The Evolution of Opportunities in Latin America's Fastest Growing Country: 50 years of Evidence

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Outline

1 Summary

2 Constructing a Historical Dataset

3 Results

Summary 1/4

Why?:

• We all care about a fundamental question: how do countries develop?

• But we typically lack long series of microdata to document how development varies across groups, space and over time.

What?:

This paper contributes to fill a gap in our knowledge of the long-run evolution of opportunities in developing countries.

- We describe the evolution of 'education opportunities' over the last five decades.
- In Chile, perhaps the fastest-growing country in Latin America.

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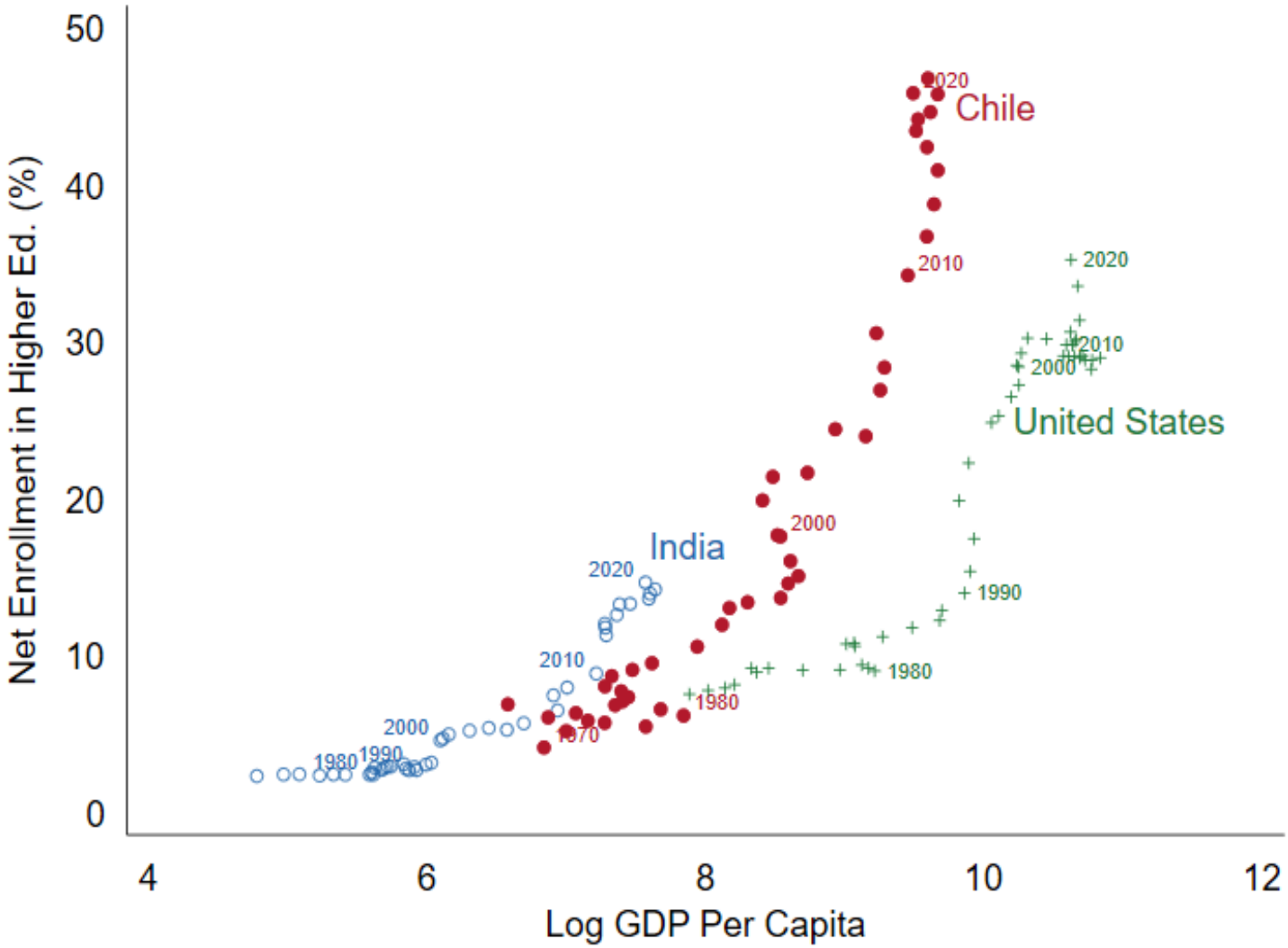
Fast Economic Growth& Increase in Higher Education Enrollment



Summary 2/4

How?:

• We put together a unique dataset from Chile's centralized application and admissions system to higher education.

⇒ These are detailed administrative records of the population of test takers from 1967 onwards:

+ We digitized historical records in paper (exhaustive back-and-forth checking procedures) since 1967 - 2000,
+ We combined them with modern data sources 2000 onwards,
+ We are merging these data with available administrative records (enrollment, graduation, teacher censuses, and more),
+ What else? We welcome ideas!

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Summary 3/4

Findings? We document the following four novel results:

- Gender gap in scores: $\Downarrow^{-}$ by a factor of ten (0.55σ to 0.06σ)
- Ethnic gap: $\Downarrow^{-}$ by about a half in scores & participation
- Share of low SES taking the exam: $\Uparrow^{+}$ by a factor of 1.5 (from 0.36 to 0.55)
- Geography: Exam take-up $\Uparrow^{+}$ for under-represented areas (about 10%)

Summary 4/4

So?

- We uncover significant long-term progress on a host of metrics.
- This evidence adds to the medium and shorter term evidence available for Chile.
- Despite progress, there are important challegens ahead: shares of top-scorers, measures of quality, and many more.
- Long term view might help us see advances and challenges typically hidden with short tem information
- ... which we believe provides some insights feeding the original fundamental question: how do countries develop?

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Admissions System in Chile

SAT equivalent called ***Prueba de Aptitude Academica*** in 1967, ***Prueba Seleccion Universitaria*** starting in 2003.

Up to eight tests, depending on the year.

With the scores in hand, and a GPA equivalent score, students apply to 8-12 options of career and college combinations.

College/Major/Campus triples choose what weights to put on each test and GPA to determine a ranking.

Students are assigned to college/carears in the order of their target specific score until slots are filled up.

Design is thought to be such that it resembles Deferred Acceptanc and there is no incentive for strategic behavior regarding the ordering of preferences.

Historical Data

- The higher education system in Chile has the unique feature of a centralized application and admissions system since 1967.

- The information on all test scores, applications and assignment outcomes were printed in books and newspapers and stored to this day.

Historical Data : Newspapers

EL MERCURIO

Santiago de Chile, Martes 18 de E nero de 1977

RESULTADOS DE LA P. A. A.

TERCERA PARTE

UNIVERSIDADES CHILENAS

PROCESO DE ADMISION 1977

RESULTADOS DE LA PRUEBA DE APTITUD ACADEMICA Y PRUEBAS DE CONOCIMIENTOS ESPECIFICOS

1.–RESULTADOS DE LAS PRUEBAS DE APTITUD ACADEMICA Y CONOCIMIENTOS ESPECIFICOS.

Las Universidades Chilenas publican los resultados que obtuvieron los candidatos que rindieron la Prueba de Aptitud Academica y las Pruebas de Conocimientos Especificos de Biologia, Ciencias Sociales, Fisica y Quimica y Matemáticas, entre los días 20 al 22 de diciembre de 1976.

Esta lista de resultados está ordenada por el NUMERO DE INSCRIPCION de los candidatos y contiene las columnas que se indican, en el mismo orden, de izquierda a derecha:

- —. Número de Inscripción.
- —. Apellido Paterno.
- —. Inicial del Apellido Materno.
- —. Nombres.
- —. Puntaje de la Parte Verbal de la Prueba de Aptitud Académica.
- —. Puntaje de la Parte Matematica de la Prueba de Aptitud Académica.
- —. Puntaje de la Prueba de Conocimientos Especificos de Biologia.
- —. Puntaje de la Prueba de Conocimientos Especificos de Ciencias Sociales.
- —. Puntaje de la Prueba de Conocimientos Especificos de Fisica y Química.
- —. Puntaje de la Prueba de Conocimientos Especificos de Matemáticas.

LAS CONSULTAS SOBRE LOS RESULTADOS DE LAS PRUEBAS SE RECIBIRAN EN TODAS LAS SECRETARIAS DE ADMISION, DEL 17 AL 20 DE ENERO EXCLUSIVAMENTE.

2.–LAS NOTAS DE EDUCACION MEDIA

Con el objeto de permitir que cada candidato pueda estimar lo más aproximadamente posible cual será el puntaje definitivo que le corresponderia por sus calificaciones de Educacion Media, se publican a continuacion las escalas de conversion de Notas de Educación Media correspondientes al Proceso de Admision 1976.

Debemos dejar muy en claro que estas escalas de conversion corresponden al Proceso de Admision para el Ano Académico 1976, ya pasado, y se entregan a los candidatos con el solo proposito de que puedan calcular aproximadamente su puntaje por notas, pues estos puntajes experimentan ligeras variaciones de un ano a otro.

Se puede observar que Médicos promedios tienen un puntaje standard diferente, lo cual se debe a la ubicacion de los candidatos de acuerdo al tipo de educacion de que han egresado.

Las Universidades Chilenas han aprobado, por razones estrictamente educacionales, la formacion de tres grupos para determinar el puntaje correspondiente al promedio de notas de educación media, basados en las caracteristicas propias de cada uno de estos grupos, la cual determinó para el

3.–POSTULACIONES

A.— INFORMACIONES GENERALES.—

La postulación es un acto mediante el cual un candidato a cualquiera de las Universidades Chilenas indica definitivamente la o las Universidades, y la o las carreras en cuyos procesos de selección desean participar. **Por lo tanto, se trata de un acto sumamente importante para los candidatos, ya que no es posible efectuar correcciones con posterioridad.**

B.— FORMULARIO DE POSTULACIONES.

El Formulario de Postulaciones ha sido diseñado especialmente para que todos los candidatos indiquen la Universidad o Universidades y la carrera en cuyos procesos de selección desean participar.

El Formulario de Postulaciones deberá ser retirado de la Secretaría de Admision mas proxima al candidato, dentro de los plazos fijados para este efecto.

Este formulario esta impreso en el anverso y el reverso. En el anverso podemos distinguir 4 secciones:

a) **Identificación del postulante.**— Se requiere que el candidato copie su **NUMERO DE INSCRIPCION completo (8 cifras)** (sin omitir los ceros ubicados a la izquierda), que esta indicado en su Tarjeta de Identificación y escriba con letra clara su Apellido Paterno, Materno y Nombres.

b) **Postulación conjunta.**— Hay un recuadro que contiene 12 espacios especiales para dejar registradas allí igual numero de **CLAVES DE CARRERAS** e indicar los nombres de las carreras a que desea postular del conjunto de Universidades que integran sus postulaciones.

c) **Postulacion a la Universidad Catolica de Valparaiso.**— Consta de un recuadro [illegible] a la **CLAVE DEL AREA** correspondiente de la Universidad Catolica de Valparaiso.

ESCRIBA LA CLAVE, NOMBRE, SEXO Y UNIVERSIDAD DE LA CARRERA O CARRERAS QUE LE INTERESAN.
COMPRUEBE QUE LAS CLAVES Y EL NOMBRE DE LA CARRERA SEAN COINCIDENTES Y CORRESPONDAN A LA QUE USTED DESEA POSTULAR.

d) **Resumen de Postulaciones.**— Este es el último sector del anverso y está prepicado para cortarlo. En este sector el candidato debe copiar

versidad de Chile, la Universidad Católica de Chile, la Universidad Técnica "Federico Santa María", la Universidad Técnica del Estado, la Universidad Austral de Chile y la Universidad del Norte.

Si un postulante indicase carreras de la Universidad de Chile, que pertenezcan a tres o más áreas de carreras diferentes, se le eliminarán las postulaciones correspondientes a las áreas indicadas en exceso y que sobrepasen a dos áreas. Por cuanto esta Universidad limita las postulaciones a dos áreas diferentes, y a un maximo de tres carreras por área, el candidato puede marcar:

— 3 carreras de un área y 3 carreras de otra área, o
— 3 carreras de un área y 1 ó 2 carreras de otra área, o
— 3 ó 2 ó 1 carrera de una sola área, si así lo decide.

El postulante puede marcar claves de carreras de las 7 Universidades, de 6 de ellas, de 5 de ellas o de una de ellas, pero sin exceder el límite fijado por cada una de las Universidades separadamente.

Por consiguiente, si un postulante así lo deseara, puede marcar solamente 3 carreras de la Universidad Católica de Chile, y ninguna de otra Universidad; ó 2 carreras de la Universidad Técnica del Estado, 6 de la Universidad de Chile, divididos en dos áreas, y 3 de la Universidad Austral, no indicando carreras de las otras universidades, o **efectuando cualquiera otra combinación de carreras o universidades sin exceder los límites maximos ya indicados.**

DEL ORDEN DE LAS POSTULACIONES.

El postulante deberá **marcar las carreras en el orden que realmente las prefiera,** colocando en primer lugar aquella que más le interesa estudiar; en segundo lugar, la que preferiría de no quedar seleccionado en la primera; en tercer lugar, aquella que preferiría de no quedar seleccionado en las anteriores, y así sucesivamente.

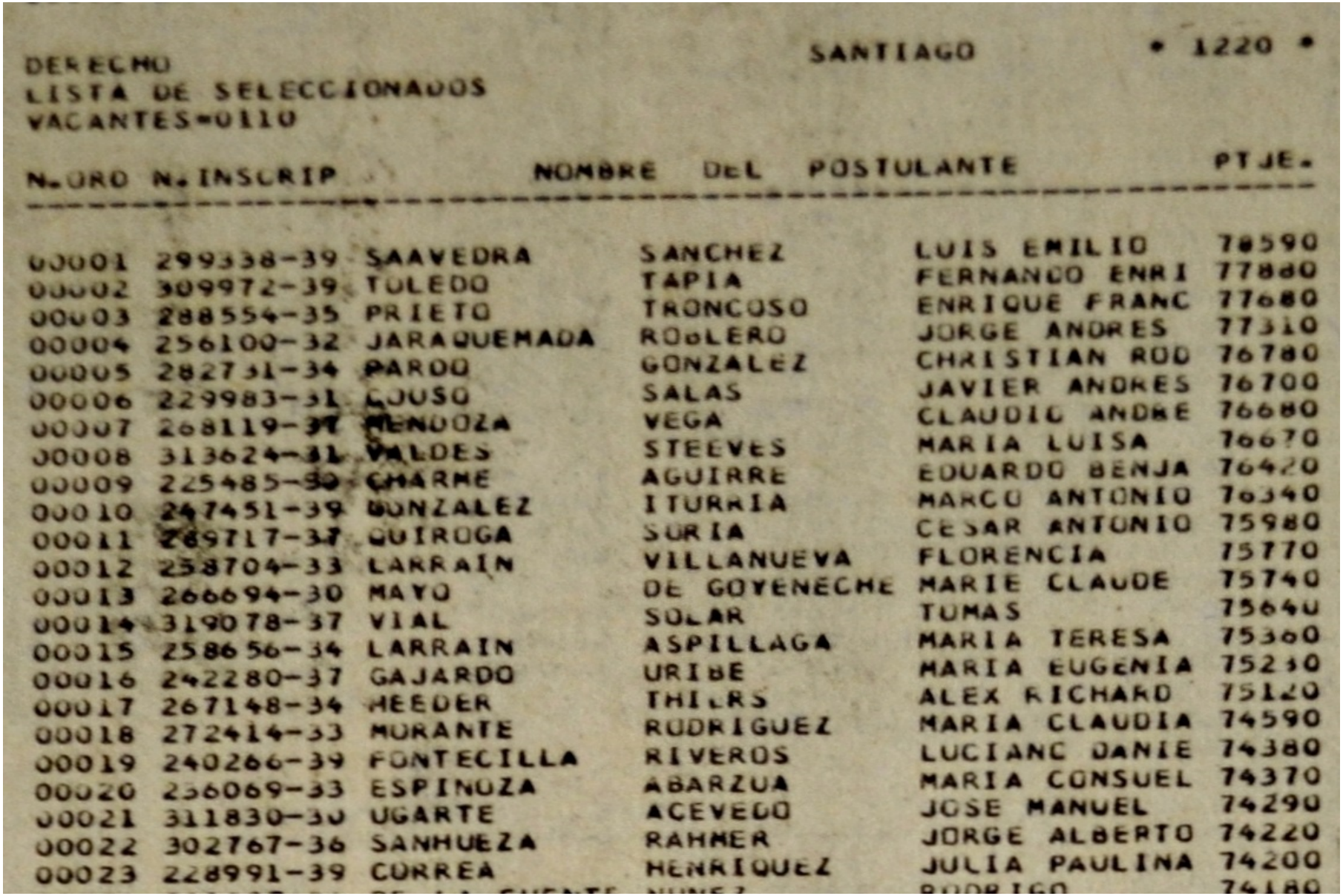
Esto se traduce en que no es necesario ni conveniente para el postulante indicar ordenadamente las carreras de una Universidad o de varias de ellas, por ejemplo, seis carreras seguidas de la Universidad de Chile, luego tres de la Universidad Católica de Chile, dos de la Universidad Técnica del Estado y una de la Universidad de Concepcion, poniendolas por orden dentro de cada Universidad.

Por el contrario, el postulante **deberá indicar las carreras en el orden estricto de su preferencia, sin importar qué carreras de distintas universidades queden mezcladas.**

E.— POSTULACION A LA UNIVERSIDAD CATOLICA DE VALPARAISO.

La Universidad Católica de Valparaíso tiene un sistema de admisión por área. El **área de admisión** está constituida por la agrupación de carreras afines a las cuales se le aplican los mismos factores de selección y coeficientes de ponderación. Las áreas de admisión de la Universidad Católica de Valparaíso son:

Historical Data : Newspapers



DERECHO — SANTIAGO — • 1220 •

LISTA DE SELECCIONADOS

VACANTES=0110

N.ORD	N.INSCRIP	NOMBRE DEL POSTULANTE			PTJE.
00001	299338-39	SAAVEDRA	SANCHEZ	LUIS EMILIO	78590
00002	309972-39	TOLEDO	TAPIA	FERNANDO ENRI	77880
00003	288554-35	PRIETO	TRONCOSO	ENRIQUE FRANC	77680
00004	256100-32	JARAQUEMADA	ROBLERO	JORGE ANDRES	77310
00005	282731-34	PARDO	GONZALEZ	CHRISTIAN ROD	76780
00006	229983-31	LOUSO	SALAS	JAVIER ANDRES	76700
00007	268119-37	MENDOZA	VEGA	CLAUDIO ANDRE	76680
00008	313624-31	VALDES	STEEVES	MARIA LUISA	76670
00009	225485-30	CHARME	AGUIRRE	EDUARDO BENJA	76420
00010	247451-39	GONZALEZ	ITURRIA	MARCO ANTONIO	76340
00011	269717-37	QUIROGA	SORIA	CESAR ANTONIO	75980
00012	258704-33	LARRAIN	VILLANUEVA	FLORENCIA	75770
00013	266694-30	MAYO	DE GOYENECHE	MARIE CLAUDE	75740
00014	319078-37	VIAL	SOLAR	TOMAS	75640
00015	258656-34	LARRAIN	ASPILLAGA	MARIA TERESA	75360
00016	242280-37	GAJARDO	URIBE	MARIA EUGENIA	75230
00017	267148-34	HEEDER	THIERS	ALEX RICHARD	75120
00018	272414-33	MORANTE	RODRIGUEZ	MARIA CLAUDIA	74590
00019	240266-39	FONTECILLA	RIVEROS	LUCIANO DANIE	74380
00020	256069-33	ESPINOZA	ABARZUA	MARIA CONSUEL	74370
00021	311830-30	UGARTE	ACEVEDO	JOSE MANUEL	74290
00022	302767-36	SANHUEZA	RAHMER	JORGE ALBERTO	74220
00023	228991-39	CORREA	HENRIQUEZ	JULIA PAULINA	74200

Historical Data : Application and Assignment

• We secured an agreement with the local authorities to use this information and have been able to locate and take digital copies of these books.

Historical Data

- We have
  - Collected digital copies of old books and newspapers ;
  - Sent the images to India to be processed;
  - Exhaustive back-and-forth auditing the processed data;
  - Supplemented with aggregated info from official reports

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  - Sent the images to India to be processed;
  - Exhaustive back-and-forth auditing the processed data;
  - Supplemented with aggregated info from official reports

Historical Data

- Significant efforts were made to find, compile, audit and digitize records from archival sources.
- As a result:
  - 24 Million Test Scores
  - 6.5 Million Observations
  - 135k Pictures [Pre-digital era]
  - 400 Books [Pre-digital era]
  - 50 years of Data

Historical Data

Each year of data consisted of 10-12 books with 300-400 pages each. Three types of books, by subperiod:

Books	1967-1974	1975-76-80	1977-88-{80}
(A) Scores (Antecedentes)			
(B) Registration IDs (Indices)	X		
(C) Applications (Conglomerado)	X	X	

Information printed in the books:

(A) Reference number, test scores and high school GPA.

(B) Reference number, ID number (RUT), name, sex, year of graduation, region, school code.

(C) Reference number, application majors and scores and admission results.

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Figure: Example: Old Book (A) with PAA Scores

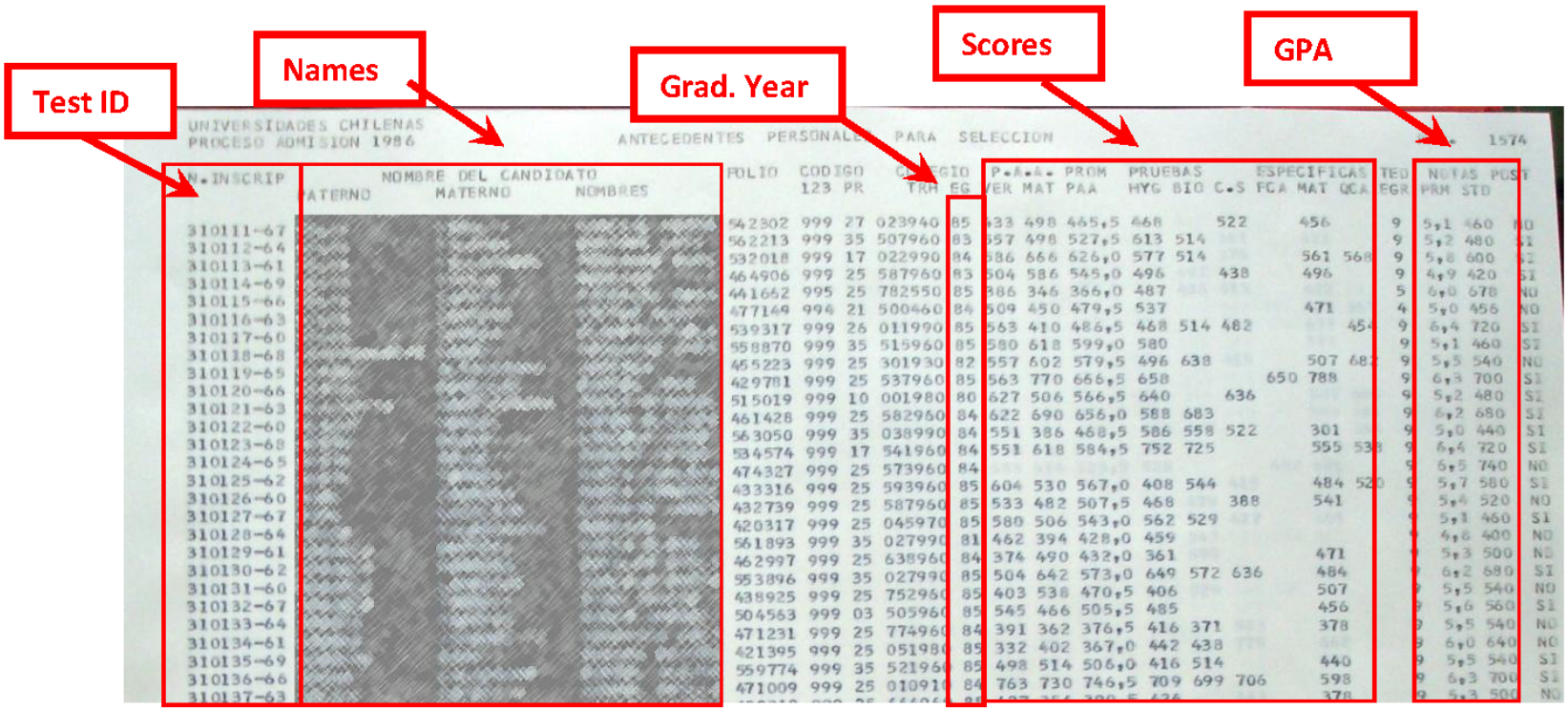
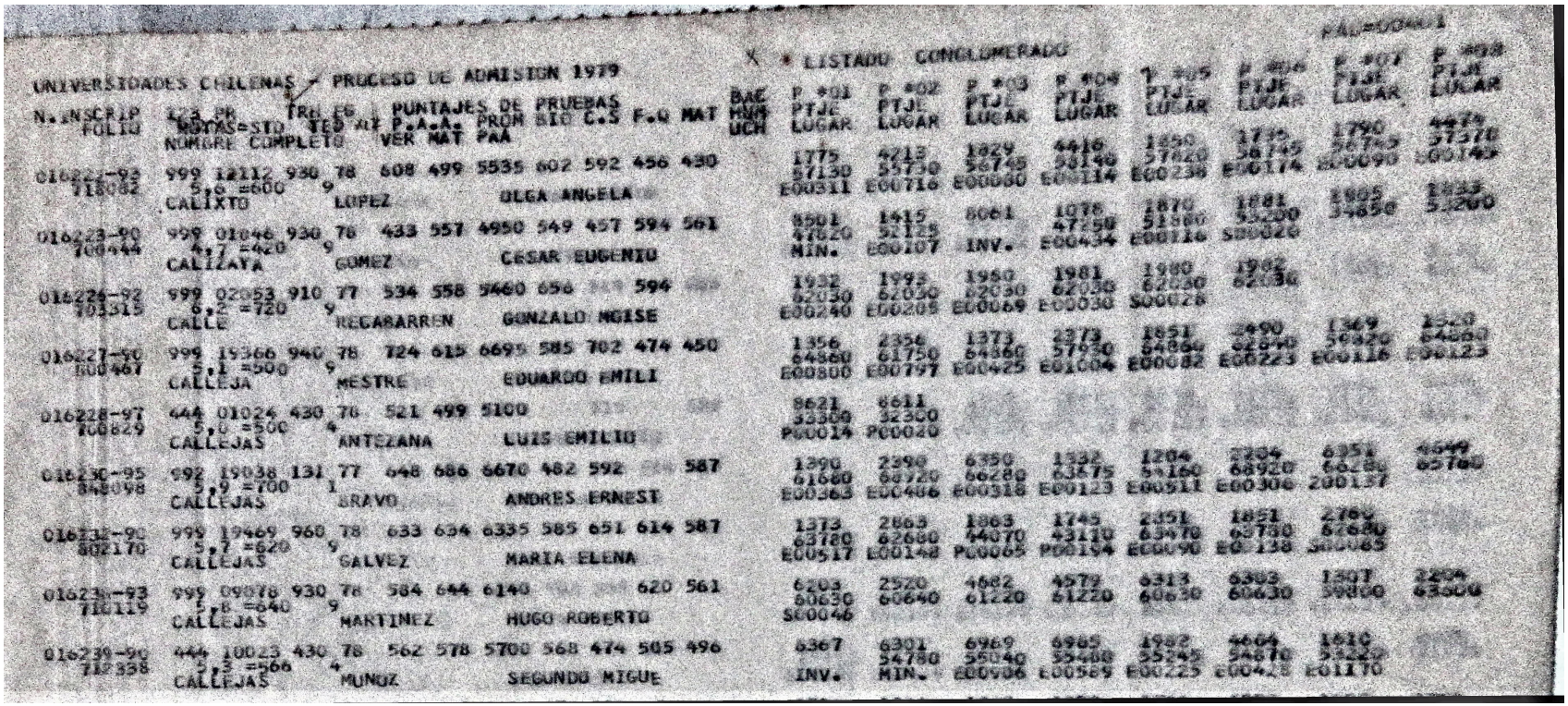


Figure: Example: Old Book (B) with ID number (RUT)

Note: Personal information intentionally blurred.

Figure: Example: Old Book (B) with Applications



Historical Data

- We distinguish three components within the 1967-1988 period:

  1. The first is to finish the process of digitalizing and processing the scores, applications, and results from 1981-1988.
  2. The second piece is to add test score data for all participants from 1967 onward.
  3. The final part is adding the scores, applications, and results from 1976-1980.

Research Paper

1. Summary
2. Constructing a Historical Dataset
   - How Did we Do?: Aggregate vs Recovered Microdata
3. Results

Old Aggregated Data Sources:
Diaz, Himmel, Maltes (1985).

TABLA 3

CARACTERISTICAS DE LA PARTE MATEMATICA DE LA PRUEBA DE APTITUD ACADEMICA

AÑOS		1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
N°Preg.		50	50	50	50	50	50	50	50	50	50	50	50
Puntajes Brutos	N	29.678	31.011	36.042	49.244	50.079	76.858	107.818	103.219	119.504	91.445	84.806	102.494
	$\bar{X}$	16,1	16,9	18,1	17,9	17,7	16,7	16,1	17,5	19,7	20,7	23,1	23,1
	s	11,38	11,46	11,24	12,34	13,20	12,62	12,51	13,21	13,43	13,69	14,03	13,30

How Did we Do?: Test-Takers by Year [1967-1988]

Year	Aggregated Data (External)
1967	29,678
1968	31,011
1969	36,042
1970	49,244
1971	50,079
1972	76,858
1973	107,818
1974	103,219
1975	119,504
1976	91,445
1977	84,806
1978	102,494
1979	107,274
1980	110,508
1981	117,371
1982	109,351
1983	119,245
1984	122,201
1985	121,169
1986	125,522
1987	114,775
1988	110,652

How Did we Do?: Test-Takers by Year [1967-1988]

Year	Aggregated Data (External)	Our Data
1967	29,678	29,655
1968	31,011	31,014
1969	36,042	35,935
1970	49,244	42,759
1971	50,079	50,072
1972	76,858	76,076
1973	107,818	107,795
1974	103,219	103,219
1975	119,504	119,521
1976	91,445	91,424
1977	84,806	84,820
1978	102,494	102,541
1979	107,274	107,275
1980	110,508	110,354
1981	117,371	117,344
1982	109,351	109,196
1983	119,245	119,238
1984	122,201	122,120
1985	121,169	121,164
1986	125,522	125,519
1987	114,775	114,462
1988	110,652	110,650

How Did we Do?: Test-Takers by Year [1967-1988]

Year	Aggregated Data (External)	Our Data	Percentage
1967	29,678	29,655	99.92
1968	31,011	31,014	100.01
1969	36,042	35,935	99.70
1970	49,244	42,759	86.83
1971	50,079	50,072	99.99
1972	76,858	76,076	98.98
1973	107,818	107,795	99.98
1974	103,219	103,219	100.00
1975	119,504	119,521	100.01
1976	91,445	91,424	99.98
1977	84,806	84,820	100.02
1978	102,494	102,541	100.05
1979	107,274	107,275	100.00
1980	110,508	110,354	99.86
1981	117,371	117,344	99.98
1982	109,351	109,196	99.86
1983	119,245	119,238	99.99
1984	122,201	122,120	99.93
1985	121,169	121,164	100.00
1986	125,522	125,519	100.00
1987	114,775	114,462	99.73
1988	110,652	110,650	100.00

How Did we Do?: Test-Takers by Year, Special Subjects

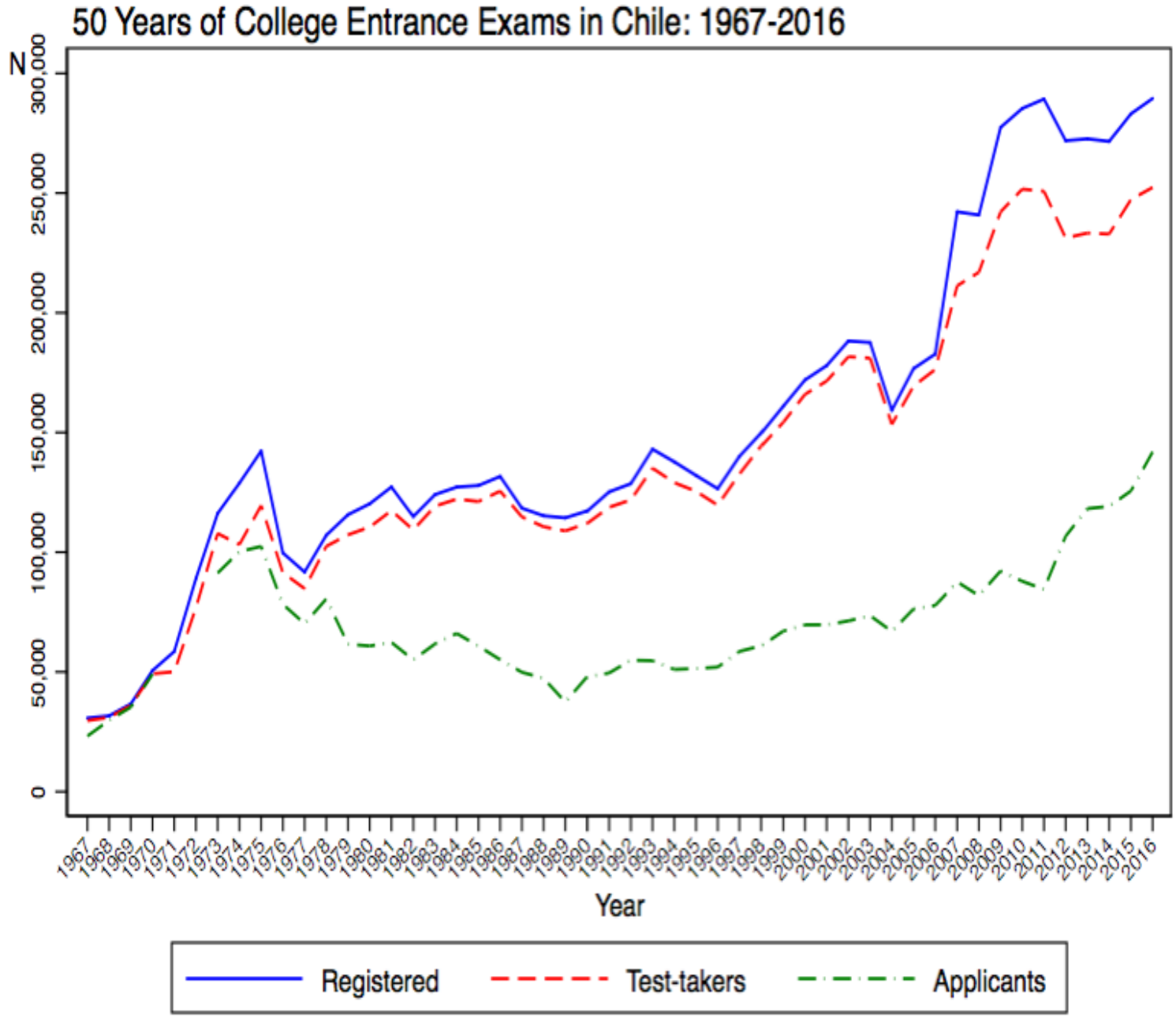
Year	Advanced Math		Biology		Chemistry/Physics		Soc. Sciences	
	External	Ours	External	Ours	External	Ours	External	Ours
1975	88,976		72,769		72,769		71,610	
1976	73,788		63,998		63,998		63,513	
1977	67,762		56,036		51,913		53,252	
1978	83,446		65,505		65,076		65,776	
1979	85,503		72,165		68,157		72,601	
1980	84,698		73,836		68,629		73,954	
1981	85,255		66,428		58,498		59,306	
1982	73,431		53,743		61,713		45,359	
1983	72,916		57,943		45,852		49,503	
1984	71,939		64,447		36,510		52,097	

How Did we Do?: Test-Takers by Year Special Subjects

Year	Advanced Math		Biology		Chem./Physics		Soc. Sciences	
	External	Ours	External	Ours	External	Ours	External	Ours
1975	88,976	88,672	72,769	72,780	72,769	72,780	71,610	71,498
1976	73,788	73,692	63,998	64,032	63,998	64,032	63,513	63,529
1977	67,762	67,587	56,036	56,027	51,913	51,965	53,252	53,143
1978	83,446	83,383	65,505	65,502	65,076	65,142	65,776	65,798
1979	85,503	85,213	72,165	71,946	68,157	68,243	72,601	72,507
1980	84,698	84,453	73,836	73,727	68,629	68,297	73,954	73,813
1981	85,255	85,170	66,428	66,262	58,498	58,324	59,306	59,116
1982	73,431	73,215	53,743	53,502	61,713	61,426	45,359	45,244
1983	72,916	72,865	57,943	57,836	45,852	45,684	49,503	49,462
1984	71,939	71,808	64,447	64,296	36,510	36,385	52,097	51,998

How Did we Do?: Test-Takers by Year [1989-2003]

Year	Aggregated Data (External)	Our Data	Percentage
1989	108,871	108,855	99.99
1990	112,091	112,090	100.00
1991	118,778	118,778	100.00
1992	121,824	121,364	99.62
1993	135,081	135,221	100.10
1994	129,048	129,050	100.00
1995	125,444	125,432	99.99
1996	119,643	119,588	99.95
1997	132,664	132,610	99.96
1998	144,381	142,382	98.62
1999	154,244	154,244	100.00
2000	165,904	165,908	100.00
2001	171,491	171,879	100.23
2002	181,640	182,019	100.21
2003	181,063	181,486	100.23


50 Years of College Entrance Exams in Chile: 1967-2016
N
300,000
250,000
200,000
150,000
100,000
50,000
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2011
2012
2013
2014
2015
2016
Year
Registered
Test-takers
Applicants

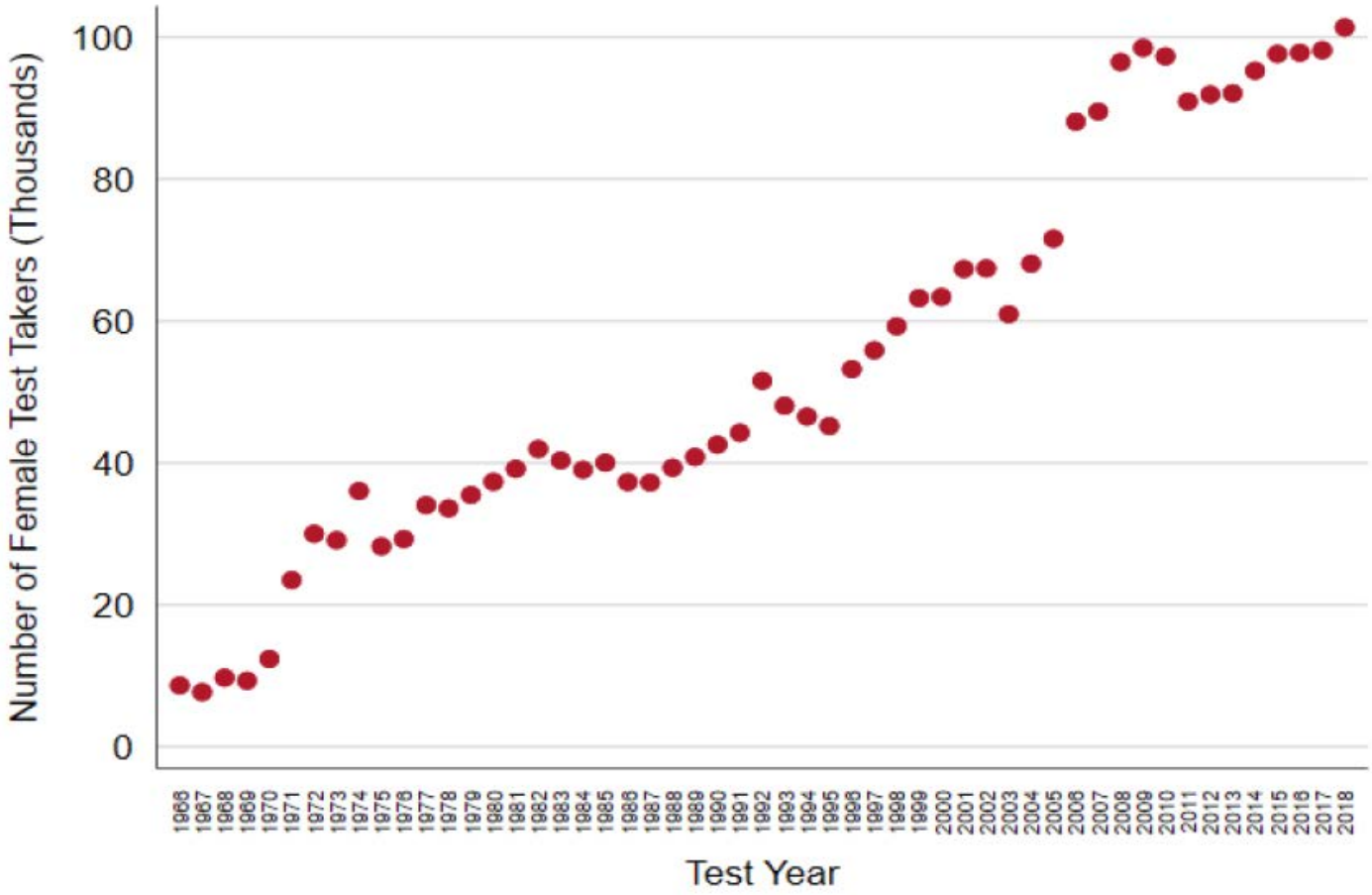
Research Paper

1 Summary

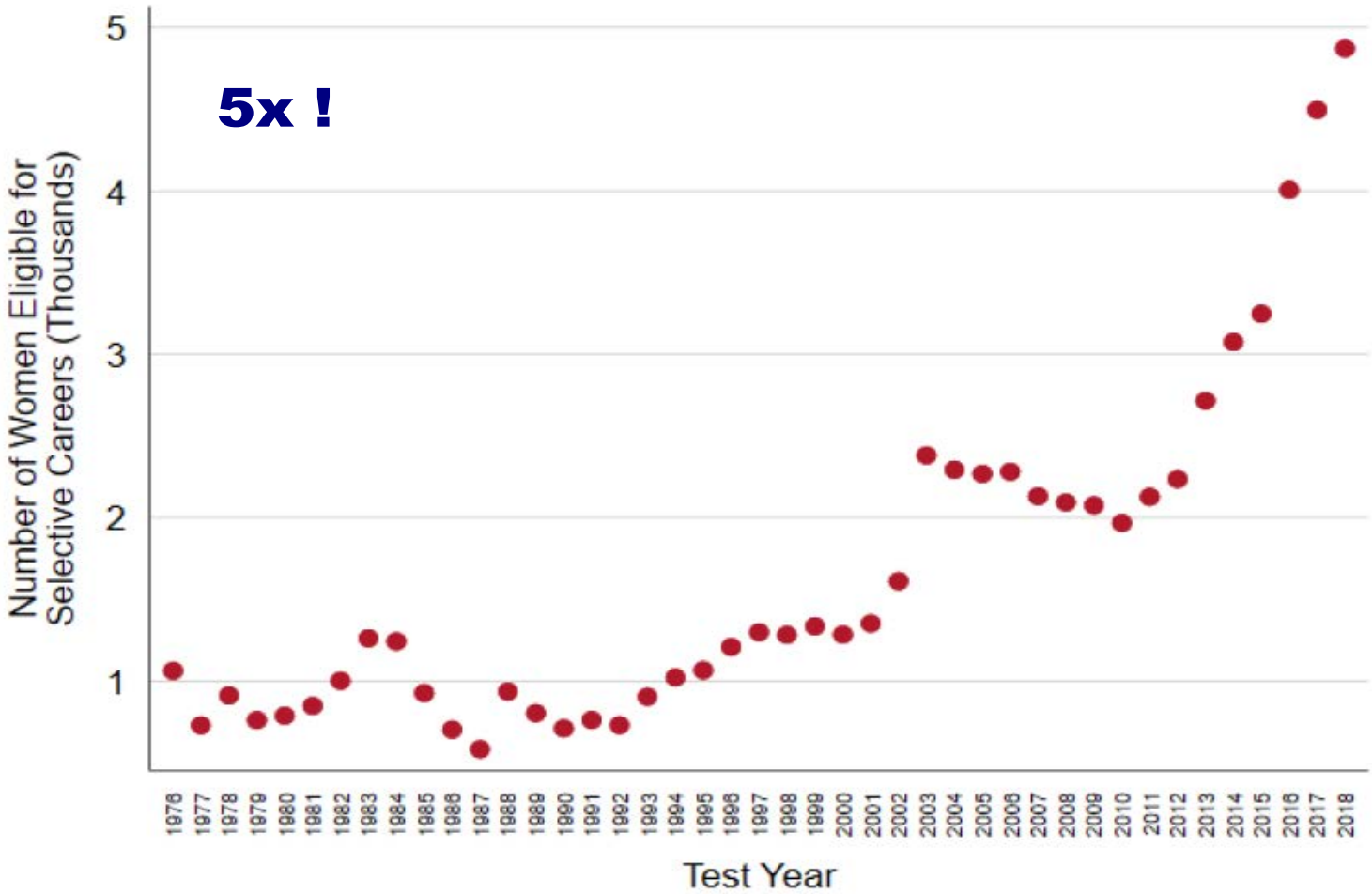
2 Constructing a Historical Dataset

3 Results

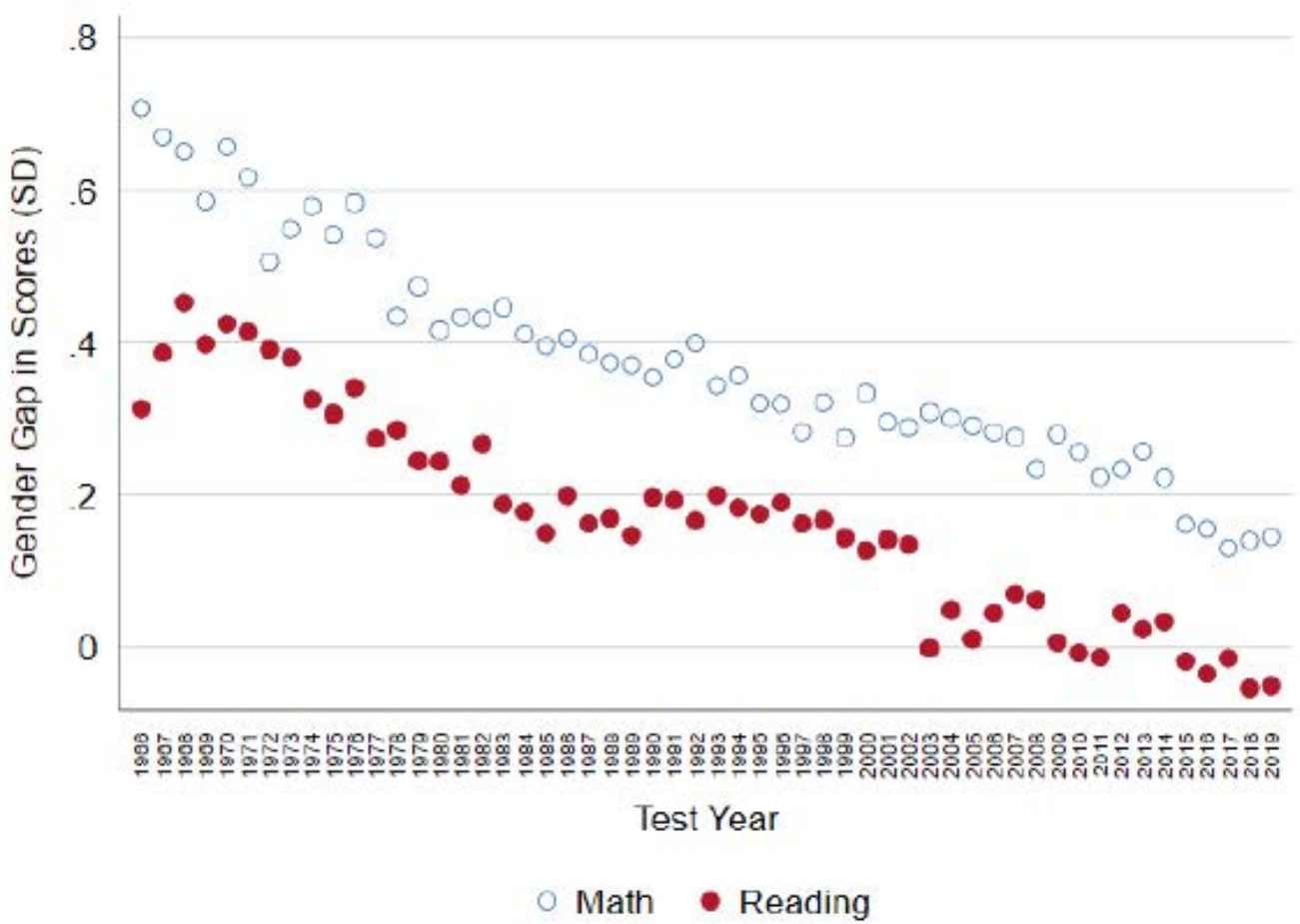
Women taking College Entrance Exam

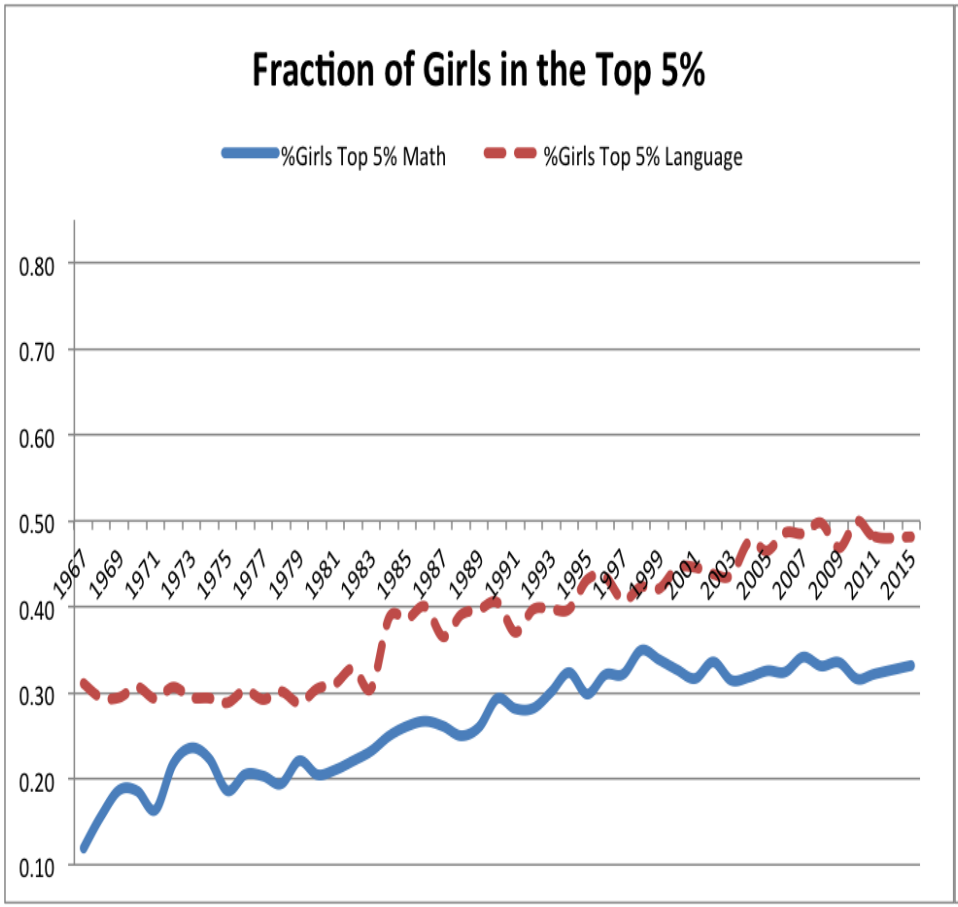


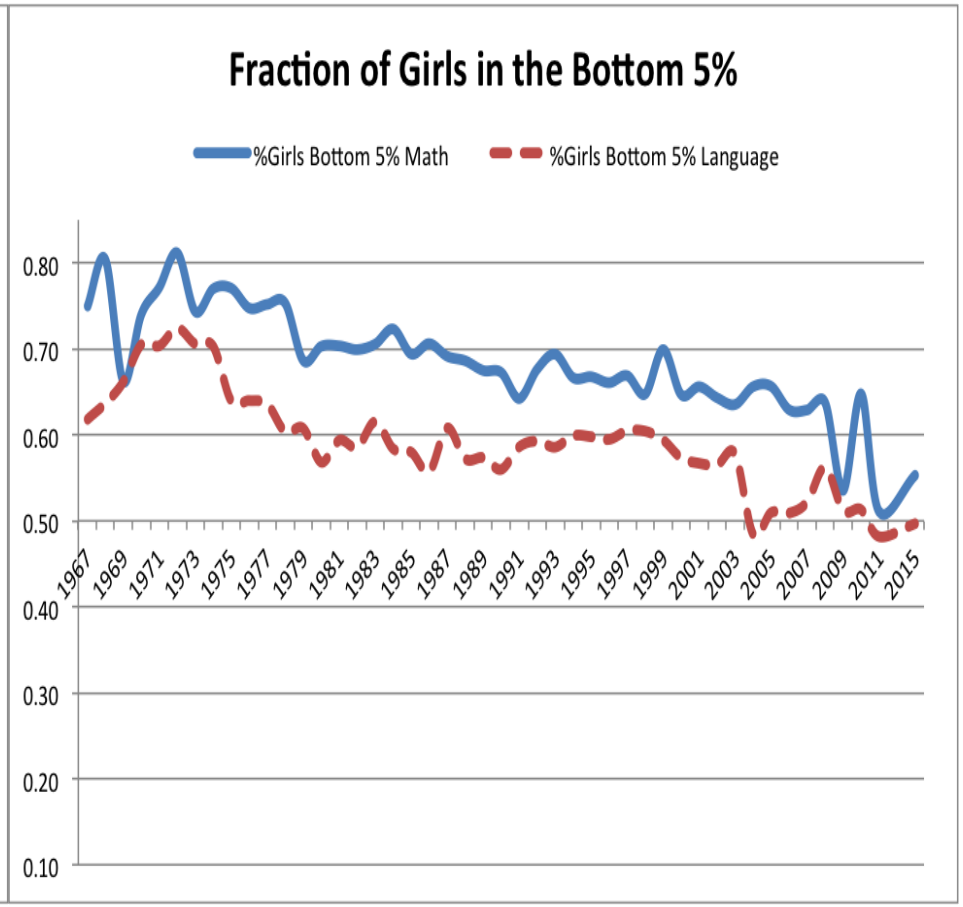
Women eligible for Elite College/Majors



Gender Gap in Average Math/Lang Score




Fraction of Girls in the Top 5%
%Girls Top 5% Math
%Girls Top 5% Language
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
1967 1969 1971 1973 1975 1977 1979 1981 1983 1985 1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2015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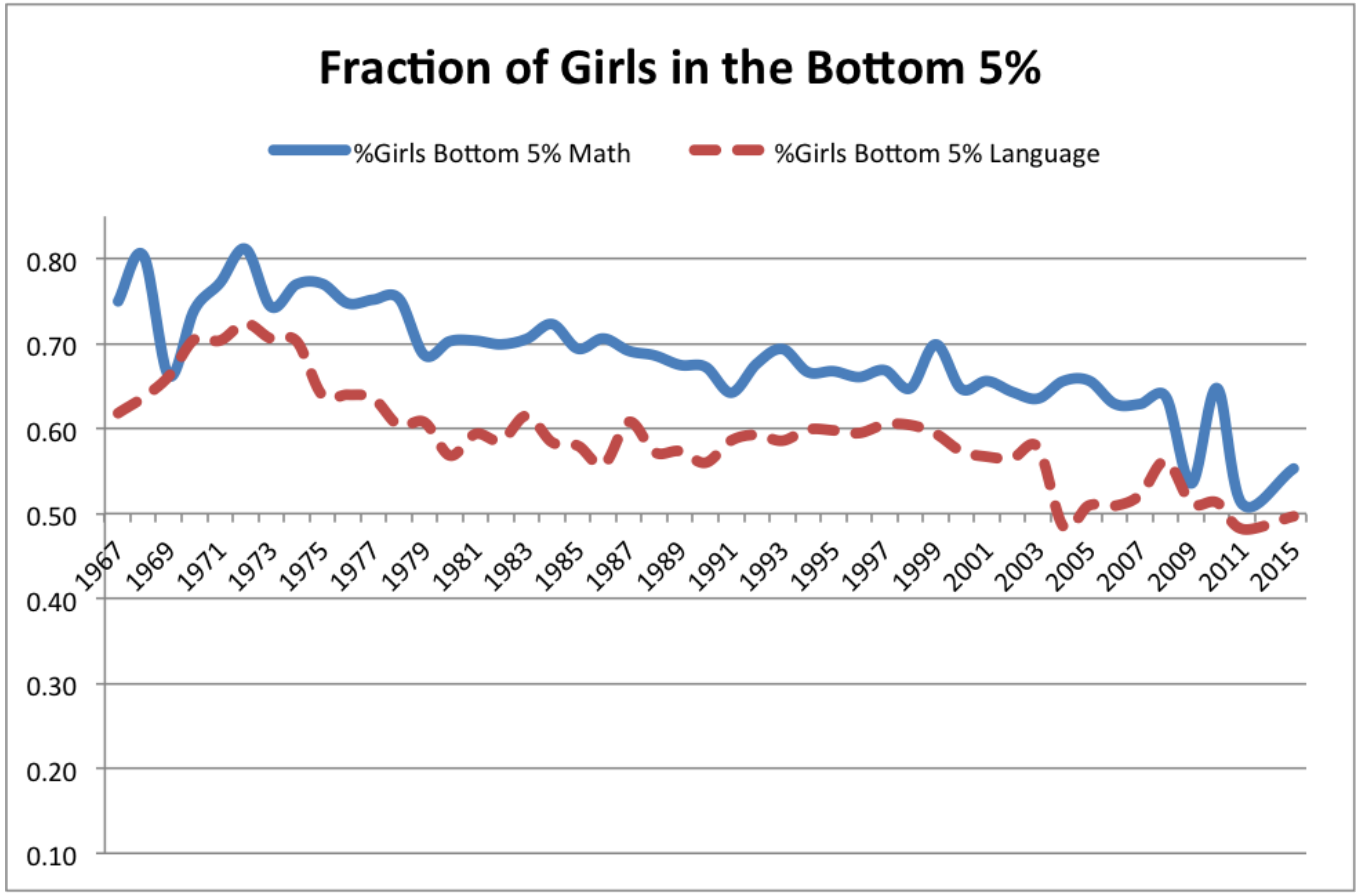
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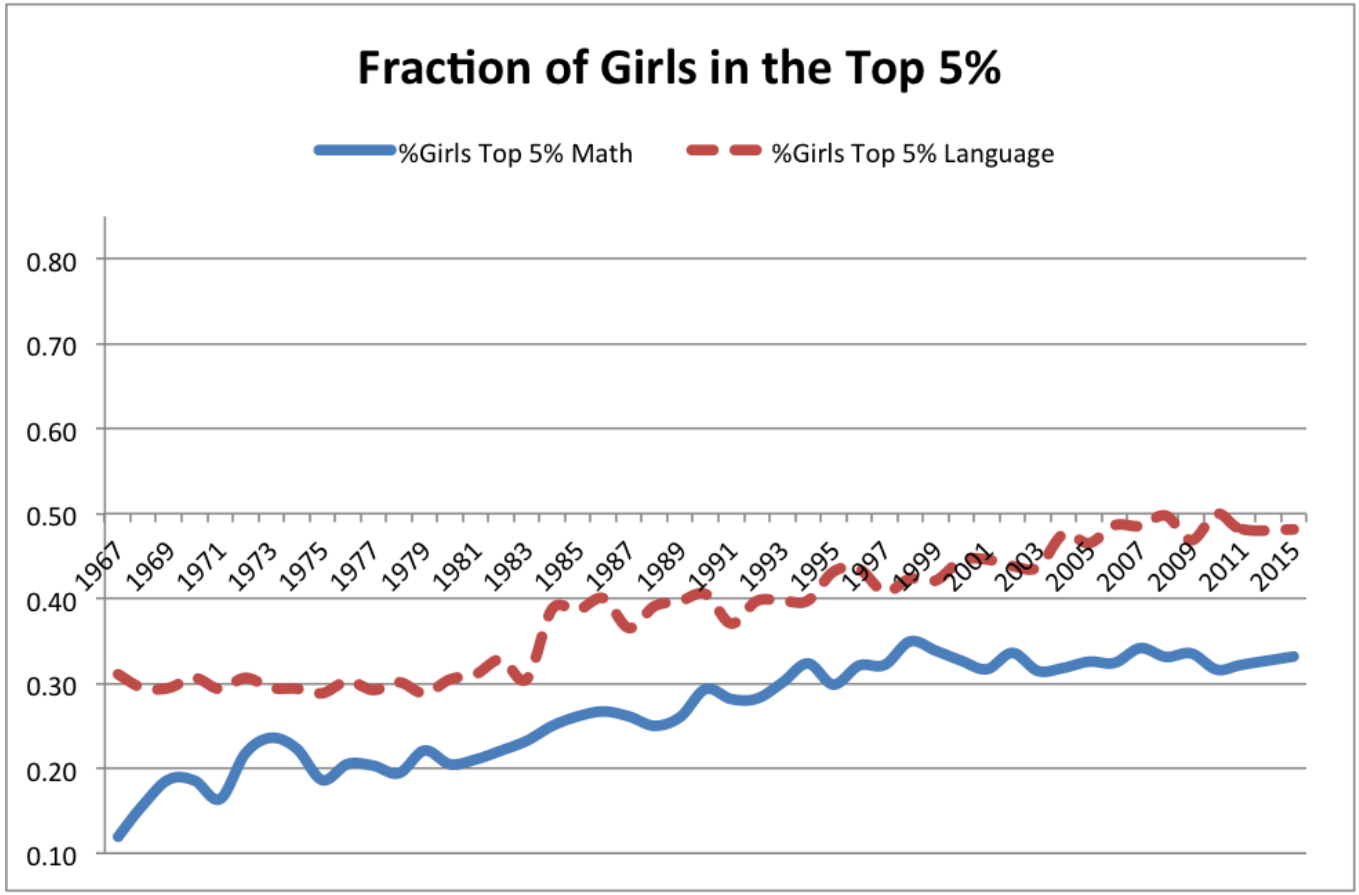
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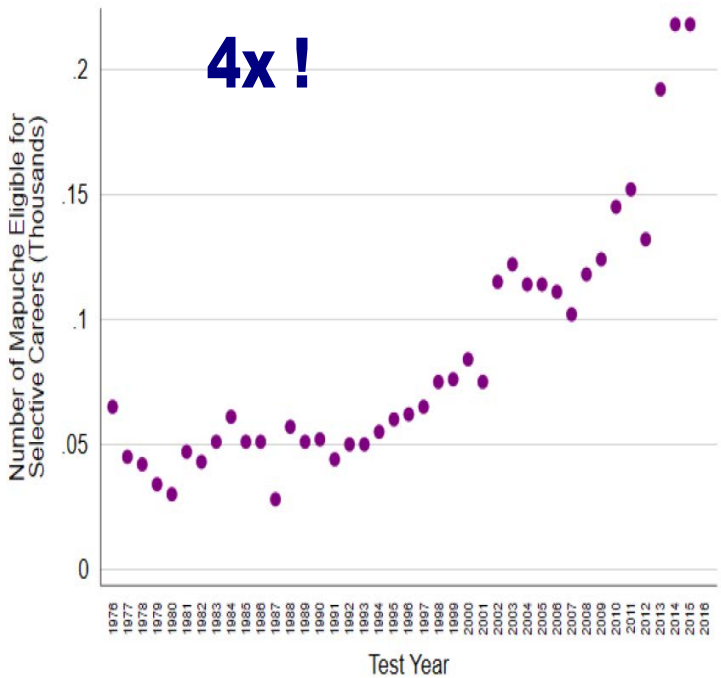
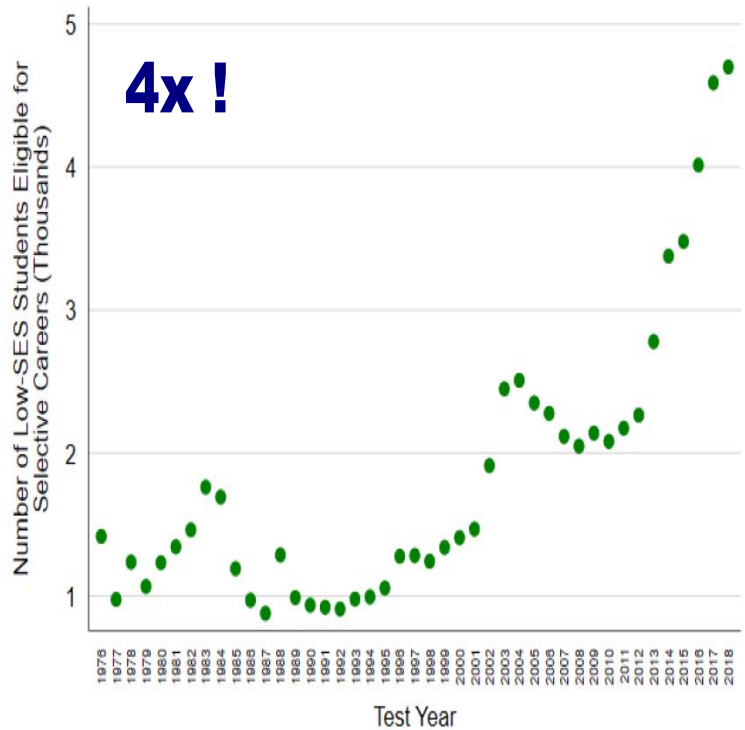
Disadvantaged Groups @ Elite College/Majors

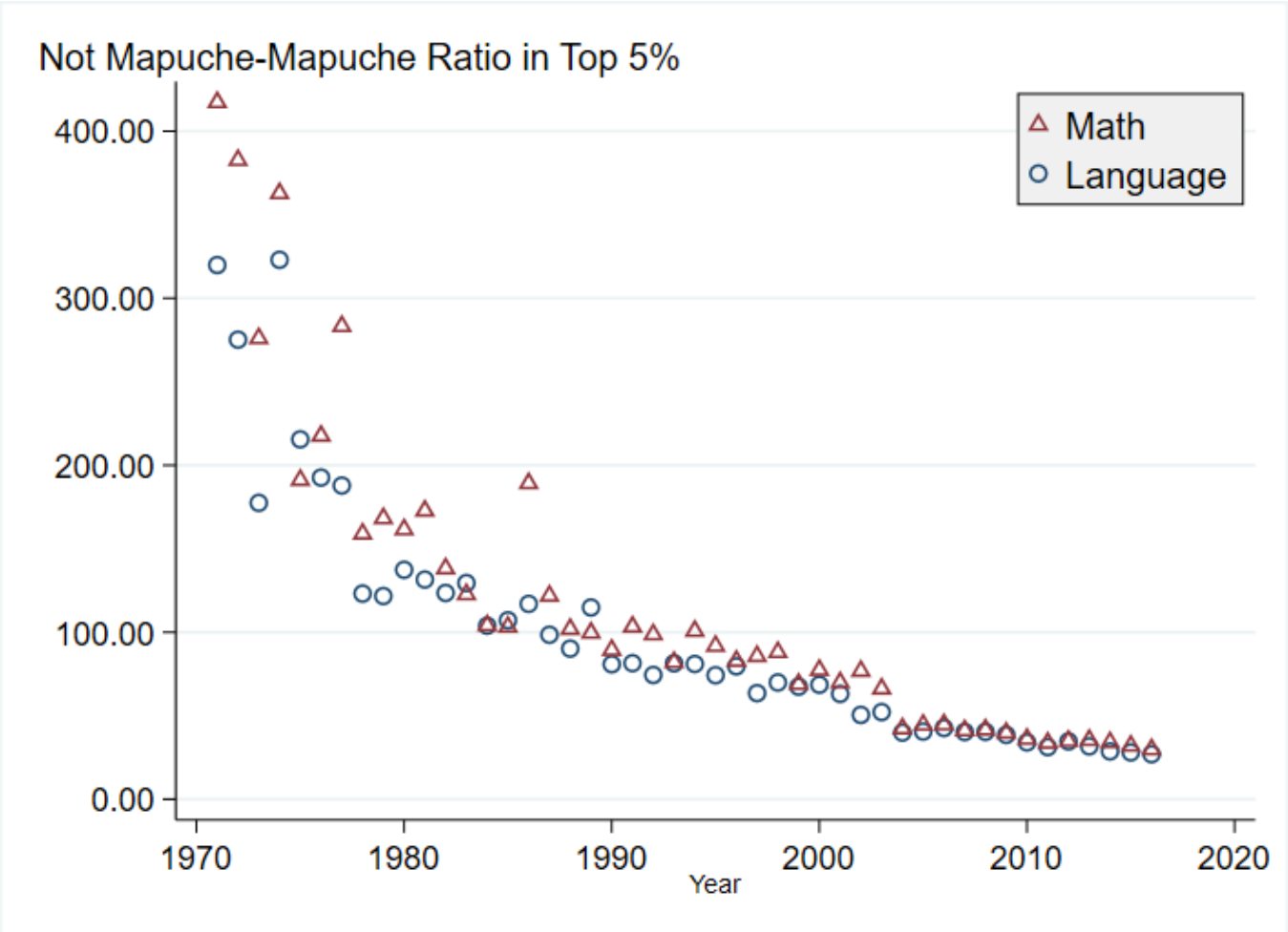
Mapuche Descendants

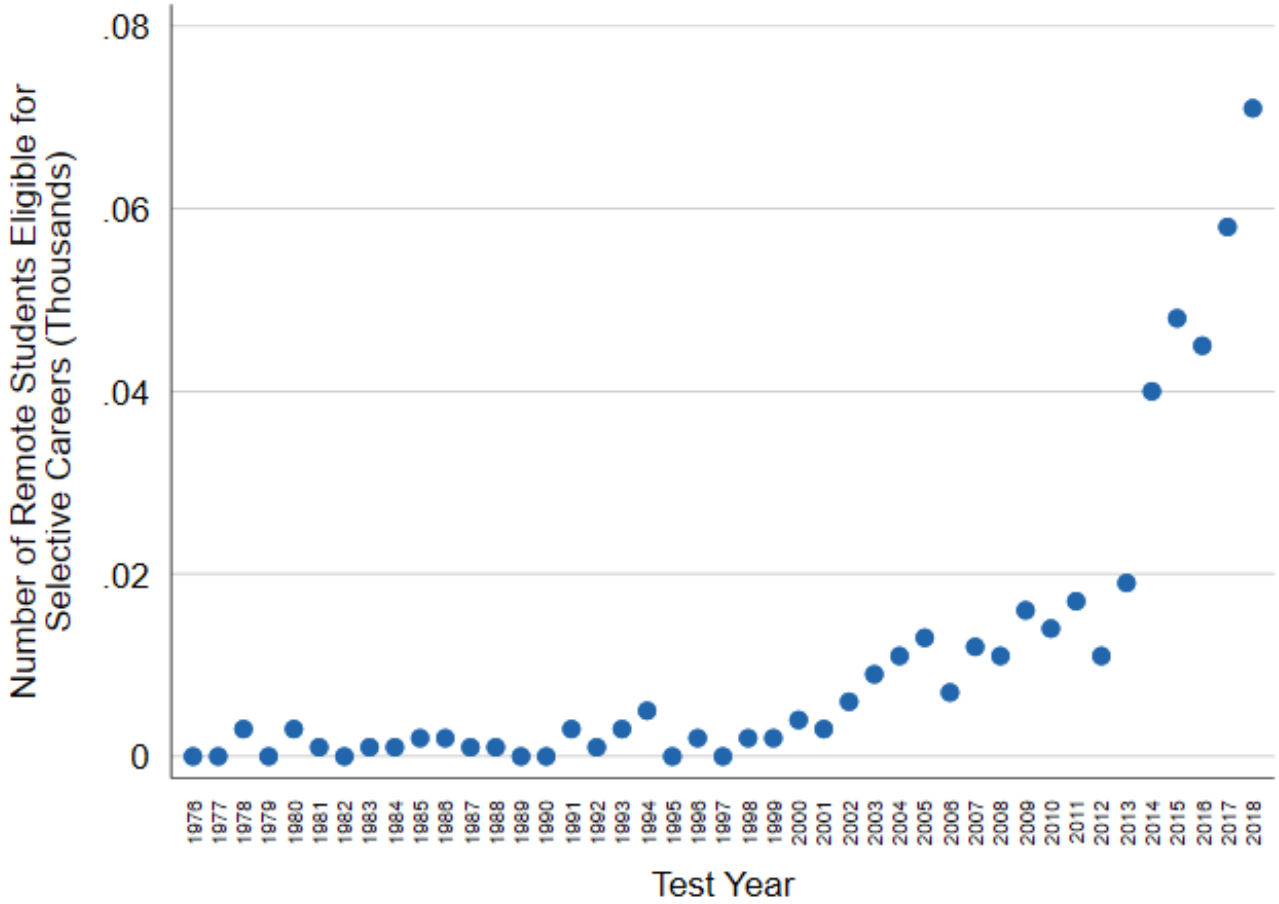


Low SES



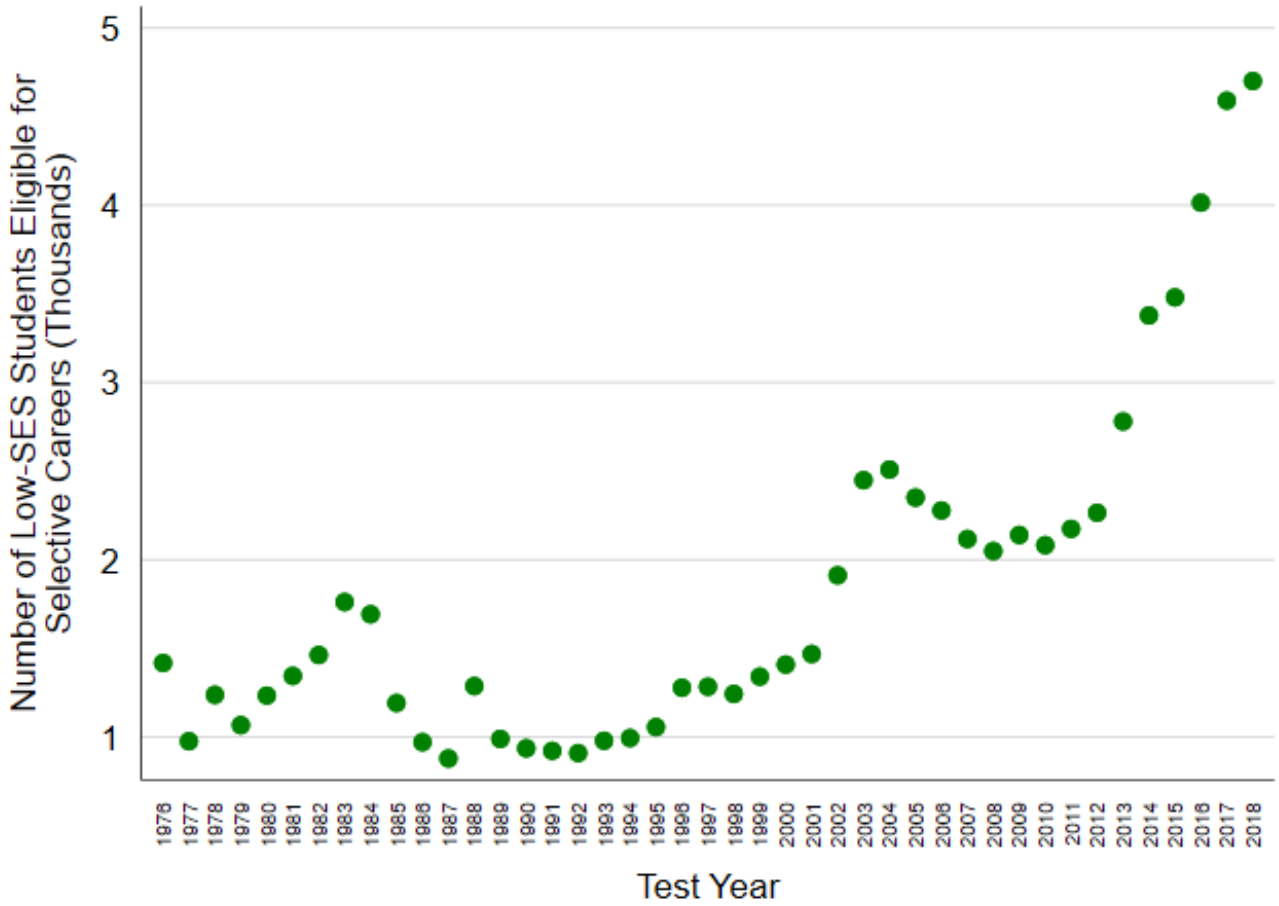
Share in Top 5% by Ethnicity





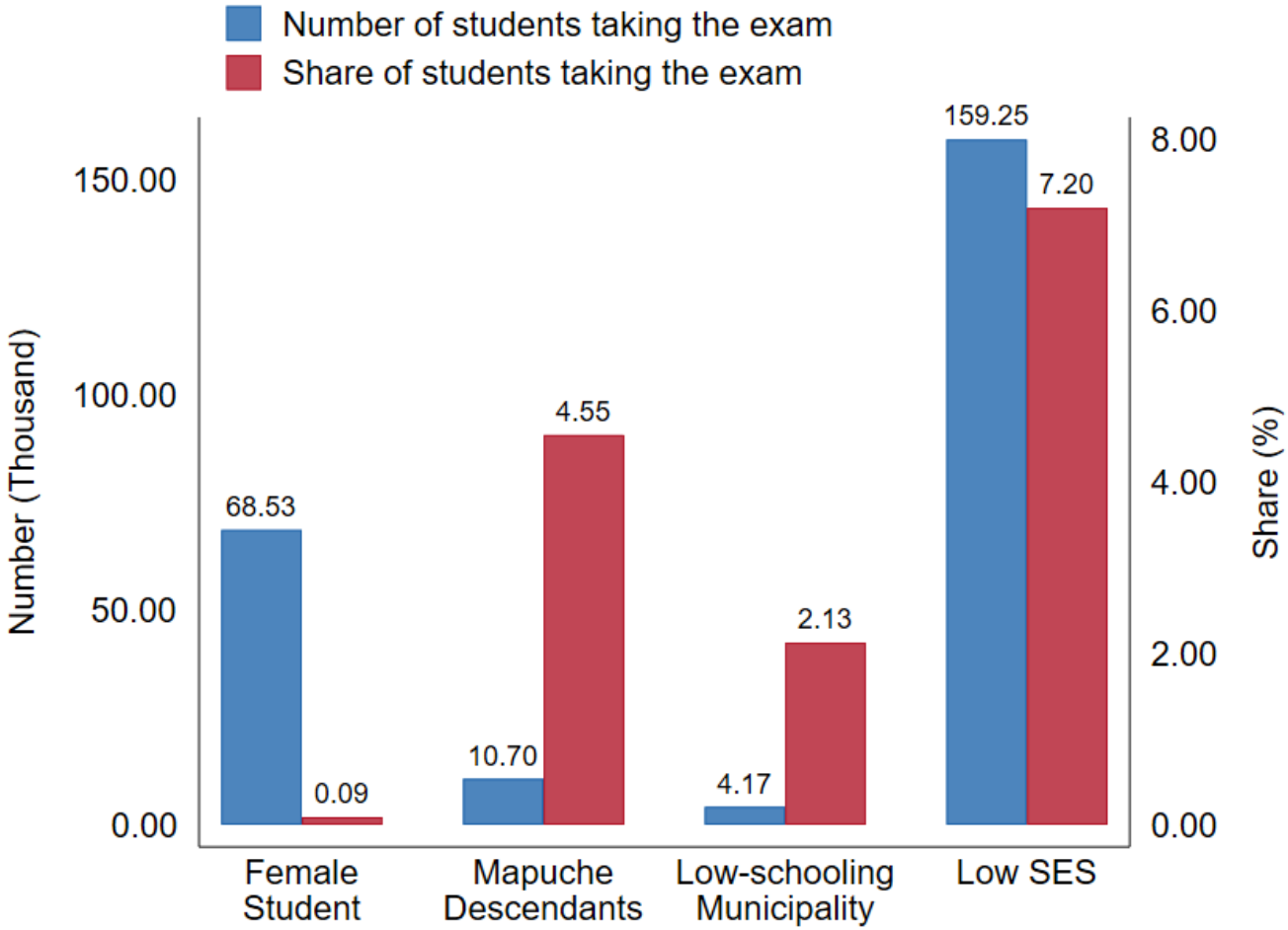
(c) Municipalities with low levels of schooling in the 1980s

Low SES

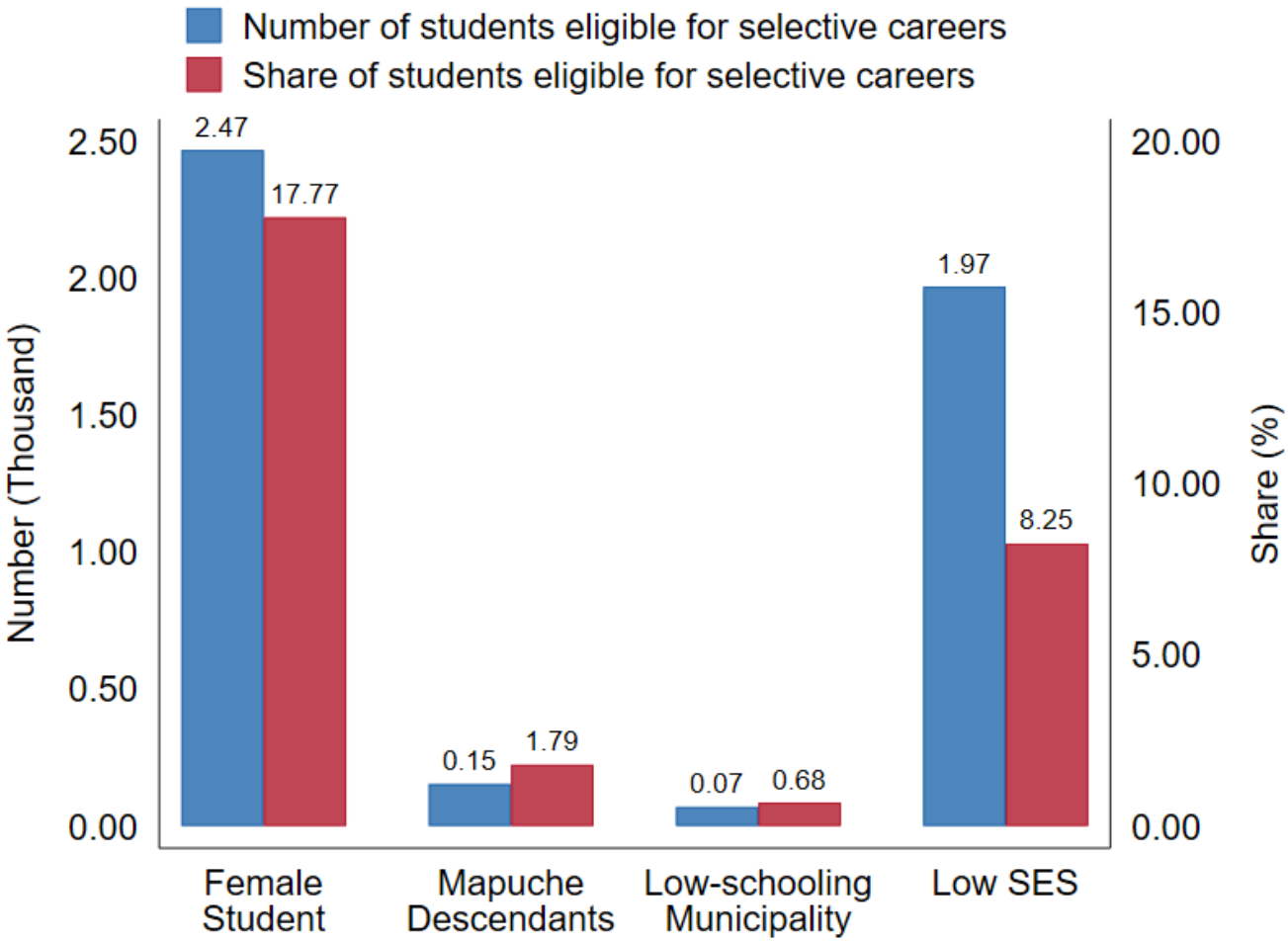


(d) Low-SES students

All Test-Takers Progress



Test-Takers Progress for Elite Degrees



Conclusion

- We uncover significant long-term progress on a host of metrics.
- This evidence adds to the medium and shorter term evidence available for Chile.
- Despite progress, there are important challegens ahead: shares of top-scorers, measures of quality, and many more.
- Long term view might help us see advances and challenges typically hidden with short tem information
- ... which we believe provides some insights feeding the original fundamental question: how do countries develop?

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