English skills and labor market outcomes in Mexico

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Motivation: Returns to English language abilites

- Language skills are a form of human capital
- English is valuable in the world economy
  - Globalization: trade, technology and culture
  - Migration: national and international

- In English speaking countries, English language is needed for communication
- How valuable is English for non-English speaking countries?

Related Literature

- English speaking countries
  - Immigrants: Bleakley and Chin (2004); Chiswick and Miller (2015)
  - Former British colonies: Azam, Chin and Prakash (2013); Eriksson (2014); Chakraborty and Bakshi (2016)
- Non-English-speaking countries: Lang and Siniver (2009)
- English language skills in Mexico: McConnell and Leclere (2002); Flores-Yeffal (2019); Delgado-Helleseter (2020)

This paper in a nutshell

- Describe prevalence of English skills in Mexico
  - Take advantage of an unusual data set that measures English skills in Mexico
- Quantify the relationship between English skills and labor market outcomes in Mexico
  - Exploit state policy changes that give state by cohort variation in exposure to English instruction

Background

- Importance of English language for Mexico
  - Neighboring country with the US
  - Investment, trade and migration
- Very little known about English language skills in Mexico
  - Who speaks English?
  - I use the 2014 Subjective Well-being Survey (BIARE) to describe English skills in Mexico
- Very little known about returns to English skills
  - Public schools spend money on English instruction
  - Some industries and occupations demand workers who speak English

English speaking ability: a rare skill in Mexico

- BIARE is a nationally representative survey with adult respondents 18 and older
- I use the response to the following question to form measure of English ability
  - Do you speak English?
  - I code it as one if the respondent says yes, and zero otherwise
- 2.75% of Mexicans speak English

English speaking ability by occupations

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

Empirical framework

We want to estimate the effect of English skills, Eng_i, on wages, ω_i, which can be approximated with the following structural equation:

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

where $\boldsymbol{X_i}$ is a vector of controls including: education, experience, gender, marital status, ethnicity, student status, cohort FE and geographical context (rural/urban)

Empirical challenges

- Concern that English skills, Eng_i, are endogenous in the wage equation
  - Omitted variables: abilities may be correlated with both English skills and wages
  - Measurement error of English skills variable
- OLS estimation would lead to a biased estimate of β
- Take advantage of state policy changes of English instruction to form an instrument for English skills to obtain a consistent estimate of β
- Since the early 90's some Mexican states implemented English programs to offer English instruction in public primary schools

Policy changes in Mexican states

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.

Estimating the effect of policy changes

- Use Difference in Differences to estimate the effect of these policies
- Simple illustration with one policy change:

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

- where y_{isc} is the outcome variable; in first stage equation it is Eng_{isc}, in second stage it is wages, ω_{isc}
- $after_c$: takes the value of one if the individual i belongs to one of the cohorts that had exposure
- $treatment_s$ takes the value of one if individual i lives in a treated state and zero otherwise

Parallel Trend Assumption (one policy change)

- 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. Reference cohort is the one that just missed the policy

▸▸ PTA

Combining the policy changes (Staggered Difference in Differences)

Instead of looking at policies one by one, use all these policies at once

$$y_{isc} = \theta + \psi \cdot HadPolicy_{sc} + \delta_s + \kappa_c + \boldsymbol{X_{isc}\Psi} + \varepsilon_{isc}$$

where $HadPolicy_{sc}$ takes the value of one if individual i lives in a treated state and he/she belongs to one of the affected cohorts (zero otherwise)

Parallel Trend Assumption (combining all policies)

I use an event study specification to examine if pre-trends are present

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

where c_s^* denotes the first cohort affected by the intervention in state s, so $c - c_s^*$ is the time relative to c_s^* with negative values reflecting older cohorts not exposed to the policy. Omitted category is -1. Before cohorts with zero effect suggest parallel trends

PTA

IV estimation

Equation of interest (structural equation):

$$\omega_{isc} = \alpha + \beta \cdot Eng_{isc} + \boldsymbol{X_{isc}\Pi} + \epsilon_{isc}$$

Use $HadPolicy_{sc}$ to instrument for Eng_{isc}. First stage equation:

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

Reduced form equation:

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

The proposed instrument, $HadPolicy_{sc}$, fulfills two conditions:

- Relevance condition
- Exclusion restriction

Data

Household survey (2014 BIARE)

- Individual level data
- BIARE surveyed 44,518 households
  - Representative at national and state level
- Very rich questionnaire

School data on exposure to Eng instruction in primary school

- Mexican School Census (1997-2007)
- Weekly hours of English instruction (exposure)
  - By school-cohort, average over primary school
  - By cohort, take locality average
- Merge English instruction measure to individual level data (in BIARE) by locality and cohort

Results: OLS estimation of structural equation

Table 6: Returns to English abilities in Mexico

	(1) ln(wage)	(2) ln(wage)	(3) ln(wage)	(4) ln(wage)	(5) ln(wage)
Panel A: Men and Women					
Speak Eng	0.985***	0.811***	0.091	-0.028	-0.048
	(0.094)	(0.091)	(0.079)	(0.080)	(0.077)
Observations	49,884	49,884	49,884	49,884	49,884
Adjusted R^2	0.005	0.080	0.153	0.182	0.248
Panel B: Men (β^M)					
Speak Eng	0.771***	0.650***	0.098	0.054	0.027
	(0.113)	(0.109)	(0.098)	(0.098)	(0.100)
Observations	30,765	30,765	30,765	30,765	30,765
Adjusted R^2	0.005	0.055	0.124	0.161	0.261
Panel C: Women (β^W)					
Speak Eng	1.289***	1.125***	0.142	-0.084	-0.090
	(0.172)	(0.171)	(0.155)	(0.151)	(0.150)
Observations	19,119	19,119	19,119	19,119	19,119
Adjusted R^2	0.005	0.055	0.144	0.188	0.306
$\beta^M = \beta^W$ [p-value]	[0.013]	[0.012]	[0.028]	[0.036]	[0.037]
Basic controls	NO	YES	YES	YES	YES
Education	NO	NO	YES	YES	YES
Other controls	NO	NO	NO	YES	YES
Locality FE	NO	NO	NO	NO	YES

Results: Effect of state policy changes

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

	(1) Hrs Eng	(2) Speak Eng	(3) Paid work	(4) ln(wage)
Panel A: Aguascalientes				
After×Treat	0.369***	0.028	-0.060	-0.134
	(0.088)	(0.022)	(0.055)	(0.203)
Observations	742	742	1,425	742
Adjusted R^2	0.917	0.023	0.209	0.112
Panel B: Coahuila				
After×Treat	0.440***	0.020	-0.015	0.099
	(0.106)	(0.017)	(0.035)	(0.236)
Observations	1,245	1,245	2,123	1,245
Adjusted R^2	0.588	0.026	0.227	0.139
Panel C: Durango				
After×Treat	0.118	0.013	-0.026	-0.175
	(0.103)	(0.033)	(0.044)	(0.166)
Observations	818	818	1,711	818
Adjusted R^2	0.648	0.010	0.232	0.168
Panel E: Nuevo Leon				
After×Treat	0.255***	0.053**	-0.002	-0.136
	(0.080)	(0.026)	(0.037)	(0.185)
Observations	1,044	1,044	1,897	1,044
Adjusted R^2	0.711	0.028	0.230	0.158

Results: Effect of state policy changes

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

	(1) Hrs Eng	(2) Speak Eng	(3) Paid work	(4) ln(wage)
Panel F: Sinaloa				
After×Treat	0.122*	0.005	0.073	0.157
	(0.069)	(0.042)	(0.049)	(0.421)
Observations	440	440	1,112	440
Adjusted R^2	0.920	0.082	0.224	0.186
Panel G: Sonora				
After×Treat	0.098*	0.031	-0.125***	0.233
	(0.058)	(0.027)	(0.041)	(0.205)
Observations	561	561	1,438	561
Adjusted R^2	0.720	0.043	0.231	0.196
Panel H: Tamaulipas				
After×Treat	0.128	0.039	-0.028	0.101
	(0.077)	(0.029)	(0.036)	(0.189)
Observations	921	921	1,807	921
Adjusted R^2	0.879	0.058	0.211	0.150

Results: Effect of the policies combined (SDD)

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

	(1) Hrs Eng	(2) Speak Eng	(3) ln(wage)	(4) Paid work	(5) Student
Panel A: Full sample					
Had Policy	0.308***	0.015**	0.019	-0.020	0.038***
	(0.046)	(0.008)	(0.080)	(0.013)	(0.014)
Observations	13,131	13,131	13,131	22,517	22,517
Adjusted R^2	0.596	0.075	0.153	0.219	0.370
Panel B: Low education sample (β^L)					
Had Policy	0.305***	0.010	-0.169	0.016	0.005
	(0.062)	(0.007)	(0.123)	(0.021)	(0.014)
Observations	6,624	6,624	6,624	10,898	10,898
Adjusted R^2	0.522	0.016	0.162	0.225	0.043
Panel C: High education sample (β^H)					
Had Policy	0.304***	0.019	0.227**	-0.025	0.031*
	(0.040)	(0.014)	(0.099)	(0.018)	(0.017)
Observations	6,507	6,507	6,507	11,619	11,619
Adjusted R^2	0.659	0.070	0.146	0.263	0.432
$\beta^L = \beta^H$ [p-value]	[0.954]	[0.522]	[0.004]	[0.058]	[0.204]

Results: Effect of the policies combined on occupational decisions (SDD)

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	0.006	-0.031	0.015	-0.020	-0.004	-0.017	0.015	0.025	0.013	-0.002
	(0.007)	(0.020)	(0.016)	(0.013)	(0.013)	(0.014)	(0.013)	(0.017)	(0.020)	(0.004)
Observations	13,131	13,131	13,131	13,131	13,131	13,131	13,131	13,131	13,131	13,131
Adjusted R^2	0.259	0.174	0.094	0.062	0.011	0.045	0.047	0.250	0.050	0.025
Panel B: Heterogeneous effects by gender										
Men (β^M)										
Had Policy	0.001	-0.028	0.019	-0.022	-0.007	-0.017	0.026*	0.012	0.021	-0.004
	(0.011)	(0.026)	(0.024)	(0.019)	(0.015)	(0.013)	(0.013)	(0.024)	(0.026)	(0.006)
Observations	8,008	8,008	8,008	8,008	8,008	8,008	8,008	8,008	8,008	8,008
Adjusted R^2	0.309	0.192	0.082	0.064	0.008	0.019	0.008	0.180	0.068	0.034
Women (β^W)										
Had Policy	0.006	-0.047*	0.010	-0.014	0.010	-0.010	0.001	0.050**	-0.008	0.003
	(0.007)	(0.027)	(0.021)	(0.017)	(0.023)	(0.028)	(0.031)	(0.025)	(0.028)	(0.004)
Observations	5,123	5,123	5,123	5,123	5,123	5,123	5,123	5,123	5,123	5,123
Adjusted R^2	0.370	0.234	0.119	0.059	0.013	0.071	0.048	0.343	0.026	0.050
$\beta^M = \beta^W$ [p-value]	[0.427]	[0.580]	[0.978]	[0.837]	[0.370]	[0.904]	[0.435]	[0.255]	[0.343]	[0.283]

Results: IV estimate on wages

Table 9: Returns to English abilities
(IV estimate)

	(1) Structural-OLS	(2) First Stage	(3) Reduced Form	(4) Structural-IV
Speak Eng	0.142			1.252
	(0.102)			(5.084)
Had Policy		0.015**	0.019	
		(0.008)	(0.080)	
Observations	13,131	13,131	13,131	13,131
Adjusted R^2	0.153	0.075	0.153	

Next steps

- Additional robustness checks
  - Implement SDD as suggested by
    - Goodman-Bacon, Andrew (2021)
    - Sun, Liyang and Sarah Abraham (2021)
    - Callaway, Brantly and Pedro H. C. Sant'Anna (2021)
- Examine other outcomes:
  - Migration, education, well-being, social outcomes

Robustness checks: Different control groups

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

	(1) Hrs Eng	(2) Speak Eng	(3) Paid work	(4) ln(wage)
Panel A: Aguascalientes				
After×Treat	0.392***	0.002	-0.053	0.037
	(0.076)	(0.009)	(0.046)	(0.106)
Observations	2,163	2,163	4,138	2,163
Adjusted R^2	0.789	0.001	0.196	0.152
Panel B: Coahuila				
After×Treat	0.437***	0.015	-0.030	0.022
	(0.103)	(0.014)	(0.030)	(0.190)
Observations	2,541	2,541	4,578	2,541
Adjusted R^2	0.549	0.007	0.227	0.167
Panel C: Durango				
After×Treat	0.060	0.031	-0.002	-0.114
	(0.099)	(0.027)	(0.027)	(0.156)
Observations	1,991	1,991	4,083	1,991
Adjusted R^2	0.546	0.005	0.192	0.146
Panel E: Nuevo Leon				
After×Treat	0.232***	0.032*	-0.010	0.056
	(0.067)	(0.017)	(0.033)	(0.188)
Observations	2,152	2,152	4,038	2,152
Adjusted R^2	0.724	0.025	0.226	0.152

Robustness checks: Different control groups

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

	(1) Hrs Eng	(2) Speak Eng	(3) Paid work	(4) ln(wage)
Panel F: Sinaloa				
After×Treat	0.097**	0.013	-0.018	-0.013
	(0.039)	(0.025)	(0.040)	(0.234)
Observations	1,477	1,477	3,493	1,477
Adjusted R^2	0.554	0.043	0.212	0.185
Panel G: Sonora				
After×Treat	-0.020	0.008	-0.129***	0.151
	(0.055)	(0.017)	(0.039)	(0.224)
Observations	1,059	1,059	2,702	1,059
Adjusted R^2	0.711	0.075	0.218	0.179
Panel H: Tamaulipas				
After×Treat	0.138*	0.020	-0.037	0.211
	(0.075)	(0.020)	(0.032)	(0.185)
Observations	2,755	2,755	5,440	2,755
Adjusted R^2	0.818	0.033	0.208	0.157

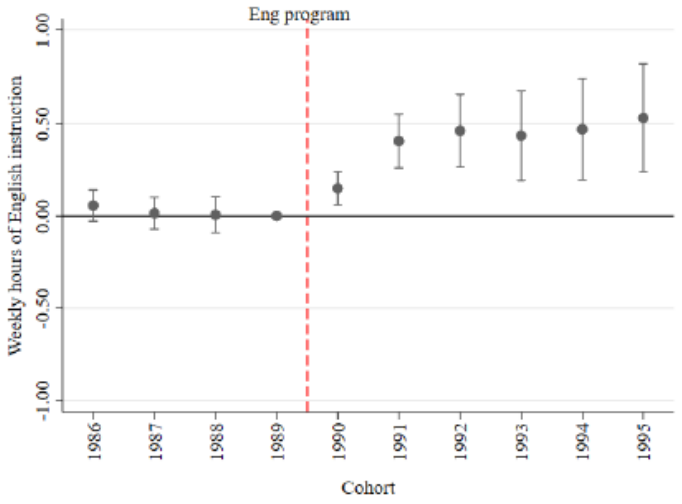
Robustness checks: Narrower comparison window

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

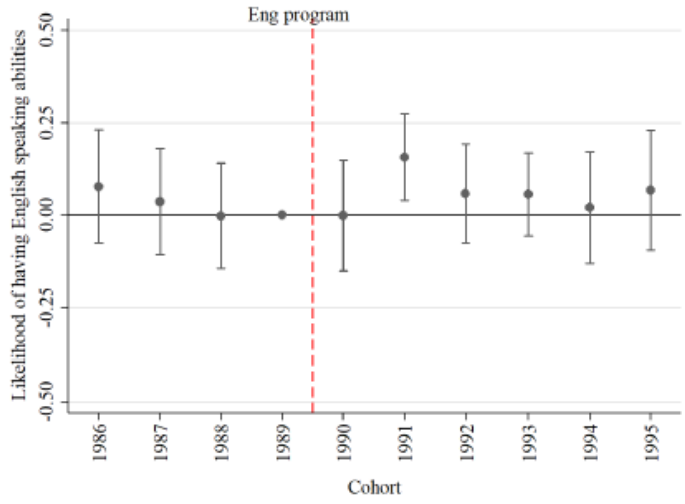
	(1) Structural-OLS	(2) First Stage	(3) Reduced Form	(4) Structural-IV
Speak Eng	0.086			-4.081
	(0.156)			(6.348)
Had Policy		0.018*	-0.073	
		(0.010)	(0.111)	
Observations	5,926	5,926	5,926	5,926
Adjusted R^2	0.159	0.050	0.159	

Parallel Trend Assumption (Aguascalientes)

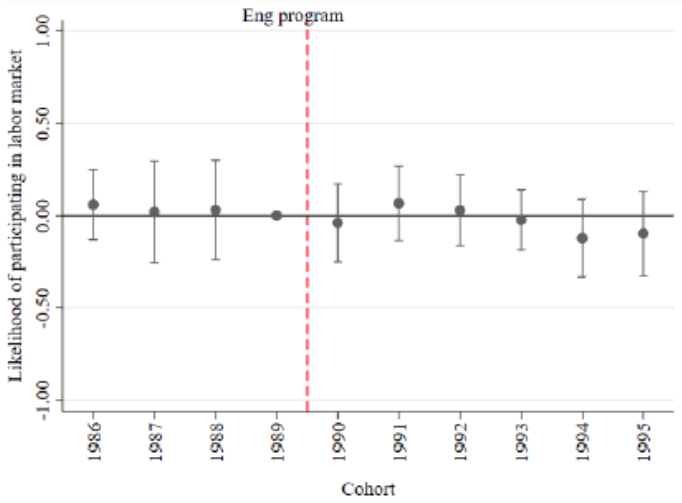
Back



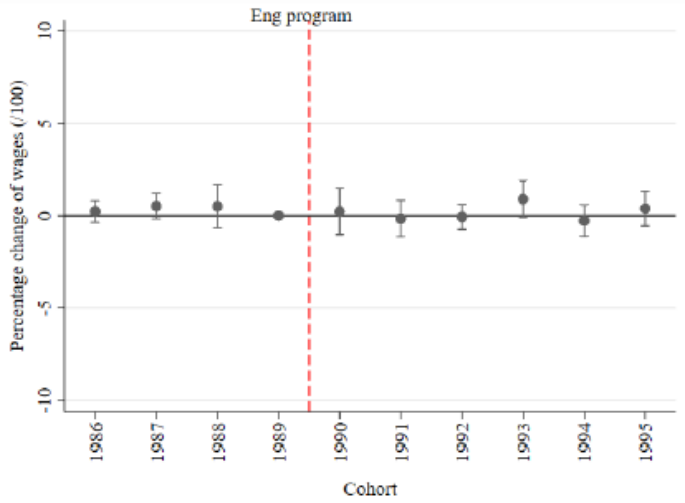
(a) Hours of English



(b) Speak English

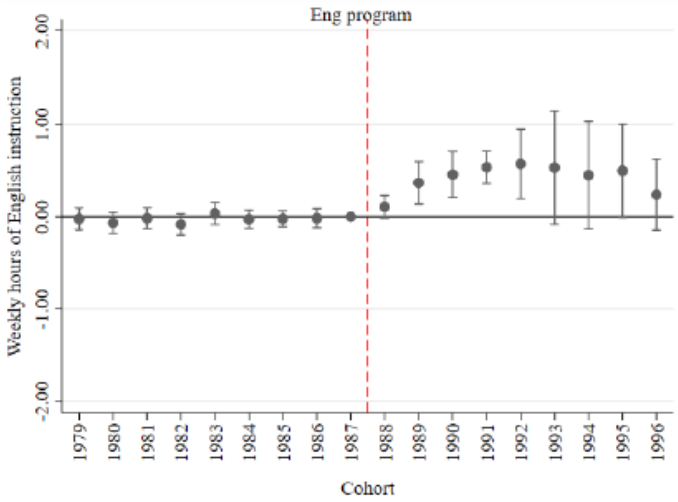


(c) Labor force

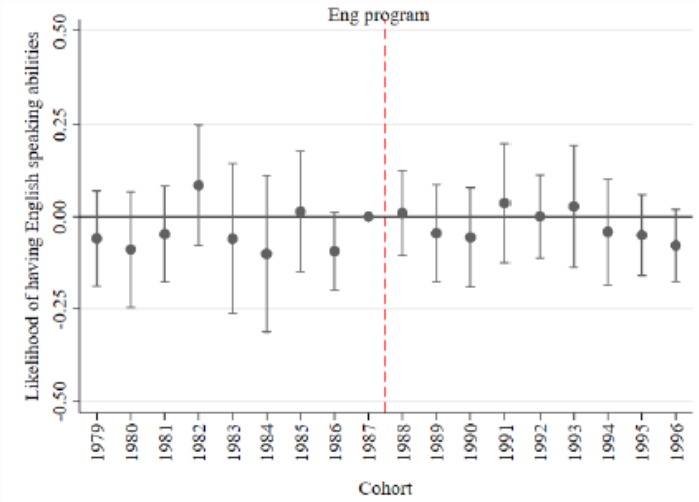


(d) Ln(wage)

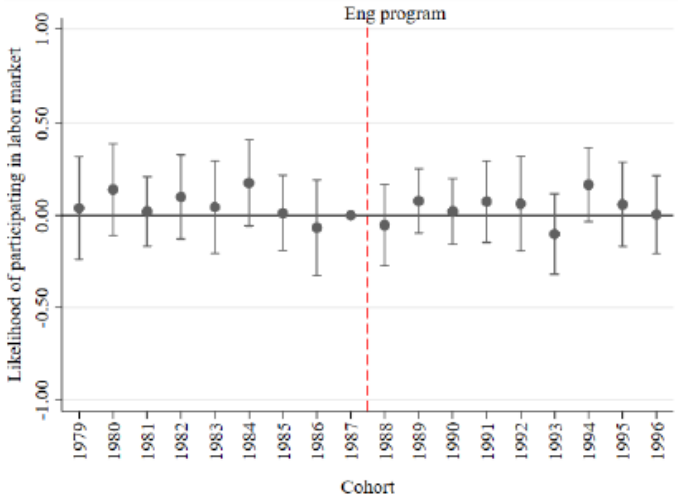
Parallel Trend Assumption (Coahuila)



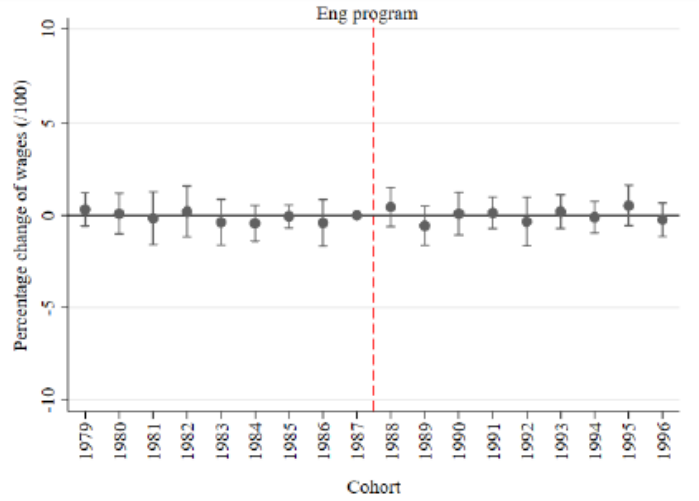
(a) Hours of English



(b) Speak English

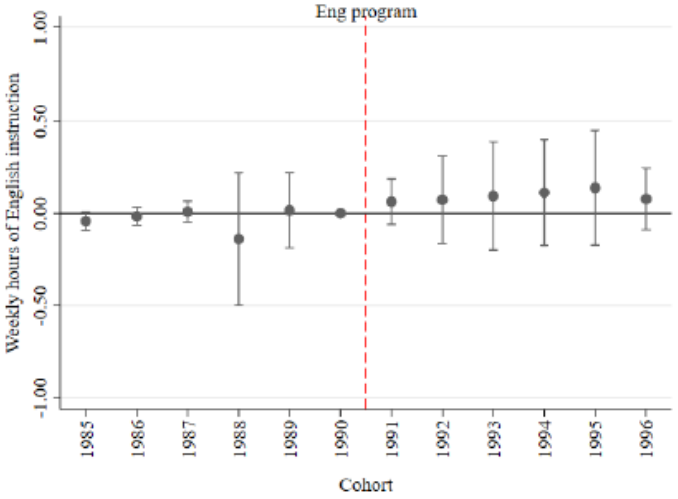


(c) Labor force

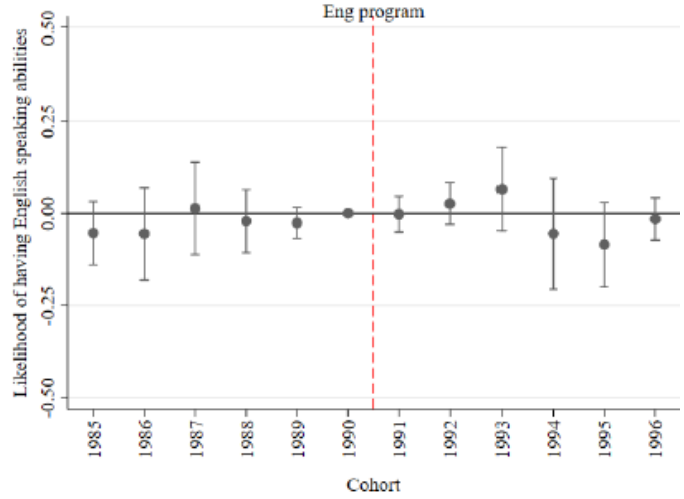


(d) Ln(wage)

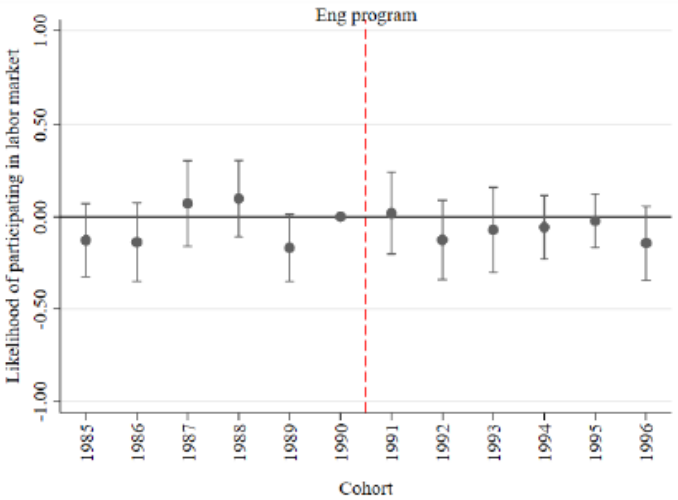
Parallel Trend Assumption (Durango)



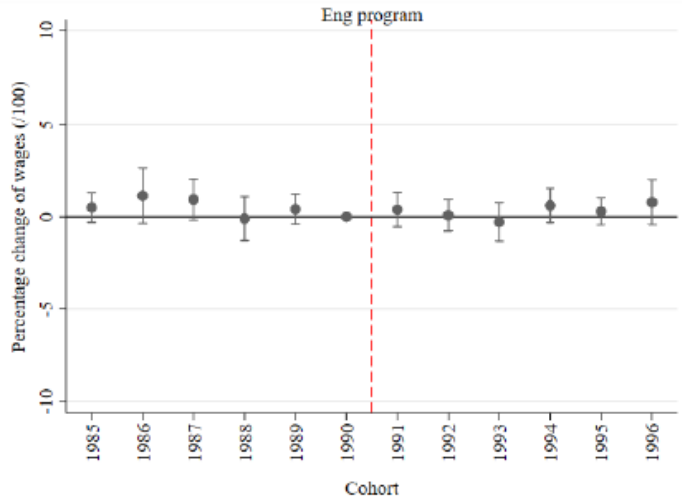
(a) Hours of English



(b) Speak English

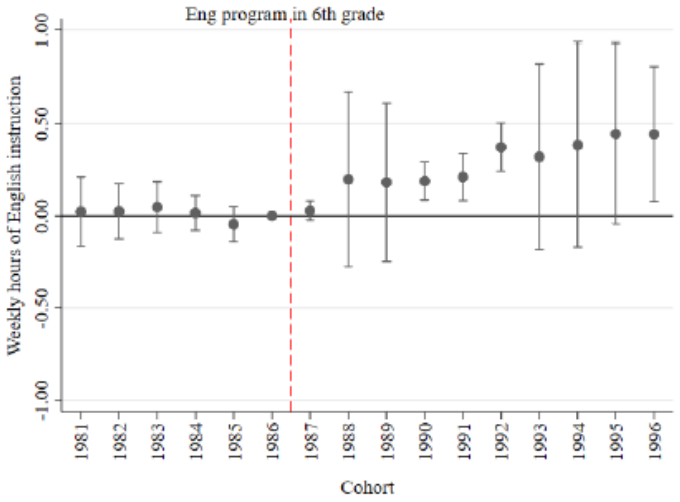


(c) Labor force

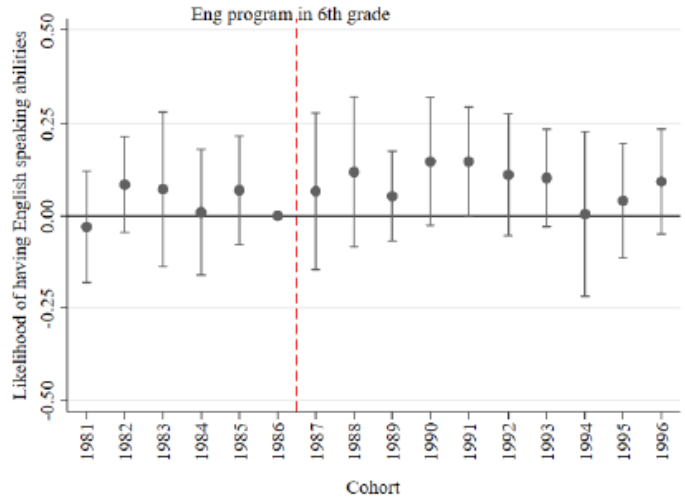


(d) Ln(wage)

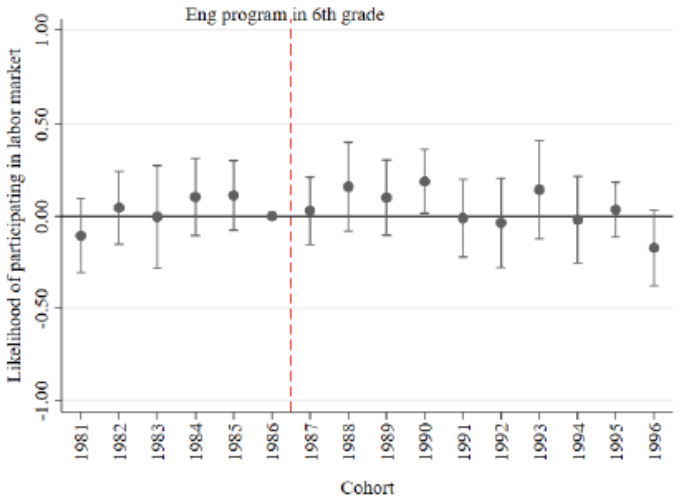
Parallel Trend Assumption (Nuevo Leon)



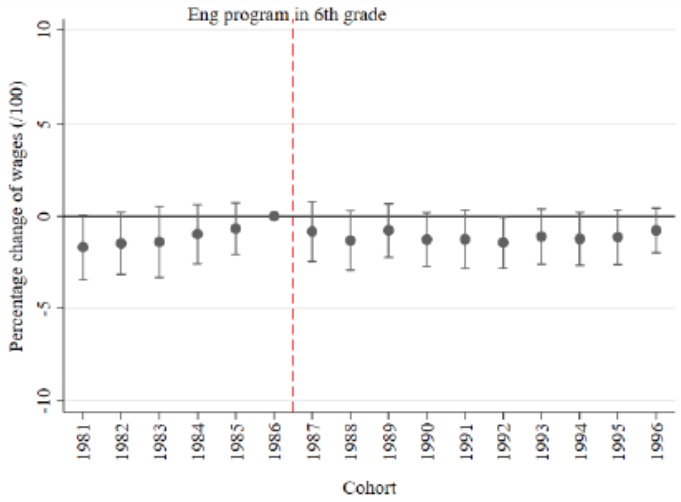
(a) Hours of English



(b) Speak English

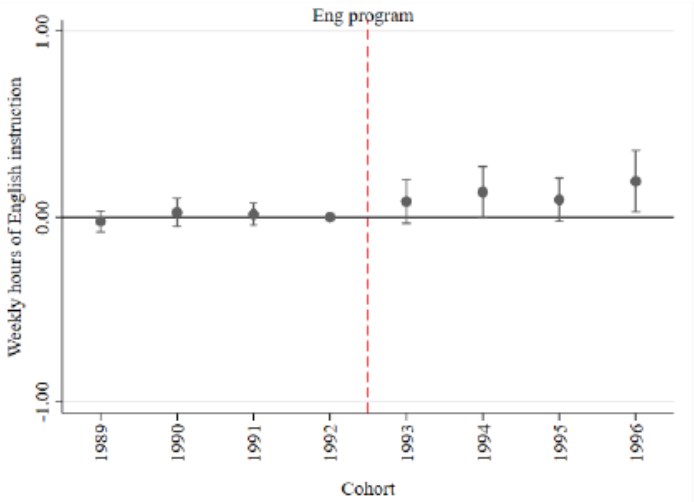


(c) Labor force

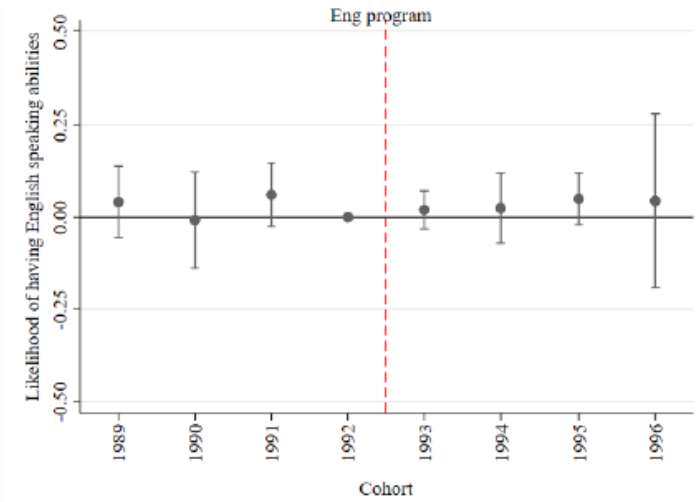


(d) Ln(wage)

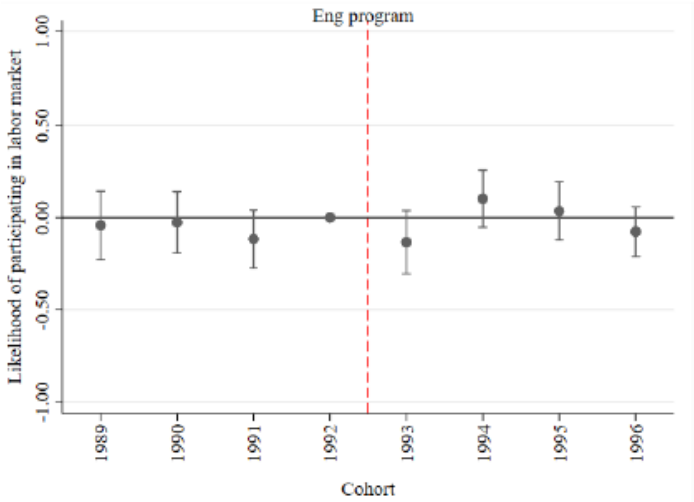
Parallel Trend Assumption (Sinaloa)



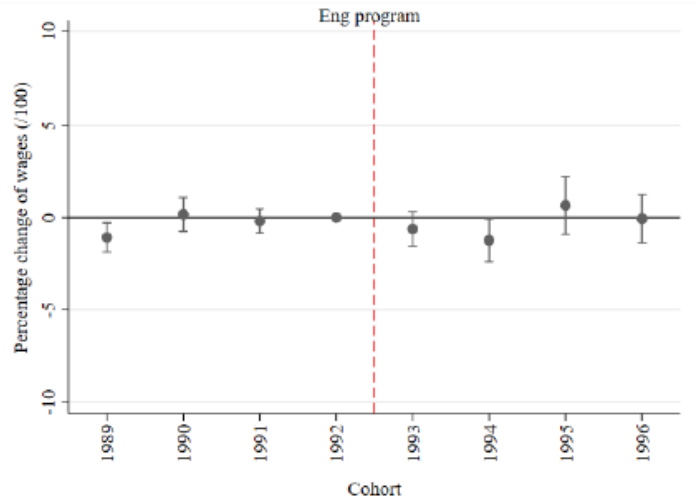
(a) Hours of English



(b) Speak English

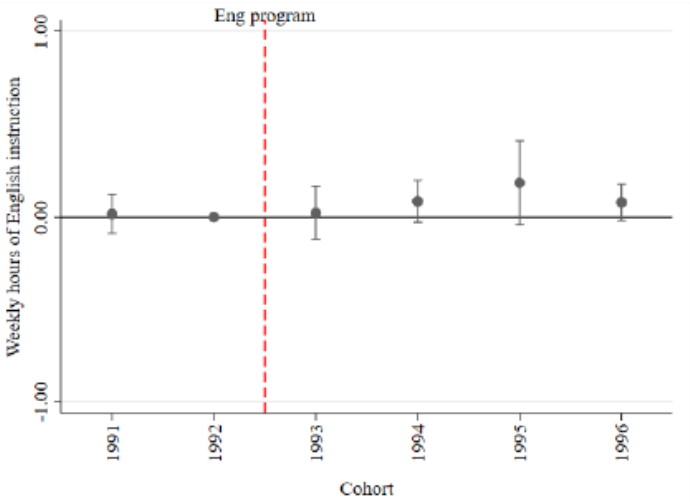


(c) Labor force

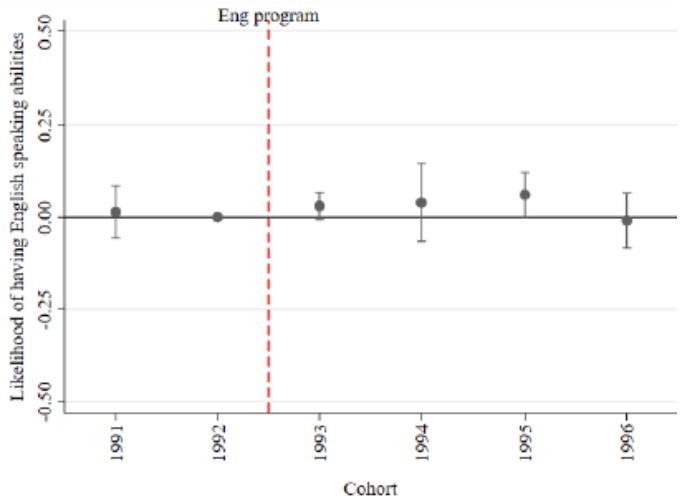


(d) Ln(wage)

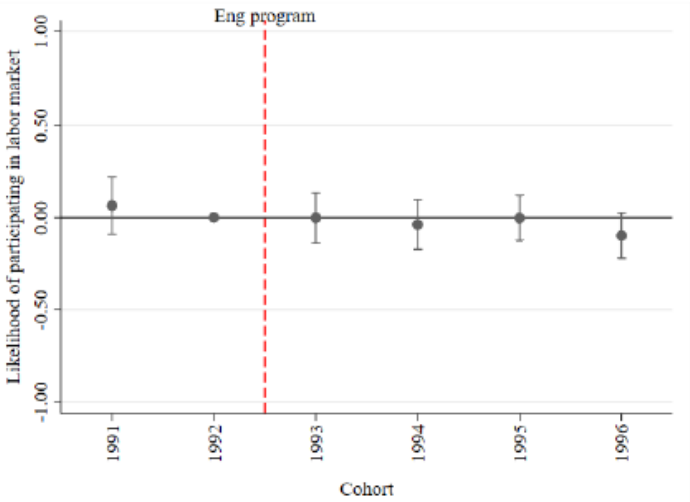
Parallel Trend Assumption (Sonora)



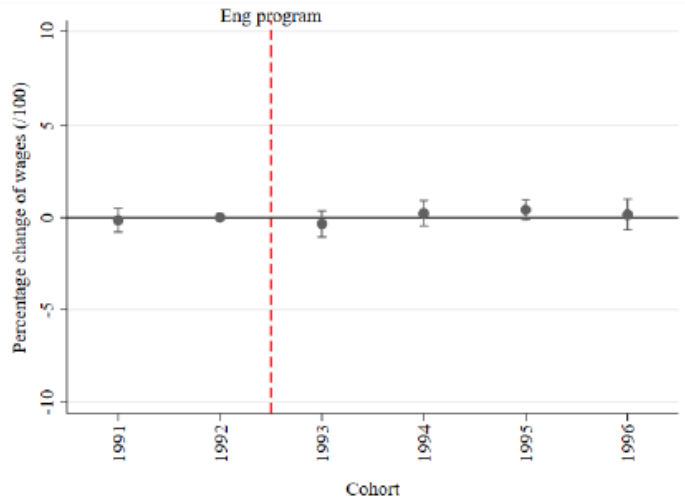
(a) Hours of English



(b) Speak English



(c) Labor force



(d) Ln(wage)

Parallel Trend Assumption (Tamaulipas)

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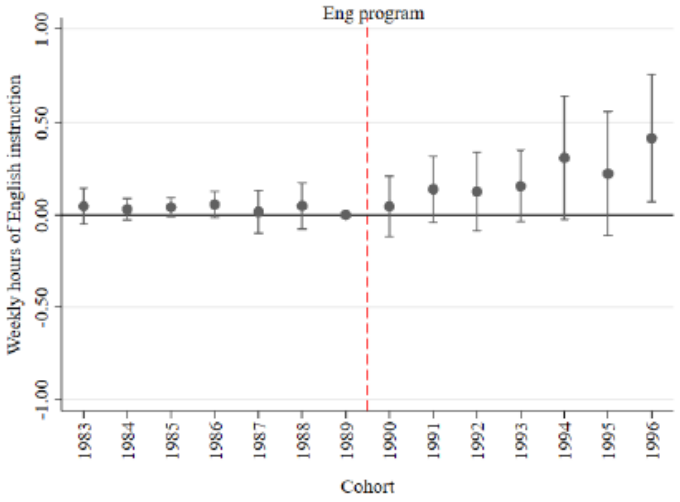
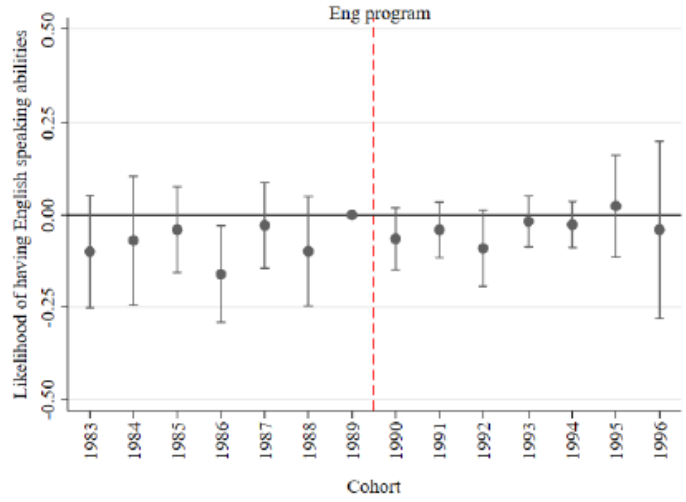
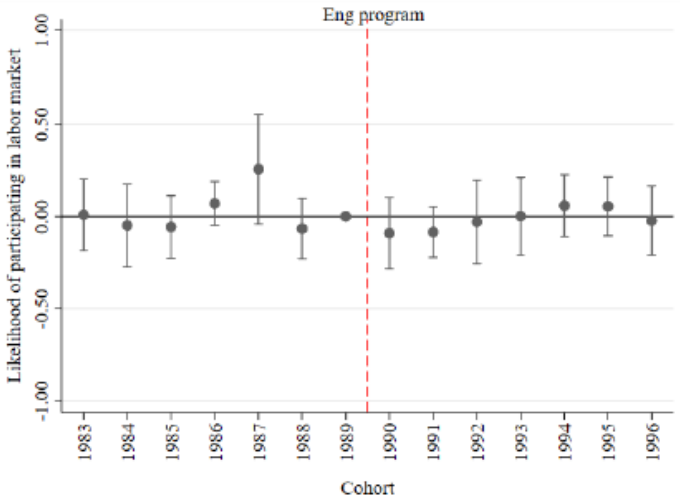


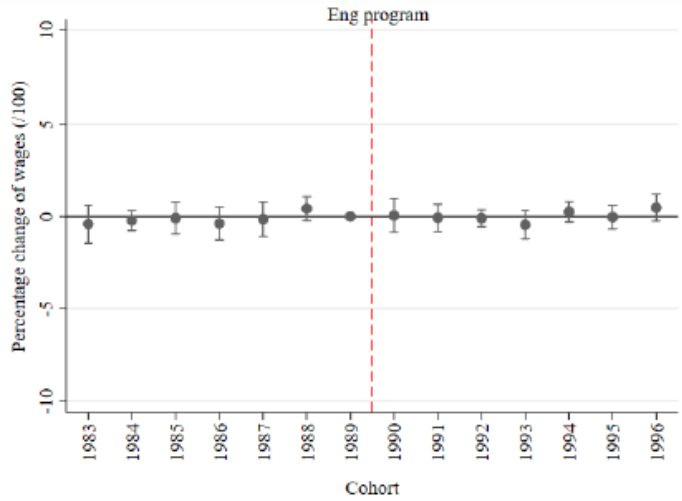
(a) Hours of English



(b) Speak English



(c) Labor force



(d) Ln(wage)

PTA Staggered DiD: All states

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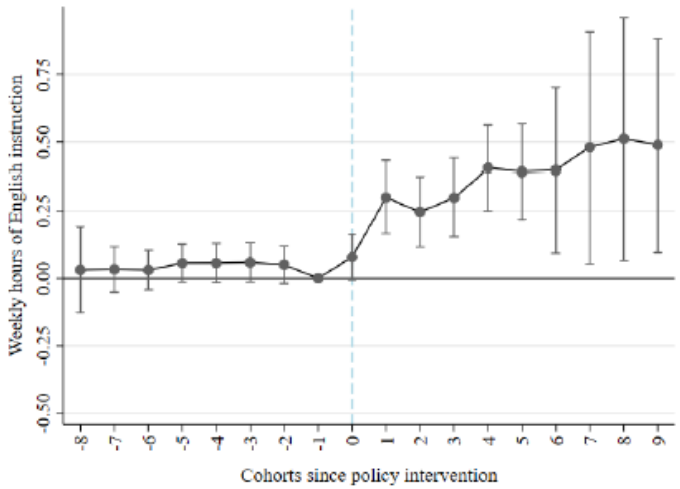
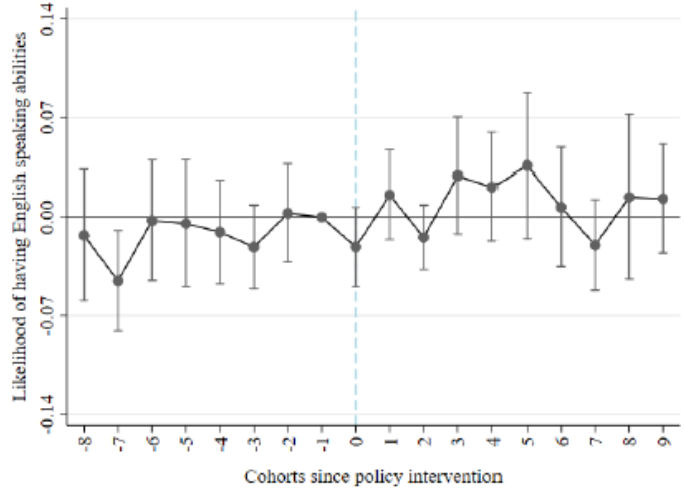
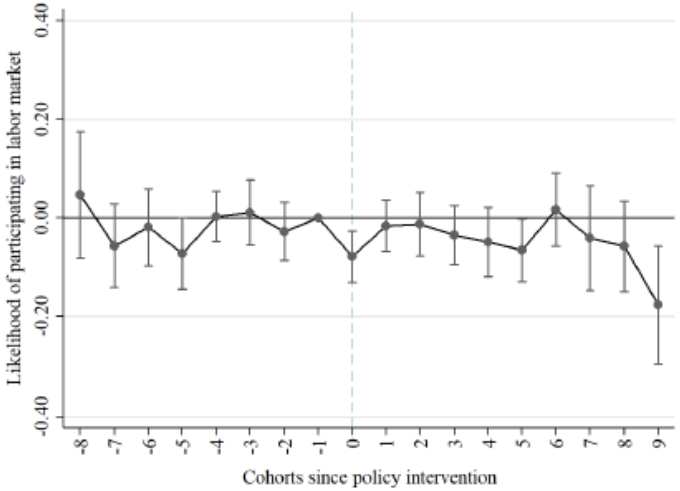


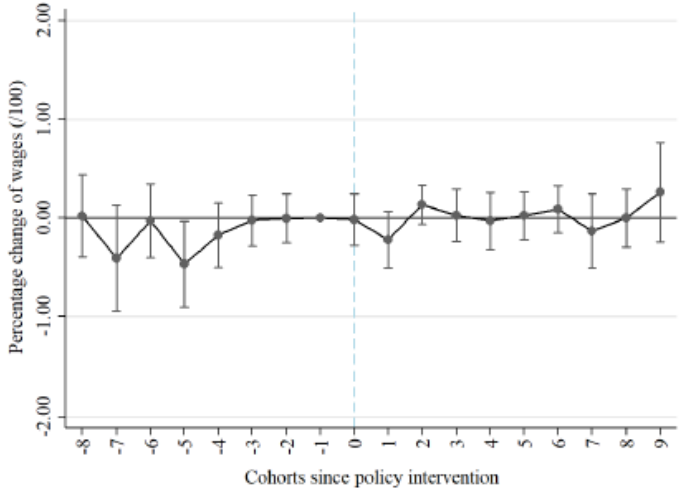
(a) Hours of English



(b) Speak English



(c) Labor force



(d) Ln(wage)