Quantifying the public health impact of state policies to address organ donation shortages in the United States

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Disclosures

❖ All coauthors have no competing financial or other interests to declare

Research motivation

❖ Shortage of organs for transplantation remains a major public health policy issue

❖ Outright payment for organs unlikely due to ethical concerns

❖ Growing support for other types of state policies to provide incentives for volunteer donation

❖ Effectiveness of state organ donation policies remains unknown

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Research question

❖ What is the impact of different state policies on organ donation and transplantation rates from 1988 to 2010?

- First person consent laws
- Donor registries
- Dedicated revenue streams for donor recruitment activities
- Population education
- Paid leave for donors
- Tax incentives

Methods: overview

- ❖ Documents review to code 50-state organ donation policies over time

- ❖ Descriptive analyses to document national trends

- ❖ Differences-in-differences regression analysis to compare pre- and post-legislation changes in organ donation and transplantation rates

Methods: documents review

❖ Collected retrospective legal data in four areas: revenue sources, donor education, leave of absence, legal consent

❖ Outcomes:
  ▪ Dichotomous yes/no
  ▪ Dates of implementation and enactment

❖ Sources:
  ▪ www.organdonor.gov (starting point)
  ▪ State legislative websites
  ▪ Westlaw

❖ Data collection between December 2012-April 2013

Methods: differences-in-differences estimation

❖ Quasi-experimental design

❖ States that enacted a policy serve as the "treatment" group; those that did not are the "control group"

❖ Formulation, for one policy:

$\ln(D_{it}) = \beta_0 + \beta_1 * Deduction_{it} + \boldsymbol{\beta} * \mathbf{X_{it}} + \lambda_i + \eta_t + \varepsilon_{it}$

where D_{it} is the donation rate in state i in year t, $Deduction_{it}$ = 1 if a tax deduction was available in state i during a particular year t, $\mathbf{X_{it}}$, λ_i, and η_t are controls for other state-year characteristics, state fixed effects, and year fixed effects, respectively.

Methods: regression models

❖ Separate variables to represent each policy (N=6)

❖ Stratified models for two outcomes to test possible differential effects

- Organ donors per capita
- Transplantations per capita
- Stratified by living/deceased donors

❖ Sensitivity tests

- Time lags up to 5 years (delayed implementation)
- Model that sums all policies (combined policy effect)
- Models that only examine one policy at a time (6 models)

Methods: quantitative data sources

- ❖ Outcome variables:
  - Annual organ donors per state-year (United Network for Organ Sharing database)
  - Annual organ transplantations per state-year (Organ Procurement and Transplantation Network database)

- ❖ Control variables:
  - State per capita income and population (Bureau of Economic Analysis)
  - % uninsured, % Medicare, number of transplant centers, physicians per state (Area Resource File)
  - ESRD population per state (USRDS website)
  - State political ideology (Barry & Busch, 2007)

Results: overall increase in organ donors per 100,000 population over time
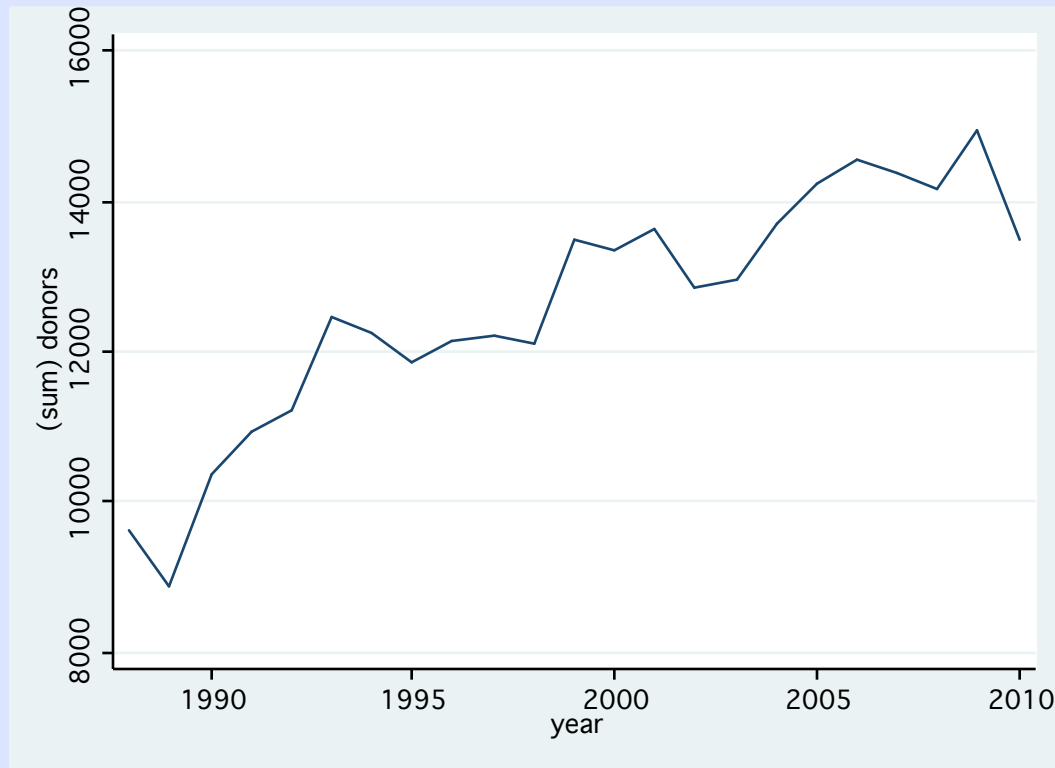
Results: all states passed at least one policy, with 14% adopting all 6 policies
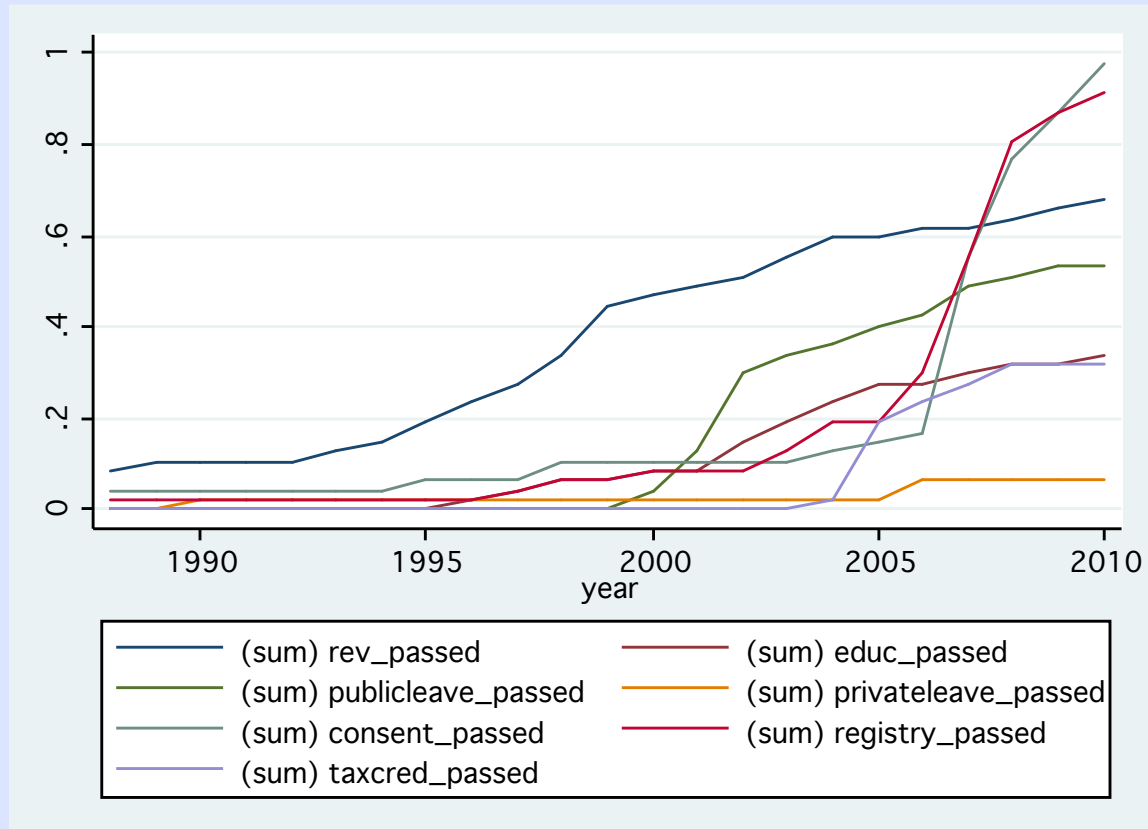
Results: regression models

	Ln(Deceased Donors)	Ln(Living Donors)	Ln(Deceased Donor Transplant)	Ln(Living Donor Transplant)
Revenue Policy	0.0486**	0.00494	0.0802***	0.0121
	(0.0198)	(0.0423)	(0.0247)	(0.0427)
Educational Policy	-0.0186	0.0457	0.0449	0.0388
	(0.0308)	(0.0639)	(0.0369)	(0.0619)
Public Sector Leave	0.0325	0.0773*	0.0585	0.0981**
	(0.0234)	(0.0399)	(0.0356)	(0.0396)
Private Sector Leave	-0.0158	0.0777	-0.00762	0.0982
	(0.0468)	(0.0790)	(0.0778)	(0.0821)
First Person Consent	-0.00756	0.0111	-0.0352	-0.00895
	(0.0203)	(0.0397)	(0.0309)	(0.0401)
Registry Law	0.0222	-0.0653*	-0.00176	-0.0661*
	(0.0193)	(0.0368)	(0.0295)	(0.0380)
Tax Law	0.0178	0.0403	0.0611	0.0344
	(0.0251)	(0.0469)	(0.0401)	(0.0465)
N	862	851	917	998
R^2	0.901	0.922	0.886	0.914

Donation and transplantation models stratified by type of donation (deceased versus living)

	Ln(Deceased Donors)	Ln(Living Donors)	Ln(Deceased Donor Transplant)	Ln(Living Donor Transplant)
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Revenue policies are associated with *increased* donations and transplantations among *deceased* donors

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	(0.0251)	(0.0469)	(0.0401)	(0.0465)

Public sector leave policies are associated with *increased* donations and transplantations among *living* donors; but no effect for private sector leave

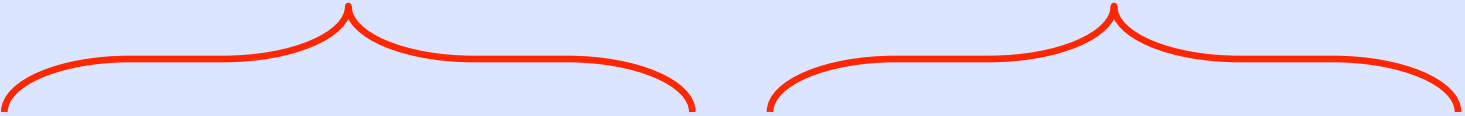|	Ln(Deceased Donors)	Ln(Living Donors)	Ln(Deceased Donor Transplant)	Ln(Living Donor Transplant)
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Registry Law	0.0222	-0.0653*	-0.00176	-0.0661*
	(0.0193)	(0.0368)	(0.0295)	(0.0380)
Tax Law	0.0178	0.0403	0.0611	0.0344
	(0.0251)	(0.0469)	(0.0401)	(0.0465)

Organ donation registries are associated with *decreased* donations and transplantations among *living* donors; and no effect among deceased donors

	Ln(Deceased Donors)	Ln(Living Donors)	Ln(Deceased Donor Transplant)	Ln(Living Donor Transplant)
Revenue Policy	0.0486**	0.00494	0.0802***	0.0121
	(0.0198)	(0.0423)	(0.0247)	(0.0427)
Educational Policy	-0.0186	0.0457	0.0449	0.0388
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	(0.0251)	(0.0469)	(0.0401)	(0.0465)

Education policies, first person consent, and tax laws have no effect on donations or transplantations

	Ln(Deceased Donors)	Ln(Living Donors)	Ln(Deceased Donor Transplant)	Ln(Living Donor Transplant)
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	(0.0198)	(0.0423)	(0.0247)	(0.0427)
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Consistent story for the effect of policies on both donation and transplantation

	Ln(Deceased Donors)	Ln(Living Donors)	Ln(Deceased Donor Transplant)	Ln(Living Donor Transplant)
Revenue Policy	0.0486**	0.00494	0.0802***	0.0121
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	(0.0193)	(0.0368)	(0.0295)	(0.0380)
Tax Law	0.0178	0.0403	0.0611	0.0344
	(0.0251)	(0.0469)	(0.0401)	(0.0465)

Among policies with statistical significance, the magnitude of effect is fairly small

	Ln(Deceased Donors)	Ln(Living Donors)	Ln(Deceased Donor Transplant)	Ln(Living Donor Transplant)
Revenue Policy	0.0486**	0.00494	0.0802***	0.0121
	(0.0198)	(0.0423)	(0.0247)	(0.0427)
Educational Policy	-0.0186	0.0457	0.0449	0.0388
	(0.0308)	(0.0639)		
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Passing a revenue policy is associated with a 4.9% increase in deceased donors. For an average state with 145 deceased donors, that translates into 7 additional deceased donors.

Passing a public sector leave policy is associated with a 7.7% increase in living donors. For an average state with 118 living donors, that translates into 9 additional living donors.

Limitations

❖ One coder for state laws

❖ Difficult to identify enactment dates

❖ State-level analysis may miss important differences at local level

❖ Policies not uniform across states

❖ Understanding the pathway by which these policies increase donation requires more granular community-level data

Conclusions

- Promoting the use of protected state funds for organ donation and public sector leave is promising; other donation-related policies have minimal to no effect

- Counterintuitive findings on state organ donation registries may signal that having a registry is not sufficient to encourage donation; other policies need to be implemented in tandem

- May need new or altered policy designs to increase organ donation rates

- Systematic evaluations of the effectiveness of state policy solutions are critical to guiding future public health practice

Next steps

- ❖ How do these policies get implemented?
    - ▪ Which policies get adopted first?
    - ▪ Are policies adopted sequentially or simultaneously?

- ❖ Why are some states early adopters?
    - ▪ Is adoption related to political characteristics, need (organ shortages), or other characteristics?
    - ▪ Are there regional diffusion effects?

- ❖ In what ways do these policies differ across states?

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