which have consistently increased the hours of English instruction offered in these schools. Hence, in this section, I will describe how was the implementation in most of these states. However, some of these do not have a publicly available registry of their English programs, which implies that my identification strategy would be mainly data driven for those particular cases.

The first two Mexican states that offered English instruction in primary schools were Nuevo Leon and Sonora. The English program in the Mexican state of Nuevo Leon was launched in 1993 with one hundred randomly chosen elementary schools benefiting only high achievement students of fourth, fifth and sixth grades.[4] However, it was until the year 1998 that the state English program implemented the English instruction as part of the regular curricula in the participant schools and only in sixth grade. This is the expansion that I exploit in this paper. Progressively, the state government increased the English program's coverage among elementary schools including some preschools. For example, in 2008 the program expanded the coverage to students of fifth grade in those schools that were already beneficiaries of the program in sixth grades. So that by 2008 the state English program covered around 60% of all elementary schools of Nuevo Leon.[5]

The state of Sonora also launched its English program in the year 1993 as a trial stage, but it was until the year 2004 that English language was incorporated as a subject in the regular curricula of public primary schools. In the expansion of 2004, the program considered to offer English instruction to only the first and second grades of 10 out of 72 counties. After that, the program gradually expanded the coverage to all grades that comprise primary school in Mexico (from first to sixth) and to more beneficiary counties, reaching a state coverage of almost 50% by the year 2010 (Reyes Cruz, Murrieta Loyo and Hernández Méndez, 2011).

The Mexican state of Coahuila followed the former two states with the implementation of an English program in 1995, benefiting 100 primary schools located in 11 (out of 38) counties.

[4]Elementary schools in Mexico comprise from first to sixth grade, middle schools comprise from seventh to ninth grade, while high school comprises from tenth to twelfth grade. All three educational levels are part of the basic compulsory education system.

[5]All this information is publicly available in Nuevo Leon English program website.

This program started offering English classes only to the first grade of beneficiary schools. In the year 1998 this English program started a trial stage to offer English instruction in preschool and in 1999 the state government increased the coverage among preschools and primary schools. Since then, the program has progressively expanded among schools and grades. And, nowadays, the program benefits the three grades that comprise preschool in Mexico, the six grades that comprise primary school (from first to sixth) and the three grades that comprise middle school (from seventh to ninth). The current coverage includes 26 (out of 38) counties from the state.[6] The expansion that I exploit in this paper is the one of 1999.

Then, the state of Tamaulipas launched an English program in the 2001-2002 school year, offering English instruction to the fourth grade of urban primary schools in the state. This initial program benefited 44,777 students. For the 2003-2004 school year, the state English program expanded its coverage from fourth to sixth grade. Subsequently, in 2005, the program expanded to cover all six grades that comprise primary school in Mexico. In the 2011-2012 school year, all the preschools in the state were incorporated to the English program.[7] The Tamaulipas policy change that I exploit in this paper is the first time implementation of 2001.

For the remaining states; Aguascalientes, Durango and Sinaloa, there are not official sources indicating the process of implementation of their English programs. However, administrative data from the Mexican school census suggests that these states launched their English programs in 2001, 2002 and 2004, respectively (see Figure A.1 and Figure A.2). Unofficial sources point out that the implementation of the English program in Durango was in 2002 as a pilot program, which operated for six years in a few public primary schools. In 2008, English instruction was incorporated in the regular curricula of the beneficiary primary schools. In 2009 the program reached a 20% coverage of the kids enrolled in Durango primary schools.

3 Data

My main source of information is the 2014 Mexican Subjective Well-being Survey (BIARE, for its acronym in Spanish). BIARE is a representative survey of the Mexican population at national and state level. In 2014, this survey was conducted as part of the Mexican Household Income and Expenditure Survey (ENIGH), and as an annex of the Socioeconomic Conditions Module. This latter implies that it is possible to have variables that characterize the socioeconomic condition of individuals and households in the same database, which are currently used to measure poverty in Mexico.

BIARE round of 2014 is special because it asked for unique occasion about individuals' English speaking-abilities. Respondents of this survey are adults 18 years of age and older.

[6] All this information is publicly available in Coahuila English program website.
[7] All this information is publicly available in Tamaulipas English program website.

And the survey concentrates only on one adult per household. Interviews in this survey are all face to face and it requires that the information be provided by the respondent only; not through a third party. Respondents are asked a set of questions regarding their demographic and economic characteristics, their perceived well-being, as well as their ability to speak English.

The second source of information I use is the Mexican school census (also known as Statistics 911). The school census allows for identifying the public schools that have offered English instruction in Mexico. This source of information is also key to construct a variable of exposure to English instruction, which allows me to identify the magnitude of the state English programs implemented in Mexico since the early 90's. To construct this exposure variable I only consider public elementary schools in the morning shift as the afternoon shifts are unstable (not every year the same school provide both shifts).

Table 5: Descriptive statistics

Variable	Full Sample	Speak English (a)	Don't spk English (b)	Diff. (a-b)
Individual characteristics				
English (speaking ability)	0.03	1.00	0.00	-
English instruction (hours)	0.09	0.15	0.08	0.07***
Education (years)	9.43	13.93	9.30	4.62***
Experience (years)	23.80	17.32	23.99	-6.67***
Age (years)	38.23	36.24	38.29	-2.05***
Female (%)	0.52	0.41	0.53	-0.12***
Married (%)	0.63	0.49	0.64	-0.15***
Wage (monthly pesos)	4,211.47	11,277.79	4,011.46	7,266.33***
Student (%)	0.09	0.18	0.08	0.09***
Worker (%)	0.68	0.78	0.68	0.10***
Household characteristics				
Rural (%)	0.21	0.07	0.21	-0.14***
Female household head (%)	0.22	0.25	0.22	0.03**
Age household head (years)	48.65	46.26	48.72	-2.45***
Education household head (%)	5.58	8.11	5.51	2.60***
Household size (persons)	4.46	3.31	4.49	-1.18***
Observations	83,630	2,532	81,098	83,630

Note: These summary statistics consist of Mexicans ages 18–65 who self-reported their ability to speak in English. Statistics shown in this table are obtained considering the survey weights.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

I measure exposure, by cohort and by locality, as weekly hours of English instruction using the ratio of total weekly hours of English instruction in each school and the total number

of classes.[8] Then, for each cohort, I take the average hours over the six years that comprise primary school in Mexico. Finally, I take the average, by cohort, of all schools in a given locality weighting by number of students per school. Hence, the locality average is always smaller than the figure per school because most of the primary schools in Mexico do not offer English instruction.

I link my exposure variable to BIARE database by cohort and by locality. In BIARE database, cohort 1996 attended sixth grade (last grade of primary school in Mexico) in 2007, while the data I constructed for 2007 with the Mexican school census includes the average exposure from 2002 to 2007, for cohort 1996. Since I impute the average exposure at locality level, my estimate of the policy change on the exposure could be understated because this exposure variable includes schools with zero hours of English instruction. Nevertheless, this exposure measure is still informative. Furthermore, the final database I built is the first (in Mexico) to include both variables, exposure to English instruction and English skills.

The final database allows to identify what individuals have English abilities and the hours of English instruction they had exposure to in primary school. I only consider respondents between 18 and 65 years of age, which helps to rule out kids who are more likely to be enrolled in school and retired individuals. A preliminary analysis between Mexican English speakers and non-English speakers (shown in Table 5) suggests that the former are more educated probably because they are acquiring English abilities in school; they earn more, which is consistent with the generalized idea of the positive returns to English skills in non-English speaking countries; and it is more likely that they are enrolled in school and that they participate in the labor market. I will explore more carefully these two latter findings along the paper. On the other hand, Mexican English speakers are younger, potentially because they were more likely to be exposed to the recently implemented English programs in Mexico. Likewise, they have less labor experience, which is consistent with the fact that they are younger. Finally, I also show that English speakers are less likely to be women or married.

My descriptive analysis suggests that individuals who had more exposure to English instruction are more likely to have English abilities (see the second row of Table 5). This is consistent with my previous analysis in section 1, where I showed that younger individuals (which are more likely to have exposure to English instruction) have more English skills than older ones, and I also showed that there are significant differences in English abilities when we compare individuals living in states with English programs and individuals living in the other states (without English programs).

[8]Locality is the smallest geographical delimited area in Mexico. It could include as few as one single household in a rural context (*rancheria*) or more than 100,000 inhabitants in big Mexican cities. The next geographical size is county, composed by several localities. Finally, states are subdivided by these counties.

4 Empirical strategy

To answer my research question, I start offering a first estimate of the returns to English skills using a model in which I control for observable characteristics that substantially mitigate the selection bias. Then, I provide a more causal estimate by exploiting different policy changes that introduced English instruction in public elementary schools of seven Mexican states: Aguascalientes, Coahuila, Durango, Nuevo Leon, Sonora, Sinaloa and Tamaulipas. Each of those states launched their English programs in different moments of time and with different intensities, in both terms of coverage and hours of English instruction. Since treated individuals are those kids enrolled in school at the moment of the intervention (because they were exposed to English instruction), only certain cohorts could had been potentially affected. In general, younger cohorts had some exposure to English instruction, while older cohorts had minimum or no-exposure at all.

In this paper I exploit two sources of variation: state and cohort. Both are driven by the policy interventions. Then, I propose to use these two sources of variation in a staggered Difference in Differences (SDD) model to estimate the first stage and the reduced form equations. However, I also provide estimates using DD models per state. Then, I explore the second stage to provide an instrumental variables (IV) estimate using the exogeneity caused by the intervention as an instrument of the endogenous regressor (English skills). This latter offers the local average treatment effect for those kids who actually acquired English abilities.

4.1 Returns to English skills (main model)

In Mexico, like in many other non-English speaking countries, children could have access to English instruction almost exclusively either through the private education system or through private courses and private tutors. However, English instruction cannot be accessed by most of the population because of the high monetary cost that it involves. Furthermore, even for those whom the monetary cost is not a determinant restriction, learning a foreign language would imply non-monetary costs (time and effort) that could prevent individuals from learning it.

The general view among non-English speaking countries is that English abilities will provide better labor market opportunities. However, this claim has not been formally proved by the previous literature. A naive approach would compare wages, ω_i, from English speakers, $Eng_i = 1$, and non-English speakers, $Eng_i = 0$. However, a comparison between these two groups would produce a biased estimate because of the omitted variables problem. If we do not address this issue, we would overstate our estimate because education and experience have been proved to positively affect wages. Thus omitting these two important explanatory variables from our model would violate the spherical errors assumption and exaggerate our returns to English skills estimate.

I first estimate the returns to English skills controlling for education, experience and its square, as in Mincer (1974). Notice, however, that I fully control for education fixed effects (FE) in order to take into account the non-linear relationship between education and English abilities (as explained in subsection 1.1). Second, although the previous estimate would take into account a lot of the differences between English speakers (ES) and non-English speakers (NES) related to education and experience, there is still a concern of selection bias. In fact, an important factor of the omitted variables problem is attributed to differences in the family background. For example, ES could have parents who care more of them and their human capital accumulation because these parents are younger (and understand better the value of English), wealthier, or because they have more education. Although I do not observe these family background characteristics, I try to mitigate the omitted variables problem by controlling for gender, marital status, ethnicity and student status of each observed individual, i, as well as a geographical context variable (rural/urban) and the aforementioned Mincer controls, in a vector $\boldsymbol{X_i}$, as follows:

$$\omega_i = \alpha + \beta \cdot Eng_i + \boldsymbol{X_i}\boldsymbol{\Pi} + \epsilon_i \tag{1}$$

The estimate, β, would be still biased if we do not take into account geographical differences. For example, it is more likely that individuals living in northern states speak English either because some of them work in the US or simply because they have a closer relationship to the US in terms of culture and education. On the other hand, southern states are farther and less related to the American culture, so it is natural to expect fewer ES (as explained in subsection 1.2). Hence, I propose two modifications to Equation 1. The first one includes state FE, while the second one controls for locality FE. This latter specification intends to capture differences in smaller geographical areas such as touristic places or migration senders villages.

4.2 Alternative identification strategy: state English programs

4.2.1 Difference in Differences model

Even after controlling for observables, $\boldsymbol{X_i}$, we may be worried of a remaining omitted variables problem due to unobserved abilities and other family background variables. However, an exogenous variation that affects English abilities may be used as an instrument in an IV approach. I exploit policy changes in several Mexican states, which offered English instruction in Mexican public primary schools to provide a causal estimate of the effect of English skills on labor market outcomes.

In this subsection I show the proposed first stage and reduced form equations using individual DD models to each Mexican state that introduced English instruction in public primary schools. As comparison groups, I propose neighboring states that had not offered

English instruction in school. However, to rule out concerns about ad-hock comparison states, I also offer estimates using different control groups. Table A.3 summarizes the moment of the intervention, the policy change I exploit, the cohorts affected by this policy and the comparison states I propose.

Let us consider y_{isc} as any of the main outcomes I study in this paper: exposure to English instruction, English abilities, labor force participation and wages. I estimate the intention to treat effect of offering English instruction in primary schools on these outcomes, using the following specification:

$$y_{isc} = \phi + \gamma \cdot (treatment_s \times after_c) + \delta \cdot treatment_s + \kappa_c + \boldsymbol{X_{isc}\Gamma} + \varepsilon_{isc}$$

where $treatment_s$ is a dummy variable that takes the value of one if individual i lives in a state that introduced an English program (treated state) and zero otherwise. Likewise, $after_c$ is a dummy variable that takes the value of one if the individual i belongs to one of the cohorts that potentially had exposure to English instruction (either in the treated state or hypothetically in the comparison one), and zero for cohorts that had not exposure. Notice, that this specification is similar to Equation 1 except that it includes these latter dummy variables and the interaction term $(treatment_s \times after_c)$.

In the first stage equation, Eng_{isc} is the dependent variable and γ gives the effect of the policy change, on the acquisition of English skills. In the reduced form equation, ω_{isc} is the dependent variable. Hence, γ would give the intention to treat effect of offering English instruction in primary schools on wages.

In both equations, my identifying assumption is the parallel trend assumption (PTA), which suggests that the change in the outcomes of interest between pre-treatment and post-treatment cohorts would have been the same in the treatment and the comparison states had the English program not introduced/expanded in the states with English programs. Hence, interpreting γ as the effect of the policy requires that the PTA holds.

I offer suggestive evidence on the validity of my identifying assumption using the following event study type specification:

$$y_{isc} = \phi + \sum_c \gamma_c \cdot I_{(treatment_{sc}=c)} + \delta \cdot treatment_s + \kappa_c + \boldsymbol{X_{isc}\Gamma} + \varepsilon_{isc}$$

where $I_{(treatment_{sc}=c)}$ is an indicator function, which identifies if individual i potentially had exposure, depending on the cohort and state he/she was born. In all models, the cohort before the intervention is the reference one (cohort that just missed the policy). In order to support the validity of the parallel trend assumption, we should expect that the English program had no significant effect on pre-treatment cohorts. I show results of this latter equation in section A.3.

4.2.2 Staggered Difference in Differences

In this subsection I pool the states that introduced/expanded English programs in public primary schools to offer an average effect of this type of policies in Mexico. Although it is already of interest to know the individual effect per state, we would like to say something of the potential effect of an English program at a regional or national level. This latter is of particular interest given the lack of data needed to evaluate the National English Program in Basic Education (NEPBE) launched in 2009, nowadays known as National English Program (or PRONI for its acronym in Spanish).

Such a model of pooled states (with interventions of different intensities and implemented in different moments of time) is known in the literature as staggered DD. To estimate this model I define $HadPolicy_{sc}$ as a dummy variable that takes the value of one if the individual i lives in a treatment state and he/she belongs to one of the affected cohorts, while it takes the value of zero otherwise. The proposed first stage and reduced form equations are the following:

$$Eng_{isc} = \theta^{fs} + \psi^{fs} \cdot HadPolicy_{sc} + \delta_s^{fs} + \kappa_c^{fs} + \boldsymbol{X_{isc}}\boldsymbol{\Psi^{fs}} + \varepsilon_{isc}^{fs} \tag{2}$$

$$\omega_{isc} = \theta^{rf} + \psi^{rf} \cdot HadPolicy_{sc} + \delta_s^{rf} + \kappa_c^{rf} + \boldsymbol{X_{isc}}\boldsymbol{\Psi^{rf}} + \varepsilon_{isc}^{rf} \tag{3}$$

where ψ^{fs} measures the effect of an English program in Mexico on exposure to English instruction, the acquisition of English abilities and labor market outcomes. In these specifications, I fully control for state fixed effects, δ_s, common cohort trends, κ_c, and a vector of controls, $\boldsymbol{X_{isc}}$, with demographic and household characteristics as previously defined. Hence, this model could also be categorized as a Two Way Fixed Effects (TWFE) model.

Notice that the validity of my results will depend on the parallel trend assumption, which suggests that the change in the outcomes of interest between pre-treatment and post-treatment cohorts would have been the same in the treatment and the comparison states had the English program not introduced/expanded in the former. I will provide evidence that supports the validity of this assumption by analyzing the following event study type equation:

$$y_{isc} = \theta + \sum_c \psi_c \cdot I_{(treatment_{sc}=c-c_s^*)} + \delta_s + \kappa_c + \boldsymbol{X_{isc}}\boldsymbol{\Psi} + \varepsilon_{isc}$$

where c_s^* denotes the first cohort affected by the intervention in state s. In all models, so $c - c_s^*$ is the time relative to c_s^* with negative values reflecting older cohorts not exposed to the policy. The omitted category is -1. Negative categories with zero effect validate the

identifying assumption (PTA). In Figure A.10 I provide suggestive evidence on the validity of this identifying assumption.

4.2.3 Instrumental Variables

We could be interested in measuring the effect of having English abilities, Eng_{isc}, on wages, ω_{isc}, instead of the effect of offering English instruction, as described by Equation 3. However, our estimate β could be biased because of a remaining omitted variables problem. Indeed, we should not compare individuals with English abilities and individuals without them because it is likely that the former come from a wealthier family, had more education, and/or live in better neighborhoods (as shown in Table 5). To overcome this problem, I propose to use an instrumental variables (IV) approach, where I would take advantage of the exogenous variation caused by the state English programs to instrument the endogenous regressor, Eng_{isc}.

The first-stage and reduced from equations of my IV strategy are Equation 2 and Equation 3, respectively. On the other hand, the second stage is the following IV specification:

$$\omega_{isc} = \phi_0 + \phi_1 \cdot \widehat{Eng}_{isc} + \delta_s + \kappa_c + \boldsymbol{X_{isc}\Phi} + v_{isc} \tag{4}$$

The estimate ϕ_1 will provide the Local Average Treatment Effect of having English abilities on wages. Notice that, my results rely on two conditions: the relevance condition and the exclusion restriction. I provide evidence on the former by looking at the statistical significance of ψ^{fs} in the first stage equation (see Equation 2). On the other hand, I am aware that there is not formal test for the exclusion restriction. However, I claim that the exogenous change caused by the intervention affects wages only through the acquisition of English abilities. The supporting idea behind this claim is that English programs in Mexico do not affect other cognitive abilities (as recently shown by Gálvez-Soriano (2023)). Hence, we could think that any effect of English programs on labor market outcomes would be only through the acquisition of English abilities.

5 Results

We are interested in estimating the returns to English skills in Mexico. However, there are two main challenges that I address in this paper. First, there is no database that measures English abilities in Mexico so, I get around this issue by using the BIARE survey, which for unique occasion asked about English speaking abilities in 2014. Second, there is an evident omitted variables problem. We could not compare individuals who decided to learn English with those that did not. Indeed, it is likely that the former come from wealthier families,

live in better neighborhoods and/or have more educated parents who care about the human capital accumulation of their kids. We could also think of a situation where geographical location plays an important role. This is the case of Mexico, where individuals living in northern states could be more interested in the acquisition of English skills to find jobs in the US or to work in firms requiring English skills in Mexico.

To mitigate the omitted variables bias, I control for observable characteristics that affect wages and for locality FE to compare individuals within the same geographical context. First, I rely on a locality fixed effects approach, which controls for unobservable characteristics that affect wages and may influence the decision of learning English, and that are fixed over time. Additionally, I control for observable characteristics, which potentially explain wages and may also explain why some individuals acquired English abilities and some did not.

Notice that even after controlling for localities FE and observable characteristics, there could be a residual selection problem either because within localities there are unobservable differences among individuals or because there are unobservable differences at locality level that are not fixed over time. To solve this problem I propose to use a DD strategy where I exploit the implementation of state English programs, which exogenously affected the exposure to English instruction among individuals within the same state. In other words, I exploit a state by cohort variation in my second identification strategy.

5.1 Returns to English skills in Mexico

In this section I provide a first estimate of the returns to English skills relying on locality FE and controlling for observable characteristics. I offer five estimates that progressively show how I mitigate the omitted variables problem: a naive estimate, using Mincer controls, including additional controls (such as family background), controlling for state FE and controlling for locality FE. I also offer five estimates using a low-education sample, which isolates the effect of English abilities on wages from spillover effects of education, experience and unobserved abilities. I summarize four main findings from this initial approach. First, the omitted variables problem is mostly due to education and sociodemographic characteristics. Second, English speakers earn 32% more than non-English speakers (0.276 natural log points). Third, men English speakers earn more than women English speakers. And, fourth, there are not significant returns to English skills among low educated individuals.

Table 6: Returns to English abilities in Mexico

	Full sample					Low-education sample				
	(1) ln(wage)	(2) ln(wage)	(3) ln(wage)	(4) ln(wage)	(5) ln(wage)	(6) ln(wage)	(7) ln(wage)	(8) ln(wage)	(9) ln(wage)	(10) ln(wage)
Panel A: Men and Women										
Speak Eng	0.934***	0.803***	0.277***	0.211***	0.142**	0.412***	0.271*	0.223	0.156	0.058
	(0.078)	(0.073)	(0.071)	(0.070)	(0.070)	(0.155)	(0.156)	(0.152)	(0.153)	(0.159)
Observations	57,550	57,550	57,550	57,550	57,550	32,601	32,601	32,601	32,601	32,601
Adjusted R^2	0.005	0.057	0.103	0.124	0.175	0.000	0.043	0.051	0.076	0.157
Panel B: Men (β^M)										
Speak Eng	0.905***	0.792***	0.335***	0.343***	0.290***	0.304*	0.225	0.188	0.219	0.135
	(0.090)	(0.086)	(0.078)	(0.079)	(0.082)	(0.173)	(0.174)	(0.169)	(0.171)	(0.190)
Observations	35,287	35,287	35,287	35,287	35,287	20,891	20,891	20,891	20,891	20,891
Adjusted R^2	0.005	0.056	0.099	0.141	0.215	0.000	0.036	0.047	0.096	0.217
Panel C: Women (β^W)										
Speak Eng	0.933***	0.819***	0.174	0.030	-0.030	0.368	0.447	0.354	0.023	0.101
	(0.143)	(0.134)	(0.136)	(0.137)	(0.137)	(0.347)	(0.331)	(0.322)	(0.326)	(0.361)
Observations	22,263	22,263	22,263	22,263	22,263	11,710	11,710	11,710	11,710	11,710
Adjusted R^2	0.004	0.045	0.099	0.126	0.216	0.000	0.029	0.034	0.077	0.227
$\beta^M = \beta^W$ [p-value]	[0.865]	[0.832]	[0.753]	[0.578]	[0.467]	[0.869]	[0.580]	[0.722]	[0.894]	[0.675]
Basic controls	NO	YES	YES	YES	YES	NO	YES	YES	YES	YES
Education	NO	NO	YES	YES	YES	NO	NO	YES	YES	YES
Other controls	NO	NO	NO	YES	YES	NO	NO	NO	YES	YES
Locality FE	NO	NO	NO	NO	YES	NO	NO	NO	NO	YES

Note: This table shows the effect of having English abilities on wages in Mexico. The sample consists of Mexicans ages 18–65 who reported being able or not to speak English. Basic controls include: cohort fixed effects, gender and indigenous dummy. Other controls include: geographical context (rural/urban), marital status and state fixed effects. Standard errors clustered at locality level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Education and sociodemographic characteristics account for almost three fourths of the selection bias due to the omitted variables problem. A naive estimate would suggest that English speakers earn 318% more than non-English speakers in Mexico (1.430 natural log points). However, this estimate contains confounding factors such as education and experience. Indeed, once I control for these variables the estimated effect reduces by more than half. Furthermore, other important factors that cause the omitted variables problem are the individual's sociodemographic characteristics. In particular, kids living in urban areas, male and non-indigenous people are more likely to know English. I mitigate the omitted variables problem by controlling for these characteristics as shown in column (3) of Table 6, where the bias got reduced by a modest amount (with respect to the previous estimate). The remaining estimates (from column 4 to 5) reduce the bias by controlling for geographical differences at state and locality level, respectively.

In Mexico, English speakers earn 32% more than non-English speakers. This conclusion derives from my proposed model, which implies two main assumptions. First, the set of controls I include in the model account for most of the omitted variables. Second, the remaining unobservable factors that affect the acquisition of English abilities are constant over time and aggregated at locality level. If we are willing to believe that these assumptions are valid, we may conclude that English speakers earn 32% more than non-English speakers (see column 5 of Table 6). This estimate is quite similar from previous findings of Delgado Helleseter (2020), who suggests that the wage premium of Mexican English speakers is 28%.

Men English speakers earn more than women English speakers. Indeed, I find that the returns to English skills estimate is driven by men, who earn 50% more than non-English speakers (0.405 natural log points). Women, on the other hand, do not earn more either they have English skills or not, although point estimate is positive. Furthermore, there is a statistically significant gender wage gap. Indeed, despite having the same abilities, women do not receive the same English wage premium that men do. It is likely that this gender wage gap can be explained by occupational decisions that may differ between men and women. I will explore more on this mechanism in the following sections. Previous results found by Azam, Chin and Prakash (2013) are in line with my own findings as they found that women with English skills earn less than men English speakers (22.3% and 34.5%, respectively).

There are not significant returns to English skills among low educated individuals. Previously, I showed that the ability to speak English increases with educational attainment. However, the exogenous change in exposure to English instruction that I will explore in the next section, takes place in elementary and middle school. Hence, as an additional exercise, I propose to look at the returns to English skills among low educated individuals (nine years of education or less). This exercise will isolate the effect of English skills (obtained during the basic education system) from the positive externalities that exposure at early stages of life have on English proficiency and labor market outcomes. I do not find any significant effect of English skills on wages, but point estimate is positive. Nevertheless, this exercise removes the potentially positive mechanism of finding a better job, as an English speaker.

5.2 Exposure, English abilities and labor market outcomes

The model from the previous section control for a lot of the omitted variables bias using observed characteristics of the individuals as well as unobserved locality characteristics that control for a better socioeconomic context in which English speakers live. However, this model may not yet provided a causal effect of English skills on wages. First, there are unobserved characteristics that I am not including in the model such as cognitive abilities and family background characteristics that I do not observe in the data but which may affect wages, as well as the decision of learning English. Second, it could be the case that there are economic factors that change in time and that affect the decision of learn English, which are not capture by the locality FE.

In this section I offer a causal effect of English skills on wages. First, I provide an estimate of the Intention to Treat (ITT) effect of offering English instruction at school. I obtain this ITT estimate for each state that implemented/expanded an English program since the early 90's or 2000's. Then I pool these states in a staggered DD model. Second, with this latter model I study heterogeneous effects in four dimensions: gender, indigenous condition, geographical context (rural/urban) and socioeconomic status (SES). Finally, I propose an IV estimate, where I use the exogenous variation generated by the state English programs as an instrument. This latter provides the Local Average Treatment Effect (LATE), which can be interpreted as the returns to English abilities among those individuals who reported having English skills after being offered English instruction at school.

5.2.1 Intention to Treat Effect

In this subsection, I provide an alternative estimate of the returns to English skills in Mexico, which rules out concerns of remaining omitted variables bias. To this purpose I propose a DD strategy where I use state by cohort variation in exposure to English instruction in primary school. With this strategy I estimate the ITT effect of offering English instruction in primary school. I study four main outcomes: exposure to English instruction, English abilities, labor force participation and wages. Notice that the effect of the first stage is captured by the 'English ability' outcome. In other words, a statistically significant first stage would provide evidence that exposure to English instruction leads to the acquisition of English skills in Mexico. The remaining regression outcomes provide results of the reduced form model.

By analyzing each state separately, I obtain four main findings on the effect of English programs on labor market outcomes. First, three out of seven states significantly increased the hours of English instruction they offered in primary schools. Second, these are also the same states in which there was a significant increase in English abilities. Third, the acquisition of English abilities improves with the years of schooling. And, fourth, the state English programs had no effects on neither labor force participation nor wages (expect for Tamaulipas, with a significant increase on wages; see Table 7).

Table 7: Intention to Treat effect of offering English instruction at school (DD estimate by state)

	Full sample				Low education sample			
	(1) Hrs Eng	(2) Speak Eng	(3) Work	(4) ln(wage)	(5) Hrs Eng	(6) Speak Eng	(7) Work	(8) ln(wage)
Panel A: Aguascalientes								
After×Treat	0.385***	0.078***	-0.019	-0.088	0.360***	0.040*	-0.005	0.541
	(0.083)	(0.023)	(0.052)	(0.334)	(0.113)	(0.023)	(0.063)	(0.434)
Observations	946	946	1,425	946	462	462	672	462
Adjusted R^2	0.924	0.003	0.243	0.101	0.924	0.006	0.385	0.123
Panel B: Coahuila								
After×Treat	0.460***	0.023	-0.011	0.197	0.406***	0.005	0.007	0.330
	(0.114)	(0.015)	(0.031)	(0.276)	(0.121)	(0.021)	(0.055)	(0.324)
Observations	1,485	1,485	2,123	1,485	708	708	999	708
Adjusted R^2	0.590	0.034	0.234	0.168	0.543	0.005	0.331	0.186
Panel C: Durango								
After×Treat	0.078	0.010	-0.054	-0.077	0.062	0.018	-0.072	0.319
	(0.087)	(0.026)	(0.061)	(0.389)	(0.093)	(0.031)	(0.063)	(0.419)
Observations	1,068	1,068	1,711	1,068	507	507	793	507
Adjusted R^2	0.691	0.002	0.275	0.164	0.690	0.204	0.422	0.244
Panel E: Nuevo Leon								
After×Treat	0.160**	0.051**	-0.005	-0.456**	0.122	0.025**	-0.032	-0.463
	(0.080)	(0.024)	(0.040)	(0.196)	(0.099)	(0.012)	(0.077)	(0.395)
Observations	1,302	1,302	1,897	1,302	577	577	860	577
Adjusted R^2	0.737	0.037	0.210	0.146	0.744	0.112	0.340	0.129
Panel F: Sinaloa								
After×Treat	0.116	-0.010	0.028	0.624	0.097	-0.009	0.124	1.764**
	(0.071)	(0.028)	(0.052)	(0.504)	(0.080)	(0.039)	(0.089)	(0.866)
Observations	659	659	1,112	659	219	219	342	219
Adjusted R^2	0.915	0.054	0.227	0.113	0.923	0.177	0.479	0.176
Panel G: Sonora								
After×Treat	0.090	0.013	-0.002	-0.420	0.125	0.024	0.052	-1.375***
	(0.055)	(0.021)	(0.041)	(0.310)	(0.075)	(0.018)	(0.090)	(0.479)
Observations	811	811	1,438	811	332	332	487	332
Adjusted R^2	0.710	0.020	0.200	0.144	0.649	0.090	0.265	0.121
Panel H: Tamaulipas								
After×Treat	0.174**	0.073***	0.043	-0.042	0.175**	-0.016	-0.008	0.354
	(0.085)	(0.025)	(0.034)	(0.242)	(0.083)	(0.021)	(0.050)	(0.534)
Observations	1,176	1,176	1,807	1,176	459	459	682	459
Adjusted R^2	0.859	0.039	0.213	0.137	0.860	0.009	0.276	0.132

Note: This table shows the effect of several state English programs on exposure to weekly hours of English instruction (column 1), English abilities (column 2), labor force participation and wages (columns 3 and 4, respectively). The sample consists of Mexicans ages 18–33. Controls include: gender, indigenous people dummy, years of schooling of household head, education fixed effects, cohort fixed effects and locality fixed effects. Standard errors clustered at locality level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Not all states offered enough hours of English instruction to represent a statistically significant increase in exposure from the perspective of the individuals intended to be treated. In particular, Aguascalientes, Coahuila and Tamaulipas had a significant increase in hours of English instruction with the implementation of their respective state English programs. Point estimates suggest that the remaining states (Durango, Nuevo Leon, Sinaloa and Sonora) also increase the exposure of English instruction at school, but this increase was not statistically significant for individuals in my sample.

A significant increase on hours of English instruction translates into the acquisition of English skills. Indeed, only for states with a significant increase in exposure, there is a significant increase in the acquisition of English skills. This result suggests that a larger implementation/expansion of an English program, such as the one offered by the Mexican government in 2009 with the National English Program in Basic Education (NEPBE), would have significantly increased English abilities among the population who had exposure to the program.

The acquisition of English abilities improves with the years of schooling. This claim comes from the comparison between estimates of columns (2) and (6).[9] Two potential mechanisms explain this result: familiarity with English language at early stages of life and high ability individuals learning better. First, early exposure may lead kids to pick English language up better than kids without previous exposure. This would be consistent with the existing literature in language development (Lenneberg, 1967; Newport, 2002) and second language acquisition (Bleakley and Chin, 2010). Second, it may also be the case that high ability individuals are also the ones who learn English better and precisely the ones who show a high educational attainment.

The state English programs had no effects on neither labor force participation nor wages. One exception was Tamaulipas, which is also the state with greater effect on English skills acquisition. For the remaining states, there is not any effect on labor force participation and no effect on wages. Although point estimate suggest that the effect on wages could be positive. This is also true using the low-education sample among the states with a significant increase in exposure and English skills. However, results using the low-education sample may suggest a negative effect on wages among the states with a non-significant effect on exposure (except for Sinaloa where the point estimate is positive).

On the other hand, results from the staggered DD specification suggest that the implementation of English programs may lead to have higher wages. In particular, English programs increase wages by 25% (0.229 natural log points). This increase in wages could be due to the acquisition of English skills, but may also involve other mechanisms ranging from a signaling effect to improvements on other cognitive skills. However, this latter mechanism is less plausible in light of recent evidence provided by Gálvez-Soriano (2023), where he shows that exposure to English instruction has no effect on cognitive skills (language and

[9]The low education sample is composed by individuals who reported having nine years of education or less.

mathematical skills).

Finally, I find that English programs may lead to the acquisition of English abilities. Indeed, these type of English programs increase English skills by 1.8% (see Table 8). Furthermore, if we consider hours of English instruction as an exogenous variable (due to the implementation/expansion of the English programs), we may argue that an English program in Mexico may have increased the acquisition of English skills by 6% (0.018/0.293).

Table 8: Intention to Treat effect of offering English instruction at school (SDD estimate)

	(1) Hrs Eng	(2) Speak Eng	(3) Work	(4) ln(wage)
Panel A: All states				
Had Policy	0.273***	0.019**	-0.022	0.020
	(0.045)	(0.009)	(0.015)	(0.088)
Observations	15,819	15,819	22,517	15,819
Adjusted R^2	0.608	0.070	0.240	0.140
Panel B: Heterogeneous effects by gender				
Men (β^M)				
Had Policy	0.261***	0.019*	-0.034*	0.017
	(0.044)	(0.011)	(0.018)	(0.121)
Observations	9,688	9,688	11,021	9,688
Adjusted R^2	0.599	0.070	0.261	0.183
Women (β^W)				
Had Policy	0.301***	0.023*	0.008	-0.004
	(0.054)	(0.013)	(0.023)	(0.143)
Observations	6,131	6,131	11,496	6,131
Adjusted R^2	0.611	0.045	0.174	0.147
$\beta^M = \beta^W$ [p-value]	[0.116]	[0.450]	[0.000]	[0.714]

Note: This table shows the effect of several state English programs on exposure to weekly hours of English instruction (column 1), English abilities (column 2), labor force participation and wages (columns 3 and 4, respectively). The sample consists of Mexicans ages 18–33. Controls include: gender, indigenous people dummy, years of schooling of household head, education fixed effects, cohort fixed effects and locality fixed effects. Standard errors clustered at locality level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.2.2 Heterogeneous effects

In this subsection I explore four sources of heterogeneous effects: by gender, geographical context, ethnicity and socioeconomic status. From this analysis I find that, first, women

learned English better and, hence, have higher wages. Second, English programs increased English skills only among non-indigenous people, with a potentially positive effect on wages. Similarly, English programs increased English abilities only among individuals living in urban areas but not in rural ones. Finally, English programs potentially increase English skills of low-income individuals, but not among high income ones.

Women learned English better and, hence, have higher wages. Indeed, I find that the positive effect on wages found in subsubsection 5.2.1 is mainly driven by women, who see their wages increased by 44% (0.371 natural log points) as a consequence of the English program implementation (see panel B of Table 8). Furthermore, this positive effect on women's wages may be explained by the acquisition of English skills, which resulted significant only for women and not for men. Notice that the gender wage difference is statistically significant. This is also true for English abilities (although at a lower significant level). However, exposure is the same for men and women, which suggests that women learn English better than men. As there is not a similar empirical approach used in the existing literature, it is not possible to compare these results with other papers. However, I will explore occupational decisions as a potential mechanism that explain these differences, in subsubsection 5.2.4.

English programs increased English skills only among non-indigenous people. It is likely that this result is a consequence of a non-significant effect of the English programs on exposure to English instruction. In other words, indigenous people did not have enough exposure as to improve their English skills. Consequently, I do not find any effect on indigenous people's wages. On the other hand, English programs significantly increased English skills and, potentially, also increased wages of non-indigenous people (see panel A of Table A.4).

Similarly, English programs increased English abilities only among individuals living in urban areas but not in rural ones. In particular, I find that English programs increase English abilities by 2% and wages by 27% (0.245 natural log points). The results on English skills may be due to differences in the implementation of the programs themselves. Which means that the first English programs were implemented only in urban areas due to the requirements of access to computers and to Internet, which are almost exclusively available in the urban context. Consequently, rural areas did not increase exposure and, hence, there is no effect on English skills and wages (see panel B of Table A.4).

English programs potentially increase English skills of low-income individuals, but not among high income ones. Interestingly, the effect on exposure is greater among high-income individuals, which may be also explained by the logic of urban areas having more exposure, as low-income individuals concentrate in the rural context. On the other hand, the non-significant effect on the acquisition abilities among high-income individuals could be explained by a negligible relative change on exposure as these type of individuals are more likely to receive bilingual education in the private education system. Likewise, the lack of effect on wages is a consequence of the aforementioned negligible relative change on exposure.

5.2.3 Local Average Treatment Effect (LATE)

Estimates shown in subsubsection 5.2.3 suggest that English programs may increase wages (according to the reduced form equation). However, this effect may be explained by mechanisms other than the acquisition of English abilities. To isolate the effect of English programs on wages, I propose to instrument the endogenous regressor, Eng_{isc}, with the policy change variable, $HadPolicy_{sc}$. This would give me the local average treatment effect of English programs (among individuals who actually acquired English skills) on wages.

My results suggest that the increase in wages is not due to the acquisition of English abilities. Indeed, I do not find a significant effect of English skills on wages, although the point estimate suggests a positive effect (see Table 9). Hence, it could be possible that the positive effect on wages shown in the reduced form equation is due to positive externalities of English instruction, which could operate through other cognitive skills, more education, occupational decisions, among others. In next section, I will explore occupational decisions as a potential mechanism.

Table 9: Returns to English abilities
(IV estimate)

	(1) Structural-OLS	(2) First Stage	(3) Reduced Form	(4) Structural-IV
Speak Eng	0.211**			1.046
	(0.086)			(4.497)
Had Policy		0.019**	0.020	
		(0.009)	(0.088)	
Observations	15,819	15,819	15,819	15,819
Adjusted R^2	0.140	0.070	0.140	

Note: This table shows the structural equation (column 1), first stage (column 2), reduced form and IV estimates (columns 3 and 4, respectively). The sample consists of Mexicans ages 18–33. Controls include: gender, indigenous people dummy, years of schooling of household head, education fixed effects, cohort fixed effects and locality fixed effects. Standard errors clustered at locality level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.2.4 Mechanisms

Among the potential mechanisms that explain the non-significant effect of English skills on wages, occupational decisions seem to provide a plausible explanation as there may be movements among occupations leaving earnings unaffected. Similarly, although other cognitive skills may also explain the effect on wages, the existing literature has shown that exposure to English instruction has no effect on cognitive skills in Mexico (see subsubsection 5.2.2).

To study the effect of English programs on occupations, I use the International Standard Classification of Occupations (ISCO-08) from the International Labor Organization (ILO) at

one digit code level. Farming category includes agricultural, forestry and fishery laborers. Elementary category refers to cleaners, helpers, building construction laborers, transport and storage labourers, food preparation assistants, street sales workers, and garbage collectors. Machine operators comprise plant and machine operators, and assemblers in several economic industries (this category also includes locomotive, car, van, motorcycle, taxi, heavy truck, bus, mobile plant and ships operators). Most of the workers in construction industry are classified in Crafts along with blacksmiths, toolmakers, machinery mechanics and repairers, and handicraft and printing workers. Customer service comprise travel attendants, conductors, guides, cooks, waiters, bartenders, hairdressers, beauticians, personal care workers and protective services workers. Sales includes salespersons, cashiers and ticket clerks. Professionals contains occupations of science, engineering, health, teaching, business and administration, information and communications technology, and legal, social and cultural workers.

Using this classification, I obtain three main findings. First, there is a substitution of occupations with low requirements of English skills for occupations requiring more English skills. Second, men are not moving to professional and technical occupations. Instead, men are substituting crafts and elementary occupations for clerical support ones. And, third, women make a strong substitution of elementary occupations and sales for professionals and technical occupations. Overall, these results suggest that although English abilities may not affect wages, individuals are better off because they are moving from occupations that require more physical effort to occupations less demanding on physical work.

There is a substitution of occupations with low requirements of English skills for occupations requiring more English skills. Occupations from column (1) to column (6) in Table 10 are the six occupations with less requirement of English abilities (according to my previous findings of Table 3). Indeed, the proportion of English speakers in sales occupations (2.2%) is below the national mean (2.75%), while clerical support occupations almost double this proportion (with 4% of English speakers). Furthermore, in general, I find a substitution of the six first occupations (with less proportions of English speakers) for the three occupations with more proportion of English speakers (plus the category of individuals who reported working abroad). Two exceptions are farming and machine operators. The case of farming occupations could be explained with individuals who decided to migrate after acquiring English skills and that returned to their home villages to continue working in agricultural related activities. On the other hand, a potential story for the increase in the likelihood of working as a machine operator could be explained as a result of more individuals moving to occupations requiring understanding a minimum of English to operate machines with controllers descriptions in English.

Table 10: ITT effect of offering English instruction at school on occupational decisions (SDD estimate)

	(1) Farming	(2) Elem	(3) Machine operator	(4) Crafts	(5) Customer service	(6) Sales	(7) Clerical support	(8) Prof/ Tech	(9) Mgmt	(10) Abroad
Panel A: Full sample										
Had Policy	0.008	-0.030*	0.006	-0.014	-0.007	-0.014	0.014	0.022	0.005	0.000
	(0.006)	(0.017)	(0.013)	(0.010)	(0.011)	(0.011)	(0.010)	(0.015)	(0.017)	(0.004)
Observations	15,819	15,819	15,819	15,819	15,819	15,819	15,819	15,819	15,819	15,819
Adjusted R^2	0.230	0.156	0.089	0.059	0.009	0.051	0.043	0.225	0.049	0.020
Panel B: Heterogeneous effects by gender										
Men (β^M)										
Had Policy	0.009	-0.030	0.003	-0.015	-0.005	0.001	0.026*	0.000	0.006	0.000
	(0.009)	(0.022)	(0.019)	(0.015)	(0.013)	(0.013)	(0.013)	(0.020)	(0.020)	(0.006)
Observations	9,688	9,688	9,688	9,688	9,688	9,688	9,688	9,688	9,688	9,688
Adjusted R^2	0.268	0.170	0.080	0.061	0.010	0.023	0.002	0.168	0.066	0.029
Women (β^W)										
Had Policy	0.006	-0.043**	0.009	-0.014	-0.004	-0.029	-0.004	0.062***	0.001	0.000
	(0.005)	(0.022)	(0.017)	(0.013)	(0.019)	(0.022)	(0.023)	(0.023)	(0.022)	(0.003)
Observations	6,131	6,131	6,131	6,131	6,131	6,131	6,131	6,131	6,131	6,131
Adjusted R^2	0.321	0.214	0.109	0.080	0.007	0.073	0.037	0.301	0.025	0.042
$\beta^M = \beta^W$ [p-value]	[0.110]	[0.000]	[0.698]	[0.008]	[0.622]	[0.732]	[0.997]	[0.035]	[0.748]	[0.237]

Note: This table shows heterogeneous effects of offering English instruction in several Mexican states on occupational decisions. The occupations were determined using the International Standard Classification of Occupations (ISCO-08) from the International Labor Organization (ILO) at one digit code level. The managerial category includes supervisors from other occupations. The abroad category contains individuals who reported working abroad, but it is a mix of all other categories. The sample contains Mexicans ages 18–33 who self-reported their ability to speak in English. Standard errors clustered at locality level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Men are not moving to professional and technical occupations, but they substitute crafts and elementary occupations for clerical support ones. Indeed, as in the case of the national results (including men and women), men who had exposure to the policy substitute occupations with low requirements of English skills for occupations with more requirements. However, one interesting exception is professional and technical occupations. In other words, it is unlikely that men who used to work as cleaners, helpers and craftsmen are now professional workers. Instead, workers in elementary occupations are now working as clerks and assistants, which means that they are moving from physical demanding jobs to occupations more cognitive demanding.

Women make a strong substitution of elementary and sales occupations for professional and technical occupations. In fact, as men do, women also substitute jobs with low English skills requirements for jobs more demanding on English skills. And, although women make a strong substitution of elementary occupations (like men), they additionally substitute sales occupations (unlike men). This is an interesting finding in light of proportionally more women than men working in sales. Furthermore, these women who are moving away from elementary and sales are going to professional and technical occupations. This is also a striking finding because it could be inferred that women who had exposure to the intervention are more likely to graduate from college or with a technical degree.

6 Robustness Checks

In this section, I offer two robustness checks that provide more reliability of my results. First, I provide evidence that my results from Table 7 are robust to changes in the comparison states. Then, I propose a narrower comparison window in my staggered DD specification to show that my results are robust when the comparison group contains younger cohorts.

Table 11 shows the results of the robustness check where I change the comparison group. Originally, I proposed one single comparison state per single policy, while now I am proposing to compare each treatment state with all neighboring states (always including the originally proposed comparison one). The idea of this exercise is to show that my estimates do not significantly change to a different comparison group.

I do find that my original estimates are robust to changes in the comparison group. Indeed, most of my estimates from Table 7 keep the same sign and significance even after changing the comparison states. There are two exceptions. First, the effect of Durango English program is not statistically significant on English skills. This result is not surprising since the original estimate was significant only at the 90% confidence level. Second, the increase in exposure to English instruction in the state of Sinaloa becomes statistically significant, which positively impacts wages. However, the parallel trend assumption does to seem to hold for the exposure variable (see Figure A.15). For the remaining states, I provide suggestive evidence on the validity of the parallel trend assumption (see Appendix, section A.3).

Table 11: ITT effect of offering Eng instruction (DD estimate with multiple comparison groups)

	(1) Hrs Eng	(2) Speak Eng	(3) Work	(4) ln(wage)
Panel A: Aguascalientes				
After×Treat	0.432***	0.047***	-0.043	0.175
	(0.073)	(0.012)	(0.041)	(0.200)
Observations	2,818	2,818	4,138	2,818
Adjusted R^2	0.800	0.014	0.231	0.136
Panel B: Coahuila				
After×Treat	0.451***	0.018	-0.023	0.066
	(0.113)	(0.012)	(0.031)	(0.167)
Observations	3,089	3,089	4,578	3,089
Adjusted R^2	0.555	0.014	0.245	0.160
Panel C: Durango				
After×Treat	0.060	0.020	-0.073	-0.031
	(0.084)	(0.025)	(0.048)	(0.336)
Observations	1,625	1,625	2,606	1,625
Adjusted R^2	0.692	0.007	0.273	0.142
Panel E: Nuevo Leon				
After×Treat	0.146**	0.034*	-0.011	-0.108
	(0.064)	(0.020)	(0.031)	(0.194)
Observations	2,686	2,686	4,038	2,686
Adjusted R^2	0.749	0.036	0.223	0.148
Panel F: Sinaloa				
After×Treat	0.099***	0.005	0.013	0.248
	(0.037)	(0.016)	(0.039)	(0.283)
Observations	2,065	2,065	3,493	2,065
Adjusted R^2	0.600	0.027	0.208	0.151
Panel G: Sonora				
After×Treat	-0.029	0.006	-0.034	-0.396
	(0.050)	(0.020)	(0.042)	(0.330)
Observations	1,557	1,557	2,702	1,557
Adjusted R^2	0.700	0.027	0.197	0.152
Panel H: Tamaulipas				
After×Treat	0.180**	0.050***	0.025	-0.002
	(0.082)	(0.016)	(0.028)	(0.214)
Observations	3,532	3,532	5,440	3,532
Adjusted R^2	0.810	0.026	0.221	0.147

Note: This table shows the effect of several state English programs on exposure to weekly hours of English instruction, English abilities, labor force participation and wages. Standard errors clustered at locality level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 12: Returns to English abilities
(IV estimate with narrower comparison group)

	(1) Structural-OLS	(2) First Stage	(3) Reduced Form	(4) Structural-IV
Speak Eng	0.103			-0.840
	(0.145)			(5.647)
Had Policy		0.021**	-0.018	
		(0.009)	(0.125)	
Observations	8,009	8,009	8,009	8,009
Adjusted R^2	0.111	0.038	0.111	

Note: This table shows the structural equation (column 1), first stage (column 2), reduced form and IV estimates (columns 3 and 4, respectively). The sample consists of Mexicans ages 18–33. Controls include: gender, indigenous people dummy, years of schooling of household head, education fixed effects, cohort fixed effects and locality fixed effects. Standard errors clustered at locality level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

In the second robustness check, I address the concern that I may be comparing young adults affected by the intervention with older individuals whose exposure to English and technology could vary significantly from those younger cohorts. Part of this concern is already addressed by the cohorts FE. However, if exposure to English and technology varies over time, my results may be affected by this older cohorts. Hence, I propose an exercise in which I compare the treated cohorts to a narrower window to untreated cohorts.

My results suggest that the estimates from my staggered DD specification and my IV strategy are robust to changes in the comparison group. First, I provide suggestive evidence on the validity of the parallel trend assumption in Figure A.10. Then, I show the IV estimates from this exercise in Table 12. I find that the estimates with a different comparison group are the same in sign and significance as the original results. However, the instrument estimate in the reduced form equation becomes non-significant. Nevertheless, the conclusion derived from the IV estimate turns out the same. Indeed, I still find that English skills have no effect on wages.

7 Conclusions

In this paper I offer a comprehensive description of the English abilities in Mexico, which was never done before by the existing literature due to the lack of data on English skills. Furthermore, I provide the first causal estimate on the effect of exposure to English instruction on the acquisition of English abilities as well as the returns to English skills in Mexico. This latter finding will contribute to the literature, which has mostly offered evidence on returns to English skills in the context of immigrants in English-speaking countries or in the context of former British colonies (India and South Africa). My results provide some of the

first estimates in the context of a non-English-speaking country and the first among Latin American economies.

In my descriptive analysis I document six important facts. First, there is a gender-English gap in Mexico, with more men declaring to speak English. Second, more exposure to English instruction is associated with more English skills. Third, the ability to speak English increases with educational attainment. Fourth, indigenous people are way behind in the process of learning English. Similarly, rural areas are falling behind in this learning process. And, sixth, there are more English speakers among high-income Mexicans than low-income ones, however, English instruction in public schools may be helping to close this gap. Additionally, I find that elementary and manual unskilled occupations do not require English abilities in Mexico. On the other hand, clerical support, professional and managerial occupations concentrate most of the English speakers in Mexico. After the descriptive analysis, I explore the relationship between English skills and wages.

A first estimate of the returns to English skills in Mexico would suggest that English speakers earn 32% more than non-English speakers. Additionally, I find that the omitted variables problem, that produces a bias estimate, is mostly due to education and socio-demographic characteristics. Furthermore, men English speakers earn more than women English speakers. And, there are not significant returns to English skills among low educated individuals. All these estimates rely on a model in which I control for observable characteristics. However, we may still be concern of an edogeneity problem due to omitted variables such as abilities and family background variables. Furthermore, it may also be the case that my estimates are biased due to a measurement error in the English skills variable.

To provide a causal estimate, I exploit the implementation of state English programs that offered English instruction in public primary schools. First, I provide an estimate of the Intention to Treat (ITT) effect of offering English instruction at school. I obtain this ITT estimate for each state that implemented/expanded an English program since the early 90's or 2000's. Then I pool these states in a staggered DD model. Second, with this latter model I study heterogeneous effects in three dimensions: gender, indigenous condition, geographical context (rural/urban). Finally, I propose an IV estimate, where I use the exogenous variation generated by the state English programs as an instrument. This latter provides the Local Average Treatment Effect (LATE), which can be interpreted as the returns to English abilities among those individuals who reported having English skills after being offered English instruction at school.

My results suggest that the implementation of English programs may lead to have higher wages. In particular, English programs increase wages by 25% (0.229 natural log points). This increase in wages could be due to the acquisition of English skills, but may also involve other mechanisms ranging from a signaling effect to improvements on other cognitive skills. However, this latter mechanism is less plausible in light of recent evidence provided by Gálvez-Soriano (2023), where he shows that exposure to English instruction has no effect on cognitive skills (language and mathematical skills). Furthermore, I find that English programs may lead to the acquisition of English abilities. Indeed, these type of programs increase English

skills by 1.8%. Furthermore, if we consider hours of English instruction as an exogenous variable (due to the implementation/expansion of the English programs), we may argue that an English program in Mexico may increase the acquisition of English skills by 6% (0.018/0.293).

Looking at the heterogeneous effects I find that, first, women learned English better and, hence, have higher wages. Second, English programs increased English skills only among non-indigenous people, with a potentially positive effect on wages. Similarly, English programs increased English abilities only among individuals living in urban areas but not in rural ones. Finally, English programs potentially increase English skills of low-income individuals, but not among high income ones, reflecting the catching up effect that these programs have as they were implemented only in public schools.

Furthermore, my IV estimate provides evidence that English skills do not conduce to higher wages in Mexico. Likewise, my results suggest that the effect of English programs increasing wages is not due to the acquisition of English abilities. Indeed, I do not find a significant effect of English skills on wages, although the point estimate suggests a positive effect. Hence, it could be possible that the positive effect on wages shown in the reduced form equation is due to positive externalities of English instruction, which could operate through other cognitive skills, more education, occupational decisions, among others. Indeed, I do find that there is a substitution of occupations with low requirements of English skills for occupations requiring more English skills. Second, men substitute crafts and elementary occupations for clerical support ones. And, third, women make a strong substitution of elementary occupations and sales for professionals and technical occupations. Overall, these results suggest that although English abilities may not affect wages, individuals are better off because they are moving from occupations that require more physical effort to occupations less demanding on physical work.

Finally, I am aware, however, that my results rely on the self reported English ability variable, which could still result in a biased estimate due to a measurement error problem. In particular, it is likely that English skills are sub-reported in BIARE survey, which leads to a overstated effect in the second stage. And, although the final effect is not statistically significant, point estimate seem implausible. Nevertheless, this first approach to estimate the returns to English skills in a Mexico results in an improvement of our understanding on the value of English among non-English-speaking countries. Furthermore, this document could be a referent for future research as it provides the first causal estimate of its kind among the existing literature.

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Appendix

A.1 English abilities, occupations and economic industries

Table A.1: English abilities by occupations (low education)

Occupation	(1) Speak English	(2) Wages (pesos/month)	(3) Female	(4) Education (years)	(5) Shares
Farming	0.008	2,556.77	0.18	4.75	0.116
Elementary occupations	0.007	2,962.20	0.43	6.29	0.343
Machine operators	0.009	5,513.96	0.18	7.57	0.112
Crafts	0.009	4,044.76	0.29	6.45	0.133
Customer service	0.012	4,203.19	0.49	7.03	0.081
Sales	0.005	3,521.73	0.59	7.05	0.117
Clerical support	0.012	5,139.45	0.51	8.34	0.025
Professionals/Technicians	0.013	5,447.58	0.17	7.68	0.039
Managerial	0.016	7,058.67	0.42	7.78	0.031
Abroad	0.104	9,874.29	0.25	7.73	0.003

Note: This table shows the percentage of individuals who have English speaking abilities, mean wages, percentage of women and their mean schooling, by aggregates of occupations in Mexico. The occupations were determined using the International Standard Classification of Occupations (ISCO-08) from the International Labor Organization (ILO) at one digit code level. The managerial category includes supervisors from other occupations. The abroad category contains individuals who reported working abroad, but it is a mix of all other categories. The sample contains Mexicans ages 18–65 who self-reported their ability to speak in English and who have nine years of education or less. Mean English ability for this sample is 0.007 (0.7%).

Table A.2: English ability by economic industries (low education)

Industry	(1) Speak English	(2) Wages (pesos/month)	(3) Female	(4) Education (years)	(5) Shares
Agriculture	0.008	2,449.31	0.18	5.04	0.198
Other Services	0.007	3,115.65	0.67	6.53	0.128
Construction	0.008	4,582.67	0.01	6.45	0.107
Commerce	0.009	3,728.85	0.50	7.01	0.181
Manufactures	0.008	4,281.93	0.40	7.29	0.171
Hospitality and Entertainment	0.011	3,744.21	0.64	6.85	0.086
Transportation	0.017	5,971.60	0.04	7.44	0.046
Administrative and Support	0.010	4,076.10	0.32	7.07	0.026
Government	0.007	6,228.79	0.22	7.27	0.023
Professional/Technical	0.007	4,839.42	0.60	7.64	0.025
Telecom/Finance	0.002	5,160.65	0.25	7.46	0.007
Abroad	0.105	9,985.99	0.25	7.75	0.003

Note: This table shows the percentage of individuals who have English speaking abilities, mean wages, percentage of women and their mean schooling, by aggregates of economic industries in Mexico. The economic industries were determined using the North American Industry Classification System (NAICS) at two digit code level. The 'Construction' category includes mining, utilities and construction industries. The 'Telecom/Finance' category includes telecommunications, finance and real state industries. Finally, the 'Professional/Technical' category includes professional, technical and management industries. The abroad category contains individuals who reported working abroad, but it is a mix of all economic industries. The sample contains Mexicans ages 18–65 who self-reported their ability to speak in English and who have nine or less years of education. Mean English ability for this sample is 0.007 (0.7%).

Table A.3: Policy changes in Mexican states

State	Year of impl.	Policy change	Cohorts affected	Hrs of English		Policy details	Comparison state
				Before policy	After policy		
Nuevo Leon	1993	1998	1981-1996	0.97	2.75	Only sixth grades	SLP
Sonora	1993	2004	1989-1996	1.64	5.52	Only 1st and 2nd grades	BC
Coahuila	1995	1999	1979-1996	2.73	9.09	Started w/trial stage	Chihuahua
Tamaulipas	2001	2001	1983-1996	1.21	2.89	Only fourth grades	BC
Aguascalientes	2001	2001	1986-1995	2.36	8.13	No info. available	Zacatecas
Durango	2002	2002	1985-1996	0.33	1.00	Started w/trial stage	SLP
Sinaloa	2004	2004	1989-1996	0.70	1.86	No info. available	Nayarit

Note: These summary statistics consist of Mexicans ages 18–65 who self-reported their ability to speak English.
Source: I computed the hours of English instruction using the Mexican school census (Statistics 911). Policy details from Nuevo Leon, Sonora, Coahila and Tamaulipas were obtained from their respective websites (see section 2 for the original sources). Details from Durango were obtained from an unofficial source. There are not information available for the state English programs of Aguascalientes and Sinaloa. However, for all states, the information provided from the data in the school census coincides with official and unofficial sources in terms of the release year of each state English program.

Table A.4: Heterogeneous effects of offering English instruction at school (SDD estimate)

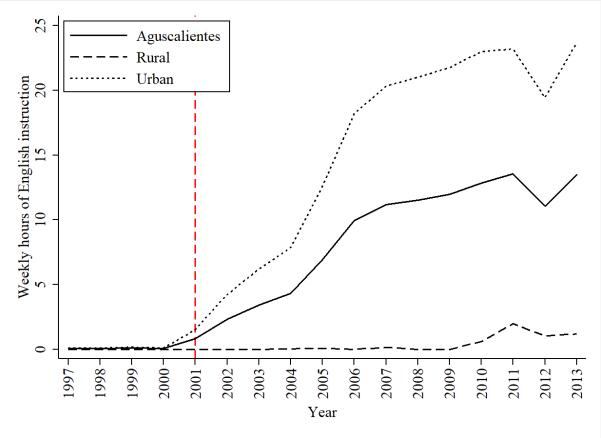
	(1) Hrs Eng	(2) Speak Eng	(3) Work Participation	(4) ln(wage)
Panel A: Heterogeneous effects by ethnicity				
Indigenous (β^I)				
Had Policy	0.119	-0.027	0.167	-0.344
	(0.154)	(0.056)	(0.147)	(1.231)
Observations	237	237	340	237
Adjusted R^2	0.876	0.441	0.408	0.343
Non-Indigenous (β^N)				
Had Policy	0.274***	0.019**	-0.022	0.028
	(0.045)	(0.009)	(0.015)	(0.088)
Observations	15,582	15,582	22,177	15,582
Adjusted R^2	0.607	0.070	0.240	0.137
$\beta^I = \beta^N$ [p-value]	[0.400]	[0.182]	[0.116]	[0.663]
Panel B: By geographical context				
Rural (β^R)				
Had Policy	-0.021	0.012	0.004	0.075
	(0.019)	(0.012)	(0.033)	(0.276)
Observations	2,683	2,683	4,208	2,683
Adjusted R^2	0.039	0.054	0.378	0.163
Urban (β^U)				
Had Policy	0.302***	0.020*	-0.020	0.014
	(0.049)	(0.010)	(0.016)	(0.093)
Observations	13,136	13,136	18,309	13,136
Adjusted R^2	0.630	0.081	0.219	0.118
$\beta^R = \beta^U$ [p-value]	[0.000]	[0.305]	[0.000]	[0.460]

Note: This table shows heterogeneous effects of offering English instruction in several Mexican states on exposure to weekly hours of English instruction, English abilities, labor force participation and wages. Standard errors clustered at locality level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

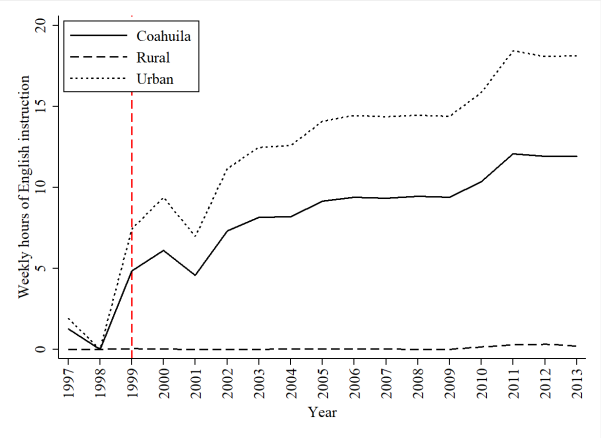
A.2 States that have launched English programs in public primary schools

A.3 Parallel Trend Assumption

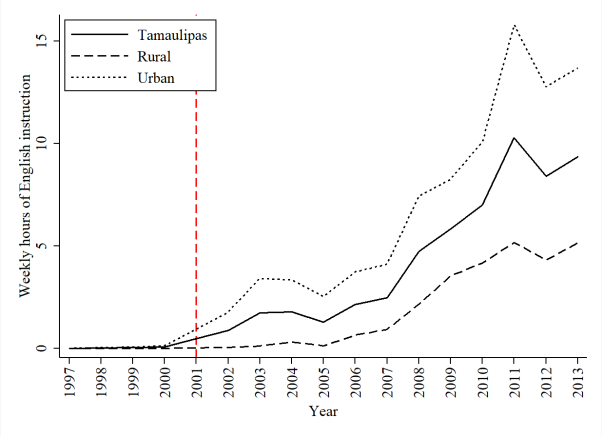
Figure A.1: Mexican states with a significant increase in hours of English instruction in public primary schools



(a) Aguascalientes



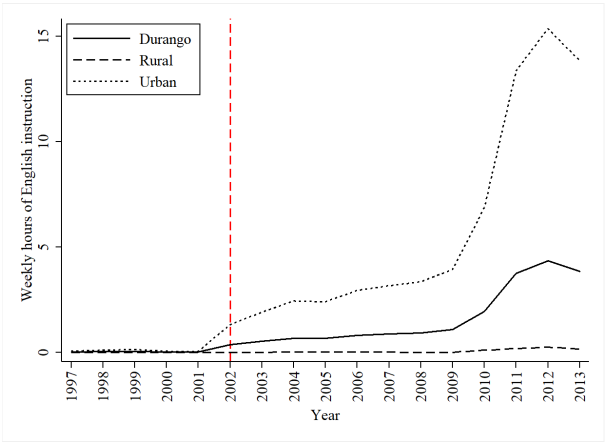
(b) Coahuila



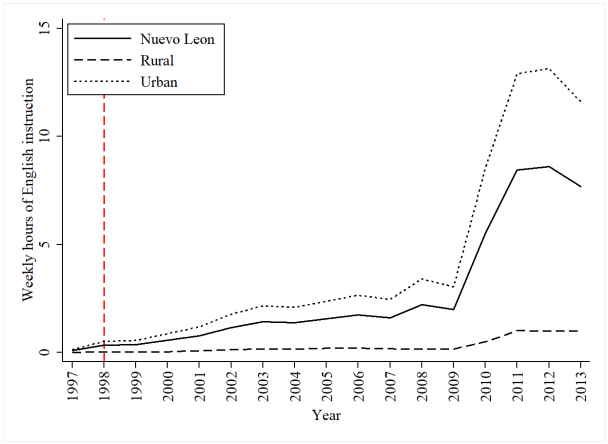
(c) Tamaulipas

Note: Average weekly hours of English instruction are plotted. The data used comes from the administrative records in the Mexican school census (also known as Statistics 911). The vertical doted lines represent the first year of implementation/expansion of the state English program. The four states shown in this figure represent only the Mexican states that had a significant increase in hours of English instruction during the implementation/expansion of their respective English programs.

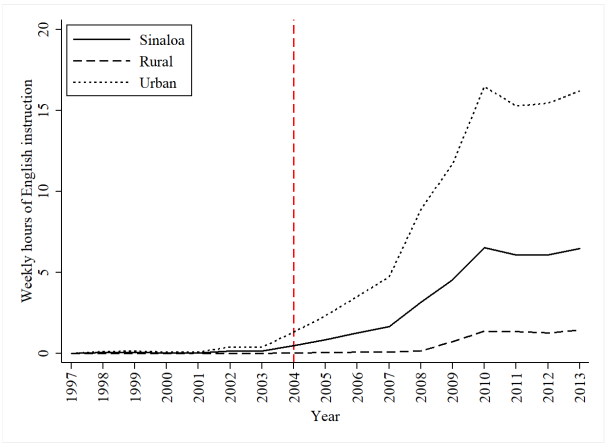
Figure A.2: Mexican states with some English instruction in public primary schools



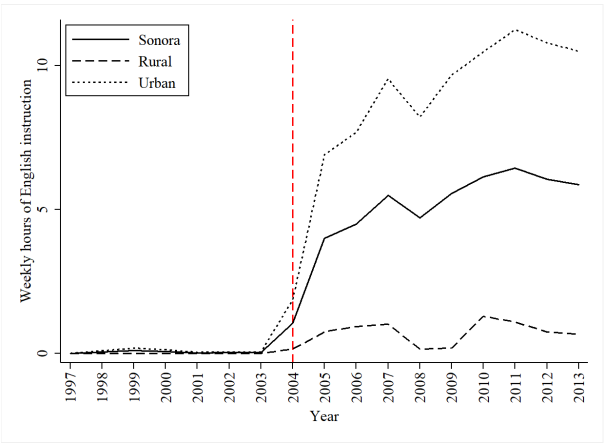
(a) Durango



(b) Nuevo Leon



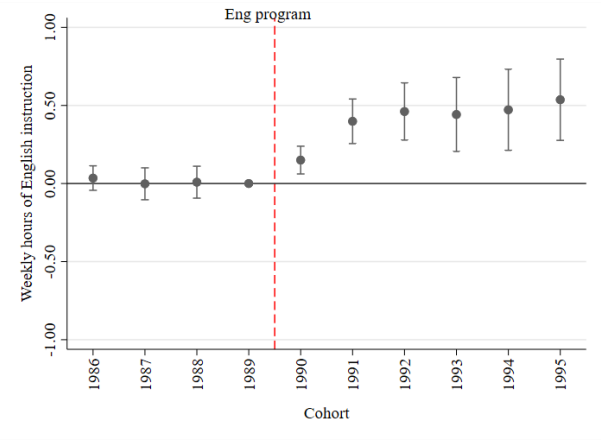
(c) Sinaloa



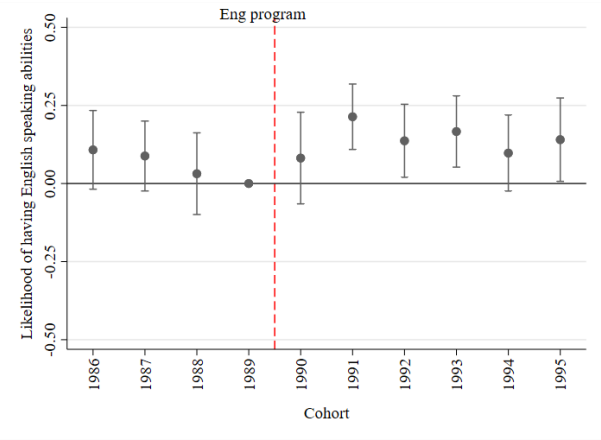
(d) Sonora

Note: Average weekly hours of English instruction are plotted. The data used comes from the administrative records in the Mexican school census (also known as Statistics 911). The vertical doted lines represent the first year of implementation/expansion of the state English program. The four states shown in this figure represent only the Mexican states that implemented some English program, but offering it to a small number of schools and/or to some selected grades, resulting in an insignificant increase in hours of English instruction.

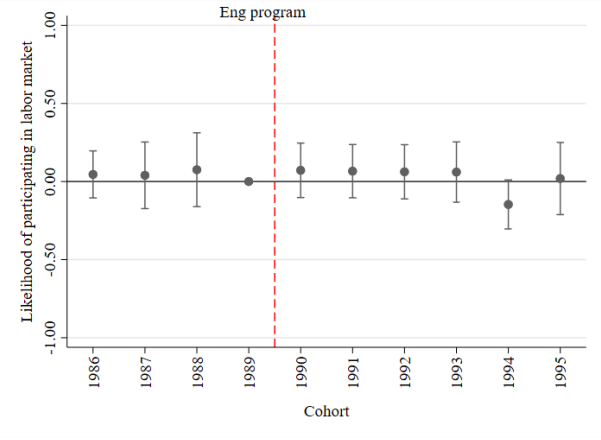
Figure A.3: Pre-trends test for Aguascalientes



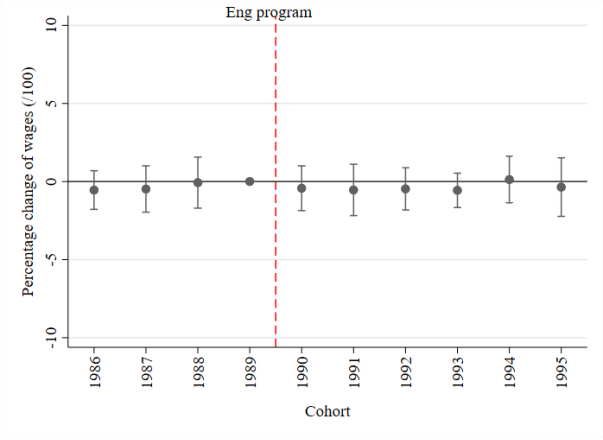
(a) Hours of English



(b) Speak English



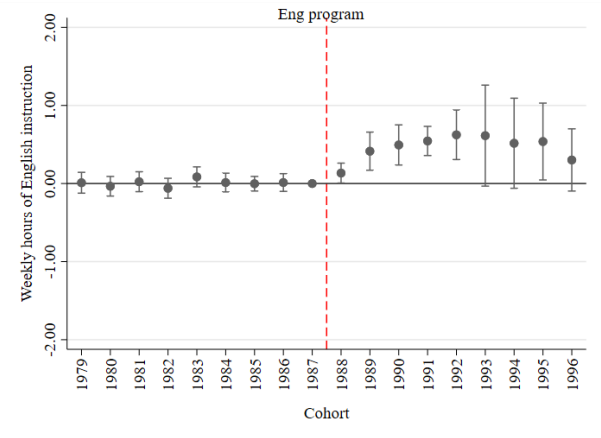
(c) Labor force



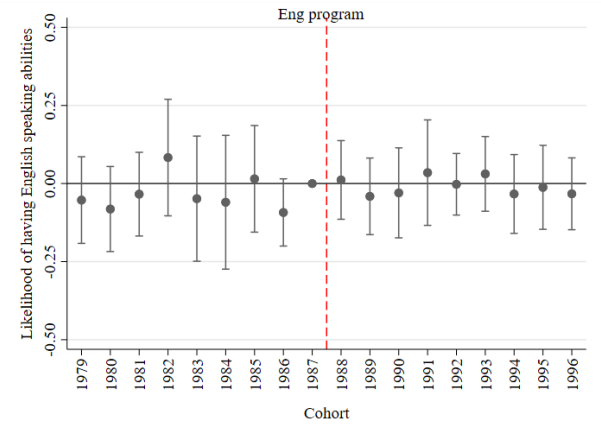
(d) Ln(wage)

Note: Plotted estimates represent the interaction terms between the treatment variable and an indicator function for each cohort (1986-1995) in an event study type regression. The omitted cohort is 1989. The vertical dotted line indicates the introduction of the state English program in Aguascalientes. The no statistically significant estimates at the left of the vertical dotted line suggest parallel trends before the policy implementation.

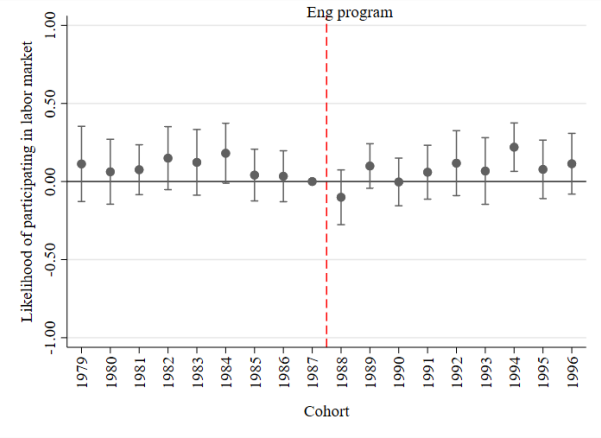
Figure A.4: Pre-trends test for Coahuila



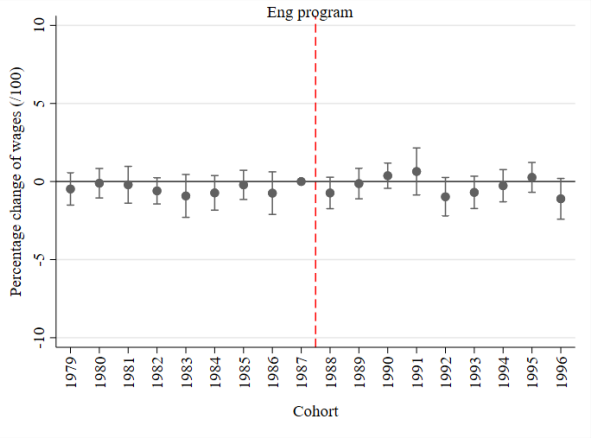
(a) Hours of English



(b) Speak English



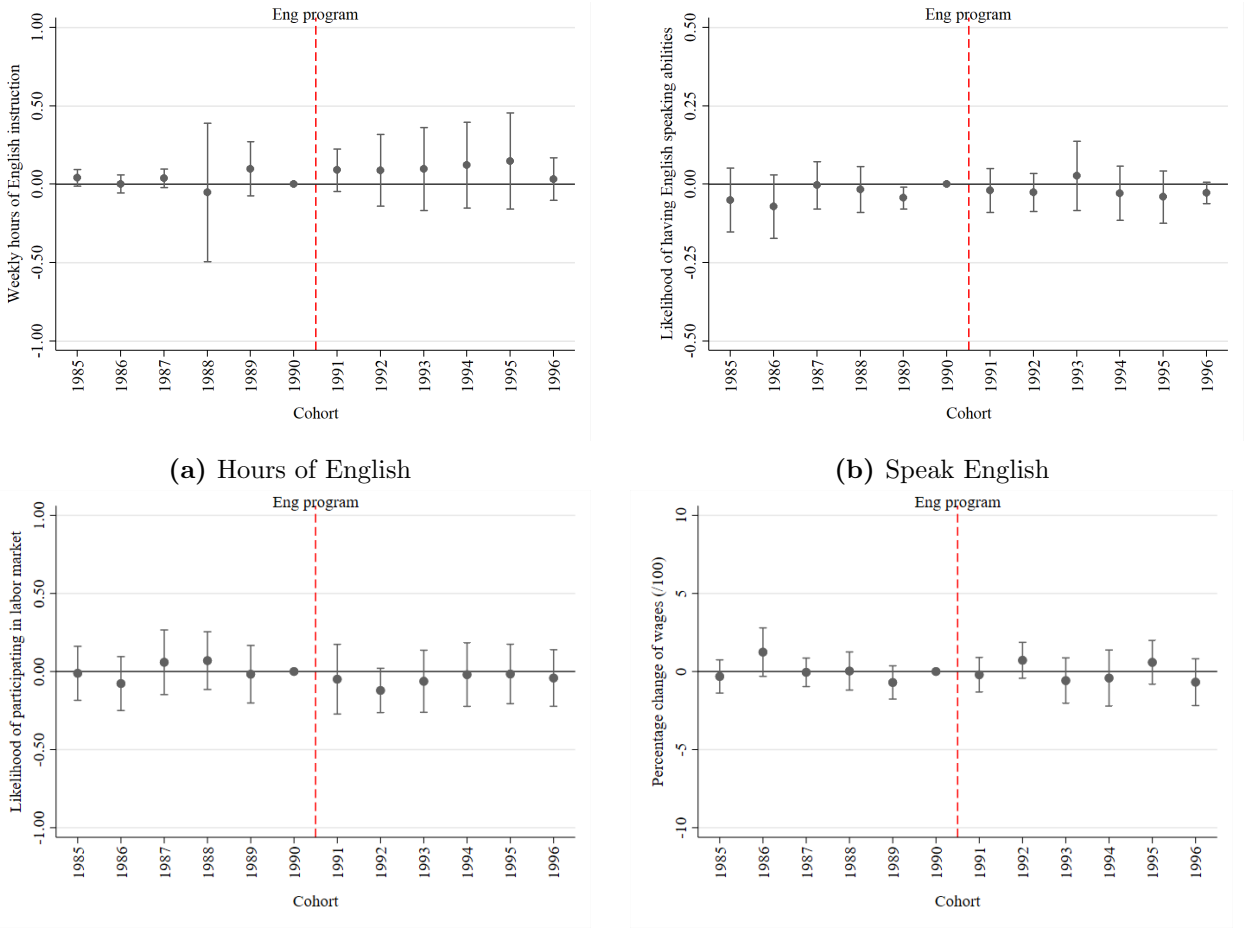
(c) Labor force



(d) Ln(wage)

Note: Plotted estimates represent the interaction terms between the treatment variable and an indicator function for each cohort (1986-1995) in an event study type regression. The omitted cohort is 1989. The vertical dotted line indicates the introduction of the state English program in Coahuila. The no statistically significant estimates at the left of the vertical dotted line suggest parallel trends before the policy implementation.

Figure A.5: Pre-trends test for Durango



(a) Hours of English

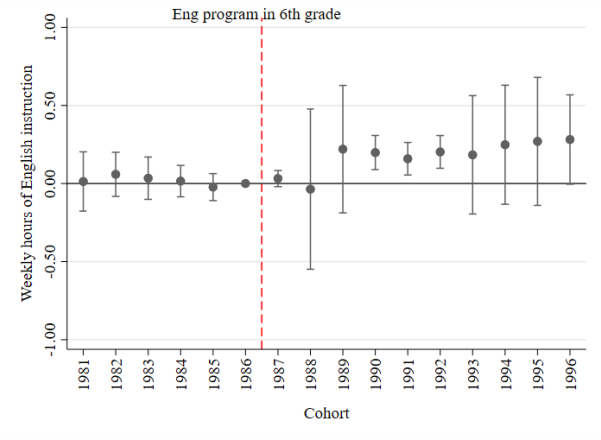
(b) Speak English

(c) Labor force

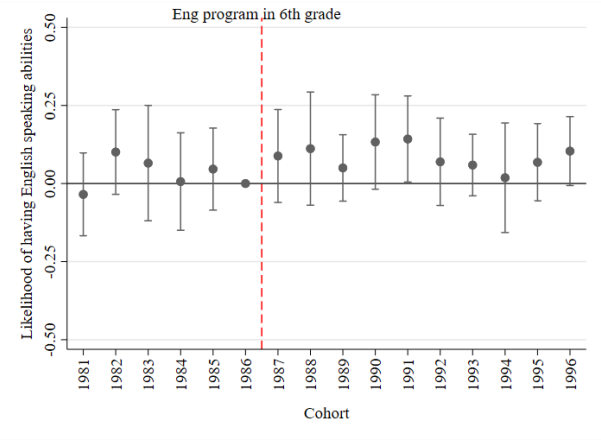
(d) Ln(wage)

Note: Plotted estimates represent the interaction terms between the treatment variable and an indicator function for each cohort (1985-1996) in an event study type regression. The omitted cohort is 1990. The vertical dotted line indicates the introduction of the state English program in Durango. The no statistically significant estimates at the left of the vertical dotted line suggest parallel trends before the policy implementation.

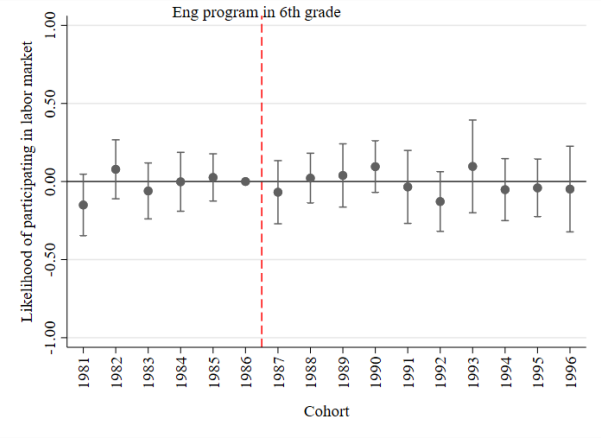
Figure A.6: Pre-trends test for Nuevo Leon



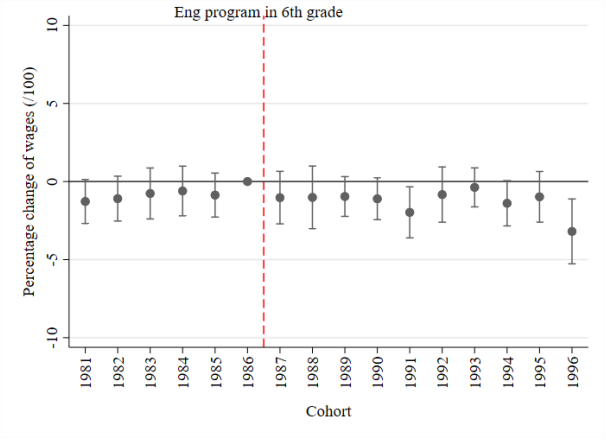
(a) Hours of English



(b) Speak English



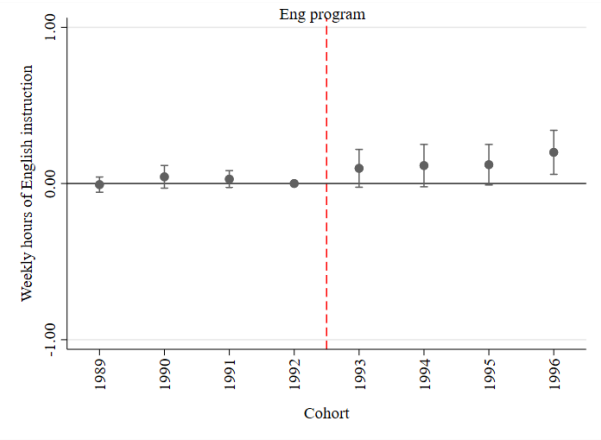
(c) Labor force



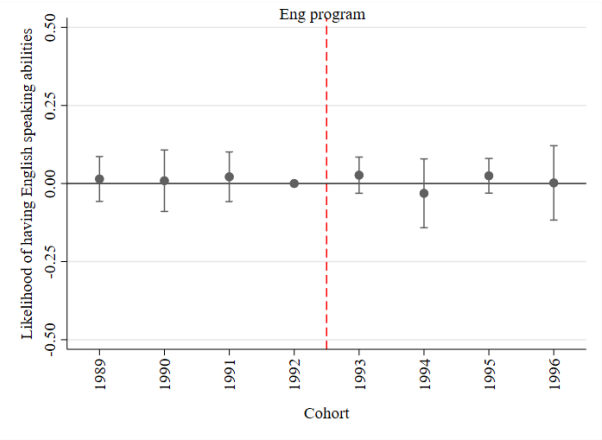
(d) Ln(wage)

Note: Plotted estimates represent the interaction terms between the treatment variable and an indicator function for each cohort (1981-1996) in an event study type regression. The omitted cohort is 1986. The vertical dotted line indicates the introduction of the state English program in Nuevo Leon. The no statistically significant estimates at the left of the vertical dotted line suggest parallel trends before the policy implementation.

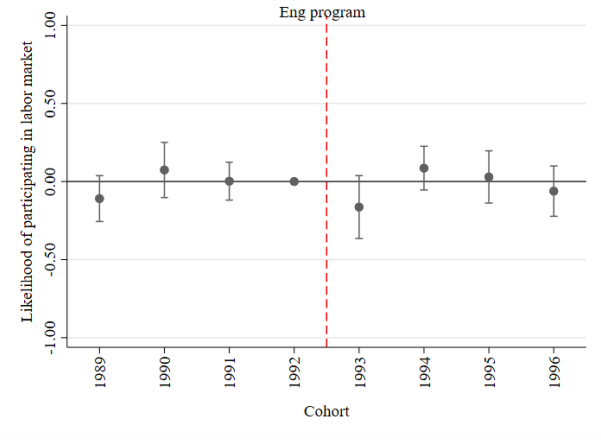
Figure A.7: Pre-trends test for Sinaloa



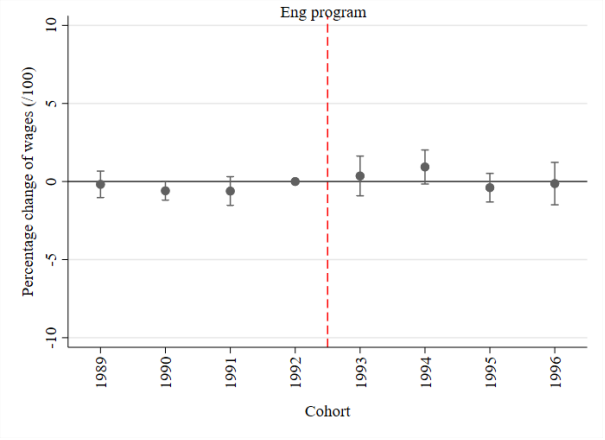
(a) Hours of English



(b) Speak English



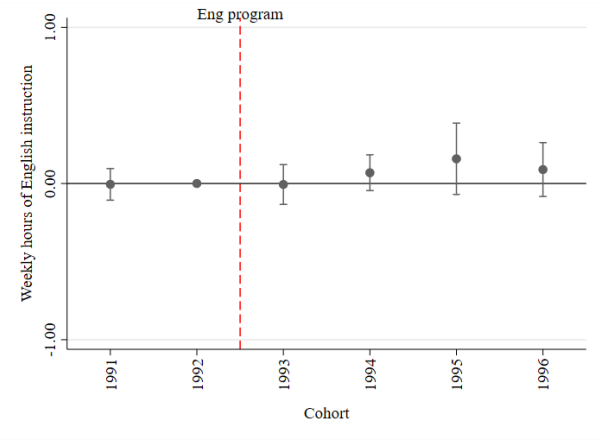
(c) Labor force



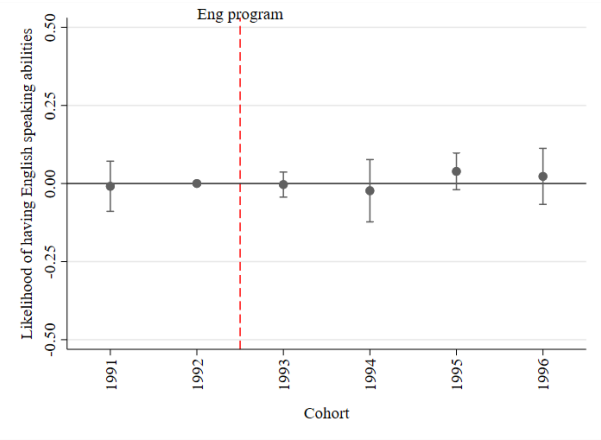
(d) Ln(wage)

Note: Plotted estimates represent the interaction terms between the treatment variable and an indicator function for each cohort (1989-1996) in an event study type regression. The omitted cohort is 1991. The vertical dotted line indicates the introduction of the state English program in Sinaloa. The no statistically significant estimates at the left of the vertical dotted line suggest parallel trends before the policy implementation.

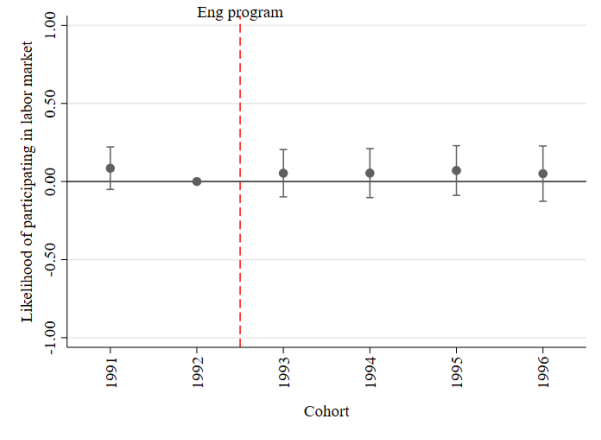
Figure A.8: Pre-trends test for Sonora



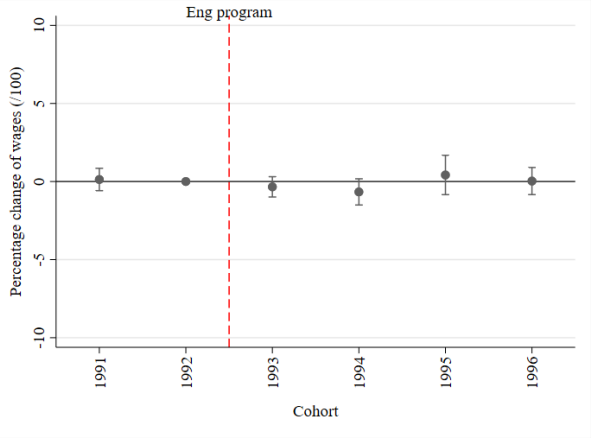
(a) Hours of English



(b) Speak English



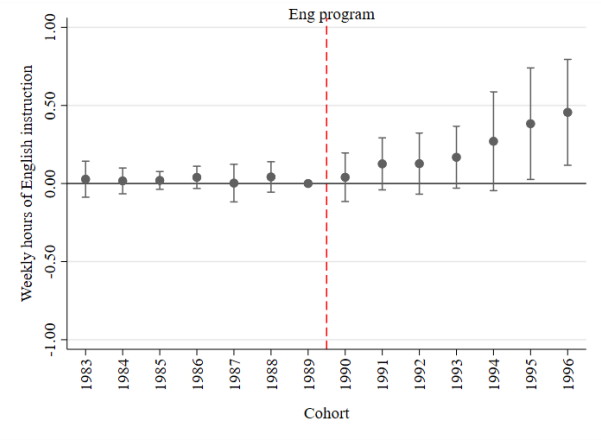
(c) Labor force



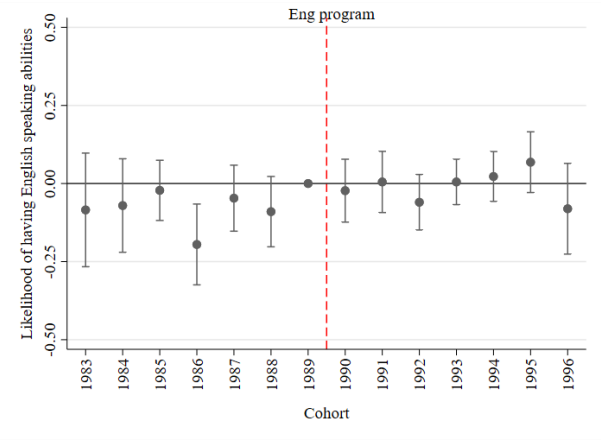
(d) Ln(wage)

Note: Plotted estimates represent the interaction terms between the treatment variable and an indicator function for each cohort (1989-1996) in an event study type regression. The omitted cohort is 1991. The vertical dotted line indicates the introduction of the state English program in Sonora. The no statistically significant estimates at the left of the vertical dotted line suggest parallel trends before the policy implementation.

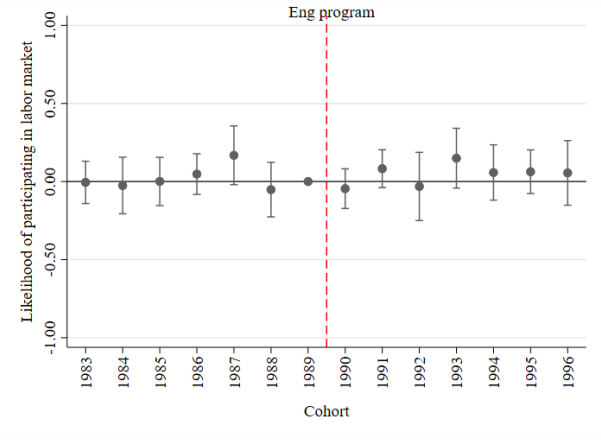
Figure A.9: Pre-trends test for Tamaulipas



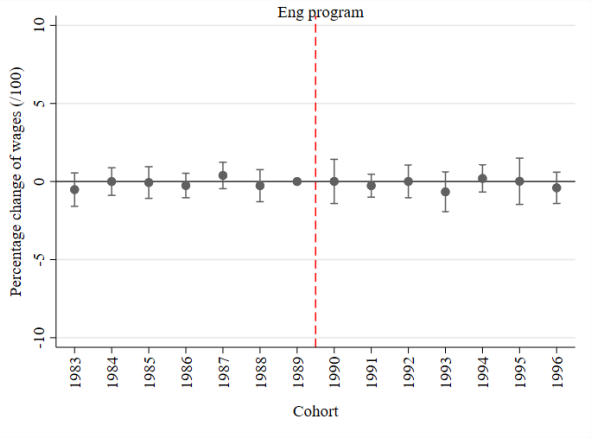
(a) Hours of English



(b) Speak English



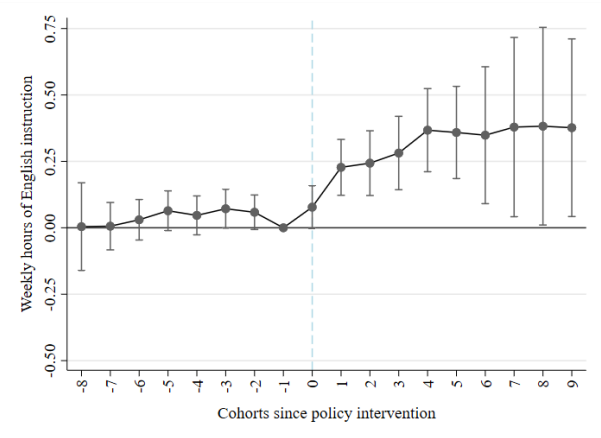
(c) Labor force



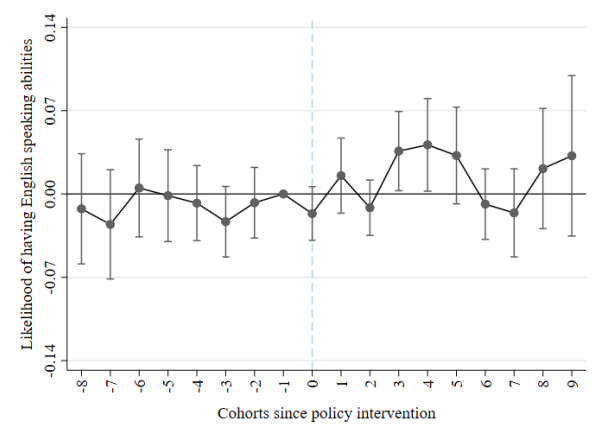
(d) Ln(wage)

Note: Plotted estimates represent the interaction terms between the treatment variable and an indicator function for each cohort (1983-1996) in an event study type regression. The omitted cohort is 1991. The vertical dotted line indicates the introduction of the state English program in Tamaulipas. The no statistically significant estimates at the left of the vertical dotted line suggest parallel trends before the policy implementation.

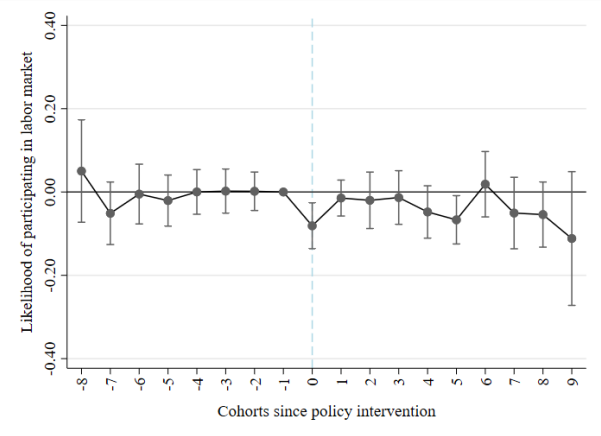
Figure A.10: Pre-trends test pooling all states (SDD estimate)



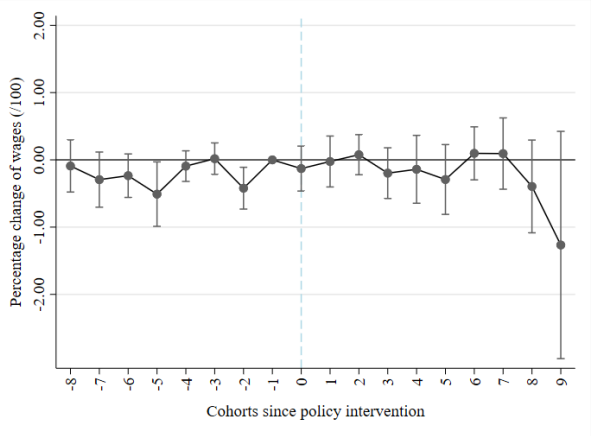
(a) Hours of English



(b) Speak English



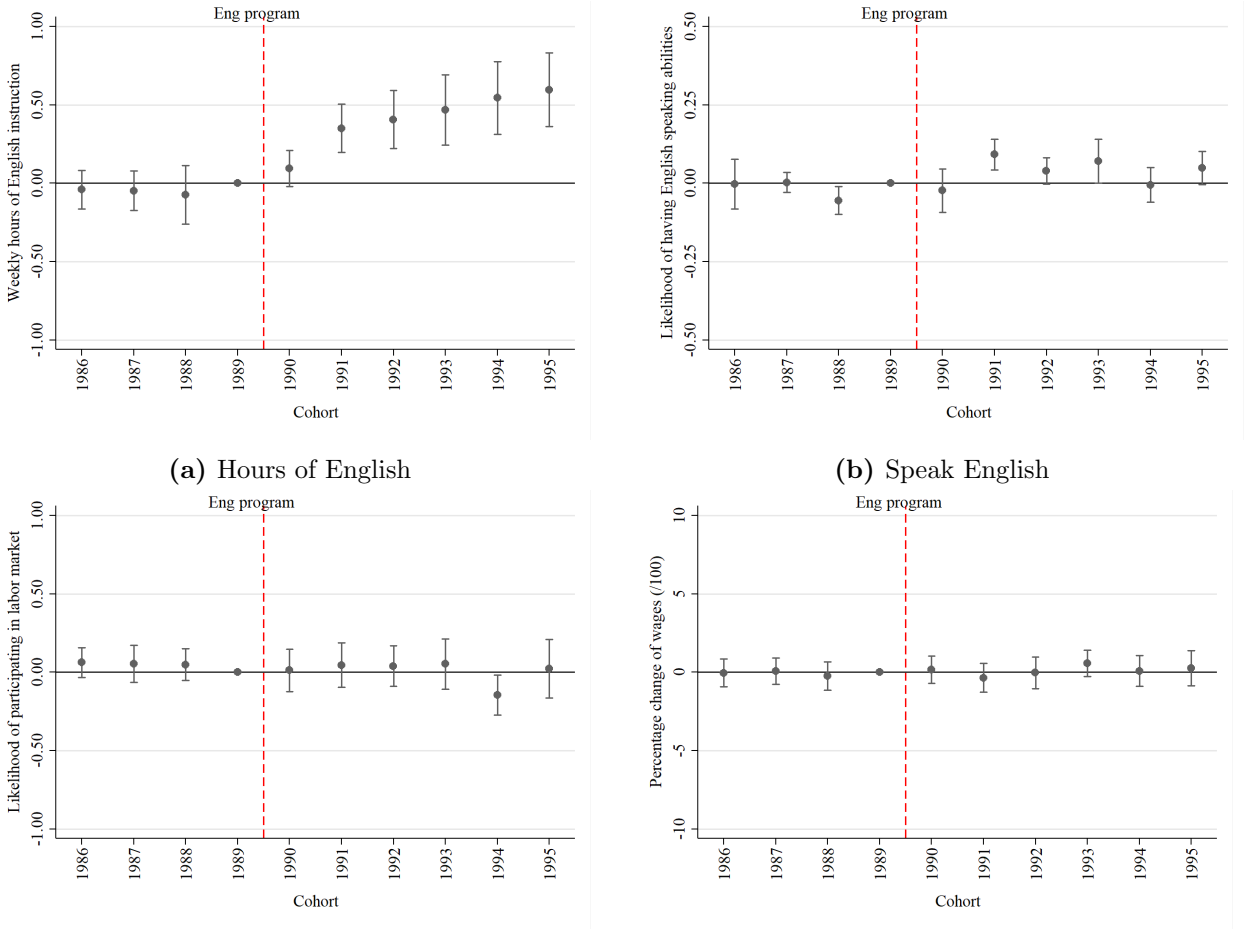
(c) Labor force



(d) Ln(wage)

Note: Plotted estimates represent the interaction terms between the treatment variable and an indicator function for each cohort since the policy intervention, in an event study type regression. The omitted cohort is one year before the state English programs. The vertical dotted lines indicates the moment of the intervention. The no statistically significant estimates at the left of the vertical dotted line suggest parallel trends before the policy.

Figure A.11: Pre-trends test for Aguascalientes (multiple comparison groups)



(a) Hours of English

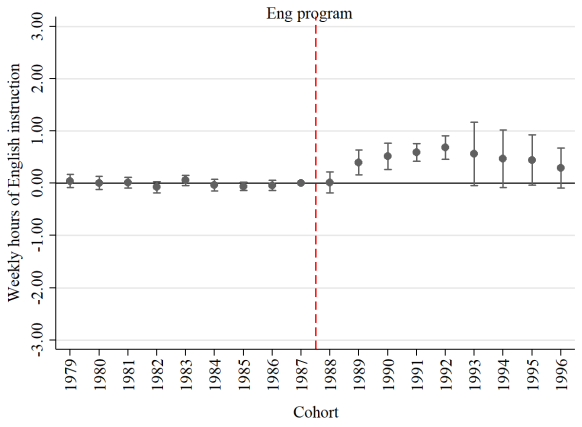
(b) Speak English

(c) Labor force

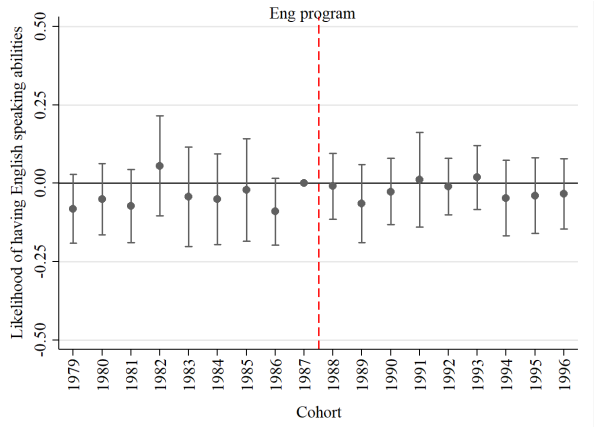
(d) Ln(wage)

Note: Plotted estimates represent the interaction terms between the treatment variable and an indicator function for each cohort (1986-1995) in an event study type regression. The omitted cohort is 1989. The vertical dotted line indicates the introduction of the state English program in Aguascalientes. The no statistically significant estimates at the left of the vertical dotted line suggest parallel trends before the policy implementation.

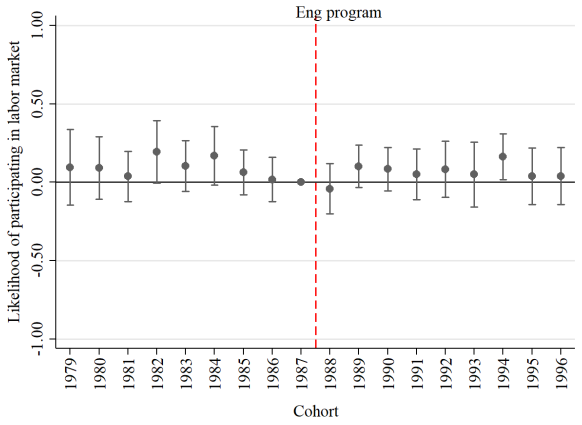
Figure A.12: Pre-trends test for Coahuila (multiple comparison groups)



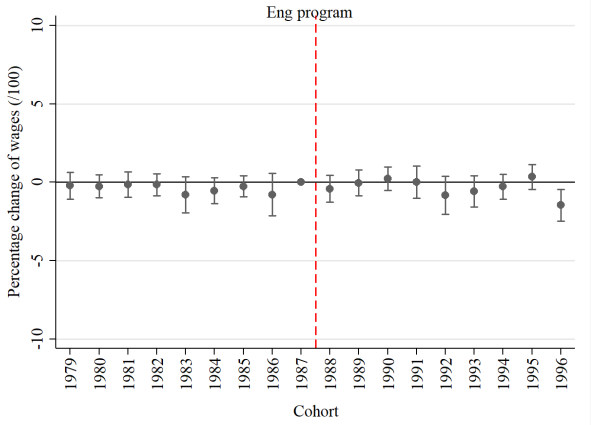
(a) Hours of English



(b) Speak English



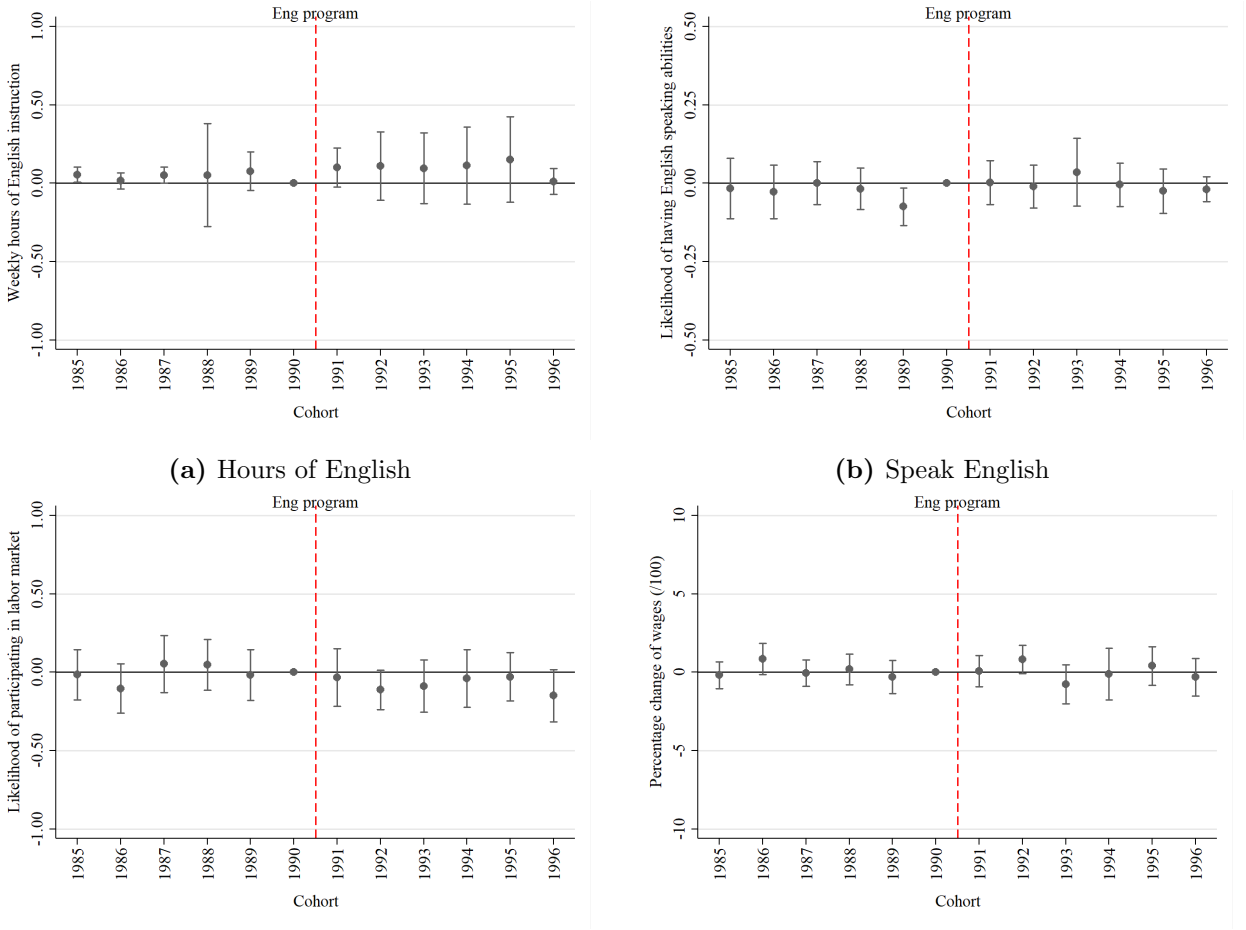
(c) Labor force



(d) Ln(wage)

Note: Plotted estimates represent the interaction terms between the treatment variable and an indicator function for each cohort (1986-1995) in an event study type regression. The omitted cohort is 1989. The vertical dotted line indicates the introduction of the state English program in Coahuila. The no statistically significant estimates at the left of the vertical dotted line suggest parallel trends before the policy implementation.

Figure A.13: Pre-trends test for Durango (multiple comparison groups)



(a) Hours of English

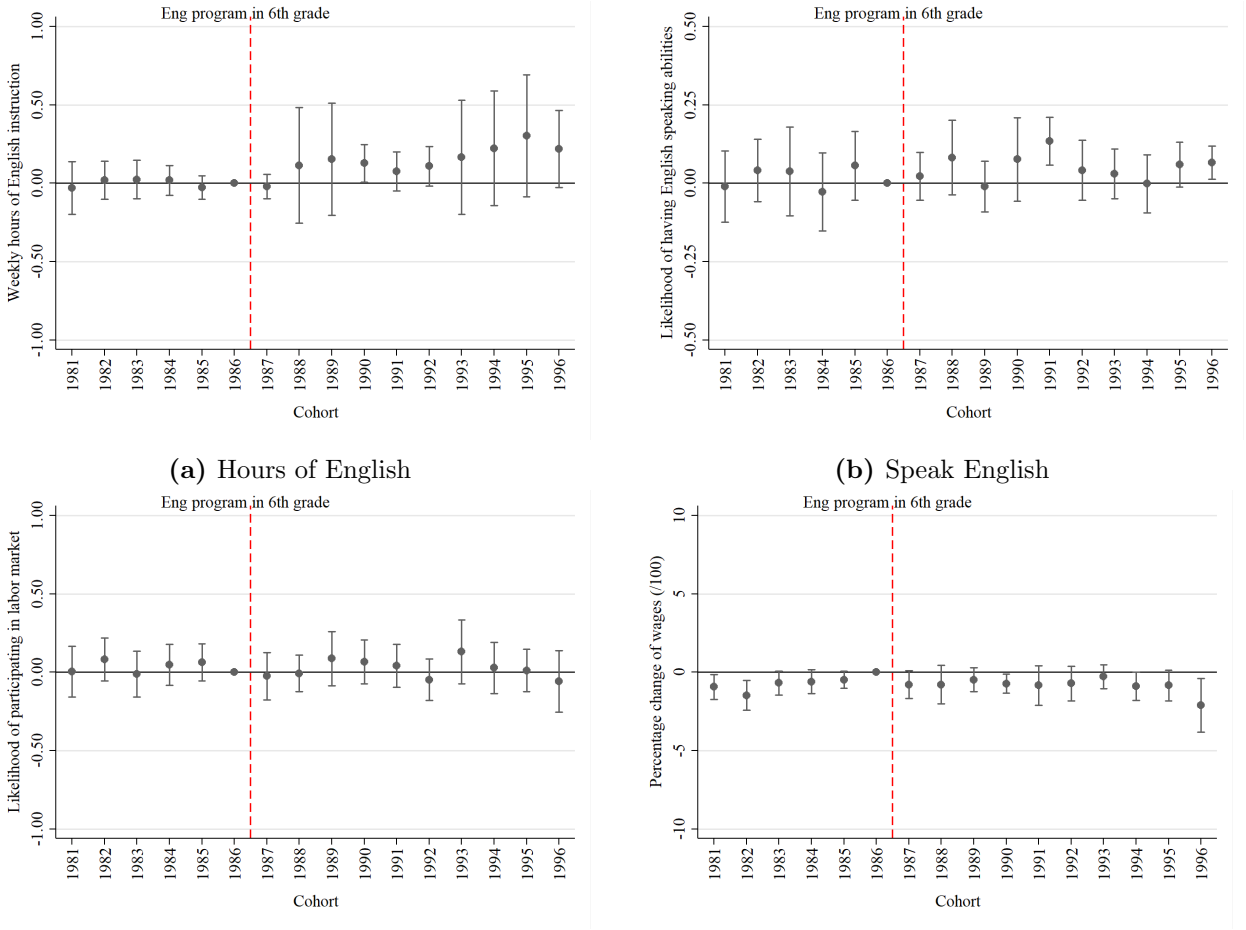
(b) Speak English

(c) Labor force

(d) Ln(wage)

Note: Plotted estimates represent the interaction terms between the treatment variable and an indicator function for each cohort (1985-1996) in an event study type regression. The omitted cohort is 1990. The vertical dotted line indicates the introduction of the state English program in Durango. The no statistically significant estimates at the left of the vertical dotted line suggest parallel trends before the policy implementation.

Figure A.14: Pre-trends test for Nuevo Leon (multiple comparison groups)



(a) Hours of English

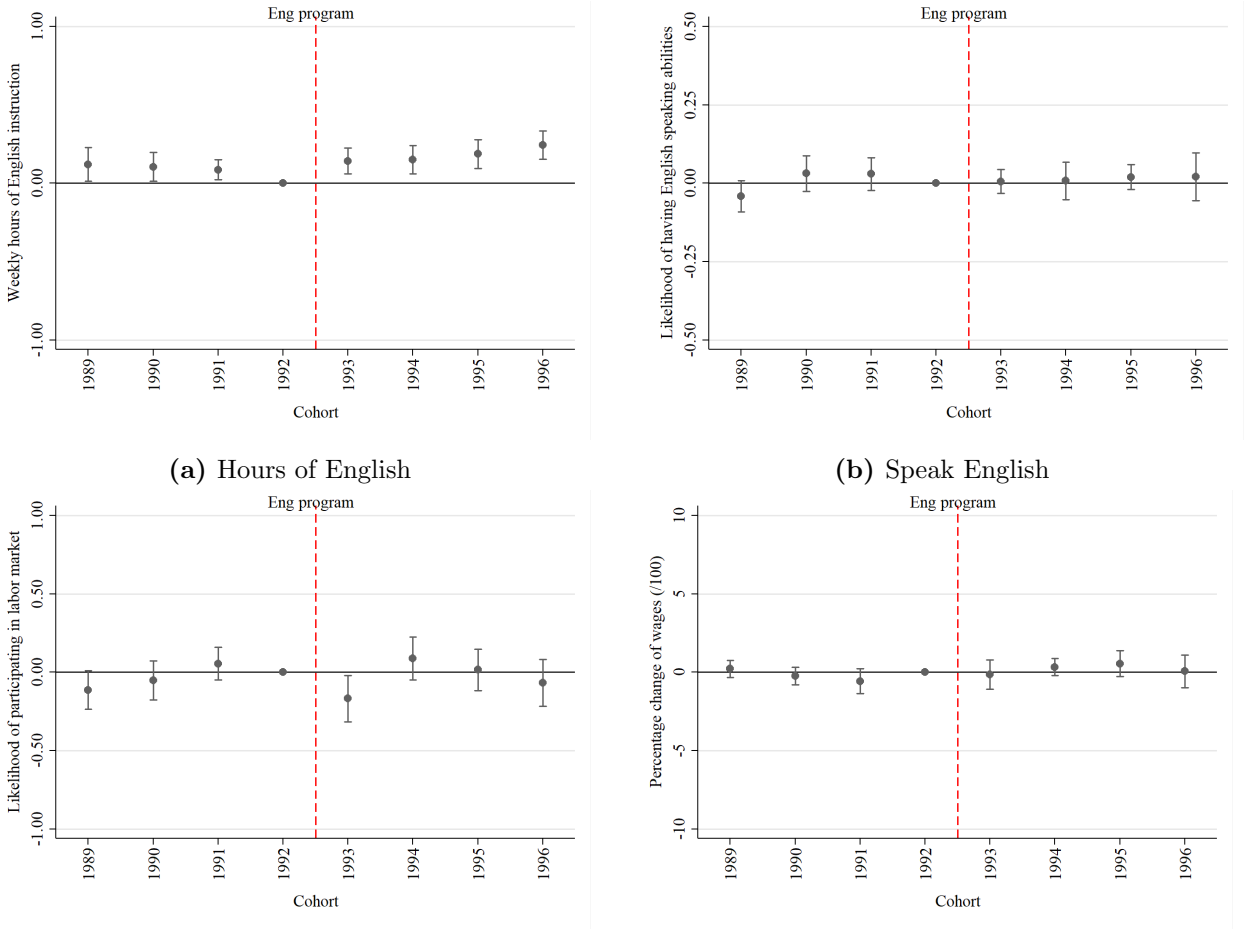
(b) Speak English

(c) Labor force

(d) Ln(wage)

Note: Plotted estimates represent the interaction terms between the treatment variable and an indicator function for each cohort (1981-1996) in an event study type regression. The omitted cohort is 1986. The vertical dotted line indicates the introduction of the state English program in Nuevo Leon. The no statistically significant estimates at the left of the vertical dotted line suggest parallel trends before the policy implementation.

Figure A.15: Pre-trends test for Sinaloa (multiple comparison groups)



(a) Hours of English

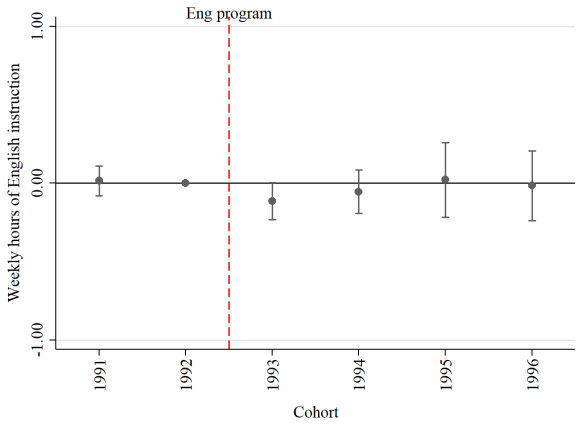
(b) Speak English

(c) Labor force

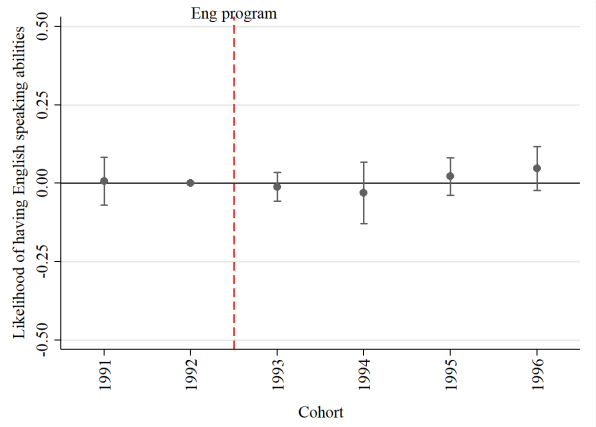
(d) Ln(wage)

Note: Plotted estimates represent the interaction terms between the treatment variable and an indicator function for each cohort (1989-1996) in an event study type regression. The omitted cohort is 1991. The vertical dotted line indicates the introduction of the state English program in Sinaloa. The no statistically significant estimates at the left of the vertical dotted line suggest parallel trends before the policy implementation.

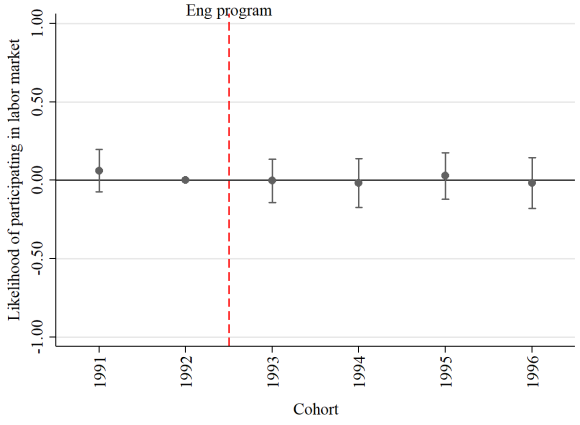
Figure A.16: Pre-trends test for Sonora (multiple comparison groups)



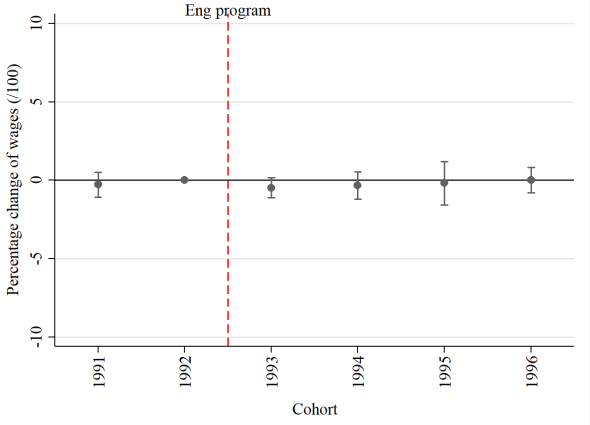
(a) Hours of English



(b) Speak English



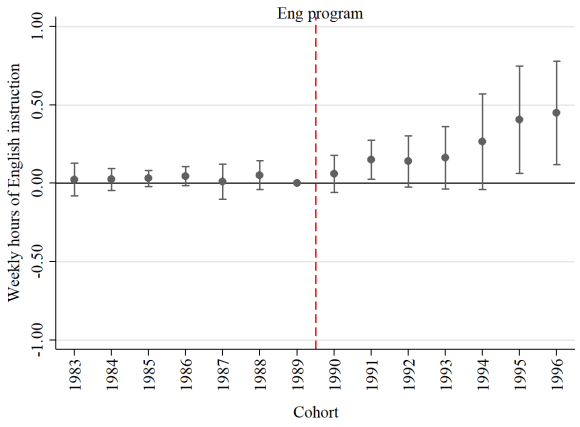
(c) Labor force



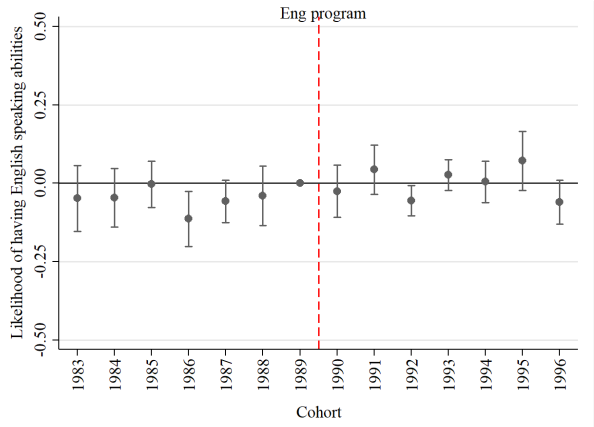
(d) Ln(wage)

Note: Plotted estimates represent the interaction terms between the treatment variable and an indicator function for each cohort (1989-1996) in an event study type regression. The omitted cohort is 1991. The vertical dotted line indicates the introduction of the state English program in Sonora. The no statistically significant estimates at the left of the vertical dotted line suggest parallel trends before the policy implementation.

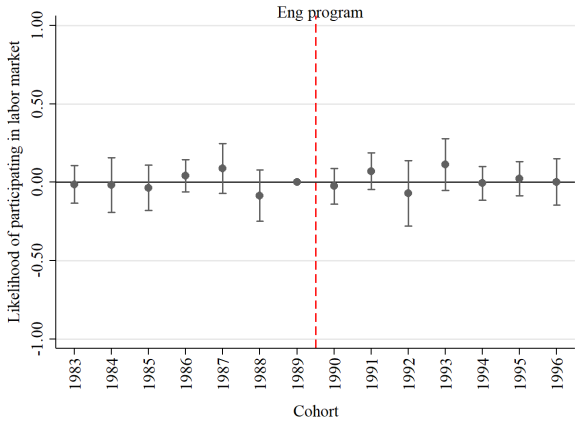
Figure A.17: Pre-trends test for Tamaulipas (multiple comparison groups)



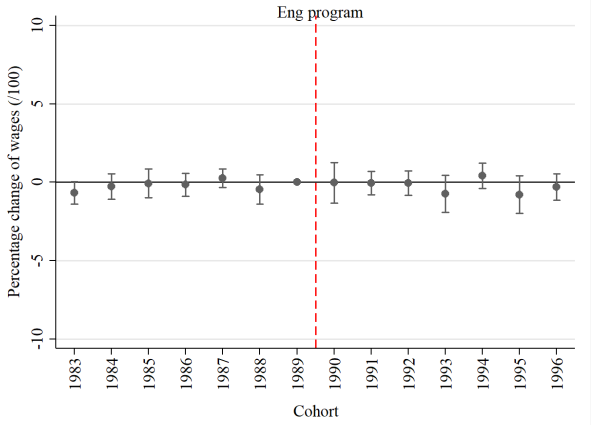
(a) Hours of English



(b) Speak English



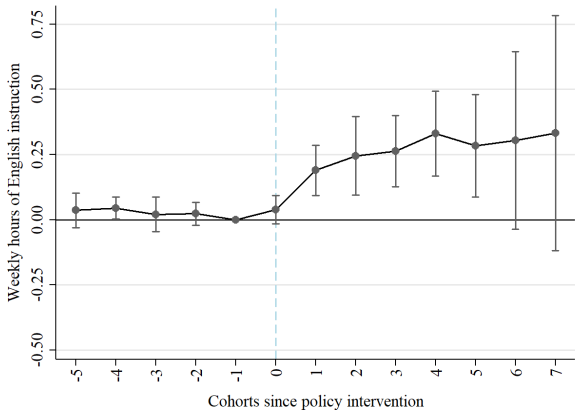
(c) Labor force



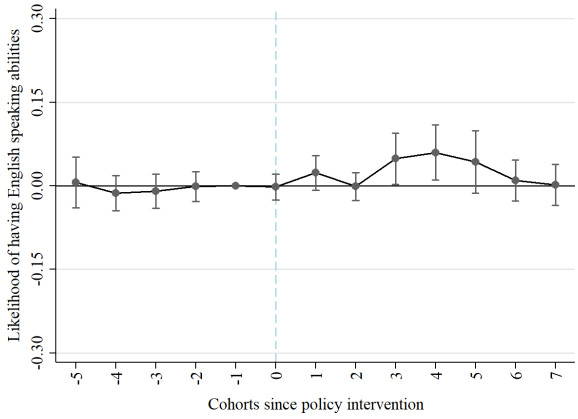
(d) Ln(wage)

Note: Plotted estimates represent the interaction terms between the treatment variable and an indicator function for each cohort (1983-1996) in an event study type regression. The omitted cohort is 1991. The vertical dotted line indicates the introduction of the state English program in Tamaulipas. The no statistically significant estimates at the left of the vertical dotted line suggest parallel trends before the policy implementation.

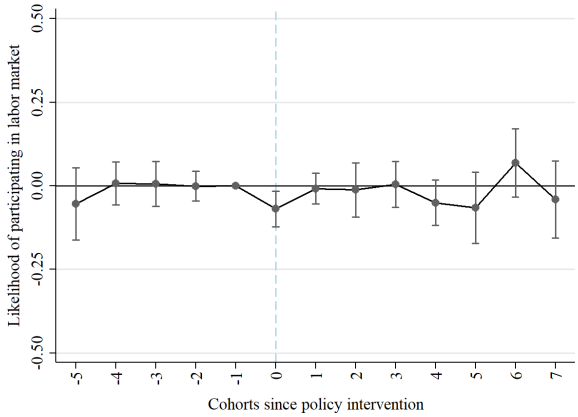
Figure A.18: Pre-trends test pooling all states (SDD estimate with narrower comparison group)



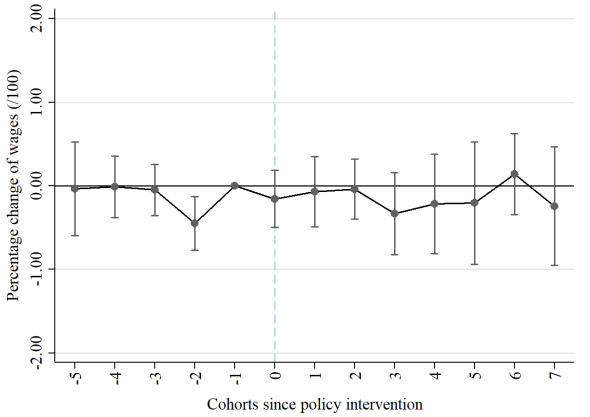
(a) Hours of English



(b) Speak English



(c) Labor force



(d) Ln(wage)

Note: Plotted estimates represent the interaction terms between the treatment variable and an indicator function for each cohort since the policy intervention, in an event study type regression. The omitted cohort is one year before the state English programs. The vertical dotted lines indicates the moment of the intervention. The no statistically significant estimates at the left of the vertical dotted line suggest parallel trends before the policy.