Approximating The Equilibrium Effects of Informed School Choice

Claudia Allende, Francisco Gallego and Christopher A. Neilson

NBER Summer Institute, Education Economics Meetings
Cambridge, Massachusetts
July 25th, 2018

PRINCETON UNIVERSITY

Coauthors



Claudia Allende Santa Cruz
Columbia University
5th year PhD student
Advisors: Kate Ho, Peter Bergman, Chris Neilson

Industrial Organization, Education and Labor Economics.

Coauthors



Claudia Allende Santa Cruz
Columbia University
5th year PhD student
Advisors: Kate Ho, Peter Bergman, Chris Neilson

Industrial Organization, Education and Labor Economics.



Francisco Gallego
Professor of Economics, PUC Chile
Scientific Director J-PAL LAC, Director EH Clio Lab
Ph.D., MIT

Development, Education, Political Economy and History.

Motivation

- Lack of information on product quality can have important effects on market structure and equilibrium outcomes.

Motivation

- Lack of information on product quality can have important effects on market structure and equilibrium outcomes.
- Certain aspects of quality can be difficult to observe in education markets, especially in developing countries.

Motivation

- Lack of information on product quality can have important effects on market structure and equilibrium outcomes.
- Certain aspects of quality can be difficult to observe in education markets, especially in developing countries.

  $\Rightarrow$ This potentially has consequences on individual choices as well as market efficiency.

Motivation

- Lack of information on product quality can have important effects on market structure and equilibrium outcomes.
- Certain aspects of quality can be difficult to observe in education markets, especially in developing countries.

  $\Rightarrow$ This potentially has consequences on individual choices as well as market efficiency.

- Poor and less educated families in developing countries may also underestimate the returns to investment in human capital.

Motivation

- Lack of information on product quality can have important effects on market structure and equilibrium outcomes.
- Certain aspects of quality can be difficult to observe in education markets, especially in developing countries.

  $\Rightarrow$ This potentially has consequences on individual choices as well as market efficiency.

- Poor and less educated families in developing countries may also underestimate the returns to investment in human capital.

  $\Rightarrow$ Less demand for quality can lead to lower investment by parents and in aggregate, by providers of education services.

Information Interventions in Education

Prior experimental research has shown that information interventions can change schooling choices, potentially leading to improved outcomes in a **cheap and cost effective way**.

Information Interventions in Education

Prior experimental research has shown that information interventions can change schooling choices, potentially leading to improved outcomes in a **cheap and cost effective way**.

- Returns to levels of education: Jensen (2010); many others

Information Interventions in Education

Prior experimental research has shown that information interventions can change schooling choices, potentially leading to improved outcomes in a **cheap and cost effective way**.

- Returns to levels of education: Jensen (2010); many others
- Returns to Major: Wiswall and Zafar (2015); Hastings, Neilson and Zimmerman (2015)

Information Interventions in Education

Prior experimental research has shown that information interventions can change schooling choices, potentially leading to improved outcomes in a **cheap and cost effective way**.

- Returns to levels of education: Jensen (2010); many others
- Returns to Major: Wiswall and Zafar (2015); Hastings, Neilson and Zimmerman (2015)
- Feasibility/Financial Aid: Dinkelman and Martinez (2014); Hoxby and Turner (2015)

Information Interventions in Education

Prior experimental research has shown that information interventions can change schooling choices, potentially leading to improved outcomes in a **cheap and cost effective way**.

- Returns to levels of education: Jensen (2010); many others
- Returns to Major: Wiswall and Zafar (2015); Hastings, Neilson and Zimmerman (2015)
- Feasibility/Financial Aid: Dinkelman and Martinez (2014); Hoxby and Turner (2015)
- School quality **Report Cards**:

Individuals Hastings & Weinstein (2008) - RCT, small-scale, US school district, right after reform.

Villages Andrabi, Das and Khwaja (2017) - RCT, market level, Pakistan, no prior standardized information.

Null Mizala and Urquiola (2013) in Chile, Gallego and Neilson (tba) in Peru.

Limits to what we know for policy recommendations

- Hard to know how RCT results translate to other context.

  Will an information intervention change individual behavior in a different context?

Limits to what we know for policy recommendations

- Hard to know how RCT results translate to other context.

  Will an information intervention change individual behavior in a different context?

- Hard to know how a scaled up version of the policy would look like given that if behavior were to change, **capacity constraints** might limit effects.

Limits to what we know for policy recommendations

- Hard to know how RCT results translate to other context.

  Will an information intervention change individual behavior in a different context?

- Hard to know how a scaled up version of the policy would look like given that if behavior were to change, **capacity constraints** might limit effects.

- Equilibrium **supply side** reactions might also increase (raising quality) or mitigate effects (raising prices).

Limits to what we know for policy recommendations

- Hard to know how RCT results translate to other context.

  Will an information intervention change individual behavior in a different context?

- Hard to know how a scaled up version of the policy would look like given that if behavior were to change, **capacity constraints** might limit effects.

- Equilibrium **supply side** reactions might also increase (raising quality) or mitigate effects (raising prices).

  Question: How can we move from positive, but small-scale, experimental evidence towards an at scale policy recommendation?

Drawing Board $\rightarrow$ Field Experiment $\rightarrow$ Policy Rec

1. Use theory about school choice + past research $\Rightarrow$ develop a series of potential interventions for a new context.

Drawing Board $\rightarrow$ Field Experiment $\rightarrow$ Policy Rec

1. Use theory about school choice + past research $\Rightarrow$ develop a series of potential interventions for a new context.

2. Test the effectiveness of these interventions at a small-scale via RCTs in relevant context.

Drawing Board → Field Experiment → Policy Rec

1 Use theory about school choice + past research ⇒ develop a series of potential interventions for a new context.

2 Test the effectiveness of these interventions at a small-scale via RCTs in relevant context.

3a If RCT possible → Take the more effective versions and evaluate at scale.

Drawing Board → Field Experiment → Policy Rec

1. Use theory about school choice + past research ⇒ develop a series of potential interventions for a new context.

2. Test the effectiveness of these interventions at a small-scale via RCTs in relevant context.

3a. If RCT possible → Take the more effective versions and evaluate at scale.

3b. If scale RCT not possible → Use best available empirical models of economic behavior to try to predict equilibrium effects of an at scale implementation.

Drawing Board → Field Experiment → Policy Rec

1. Use theory about school choice + past research ⇒ develop a series of potential interventions for a new context.

2. Test the effectiveness of these interventions at a small-scale via RCTs in relevant context.

3a. If RCT possible → Take the more effective versions and evaluate at scale.

3b. If scale RCT not possible → Use best available empirical models of economic behavior to try to predict equilibrium effects of an at scale implementation.

Paper goal: Empirically implement steps 1, 2 and 3b using our own medium sized RCT together with an empirical model of demand and supply to simulate general equilibrium effects of the scaled up implementation.

The Policy Relevant Context

- The context is the market for elementary schools in Chile which is characterized by a high degree of choice.

The Policy Relevant Context

- The context is the market for elementary schools in Chile which is characterized by a high degree of choice.
- Vouchers and current regulation make attending better schools accessible but in the aggregate many poorer low SES students attend low performing and low value added schools.

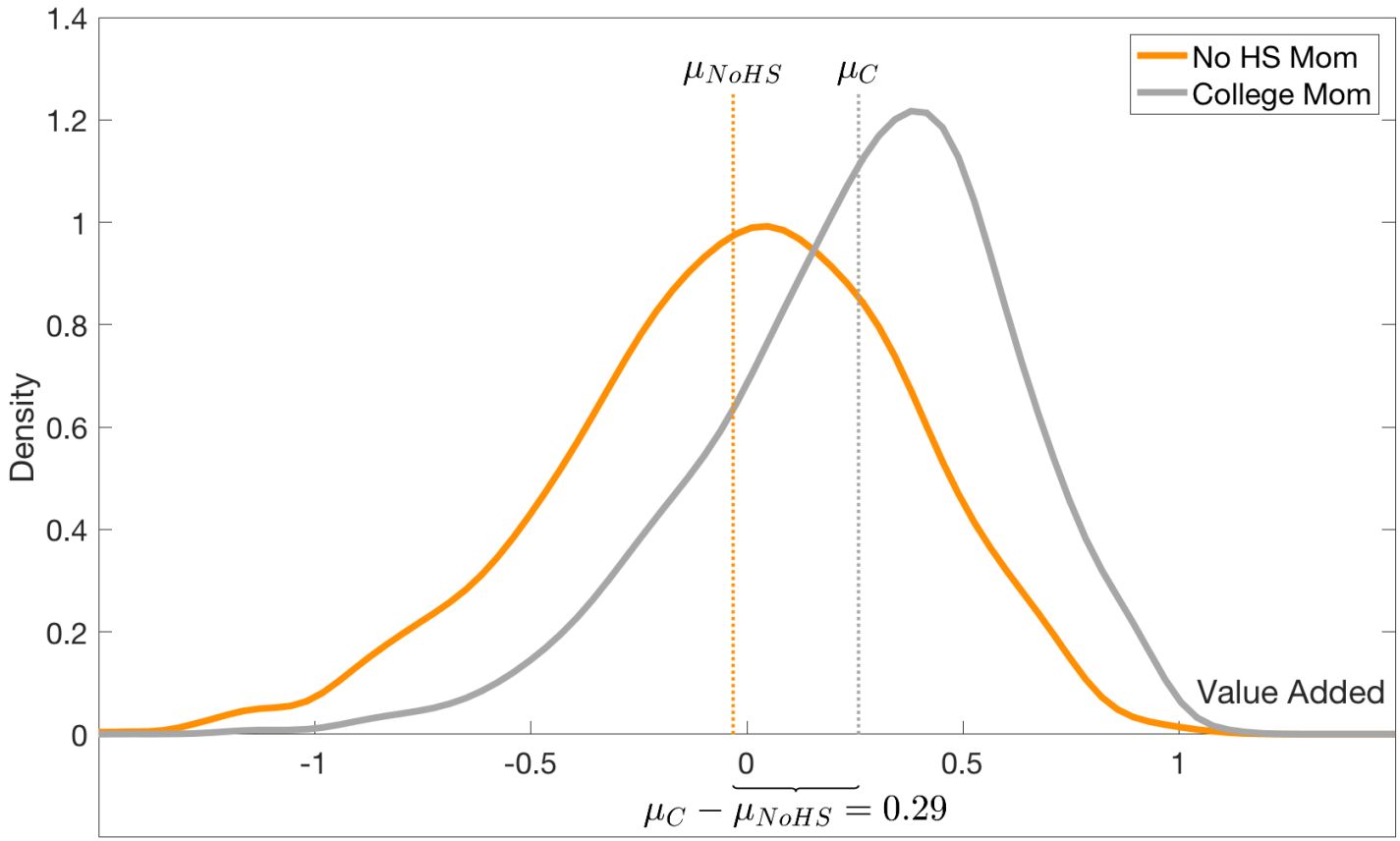
The Policy Relevant Context

- The context is the market for elementary schools in Chile which is characterized by a high degree of choice.
- Vouchers and current regulation make attending better schools accessible but in the aggregate many poorer low SES students attend low performing and low value added schools.

The Policy Relevant Context

- The context is the market for elementary schools in Chile which is characterized by a high degree of choice.
- Vouchers and current regulation make attending better schools accessible but in the aggregate many poorer low SES students attend low performing and low value added schools.
- Government is interested in promoting information in education markets via *Mas informacion, mejor educacion* program of Minister of Education J. Lavin.

Inequality of School Quality



Teachers VA

Intervention Parameters

- Cost effective implementation, easy to scale.

Intervention Parameters

- Cost effective implementation, easy to scale.

  $\Rightarrow$ Intervention through public sector, minimal preparation or training.

Intervention Parameters

- Cost effective implementation, easy to scale.

  $\Rightarrow$ Intervention through public sector, minimal preparation or training.

- Literature suggests the information intervention (nudge) would work best if done at or near time of the decision.

Intervention Parameters

- Cost effective implementation, easy to scale.

  $\Rightarrow$ Intervention through public sector, minimal preparation or training.

- Literature suggests the information intervention (nudge) would work best if done at or near time of the decision.

  $\Rightarrow$ Intervention at **public pre-schools**, during parent-teacher conference.

Implementation Specifics

Implementation Specifics

- Discussion on the importance of the school choice decision.

Implementation Specifics

- Discussion on the importance of the school choice decision.
- An informative report card with emphasis on location, price and test scores.

Implementation Specifics

- Discussion on the importance of the school choice decision.
- An informative report card with emphasis on location, price and test scores.
- A motivational video was shown with emphasis on the importance of the choice.

Implementation Specifics

- Discussion on the importance of the school choice decision.
- An informative report card with emphasis on location, price and test scores.
- A motivational video was shown with emphasis on the importance of the choice.

Implementation Specifics

- Discussion on the importance of the school choice decision.
- An informative report card with emphasis on location, price and test scores.
- A motivational video was shown with emphasis on the importance of the choice.

Implementation Specifics

- Discussion on the importance of the school choice decision.
- An informative report card with emphasis on location, price and test scores.
- A motivational video was shown with emphasis on the importance of the choice.

Implementation Specifics

- Discussion on the importance of the school choice decision.
- An informative report card with emphasis on location, price and test scores.
- A motivational video was shown with emphasis on the importance of the choice.
- Space to make open questions about the school choice process.

Implementation Specifics

- Discussion on the importance of the school choice decision.
- An informative report card with emphasis on location, price and test scores.
- A motivational video was shown with emphasis on the importance of the choice.
- Space to make open questions about the school choice process.
- Control group had a meeting but only to discuss the end of the school year.

Choosing a School Carefully is Important



Think of your child's future.



Think of your child's education.



Think of your child's future job.



High average return to attending college.

Choosing a School Carefully is Important



Silvia searched carefully for a school that was good for her son.



Felix went to a good school and now is in college.



Rose Marie went to a good school, now is working at a bank.

Personalized Informative Card : Local Options

Cartilla de Apoyo a la Elección de Establecimientos Escolares

Ingreso a EnseñanzaBásica

Jardín Cardenal Caro **2010**

Todos los padres en Chile tienen el derecho de elegir el establecimiento escolaren que estudian sus hijos.
Esta cartilla, dirigida a padres y apoderados, ha sido diseñada para apoyar esta elección.
En esta cartilla encontrará información de los colegios más cercanos al jardín infantil donde asiste su hijo(a).

Para elegir un establecimiento escolar, es bueno fijarse en los resultados **SIMCE** de ese colegio, pues hablan de la calidad de la educación.
También encontrará en esta cartilla información sobre los costos de los colegios, la ubicación del colegio, y otras características.

Ref	Nombre Colegio	Puntaje SIMCE*	Cambio SIMCE**	Precio Mensual Del Colegio***
1	Colegio Rosa Elvira Matte De Prieto	293	7,50	Entre 5.000 y 10.000
2	Colegio Polivalente Don Orione	286	13,75	Entre 10.000 y 20.000
3	Escuela Básica Sol De Chile	261	5,75	Entre 10.000 y 20.000
4	Colegio Polivalente Saint Trinity	250	-8,00	Menos de 5.000
5	Escuela Básica Clara Estrella	250	-26,00	No Cobra Mensualidad
6	Colegio Kennedy	249	13,75	Entre 5.000 y 10.000
7	Escuela Básica Santa Adela	247	-10,25	No Cobra Mensualidad
8	Colegio Adventista Buenaventura	243	-7,50	Menos de 5.000
9	Centro Educacional Sagrado Corazón	243	-17,00	Menos de 5.000
10	Colegio Saint Orland 2	239	1,25	No Cobra Mensualidad
11	Escuela Básica Karol Cardenal De Cracovia	238	0,00	No Cobra Mensualidad
12	Escuela Alicia Ariztía De Silva	235	9,25	No Cobra Mensualidad
13	Escuela Básica Parque Las Américas	235	6,00	No Cobra Mensualidad
14	Colegio Básica Hernán Olguín Maibee	233	-2,75	No Cobra Mensualidad
15	Escuela Básica Las Espigas	232	31,75	No Cobra Mensualidad
16	Liceo Polivalente B 133	232	1,50	No Cobra Mensualidad
17	Escuela Básica Raúl Sáez S.	231	-1,25	No Cobra Mensualidad
18	Escuela Acapulco Dn 582	227	7,25	No Cobra Mensualidad
19	Escuela Básica Bernardo O'Higgins	224	-19,75	No Cobra Mensualidad
20	Escuela Conquistando Futuro	219	-15,00	No Cobra Mensualidad
21	Blue Star College	216	7,50	No Cobra Mensualidad
22	Liceo Tte. 2 Francisco Mery Aguirre	215	-1,00	No Cobra Mensualidad
23	Escuela Salomon Sack	215	8,00	No Cobra Mensualidad
24	Escuela Básica Lo Valledor	212	24,25	No Cobra Mensualidad
25	Escuela Republica De Las Filipinas	206	-18,25	No Cobra Mensualidad
26	Escuela Especial Particular Despertar De	204	s/i	No Cobra Mensualidad
27	Escuela Básica Saint Phillip Of Nery	202	-10,50	Menos de 5.000
28	Escuela Básica Republica De Indonesia	200	-16,75	No Cobra Mensualidad

*Valores promedio de 4° básico de los años 2006 a 2009.
**Cambio en el puntaje en 2006-2007 y 2008-2009.
***Valores aproximados para el año 2009.

Puntajes **SOBRE el Promedio Nacional.**

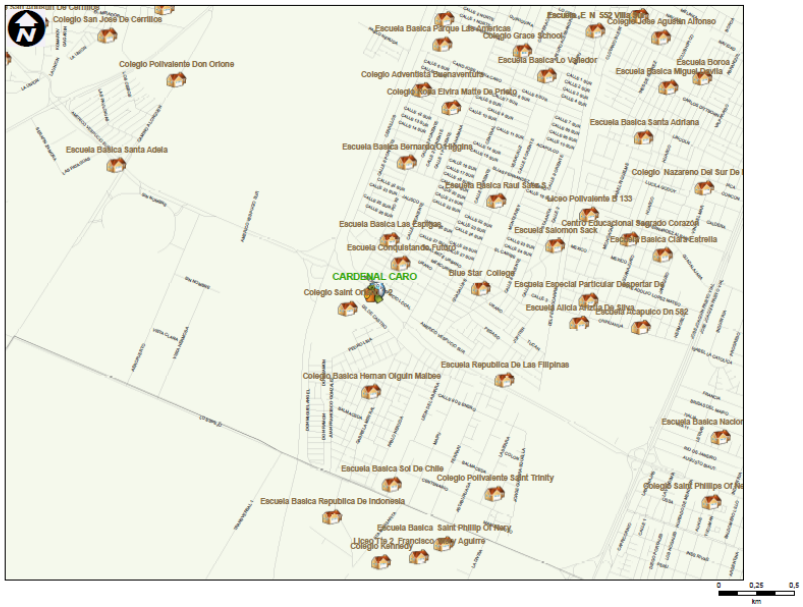
Puntajes **BAJO el Promedio Nacional.**

El Promedio Nacional es de **250 puntos**

Los colegios en los que aparece s/i son aquellos que no tienen la información disponible

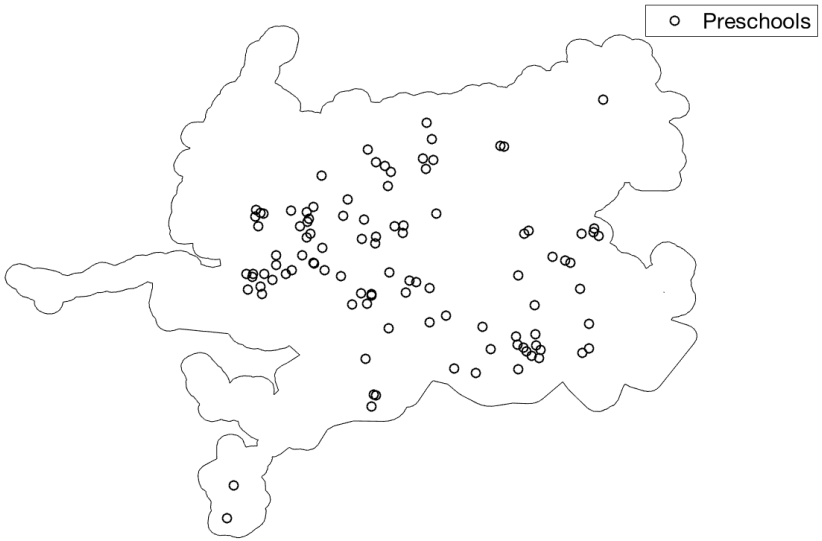
INGRESO A ENSEÑANZA BÁSICA

Jardín Cardenal Caro



Treatment and control groups for Santiago

Sample Size: 133 preschools across three regions.

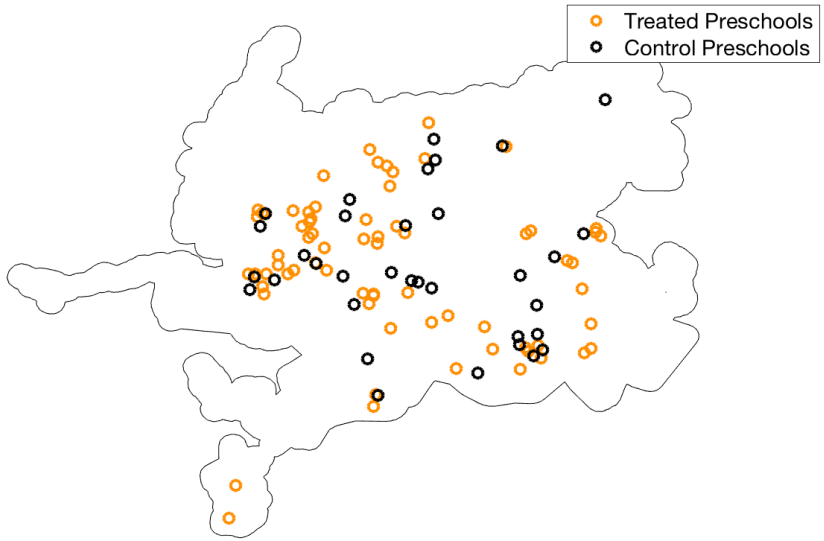


Balance Schools | Balance Enrolled

Treatment and control groups for Santiago

Sample Size: 133 preschools across three regions.

Take up: 10 preschools declined participation.



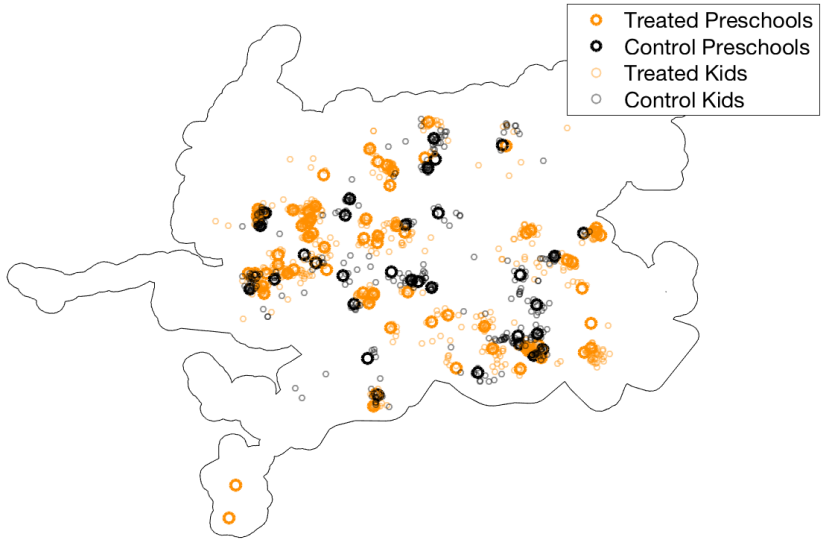
Balance Schools | Balance Enrolled

Treatment and control groups for Santiago

Sample Size: 133 preschools across three regions.

Take up: 10 preschools declined participation.

Data: Collected Baseline, Follow up, Admin. Records.



Balance Schools | Balance Enrolled

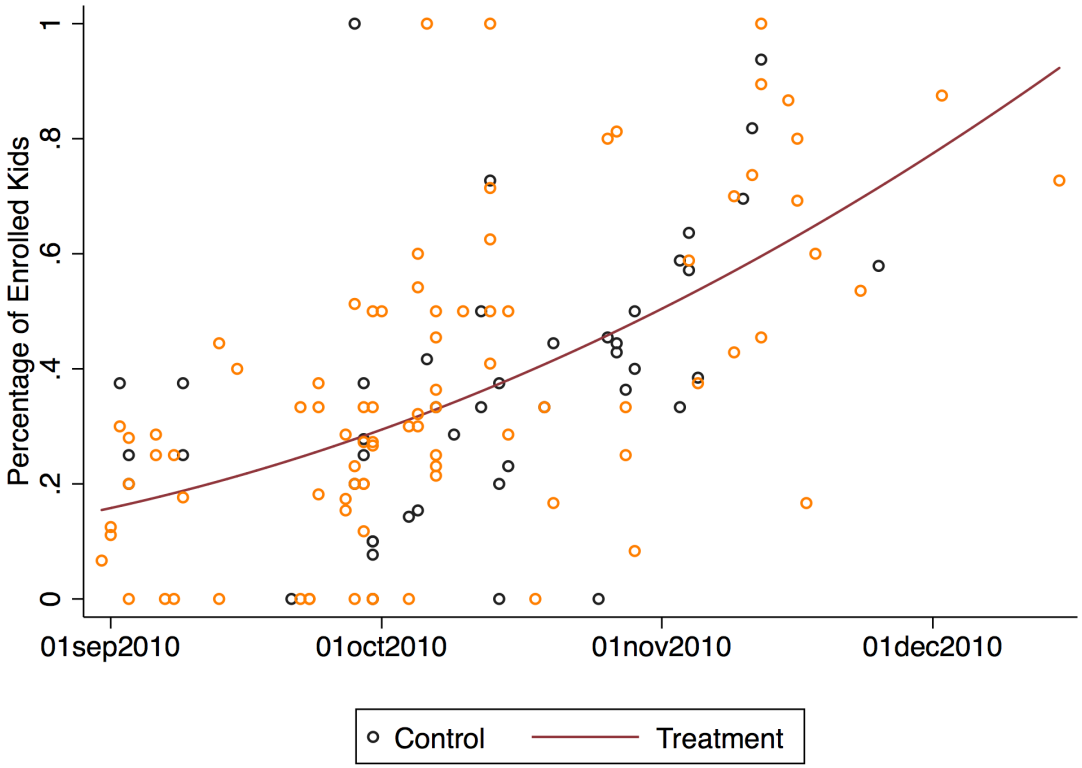
Treatment and control groups for Santiago

Sample Size: 133 preschools across three regions.

Take up: 10 preschools declined participation.

Data: Collected Baseline, Follow up, Admin. Records.

Timing: Visited preschools over three months.



Balance Schools | Balance Enrolled

Balance at the Family Level

	T-C		Mean Control	
Enrollment	-1.9	(3.2)	41.5	(2.5)
Mean attendance	-1.1	(2.4)	28.7	(1.9)
Mother HE	-0.6	(1.5)	9.5	(1.3)
Mother HS	-0.9	(2.1)	48.3	(1.6)
Mother NHS	0.8	(1.0)	7.3	(0.6)
Q1 Income	0.6	(2.9)	57.9	(2.3)
Q2 Income	0.3	(2.1)	31.3	(1.6)
Q3 Income	-1.1	(1.2)	8.7	(0.9)
Very Poor	0.6	(1.8)	14.9	(1.4)
Poor	0.1	(2.2)	40.6	(1.8)

Balance Across Enrollment Status

	Enrolled-Nonenrolled		Mean Control	
Household size	-0.04	(0.12)	4.92	(0.08)
Durable goods	*0.38**	*(0.12)*	*4.46*	*(0.08)*
Owns Dwelling	0.05	(0.03)	0.34	(0.02)
Mother head of hh	0.001	(0.03)	0.83	(0.01)
Mother NHS	-0.01	(0.02)	0.19	(0.02)
Mother HS	-0.04	(0.02)	0.39	(0.02)
Mother HE	0.007	(0.01)	0.83	(0.02)
Poor	-0.01	(0.01)	0.89	(0.01)
Another child in primary	0.01	(0.03)	0.40	(0.02)
Gestation Weeks	-0.02	(0.09)	38.7	(0.05)
Birth Weight	-0.03	(0.26)	3.34	(15.40)
Mother's Age	0.32	(0.36)	25.3	(0.21)
Father's Age	-1.6	(1.22)	36.4	(0.93)
Marital Status	-0.02	(0.02)	1.7	(0.01)
Doctor	-0.01	(0.02)	0.3	(0.02)
Hospital	*0.01**	*(0.01)*	*0.97*	*(0.01)*
Number of Children	0.10	(0.09)	1.8	(0.04)

Results on School Choice - Price, Quality and Distance

Table: Effect of Treatment on Price, Quality and Distance

	Price		Quality			Distance
Panel A: Full Sample						
	Positive	OoP	2nd - Lang	4th -Average	Value Added	
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	0.076**	0.063	0.029	0.027	0.032	0.245
	(0.034)	(0.076)	(0.020)	(0.028)	(0.027)	(0.194)
N obs.	1355	1352	1353	1355	1349	1355
Panel B: Already enrolled						
Treatment	0.000	0.050	-0.018	-0.043	-0.053	-0.265
	(0.057)	(0.154)	(0.039)	(0.047)	(0.050)	(0.375)
N obs.	527	525	527	527	526	527
Panel C: Not enrolled						
Treatment	0.159***	0.104	0.058**	0.070**	0.084**	0.440**
	(0.041)	(0.099)	(0.029)	(0.035)	(0.034)	(0.221)
N obs.	828	827	826	828	823	828

Note: Controls include market characteristics of schools (number and test scores mean, standard deviation and percentiles 25, 50 and 75.).

Details

Results on Outcomes: Student Test Scores

Table: Effect of Treatment on Student Test Scores

	Lang - 2nd		Average - 4th		Lang - 4th		Math - 4th	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Full Sample								
Treatment	-0.008	-0.028	0.103*	0.085	0.046	0.021	0.149**	0.137**
	(0.052)	(0.059)	(0.058)	(0.058)	(0.066)	(0.068)	(0.062)	(0.060)
N obs.	1392	1218	1267	1112	1242	1093	1240	1090
Panel B: Enrolled sample								
Treatment	-0.076	-0.110	-0.080	-0.115	-0.102	-0.140	-0.012	-0.036
	(0.110)	(0.109)	(0.103)	(0.107)	(0.120)	(0.126)	(0.111)	(0.115)
N obs.	492	484	450	443	448	441	438	432
Panel C: Not enrolled sample								
Treatment	0.068	0.050	0.232***	0.214***	0.173*	0.136	0.254***	0.257***
	(0.072)	(0.073)	(0.083)	(0.078)	(0.099)	(0.092)	(0.079)	(0.076)
N obs.	761	734	695	669	677	652	682	658

Note: Controls include market characteristics of schools (number and test scores mean, standard deviation and percentiles 25, 50 and 75.).

Accum. VA

Summary of RCT Results

1. Evidence suggests treatment shifts family school choice behavior $\Rightarrow$ Increases average school quality, price and distance chosen.

Summary of RCT Results

1. Evidence suggests treatment shifts family school choice behavior $\Rightarrow$ Increases average school quality, price and distance chosen.

2. Evidence suggests treatment student achievement **five years later** $\Rightarrow$ Increases average student test scores.

Summary of RCT Results

1. Evidence suggests treatment shifts family school choice behavior $\Rightarrow$ Increases average school quality, price and distance chosen.
2. Evidence suggests treatment student achievement **five years later** $\Rightarrow$ Increases average student test scores.
3. Some evidence of heterogeneous effects across SES groups.

Summary of RCT Results

1. Evidence suggests treatment shifts family school choice behavior $\Rightarrow$ Increases average school quality, price and distance chosen.

2. Evidence suggests treatment student achievement **five years later** $\Rightarrow$ Increases average student test scores.

3. Some evidence of heterogeneous effects across SES groups.
   - Treatment effects are bigger for the lowest SES (mothers who did not finish HS)

Summary of RCT Results

1. Evidence suggests treatment shifts family school choice behavior $\Rightarrow$ Increases average school quality, price and distance chosen.

2. Evidence suggests treatment student achievement **five years later** $\Rightarrow$ Increases average student test scores.

3. Some evidence of heterogeneous effects across SES groups.
   - Treatment effects are bigger for the lowest SES (mothers who did not finish HS)

Summary of RCT Results

1. Evidence suggests treatment shifts family school choice behavior $\Rightarrow$ Increases average school quality, price and distance chosen.

2. Evidence suggests treatment student achievement **five years later** $\Rightarrow$ Increases average student test scores.

3. Some evidence of heterogeneous effects across SES groups.
   - Treatment effects are bigger for the lowest SES (mothers who did not finish HS)

$\Rightarrow$ How do we take these results small scale ATE and think about potential policy effects of a scale up?

Roadmap for this paper

1. **RCT:** Describe results of an RCT evaluating the effects of an information intervention

Roadmap for this paper

1. **RCT:** Describe results of an RCT evaluating the effects of an information intervention
2. **Model Demand and Supply:** Exploit the variation from both the administrative data, recent policy changes and the RCT experiment to a estimate a model of demand and supply for schools.

Roadmap for this paper

1. **RCT:** Describe results of an RCT evaluating the effects of an information intervention
2. **Model Demand and Supply:** Exploit the variation from both the administrative data, recent policy changes and the RCT experiment to a estimate a model of demand and supply for schools.
3. **Counterfactuals** Use the model to describe different counterfactual exercises to quantify the effects of a policy that scales up the intervention.

Demand for Differentiated Schools

Family i is characterized by $(x_i, v_i, \epsilon_i, \text{loc}_i)$ and gets the following utility from school j :

Demand for Differentiated Schools

Family i is characterized by $(x_i, v_i, \epsilon_i, \text{loc}_i)$ and gets the following utility from school j :

Demand for Differentiated Schools

Family i is characterized by $(x_i, v_i, \epsilon_i, \text{loc}_i)$ and gets the following utility from school j :

$$u_{ij} = \delta_j + \beta_i q_j - \alpha_i p_j + \lambda_i D_{ij} + \epsilon_{ij}$$

q_{jt} : Schools value added in terms of test scores.

p_{jt} : Schools price over the voucher.

x_i : Observable child and family characteristics such as mother's education and income.

v_i^q : Unobservable child and family preferences for quality.

loc_i : Location of family.

δ_j : School mean utility.

D_{ij} : Distance from school j to family i.

Demand for Differentiated Schools

Family i is characterized by $(x_i, v_i, \epsilon_i, \text{loc}_i)$ and gets the following utility from school j :

$$u_{ij} = \delta_j + \beta_i q_j - \alpha_i p_j + \lambda_i D_{ij} + \epsilon_{ij}$$

$$\alpha_i = \sum_k \alpha_k \cdot \text{Type}_{ik} \qquad \text{and} \qquad \lambda_i = \sum_k \lambda_k \cdot \text{Type}_{ik}$$

$$\beta_i = \sum_k (\beta_k + \phi_k \cdot \text{Treat}_i) \cdot \text{Type}_{ik} + \beta^U v_i^q$$

$$v_i^q \sim N(0, \sigma^q) \qquad \text{score}_{ijt} = q_{jt} + X_i\gamma + \nu_{ijt}$$

q_{jt} : Schools value added in terms of test scores.

p_{jt} : Schools price over the voucher.

x_i : Observable child and family characteristics such as mother's education and income.

v_i^q : Unobservable child and family preferences for quality.

loc_i : Location of family.

δ_j : School mean utility.

D_{ij} : Distance from school j to family i.

Families in the Model

Consumers have three types of characteristics in the model:

Families in the Model

Consumers have three types of characteristics in the model:

Education of the mother: Less than HS, HS and More than HS.

Families in the Model

Consumers have three types of characteristics in the model:

Education of the mother: Less than HS, HS and More than HS.

Income status: Income Status, Poorest 40%

Families in the Model

Consumers have three types of characteristics in the model:

Education of the mother: Less than HS, HS and More than HS.

Income status: Income Status, Poorest 40%

Location: Node in the market, nodes are groups of approximately 5 blocks.

Families in the Model

Consumers have three types of characteristics in the model:

Education of the mother: Less than HS, HS and More than HS.

Income status: Income Status, Poorest 40%

Location: Node in the market, nodes are groups of approximately 5 blocks.

This determines 6 "Types" of consumers that live at each of the N_m nodes in the market.

Families in the Model

Consumers have three types of characteristics in the model:

Education of the mother: Less than HS, HS and More than HS.

Income status: Income Status, Poorest 40%

Location: Node in the market, nodes are groups of approximately 5 blocks.

This determines 6 "Types" of consumers that live at each of the N_m nodes in the market.

The experiment generates more 4 more "Types" of consumers once they are exposed to the treatment.

Families in the Model

Consumers have three types of characteristics in the model:

Education of the mother: Less than HS, HS and More than HS.

Income status: Income Status, Poorest 40%

Location: Node in the market, nodes are groups of approximately 5 blocks.

This determines 6 "Types" of consumers that live at each of the N_m nodes in the market.

The experiment generates more 4 more "Types" of consumers once they are exposed to the treatment.

Consumers also vary by their unobservable preference for school quality v_i^q.

Determining the Distribution of School Quality Attended

The market share of a given school j will be :

$$s_j(\mathbf{q}, \mathbf{p}, \boldsymbol{\xi}) = \sum_k^K \sum_n^{N_m} s_{jk}^n(\mathbf{q}, \mathbf{p}, \boldsymbol{\xi}) \cdot w_k(n) \Pi_k$$

Determining the Distribution of School Quality Attended

The market share of a given school j will be :

$$s_j(\mathbf{q}, \mathbf{p}, \boldsymbol{\xi}) \quad = \sum_k^K \sum_n^{N_m} s_{jk}^n(\mathbf{q}, \mathbf{p}, \boldsymbol{\xi}) \cdot w_k(n) \Pi_k$$

- Distribution of school quality chosen by families of different SES can be attributed to two source: **Preferences** and **Choice sets**.

Determining the Distribution of School Quality Attended

The market share of a given school j will be :

$$s_j(\mathbf{q}, \mathbf{p}, \boldsymbol{\xi}) \quad = \sum_k^K \sum_n^{N_m} s_{jk}^n(\mathbf{q}, \mathbf{p}, \boldsymbol{\xi}) \cdot w_k(n) \Pi_k$$

- Distribution of school quality chosen by families of different SES can be attributed to two source: **Preferences** and **Choice sets**.
- Change in quality of schools chosen given the experiment must be driven by **changing preferences** (weights on Xs) given random assignment.

Determining the Distribution of School Quality Attended

The market share of a given school j will be :

$$s_j(\mathbf{q}, \mathbf{p}, \boldsymbol{\xi}) \quad = \sum_k^K \sum_n^{N_m} s_{jk}^n(\mathbf{q}, \mathbf{p}, \boldsymbol{\xi}) \cdot w_k(n) \Pi_k$$

- Distribution of school quality chosen by families of different SES can be attributed to two source: **Preferences** and **Choice sets**.
- Change in quality of schools chosen given the experiment must be driven by **changing preferences** (weights on Xs) given random assignment.
- Its possible preferences changed but given limits to choices, we see small average ITT effects.

Estimation of School Choice

This section draws on demand estimation from Neilson (2014, 2017) and follows standard empirical IO tools.

Estimation of School Choice

This section draws on demand estimation from Neilson (2014, 2017) and follows standard empirical IO tools.

Firm optimization from the supply side implies there is an endogeneity problem as prices and quality are correlated with unobservable ξ_{jt}. Berry (1994)

Estimation of the parameters $\theta = \{\alpha, \beta, \lambda, \sigma, \xi\}$ is done by **method of simulated moments**.

Estimation of School Choice

This section draws on demand estimation from Neilson (2014, 2017) and follows standard empirical IO tools.

Firm optimization from the supply side implies there is an endogeneity problem as prices and quality are correlated with unobservable ξ_{jt}. Berry (1994)

Estimation of the parameters $\theta = \{\alpha, \beta, \lambda, \sigma, \xi\}$ is done by **method of simulated moments**.

We combine **aggregate**, **IV** and **micro moments** from administrative data in estimation following the literature. Berry (1994), BLP (1995), Petrin (2002), BLP (2004), and for this setting see Neilson (2017).

Estimation of School Choice

This section draws on demand estimation from Neilson (2014, 2017) and follows standard empirical IO tools.

Firm optimization from the supply side implies there is an endogeneity problem as prices and quality are correlated with unobservable ξ_{jt}. Berry (1994)

Estimation of the parameters $\theta = \{\alpha, \beta, \lambda, \sigma, \xi\}$ is done by **method of simulated moments**.

We combine **aggregate**, **IV** and **micro moments** from administrative data in estimation following the literature. Berry (1994), BLP (1995), Petrin (2002), BLP (2004), and for this setting see Neilson (2017).

We add a second stage of estimation with additional **Experiment Moments** that are produced from the RCT.

Experiment Moments

The experiment provides several potential instruments to be used in estimation.

Experiment Moments

The experiment provides several potential instruments to be used in estimation. We choose to match the coefficents for ITT which is most salient results generally presented in experimental work.

$$\beta^T = (X'X)^{-1} X'q$$

Experiment Moments

The experiment provides several potential instruments to be used in estimation. We choose to match the coefficents for ITT which is most salient results generally presented in experimental work.

$$\beta^T = (X'X)^{-1} X'q$$

To generate these moments we map observations in the experimental sample to nodes on the map and types.

Experiment Moments

The experiment provides several potential instruments to be used in estimation. We choose to match the coefficents for ITT which is most salient results generally presented in experimental work.

$$\beta^T = (X'X)^{-1} X'q$$

To generate these moments we map observations in the experimental sample to nodes on the map and types.
We simulate 1000 samples of unobservables for the experimental sample and use the simulated choices to run regresstions

$$\widetilde{\beta}_s^T = (X'X)^{-1} X'\widetilde{q}_s$$

$$M^{Exp}(\theta) = \frac{1}{N_s} \sum_{s=1}^{N_s} \left(\beta^T - \widetilde{\beta}_s^T \right)$$

Summary of Moments

Aggregate moments : $\overline{s} = s(\theta)$.

In other words the empirical share equation must hold for each firm in each market x time period.

Summary of Moments

Aggregate moments : $\overline{s} = s(\theta)$.
In other words the empirical share equation must hold for each firm in each market x time period.

IV moments : $E(IV'\xi) = 0)$
Instruments for price and quality need to be exogenous to the firm x time x market specific unobservable ξ. Instruments

Summary of Moments

Aggregate moments : $\overline{s} = s(\theta)$.
In other words the empirical share equation must hold for each firm in each market x time period.

IV moments : $E(IV'\xi) = 0)$
Instruments for price and quality need to be exogenous to the firm x time x market specific unobservable ξ. Instruments

Micro moments : $\overline{M} = M(\theta)$
Model needs to replicate certain aspects of microdata, in particular average quality, price and distance traveled by each type of consumer in each market.

Summary of Moments

Aggregate moments : $\overline{s} = s(\theta)$.
In other words the empirical share equation must hold for each firm in each market x time period.

IV moments : $E(IV'\xi) = 0)$
Instruments for price and quality need to be exogenous to the firm x time x market specific unobservable ξ. Instruments

Micro moments : $\overline{M} = M(\theta)$
Model needs to replicate certain aspects of microdata, in particular average quality, price and distance traveled by each type of consumer in each market.

Experiment moments : $\overline{M^T} = M(\theta, T)$
Model needs to replicate the β ITT observed in the experiment. Moments

Table: Demand Model Estimates

φ_k^q - Weight on Quality	
Quality	1.37†
Mother HS	1.57†
Mother College	1.89†
Poor Household	-0.58†
Treated Mother No HS	0.58†
Treated Mother hspace	0.22†
φ_k^p - Weight on Price	
Mother No HS	-9.89†
Mother HS	-2.84†
Mother College	-0.01†
Poor Household	-3.31†
Treated Mother No HS	7.74†
Treated Mother HS	1.01†
φ_k^d - Weight on Distance	
Mother No HS	-0.99†
Mother HS	-0.70†
Mother College	-0.38†
Poor Household	-0.21†
Treated Mother No HS	0.44†
Treated Mother HS	0.35†
σ - Quality	0.13†

Note: † indicates significance at 0.01 confidence level.

Demand Side Simulation

- Demand side estimates allow for considering sorting and congestion.

Demand Side Simulation

- Demand side estimates allow for considering sorting and congestion.
- The assumption behind these exercises is that once the policy is expanded each student can go to her most prefered school.

Demand Side Simulation

- Demand side estimates allow for considering sorting and congestion.
- The assumption behind these exercises is that once the policy is expanded each student can go to her most prefered school.
- However, the simulated sorting of students may not be feasible. To take this into account:

Demand Side Simulation

- Demand side estimates allow for considering sorting and congestion.
- The assumption behind these exercises is that once the policy is expanded each student can go to her most prefered school.
- However, the simulated sorting of students may not be feasible. To take this into account:
  - We impose capacity constraints on schools (we the to be assume fixed in the short run)

Demand Side Simulation

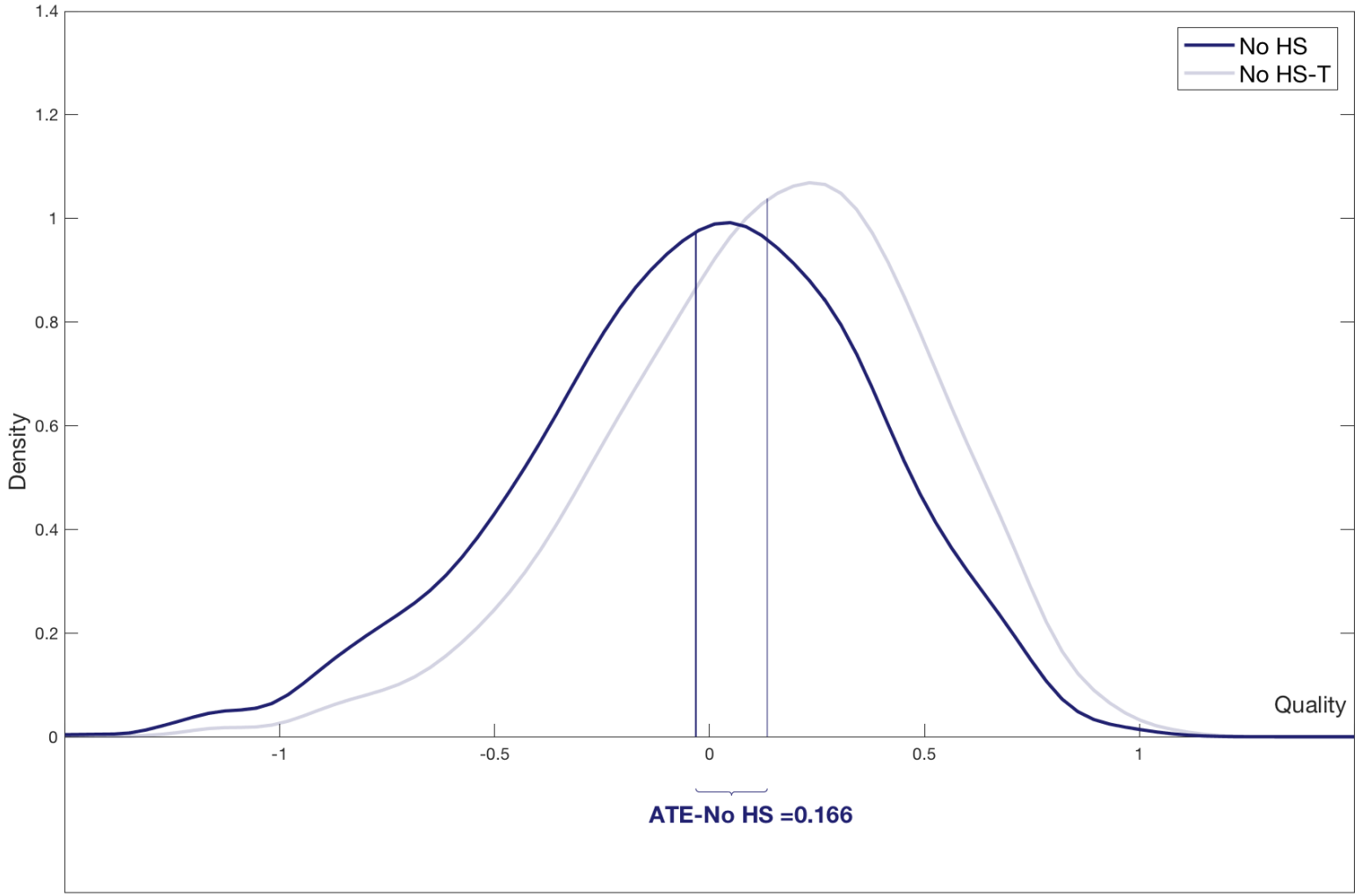
- Demand side estimates allow for considering sorting and congestion.
- The assumption behind these exercises is that once the policy is expanded each student can go to her most prefered school.
- However, the simulated sorting of students may not be feasible. To take this into account:
  - We impose capacity constraints on schools (we the to be assume fixed in the short run)
  - Based on preferences from the model, we simulated rank order lists.

Demand Side Simulation

- Demand side estimates allow for considering sorting and congestion.
- The assumption behind these exercises is that once the policy is expanded each student can go to her most prefered school.
- However, the simulated sorting of students may not be feasible. To take this into account:
  - We impose capacity constraints on schools (we the to be assume fixed in the short run)
  - Based on preferences from the model, we simulated rank order lists.
  - We solve excess of demand by using a DA centralized mechanism. This is a reasonable counterfactual, as Chile implementated such admission system in 2017.

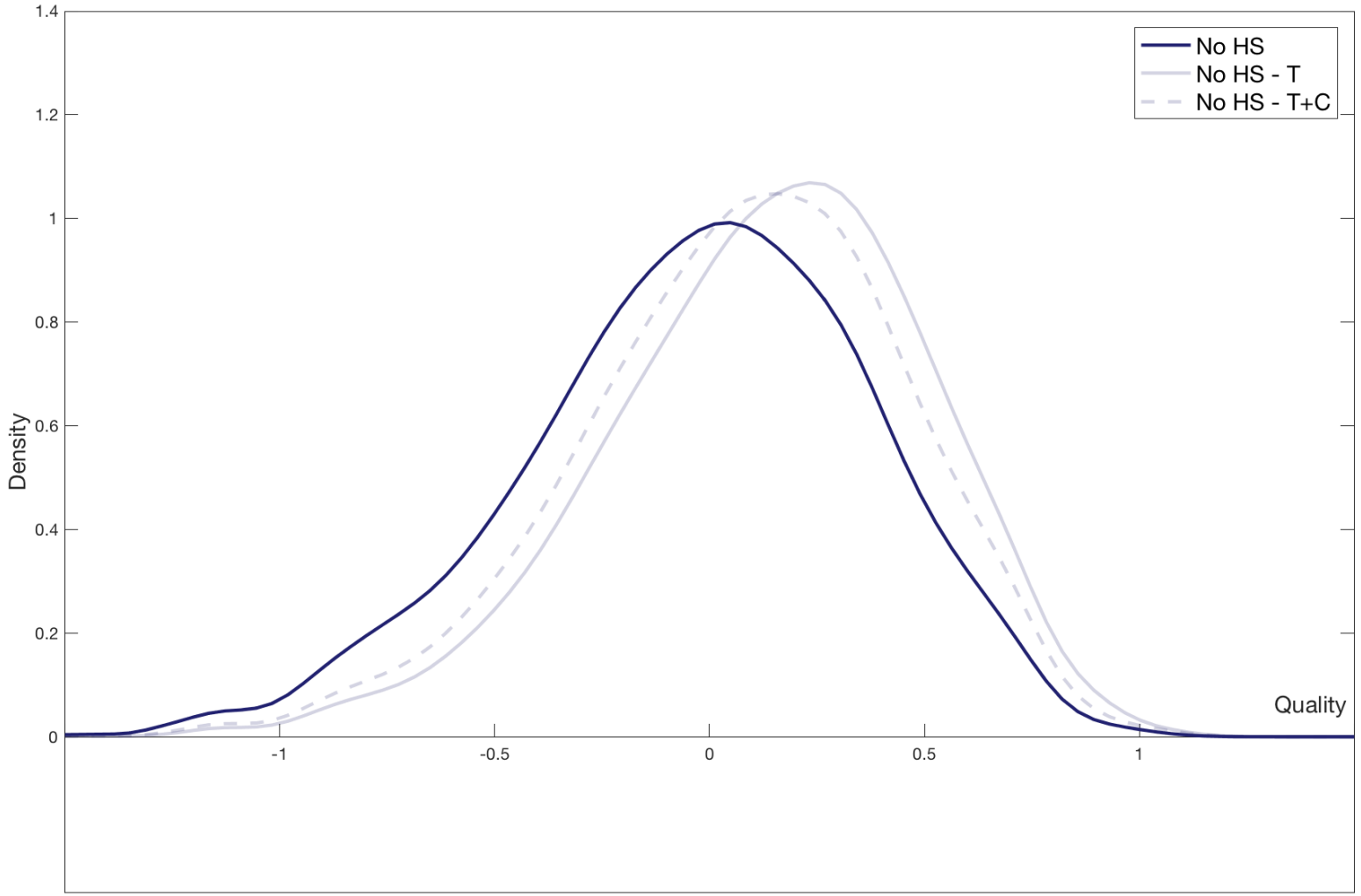
Distribution of School Quality when Policy is Expanded

We can look at the ATE for each type group



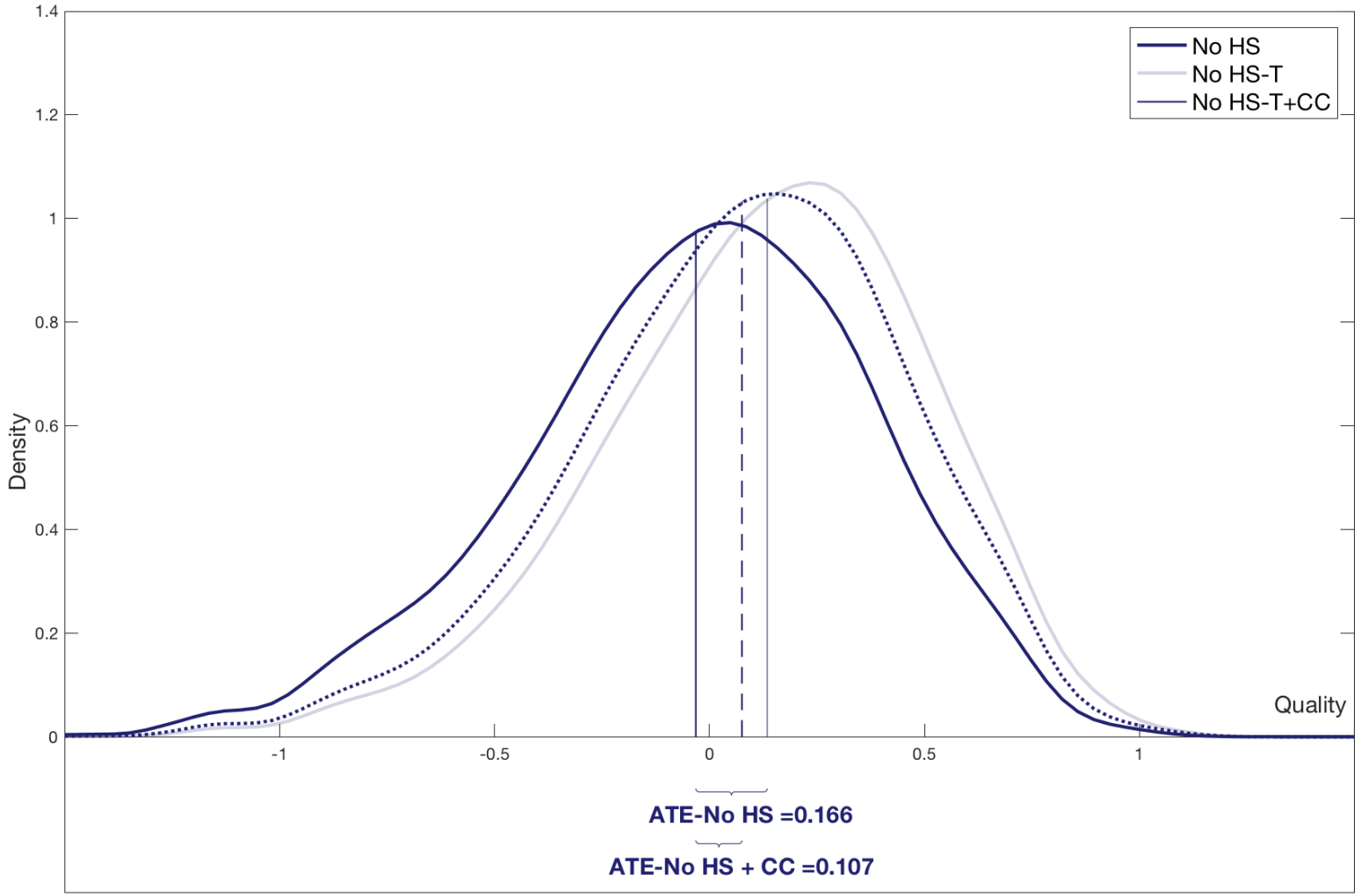
Distribution of School Quality when Policy is Expanded

We can look at the ATE for each type group



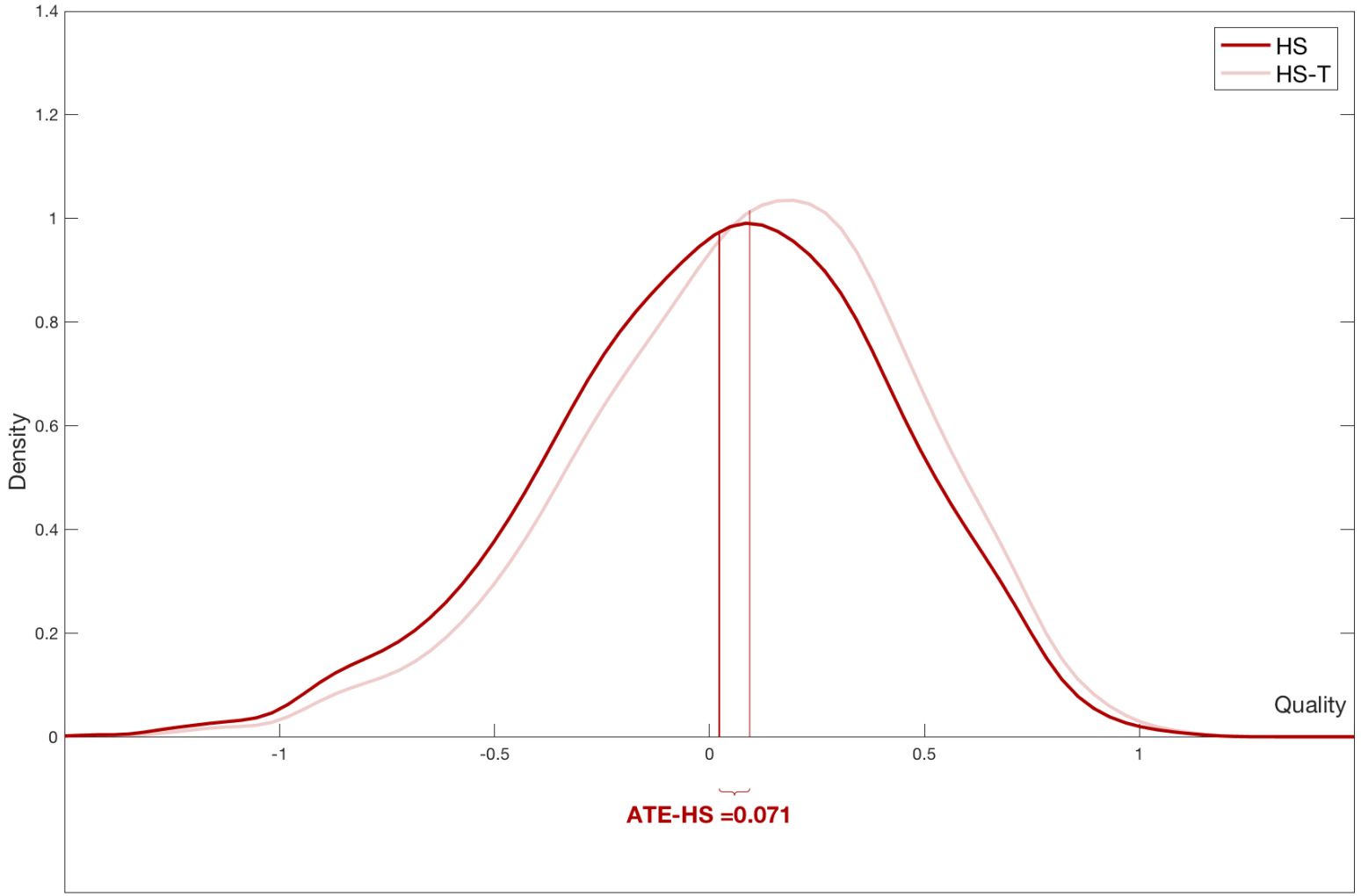
Distribution of School Quality when Policy is Expanded

We can look at the ATE for each type group



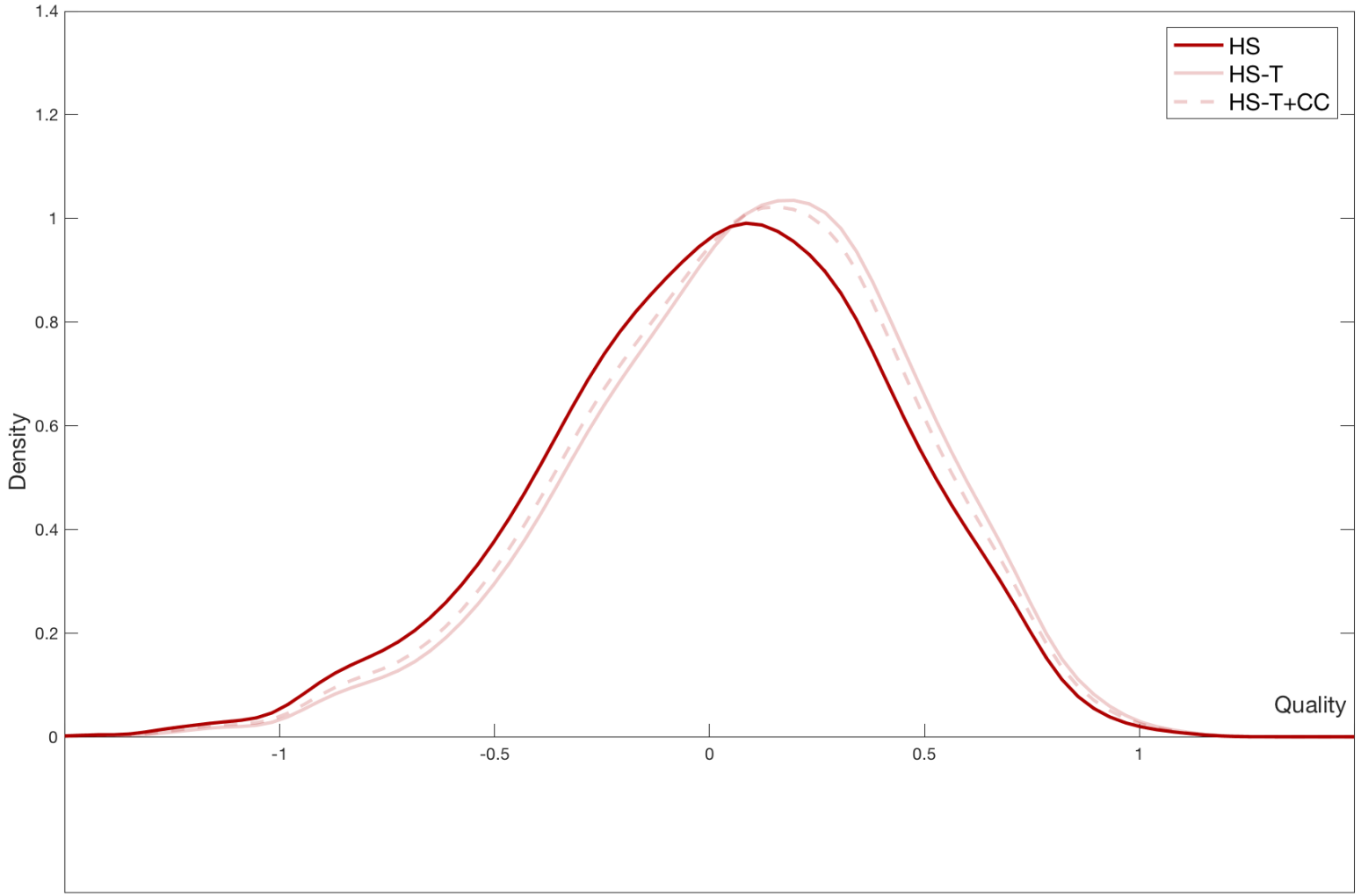
Distribution of School Quality when Policy is Expanded

We can look at the ATE for each type group



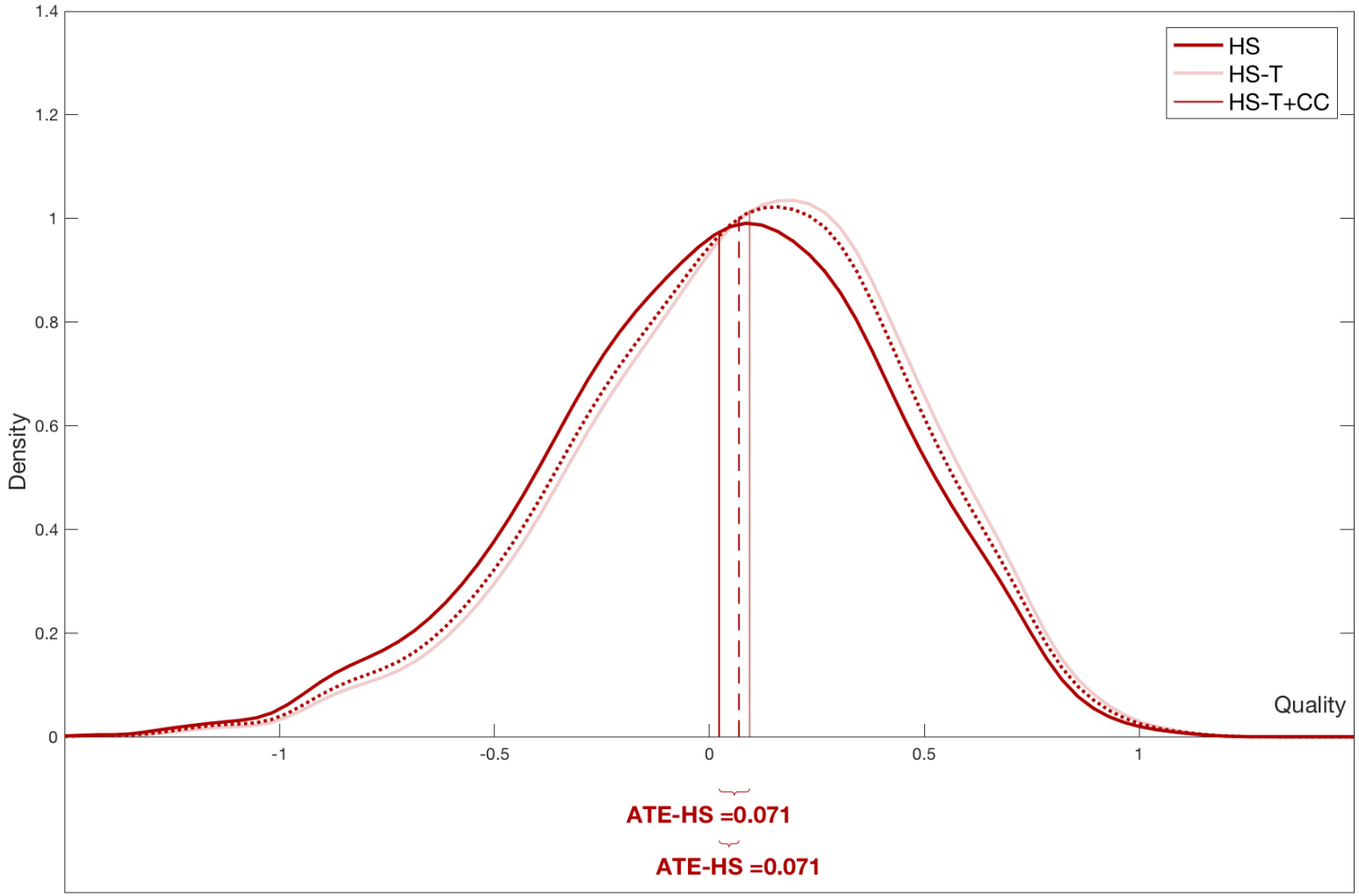
Distribution of School Quality when Policy is Expanded

We can look at the ATE for each type group



Distribution of School Quality when Policy is Expanded

We can look at the ATE for each type group



Supply Side Considerations

Supply Side Considerations

- Supply side can have non trivial effects if schools react to demand side pressure.

Supply Side Considerations

- Supply side can have non trivial effects if schools react to demand side pressure.
  1. Many schools are for profit.

Supply Side Considerations

- Supply side can have non trivial effects if schools react to demand side pressure.
  1. Many schools are for profit.
  2. Prior work has shown that supply side effects can be important in Chile - Neilson (2014, 2017), and information has supply side well as in other context Andrabi, Das, Khwaja (2017)

Schools as profit maximizing firms

Schools as profit maximizing firms

We model schools behavior as profit maximizing firms to get insights on what their incentives are and how they might change if the policy were to be scaled up.

The profit function for a school in a particular market with N students is the following :

Schools as profit maximizing firms

We model schools behavior as profit maximizing firms to get insights on what their incentives are and how they might change if the policy were to be scaled up.

The profit function for a school in a particular market with N students is the following :

$$\pi_j(\mathbf{q}, \mathbf{p}, \boldsymbol{\xi}) = N s_j(\mathbf{q}, \mathbf{p}, \boldsymbol{\xi}) (v + p_j - MC(q_j)) - F_j$$

Schools as profit maximizing firms

We model schools behavior as profit maximizing firms to get insights on what their incentives are and how they might change if the policy were to be scaled up.

The profit function for a school in a particular market with N students is the following :

$$\pi_j(\mathbf{q}, \mathbf{p}, \boldsymbol{\xi}) = N s_j(\mathbf{q}, \mathbf{p}, \boldsymbol{\xi}) \left(v + p_j - MC(q_j)\right) - F_j$$

$$\pi_j(\mathbf{q}, \mathbf{p}, \boldsymbol{\xi}) = N \underbrace{\left(\sum_k^K \sum_n^{N_m} s_{nk}(\mathbf{q}, \mathbf{p}, \boldsymbol{\xi}) w_k(n) \Pi_k \right)}_{s_j} \left(v + p_j - MC(q_j)\right) - F_j$$

First Order Conditions : Quality

Firms choose quality comparing the marginal benefit of attracting more students relative to the marginal increase in the costs.

First Order Conditions : Quality

Firms choose quality comparing the marginal benefit of attracting more students relative to the marginal increase in the costs. Market power will allow firms to provide quality with a "**mark down**" relative to marginal costs.

First Order Conditions : Quality

Firms choose quality comparing the marginal benefit of attracting more students relative to the marginal increase in the costs. Market power will allow firms to provide quality with a "**mark down**" relative to marginal costs. Assuming $MC(q_{jt}) = \sum_l \gamma_l w_j^l + (\gamma_q + \omega_{jt})\, q_{jt}$.

$$\frac{\partial \pi_j(\mathbf{q}, \mathbf{p}, \boldsymbol{\xi})}{\partial q_j} = N \frac{\partial s_j(\mathbf{q}, \mathbf{p}, \boldsymbol{\xi})}{\partial q_j} (v + p_j - MC(q_j)) + N s_j(\mathbf{q}, \mathbf{p}, \boldsymbol{\xi}) \cdot (\gamma^q + \omega_{jt}) = 0 \quad (1)$$

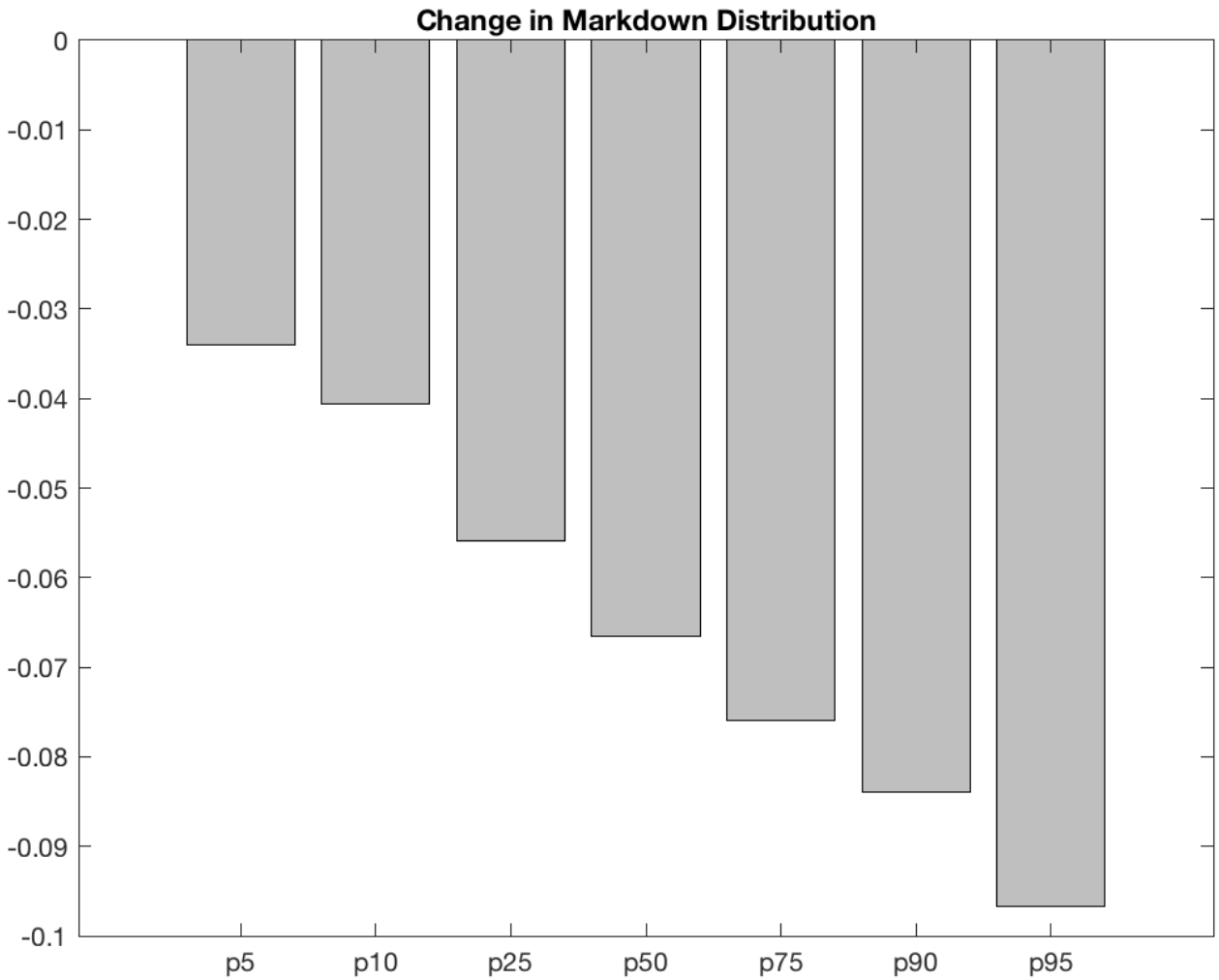
First Order Conditions : Quality

Firms choose quality comparing the marginal benefit of attracting more students relative to the marginal increase in the costs. Market power will allow firms to provide quality with a "**mark down**" relative to marginal costs. Assuming $MC(q_{jt}) = \sum_l \gamma_l w_j^l + (\gamma_q + \omega_{jt})\, q_{jt}$.

$$\frac{\partial \pi_j(\mathbf{q},\mathbf{p},\boldsymbol{\xi})}{\partial q_j} = N \frac{\partial s_j(\mathbf{q},\mathbf{p},\boldsymbol{\xi})}{\partial q_j} (v + p_j - MC(q_j)) + N s_j(\mathbf{q},\mathbf{p},\boldsymbol{\xi}) \cdot (\gamma^q + \omega_{jt}) = 0 \quad (1)$$

$$q_{jt}^* = \left[\frac{v + p_{jt} - \sum_l \gamma_l w_{jt}^l}{\gamma_q + \omega_{jt}} \right] - \underbrace{s_{jt}(\mathbf{q},\mathbf{p},\boldsymbol{\xi}) \left[\frac{\partial s_{jt}(\mathbf{q},\mathbf{p},\boldsymbol{\xi})}{\partial q_{jt}} \right]^{-1}}_{\text{Quality Mark Down}} \quad (2)$$

Mark-down change - Percentiles



Supply Side Estimation

- Take advantage of variation in policy over time and costs across markets.
  - Targeted vouchers (choice sets + transfers Details)
  - Teacher wages (policy variation in public sector + IRS data for private sector)

Supply Side Estimation

- Take advantage of variation in policy over time and costs across markets.
  - Targeted vouchers (choice sets + transfers Details)
  - Teacher wages (policy variation in public sector + IRS data for private sector)
- We exploit the panel nature of the data estimating persistence in marginal costs by firm.

Supply Side Moments for Estimation of Cost Parameters

- We get an expression for the cost unobservable rearranging the quality FOC
- We explit the panel structure of the data
- We decompose the unobservable $\omega_{jt} = \overline{\omega_j} + \Delta\omega_{jt}$
  - A school-specific fixed component $\overline{\omega_j}$
  - A time-school-specific component $\Delta\omega_{jt}$

$$\Delta\omega_{jt} = \frac{v + p_{jt} - \sum_l \gamma^l w_{jt}^l}{\left[q_{jt}^* + s_{jt}(\mathbf{q}, \mathbf{p}, \boldsymbol{\xi}) \left[\frac{\partial s_{jt}(\mathbf{q}, \mathbf{p}, \boldsymbol{\xi})}{\partial q_{jt}} \right]^{-1} \right]} - \gamma^q - \overline{\omega_j} \tag{3}$$

- We make this expression orthogonal to the instruments.

Supply Estimation and Experimental Results

Table: Supply Model Estimates

	Coef.	Std. Error
γ_I		
Voucher	0.44	0.13
Public	0.74	0.23
For Profit	0.16	0.09
Religious	-0.15	0.05
Constant (Mean Market FE)	0.27	-
γ_q		
Constant (Mean Firm FE)	0.31	-

Figure: Market Fixed Effects

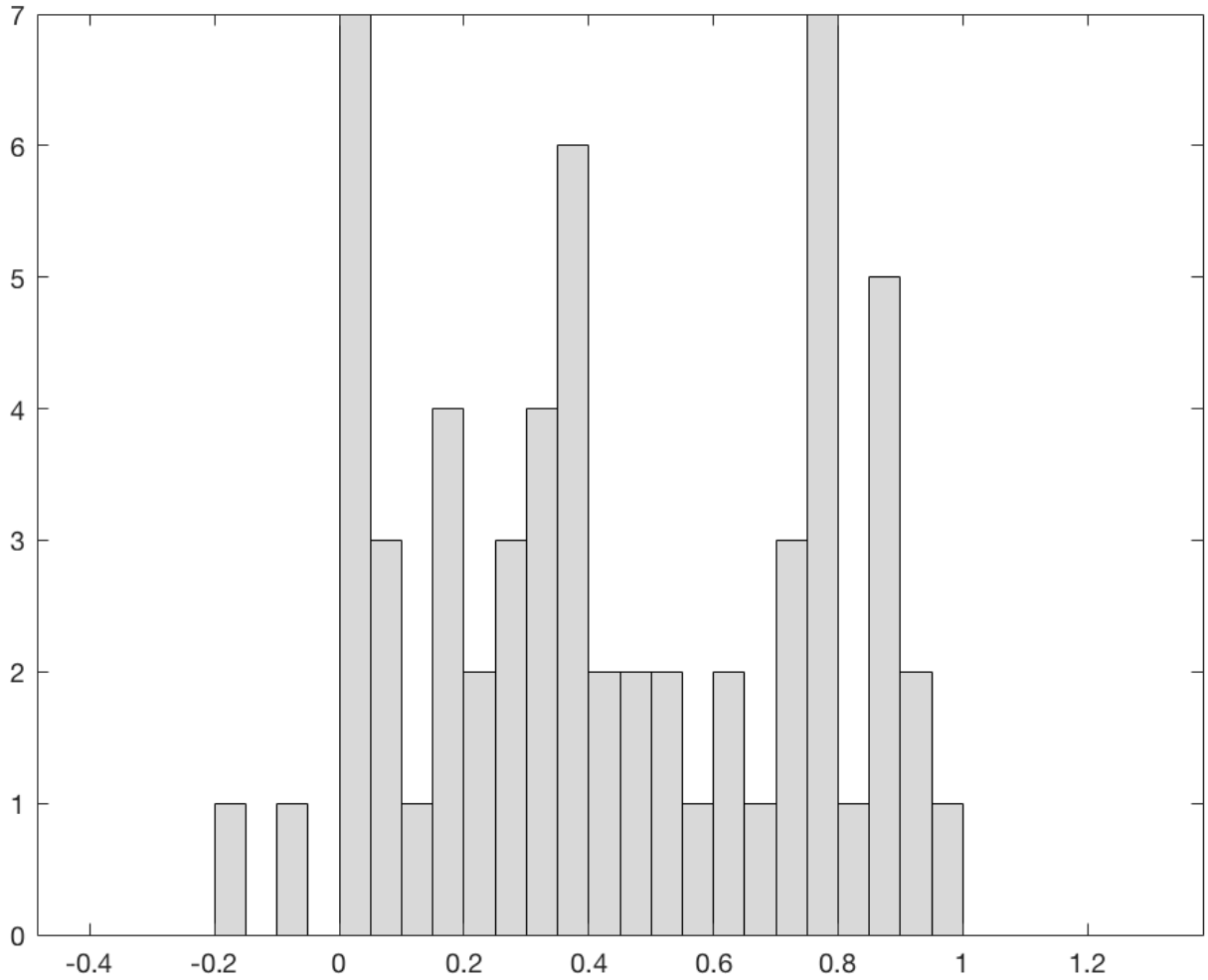


Figure: Firm Fixed Effects

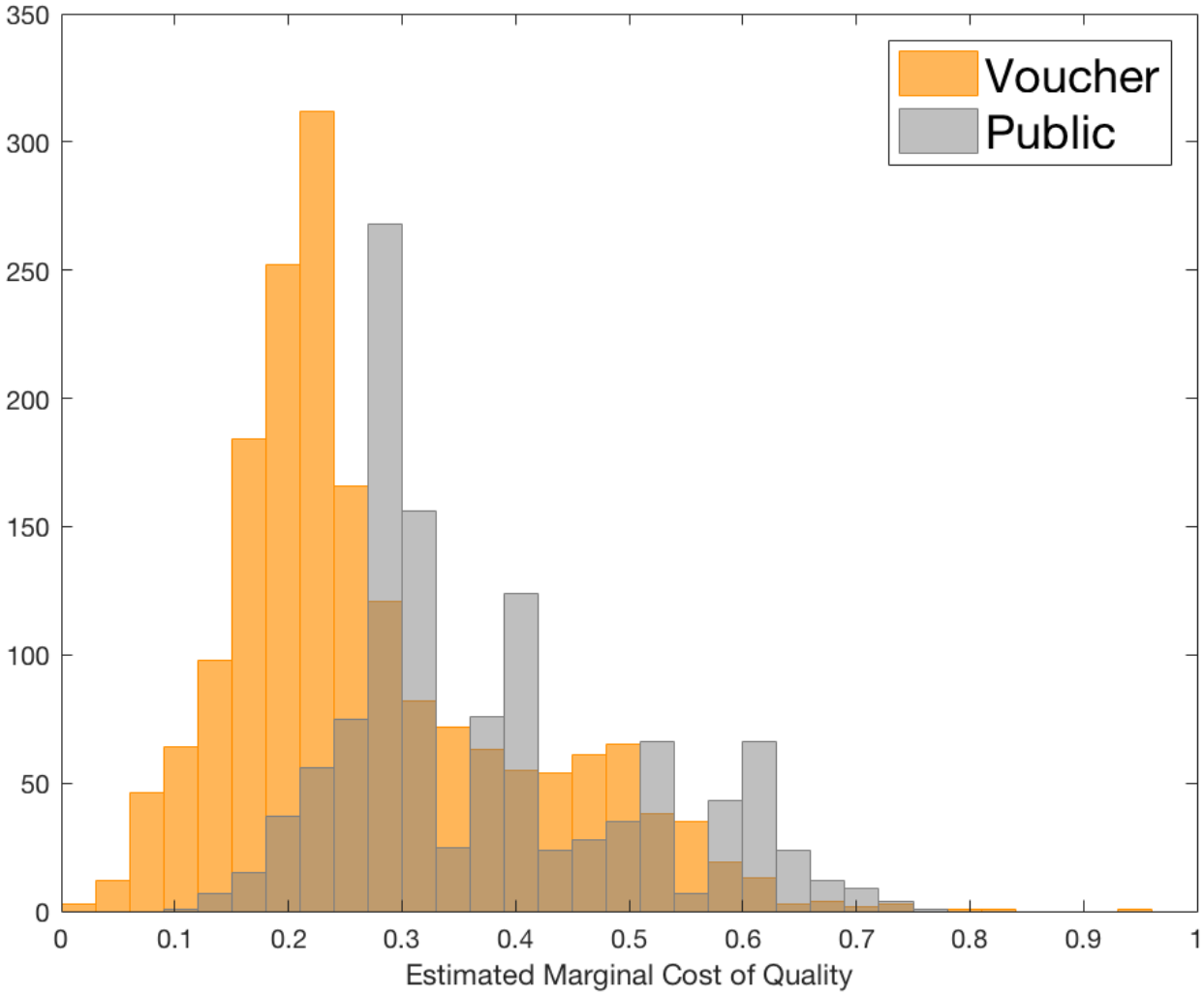
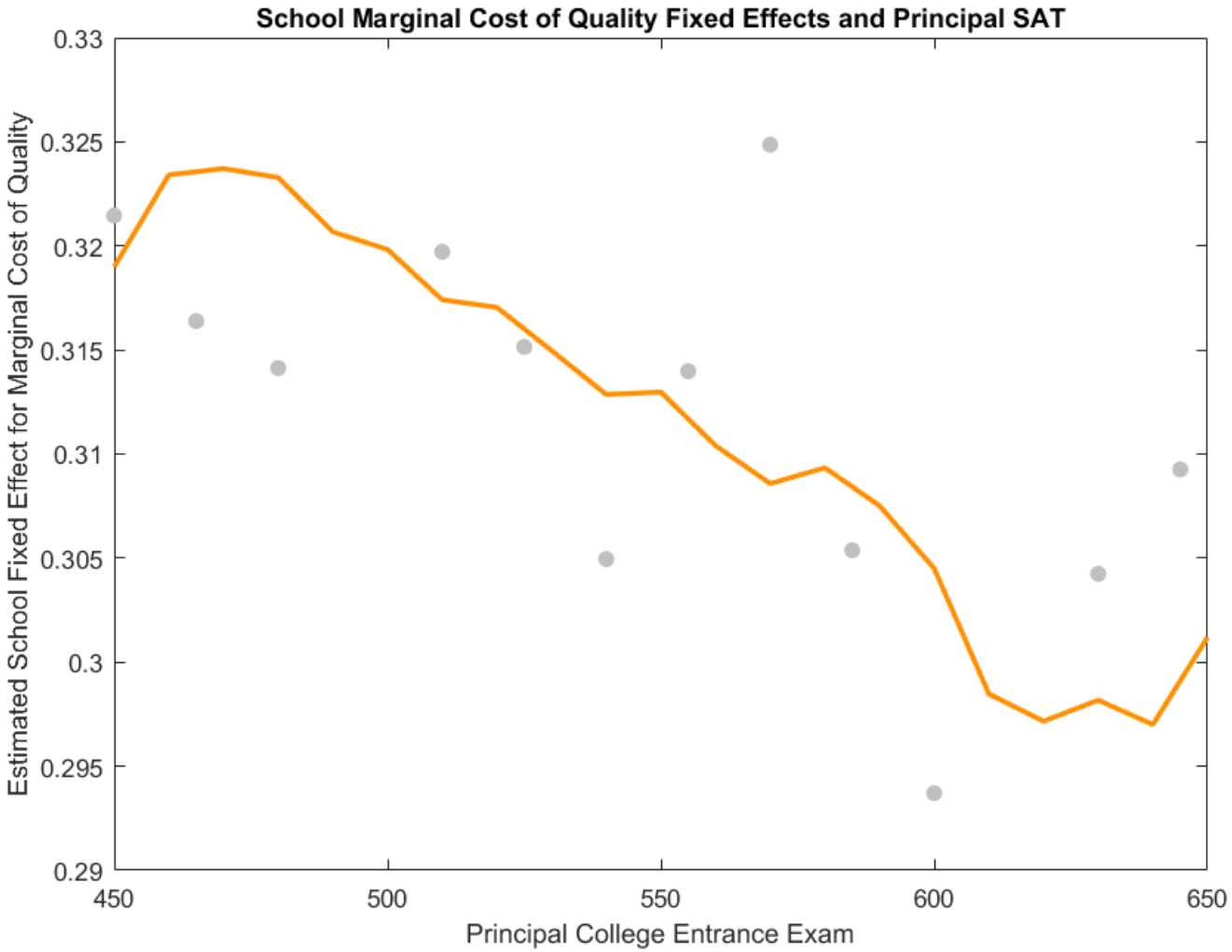
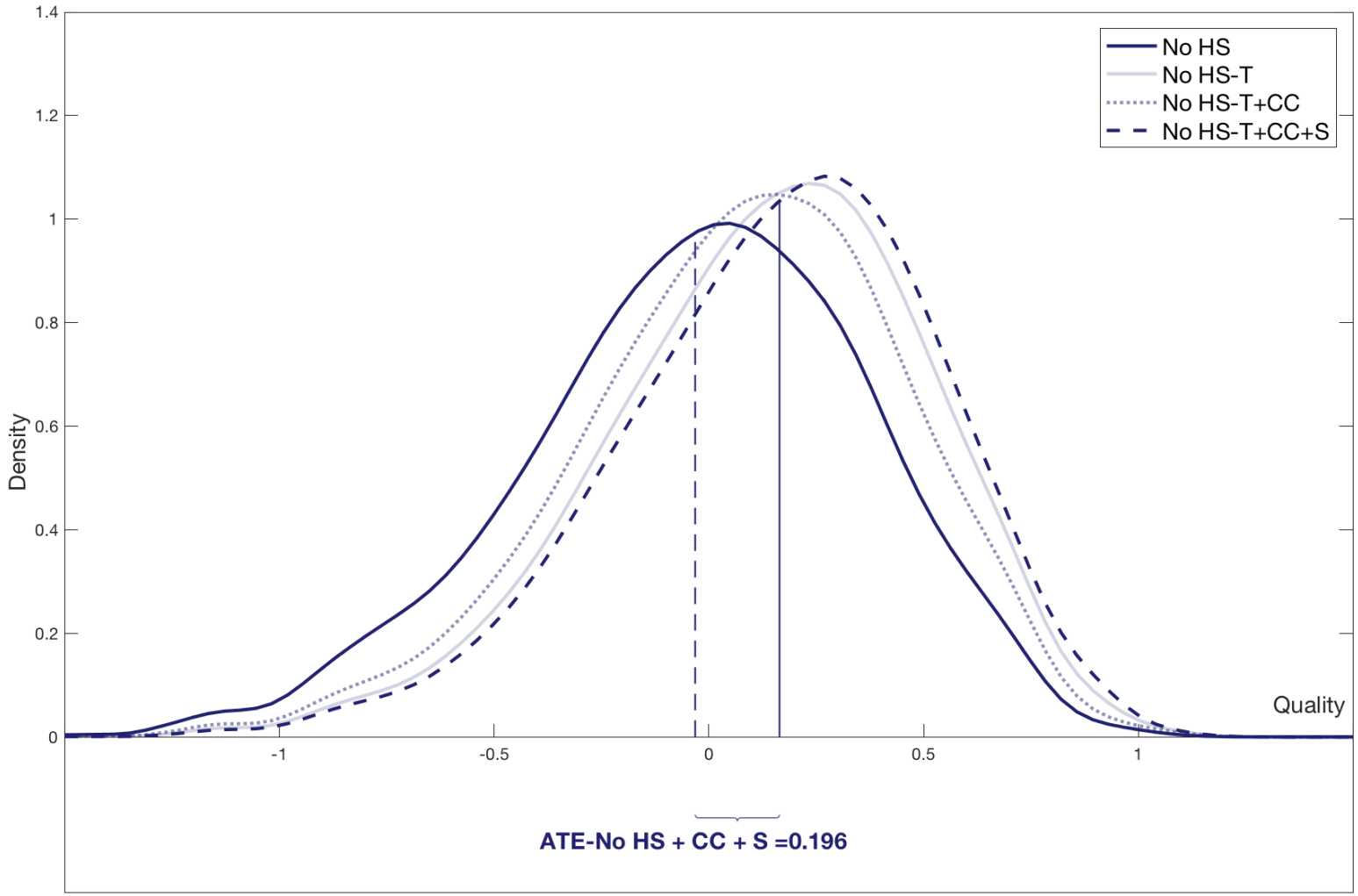


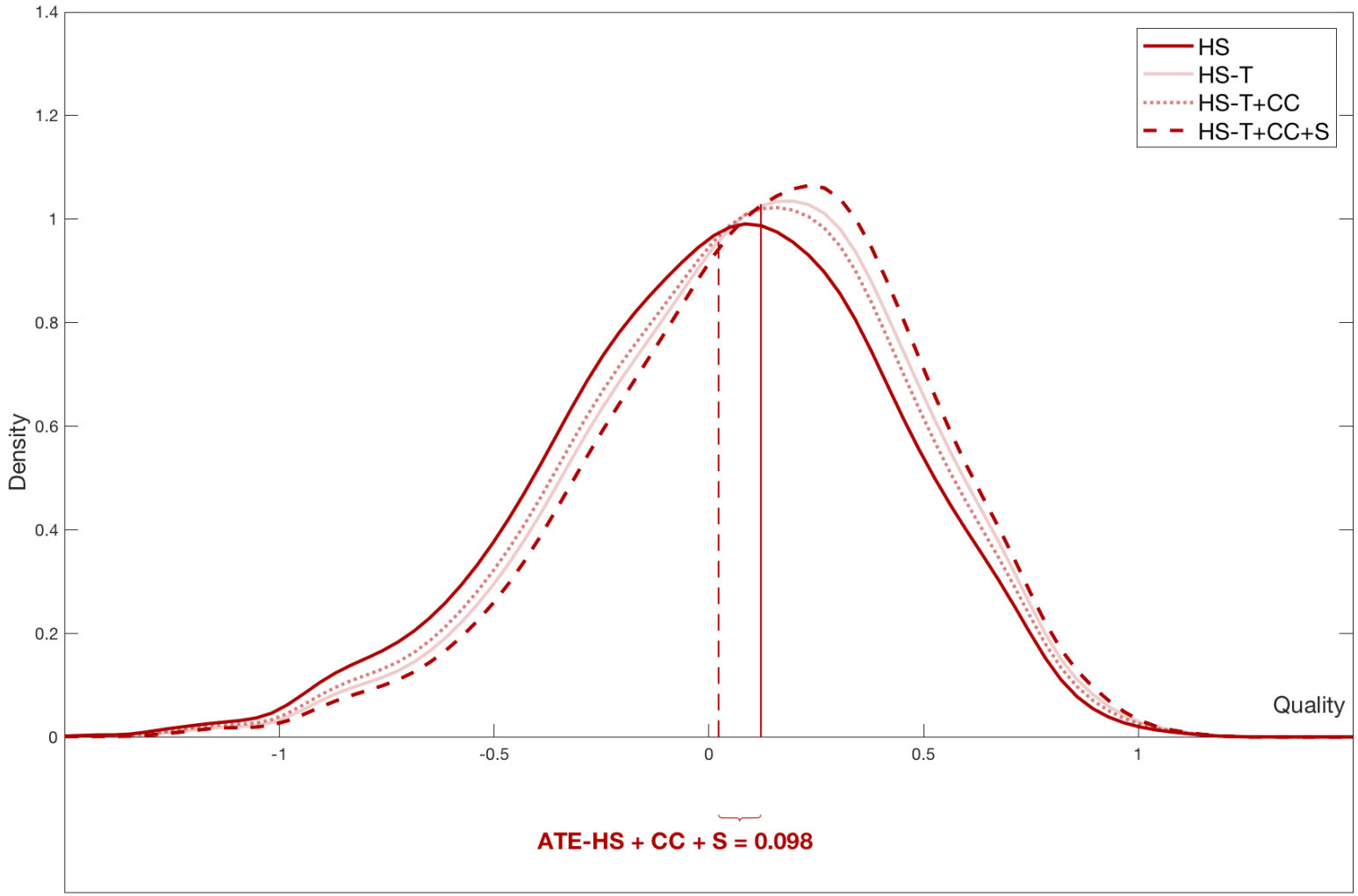
Figure: Firm Fixed Effects and Principal Human Capital



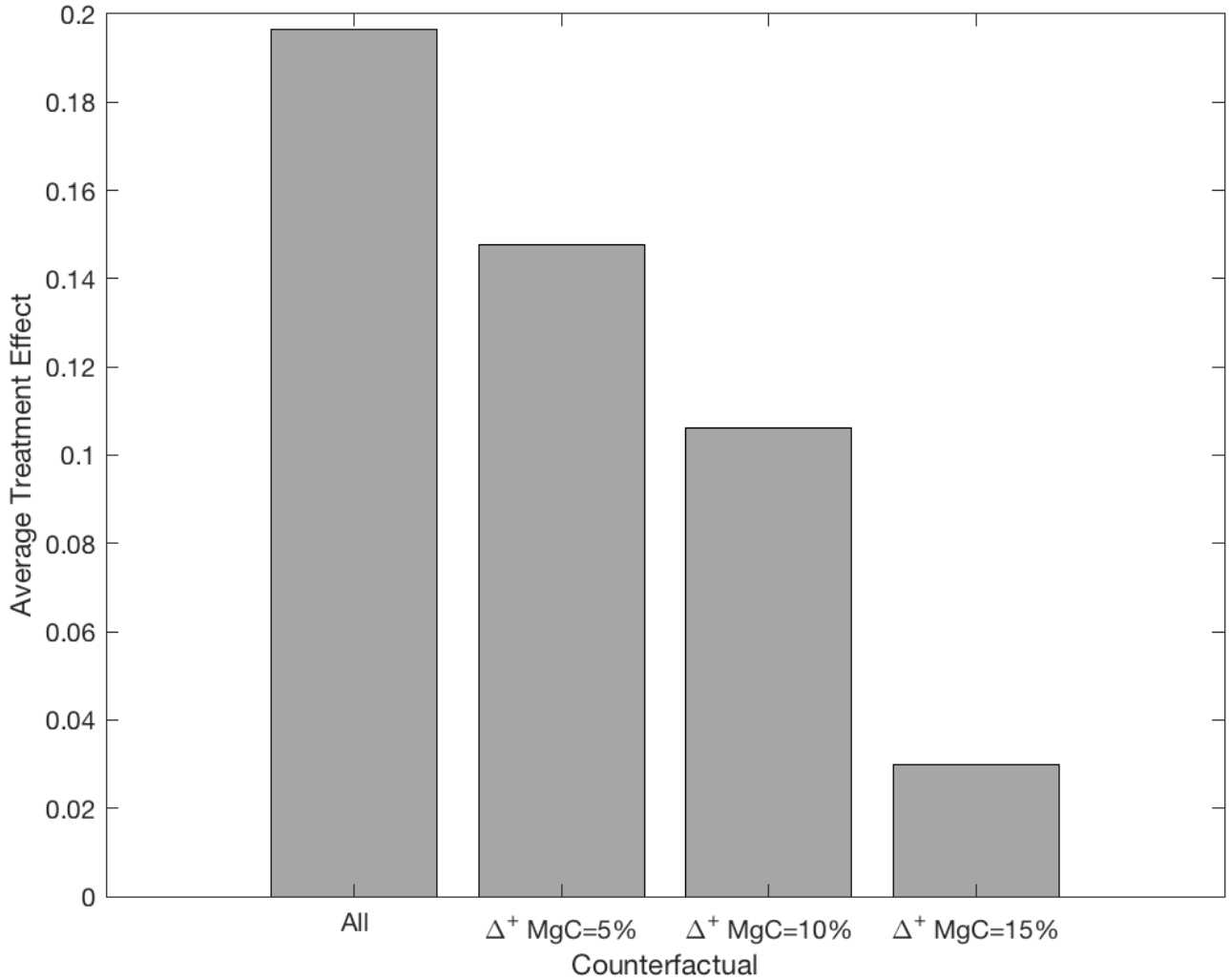
Supply Responses when Policy is Expanded



Supply Responses when Policy is Expanded



Supply Responses when Policy is Expanded



Counterfactuals Summary

Table: ATE for Counterfactuals

	Experiment	Model						
	ATE	Base	CC	CC+S (All)	CC+S (noPub)	$\Delta^{+}5\%$	$\Delta^{+}10\%$	$\Delta^{+}15\%$
All	-	0.0756	0.0464	0.1013	0.0449	0.0770	0.0569	0.0193
No HS Mon	0.1210	0.1662	0.1072	0.1964	0.0817	0.1477	0.1061	0.0299
HS Mom	0.0560	0.0709	0.0463	0.0985	0.0600	0.0721	0.0518	0.0150
College Mom	-	0.0000	-0.0168	0.0127	0.0126	0.0110	0.0080	0.0060

Drawing Board $\rightarrow$ Field Experiment $\rightarrow$ Policy Recommendations

1. Use theory about school choice and past research to develop a series of potential interventions for a new context.

Drawing Board → Field Experiment → Policy Recommendations

1. Use theory about school choice and past research to develop a series of potential interventions for a new context.

2. Test the effectiveness of these interventions at a small-scale via RCTs in relevant context.

Drawing Board $\rightarrow$ Field Experiment $\rightarrow$ Policy Recommendations

1 Use theory about school choice and past research to develop a series of potential interventions for a new context.

2 Test the effectiveness of these interventions at a small-scale via RCTs in relevant context.

3b Used best available empirical models of economic behavior to try to predict equilibrium effects of an at scale implementation.

Drawing Board → Field Experiment → Policy Recommendations

1 Use theory about school choice and past research to develop a series of potential interventions for a new context.

2 Test the effectiveness of these interventions at a small-scale via RCTs in relevant context.

3b Used best available empirical models of economic behavior to try to predict equilibrium effects of an at scale implementation.

4 We provide a range of expected policy effects that take into account past behavior of families and schools

Discussion

- We have presented the results of a field experiment designed to shift behavior regarding school choice.

Discussion

- We have presented the results of a field experiment designed to shift behavior regarding school choice.
  1. Find effects on choices.

Discussion

- We have presented the results of a field experiment designed to shift behavior regarding school choice.
  1. Find effects on choices.
  2. Find effects on outcomes.

Discussion

- We have presented the results of a field experiment designed to shift behavior regarding school choice.
  1. Find effects on choices.
  2. Find effects on outcomes.

- Results suggest scale up effects will to be equal or larger than RCT results would suggest.

Discussion

- We have presented the results of a field experiment designed to shift behavior regarding school choice.
  1. Find effects on choices.
  2. Find effects on outcomes.

- Results suggest scale up effects will to be equal or larger than RCT results would suggest.
- Partly due to supply side reaction improves outcomes the most for the poorest students.

Discussion

- We have presented the results of a field experiment designed to shift behavior regarding school choice.
  1. Find effects on choices.
  2. Find effects on outcomes.

- Results suggest scale up effects will to be equal or larger than RCT results would suggest.
- Partly due to supply side reaction improves outcomes the most for the poorest students.

Now we know what are the main forces affecting scale up and have a quantitative prediction to give policy advice.

Discussion - Take home on framework

- RCT evidence and empirical models of demand and supply can be complements in research looking to provide policy recomendations.

Discussion - Take home on framework

- RCT evidence and empirical models of demand and supply can be complements in research looking to provide policy recomendations.
- Many times a full RCT is not possible but incorporating best empirical models of demand and supply can help piece relevant forces together.

Discussion - Take home on framework

- RCT evidence and empirical models of demand and supply can be complements in research looking to provide policy recomendations.
- Many times a full RCT is not possible but incorporating best empirical models of demand and supply can help piece relevant forces together.

- To move from RCT results towards policy effects, we took model of demand and supply from empirical IO typically used in other policy evaluation context such as for merger analysis.

Discussion - Take home on framework

- RCT evidence and empirical models of demand and supply can be complements in research looking to provide policy recomendations.
- Many times a full RCT is not possible but incorporating best empirical models of demand and supply can help piece relevant forces together.

- To move from RCT results towards policy effects, we took model of demand and supply from empirical IO typically used in other policy evaluation context such as for merger analysis.
  - Incorporates the choice environment explicitly.

Discussion - Take home on framework

- RCT evidence and empirical models of demand and supply can be complements in research looking to provide policy recomendations.
- Many times a full RCT is not possible but incorporating best empirical models of demand and supply can help piece relevant forces together.

- To move from RCT results towards policy effects, we took model of demand and supply from empirical IO typically used in other policy evaluation context such as for merger analysis.
  - Incorporates the choice environment explicitly.
  - Can be used to study equilibrium effects of sorting and incentives for the supply side.

Discussion - Take home on framework

- RCT evidence and empirical models of demand and supply can be complements in research looking to provide policy recomendations.
- Many times a full RCT is not possible but incorporating best empirical models of demand and supply can help piece relevant forces together.

- To move from RCT results towards policy effects, we took model of demand and supply from empirical IO typically used in other policy evaluation context such as for merger analysis.
  - Incorporates the choice environment explicitly.
  - Can be used to study equilibrium effects of sorting and incentives for the supply side.
  - Adding supply side model allows for additional feedback effects lifting outcomes for poorest students.

Discussion - Take home on framework

- RCT evidence and empirical models of demand and supply can be complements in research looking to provide policy recomendations.
- Many times a full RCT is not possible but incorporating best empirical models of demand and supply can help piece relevant forces together.

- To move from RCT results towards policy effects, we took model of demand and supply from empirical IO typically used in other policy evaluation context such as for merger analysis.
  - Incorporates the choice environment explicitly.
  - Can be used to study equilibrium effects of sorting and incentives for the supply side.
  - Adding supply side model allows for additional feedback effects lifting outcomes for poorest students.
- Getting a clean RCT is hard. Researchers should get the most out of the ones that do work!

Accumulated VA Choice

Table: Effect of Treatment on Accum. VA Choice - 4th

	Accum. VA 1 - Poor		Accum. VA 2 - Poor		Accum. VA 1 - Ever Poor	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Full Sample						
Treatment	0.140	0.119	0.125	0.116	0.140	0.119
	(0.112)	(0.111)	(0.109)	(0.109)	(0.107)	(0.109)
N obs.	1267	1112	1267	1112	1267	1112
Panel B: Enrolled sample						
Treatment	-0.151	-0.088	-0.147	-0.087	-0.137	-0.076
	(0.198)	(0.185)	(0.190)	(0.179)	(0.202)	(0.188)
N obs.	450	443	450	443	450	443
Panel C: Not enrolled sample						
Treatment	0.337**	0.333**	0.329**	0.338**	0.327***	0.329**
	(0.136)	(0.141)	(0.134)	(0.138)	(0.126)	(0.136)
N obs.	695	669	695	669	695	669
Randomization controls	×		×		×	
Expanded controls		×		×		×

Note: Randomization controls include market characteristics of schools (number and test scores mean, standard deviation and percentiles 25, 50 and 75.). Expanded controls include Mother's education, household information (size, durable goods, owned house), baseline school choice information.

Back to Results

Results on School Choice - Price

Table: Effect of Treatment on Price Chosen

	School Positive Price		OOP Positive Price		OOP Price	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Full Sample						
Treatment	0.070*	0.076**	-0.003	0.005	0.035	0.063
	(0.037)	(0.034)	(0.028)	(0.023)	(0.088)	(0.076)
N obs.	1545	1355	1545	1355	1541	1352
Panel B: Already enrolled						
Treatment	-0.002	0.000	-0.006	-0.012	0.073	0.050
	(0.055)	(0.057)	(0.054)	(0.051)	(0.167)	(0.154)
N obs.	536	527	536	527	534	525
Panel C: Not enrolled						
Treatment	0.157***	0.159***	0.036	0.036	0.104	0.104
	(0.043)	(0.041)	(0.038)	(0.033)	(0.117)	(0.099)
N obs.	861	828	861	828	860	827
Randomization controls	×		×			
Expanded controls		×		×		

Note: Randomization controls include market characteristics of schools (number and test scores mean, standard deviation and percentiles 25, 50 and 75.). Expanded controls include Mother's education, household information (size, durable goods, owned house), baseline school choice information.

Back to Results

Results on School Choice - Test Scores

Table: Effect of Treatment on Test Scores Chosen - All

	Language 2nd		Average 4th		4th Lang		4th Math	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Full Sample								
Treatment	0.016	0.029	0.026	0.027	0.027	0.027	0.025	0.028
	(0.023)	(0.020)	(0.030)	(0.028)	(0.030)	(0.027)	(0.031)	(0.030)
N obs.	1543	1353	1545	1355	1545	1355	1545	1355
Panel B: Enrolled sample								
Treatment	-0.015	-0.018	-0.034	-0.043	-0.016	-0.026	-0.051	-0.060
	(0.042)	(0.039)	(0.050)	(0.047)	(0.047)	(0.044)	(0.055)	(0.054)
N obs.	536	527	536	527	536	527	536	527
Panel C: Not enrolled sample								
Treatment	0.050*	0.058**	0.066*	0.070**	0.051	0.054	0.081**	0.087**
	(0.028)	(0.029)	(0.034)	(0.035)	(0.033)	(0.033)	(0.037)	(0.039)
N obs.	859	826	861	828	861	828	861	828
Randomization controls	×		×		×			
Expanded controls		×		×		×		

Note: Randomization controls include market characteristics of schools (number and test scores mean, standard deviation and percentiles 25, 50 and 75.). Expanded controls include Mother's education, household information (size, durable goods, owned house), baseline school choice information.

Back to Results

Results on School Choice - Value Added

Table: Effect of Treatment on Value Added Chosen

	VA 1 - Poor		VA 2 - Poor		VA 1 - Ever Poor	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Full Sample						
Treatment	0.031	0.033	0.027	0.032	0.028	0.030
	(0.028)	(0.028)	(0.027)	(0.027)	(0.027)	(0.028)
N obs.	1538	1349	1538	1349	1545	1355
Panel B: Enrolled sample						
Treatment	-0.069	-0.051	-0.071	-0.053	-0.070	-0.052
	(0.053)	(0.050)	(0.051)	(0.050)	(0.053)	(0.051)
N obs.	535	526	535	526	536	527
Panel C: Not enrolled sample						
Treatment	0.083**	0.084**	0.081**	0.084**	0.080**	0.083**
	(0.033)	(0.035)	(0.033)	(0.034)	(0.031)	(0.033)
N obs.	856	823	856	823	861	828
Randomization controls	×		×		×	
Expanded controls		×		×		×

Note: Randomization controls include market characteristics of schools (number and test scores mean, standard deviation and percentiles 25, 50 and 75.). Expanded controls include Mother's education, household information (size, durable goods, owned house), baseline school choice information.

Back to Results

Balance - Families

Table: Balance at the Family Level

	T-C		Mean Control	
Enrollment	-1.9	(3.2)	41.5	(2.5)
Mean attendance	-1.1	(2.4)	28.7	(1.9)
Mother HE	-0.6	(1.5)	9.5	(1.3)
Mother HS	-0.9	(2.1)	48.3	(1.6)
Mother NHS	0.8	(1.0)	7.3	(0.6)
Q1 Income	0.6	(2.9)	57.9	(2.3)
Q2 Income	0.3	(2.1)	31.3	(1.6)
Q3 Income	-1.1	(1.2)	8.7	(0.9)
Very Poor	0.6	(1.8)	14.9	(1.4)
Poor	0.1	(2.2)	40.6	(1.8)

Back

Balance - Enrolled

Table: Balance for Being Enrolled at Baseline

	Enrolled-Nonenrolled		Mean Control	
Household size	-0.04	(0.12)	4.92	(0.08)
Durable goods	*0.38**	*(0.12)*	*4.46*	*(0.08)*
Owns Dwelling	0.05	(0.03)	0.34	(0.02)
Mother head of hh	0.001	(0.03)	0.83	(0.01)
Mother NHS	-0.01	(0.02)	0.19	(0.02)
Mother HS	-0.04	(0.02)	0.39	(0.02)
Mother HE	0.007	(0.01)	0.83	(0.02)
Poor	-0.01	(0.01)	0.89	(0.01)
Another child in primary	0.01	(0.03)	0.40	(0.02)
Gestation Weeks	-0.02	(0.09)	38.7	(0.05)
Birth Weight	-0.03	(0.26)	3.34	(15.40)
Mother's Age	0.32	(0.36)	25.3	(0.21)
Father's Age	-1.6	(1.22)	36.4	(0.93)
Marital Status	-0.02	(0.02)	1.7	(0.01)
Doctor	-0.01	(0.02)	0.3	(0.02)
Hospital	*0.01**	*(0.01)*	*0.97*	*(0.01)*
Number of Children	0.10	(0.09)	1.8	(0.04)

Back to Experiment

Results on School Choice - Distance

Table: Effect of Treatment on Distance Traveled

	Distance Traveled	
	(1)	(2)
Panel A: Full Sample		
Treatment	0.370*	0.245
	(0.198)	(0.194)
N obs.	1545	1355
Panel B: Already enrolled		
Treatment	-0.087	-0.265
	(0.384)	(0.375)
Panel c: Not enrolled		
Treatment	0.520**	0.440**
	(0.207)	(0.221)
N obs.	861	828
Randomization controls	×	
Expanded controls		×

Note: Randomization controls include market characteristics of schools (number and test scores mean, standard deviation and percentiles 25, 50 and 75.). Expanded controls include Mother's education, household information (size, durable goods, owned house), baseline school choice information.

Back to Results

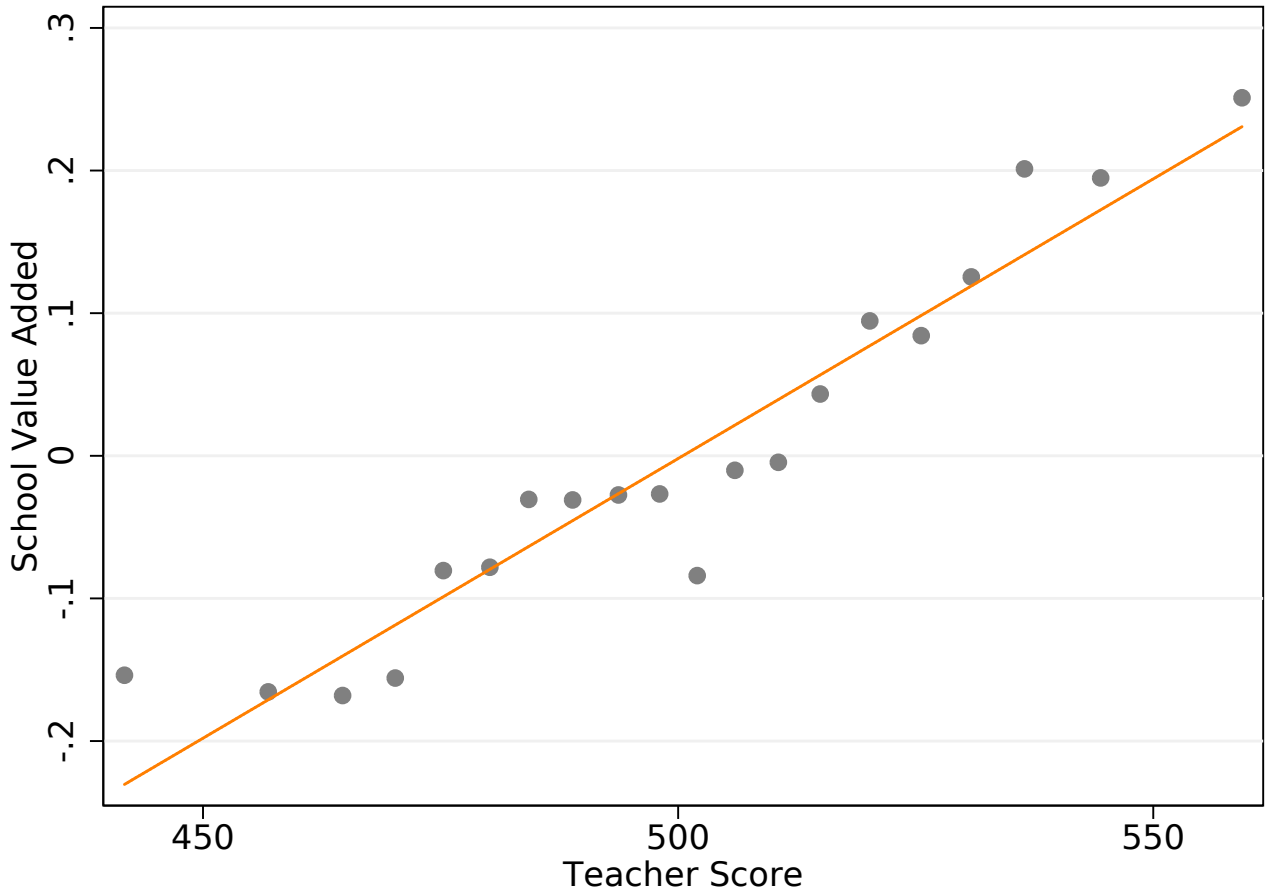
IV Moments - Instruments

The instruments include:

- Baseline voucher (time variation).
- Variation in prices induced by the SEP policy (targeted vouchers).
  - Percent of Kids Elegible for SEP within 1 km
  - Interacted with SEP policy timing
- Cross-market cost shifters: teacher wages (from IRS).
  - Teacher Wage Market FE (pct 75)
  - Teacher Wage Market FE (pct 25)
- Additional instruments
  - Number of for profit Schools within 0.5 km
  - Number of for profit Schools within 5 km
  - Percent of Kids with non poor HE mom within 1 km
  - Distance to closest school
  - Average distance to nearest 5 schools

Back to Moments

Figure: Value Added and Teacher Test Scores



Back to Graph

Experiment Moments

	Distance	OOP Price	Value Added
	(1)	(2)	(3)
Panel A: All Non Enrolled			
Treatment	0.248	0.002	0.092
	(0.065)	(0.001)	(0.032)
N obs.	699	796	789
Panel B: Non Enrolled - No High School Mom			
Treatment	0.278	0.002	0.121
	(0.131)	(0.002)	(0.051)
N obs.	214	241	239
Panel C: Non Enrolled - High School Mom			
Treatment	0.250	0.002	0.056
	(0.074)	(0.002)	(0.039)
N obs.			

Back to Moments

Bibliography