12) Multifaceted Investigation of the Causal Effect

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Mincer (1974): Schooling, Experience, and Earnings

$$\ln Y_i = \alpha + \rho S_i + \beta_1 X_i + \beta_2 X_i^2 + e_i$$

$$\ln Y_i = \alpha + \underset{(.002)}{.070}\, S_i + e_i$$

$$\ln Y_i = \alpha + \underset{(.001)}{.107}\, S_i + \underset{(.001)}{.081}\, X_i - \underset{(.00002)}{.0012}\, X_i^2 + e_i$$

Griliches (1977): Ability Bias

$$\ln Y_i = \alpha^l + \rho^l S_i + \gamma A_i + e_i$$

$$\rho^s = \rho^l + \underbrace{\delta_{AS}\gamma}_{\text{ability bias}},$$

IQ as proxy for ability and controlling for potential experience:

$$\rho^l = .059$$

$$\rho^s = .068$$

How Bad Control Creates Selection Bias

	Potential occupation		Potential earnings		Average earnings by occupation	
	Without college	With college	Without college	With college	Without college	With college
Type of worker	(1)	(2)	(3)	(4)	(5)	(6)
Always Blue (AB)	Blue	Blue	1,000	1,500	Blue 1,500	Blue 1,500
Blue White (BW)	Blue	White	2,000	2,500		White 3,000
Always White (AW)	White	White	3,000	3,500	White 3,000	

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Twins Analysis

$$\ln Y_{if} = \alpha^l + \rho^l S_{if} + \lambda A_{if} + e^l_{if}$$

$$\ln Y_{1,f} = \alpha^l + \rho^l S_{1,f} + \lambda A_f + e^l_{1,f}$$

$$\ln Y_{2,f} = \alpha^l + \rho^l S_{2,f} + \lambda A_f + e^l_{2,f}$$

$$\ln Y_{1,f} - \ln Y_{2,f} = \rho^l \left(S_{1,f} - S_{2,f}\right) + e^l_{1,f} - e^l_{2,f}$$

Classical Measurement Error

$$Y_i = \alpha + \beta S_i^* + e_i$$

$$S_i = S_i^* + m_i,$$

$$E[m_i] = 0$$

$$C(S_i^*, m_i) = C(e_i, m_i) = 0.$$

Attenuation Bias

$$\beta = \frac{C(Y_i, S_i^*)}{V(S_i^*)}.$$

$$\beta_b = \frac{C(Y_i, S_i)}{V(S_i)}$$

$$= \frac{C(\alpha + \beta S_i^* + e_i, S_i^* + m_i)}{V(S_i)}$$

$$= \frac{C(\alpha + \beta S_i^* + e_i, S_i^*)}{V(S_i)} = \beta \frac{V(S_i^*)}{V(S_i)}.$$

Returns to Schooling for Twinsburg Twins

	Dependent variable			
	Log wage (1)	Difference in log wage (2)	Log wage (3)	Difference in log wage (4)
Years of education	.110 (.010)		.116 (.011)	
Difference in years of education		.062 (.020)		.108 (.034)
Age	.104 (.012)		.104 (.012)	
Age squared/100	−.106 (.015)		−.106 (.015)	
Dummy for female	−.318 (.040)		−.316 (.040)	
Dummy for white	−.100 (.068)		−.098 (.068)	
Instrument education with twin report	No	No	Yes	Yes
Sample size	680	340	680	340

Angrist & Pischke (2014)

Returns to Schooling Using Child Labor Law Instruments

	Dependent variable			
	Years of schooling		Log weekly wages	
	(1)	(2)	(3)	(4)
A. First-stage and reduced-form estimates				
Child labor law req. 7 years	.166	−.024	.010	−.013
	(.067)	(.048)	(.011)	(.011)
Child labor law req. 8 years	.191	.024	.013	.005
	(.062)	(.051)	(.010)	(.010)
Child labor law req. 9 years or more	.400	.016	.046	.008
	(.098)	(.053)	(.017)	(.014)
B. Second-stage estimates				
Years of education			.124	.399
			(.036)	(.360)
State of birth dummies × linear year of birth trends	No	Yes	No	Yes

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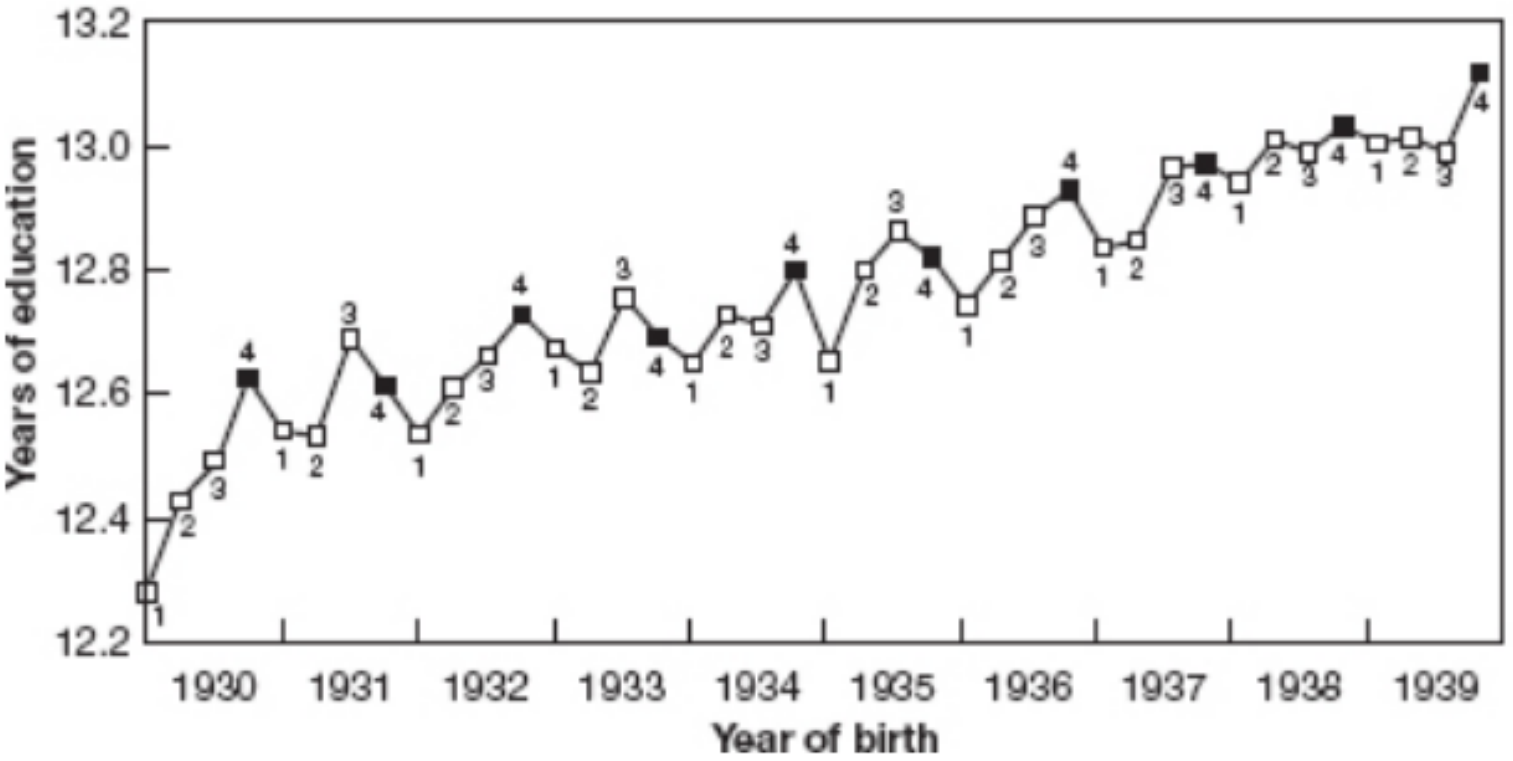
The Quarter of Birth First Stage



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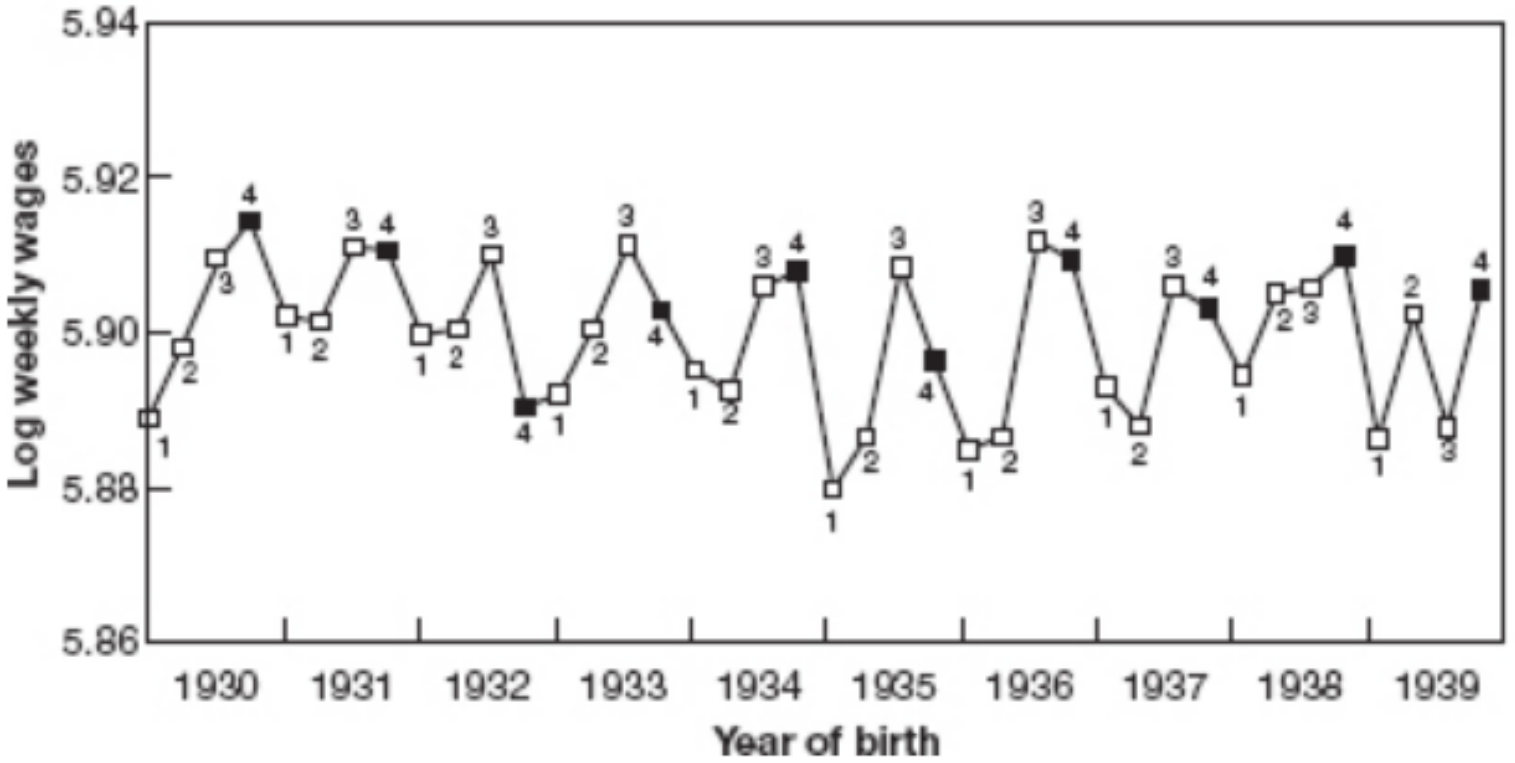
The Quarter of Birth Reduced Form



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Returns to Schooling Using a Single Quarter of Birth Instrument

	Born in quarters 1–3	Born in quarter 4	Difference
Log weekly wage	5.8983	5.9051	.0068
			(.0027)
Years of education	12.7473	12.8394	.0921
			(.0132)
IV estimate of the returns to schooling			.074
			(.028)

Angrist & Pischke (2014)

Returns to Schooling Using Alternative Quarter of Birth Instruments

	OLS (1)	2SLS (2)	OLS (3)	2SLS (4)	2SLS (5)
Years of education	.071 (.0004)	.074 (.028)	.071 (.0004)	.075 (.028)	.105 (.020)
First-stage F-statistic		48		47	33
Instruments	None	Quarter 4	None	Quarter 4	3 quarter dummies
Year of birth controls	No	No	Yes	Yes	Yes

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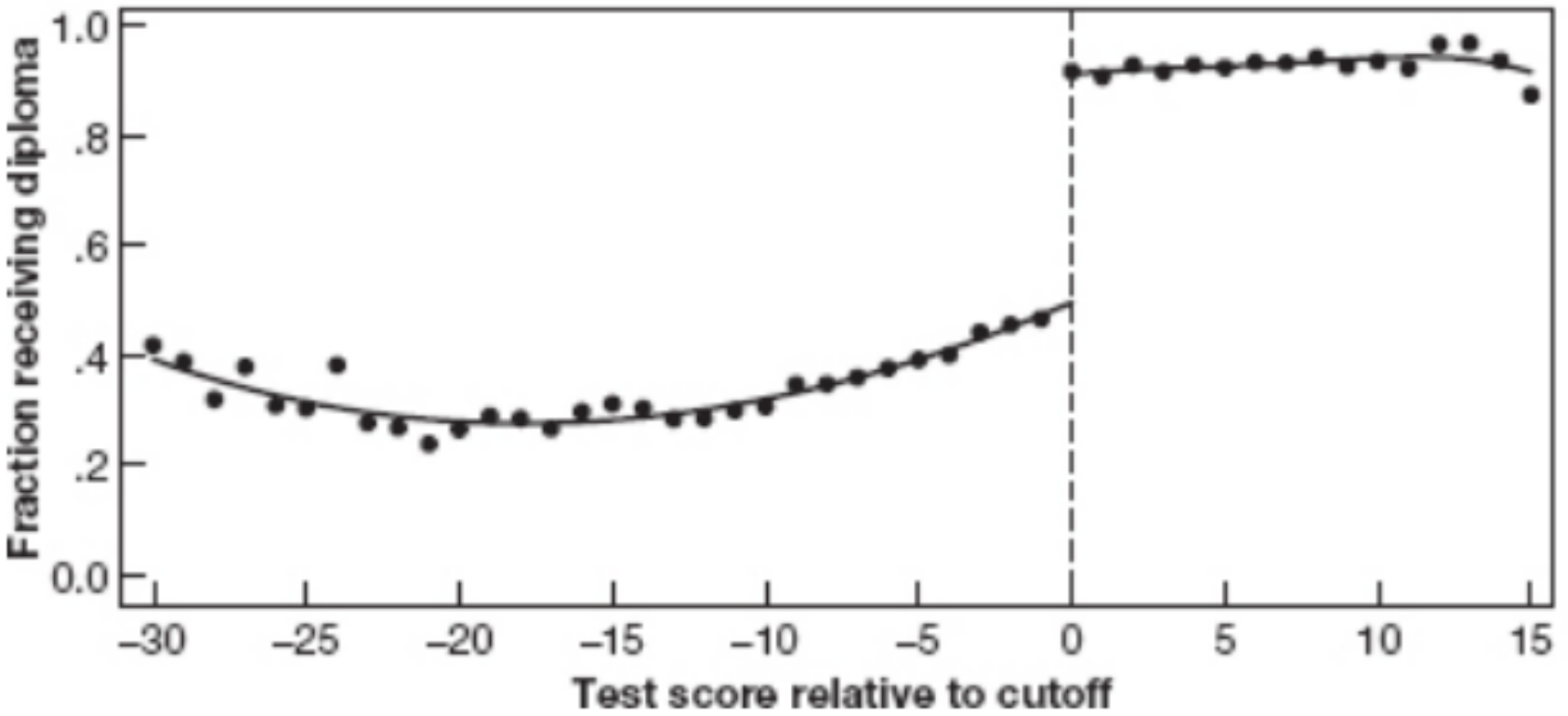
Last-Chance Exam Scores and Texas Sheepskin



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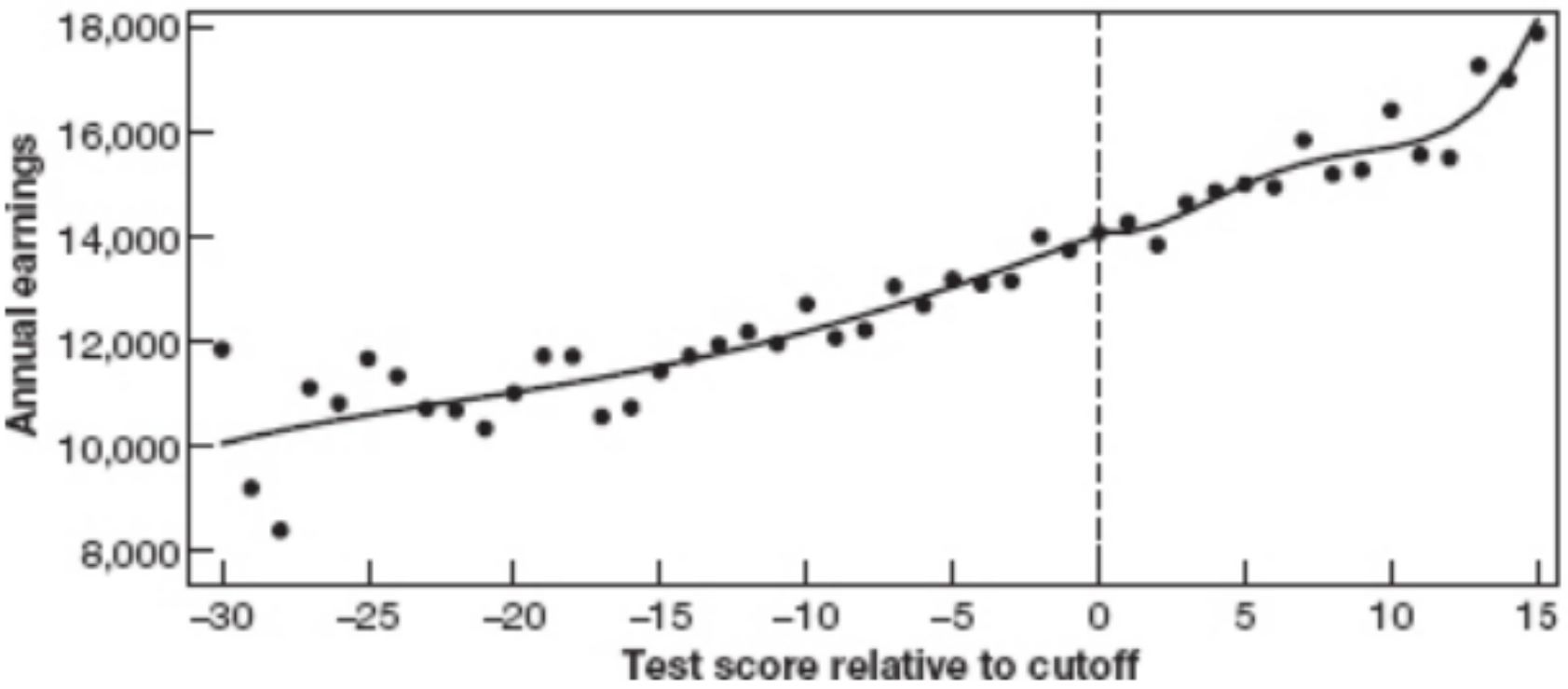
Fuzzy RD first stage of nearly .5

Dummy for passing the exit exam as an IV for the effect of diploma receipt on earnings

The Effect of Last-Chance Exam Scores on Earnings



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Diploma Effect = \$52 and SE = \$630