Case DID: "Water for Life: The Impact of the Privatization of Water Services on Child Mortality" by S. Galiani, P. Gertler and E. Schargrodsky

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1. Motivation

- Access to safe water is critical for health, specially for children
- There is little consensus about how to achieve the goal of increasing access to safe water in the developing world:
  - Private provision can lead to better quality service and efficient provision but it can hurt the poor
  - Public provision can private cheaper (subsidized) services, but quality issues are important
- This paper studies the impact of the privatization of water services on child mortality in Argentina
- Natural experiment: Local governments are responsible for delivering water services and only some municipalities chose to privatize those services during 90s
- Concern: Selection into privatization

Graphical evidence

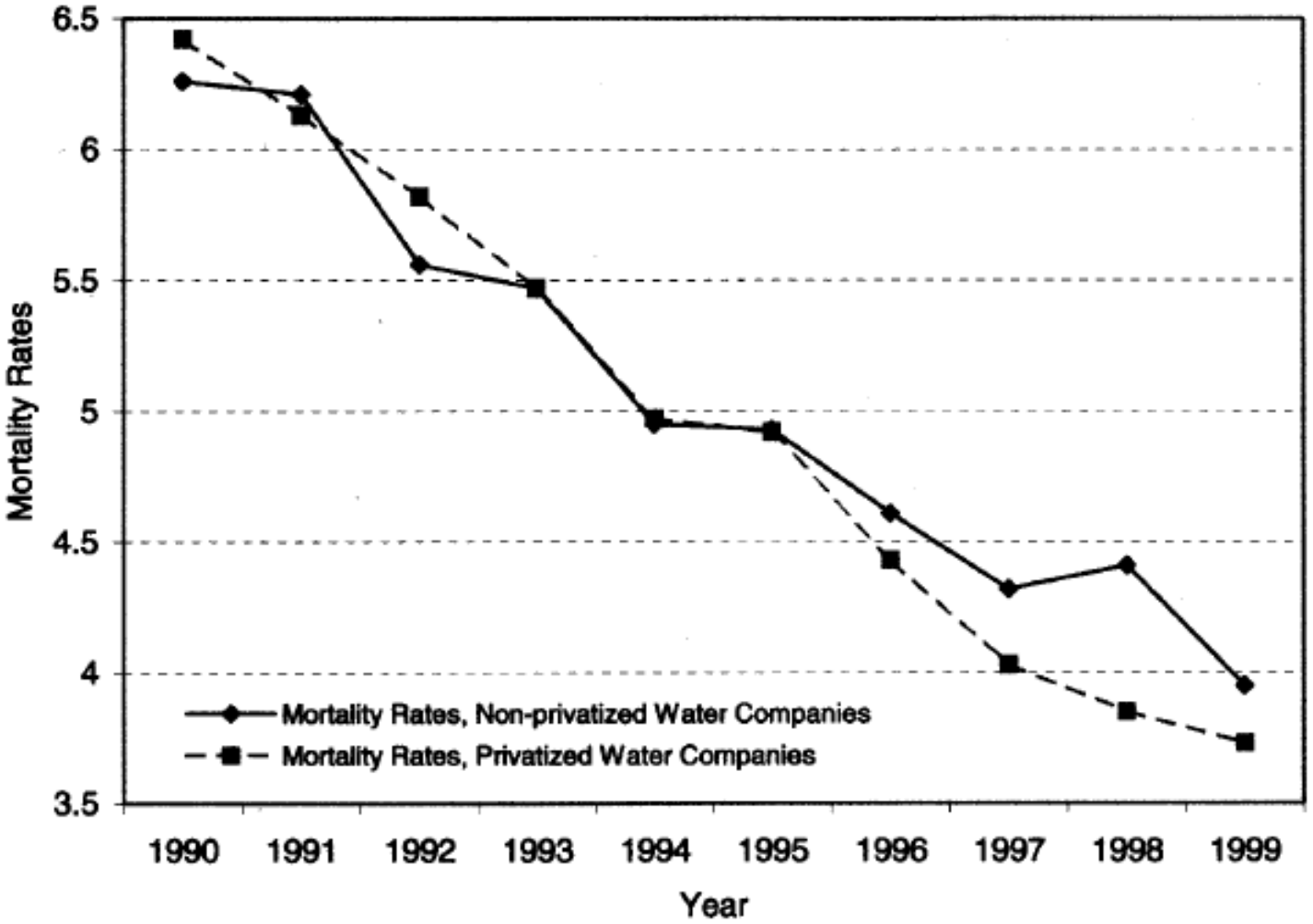

FIG. 1.—Evolution of mortality rates for municipalities with privatized vs. nonprivatized water services

2. Privatization of Water Services in Argentina

- From 1870 to 1980: Obras Sanitarias de la Nacion (OSN) was the single public provider
- 1980: Responsibility of water provision was transferred to local governments
- 1991-1999: 28% of municipalities (60% in terms of population) chose to privatize water services
- Why did local governments privatize water services?
  - Political influences from central government (Peronist party)(see Fig2)
  - Poorer municipalities more prone to privatize services
  - Privatization decision was made in response to economic shocks

Timing of privatization

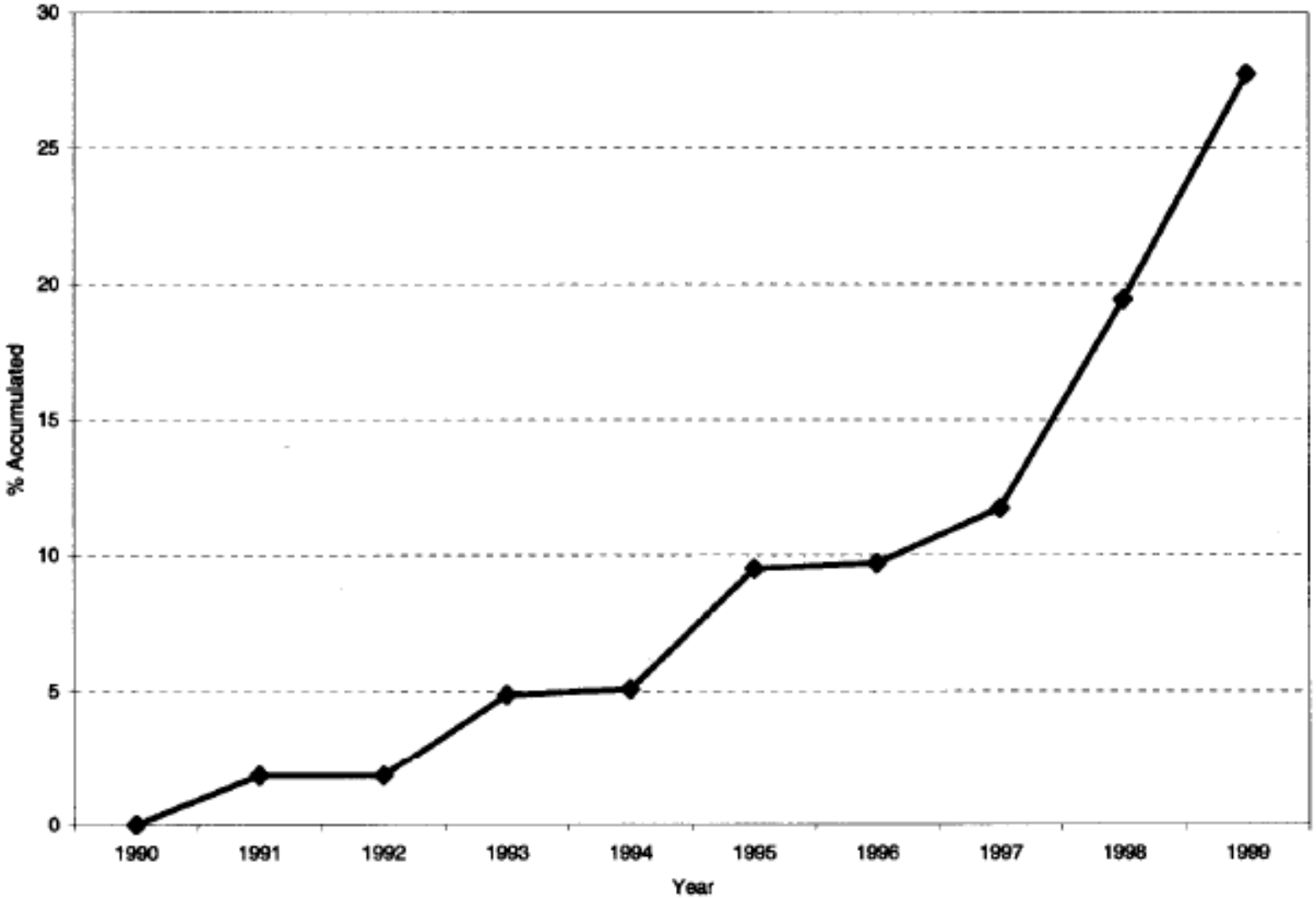

FIG. 2.—Percentage of municipalities with privatized water systems

Probability of being privatized

TABLE 2
DISCRETE-TIME HAZARD ESTIMATE OF THE PROBABILITY OF BEING PRIVATIZED

	Mean (Standard Deviation) (1)	Model 1 (2)	Model 2 (3)
Time-varying covariates:			
Federal government operates services (= 1)	.018	15.975***	16.035***
	(.134)	(2.719)	(2.727)
Local government by Radical party (= 1)	.139	−3.198***	−3.204***
	(.346)	(1.067)	(1.067)
Local government by Peronist party (= 1)	.719	−.042	−.054
	(.449)	(.401)	(.402)
Δ log GDP per capita$_{t-1}$	.047	4.294	4.259
	(.135)	(3.567)	(3.561)
Δ unemployment rate$_{t-1}$	.006	−6.692	−6.805
	(.029)	(5.696)	(5.711)
Δ income inequality$_{t-1}$	.005	.483	.139
	(.014)	(7.483)	(7.503)
Δ child mortality rate$_{t-1}$	−.266		.034
	(2.994)		(.043)

Probability of being privatized...continue

Fixed pretreatment characteristics as of 1991:			
GDP per capita	60.601	−.022***	−.022***
	(30.388)	(.007)	(.008)
Unemployment rate	.045	12.871**	12.790**
	(.023)	(5.384)	(5.383)
Income inequality	.452	−3.591	−3.469
	(.021)	(5.820)	(5.805)
Child mortality rate	6.208		−.009
	(3.683)		(.036)
Population is 5,000–25,000 (=1)	.419	.227	.225
	(.493)	(.471)	(.480)
Population is 25,000–50,000 (=1)	.202	.106	.110
	(.402)	(.535)	(.540)
Population is 50,000–100,000 (=1)	.114	−.261	−.256
	(.318)	(.605)	(.610)
Population is 100,000–250,000 (=1)	.079	.663	.668
	(.269)	(.612)	(.615)
Population is more than 250,000 (=1)	.066	1.159*	1.151*
	(.249)	(.631)	(.640)
Proportion of families with UBN	.246	−13.660**	−13.328**
	(.151)	(6.067)	(6.226)
Proportion of families living in overcrowded housing	.097	13.560*	13.444*
	(.059)	(7.150)	(7.200)
Proportion of families living in poor housing	.060	6.980**	6.987**
	(.049)	(3.472)	(3.451)
Proportion of families living below subsistence	.036	5.221	4.917
	(.022)	(7.418)	(7.449)
Proportion of houses with no toilet	.095	10.143**	9.798**
	(.117)	(4.429)	(4.563)
No sewerage connection (=1)	.280	−.182	−.171
	(.449)	(.323)	(.328)
Proportion of household heads with more than high school education	.025	−27.242**	−27.182**
	(.012)	(10.971)	(11.003)

Probability of being privatized...continue

TABLE 2
(Continued)

	Mean (Standard Deviation) (1)	Model 1 (2)	Model 2 (3)
Mean household head's age between 45 and 52 (= 1)	.653 (.476)	.279 (.343)	.288 (.343)
Mean household head's age above 52 (= 1)	.144 (.351)	.506 (.456)	.513 (.456)
Duration dependence[a]		yes	yes
Observations		2,281	2,281

NOTE.—Standard errors are in parentheses.
* Statistically different from zero at the .1 level.
** Statistically different from zero at the .05 level.
*** Statistically different from zero at the .01 level.
[a] A fifth-order polynomial in time controls for duration dependence. Each coefficient in the polynomial is statistically different from zero at the .1 level.

3. The Effect of Privatization on Child Mortality

- Authors are interested in comparing mortality when water services are privately provided to the counterfactual
- Econometric specification:

$$y_i = \alpha dl_{it} + \beta X_{it} + \lambda_t + \mu_i + \epsilon_{it} \tag{1}$$

- The coefficient of interest is α

Results

TABLE 3
IMPACT OF PRIVATIZATION OF WATER SERVICES ON CHILD MORTALITY

	Full Sample			Using Observations on Common Support			Kern Matc on Comm Suppo
	(1)	(2)	(3)	(4)	(5)	(6)	(7
Private water services (=1)	−.334	−.320	−.283	−.540	−.541	−.525	− .60
	(.169)**	(.170)*	(.170)*	(.177)***	(.178)***	(.178)***	(.168
	[.157]**	[.163]**	[.162]*	[.191]***	[.198]***	[.195]***	
	{.195}*	{.203}	{.194}	{.261}**	{.274}**	{.266}**	
%Δ in mortality rate	−5.3	−5.1	−4.5	−8.6	−8.6	−8.4	−9.7
Other covariates:							
Real GDP per capita		.007	.009		.005	.006	
		(.005)	(.006)		(.006)	(.006)	
		[.006]	[.006]		[.007]	[.007]	
		{.007}	{.007}		{.007}	{.008}	
Unemployment rate		−.555	−.636		−.778	−.836	
		(1.757)	(1.758)		(1.797)	(1.802)	
		[2.161]	[2.166]		[2.249]	[2.263]	
		{2.862}	{2.846}		{2.635}	{2.635}	

Results...

Income inequality		5.171	5.085		2.932	3.052	
		(2.868)*	(2.880)*		(2.907)	(2.926)	
		[3.468]	[3.445]		[3.314]	[3.289]	
		{3.696}	{3.691}		{3.833}	{3.838}	
Public spending per capita		−.028	−.035		−.068	−.070	
		(.038)	(.038)		(.039)*	(.039)*	
		[.055]	[.055]		[.059]	[.059]	
		{.054}	{.055}		{.049}	{.050}	
Local government by Radical party (=1)			.482			.166	
			(.267)*			(.284)	
			[.281]*			[.301]	
			{.288}*			{.365}	
Local government by Peronist party (=1)			−.202			−.168	
			(.191)			(.193)	
			[.202]			[.230]	
			{.254}			{.309}	
R^2	.1227	.1256	.1272	.1390	.1415	.1420	
Observations	4,732	4,597	4,597	3,970	3,870	3,870	3,970

NOTE.—Each column reports the estimated coefficients of a separate regression model in which the dependent variable is the child mortality rate, whose mean was 6.25 per thousand in 1990. Standard errors are in parentheses. Standard errors clustered at the municipality level are in brackets. Standard errors clustered at the province-year level are in braces. All the regressions include year and municipality fixed effects. The sample includes the municipalities with always-public, privatized, and nonprofit cooperative water companies (see table 1).

[a] Standard errors for the kernel matching estimate are bootstrapped standard errors using 100 replications.

* Statistically different from zero at the .1 level of significance.

** Statistically different from zero at the .05 level of significance.

*** Statistically different from zero at the .01 level of significance.

4. Potential threats

- There may be municipality characteristics that vary across time and space that are correlated with both mortality and privatization (columns 2 and 3)
  - Positive shocks in privatizing municipalities that might have caused a reduction in mortality
  - Political parties that privatize might run better administrations
- Impact of privatization might not be homogeneous (columns 4 to 7)

Additional Robustness: Results by cause of death

TABLE 4
IMPACT OF PRIVATIZATION ON CHILD MORTALITY BY CAUSE OF DEATH

	1990 Mean Mortality Rate	Estimated Impact Coefficients	%Δ in Mortality Rate
Infectious and parasitic diseases	.565	−.103 (.048)** [.055]* {.068}	−18.2
Perinatal deaths	2.316	−.266 (.105)** [.107]** {.123}**	−11.5
All other causes in aggregate	2.565	−.082 (.114) [.101] {.109}	−3.2
All other causes disaggregated:			
Accidents	.399	−.004 (.057)	...
Congenital anomalies	.711	−.022 (.056)	...
Skin and soft-tissue diseases	.000	.000 (.001)	...
Blood and hematologic diseases	.024	−.002 (.008)	...
Nervous system disorders	.163	.025 (.026)	...
Cardiovascular diseases	.236	.006 (.030)	...
Gastrointestinal tract disorders	.051	−.001 (.010)	...
Genital and urinary diseases	.020	−.006 (.007)	...
Osteoarticular and connective tissue diseases	.003	−.001 (.001)	...
Respiratory diseases	.511	−.038 (.051)	...
Immunodeficiencies, endocrine, and nutrition system diseases	.376	−.035 (.033)	...
Mental disorders	.002	.001 (.001)	...
Tumors	.068	−.006 (.015)	...

NOTE.—Each cell reports the estimated coefficient on the private water services dummy from a different difference-in-differences regression. Standard errors are in parentheses. Standard errors clustered at the municipality level are in brackets. Standard errors clustered at the province-year level are in braces. All the regressions include year and municipality fixed effects. All the regressions use the 3,870 observations on the common support and the socioeconomic and political covariates included in the regression in col. 6 of table 3.

* Statistically different from zero at the .1 level of significance.

** Statistically different from zero at the .05 level of significance.

Heterogenous analysis: Impact by socio-economic status

TABLE 5
IMPACT OF PRIVATIZATION ON CHILD MORTALITY BY POVERTY LEVEL

	1990 Mean Mortality Rate	Estimated Impact Coefficients	%Δ in Mortality Rate
Nonpoor municipalities	5.07	.114	...
		(.233)	
		[.165]	
		{.159}	
Poor municipalities	6.97	−1.004	−14.4
		(.279)***	
		[.297]***	
		{.278}***	
Extremely poor municipalities	9.11	−2.415	−26.5
		(.544)***	
		[1.051]**	
		{.605}***	

NOTE.—Municipalities are divided into poverty groups using the government's index of UBN using data from the 1991 census. Nonpoor municipalities are defined as those in which less than 25 percent of households have UBN. Poor municipalities are defined as those in which 25–50 percent of households have UBN. Extremely poor municipalities are defined as those in which more than 50 percent of households have UBN. The reported coefficients are the interaction of the private water services dummy and UBN (recoded in a set of dummy variables in the three categories: below 25 percent, between 25 and 50 percent, and above 50 percent) in a difference-in-differences regression using only the 3,870 observations on the common support. The regression includes year and municipality fixed effects and the socioeconomic and political covariates used in the regression reported in col. 6 of table 3. Standard errors are in parentheses. Standard errors clustered at the municipality level are in brackets. Standard errors clustered at the province-year level are in braces.

** Statistically different from zero at the .05 level of significance.

*** Statistically different from zero at the .01 level of significance.

5. Concluding remarks

- This paper offers evidence that privatization can introduce not only gainings in efficiency but also can increase social welfare
- Whereas privatization can potentially hurt the poor, public provision can be so inefficient and of poor quality that improving conditions of the poor can be possible even generating private profit
- Poorest people can obtain large benefits from privatization