

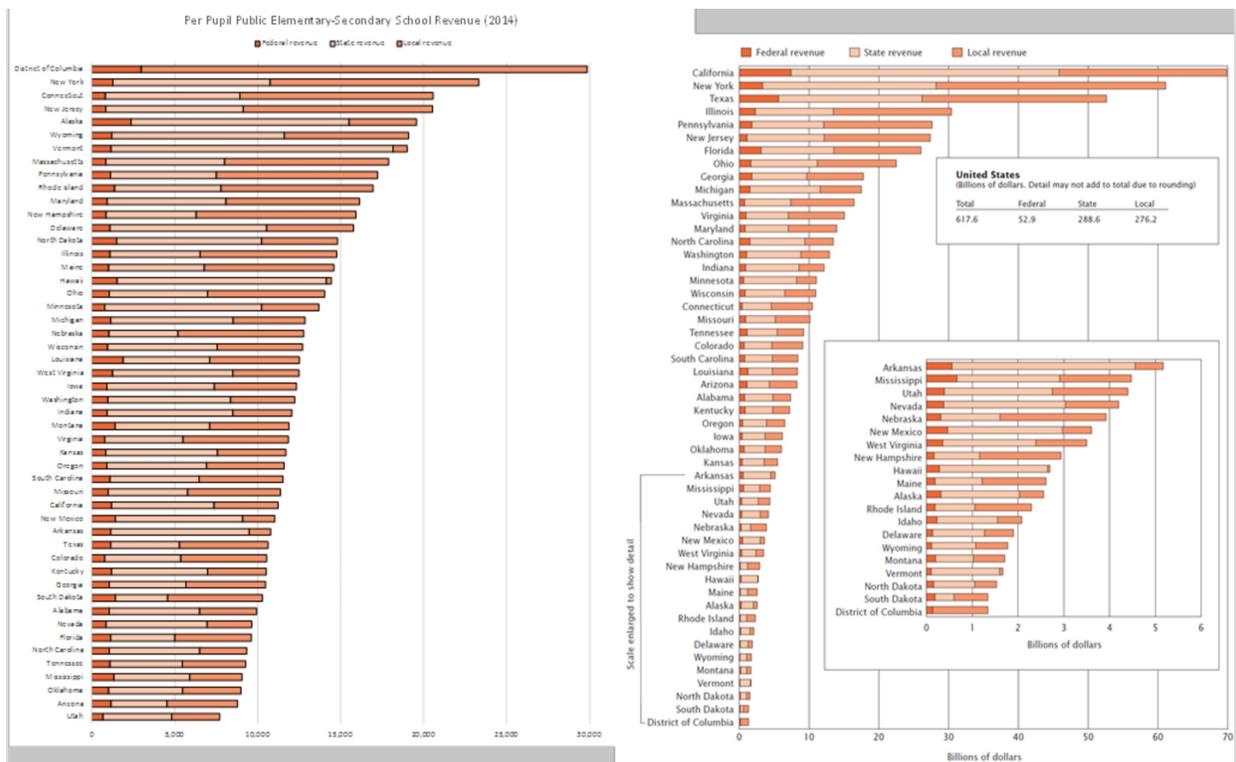
Education II: Financing and School Vouchers

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1 Overview of School Financing

- School financing is one of the largest components of public spending.
 - 8.2% of public spending in US in 2013
OECD (2017), Public spending on education (indicator) (Accessed on 09 May 2017)
 - 2.7% of federal spending (2017) [Social Security 33%, Medicare 27%, Military 16%]
6.3% of federal discretionary spending (2017) [Military 54%, Government 6.5%, Education 6.3%]
 - * Discretionary spending is 29% of federal spending each year.
 - * Education not included in Mandatory spending (which is 65% of federal spending).
 - 18% of state spending (2017) [Healthcare 36%, Education 18%, Pensions 15%]
 - * 16% of California state spending (2017) [Healthcare 35%, Pensions 18%, Education 16%]
 - * 10% of New York state spending (2017) [Healthcare 40%, Pensions 16%, Education 10%]
 - Most funding is done at the state level.
 - This was what was stipulated in the U.S. Constitution.
 - Federal K-12 funding began in 1965 with the Elementary and Secondary Education Act (ESEA).
 - This was reauthorized in recent legislation such as NCLB and ESSA.
 - Recently, a the following bill was presented by a senator who believed it was better than the department of education being run by Betsy DeVos: ‘Bill to Abolish Federal Department of Education’.
 - School funding breakdown: (typically) state 45%, local 45%, federal 10%
 - Local funding is via property taxes.
 - Large variance in spending: see [here](#) for an interactive map.
 - Public Education Finances (2014) [United States Census Bureau, Education Finance Branch]
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2 Effects of School Finance Reforms

“The Effects of School Spending on Educational and Economic Outcomes: Evidence from School Finance Reforms” [5]

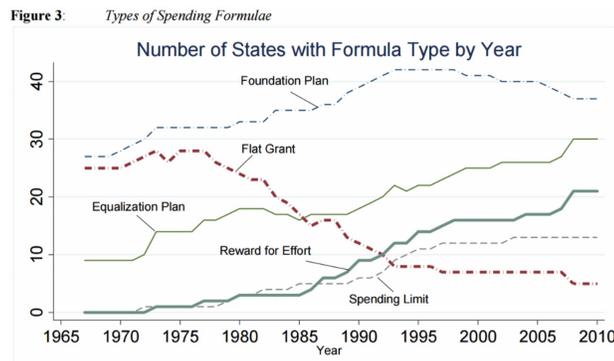
2.1 Overview of Court-Ordered School Finance Reforms

- Prior to the 1970s: schools were mostly funded by local property taxes.
- 1972-2009:
 - Court cases and rulings on different aspects of the constitutionality of school finance systems. First in each state being:
 - Earliest: California (Serrano v. Priest, 1971).
 - Latest: Oregon (Pendleton School District v. State of Oregon, 2009).
 - Most fit into two types: equity grounds and adequacy grounds.
- 1971 - mid-1980s: Challenges on equity grounds.
 - Public education should be equitable as it is a ‘fundamental interest’.
 - Local funding disadvantaged schools in low-income or wealth districts.
- 1980s onwards: Challenges on adequacy grounds.
 - States constitutionally required to provide some level of free education.

Types of School Finance Reforms

Jackson, Johnson and Persico (2014), “The effect of school finance reforms on the distribution of spending, academic achievement, and adult outcomes” [4]

- Foundation level of spending:
 - The state establishes a foundation level of per-pupil spending.
 - The state estimates a district’s required local contribution to fund this foundation level.
 - The state provides districts with the difference between the district’s required contribution and the foundation level.
 - Examples include foundation plans, foundation grants, and guaranteed minimum tax base plans.
 - In 1970, 27 states used this, and 36 states by 2010.
- Reward for Effort:
 - Incentivize local funding of schools with state-provided matching grants.
 - Generally in low-wealth districts with high tax rates.
 - 0 states used this in 1970, 21 states in 2010.
- Equalization:
 - Redistribute local and state funds from affluent districts to low-income or low-wealth districts.
 - Wealth of a district is typically determined by property value.
 - E.g. power equalization (low-wealth), categorical aid (low-income).
 - 9 states used this in 1970, 30 states in 2010.
- Spending Limits:
 - State-imposed limit on how much a district may spend on education. Anything above the limit will be repurposed for other funding.
 - 0 states used this in 1970, 12 states in 2010.
- Flat grant:
 - For every district, give them a fixed amount of money. This is becoming less popular.



2.2 Data and Research Design

Data

They used the following sources of data in their work.

- Education funding data [in dollars from the year 2000]
 - Government Census data: Every 5 years, census data shows school spending for every school district in US from 1972 onwards.
 - Historical Database on Individual Government Finances: This contains annual school district finance data for a subset of districts from 1967 and 1970-1991.
 - CCD School District Finance Survey: This contains annual school district finance data for every school district in US from 1991 onwards.
 - School finance reform data:
 - Mostly from Public School Finance Programs of the United States and Canada (PSFP).
 - The date of decisions was researched and labeled manually due to conflicting records.
 - District-level data:
 - The 1970 census gives the county-level median family income data.
 - This was linked to districts via 1969 school district boundaries.
 - Individual data:
 - Comes from the Panel Study of Income Dynamics (PSID).
 - * This is a national probability sample of families, interviewed annually during 1968-1997, biennially from 1997 onwards.
 - * This data links individuals to census blocks during childhood.
 - * Individuals used in the paper were:
 - Born 1955-1985, followed through 2011.
 - Two-thirds grew up in a state that was subject to a court-mandated school finance reform.
 - 15,353 individuals [9,035 low-income, 6,318 non-poor].
 - 1,409 school districts, 1,031 counties, all 50 states and DC.
 - 93,022 adult person-year observations.
 - * Adult outcomes recorded:
 - Educational outcomes: Graduation from high school, years of completed education.
 - Economic outcomes: wages, family income, annual incidence of poverty in adulthood (ages 20-45).
 - Another paper [6] looks at the impacts of school reform on more fine-grained education outcomes (e.g. test performance). Before that paper, it was difficult to use these kinds of measures, so this paper discusses the decision of using these measures to decide whether the reforms were having positive effects.
 - 1962 and 1970 Census of Governments
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Research design

- Two-stage least-squares, difference in differences regression model:
 - $\ln(P\bar{P}E_{5-17})_{idb} = \pi_1(\text{Exp}_{idb} \times \text{Dosage}_d) + \pi_2(\text{Exp}_{idb}) + \Pi C_{idb} + \rho_d + \rho_b + \xi_{idb}$
 - $Y_{idb} = \delta \cdot \ln(P\bar{P}E_{5-17})_{idb} + \Phi C_{idb} + \theta_d + \theta_b + \varepsilon_{idb}$.
 - i : individual
 - d : district
 - b : birth cohort
 - Exp_{idb} : indicator of exposure to a court-mandated school finance reform in the individual's childhood school district
 - Y_{idb} : adult outcome
 - Endogenous treatment variable: Per pupil spending during childhood
 - $P\bar{P}E_{5-17}$: Average school spending (in real year-2000 dollars) during expected school-age years (ages 5-17) in the individual's childhood school district.
 - Key variable: Spending change because of a court-mandated school finance reform
 - Dosage_d : Spending change experienced by exposed cohorts in district d .
 - Approach 1:
 - * Replace Exp_{idb} with indicator variables denoting the number of years after the individual turned 17 that the court order occurred.
 - * Replace dosage with quartile of the district in state distribution of per pupil spending (and regress for dynamic treatment effects $\alpha_{T, Q_{ppe}}$).
 - Approach 2:
 - * Incorporates information about income level of district prior to court order, and the type of finance reform.
 - * Find estimate dosage for observationally similar districts in other states – uses 'leave-out' estimate.
 - Controls C_{idb} :
 - Parental education and occupational status, parental income, mother's marital status at child's birth, birth weight, child health insurance coverage, gender, race-by-census division birth-cohort fixed effects, birth-cohort linear trends interact with 1960 characteristics of childhood county, county-by-year measures of school desegregation, hospital desegregation, community health centers, state funding for kindergarten, Title I school funding, etc.
 - *Question*: What is the difference between ordinary least squares and two-stage least squares? Why does it get different results for the PPE correlation?
Answer: Normally when you ordinary least squares (OLS), you're predicting an outcome based on some predictor variables— y is outcome, x are the predictor variables, and you're interested in the effect on x . You want to know causally what would happen to y if you
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change x . When you do OLS, all your estimating are correlations; you're essentially looking at the correlation in the sample of a higher x and a higher y . That's not necessarily causal, and what two-stage least squares (2SLS) does is a way of isolating the variation in x as it's related to y . They should give difference answers if the predictor that you're interested in endogenous in that it's correlated to other stuff that's related to y but isn't in your model.

- *Question:* Why would anyone use OLS over 2SLS?

Answer: OLS is useful mainly as a benchmark to know how the two compared, because it tells you what the instruments are doing, and it's independently interesting what the correlation is.

- *Question:* So the control variables are being affected by this?

Answer: They've come up with some variables that predict log per-pupil-expenditure that they think aren't correlated with other stuff that affects the outcome.

If you look just at the relationship between log PPE and all these things, there are things that affect log PPE that also affect wage and family income which aren't in their model.

The predictor in their model is log PPE and the outcome y is Y_{idb} , the wage as an adult.

- *Comment:* One incentive issue is if that a school district or city has a fixed amount of funding, some questions may come up in terms of getting them to spend that funding in a way that's beneficial to students. One of the things that came up in Cambridge, Massachusetts was that the Cambridge Public School Committee gets paid to serve even though it's a small job, and there are other perceived inefficiencies as well.

2.3 Results

Effects on School Spending

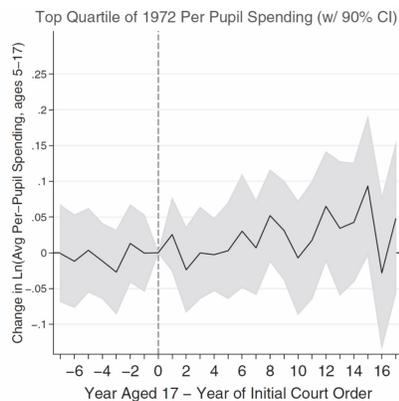


FIGURE I
The Effect of a Court-Ordered Reform on School-Age Per Pupil Spending by Prereform Spending Quartile

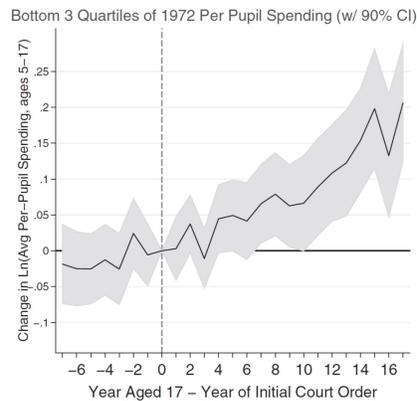
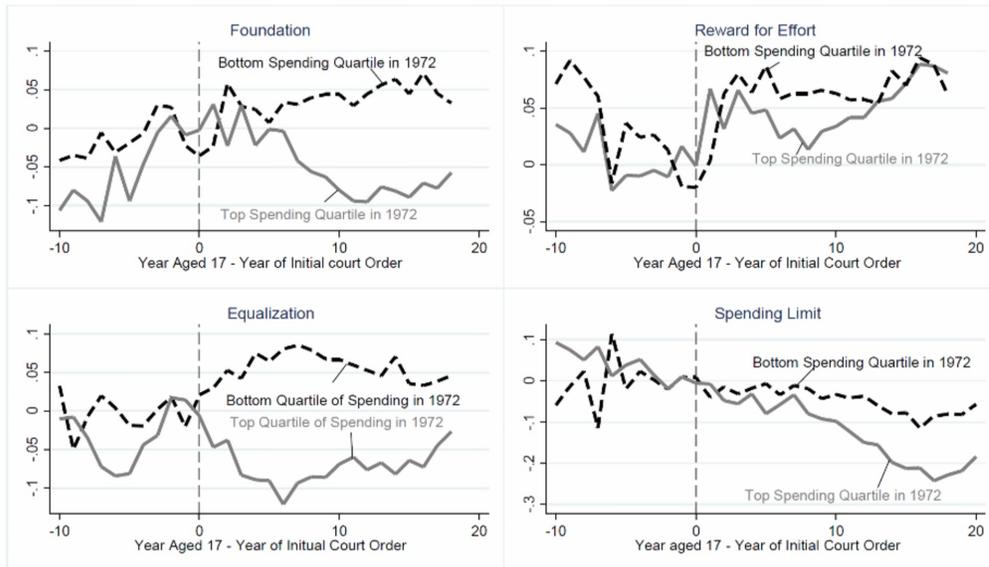


FIGURE I

Figure D2: Event-study Estimates of The Effect of Adopting Various Formula Types on Per-pupil Spending: By Spending quartile in 1972

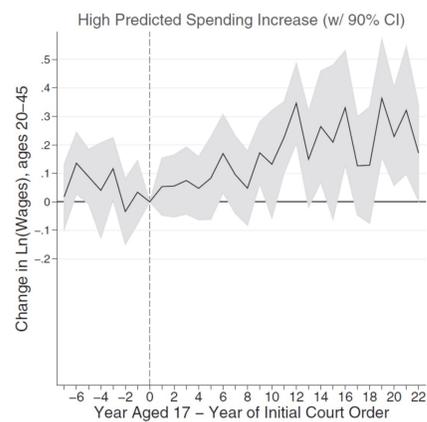
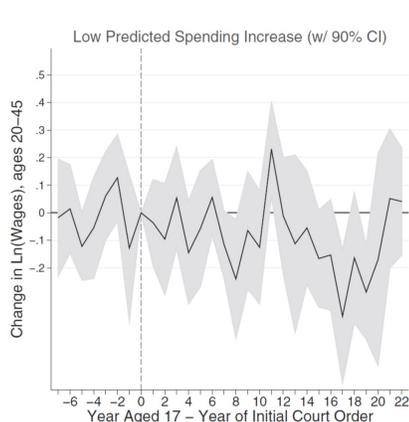


Effects on Adult Outcomes

TABLE IV

OLS VERSUS 2SLS ESTIMATES OF COURT-ORDERED SCHOOL FINANCE REFORM INDUCED EFFECTS OF PER PUPIL SPENDING ON ADULT WAGES AND FAMILY INCOME: BY CHILDHOOD POVERTY STATUS (ALL ADULT OUTCOMES ARE MEASURED BETWEEN AGES 20–45)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent variable:							
	Ln(Wage), Ages 20–45				Ln(Family Income), Ages 20–45			
	OLS	2SLS 1	2SLS 2		OLS	2SLS 1	2SLS 2	
$\text{Ln}(PPE_d)_{\text{age } 5-17}$	-0.0480 (0.0654)	0.7076*** (0.2679)	0.7743*** (0.1959)		0.0128 (0.0617)	0.8705*** (0.3348)	0.9819*** (0.2849)	
$\text{Ln}(PPE_d)_{\text{age } 5-17} \times \text{Low income}$				0.9598*** (0.3003)				1.7146*** (0.3585)
$\text{Ln}(PPE_d)_{\text{age } 5-17} \times \text{Nonpoor}$				0.5525 (0.4461)				0.2021 (0.4223)
Number of person-year obs.	106,545	106,545	106,545	106,545	151,349	151,349	151,349	151,349
Number of individuals	13,183	13,183	13,183	13,183	14,730	14,730	14,730	14,730
Number of childhood families	4,454	4,454	4,454	4,454	4,588	4,588	4,588	4,588
First-stage F-statistic	N/A	15.62	20.25	20.25	N/A	15.62	20.25	20.25



Related Literature

- Hanushek (2003) [3]: Review of literature on how school spending affects student academic performance [mostly negative conclusions].
- Lafortune, Rothstein and Schanzenbach (2016) [6]: “School Finance Reform and the Distribution of Student Achievement” Evidence from nationally representative data from National Assessment of Education Progress on effects of adequacy-based school finance reforms on educational outcomes.
- The finding that finance reform has a positive effect is fairly recent and mostly due to the paper being discussed, conflicting with Hanushek.

3 Effects of School Vouchers

“School Vouchers: A Survey of the Economics Literature” (Forthcoming in JEL)[2]

3.1 Introduction

Research Questions

1. What are the effects of vouchers on students who use them?
 2. What are the effects of vouchers on students left in the public school system?
 3. What are the effects of vouchers on public school efficiency?
 4. What is the net effect of vouchers on aggregate educational performance?
 5. What are political economy factors in the existence and design of voucher programs?
- *Question:* What are political economy factors?
Answer: They are how political actors make decisions of how to design these things.

Issues

- Arguments for vouchers:
 - Provision of education will be efficient via markets or quasi-markets (private school advantages and public school response).
 - They allow for educational and curricular variety, better matching of supply and demand.
 - With vouchers, the government could maintain oversight and regulation via restrictions on private providers and lower voucher levels.
 - They might improve efficiency and equity by decoupling residence and school choice.
 - Arguments against vouchers:
 - Sorting: They cause sorting (stratification) of students by income and ability, as well as sorting of teachers, with the best teaching the most advantaged.
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- Peer effects exacerbate the effects of sorting.
 - Informational disadvantages are exacerbated by sorting.
 - Sorting (stratification) is expensive if it is more expensive to educate disadvantaged students (perhaps due to peer effects).
 - As opposed to decisions by policy makers, vouchers cause individual (and potentially poorly informed) choice.
- Remarks:
 - Some of these effects might not be captured by small scale empirical investigations.
 - Many arguments implicitly assume ‘universal vouchers’, whereas in practice, voucher programs are only available to students from low-income households.
 - Overall: the arguments about vouchers are not as simple as market vs non-market.

3.2 Overview of Existing Voucher Programs

Small Scale Programs

- United States programs funded by tax revenues:
 - Milwaukee (1990-), Cleveland (1995-), Florida (1999-2006), Washington D.C. (2004-), Ohio (2005-), New Orleans (2008-), Indianapolis (2011-), Racine (2011-), Douglas (2013-)
 - ~ \$4000 – \$8000 funding per student.
 - Some policies:
 - * Target low-income households or underperforming schools.
 - * Use a lottery for oversubscription.
 - * Same admissions criteria for voucher and non-voucher students.
 - * All programs allow vouchers to be used at religious schools.
 - * All programs require voucher recipients take public school standardized tests.
 - * Some programs require accreditation, e.g. state charter or oversight.
 - * Some programs provide transportation and others don’t.
 - E.g. Milwaukee Parental Choice Program, 1990:
 - * Available to students with household income level $\leq 175\%$ federal poverty level.
 - * Vouchers were initially not available to religious schools, but this changed in 1998.
 - * The voucher pays $\min\{\text{tuition, standard district allocation}\}$ (district allocation was \$6442 in 2010)
 - * Initially schools could not charge additional tuition, but this changed in 2011.
 - * Private schools must be accredited, and meet one of four performance standards among voucher-supported students:
 - $\geq 70\%$ of advance a grade;
 - Frequency of attendance $\geq 90\%$;
 - $\geq 80\%$ significant academic progress;

- $\geq 70\%$ meet parental involvement criteria.
- * Private schools set the number of voucher slots.

- United States programs funded by tax credits:
 - These are financed by corporate contributions; donors get 100% corporate income tax credit.
 - Florida (2001-), Pennsylvania (2001-), Iowa (2006-), Rhode Island (2006-), Georgia (2008-), Indiana (2009-), Oklahoma (2013-)
 - \sim \$1000 – \$4000 funding per student
 - These programs mostly target low-income households.
 - All programs allow vouchers to be used at religious schools.
- United States programs funded by private foundations:
 - E.g. Children’s Scholarship Fund (CSF)
 - \sim \$1500 – \$2000 funding per student (family payment averages \$2711)
 - Programs target low-income students, mostly religious schools (64/70 in Baltimore in 2008).
- Other: Colombia (public), India (privately funded).

Large Scale Programs

Table 3: International Voucher Programs

Country	Years in operation	Enrollments in private or independent voucher-funded schools	Restrictions on private/independent schools			
			For-profit operation allowed	Selective admissions allowed	Religious affiliation allowed	Significant tuition charges allowed
Chile	1981 -	47%	Yes	Yes	Yes	Yes
Denmark	1855 -	12%	No	Yes	Yes	Yes
Holland	1917 -	70%	No	Yes	Yes	No
New Zealand	1989-	15%	Yes	Yes	Yes	No
Sweden	early 1990s -	10%	Yes	No	Yes	No

4 Overview of Existing Literature

Theory

- Milton Friedman (1962)
 - The government should provide funding while “ensuring that schools meet certain minimum standards, such as inclusion of minimum common content in programs.”

- Education is essentially a marketplace, competition for students promotes efficiency.
- Vouchers should decouple residency and school choice.

- Subsequent work: Answers to the fundamental questions depend on the voucher design.

Voucher Models	Peers Affect Quality	Public Schools			Student Differentiation			Vouchers				Private Price Discriminate	Housing Market	Public Choice		
		Homogeneous	Heterogeneous	Rent-Seeking	Income	Aptitude	Imperfectly Observed	Universal	Targeted	No Topping Up	Limit Admissions			Public Expenditure	Voucher	
Manski (1991)	x	x		x	x	x		x								
Epple and Romano (1998)	x	x			x	x		x				x				
Nechyba (1999)	x		x		x	x		x					x		x	
Nechyba (2000)	x		x		x	x			x				x		x	
Nechyba (2003)	x		x		x	x		x	x				x		x	
McMillan (2005)	indirectly	x		x	x	x		x	x							
Ferreya (2007)	x		x		x	x		x					x			
Epple and Romano (2008)	x	x			x	x		x	x	x		x				
Macleod and Urquiola (2009)		x				x	x	x			x					
Ferreya and Liang (2012)	x	x			x	x	x	x	x							
Chakrabarti (2013c)		x			x	x	x			x						
Nelson (2013)			x		x	x				x			x			
Chakrabarti (2013d)		x			x	x	x			x					x	
Public Choice Models																
Ireland (1990)		x				x				x						
Epple and Romano (1996)		x				x				x						x
Hoyt and Lee (1998)		x				x				x						x
Chen and West (2000)		x				x				x	x					x
Fernandez and Rogerson (2003)		x				x				x	x					x
Bearse, et.al. (2009)		x				x				x	x					x
Epple and Romano (2014)		x				x				x						x
Epple, Romano, and Sarpa (2014)		x				x				x						x

- Distinctive features of the education market: peer effects; private school price discrimination; linking of residency and school choice; role of school reputations and incomplete information; incentives for student effort.

- Summary of answers to questions (1)-(5):

- (1) What are the effects of vouchers on students who use them?
 - * ‘Cream skimming’: Those able to use vouchers should benefit.
 - * E.g. Epple & Romano (1998): High-achieving voucher schools serve the relatively more able and affluent, low-achieving voucher schools serve the less able and affluent.
- (2) What are the effects of vouchers on students left in the public school system?
 - * ‘Cream skimming’: Higher income households pay a premium to let their less able kids attend schools with more able kids.
 - * E.g. Manski (1992): Cream skimming will adversely affect less motivated students.
 - * E.g. Epple & Romano (1998): Stratification is caused between public and private sectors; the lowest income and ability students will attend public schools.
 - * The strongest negative effects occur when strong peer effects are present.
- (3) What are the effects of vouchers on public school efficiency?
 - * Potential sources of efficiency gains from educational competition:
 - E.g. McMillan (2005), Chakrabarti (2013): Lowering the cost of private school could cause public schools to increase effort to retain high income students.

- * Public schools may be adversely affected:
 - E.g. Epple & Romano (1998): Stratification occurs between public and private sectors; the lowest income and ability students will attend public schools.
 - E.g. McMillan (2005): They demonstrate the existence of a mechanism that has adverse effect on public school effectiveness exists.
 - E.g. McMillan (2005), Chakrabarti (2013): Lowering the cost of private school could cause public schools to lower effort to level required to retain only low income students.
- (4) What is the net effect of vouchers on aggregate educational performance?
 - * This depends on whether private school education is more effective than public schools, and the public schools' responses.
 - * E.g. Ferrerya & Liang (2012): Vouchers in conjunction with increased public monitoring of the public sector can increase everyone's achievement and welfare.
- (5) What are political economy factors in the existence and design of voucher programs?
 - * Benefits of targeted vouchers.
 - * Partial vouchers are preferred by those who would continue to attend public school (tax savings).
- Other takeaways:
 - * Price discrimination allows for additional benefits to high ability students and larger positive effects on quality.
 - * A small targeted voucher program is similar to universal vouchers, due to household mobility.

Empirical

- Distinctive features of the education market: peer effects; private school price discrimination; linking of residency and school choice; role of school reputations and incomplete information; incentives for student effort.
 - Summary of answers to questions (1)-(5):
 - (1) What are the effects of vouchers on students who use them?
 - * Many of the most credible studies are on small scale voucher schemes.
 - * In many of the best-identified studies, vouchers have an effect that is statistically indistinguishable from zero.
 - * Some recent evidence is more favorable. There is also evidence that vouchers can have substantial positive effects on specific subgroups.
 - (2) What are the effects of vouchers on students left in the public school system?
 - * Vouchers can result in sorting, but the details of the program design affect the extent of sorting.
 - (3) What are the effects of vouchers on public school efficiency?
 - * Public performance was worsened with greater private growth; higher ability/income children leave to attend private school.
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- * There was some evidence of increased public performance in Sweden.
- * Positive effects could be confounded by other factors, e.g. accountability.
- (4) What is the net effect of vouchers on aggregate educational performance?
 - * E.g. Bravo, Mukhopadhyay & Todd (2010): Vouchers for subsidized primary (secondary) schools increase (decrease) earnings in Chile.
 - * E.g. Bohlmark and Lindahl (2008): In Sweden, there was a small positive effect on 9th grade GPA, but no evidence of effect on participation in higher education.
 - * E.g. Card, Dooley & Payne (2010): There were significant average gains in achievement (test scores 3rd to 6th grade) in more competitive markets.
 - * E.g. Muralidharan & Sundararaman (2015): There were gains in test performance.
- (5) What are political economy factors in the existence and design of voucher programs?
 - * Voucher proposals in big-city districts have more support.
 - * Support for choice is predicted to have negative correlation with income.

Conclusions

- Many studies find insignificant effects of vouchers on educational outcomes.
- However, there is some evidence that vouchers can lead public schools to improve.
- ‘Fairly wide ranging empirical and theoretical work will be necessary to make progress.’

4.1 Related Literature

- Epple & Romano (2012) [1]: A more in-depth survey of theoretical models studying school vouchers.

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