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English skills and labor market outcomes in Mexico

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Motivation: Returns to English language abilites

- Language skills is 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?

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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 of English skills and labor market
  outcomes in Mexico

    - Exploit state by cohort variation in exposure to English
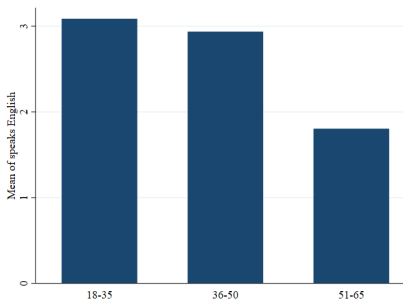   instruction in Mexican primary schools

Background

- Importance of English language for Mexico due to its close relation to the US: investment, trade and migration

- Very little known about English language skills in Mexico
  - Availability of data that measures English skills
  - 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

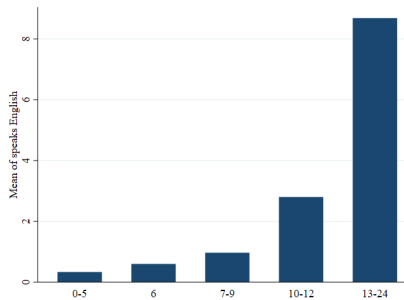## English speaking ability: a rare skill in Mexico

- BIARE is a nationally representative survey with adult respondents 18 and older

- I use this survey to measure English abilities in Mexico

  - Do you speak English?
  - I code it as one if the respondent says yes, and zero otherwise

- Almost 3% of Mexicans speak English

English speaking ability by age and education

English speaking ability by age

English speaking ability by education

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English speaking ability by gender, ethnicity, context and SES

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 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)
By socioeconomic status				
Low ($\omega < 4,201$)	1.56	2.14	1.46	0.68***
	(12.38)	(14.47)	(11.98)	(0.16)
High ($\omega > 4,201$)	5.22	5.21	5.22	-0.01
	(22.24)	(22.22)	(22.25)	(0.37)

English speakers by geography

Legend:
- ■ (0.08,0.10]
- ▦ (0.06,0.08]
- ▨ (0.04,0.06]
- ▥ (0.02,0.04]
- □ [0.00,0.02]

English speakers 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

Structural equation

To estimate the effect of English skills, Eng_i, on wages, ω_i, I propose the following structural equation:

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

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

Concern of endogeneity

- Omitted variables: abilities and other family background variables

- OLS estimation would lead to a biased estimate β

- Propose to use policy changes to form an instrument to be used in an IV approach 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 Before policy	Hrs of English After policy	Policy details	Comparison state
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:

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

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

- $after_c$: 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

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

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

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

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Combining the policy changes (Staggered Difference in Differences)

First stage equation:

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

Reduced form equation:

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

- $HadPolicy_{sc}$ 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

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

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

where c_s^* denotes the first cohort affected by the intervention in
state s

▸ PTA

Second stage (IV estimate)

Second stage equation:

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

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

- Relevance condition: see results of first stage equation

- Exclusion restriction: the intervention has no effect on labor market outcomes other than through the acquisition of English abilities

Data

Household survey

- I use the 2014 Subjective Well-being Survey (BIARE)
- Representative at national and state level
- Individuals surveyed are 18 years of age and older
- Asks if the respondent knows how to speak English

Linked to

- Mexican School Census (Statistics 911)
- Weekly hours of English instruction (exposure)
  - By school-cohort, average over primary school
  - Locality average, by cohort
- Use locality-cohort to match with BIARE

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Results: structural equation (all Mexican states)

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	1.430***	0.688***	0.403***	0.360***	0.276***
	(0.098)	(0.095)	(0.079)	(0.076)	(0.076)
Observations	83,630	83,630	83,630	83,630	83,630
Adjusted R^2	0.004	0.077	0.238	0.242	0.264
Panel B: Men (β^M)					
Speak Eng	0.833***	0.428***	0.496***	0.462***	0.405***
	(0.108)	(0.094)	(0.082)	(0.082)	(0.085)
Observations	39,801	39,801	39,801	39,801	39,801
Adjusted R^2	0.003	0.144	0.240	0.249	0.297
Panel C: Women (β^W)					
Speak Eng	1.577***	0.488**	0.377**	0.334**	0.221
	(0.204)	(0.202)	(0.173)	(0.168)	(0.175)
Observations	43,829	43,829	43,829	43,829	43,829
Adjusted R^2	0.004	0.070	0.166	0.173	0.218
$\beta^M = \beta^W$ [p-value]	[0.002]	[0.002]	[0.001]	[0.001]	[0.002]
Mincer controls	NO	YES	YES	YES	YES
Other controls	NO	NO	YES	YES	YES
State FE	NO	NO	NO	YES	NO
Locality FE	NO	NO	NO	NO	YES

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Results: first stage and reduced form equations

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

	(1) Hrs Eng	(2) Speak Eng	(3) LFP	(4) ln(wage)
Panel A: Aguascalientes				
After×Treat	0.372***	0.054***	-0.014	0.019
	(0.095)	(0.016)	(0.054)	(0.332)
Observations	1,425	1,425	1,425	1,425
Adjusted R^2	0.927	0.016	0.234	0.182
Panel B: Coahuila				
After×Treat	0.771***	0.022*	0.001	0.374
	(0.190)	(0.013)	(0.030)	(0.269)
Observations	2,123	2,123	2,123	2,123
Adjusted R^2	0.627	0.044	0.247	0.244
Panel C: Durango				
After×Treat	0.075	-0.011	-0.038	-0.184
	(0.075)	(0.013)	(0.060)	(0.346)
Observations	1,711	1,711	1,711	1,711
Adjusted R^2	0.690	0.021	0.280	0.215
Panel E: Nuevo Leon				
After×Treat	0.090	0.025	0.003	0.075
	(0.064)	(0.016)	(0.040)	(0.253)
Observations	1,897	1,897	1,897	1,897
Adjusted R^2	0.780	0.050	0.221	0.202

Results: first stage and reduced form equations

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

	(1) Hrs Eng	(2) Speak Eng	(3) LFP	(4) ln(wage)
Panel F: Sinaloa				
After×Treat	0.113	0.016	0.020	0.469
	(0.069)	(0.023)	(0.051)	(0.468)
Observations	1,112	1,112	1,112	1,112
Adjusted R^2	0.917	0.009	0.223	0.161
Panel G: Sonora				
After×Treat	0.091	-0.019	0.003	0.129
	(0.058)	(0.017)	(0.040)	(0.303)
Observations	1,438	1,438	1,438	1,438
Adjusted R^2	0.716	0.035	0.218	0.224
Panel H: Tamaulipas				
After×Treat	0.177**	0.072***	0.045	0.551**
	(0.086)	(0.026)	(0.032)	(0.229)
Observations	1,807	1,807	1,807	1,807
Adjusted R^2	0.842	0.033	0.222	0.230

Results: first stage and reduced form equations (SDD)

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

	(1) Hrs Eng	(2) Speak Eng	(3) LFP	(4) ln(wage)
Panel A: All states				
Had Policy	0.293***	0.018**	-0.017	0.229**
	(0.049)	(0.007)	(0.015)	(0.115)
Observations	22,517	22,517	22,517	22,517
Adjusted R^2	0.561	0.071	0.243	0.223
Panel B: Heterogeneous effects by gender				
Men (β^M)				
Had Policy	0.293***	0.015	-0.032*	0.163
	(0.049)	(0.011)	(0.019)	(0.134)
Observations	11,021	11,021	11,021	11,021
Adjusted R^2	0.563	0.063	0.254	0.281
Women (β^W)				
Had Policy	0.303***	0.024***	0.012	0.371**
	(0.054)	(0.008)	(0.023)	(0.175)
Observations	11,496	11,496	11,496	11,496
Adjusted R^2	0.553	0.066	0.129	0.180
$\beta^M = \beta^W$ [p-value]	[0.494]	[0.080]	[0.000]	[0.000]

Results: reduced form equations for occupational decisions (SDD)

Table 9: 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	0.005	-0.023**	0.006	-0.007	-0.005	-0.011	0.008	0.014	0.004	0.001
	(0.004)	(0.011)	(0.008)	(0.007)	(0.008)	(0.008)	(0.007)	(0.011)	(0.011)	(0.002)
Observations	22,517	22,517	22,517	22,517	22,517	22,517	22,517	22,517	22,517	22,517
Adjusted R^2	0.153	0.118	0.084	0.059	0.007	0.026	0.025	0.207	0.055	0.014
Panel B: Heterogeneous effects by gender										
Men (β^M)										
Had Policy	0.008	-0.021	0.000	-0.009	-0.003	-0.002	0.014	-0.006	0.002	0.001
	(0.008)	(0.018)	(0.015)	(0.012)	(0.010)	(0.011)	(0.011)	(0.018)	(0.016)	(0.005)
Observations	11,021	11,021	11,021	11,021	11,021	11,021	11,021	11,021	11,021	11,021
Adjusted R^2	0.250	0.166	0.094	0.069	0.012	0.020	0.007	0.161	0.068	0.027
Women (β^W)										
Had Policy	0.002	-0.020	0.011	-0.002	-0.005	-0.017	0.003	0.037***	0.002	0.001
	(0.003)	(0.013)	(0.009)	(0.007)	(0.009)	(0.012)	(0.012)	(0.013)	(0.011)	(0.001)
Observations	11,496	11,496	11,496	11,496	11,496	11,496	11,496	11,496	11,496	11,496
Adjusted R^2	0.143	0.105	0.056	0.038	0.002	0.030	0.031	0.264	0.028	0.026
$\beta^M = \beta^W$ [p-value]	[0.003]	[0.089]	[0.221]	[0.000]	[0.612]	[0.452]	[0.642]	[0.001]	[0.167]	[0.527]

Results: IV estimate on wages

Table 10: Returns to English abilities
(IV estimate)

	(1) Structural-OLS	(2) First Stage	(3) Reduced Form	(4) Structural-IV
Speak Eng	0.366***			12.580
	(0.130)			(8.552)
Had Policy		0.018**	0.229**	
		(0.007)	(0.115)	
Observations	22,517	22,517	22,517	22,517
Adjusted R^2	0.223	0.069	0.223	
F statistic	107.071	18.691	105.566	

Next steps

- Additional robustness check
  - Synthetic control method

- SDD with heterogeneous treatment effects
  - Goodman-Bacon, Andrew (2021)
  - Sun, Liyang and Sarah Abraham (2021)
  - Callaway, Brantly and Pedro H. C. Sant'Anna (2021)

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) LFP	(4) ln(wage)
Panel A: Aguascalientes				
After×Treat	0.422***	0.026***	-0.044	0.232
	(0.086)	(0.009)	(0.044)	(0.250)
Observations	4,138	4,138	4,138	4,138
Adjusted R^2	0.818	0.016	0.229	0.172
Panel B: Coahuila				
After×Treat	0.759***	0.013	-0.012	0.078
	(0.185)	(0.011)	(0.030)	(0.232)
Observations	4,578	4,578	4,578	4,578
Adjusted R^2	0.595	0.032	0.254	0.210
Panel C: Durango				
After×Treat	0.003	0.007	-0.053	-0.374
	(0.077)	(0.015)	(0.042)	(0.244)
Observations	4,083	4,083	4,083	4,083
Adjusted R^2	0.601	0.048	0.235	0.165
Panel E: Nuevo Leon				
After×Treat	0.067	0.013	0.000	0.303
	(0.053)	(0.014)	(0.031)	(0.242)
Observations	4,038	4,038	4,038	4,038
Adjusted R^2	0.761	0.045	0.235	0.195

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) LFP	(4) ln(wage)
Panel F: Sinaloa				
After×Treat	0.095***	0.016	0.015	0.708**
	(0.036)	(0.017)	(0.037)	(0.317)
Observations	3,493	3,493	3,493	3,493
Adjusted R^2	0.663	-0.002	0.217	0.194
Panel G: Sonora				
After×Treat	-0.016	-0.017	-0.030	0.010
	(0.054)	(0.018)	(0.040)	(0.248)
Observations	2,702	2,702	2,702	2,702
Adjusted R^2	0.725	0.019	0.212	0.170
Panel H: Tamaulipas				
After×Treat	0.184**	0.049***	0.024	0.494**
	(0.083)	(0.017)	(0.027)	(0.200)
Observations	5,440	5,440	5,440	5,440
Adjusted R^2	0.791	0.027	0.229	0.209

Robustness checks: Narrower comparison groups

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	0.404**			4.802
	(0.169)			(10.065)
Had Policy		0.014*	0.066	
		(0.007)	(0.140)	
Observations	12,740	12,740	12,740	12,740
Adjusted R^2	0.202	0.031	0.202	

Parallel Trend Assumption (Aguascalientes) ↪ Back
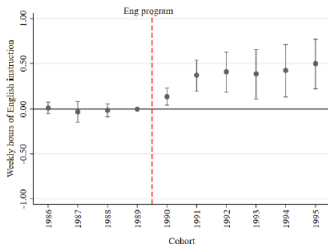
(a) Hours of English
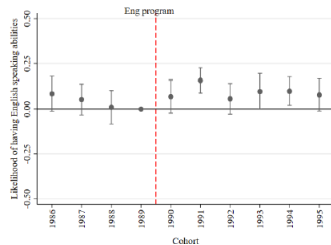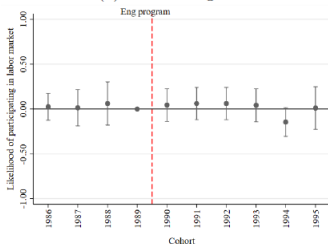
(b) Speak English
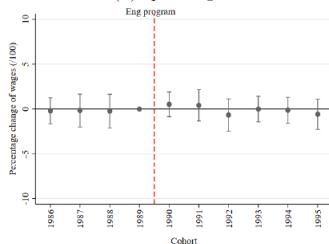
(c) Labor force

(d) Ln(wage)

Parallel Trend Assumption (Coahuila)
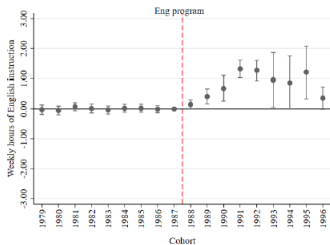
(a) Hours of English
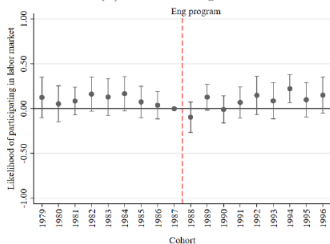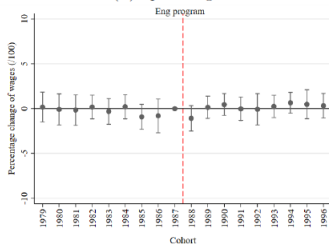
(b) Speak English
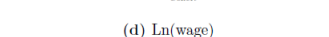
(c) Labor force

(d) Ln(wage)

Parallel Trend Assumption (Durango)
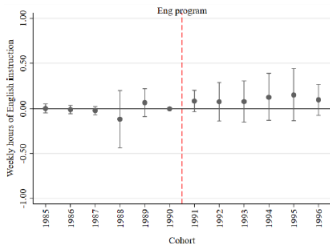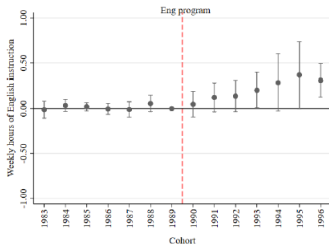

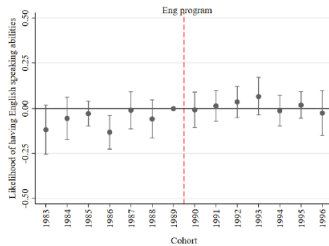(a) Hours of English
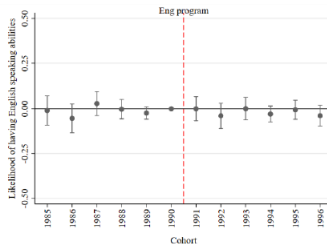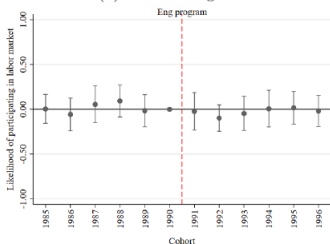
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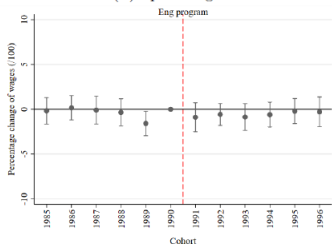
(c) Labor force

(d) Ln(wage)

Parallel Trend Assumption (Nuevo Leon)
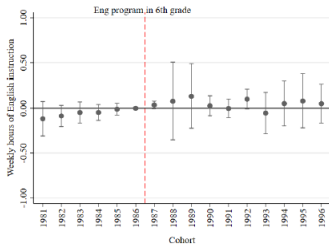
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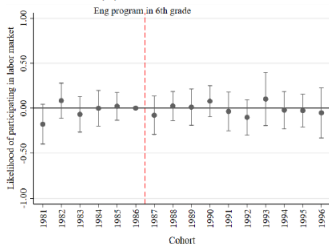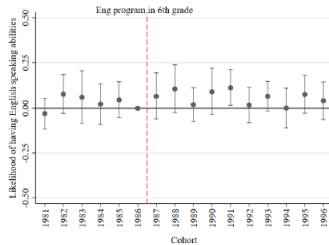
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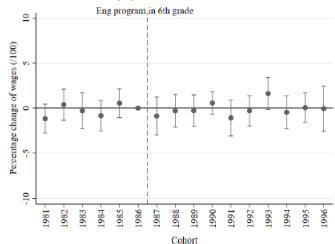
(c) Labor force

(d) Ln(wage)

Parallel Trend Assumption (Sinaloa)
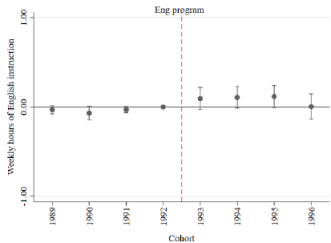
(a) Hours of English
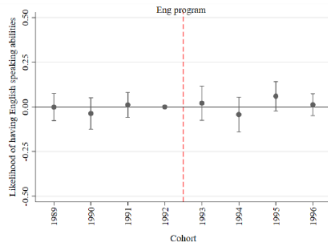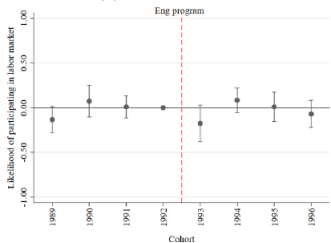
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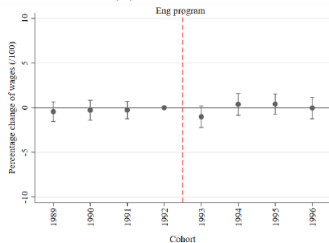
(c) Labor force

(d) Ln(wage)

Parallel Trend Assumption (Sonora)
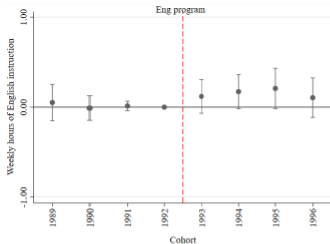
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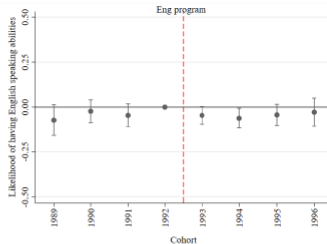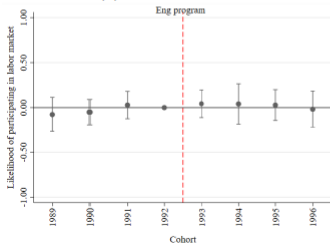
(b) Speak English
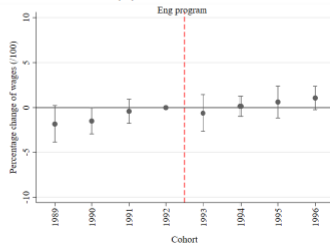
(c) Labor force

(d) Ln(wage)

Parallel Trend Assumption (Tamaulipas) ↪ Back

(a) Hours of English

(b) Speak English

(c) Labor force

(d) Ln(wage)

Motivation
○○○

Background
○○○○○○

Empirical strategy
○○○○○○○○○

Data
○

Results
○○○○○○

Next steps
○

Appendix
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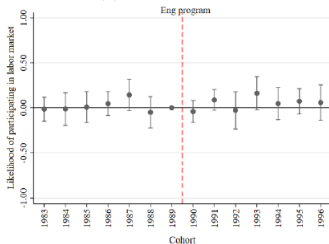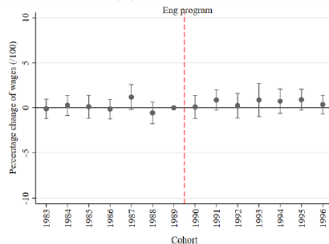
PTA Staggered DiD: All states ↪ Back
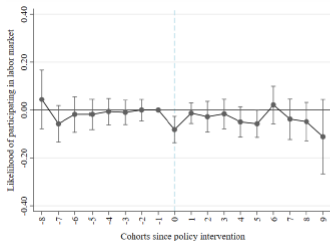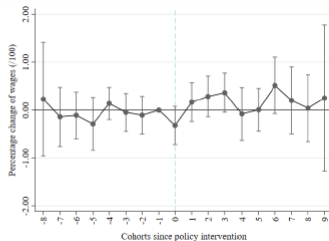

(a) Hours of English

(b) Speak English

(c) Labor force

(d) Ln(wage)