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## Youth Enfranchisement, Political Responsiveness, and Education Expenditure: Evidence from the U.S.

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## Abstract

This paper studies the effect of preregistration laws on government spending in the U.S. Preregistration allows young citizens to register before being eligible to vote and has been introduced in different states in different years. Employing a difference-in-differences regression design, we first establish that preregistration shifts state-level government spending toward expenditure on higher education. The magnitude of the increase is larger when political competition is weaker and inequality is higher. Second, we document a positive effect of preregistration on state-provided student aid and its number of recipients by comparing higher education institutions within border-county pairs. Lastly, using individual-level data on voting records, we show that preregistration promotes a de facto youth enfranchisement episode. Consistent with a political economy model of distributive politics, the results collectively suggest strong political responsiveness to the needs of the newly-enfranchised constituent group.

**JEL Classification:** D72, H52, P16.

**Keywords**: Education Expenditure, Political Responsiveness, Preregistration, Voter Turnout, Youth Enfranchisement.

# 1 Introduction

In all modern states a central activity of governments is to allocate the public budget in response to the demands of socioeconomic groups. The government's choice of how much of the public budget to redistribute and which socioeconomic groups to target is embedded within the political system. Since the seminal paper of Meltzer and Richard (1981), the political economy literature has been studying the role of electoral mechanisms in the determination of the level of government spending and the extent of redistribution. The main prediction of this literature is that groups of voters with greater political influence will have greater success in diverting resources to policies that meet their needs and aspirations.

Several contributions following Acemoglu and Robinson (2000) have established that conflict between rich and poor lies at the heart of the historical process extending the voting franchise and the consequent expansion of the welfare state. Surprisingly, conflict between different age groups and its implications for political participation and government spending have received far less attention. In the face of evolving demographic forces, the fact that in modern democracies public intervention favors pensions and health care – which benefit the old – over education expenditure – which benefits the young – has become the focus of the policy debate and has raised concern about the reluctance of the young to cast their ballot – still the most effective way to make politicians responsive to their demands.[1]

The aim of the paper is to examine the link between the political participation of various age groups and policy decisions. For this purpose, the U.S. provides an ideal institutional setting. This is due to two reasons: First, even though the U.S. has been a de jure full democracy with universal suffrage for a long time, various restrictions and extensions of political rights, which have affected the de facto ability of citizens to vote, exhibit rich variation across states and over time. Second, the U.S. is characterized by a peculiar two-step voting process that requires eligible voters to register as a prerequisite for casting their ballot. Voter registration entails a cost, in terms of effort, time, and involvement, which is especially large for the young who are meant to gather information and then show up at the voting stations for the first time.

The focus of the paper is on preregistration, an electoral provision introduced by individual states with the aim of encouraging civic engagement among the young by reducing the burden of registration.[2] Preregistration allows young individuals to register

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[1]On the growing divergence of interests between young and old and the consequent impact on specific types of government spending, see www.economist.com/news/special-report/21688591-millennials-are-brainiest-best-educated-generation-ever-yet-their-elders-often.

[2]In its report on Senate Bill 6340 concerning voter preregistration, the Senate Committee on

at a variety of locations that they frequent, such as schools, campuses, and motor vehicle bureaus, before becoming eligible to vote, independently of whether they will reach voting age prior to the next election. Starting from 1993, 13 states plus the District of Columbia have introduced preregistration laws at various points in time. Thus, this variation over time and space can be exploited in order to determine whether more convenient registration procedures can increase the voter turnout of the young and promote fiscal policies targeting their needs.

In order to interpret the empirical findings, we first develop a formal theory of electoral competition and voting participation which illustrates how preregistration laws can affect the allocation of the public budget. The theory is an adaptation of a probabilistic voting model to an environment with intergenerational conflict and individual cost of voting. Citizens are either young or old and differ in their wealth as well as in their preferences for education expenditure, since the young benefit from it while the old do not. The electoral competition takes place between two candidates – one of whom has an incumbency advantage – who run for office on a policy platform consisting of a wealth tax, education provision, and electoral rent. Voters cast their ballot or abstain after learning about the platform of each candidate and the realization of shocks affecting their voting behavior and cost. In this framework, the enactment of a preregistration law is interpreted as a decrease in the average cost of voting for the young and in the marginal electoral advantage of the old. The model predicts that following the introduction of the law politicians provide more education, which benefits the young, whose voter turnout increases relative to that of the old. Additional lessons of the model are that the link between preregistration and education expenditure is weaker when political competition is stiffer, the share of the young is larger, and inequality is lower.

The main contribution of the paper is to empirically test the predictions of the model. We use two complementary empirical strategies to identify the link between preregistration laws and economic outcomes. Since such laws have been introduced in several geographically dispersed states, and in different years, we first employ a difference-in-differences regression design and compare states with and without preregistration. Using annual financial data on the activity of state governments provided by the U.S. Census Bureau, we find that during the period 1980-2014 per capita education expenditure is on average 6% higher in states that have adopted preregistration, relative to states that have not. The effect is economically substantial and is supported by a set of informal

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Government Operations & Security of the Washington State Legislature states: "*This is a great opportunity to expand the franchise. We need to make sure people know they need to be registered before the election that occurs when they turn* 18. *This will expand access, increase engagement, and lead to more informed voters. This is a common ground that both sides can agree on.*" See app.leg.wa.gov/billsummary?BillNumber=6340&Year=2015#documentSection.

validity tests that relate to concerns regarding the timing of preregistration adoption. Remarkably, the effect manifests itself after the first election following the passage of the law and is independent of whether the governor at the time of budget approval was already in power in the reform year. This evidence is notable since it shows that preregistration and education funding do not belong to a single youth-oriented reform package and are instead outcomes of distinct policy-making processes. A battery of additional results enriches the paper's findings: (i) the increase in education expenditure is larger in states where political competition is weaker and inequality is higher, as predicted by the theory; (ii) other budget items, which are not specifically beneficial to the young, do not respond to preregistration, while education expenditure does not respond to other registration reforms not specifically targeted at the young; and (iii) the effect of preregistration operates entirely through current expenditure on higher education, rather than elementary-secondary education or capital outlays.

The second empirical strategy exploits policy discontinuities at state borders to compare higher education institutions located in counties that border each other but belong to different states. To this end, we use the Integrated Postsecondary Education Data System provided by the Delta Cost Project database, which includes information on U.S. colleges, universities, and technical and vocational institutions for the period 2002-2012. This strategy serves a twofold purpose: First, it reduces the importance of unobservable heterogeneity in education funding, since underlying economic fundamentals are expected to evolve more similarly across contiguous counties than across states. Second, it tests whether predictions for the provider of funding, i.e., a state, are mirrored by results for a recipient, i.e., a higher education institution. The results indicate that preregistration has a clear impact on state financial aid to higher education. Indeed, preregistration is associated with a 4.3% increase in the share of state grants within total student aid and a 7.1% increase in the number of recipients of state grants as a proportion of full-time first-time degree seekers. Moreover, we find no effect on other components of student financial aid, such as federal (or Pell) grants and grants financed by the institutions themselves. This result stands up to a wide variety of robustness checks. The beneficial effect of preregistration on government spending in favor of the young is therefore confirmed with a very different dataset and estimation strategy.

Finally, to test additional predictions of the theory, we investigate how voter turnout reacts to the introduction of preregistration. Using individual-level data on voting records from the Voting and Registration Supplement of the Current Population Survey for the period 1996-2014, we find that preregistration positively affects the participation of the young, as well of individuals from low-income families, who turn out at elections at a higher rate than the rest of the electorate. The estimated increase in young voter turnout

is on average 4.6% and is robust to the Heckman-probit correction for sample selection bias caused by observing voting decisions only for registered voters. The findings therefore suggest that a large number of young individuals, who otherwise would have been left without a political voice, are de facto enfranchised when they take advantage of preregistration. Taken together, the results reinforce the hypothesis that politicians respond to a higher electoral mobilization of young voters following the passage of preregistration laws by increasing the type of expenditures that target them. Indeed, current expenditure on higher education directly affects the college-age individuals in the electorate and more strongly so in the presence of higher inequality and when a larger share of them are in need of student financial aid.

This paper communicates with three strands of the literature. First, it is connected with the analysis of the determinants of democratization and de jure enfranchisement developed for the case of conflict arising between economic elites and poor masses (see, e.g., Acemoglu and Robinson, 2000, 2006; Lizzeri and Persico, 2004; and Llavador and Oxoby, 2005). Related empirical assessments of the enfranchisement effect for public spending include Lindert (1994), Aidt, Dutta, and Loukoianova (2006), and Acemoglu, Naidu, Restrepo, and Robinson (2014). Parallel investigations have addressed conflicts arising between alternative socioeconomic groups along the racial and gender dimension.[3] In contrast, we study the implications of the enfranchisement of the young in the face of a potential conflict with the old, an issue that has not been addressed to date. Furthermore, we focus on a de facto enfranchisement episode occurring in a modern democracy where universal suffrage is already established.

Second, the paper is also related to a small literature analyzing the effects of preregistration laws. Based on the cases of Florida and Hawaii, McDonald and Thornburg (2010) and Holbein and Hillygus (2016) observe that increased preregistration exposure has a positive impact on the turnout of young registrants. However, neither paper discusses the implications for government spending, which is the main contribution of the present paper. The impact of other laws aimed at easing the registration burden, such as the National Voter Registration Act and Election Day Registration, is analyzed by Highton (1997) and Besley and Case (2003). The influence of voting reforms on voter turnout and policy outcomes in other countries is investigated by Baland and Robinson (2008) in the

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[3]The implications of voting restrictions, such as poll taxes and literacy tests, enacted in the U.S. South after the Civil War and aimed at disenfranchising the blacks, have been investigated by Naidu (2012) and Bertocchi and Dimico (2017). The removal of such restrictions with the passage of the 1965 Voting Rights Act and its influence on welfare policies are discussed by Husted and Kenny (1997), Besley, Persson, and Sturm (2010), and Cascio and Washington (2014). In a similar vein, the extension of suffrage to women and its impact on the size and composition of government spending is studied by Lott and Kenny (1999) and Miller (2008) for the U.S. and by Aidt and Dallal (2008) and Bertocchi (2011) for other Western countries.

context of the secret ballot in Chile, Fujiwara (2015) in the context of electronic voting in Brazil, and Fowler (2013) and Hoffman, Leon, and Lombardi (2017) in the context of compulsory voting in Australia and Austria, respectively.

Finally, the paper is closely related to the macroeconomic literature on intergenerational conflicts over the financing and allocation of the public budget. By embedding electoral competition within models of dynamic government decision making, this literature predicts that intergenerational redistribution responds to shifts in political power across generations (see, e.g., Tabellini, 1991; Alesina and Rodrik, 1994; Krusell, Quadrini, and Ríos-Rull, 1997; Grossman and Helpman, 1998; Cooley and Soares, 1999; Hassler, Rodríguez Mora, Storesletten, and Zilibotti, 2003; Levy, 2005; Song, Storesletten, and Zilibotti, 2012; and Lancia and Russo, 2016). A major drawback of these models is their inability to quantitatively separate the effect of shifts in political power on governments spending from the effect of changes in the demographic structure, since the median age of the electorate is generally the variable chosen to capture the political strength of old relative to young voters (Strömberg, 2006). Our contribution is to assess the impact of greater political engagement among the young on fiscal outcomes, while isolating it from the impact of pure demographic forces.

The rest of the paper is organized as follows: Section 2 describes the institutional setting and historical background. Section 3 provides a theoretical framework that will be used to interpret the empirical results. Section 4 reports the estimation results for the impact of preregistration on government spending at the state level. Section 5 documents the effect of the registration reform on student financial aid at the level of institutions of higher education. The implications of preregistration laws for the political participation of the young are presented in Section 6. Section 7 concludes. Appendix A contains the figures and tables not included in the text, Appendix B presents proofs, and Appendix C provides a description of the data.[4]

# 2 Institutional Setting and Historical Background

## 2.1 The Electoral and Budgeting Processes

The U.S. is a federal republic composed of 50 states plus the District of Columbia. The U.S. Constitution establishes rules for federal elections, while state laws regulate most

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[4]The Supplementary Material includes Appendix D, with a detailed description of the legislative process leading to the approval of a preregistration bill, and Appendix E, with suggestive evidence for the impact of preregistration on the composition of state legislatures.

aspects of state and local elections. In each state, voters elect the governor directly.[5] The length of a gubernatorial term is four years except in New Hampshire and Vermont, where it is two years. In 36 states, governors cannot be elected for more than two or even one term, while the governors of 14 states can serve an unlimited number of terms.

U.S. government spending is divided between the federal, state, and local levels. At the state level, the budget is proposed by the governor and then submitted for approval to the legislature. A budget proposal indicates funding priorities and spells out the amounts that will be allocated to various state agencies. It is the most important means for a governor to influence the legislative process. The following sources of revenue are used to finance state spending: (i) General State Funds, which are the predominant means for financing state operations and are obtained via broadly-based state taxes; (ii) Other State Funds, which are restricted by law to be used for specific governmental functions and are obtained from tuitions and fees, provider taxes, donations, assessments, and local funds; (iii) Federal Funds, which are intergovernmental revenues received directly from the federal government; and (iv) Bonds. The use of funds and bonds to finance different functions of state spending varies across states.[6]

Elementary-secondary education and higher education represent respectively the second and third largest components of total state spending and are financed from different sources. In most states, elementary-secondary education is considered a local function and is primarily financed by the local property tax.[7] Spending on higher education, which includes financial support for public universities, community colleges, and vocational institutions, is in contrast primarily financed by broadly-based state taxes. However, the share of General State Funds spent on higher education has in recent years been declining, while spending on other programs, such as Medicaid, has been rising. As a consequence, an increasing share of the cost burden of higher education has been transferred from

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[5]Federal as well as many state elections are held on Election Day in November of even-numbered years. Exceptions are Kentucky, Louisiana, Mississippi, New Jersey, and Virginia which elect their governors during odd-numbered years.

[6]According to the National Association of State Budget Officers, the main functions that were funded at the state level in fiscal 2014 were: Medicaid (which uses 25.6% of State Funds, defined as General plus Other State Funds), elementary-secondary education (19.8%), higher education (10.5%), transportation (7.9%), public assistance (1.5%), and other expenditures including economic development, environmental projects, housing, parks, and state police (31.5%). See www.nasbo.org/reports-data/state-expenditure-report/state-expenditure-archives.

[7]According to the U.S. Census Bureau, in fiscal 2013 45.3% of elementary-secondary education revenues came from localities (of which, property taxes represented 65%), while 45.6% came from the state and 9% from the federal government. The significance of local property taxes varies across states. Connecticut, Illinois, Massachusetts, Nebraska, New Hampshire, New Jersey, and Rhode Island show the highest percentage of revenues from local property taxes (50% or more), while Vermont and Hawaii show the lowest (0.1 and 0%, respectively). See www.census.gov/content/dam/Census/library/publications/2015/econ/g13-aspef.pdf.

taxpayers to students through higher tuition rates.[8] Funds allocated to an institution of higher education are managed by the Board of Trustees which has the authority and responsibility to ensure the fulfillment of an institution's mission. To guarantee that institutions serve the public interest, however, many states have established independent coordinating agencies that oversee the Boards of Trustees and review budget requests submitted to the state.[9]

## 2.2 Young Voter Turnout

Voting is the most effective way to influence government decision making. In the 2012 Presidential election, only 54.9% of Americans cast their ballot. Since the 1960s turnout has been characterized by a persistent downward trend, decreasing by over 14 percentage points from its 1964 peak of 69.3%. Remarkably, there has always been a wide gap in voter turnout between different age groups. When 18-year-olds were first given the right to vote in the 1972 Presidential election, following the passage of the 26th Amendment to the Constitution, voter turnout was 52% in the 18-24 age group in comparison to 68% for citizens over 25. Ever since then, young voter turnout has persistently remained lower than that of other age groups. By the 2012 Presidential election, the corresponding figures were 41 and 65%.[10]

The lack of participation by young Americans in the voting process has been the object of increasing attention, especially since low civic engagement among the young tends to persist later in life.[11] Several explanations for the persistence of low civic engagement among the young have been advanced, such as the limited level of resources available to them and their inadequate knowledge of voting procedures and mechanisms. The fact that the young are more likely to move frequently for education or work also amplifies their difficulty in collecting information and establishing connections, which hinders their

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[8]According to the National Association of State Budget Officers, General State Funds have increased from 58.2% of total state spending on higher education in fiscal 1995 to 38.1% in fiscal 2014. As a result, Other State Funds have surpassed General State Funds as the single largest source of state spending on higher education, making up 47.4% of total state higher education expenditure. According to the same source, average in-state tuitions and fees at public four-year institutions increased by 17% from 2009-2010 to 2014-2015. See footnote 6 for the reference.

[9]As documented by the State Constitutional Provisions and Higher Education Governance Policy, independent coordinating agencies exist in 24 states. Their members are in part appointed by governors and in part nominated by the leadership of the two state chambers and the general public. The California coordinating agency, for example, is composed of 16 members, of which only three are appointed by the governor. Members usually serve an 8-year term to ensure independence from the state. Coordinating agencies have significant budgetary authority, except in New York. See www.mhec.org/sites/mhec.org/files/20130516state-constitutional-provisions-highered-governance.pdf.

[10]Young voter turnout rates are taken from the 2013 report of the Center for Information and Research on Civic Learning and Engagement which is available at http://civicyouth.org/quick-facts/youth-voting/.

[11]As observed by Strate, Parrish, Elder, and Ford (1989), the accumulation of political experience that comes with age leads to increasing levels of civic competence and voting participation.

participation at the poll. Other potential motives are linked to specific features of the U.S. political context, such as the presence of a two-party system that limits the chances of third-party candidates, who are often supported by young people, and the funding system for electoral campaigns that relies heavily on large donors.[12]

Beyond these explanations, a peculiar feature of the U.S. voting system that has been blamed for low turnout of the young is related to the two-step voting process, which forces eligible voters to register to vote in order to be able to actually cast their ballot. Registration laws were introduced by most states in the nineteenth century to fight fraud and corruption with the purpose of ensuring the integrity of the electoral process.[13] The voter registration process is currently regulated by state law, with North Dakota being the only state not requiring registration. Registration rules differ significantly across states in terms of deadlines, restrictions, and/or proofs required to register. Voter registration typically occurs between two and four weeks before each election and is organized at the county level.[14] Since registration in more than one place at a time is not permitted, moving permanently to a new county requires re-registration. The cost of registration includes the effort and time required to become familiar with the electoral process, which is especially large for first-time voters. Indeed, many newly eligible voters are unfamiliar with the registration system, including how and where to register, so that they more frequently miss voter registration deadlines. On the other hand, the share of young people who, once registered, do actually vote is quite high.[15] The positive correlation between registration and voter participation suggests that the young are actually more likely to vote when given greater opportunities to register.

## 2.3 Voter Registration Reforms

To ease the burden of registration and encourage civic engagement, particularly among socioeconomic groups that typically show lower turnout, several reforms have been introduced with largely bipartisan support at the federal and state levels. The National Voter Registration Act (NVRA) is the most far-reaching federal intervention in the state and local registration systems in history. The act was signed into law by President Clinton in 1993. Although the act was initially intended to regulate only federal elections, it

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[12]On the demographics of voter turnout, see the classic text by Wolfinger and Rosenstone (1980) and the more recent account by Holbein and Hillygus (2016).

[13]Southern states introduced registration prerequisites involving poll taxes and literacy tests in order to curb the political power of blacks following the abolition of slavery in 1865. These were later abolished by the 1965 Voting Rights Act. On the history of voter registration laws, see Ansolabehere and Konisky (2006).

[14]On voter eligibility requirements and registration procedures, see usa.gov/register-to-vote.

[15]The percentages of registered voters under 30 who cast their ballots in the 2000, 2004, and 2008 Presidential elections were 74, 82, and 84, respectively. See www.census.gov/prod/2010pubs/p20-562.pdf.

effectively changed the registration process for all elections, by eliminating the inefficient practice of maintaining separate voting lists for different types of elections. The NVRA enabled any eligible voter to register either at state motor vehicle agencies, as part of a driver's license application or renewal, or at public offices, for those requiring social assistance.[16]

In addition to the NVRA, three main voter registration reforms have been enacted at the state level: (i) Election Day Registration (EDR) allows eligible voters to register on election day. Starting with Maine in 1973, 13 states, plus the District of Columbia, currently offer EDR.[17] (ii) Online Registration allows voters to submit their application over the Internet. Starting with Arizona in 2002, 30 states plus the District of Columbia currently offer online registration.[18] (iii) Preregistration enables citizens who are not yet 18 to register as pending voters, whether or not they reach voting age before the next election. Preregistration drives are organized at customary and frequent points of contact, such as schools, campuses, and motor vehicle bureaus, in order to make it easier for youths to register and automatically be ready to vote when they turn 18.[19]

The declared goal of preregistration is to encourage voting among the young. Congressman Markey, who introduced the Gateway to Democracy Act in 2004, appealed for a national preregistration law by declaring that: *"People need to exercise their right to vote. Unfortunately, young people consistently fail to turn out to the polls on voting day [...]. It is in the best interest of the country to make it as easy as possible for the youth of our nation to go to the polls for the first time."* Although attempts have been made to expand the law nationally, preregistration remains a state provision. Florida was the first state to extend voter registration to 17-year-olds in 1971, albeit conditional on reaching voting age by the upcoming election. In 2007, Florida introduced the preregistration

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[16]The NVRA is currently in force in 44 states and the District of Columbia. Idaho, Maine, Minnesota, New Hampshire, Wisconsin, and Wyoming were exempted from the NVRA because by 1994 they had introduced Election Day Registration. North Dakota was also exempt since it has no registration requirements. There is no consensus as to the effectiveness of the NVRA in increasing voter turnout. Knack (1995) estimates that it has a positive effect, while Besley and Case (2003) find no significant effect.

[17]Besides the District of Columbia, EDR has been introduced by California, Colorado, Connecticut, Hawaii, Idaho, Illinois, Iowa, Maine, Minnesota, Montana, New Hampshire, Vermont, Wisconsin, and Wyoming. Highton (1997) and Besley and Case (2003) find evidence that EDR increases turnout.

[18]Quantitative investigations regarding the impact of Online Registration on voting in the U.S. have not been carried out as yet.

[19]Preregistration laws differ from other state provisions that tie eligibility for early registration to attaining voting age prior to a specific election. Specifically, preregistration operates on an ongoing basis, even when elections are not scheduled. Together with preregistration, a few states have signed bills into law to promote follow-up voter education programs with the aim of increasing civic engagement among the young and to leverage the success of the reform. In California, for example, Assembly Bill 700, 2013, and Assembly Bill 1817, 2014, provide channels through which communities and advocates can work with schools. The latest development in registration reforms consists of automatic registration, introduced by Oregon in 2015.

option for individuals aged 15 or older with a driver's license and in 2008 made it accessible to all 16-year-olds. Similarly, Hawaii permitted conditional registration as early as 1977 and introduced preregistration for all individuals over 16 in 1993. Other states later followed suit, often in response to a voter education campaign conducted by FairVote, a non-partisan organization that has been promoting civic engagement and election reforms since 2005.[20] Oregon enacted preregistration in 2007, California, North Carolina, and the District of Columbia in 2009, Delaware, Maryland, and Rhode Island in 2010, Maine in 2011, Colorado in 2013, Louisiana and Massachusetts in 2014, and Utah in 2015. North Carolina later repealed the law in 2013.[21] The timeline of the preregistration legislations across U.S. states is shown in Figure A1 in Appendix A.

## 2.4 Preregistration Legislation

Understanding the legislative process that leads to the approval of a preregistration bill is important in order to evaluate the validity of our empirical strategy, which relies on the introduction of preregistration as being an exogenous event with respect to a governor's budget decisions (as probed in greater detail in Section 4). We take advantage of the fact that the constitutional division of responsibilities between the executive and the legislative branches has a major impact on the approval process of various types of bills. While budget bills are first promoted by the governor, then approved by the executive body, and eventually passed by the state legislature, electoral bills like preregistration follow a reverse pattern. Thus, they are first sponsored by a member of the state legislature, then approved in the House and Senate, and finally signed by the governor to be converted into law. The opposite order of approval for electoral bills versus budget bills means that preregistration laws and fiscal policy decisions are distinct outcomes of two different games played between governors and legislatures. This argument is corroborated by Kousser and Phillips (2012) who document how state constitutions strip governors of their power over state lawmaking, while at the same time ensuring them an advantageous position over the legislature in approving the fiscal budget.[22]

A governor's restricted authority over state lawmaking is also reflected in her limited

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[20]Representative Pacheco of Rhode Island, who sponsored House Bill 5005 with four co-signers from among both Republicans and Democrats, has declared that: *"FairVote is the major asset in the preregistration battle, doing crucial legwork and reaching out to local media."* See archive.fairvote.org/ncteenspreregister.

[21]Currently, the majority of the preregistration states (California, Colorado, Delaware, Florida, Hawaii, Louisiana, Maryland, Massachusetts, Rhode Island, Utah, plus the District of Columbia) allows preregistration for 16-year-olds, while two (Maine and Oregon) allow it for 17-year-olds.

[22]Based on a nonrandom sample of governors in 28 states during the 2001-2006 legislative sessions, Kousser and Phillips (2012) find that when governors propose changes to existing constitutional, fiscal, or electoral rules, they are usually ignored by the legislature. Indeed, only 27% of such proposals pass, with another 6% ending in compromise.

use of veto power. In principle, governors can exercise an executive veto in order to block the final approval of a bill or amendment. However, among the states where a preregistration bill has been approved, veto power has been exercised only in Rhode Island by Governor Carcieri in July 2009. An important feature of preregistration laws is that they have received *bipartisan* support, with California being the only exception.[23] In view of preregistration broad and non-partisan support, state legislatures have had the ability to override an executive veto. This was the case in Rhode Island, where a veto override passed in both chambers of the state legislature in January 2010 and preregistration became law without the governor's signature. Remarkably, Delaware, Florida, Louisiana, Massachusetts, North Carolina, Utah, and the District of Columbia passed the preregistration bill almost unanimously. North Carolina is perhaps the most notable example of bipartisan approval of a preregistration bill. The bill was co-sponsored in 2009 by four legislators who included the youngest Republican and the youngest Democrat in the General Assembly. The bill was approved by a state legislature controlled by Democrats although more than 88% of the Republicans voted in favor of it. It was finally signed into law by Democratic Governor Perdue. Since then, more than 150000 teenagers have preregistered under the program. Of the 55291 who preregistered in 2012, 41% choose to do so as unaffiliated, 33% as Democrats, and 26% as Republicans, making 2012 the first year that preregistered Democrats exceeded preregistered Republicans.[24] In reaction, the Republican-controlled state legislature rescinded voter preregistration in 2013. This is an enlightening example of how a preregistration law that initially has bipartisan support may have consequences that cause it to be repealed for partisan reasons.

Further information on preregistration legislation is provided in Appendix D of Supplementary Material. The appendix also zooms in on political characteristics of preregistration states and shows that the bill's eventual approval appears to be independent of a governor's political affiliation, although in most cases the bill has been sponsored by a Democratic Representative. Indeed, among the states that have passed the bill, six had a Republican governor and seven a Democratic one. It is also worth noting that the success of a legislative process to introduce preregistration is not associated with a higher rate of young and/or more female legislators, who may be more favorable to its introduction and at the same time more supportive of liberal fiscal policies. Thus, the adoption of preregistration is not more likely when political power is in liberal hands, as one might have thought.

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[23]Although Assembly Bill 30 was approved with a relative majority in both the Senate (22-15) and the Assembly (50-28) with Democratic support only, the bill was eventually signed into law in 2009 by Republican Governor Schwarzenegger.

[24]See www.charlotteobserver.com/news/politics-government/article9137564.html.

# 3 Theoretical Framework

In this section, we present a simple model of electoral competition and voting participation which serves as a motivating theory for our estimation strategy and empirical results. The model is an adaptation of a probabilistic voting model à la Lindbeck and Weibull (1987) to an environment with intergenerational conflict and individual cost of voting. We adopt the view that candidates commit to policies catered to the needs of the majority of voters. Hence, voters actually *affect* rather than *elect* policies.[25] Although data limitations prevent us from testing this hypothesis, we present empirical evidence consistent with the predictions of the model and in support of this view.[26]

Consider a jurisdiction, such as a state, populated by a unitary mass of citizens. A fraction $\alpha$ of the population is young, denoted as $y$, whereas the remaining fraction $1 - \alpha$ is old, denoted as $o$. While the members in each group are identical, there is a different endowment of wealth in each group. Namely, a young individual has wealth $\omega^y$ which is less than $\omega^o$, the wealth of an old individual. Average wealth in the society is $\omega$. Endowments can then be conveniently rewritten as $\omega^y = \sigma\omega/\alpha$ and $\omega^o = (1 - \sigma)\omega/(1 - \alpha)$, where the parameter $\sigma \in [0, \alpha)$ provides an inverse measure of inequality, i.e., a higher $\sigma$ indicates less inequality.

Public decisions are made by a government that uses its fiscal authority to tax wealth at a rate $\tau \in [0, 1]$. The tax burden is borne by the entire population. Fiscal revenues can be used to finance public education, $e \geq 0$, but can also be diverted to finance an electoral rent, $R \geq 0$. We assume that governments are prevented from borrowing and lending. Thus, the government budget constraint is $(\tau - D(\tau))\omega = e + R$, where $D(\tau)$ is an aggregate cost that captures the deadweight loss of taxation, with $D(0) = 0$, $D_\tau > 0$, and $D_{\tau\tau} > 0$. A fiscal policy platform is then a vector $q := (\tau, e, R)$.

An individual's utility is influenced by government decision making. The utility of a young individual is $\mathcal{U}^y(q) := (1 - \tau)\omega^y + (\lambda e/\alpha)$, where $\lambda > 0$ measures the marginal benefit from public education, and that of an old individual is $\mathcal{U}^o(q) := (1 - \tau)\omega^o$, This formulation is flexible enough to capture, for example, the idea that the amount of

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[25]Existing studies have highlighted two contrasting views of the role of elections in policy formation. In one view, voters affect policies and elections have the effect of constraining candidates' policy choices. In the other view, voters merely elect policies and elections are meant to decide which candidate's policy to implement. The empirical evidence is mixed. Lee, Moretti, and Butler (2004) use voting record data from the U.S. House to show that voters appear not to affect politicians' choices, thereby rejecting the empirical validity of probabilistic voting, while Strömberg (2008) shows that a probabilistic voting setup can explain a candidate's allocation of resources in U.S. Presidential elections fairly well.

[26]In Appendix E of Supplementary Material, we report additional evidence which weakens the view that voters elect policies in the context of preregistration. Using data on state legislature ideology, and age and gender of legislators, we find no evidence that voters elected more liberal, younger, or female legislators in states with preregistration.

education consumed when an individual is young affects her future income in the amount of $\lambda e/\alpha$.[27] Education is traditionally seen as an expenditure that favors the young, due to its positive effect on future income or human capital, which the old cannot benefit from.[28]

**Electoral Competition**   The government is democratically elected according to a majority rule. The electoral competition takes place between two candidates, an incumbent and a challenger, denoted as $\varsigma \in \{\mathcal{I}, \mathcal{C}\}$, who have the ability to non-cooperatively commit to a policy platform $q_\varsigma$ before the election in order to maximize the expected rent from being in office. Thus, each candidate's objective function is $p_\varsigma(q_\mathcal{I}, q_\mathcal{C}) \cdot R_\varsigma$, where $p_\varsigma(q_\mathcal{I}, q_\mathcal{C})$ is the probability that candidate $\varsigma$ defeats her opponent by proposing a policy agenda $q_\varsigma$.

The electoral demand side is characterized by voters who derive benefits from voting regardless of whether they affect the electoral outcome.[29] The individual benefits of voting depend on both the platform of each candidate and a popularity shock $\delta$. Such a shock captures the ex-post average success of candidate $\mathcal{I}$ and is drawn from a uniform distribution on $[-(1/2) + \phi, (1/2) + \phi]$, with $\phi > 0$ measuring an incumbency advantage.[30] Net of the popularity shock, citizens support the candidate whose proposed platform maximizes their utility. Formally, a citizen who belongs to age group $i \in \{y, o\}$ supports candidate $\mathcal{I}$ if $\mathcal{V}^i(q_\mathcal{I}, q_\mathcal{C}) := \mathcal{U}^i(q_\mathcal{I}) + \delta - \mathcal{U}^i(q_\mathcal{C}) \geq 0$ and candidate $\mathcal{C}$ otherwise.

The act of voting imposes a cost $c$, which differs among individuals and is uniform on $[\underline{c}, \overline{c}^i]$. We assume that $\overline{c}^y > \overline{c}^o$, reflecting the higher cost of voting for the young relative to that of the old. This may, for example, be because they are unfamiliar with registration procedures and voting requirements. Citizens therefore vote when the utility gains from voting outweigh its costs, i.e., $c \leq |\mathcal{V}^i(q_\mathcal{I}, q_\mathcal{C})|$; otherwise they abstain.

**Political Economic Equilibrium**   Candidates and voters move sequentially. First, candidates simultaneously announce their platform $q_\varsigma$. Second, the shocks affecting individual voting behavior, i.e., the electoral advantage $\delta$ and the individual voting cost $c$,

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[27]The utility function of the young can be seen as the reduced form of a utility function in a two-period model, where agents enjoy present as well as future consumption, which increases with current investment in education. For the sake of simplicity, we analyze a static model. The results are however robust to a dynamic extension (see Lancia and Russo, 2016).

[28]The assumption that old voters are less supportive of education spending than young ones finds support in a number of empirical studies. For example, Koretz (1995) documents a strong decline in the support for public schooling among respondents over 70 relative to respondents under 30. Using U.S. data at the state level, Poterba (1997) finds that a reduction in per-child education spending is associated with an increase in the proportion of elderly residents.

[29]By assuming that people get utility directly from voting, we are avoiding the issue of why people vote. A justification for this assumption is that voters decide emotionally, rather than based on any estimation of how their vote will influence the electoral outcome (see Schuessler, 2000).

[30]The fact that the party in power has a larger ex-ante probability of winning the election is confirmed in the empirical literature and can be microfounded (see Besley and Case, 1995).

are realized. Third, the election is held and the citizens decide *whether* to vote and, if so, *for which* candidate. Finally, the winning candidate implements her political proposal. A political economic equilibrium is then defined as a vector of policy platforms and voter turnout and is characterized by solving the game via backward induction.

Two fundamental forces shape the equilibrium policy platform: (i) an intergenerational conflict over the allocation of the public budget and (ii) a political conflict over the size of the electoral rent. The intuition behind a candidate's optimal tradeoff is as follows: Candidates must be attentive to the well-being of the young and the old since individuals in both groups can vote. The young are motivated to support high taxation to finance public education. The old dislike taxes since they derive no benefits from them. Candidates, therefore, set taxes in order to balance the marginal benefit of public education for the young against the marginal cost of public funds. Moreover, although a platform with a higher rent is attractive per se, it decreases the probability of being elected. Thus, candidates grab an amount of public resources in order to equate the return on an additional unit of electoral rent to the return on public spending in terms of a larger share of supporting voters. In sum, candidates propose an equilibrium platform in order to address the economic needs of their constituencies as well as to achieve their own political aspirations. This is proved in Appendix B.

**Preregistration**   What does our model predict about the effects of preregistration on policy and voting outcomes? The enactment of a preregistration law can be simply modelled as a reduction of $\bar{c}^y$, reflecting a smaller average cost of voting for the young as well as a smaller marginal electoral advantage for the old. The following proposition presents the key results linking a preregistration law to fiscal policies and voting participation.[31]

**Proposition** *If $\lambda > \underline{\lambda}$ and $\phi < \bar{\phi}$, an interior political economic equilibrium exists and the effect of preregistration on fiscal policy rules and voter turnout is as follows:*

1. *If $\bar{c}^y$ decreases, (i) youth voter turnout increases and (ii) average public education expenditure increases;*

2. *The negative link between $\bar{c}^y$ and average public education expenditure is stronger when (i) political competition is weaker, i.e., $\phi$ is larger; (ii) the share of young voters is smaller, i.e., $\alpha$ is smaller; or (iii) inequality is higher, i.e., $\sigma$ is smaller.*

This proposition has several elements and provides a set of testable empirical predictions. In equilibrium, the education policy reflects the share of active voters within each age group and is limited by the size of the public budget. The model predicts that the

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[31]The critical levels $\bar{\phi}$ and $\underline{\lambda}$ are defined in the proof of the Proposition in Appendix B. The conditions that public education spending be productive enough, i.e., $\lambda > \underline{\lambda}$, and political competition be sufficiently stiff, i.e., $\phi < \bar{\phi}$, are sufficient for the existence of an interior equilibrium outcome.

level of education expenditure increases with the voter turnout of the group in favor of publicly provided education, i.e., the young. By lowering the cost of voting for young citizens, the enactment of a preregistration law generates a de facto enfranchisement episode, such that a larger share of young voters cast their ballot. All candidates then respond to higher voting participation by addressing the economic needs of the young, namely by providing more education expenditure (Point 1).

The model also illustrates how political competition, voter turnout demographics, and inequality mediate the impact of preregistration on education policy. Although the introduction of preregistration increases education expenditure, its effect is a non-linear function of political competition (see Point 2.i). Intuitively, when political competition becomes stiffer, candidate $\mathcal{I}$ adapts her policy towards the preferences of young voters, thus sacrificing electoral rent, while candidate $\mathcal{C}$, who advocates maximal education expenditure, will have an increased chance of winning. The resulting increase in education expenditure dampens its responsiveness to the introduction of preregistration. As a result, we expect to observe a weaker link between preregistration and expenditure on education in states where political competition is more intense.

A similar intuition lies behind the result of Point 2.ii. The larger share of the young in the electorate, the more public resources will be committed to education in the candidates' platforms. This in turn reduces the effect of preregistration reforms on the provision of education. Finally, since the young have less wealth than the old, they bear a smaller share of the fiscal burden and demand greater public expenditure through their vote. This implies that the link between preregistration laws and public education expenditure will be magnified in the presence of higher inequality (see Point 2.iii). Our model captures a simple mechanism which helps in structuring our thinking about the driving forces behind the empirical results presented below for the U.S.

# 4  Preregistration and Education Expenditure

## 4.1  Data

In this section, we empirically examine the effect of preregistration on U.S. government spending at the state level. Annual financial data on the activity of state governments is taken from the Annual Survey of State and Local Government Finances conducted by the U.S. Census Bureau. The full sample includes all of the 50 state governments for the period 1980-2014. We supplement this data with information collected from various sources regarding the timing of the introduction of the voter registration reforms across states and with a number of electoral and socioeconomic variables. Appendix C provides

detailed information on variable definitions and data sources.

Summary statistics for the main variables are provided in Table A1 of Appendix A. Preregistration, which by 2014 has been introduced in twelve states, applies to 4% of the sample, while Online Registration, EDR, and the NVRA apply respectively to 4, 11, and 50% of the sample. The second set of variables consists of state-level electoral characteristics. On average, 50% of governors belong to the Democratic party, 43% are incumbent, and 53% run in the next election. The table also provides information on political competition, gubernatorial turnout rate, and the President's party affiliation. The third set of variables consists of state-level fiscal characteristics (at constant 2014 U.S. dollars). The key variable is public total education expenditure, which in per capita terms is equal on average to $776 per year and represents 14.5% of total expenditure. Disentangling education items shows that on average 79% of expenditure is allocated to higher education and 83.4% to its current component. Thus, the current higher education component is $544, while average elementary-secondary education expenditure accounts for only $48. The table reports statistics also for other relevant outlays, including public welfare, health, assistance and subsidies, and unemployment compensation. Total taxes reflect state and local taxes and charges, including the local property tax, and are on average $2421 per capita per year. The fourth set of variables is meant to capture the socioeconomic background of each state including, among others, the share of young and blacks in the electorate, post-secondary enrollment and educational attainment, personal income, inequality, and unemployment.

## 4.2 Empirical Strategy

We wish to test the link between preregistration and government spending with particular focus on education expenditure. We therefore compare states that have adopted preregistration to states that have not. Since preregistration laws have been introduced in different states in different years, these events have generated sufficient variation across space and over time. Hence, the theoretical predictions stemming from the model can be tested using a difference-in-differences regression design. Formally, the empirical model to be tested can be spelled out as follows:

$$Edu_{s,t} = \beta \cdot Preg_{s,t} + \delta_y + \delta_s + \delta_s \cdot t + \pi \cdot X_{s,t} + \varepsilon_{s,t}$$

where $Edu_{s,t}$ is the total per capita education expenditure in state $s$ in year $t$; $Preg_{s,t}$ is a dummy variable which takes value 1 if state $s$ has adopted preregistration in year $t$, and 0 otherwise; $\delta_y$ and $\delta_s$ denote year and state fixed effects; $\delta_s \cdot t$ represents state linear time trends; $X_{s,t}$ are time-varying state characteristics; and $\varepsilon_{s,t}$ is the error term which

we cluster by state to capture serial correlation within states.[32]

Year fixed effects are meant to control for time shocks, just as state fixed effects are meant to account for a state's unobserved characteristics. State linear time trends are meant to capture differences in the trends of state-level outcomes and are added to separate out the effect of preregistration per se from the effect of, for example, FairVote programs to increase civic engagement, which advocate registration reforms and therefore may themselves be manifested in education expenditure trends. The vector $X_{s,t}$ includes potential confounders reflecting the fiscal, political, and socioeconomic characteristics listed in Table A1. In this way, fixed differences across states, common shocks varying non-linearly over time (such as the 2008 financial crisis), observable confounding variables, and state-specific differences that vary linearly over time are all removed from the estimated effect of preregistration. As a result, the coefficient $\beta$ should capture trend breaks in the outcomes of interest that coincide precisely with the timing of preregistration.
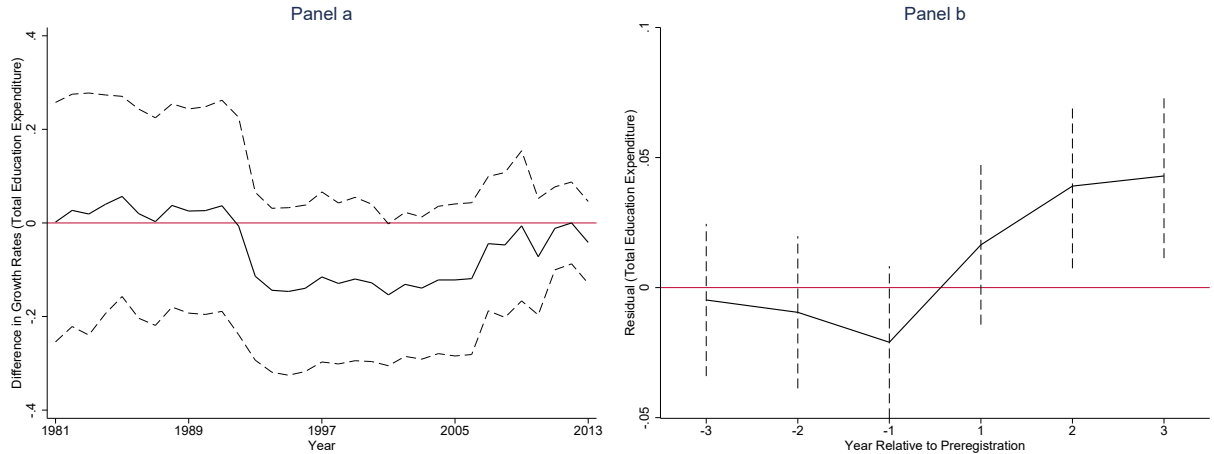


Figure 1: Parallel Trends (Panel a) and Residuals from Estimating the Empirical Model Without Preregistration (Panel b). In both panels dotted lines refer to the 90% confidence intervals.

The main identifying assumption is that the timing of preregistration is exogenous to underlying factors that might have affected the fiscal policies chosen by governors, conditional on the controls. The facts that (i) the timing of preregistration varies quite significantly across treated states, and (ii) governors exert limited authority over preregistration lawmaking, lend plausibility to the identifying assumption. Nonetheless, the possibility that state-level reforms respond to state-specific political and socioeconomic dynamics remains a valid concern, even though it is partially addressed by the inclusion of

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[32]All variables that are neither shares nor categorical are log-transformed as $\log(1+x)$ where $x$ is the variable of interest, in order to retain observations equal to zero. This occurs, for example, in the case of elementary-secondary education expenditure.

state-specific time trends. To further dig into this issue, we first show that preregistration reforms are not related to education expenditure trends of the treated and control groups. Although a visual inspection of the parallel trends assumption is not straightforward in a context with multiple treatments and periods, we nonetheless provide a graphical illustration in the spirit of an event study. Panel a of Figure 1 traces out the average year by year difference in education expenditure growth rates between treated and control states, for the period leading up to the registration change.[33] The figure shows no significant pre-treatment difference in education expenditure growth rates between the two groups of states. This suggests that education expenditure trends would have been the same in all states in the absence of the treatment.

Second, we show that the possible threat to identification originating from mean reversion at the onset of the preregistration reform (i.e., an Ashenfelter Dip) fails to be corroborated. To show this, we check for shocks to education expenditure that may have hit the treated group just prior to the preregistration year. Panel b of Figure 1 plots the coefficients obtained by regressing the residuals of the empirical model without the control $Preg_{s,t}$ on each of the three years preceding and following the introduction of preregistration in the treated states. The idea is that any shock affecting education expenditure prior to the adoption of preregistration should show up in a systematic pattern in the residuals. The figure, however, points to no significant variation in education expenditure prior to preregistration, followed by a significant increase that coincides with the enactment of a preregistration law. Overall, the evidence presented in Figure 1 indicates that the probability of shocks occurring at the same time as the registration change should be minimal.

Finally, we check that the timing of preregistration is orthogonal to a large number of predetermined state characteristics, thereby verifying that selection into treatment does not represent a threat to identification. With reference to the pre-treatment period, Table A2 of Appendix A reports point estimates, standard errors, and number of observations of pairwise correlations where the dependent variable corresponds to the preregistration year and the regressor of interest is defined by each row. All specifications include year and state fixed effects as controls. Reassuringly, none of the correlations is significant suggesting that neither political nor fiscal or socioeconomic factors determined the timing of the preregistration reform.

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[33]Formally, this is done by regressing education expenditure on time dummies and interactions between time dummies and a dummy for treated states during the pre-treatment period.

## 4.3 Results

In order to examine changes in education expenditure at the state level during the period 1980-2014, we estimate variants of the empirical model. Because the dependent variable is in logarithmic form, the coefficient estimates can be interpreted roughly as percentage changes.[34]

Table 1: Preregistration and Education Expenditure

| | Total Education Expenditure | | | | |
| --- | --- | --- | --- | --- | --- |
| | (1) | (2) | (3) | (4) | (5) |
| Preregistration | 0.049** | 0.060** | 0.071*** | 0.022 | 0.025 |
| | (0.021) | (0.023) | (0.017) | (0.016) | (0.017) |
| F(1)Preregistration | | | -0.012 | | -0.007 |
| | | | (0.009) | | (0.010) |
| F(2)Preregistration | | | -0.005 | | 0.002 |
| | | | (0.014) | | (0.014) |
| L(1)Preregistration | | | | 0.029** | 0.021 |
| | | | | (0.014) | (0.016) |
| L(2)Preregistration | | | | 0.054*** | 0.054*** |
| | | | | (0.017) | (0.012) |
| L(3)Preregistration | | | | | 0.046* |
| | | | | | (0.025) |
| | | | | | |
| State-Level Controls | No | Yes | Yes | Yes | Yes |
| State FE | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes |
| State Time Trends | Yes | Yes | Yes | Yes | Yes |
| R-squared | 0.970 | 0.975 | 0.976 | 0.976 | 0.976 |
| Observations | 1750 | 1750 | 1650 | 1650 | 1500 |

*Note:* State-level clustered standard errors are in parentheses. Significance levels: * 10%, ** 5%, *** 1%. Regression 1 includes state and year fixed effects and state linear time trends. Regressions 2-5 also control for: 1) Registration Reforms: Online Registration, Election Day Registration, NVRA; 2) Electoral variables: Dummies for gubernatorial election year and years to the next gubernatorial election, Incumbent, Year of Mandate, Governor Runs Next Election, Democratic Governor, Democratic President, Democratic Governor and President, Political Competition, Gubernatorial Turnout Rate; 3) Fiscal variables: Share of Current Expenditure, Total Taxes, Total Debt Outstanding, Total Federal Intergovernmental Revenue; 4) Socioeconomic variables: Population, Median Age, Share of 16-25, Post-Secondary Enrollment, Educational Attainment, Share of Blacks, Share of Whites, Personal Income, Inequality, Unemployment Rate.

Table 1 reports the estimation results. In Model 1, we test for the direct effect of preregistration on total per capita education expenditure after controlling for fixed effects and state linear time trends. We find a statistically significant increase in the outcome of interest of 4.9%. In Model 2, we include all the state-level variables listed in Table A1 as additional regressors in order to check for potential confounders that may have affected education expenditure through channels other than the lowering of registration costs. The coefficient of preregistration remains significant and equal to 6%. At the mean,

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[34]We first test for the effect on education expenditure of other registration reforms that aim to reduce the registration cost for all voters and not specifically youth. Table A3 in Appendix A shows that the introduction of NVRA, EDR, or Online Registration has no effect on the dependent variable.

this percentage variation corresponds to an increase of about $47 per capita in education expenditure in those states which at some point in time have adopted preregistration. To finance an equivalent increase by means of the income tax would require an average increase of 0.2 percentage points in the income tax rate (evaluated at mean income for the period 1980-2014). Panel a of Figure A2 in Appendix A displays the estimated residuals, which are centered at zero throughout the range of fitted values, indicating the absence of other relevant covariates correlated with preregistration.[35] In Model 3, we control for leads to test for potential changes in education expenditure that precede the preregistration year. The preregistration coefficient continues to be positive and significant, while anticipatory effects are not significant. Thus, we can reject the possibility of reverse causality running from education expenditure to preregistration.[36] In Model 4, we include lags in order to evaluate the incremental effect on education expenditure over time during the post-treatment period. The point estimates are statistically significant and exhibit an increasing pattern during a two-year window after treatment at the rates of 2.9 and 5.4% per year. Finally, in Model 5 we augment the base specification with both leads and lags. As in the previous models, the coefficients of the leads are close to zero, while the coefficients of the lags show an increase in education expenditure following the preregistration year that lasts up to the third post-treatment year. This pattern is depicted in Panel b of Figure A2 of Appendix A.

Up to this point, we have focused on education expenditure since it is more likely to be of interest to the young. We now also check the potential impact of preregistration on other types of public finance variables. In Table A6 of Appendix A, education expenditure is replaced by other relevant outlays, including public welfare, health, assistance and subsidies, and unemployment compensation, as well as revenues, including total taxes, public debt, and federal intergovernmental revenue. We find that the enactment of a preregistration law does not significantly affect any budget item other than education.[37]

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[35]Since Hawaii and Florida have a considerably different history with respect to the implementation of preregistration and since California is the only state where preregistration approval happened to be partisan, in Table A4 of Appendix A we check that our findings are not driven by these states by sequentially excluding them from the sample and re-estimating Model 2 of Table 1. In each case, the estimated coefficient remains unchanged. This suggests that the results capture a general relationship between registration provisions and fiscal policy outcomes, rather than the influence of only a few states.

[36]In Table A5 of Appendix A, we perform falsification tests by changing the date of adoption of preregistration to a random date within a 6-year window prior to the registration change. No statistically significant effects are observed.

[37]This lack of evidence suggests that the observed increase in education expenditure may be financed by means of a reshuffle of other budget items, which when considered individually are statistically insignificant.

## 4.4 Heterogeneity of the Effects

Consistent with the predictions of the theoretical framework, the results in Table 1 show that candidates whose goal is to win elections dedicate more resources to the age group which is likely to hold more voting power after the registration reform. This section goes on to explore the non-linear effects of preregistration on education expenditure pointed out in Section 3 by interacting preregistration with variables measuring political competition, voter turnout demographics, and inequality.

Table 2: Preregistration and Education Expenditure - Heterogeneity of the Effect

|  | Total Education Expenditure | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Prereg · Political Competition | -0.340* | | | | | | | | |
|  | (0.172) | | | | | | | | |
| Prereg · Share of 16-25 | | 1.732 | | | | | | | |
|  | | (1.511) | | | | | | | |
| Prereg · Inequality | | | 0.182** | | | | | | |
|  | | | (0.086) | | | | | | |
| Prereg · First Year of Term | | | | 0.001 | | | | | |
|  | | | | (0.014) | | | | | |
| Prereg · Second Year of Term | | | | | -0.003 | | | | |
|  | | | | | (0.016) | | | | |
| Prereg · Third Year of Term | | | | | | 0.014 | | | |
|  | | | | | | (0.010) | | | |
| Prereg · Fourth Year of Term | | | | | | | -0.011 | | |
|  | | | | | | | (0.011) | | |
| Prereg · Post-First Election Period | | | | | | | | 0.071*** | 0.067*** |
|  | | | | | | | | (0.025) | (0.023) |
| Prereg · Post-First Election Period · Incumbent | | | | | | | | | 0.012 |
|  | | | | | | | | | (0.046) |
| State FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| State Time Trends | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| R-squared | 0.975 | 0.975 | 0.975 | 0.975 | 0.975 | 0.975 | 0.975 | 0.975 | 0.975 |
| Observations | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 |

*Note:* State-level clustered standard errors are in parentheses. Significance levels: * 10%, ** 5%, *** 1%. All regressions also control for: 1) Registration Reforms: Preregistration, Online Registration, Election Day Registration, NVRA; 2) Electoral variables: Dummies for gubernatorial election year and years to the next gubernatorial election, Incumbent, Year of Mandate, Governor Runs Next Election, Democratic Governor, Democratic President, Democratic Governor and President, Political Competition, Gubernatorial Turnout Rate; 3) Fiscal variables: Share of Current Expenditure, Total Taxes, Total Debt Outstanding, Total Federal Intergovernmental Revenue; 4) Socioeconomic variables: Population, Median Age, Share of 16-25, Post-Secondary Enrollment, Educational Attainment, Share of Blacks, Share of Whites, Personal Income, Inequality, Unemployment Rate.

As a proxy for political competition, we utilize the index of political fractionalization. Higher values of this index correspond to states and periods with stiffer political competition. In Model 1 of Table 2, the preregistration–political competition interaction coefficient is negative and significant, indicating that states with weaker political competition experience larger increases in education expenditure following the introduction of preregistration, which is consistent with the theory.[38] The demographic composition of states appears not to affect the impact of preregistration on public education, as shown in Model 2 where we interact preregistration with the share of individuals aged 16-25.

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[38]If we drop Louisiana from the sample because it is the only state that follows a so-called jungle primary system for gubernatorial elections, we find that the preregistration-political competition interaction coefficient becomes −0.351, which is significant at the 5% level.

This lack of evidence, however, can be partially attributed to the limited variation in the explanatory variable relative to the mean in the post-treatment period. Finally, in Model 3, we examine how the marginal impact of preregistration varies with inequality as measured by the Theil Index. In line with the theoretical predictions, we find that the effect of preregistration on education expenditure is magnified by higher inequality. This likely reflects the presence of a relatively larger share of poor young that need financial support in order to attend college and therefore demand more public education expenditure.[39] The presence of a political cycle is tested for in Models 4-7 where we interact preregistration with each of the four years of a gubernatorial term. However, none of the interaction coefficients are statistically significant.

Finally, we execute two additional regressions in order to address the natural question of whether preregistration and education policy have been enacted as parts of a single youth-oriented policy package. These can be interpreted as additional informal tests to validate the identification strategy. If education expenditure responds to the introduction of preregistration because initiatives in the legislature are strategically linked to a governor's budget decision, we would expect to observe an increase in education expenditure during the four-year term of the legislature that approved the reform. However, when in Model 8 we include a dummy variable which takes value 1 in the years following the first election subsequent to the registration change, we find a significant and positive coefficient, similar in magnitude to the coefficient of preregistration in Table 1. This confirms that the effect of preregistration on education expenditure manifests itself during a different gubernatorial term from the one in which the reform is passed. Moreover, in Model 9 we interact the dummy variable introduced in the previous model with a variable capturing whether the elected governor is an incumbent and find that it has no significant impact. This demonstrates that changes in the education budget occurring during the post-reform term do not depend on whether the current governor was already in power in the reform year. Taken together, the results of Models 8 and 9 provide strong evidence that preregistration and education expenditure are outcomes of distinct state-level policy-making processes, thus partially reassuring about the exogeneity of registration reform with respect to the fiscal policy outcome.

## 4.5  Decomposing the Education Budget

The above results indicate that preregistration laws shift state-level government spending toward education. However, education expenditure may include components that react differently to the registration change.

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[39]We explore other sources of heterogeneity, such as the share of blacks and the party affiliation of the governor, but we do not report results for brevity since none are statistically significant.

Table 3: Preregistration and Education Expenditure by Function and Character

| | Education by Function | | Education by Character | | | |
| | Elem.-Sec. | Higher Ed. | Total Cur. | Total Cap. | Higher Cur. | Higher Cap. |
| --- | --- | --- | --- | --- | --- | --- |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Preregistration | -0.254 | 0.052** | 0.054** | 0.143 | 0.048** | 0.100 |
| | (0.289) | (0.024) | (0.022) | (0.102) | (0.022) | (0.110) |
| State FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| State Time Trends | Yes | Yes | Yes | Yes | Yes | Yes |
| R-squared | 0.849 | 0.968 | 0.978 | 0.737 | 0.973 | 0.661 |
| Observations | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 |

*Note:* State-level clustered standard errors are in parentheses. Significance levels: * 10%, ** 5%, *** 1%. All regressions also control for: 1) Registration Reforms: Online Registration, Election Day Registration, NVRA; 2) Electoral variables: Dummies for gubernatorial election year and years to the next gubernatorial election, Incumbent, Year of Mandate, Governor Runs Next Election, Democratic Governor, Democratic President, Democratic Governor and President, Political Competition, Gubernatorial Turnout Rate; 3) Fiscal variables: Share of Current Expenditure, Total Taxes, Total Debt Outstanding, Total Federal Intergovernmental Revenue; 4) Socioeconomic variables: Population, Median Age, Share of 16-25, Post-Secondary Enrollment, Educational Attainment, Share of Blacks, Share of Whites, Personal Income, Inequality, Unemployment Rate.

Table 3 disentangles education expenditure by function and character. In Models 1 and 2, we divide education expenditure by function, i.e., between elementary-secondary school expenditure and higher education expenditure. While the coefficient of preregistration for elementary-secondary education is not statistically significant, we find that higher education expenditure is increased by 5.2% in states that adopt preregistration. In Models 3 and 4, we distinguish, by character, between current operating expenditure and capital outlays. The results indicate that the effect of preregistration obtained previously manifests itself in the current component, rather than the capital component. It is then natural to divide expenditure on higher education between its current and capital components. Models 5 and 6 show that only the current component is significantly affected by preregistration and the coefficient of 4.8% is in line with the previous findings.

Collectively, the results presented in this section demonstrate that preregistration has a sizable effect on education expenditure, predominantly by way of current spending on higher education, which is the component that directly affects the prospects of young soon-to-become voters who are enrolled in college or about to enroll.

# 5 Preregistration and Student Financial Aid

## 5.1 Data

The state-level estimates provide empirical evidence of the effect of preregistration on government spending, mainly through changes in the current component of higher ed-

ucation expenditures. The higher education institution therefore becomes the relevant unit of observation to complement the state-level figures. This section employs the Integrated Postsecondary Education Data System (IPEDS) issued by the Delta Cost Project Database to test whether predictions for the provider of funding, i.e., a state, are mirrored by results for a recipient of that funding, i.e., a higher education institution.

For the period between the academic years 1987-1988 and 2011-2012, the Delta Cost Project Database provides annual data for individual colleges, universities, and technical and vocational institutions in the U.S., whether public or private, for-profit or not-for-profit. The data includes student financial aid, enrollment, and institutional and financial characteristics. The IPEDS consists of three matched datasets that cover the waves 1987-2012, 2002-2012, and 2007-2012. The number of institutions surveyed in each dataset grows in each subsequent wave. We focus on the 2002-2012 wave, which on average consists of 3968 institutions distributed over 50 U.S. states, plus the District of Columbia, and 1237 counties.[40] To construct controls for the analysis, we supplement the IPEDS with data collected from various sources for a number of socioeconomic and geographic variables at the county level, including population, personal income, geolocalization, and surface area. Appendix C provides variable definitions and data sources.

Summary statistics for the main variables are reported in Panel 1 of Table A7 of Appendix A. Public financing varies widely across higher education institutions. Student financial aid includes institutional, state, and federal (or Pell) grants, which represent respectively 15, 16, and 60% of total student aid. The recipients of these grants represent respectively 30, 25, and 50% of the total number of full-time first-time degree seekers.[41] For state grants, eligibility is tied to residency, as determined by requirements encoded in state statutes or established by state agencies of higher education. About 95% of total enrollment consists of state residents. Information is also provided on enrollment by race and gender, as well as characteristics of the institutions, such as qualitative ranking according to the Carnegie Classification, the types of degrees being offered, whether the control is public or private, and the structure of tuition.

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[40]We focus on the 2002-2012 wave since it includes the largest number of states which have adopted preregistration. In addition, it is preferable to the 2007-2012 wave since it considers a longer pre-treatment period and to the 1987-2012 wave since it suffers less from sample attrition related to the selective erosion of the initial sample over the waves.

[41]The sum of the percentages of types of grant within total student aid is less than 100% since total student aid also includes local grants, which account for only a small share and therefore are not reported here. The sum of the percentages of recipients is in contrast larger than 100%, since students can receive multiple grants. This is because federal grants are awarded on the basis of financial need, while institutional and state grants are provided also on the basis of academic merit.

## 5.2 Empirical Strategy

The estimation of preregistration's effect on education funding allocation at the level of the educational institution may be problematic due to the high level of heterogeneity among those institutions, which is spatial in nature and tends to vary with the business cycle. Indeed, a myriad of time-varying spatial heterogenous factors, such as local shocks to the demand and supply of education, other than preregistration, may affect the distribution of funding.[42] Thus, the use of an empirical approach that exploits all cross-state variation and accounts for place and time fixed effects would ignore such spatial confounds and the estimator would be subject to an omitted variable bias.

In order to reduce the effect of unobservable heterogeneity in education funding, we focus on a comparison of institutions between contiguous counties that belong to different states. By using only variation in the voting reform within U.S. county pairs that straddle a common state border, we are able to exploit policy discontinuities at state borders and identify the effect of preregistration. This is beneficial because underlying economic fundamentals are expected to evolve more similarly in contiguous counties than across states or randomly paired counties.[43] Figure A3 of Appendix A displays the location of the border-county pairs on a map of the U.S. which distinguishes between counties in states that have introduced preregistration and those in states that have not.

Summary statistics for the border-county pair sample are reported in Panel 2 of Table A7 of Appendix A. Among the 3108 counties in the lower 48 states, 1139 lie along a state border. We have a full set of institutional data for 310 border counties.[44] This yields 226 distinct border-county pairs. Of those, 65, formed by matching 85 counties, have a different registration rule at some point in the sample. Although restricted, the border-county pair sample displays strong similarities with the all-county sample in terms of student financial aid, enrollment, and characteristics of the higher education institutions.

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[42]A vast empirical literature highlights the spatial variation in education provision in the U.S. As Bound, Groen, Kezdi, and Turner (2004) point out, some of the differences across states are related to unmeasured differences in factors affecting college choice, such as the spatial distribution of specific industries. Keane and Wolpin (2001) emphasize the relationship between parental resources, borrowing constraints, and college enrollment. Goldin and Katz (1999) look at intergenerational transmission and preferences for higher education across states to show that wealthier families are more likely to expect their children to enroll in college.

[43]Such a county-pair identification strategy has been used by, among others, Dube, Lester, and Reich (2010) to estimate the labor market effects of the minimum wage and by Naidu (2012) to estimate the effect of disenfranchising the blacks on economic outcomes.

[44]If within a border-county pair there is no data available for any of the 11 years in one of the adjacent counties, then the pair is dropped from the sample. For this reason, Delaware is not part of the sample. Alaska and Hawaii are excluded from the lower 48, since they do not share a border.

Formally, the empirical model to be tested is as follows:

$$G_{i,p,t} = \beta \cdot Preg_{s,t} + \delta_c + \delta_{p,t} + \theta \cdot X_{i,p,t} + \lambda \cdot Z_{\bar{\imath},p(c),t} + \varepsilon_{i,p,t}$$

where $G_{i,p,t}$ is the primary outcome for higher education institution $i$ in border-county pair $p$ in year $t$; $Preg_{s,t}$ is a dummy variable which takes value 1 if state $s$ to which institution $i$ belongs has enacted preregistration in year $t$, and 0 otherwise; $\delta_c$ denotes fixed effects for county $c$ in which institution $i$ is located; $\delta_{p,t}$ represents border-county pair-year fixed effects; $X_{i,p,t}$ are time-varying characteristics for institution $i$ in border-county pair $p$; and $Z_{\bar{\imath},p(c),t}$ are average time-varying characteristics for higher education institutions $\bar{\imath}$ located in a county adjacent to $c$ in border-county pair $p$, which is denoted $p(c)$. We note that counties can belong to multiple border-county pairs, thereby inducing a mechanical correlation in the unobservables across pairs and potentially along an entire border segment.[45] To account for this correlation as well as the serial correlation within a state, we cluster the error term $\varepsilon_{i,p,t}$ by state and border segment.

The key to identification in this approach is the border-county pair-year fixed effect. This term captures all possible spatially distributed yearly shocks that may jointly affect contiguous institutions located in a border-county pair, such as the cross-border movements of students or spontaneous student activism. The vector $Z_{\bar{\imath},p(c),t}$ controls for local shocks which may affect the neighboring higher education institutions in the contiguous counties. For instance, assuming that education fund allocation depends on the quality of the institution, the demand for education, the number of students, the size of ethnic minorities, female representation, etc., if there is a shock in the neighboring institution which affects one of these variables, failure to control for them may lead to biased estimates. Moreover, we include county fixed effects in order to absorb permanent unobserved characteristics of the county, such as local political preferences and specific labor market conditions, and also the vector $X_{i,p,t}$ to control for the potential confounders reflecting the characteristics of educational institutions listed in Table A7.[46]

This rich set of controls implies that the coefficient $\beta$ should capture the average effect of preregistration on the distribution of public funding received by higher education institutions, since it reflects only the within-pair variation in preregistration adoption across border-county pairs over time. Furthermore, as highlighted in Section 2.1, the fact that preregistration changes are exogenous from the point of view of an individual institution, whose allocated funds are in many states managed by an independent state

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[45]A border segment is defined as the set of all counties on both sides of a given state border.

[46]We include also time-varying observable characteristics for county $c$ and the adjacent county $p(c)$ in order to control for potential confounders associated with the demographic and socioeconomic features at the local level listed in Table A7.

agency only partially linked to the government, makes it relatively straightforward to identify the effects of the registration reform.

This empirical approach does of course have drawbacks. First, it exploits variation between contiguous counties straddling a common state boundary, thus capturing local average treatment effects. However, as shown in Section 4, preregistration has an impact on national education expenditure, which also ensures the presence of global average treatment effects. Second, the estimator is based on the assumption that institutions in neighboring counties are more similar than two randomly chosen institutions due to the presence of cross-border spillovers and competition effects which make them subject to similar shocks. If this assumption is violated, then the strict exogeneity at the border-county pair level would be violated and the control groups would be improperly constructed. Even in this scenario, however, the size of the bias would likely be much smaller than the potential bias generated using an all-county sample and accounting for place and period fixed effects.[47] Furthermore, apart from local and geographically distributed shocks, there may be other specific individual shocks correlated with pre-registration and education fund allocation, which may not have been controlled for and which may affect the estimation. We shall address this concern by means of a number of robustness checks.

## 5.3 Results

Table 4 presents the estimation results for the effect of preregistration on education fund allocation. The two primary outcome measures are state grants and the number of state grant recipients. We focus on these measures since they are related to the state-level budget and directly targeted at the young and, therefore, are potentially affected by the introduction of preregistration.

In Model 1, the dependent variable is state grants, while in Model 2 it is the share of state grants within total student aid. In both models, we find a statistically significant and positive effect, implying an average increase in state grants both in terms of level and share of 42.8 and 4.3%, respectively, in the post-reform period. In Models 3 and 4, we re-estimate the empirical model for two alternative measures, i.e., state grant recipients and the share of state grant recipients within full-time first-time degree seekers. The introduction of preregistration has a statistically significant and positive effect on the number and share of state grant recipients equal to 38.6 and 7.1%, respectively, which

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[47]The presence of cross-border spillover includes the possibility of students leaving the untreated county for the within-pair treated county. However, this movement cannot be the result of larger grants allocated in the treated institutions since eligibility for state grants is tied to residency. Therefore, it is unlikely that the estimates are vulnerable to bias related to substitution effects due to treatment.

Table 4: Preregistration and State Grants

|  | State Grants | % State Grants | Recipients | % Recipients |
|---|---|---|---|---|
|  | (1) | (2) | (3) | (4) |
| Preregistration | 0.428** | 0.043*** | 0.386*** | 0.071** |
|  | (0.202) | (0.013) | (0.140) | (0.032) |
| County FE | Yes | Yes | Yes | Yes |
| Border-County Pair-Year FE | Yes | Yes | Yes | Yes |
| R-squared | 0.554 | 0.482 | 0.754 | 0.487 |
| Observations | 6945 | 6945 | 8380 | 8380 |

*Note:* State and border-segment level clustered standard errors are in parentheses. Significance levels: * 10%, ** 5%, *** 1%. All regressions also control for: 1) Institutional Variables: Full-Time First-Time Degree Seekers, Non-Resident Enrollment, White, Hispanic, and Black Enrollment, Share of Students with Loan, Carnegie Classification, Institutional Control and Sector, Medical Degree, Flagship, Has Hospital, Land Grant, and Hispanic Serving Institution, Historically Black College, Tuition Reliance, Total Expenditures, In-State and Out-of-State Tuitions; 2) Socioeconomic and Geographic Variables at the county level: Population, Personal Income, Latitude, Longitude, and Surface Area.

are similar in magnitude to the increase in state grants. This implies that, at the mean, preregistration leads to an increase in state grants of about \$1640 per full-time first-time degree seeker and 53 additional state grant recipients per institution.[48]

Table 5: Preregistration and Other Grants

|  | Federal Grants | | | | Institutional Grants | | | |
|---|---|---|---|---|---|---|---|---|
|  | Fed. Gr. | % Fed. Gr. | Rec. | % Rec. | Inst. Gr. | % Inst. Gr. | Rec. | % Rec. |
|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Preregistration | 0.030 | -0.048*** | 0.028 | 0.001 | 0.240 | -0.030 | -0.175 | -0.023 |
|  | (0.059) | (0.016) | (0.051) | (0.017) | (0.264) | (0.020) | (0.180) | (0.025) |
| County FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Border-County Pair-Year FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| R-squared | 0.864 | 0.757 | 0.879 | 0.623 | 0.662 | 0.294 | 0.744 | 0.620 |
| Observations | 8255 | 8255 | 8382 | 8382 | 5913 | 5913 | 8380 | 8380 |

*Note:* State and border-segment level clustered standard errors are in parentheses. Significance levels: * 10%, ** 5%, *** 1%. All regressions also control for: 1) Institutional Variables: Full-Time First-Time Degree Seekers, Non-Resident Enrollment, White, Hispanic, and Black Enrollment, Share of Students with Loan, Carnegie Classification, Institutional Control and Sector, Medical Degree, Flagship, Has Hospital, Land Grant, and Hispanic Serving Institution, Historically Black College, Tuition Reliance, Total Expenditures, In-State and Out-of-State Tuitions; 2) Socioeconomic and Geographic Variables at the county level: Population, Personal Income, Latitude, Longitude, and Surface Area.

Table 5 repeats the estimation presented in Table 4, but focuses on federal (Models 1-4) and institutional (Models 5-8) grants. These can be interpreted as falsification tests for the estimates, since grants not related to the state budget should not be affected by

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[48]Table A8 of Appendix A presents the estimation results for a variation of the empirical model that uses the all-county sample and accounts for county and year fixed effects and a state linear time trend. The coefficient for the impact of preregistration exhibits a downward bias in all models and is not significant for the share of state grants in total student aid. The results reflect the presence of spatial heterogeneity in the distribution of education and the improper construction of the control group.

preregistration. The results show no significant effect for preregistration on the level of these grants, nor on the number and share of recipients. We note that preregistration shows a statistically significant and negative effect on the share of federal grants within total student aid. However, this can be attributed to the increase in total student aid, which includes state grants, since the level of federal grants is indeed not affected by preregistration, as shown in Model 1.[49]

## 5.4 Robustness

The main identification assumption underlying the empirical approach is that there is no omitted variable affecting the outcomes in a similar manner to the introduction of preregistration. In order to confound the interpretation of the results as the effect of registration reform, in this section we check the robustness of the estimates by constructing two different placebo specifications. First, we match each state-border county with all its adjacent counties lying on the border within the same state. For each within-state county pair, one county is counterfactually assumed to be affected by preregistration, while the other is not. The rationale behind this is that in the absence of local shocks at state boundaries counties belonging to the same state should not differ in terms of student aid allocation.[50] Second, we form pairs of institutions within the same county. For each within-county institution pair, we fictitiously assume that one institution is affected by preregistration while the other is not. Again, the rationale behind this is that in the absence of institution-specific shocks we should observe no difference in the effect of preregistration on student aid allocation between a pair of institutions within the same county.[51]

Table 6 reports the estimation results for the effect of fictitious placebo preregistration on state grants and the number of state grant recipients, in terms of both level and share, for both falsification exercises. Reassuringly, we do not find any significant effect of preregistration on state grants and the number of recipients in the case of county

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[49]Table A9 of Appendix A presents results for the number of applications for admission. Model 2 reveals that the increase in the number of applications in the post-reform period works by way of its effect on the number of female applicants, which is 19.3% higher in treated institutions than in untreated ones. These results are qualitatively consistent with those reported in the literature. Within a simulated general equilibrium model, Epple, Romano, Sarpça, and Sieg (2013) show that cuts in state student aid result in reduced attendance rates mainly among poor students, while Abbott, Gallipoli, Meghir, and Violante (2016) show that additional student aid benefits high-ability children from poor families, especially girls.

[50]When estimating the effect of the fictitious placebo preregistration law on state grant allocation, we use the same specification of the main empirical model but employ a within-state county pair sample consisting of a full set of institutions located in 263 counties and 175 county pairs.

[51]Since matched institutions are located in the same county, we include here institution pair-year fixed effects, while disregarding controls at the county level. The within-county institution pairs sample consists of a full set of 1056 institutions and 6983 institution pairs.

Table 6: Preregistration and State Grants - Robustness

| | Within-State County Pairs | | | | Within-County Institution Pairs | | | |
|---|---|---|---|---|---|---|---|---|
| | St. Gr. | % St. Gr. | Rec. | % Rec. | St. Gr. | % St. Gr. | Rec. | % Rec. |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Preregistration | 0.193 | 0.021 | -0.183 | -0.019 | 0.216 | 0.038 | -0.059 | 0.001 |
| | (0.281) | (0.018) | (0.124) | (0.025) | (0.280) | (0.024) | (0.260) | (0.046) |
| County FE | Yes | Yes | Yes | Yes | No | No | No | No |
| Border-County Pair-Year FE | Yes | Yes | Yes | Yes | No | No | No | No |
| Institution Pair-Year FE | No | No | No | No | Yes | Yes | Yes | Yes |
| R-squared | 0.618 | 0.534 | 0.753 | 0.500 | 0.524 | 0.508 | 0.749 | 0.374 |
| Observations | 5494 | 5494 | 6467 | 6467 | 31054 | 31054 | 38553 | 38553 |

*Note:* In Models 1-4, errors are clustered at a county-pair level, while in Models 5-8 errors are clustered at a county level. Clustered standard errors are in parenthesis. Significance levels: * 10%, ** 5%, *** 1%. Regressions 1-4 also control for: 1) Institutional Variables: Full-Time First-Time Degree Seekers, Non-Resident Enrollment, White, Hispanic, and Black Enrollment, Share of Students with Loan, Carnegie Classification, Institutional Control and Sector, Medical Degree, Flagship, Has Hospital, Land Grant, and Hispanic Serving Institution, Historically Black College, Tuition Reliance, Total Expenditures, In-State and Out-of-State Tuitions; 2) Socioeconomic and Geographic Variables at the county level: Population, Personal Income, Latitude, Longitude, and Surface Area. Regressions 5-8 control for the same variables except for Socioeconomic and Geographic Variables at the county level.

pairs in the same state (Models 1-4), nor in the case of matched institutions within the same county (Models 5-8). The results of both falsification exercises serve as compelling evidence that the actual timing of preregistration is central to our main empirical result since neither local nor institutional shocks impinge on the inferences we draw.

Collectively, these results paint a consistent picture. Preregistration laws have a sizable effect on the distribution of student aid through changes in state grant allocation across U.S. higher education institutions in view of a potential de facto youth enfranchisement episode.

# 6 Political Participation

The previous analysis indicated that the adoption preregistration laws has raised expenditure on public education by a non-trivial amount. This leads us to investigate the link between preregistration and political participation. According to the theory presented in Section 3, politicians may have adopted policies that are more aligned with the preferences of the young, in response to the increase in their political participation following the passage of registration reform. Using stacked cross sections of individual-level voting records from the Voting and Registration Supplement of the Current Population Survey (CPS) carried out by the U.S. Census Bureau during the period 1996-2014, we investigate actual changes in the political participation of the young following the introduction of preregistration. The sample is confined to individuals between 18 and 90 years of age

who report having voted and/or registered. Detailed electoral and socioeconomic data is presented in Appendix C.[52]

Table A10 in Appendix A presents the summary statistics for the main variables. The preregistration treatment involves 9% of the individuals in the sample, i.e., the residents of a state which at some point during the sample period introduced preregistration provisions. On average, 62% of the respondents report having voted, while 79% report having registered, and 20% report having registered either at school, on campus, or at a hospital. The individuals are grouped into four age categories: 18-24, 25-44, 45-64, and 65-90.[53] Young voters aged 18-24 represent 11% of the sample, while women account for 53% and blacks for 9%. Average family income is between $35000 and $39999 while 33% of the sample are not participating in the labor force. Data is also presented for marital and metropolitan city status, home ownership, and educational attainment.

## 6.1 Empirical Strategy and Results

We estimate the effect of preregistration on political participation using the same difference-in-differences regression design as in Section 4, but focus on individuals within states with different registration rules as the relevant unit of observation. The baseline specification is as follows:

$$V_{i,s,t} = \beta \cdot Preg_{s,t} + \delta_y + \delta_s + \delta_s \cdot t + \pi \cdot X_{i,s,t} + \varepsilon_{i,s,t}$$

where $V_{i,s,t}$ is a dummy variable that takes value 1 if individual $i$ in state $s$ in year $t$ has registered or voted, and 0 otherwise; $Preg_{s,t}$ is a dummy variable for whether a preregistration law was enacted in state $s$ in year $t$; $\delta_y$ and $\delta_s$ denote year and state fixed effects; $\delta_s \cdot t$ are state-specific time trends that allow unobserved state turnout rate propensities to trend linearly; $X_{i,s,t}$ is a vector of time-varying individual respondent characteristics as listed in Table A10; and $\varepsilon_{i,s,t}$ is the error term which we cluster by state.[54]

Table 7 presents the estimation results for the impact of preregistration on political participation. In Models 1-4, the dependent variable is a dummy for whether the in-

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[52]Available individual-level data provides information on voting and registering behavior for Congressional and Presidential elections. The assumption underlying the analysis is that changes in voting and registering patterns at the federal election level following registration reforms are mirrored by similar changes at the state and local levels. This is particularly plausible in those states where all types of elections are held on Election Day.

[53]As a robustness check, we use other age cutoffs, such as defining the youngest age group as 18-29, with no substantive effect on the main insights of the analysis.

[54]The model also includes controls for other registration reforms at the state level, i.e., EDR and Online Registration, which may confound the effect of preregistration.

Table 7: Preregistration, Voting, and Registering

| | OLS | | | | Heckman Probit | |
| --- | --- | --- | --- | --- | --- | --- |
| | Voting | | | | Registering | Voting |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Preregistration | 0.023 | 0.018 | 0.064*** | 0.050* | 0.038 | 0.038 |
| | (0.016) | (0.016) | (0.016) | (0.027) | (0.025) | (0.050) |
| Age 18-24 | -0.279*** | -0.282*** | -0.283*** | -0.282*** | -0.729*** | -0.647*** |
| | (0.006) | (0.006) | (0.006) | (0.006) | (0.021) | (0.019) |
| Age 25-44 | -0.192*** | -0.192*** | -0.194*** | -0.192*** | -0.516*** | -0.510*** |
| | (0.004) | (0.004) | (0.004) | (0.004) | (0.017) | (0.015) |
| Age 45-64 | -0.077*** | -0.077*** | -0.079*** | -0.078*** | -0.265*** | -0.161*** |
| | (0.003) | (0.003) | (0.003) | (0.003) | (0.013) | (0.013) |
| Preregistration·Age 18-24 | | 0.046*** | | 0.044*** | 0.090*** | 0.093*** |
| | | (0.008) | | (0.009) | (0.020) | (0.029) |
| Preregistration·Age 25-44 | | | -0.029*** | | | |
| | | | (0.006) | | | |
| Preregistration·Age 45-64 | | | -0.052*** | | | |
| | | | (0.010) | | | |
| Preregistration·Age 65-90 | | | -0.065*** | | | |
| | | | (0.010) | | | |
| Preregistration·Family Income | | | | -0.003* | | |
| | | | | (0.001) | | |
| State FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| State Time Trends | Yes | Yes | Yes | Yes | Yes | Yes |
| R-squared | 0.221 | 0.221 | 0.221 | 0.221 | | |
| Observations | 561372 | 561372 | 561372 | 561372 | 561372 | 443445 |

*Note:* State-level clustered standard errors are in parentheses. Significance levels: * 10%, ** 5%, *** 1%. All regressions also control for: 1) Registration Reforms: Online Registration, Election Day Registration; 2) Electoral variables: Duration of Residence at Current Address; 3) Socioeconomic variables: Sex, Black, Hispanic, Citizenship, Marital Status, Metropolitan Area, Educational Attainment, Family Income, Housing Tenure, Employment Status, Labor Force Status. The variable Duration of Residence at Current Address is the exclusion restriction in the selection equation in Model 5. The Wald test rejects the null hypothesis that the inverse Mills ratio equal 0 at the 1% significance level.

dividual has voted. The passage of preregistration laws increases total voter turnout by 2.3% in Model 1 though the effect is not statistically significant. Dummies for each age group, where the 65-90 age group is the omitted reference variable, show that voter turnout increases monotonically with age, with the lowest participation rate observed in the 18-24 group. When in Model 2 we interact preregistration with the 18-24 age group, we observe a statistically significant and positive interaction effect on the order of 4.6%. The fact that individuals aged 18-24 comprise only 11% of total eligible voters is the reason why the direct effect of preregistration on total voter turnout is not significant. In Model 3, we interact preregistration with the other age groups, in order to show how the turnout gap between young voters and the rest of the electorate changes after the passage of the reform. We find that the turnout gap between the 18-24 and 65-90 age

groups decreases from 28.3 to 21.8% following the introduction of preregistration, while the gaps with respect to the 55-64 and the 25-44 age groups decrease by 5.2 and 2.9%, respectively. The results therefore indicate that preregistration mobilizes the young to vote more than other age groups.

It is commonly claimed in the political science literature that low-income individuals tend to remain unregistered and therefore exhibit low levels of political participation.[55] This leads us to test whether the reduction of registration costs induces more low-income individuals to vote and, if so, whether the effect of the reform on the turnout of the young remains intact. Augmenting Model 2 with the preregistration-family income interaction, Model 4 reveals a significant impact of preregistration on voter turnout of individuals from poor families. Remarkably, however, the effect on the electoral mobilization of the young remains unchanged, with respect to both magnitude and significance.[56]

A potential concern is that the distribution of voters is censored since the voting decision is observed only for eligible voters who have registered and are presumably more politically engaged. Thus, the presence of sample selection bias may limit the validity of the estimation results. To address this concern, we use the Heckman-probit correction to examine the link between preregistration and voter turnout conditional on the probability of individuals being registered. The duration of an individual's residence at her current address is used as the exclusion restriction, in view of the fact that most states have length-of-residency requirements for registration, though such requirements have no direct impact on turnout.[57] In Model 5, we run the selection equation of the Heckman-probit correction and find that preregistration laws have no significant impact on voter registration. The interaction coefficient between preregistration and the 18-24 age group, however, reveals that registration increases substantially among the young relative to other age groups.[58] In Model 6, we then estimate the change in voter turnout conditional on voters being registered and find an increase of 9.3% in the voting share of individuals aged 18-24 after the adoption of preregistration. Notably, after taking into account the estimated probability of registering, the Heckman correction aligns both in

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[55] For an analysis of the link between income and voter turnout, see Leighley and Nagler (2013).

[56] When we interact preregistration with other voter characteristics, such as gender, educational attainment, race, and marital and employment status, no statistically significant effects are found. We do not report these results for brevity.

[57] It is still possible that individuals who are more engaged in politics are also more likely to update their registration when they move. If this is the case, then the results may overstate the true effect. Although this concern cannot be addressed with the available data, we will show that the results are similar to those obtained from unconditional estimation.

[58] We test the impact of preregistration on the share of individuals registering at school and find a statistically significant and positive coefficient of 14.9% and an increase in registration of 13.5% among the youngest group relative to the other age groups. These results suggest that the effectiveness of registration is enhanced when it takes place at locations that the young frequent, thus making it easier for them to gather information and overcome the cost of participation.

magnitude and significance with the unconditional results of Model 2.

Finally, it is worth mentioning that the available data is in the form of stacked cross sections, i.e., the samples of respondents in the pre- and post-treatment periods differ, thereby making the estimation results possibly subject to omitted variable bias. For example, it is likely that individuals who vote have a substantially stronger interest in politics than those who don't, and that such interest varies along the life cycle. Such a bias may limit the statistical power of the results in Table 7. On the other hand, we find strong suggestive evidence that preregistration has a greater impact on the voter turnout of the young, which reconciles with the results reported in previous sections that showed a shift of public spending toward education. Overall, the empirical results indicate that state-level politicians respond to changes in electoral composition following the de facto enfranchisement events of the 2000s, in a manner consistent with the theoretical framework in Section 3.

# 7 Conclusions

This paper investigates the effect of preregistration laws on government spending and political participation in the U.S. Preregistration allows individuals to complete their registration application sometime before they reach voting age so as to be automatically added to the registration rolls once they come of age. By exploiting the variation in the timing of the passage of preregistration laws across states, we show that preregistration leads to a 6% increase in total per capita education expenditure at the state level and a 4.3% increase in the share of state-provided student aid within total student aid at the level of institutions of higher education. The results also produce evidence of a shift in electoral composition toward a greater representation of the young in the post-reform period. Consistent with the predictions of a political economy model of distributive politics, the results collectively suggest strong political responsiveness to the needs of the newly-enfranchised constituent group.

A caveat to be considered is that the results may apply only to a specific country and time period. For example, the fact that political competition is strongly bipartisan, that voting is conditional on registration, and that the approval processes for electoral and budget bills involve a reverse legislative pattern are all features specific to the U.S. context. Nonetheless, the analysis reinforces a common insight from political economics, i.e., that increased electoral participation by a politically disadvantaged group is a precondition for the advancement of policies that benefit it. Thus, recent attempts to roll back preregistration in some U.S. states, which would make voting registration more restrictive, may be misguided not only because they tend to disenfranchise young voters,

but also because they weaken the political incentive to implement fiscal policies to their benefit, such as the provision of public education.[59]

Whether similar results can be replicated in different contexts is a question ripe for investigation, especially since youth disenchantment with the ballot is becoming a growing phenomenon across democracies. Many European countries (such as Austria, Germany, Norway, and the UK) are considering whether to lower the voting age from 18 to 16 as part of an effort to promote more active social and political engagement among the young.[60] Our empirical results confirm that we can expect a stronger impact for electoral reform on public policy in countries characterized by weak political competition, high inequality and, as predicted by the model, an aging population. Future research should investigate these issues in different settings.

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[59]In the 2016 presidential election, 15 states introduced new restrictive voting requirements, such as voter ID laws. This is part of a broader movement to curtail voting, which began after the 2010 midterm election. See brennancenter.org/sites/default/files/analysis.

[60]On the debate on whether to lower the voting age to 16, see www.economist.com/news/leaders/21716030-young-voters-are-becoming-disillusioned-elections-catch-them-early-and-teach-them-value.

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# Appendices

These appendices present the figures and tables (Appendix A), the proof (Appendix B), and the description of the data (Appendix C) that were referred to in the main text.
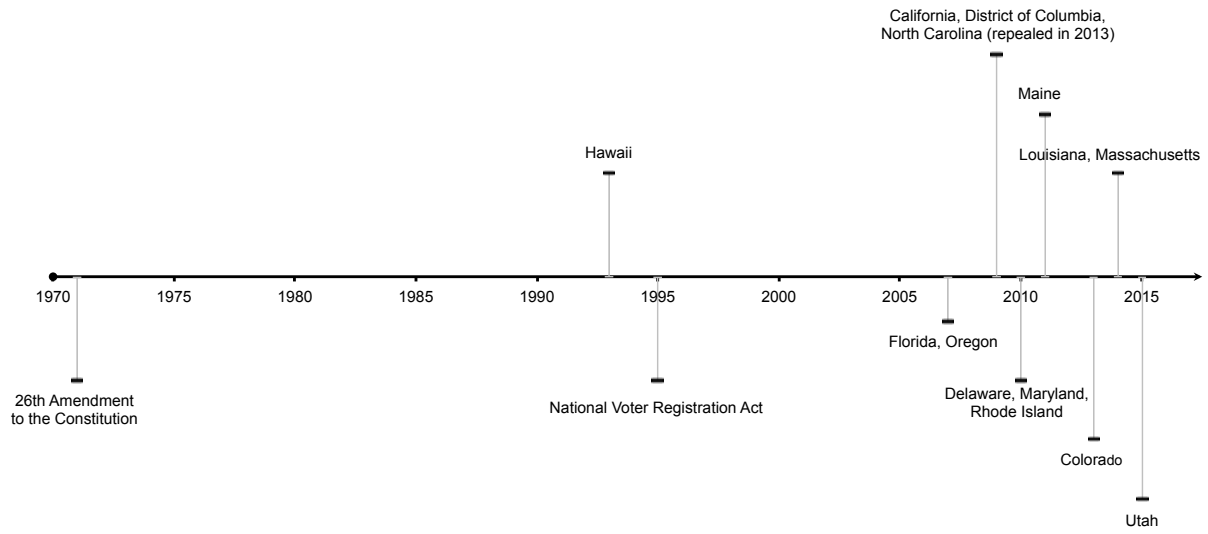
APPENDIX A. FIGURES AND TABLES



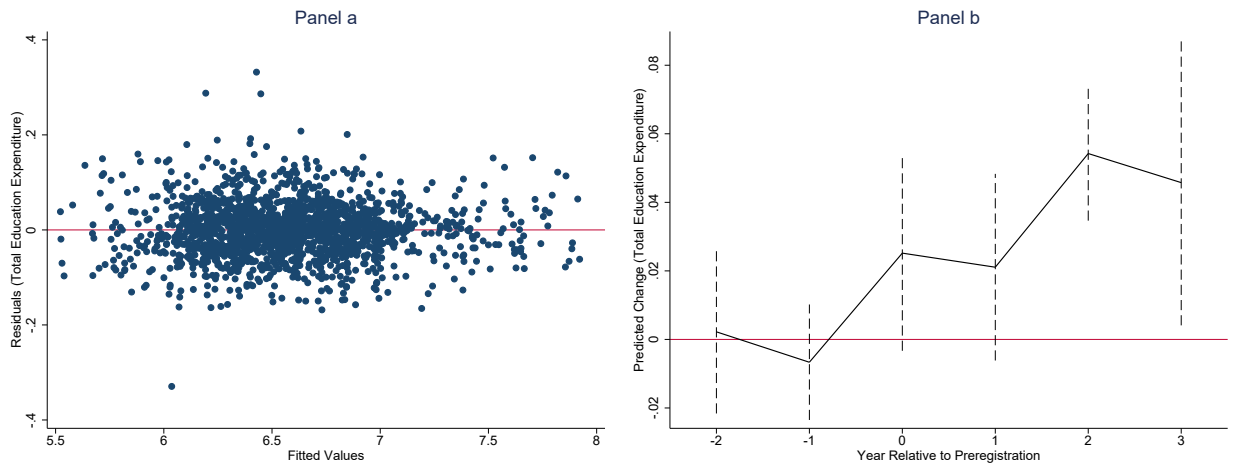Figure A1: The Timeline of Preregistration Legislation in the U.S.



Figure A2: Residuals versus Fitted Values of Total Education Expenditure (Panel a) and Predicted Changes in Total Education Expenditure (Panel b). In Panel b, Year 0 refers to the preregistration year and dotted lines refer to the 90% confidence interval.

# Table A1: Summary Statistics - State-Level Data

|  | Mean | Std. dev. | Obs. | Min. | Max. |
|---|---|---|---|---|---|
| **Registration Reforms** |  |  |  |  |  |
| Preregistration | 0.04 | 0.20 | 1750 | 0 | 1 |
| Online Registration | 0.04 | 0.20 | 1750 | 0 | 1 |
| Election Day Registration (EDR) | 0.11 | 0.31 | 1750 | 0 | 1 |
| National Voter Registration Act (NRVA) | 0.50 | 0.50 | 1750 | 0 | 1 |
| **Electoral Variables** |  |  |  |  |  |
| Incumbent | 0.43 | 0.50 | 1750 | 0 | 1 |
| Year of Mandate | 2.45 | 1.12 | 1750 | 1 | 4 |
| Governor Runs Next Election | 0.53 | 0.50 | 1750 | 0 | 1 |
| Democratic Governor | 0.50 | 0.50 | 1750 | 0 | 1 |
| Democratic President | 0.43 | 0.50 | 1750 | 0 | 1 |
| Political Competition (Herfidahl Index) | 0.51 | 0.06 | 1750 | 0.30 | 0.72 |
| Gubernatorial Turnout Rate | 0.46 | 0.10 | 1750 | 0.17 | 0.86 |
| **Fiscal Variables (per capita at constant 2014 U.S. dollars)** |  |  |  |  |  |
| Total Education Expenditure | 776.24 | 351.79 | 1750 | 230 | 2914 |
| Total Education - Current Operating Expenditure | 647.19 | 297.73 | 1750 | 198 | 2623 |
| Total Education - Capital Outlay | 78.06 | 59.64 | 1750 | 5 | 845 |
| Higher Education Expenditure | 610.79 | 217.10 | 1750 | 168 | 1396 |
| Higher Education - Current Operating Expenditure | 543.55 | 188.58 | 1750 | 142 | 1278 |
| Higher Education - Capital Outlay | 67.25 | 40.66 | 1750 | 1 | 410 |
| Elementary-Secondary Education Expenditure | 48.31 | 210 | 1750 | 0 | 1925 |
| Public Welfare Expenditure | 984.02 | 493.56 | 1750 | 149 | 2835 |
| Health & Hospital Direct Expenditure | 297.71 | 135.13 | 1750 | 77 | 1025 |
| Total Assistance & Subsidies | 135.06 | 68.71 | 1750 | 20 | 434 |
| Unemployment Compensation Expenditure | 167.02 | 119.31 | 1750 | 15 | 966 |
| Total Expenditure | 5348.05 | 2204.67 | 1750 | 2114 | 20451 |
| Total Current Expenditure | 4915.82 | 2015.69 | 1750 | 1890 | 17680 |
| Total Taxes | 2420.98 | 988.83 | 1750 | 747 | 14418 |
| Total Debt Outstanding | 3202.36 | 2615.17 | 1750 | 99 | 27627 |
| Total Federal Intergovernmental Revenue | 1344.94 | 618.06 | 1750 | 394 | 4494 |
| **Socioeconomic Variables** |  |  |  |  |  |
| Population (in thousands) | 5433.04 | 5970.86 | 1750 | 405.32 | 38680.81 |
| Median Age | 34.00 | 3.20 | 1750 | 23.70 | 43.68 |
| Share of 16-25 | 0.20 | 0.03 | 1750 | 0.15 | 0.32 |
| Post-Secondary Enrollment (in thousands) | 310.41 | 369.49 | 1750 | 21.15 | 2732.15 |
| Educational Attainment (High School Diploma) | 0.59 | 0.06 | 1750 | 0.39 | 0.74 |
| Share of Blacks | 0.10 | 0.09 | 1750 | 0.00 | 0.38 |
| Share of Whites | 0.84 | 0.13 | 1750 | 0.24 | 0.99 |
| Personal Income | 26246.09 | 11529.33 | 1750 | 7127 | 66770 |
| Inequality (Theil Index) | 0.69 | 0.23 | 1750 | 0.29 | 2.58 |
| Unemployment Rate | 6.08 | 2.11 | 1750 | 2.30 | 17.79 |

## Table A2: Pre-Treatment Test

| | Year of Preregistration | | |
| --- | --- | --- | --- |
| | Coefficient | Standard Error | Observations |
| **Fiscal Variables (at constant** 2014 **U.S. dollars)** | | | |
| | | | |
| Total Education Expenditure | -0.007 | 0.019 | 1689 |
| Total Expenditure | 0.008 | 0.023 | 1689 |
| Share of Current Expenditure | -0.155 | 0.163 | 1689 |
| Total Taxes | -0.009 | 0.010 | 1689 |
| Total Debt Outstanding | 0.000 | 0.009 | 1689 |
| Total Federal Intergovernmental Revenue | -0.001 | 0.020 | 1689 |
| | | | |
| **Electoral Variables** | | | |
| | | | |
| Incumbent | -0.002 | 0.005 | 1689 |
| Governor Runs Next Election | -0.004 | 0.004 | 1689 |
| Democratic Governor | -0.001 | 0.004 | 1689 |
| Democratic Party Voting Share | -0.019 | 0.022 | 1689 |
| Political Competition (Herfindahl Index) | 0.098 | 0.059 | 1689 |
| Gubernatorial Turnout Rate | 0.029 | 0.054 | 1689 |
| | | | |
| **Socioeconomic Variables** | | | |
| | | | |
| Median Age | 0.003 | 0.005 | 1689 |
| Share of 16-25 | 0.229 | 0.342 | 1689 |
| Post-Secondary Enrollment (in thousands) | -0.031 | 0.243 | 1689 |
| Educational Attainment (High School Diploma) | -0.098 | 0.113 | 1689 |
| Personal Income | -0.015 | 0.046 | 1689 |
| Inequality (Theil Index) | -0.030 | 0.022 | 1689 |

*Note:* Standard errors are clustered at state level. Significance levels: * 10%, ** 5%, *** 1%. All regressions control for state and year fixed effects.

## Table A3: Registration Reforms and Education Expenditure

| | Total Education Expenditure | | |
| --- | --- | --- | --- |
| | (1) | (2) | (3) |
| National Voter Registration Act (NRVA) | 0.018 | | |
| | (0.038) | | |
| Online Registration | | 0.010 | |
| | | (0.020) | |
| Election Day Registration (EDR) | | | -0.022 |
| | | | (0.042) |
| State FE | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes |
| State Time Trends | Yes | Yes | Yes |
| R-squared | 0.975 | 0.975 | 0.975 |
| Observations | 1750 | 1750 | 1750 |

*Note:* State-level clustered standard errors are in parentheses. Significance levels: * 10%, ** 5%, *** 1%. All regressions also control for: 1) Electoral variables: Dummies for gubernatorial election year and years to the next gubernatorial election, Incumbent, Year of Mandate, Governor Runs Next Election, Democratic Governor, Democratic President, Democratic Governor and President, Political Competition, Gubernatorial Turnout Rate; 2) Fiscal variables: Share of Current Expenditure, Total Taxes, Total Debt Outstanding, Total Federal Intergovernmental Revenue; 3) Socioeconomic variables: Population, Median Age, Share of 16-25, Post-Secondary Enrollment, Educational Attainment, Share of Blacks, Share of Whites, Personal Income, Inequality, Unemployment Rate.

## Table A4: Robustness to Hawaii, Florida, and California

| | Total Education Expenditure | | |
| --- | --- | --- | --- |
| | No Hawaii | No Florida | No California |
| | (1) | (2) | (3) |
| Preregistration | 0.055** | 0.056** | 0.052** |
| | (0.024) | (0.024) | (0.024) |
| State FE | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes |
| State Time Trends | Yes | Yes | Yes |
| R-squared | 0.971 | 0.974 | 0.975 |
| Observations | 1715 | 1715 | 1715 |

*Note:* State-level clustered standard errors are in parentheses. Significance levels: * 10%, ** 5%, *** 1%. All regressions also control for: 1) Registration Reforms: Online Registration, Election Day Registration, NVRA; 2) Electoral variables: Dummies for gubernatorial election year and years to the next gubernatorial election, Incumbent, Year of Mandate, Governor Runs Next Election, Democratic Governor, Democratic President, Democratic Governor and President, Political Competition, Gubernatorial Turnout Rate; 3) Fiscal variables: Share of Current Expenditure, Total Taxes, Total Debt Outstanding, Total Federal Intergovernmental Revenue; 4) Socioeconomic variables: Population, Median Age, Share of 16-25, Post-Secondary Enrollment, Educational Attainment, Share of Blacks, Share of Whites, Personal Income, Inequality, Unemployment Rate.

## Table A5: Preponing Preregistration

| | Total Education Expenditure | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| F(3)Preregistration | 0.004 | | | |
| | (0.019) | | | |
| F(4)Preregistration | | 0.012 | | |
| | | (0.021) | | |
| F(5)Preregistration | | | 0.018 | |
| | | | (0.025) | |
| F(6)Preregistration | | | | 0.012 |
| | | | | (0.024) |
| State FE | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |
| State Time Trends | Yes | Yes | Yes | Yes |
| R-squared | 0.977 | 0.977 | 0.977 | 0.977 |
| Observations | 1600 | 1550 | 1500 | 1450 |

*Note:* State-level clustered standard errors are in parentheses. Significance levels: * 10%, ** 5%, *** 1%. All regressions also control for: 1) Registration Reforms: Online Registration, Election Day Registration, NVRA; 2) Electoral variables: Dummies for gubernatorial election year and years to the next gubernatorial election, Incumbent, Year of Mandate, Governor Runs Next Election, Democratic Governor, Democratic President, Democratic Governor and President, Political Competition, Gubernatorial Turnout Rate; 3) Fiscal variables: Share of Current Expenditure, Total Taxes, Total Debt Outstanding, Total Federal Intergovernmental Revenue; 4) Socioeconomic variables: Population, Median Age, Share of 16-25, Post-Secondary Enrollment, Educational Attainment, Share of Blacks, Share of Whites, Personal Income, Inequality, Unemployment Rate.

## Table A6: Preregistration and Public Finance Variables

| | Fiscal Expenditure | | | | Fiscal Revenue | | |
|---|---|---|---|---|---|---|---|
| | Pub. Welf. | Health | Assist. | Unemp. | Tax Rev. | Federal IG | Debt |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Preregistration | 0.015 | -0.053 | 0.018 | -0.035 | 0.006 | -0.011 | 0.080 |
| | (0.038) | (0.047) | (0.092) | (0.074) | (0.026) | (0.040) | (0.064) |
| State FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| State Time Trends | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| R-squared | 0.967 | 0.881 | 0.849 | 0.922 | 0.921 | 0.967 | 0.952 |
| Observations | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 |

*Note:* State-level clustered standard errors are in parentheses. Significance levels: * 10%, ** 5%, *** 1%. Regressions 1-4 also control for: 1) Registration Reforms: Online Registration, Election Day Registration, NVRA; 2) Electoral variables: Dummies for gubernatorial election year and years to the next gubernatorial election, Incumbent, Year of Mandate, Governor Runs Next Election, Democratic Governor, Democratic President, Democratic Governor and President, Political Competition, Gubernatorial Turnout Rate; 3) Fiscal variables: Share of Current Expenditure, Total Taxes, Total Debt Outstanding, Total Federal Intergovernmental Revenue; 4) Socioeconomic variables: Population, Median Age, Share of 16-25, Post-Secondary Enrollment, Educational Attainment, Share of Blacks, Share of Whites, Personal Income, Inequality, Unemployment Rate. Regressions 5-7 control for the same variables except for fiscal variables that are not Current over Total Expenditure.

## Table A7: Summary Statistics - Higher Education Institution-Level Data

| | (1) All-County Sample | | | | | (2) Border-County Pair Sample | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | Std. dev. | Obs. | Min. | Max. | Mean | Std. dev. | Obs. | Min. | Max. |
| **Registration Reform** | | | | | | | | | | |
| Preregistration | 0.09 | 0.28 | 43345 | 0 | 1 | 0.06 | 0.23 | 16972 | 0 | 1 |
| **Institutional Variables** | | | | | | | | | | |
| Total Student Aid (in thousands) | 12807.99 | 37934.39 | 43003 | 0 | 3541234 | 11933.17 | 27449.53 | 16825 | 1.11 | 485993.97 |
| State Grants (in thousands) | 2256.98 | 8724.67 | 29118 | 0 | 365084.84 | 1819.42 | 9585.11 | 11598 | 0.01 | 365084.84 |
| % State Grants | 0.16 | 0.16 | 29116 | 0 | 1 | 0.15 | 0.15 | 11598 | 0 | 1 |
| Nr. of Receivers State Grants | 177.87 | 524.96 | 40514 | 0 | 23570 | 136.33 | 293.07 | 15926 | 0 | 5609 |
| % Receivers State Grants | 0.25 | 0.25 | 40083 | 0 | 1 | 0.24 | 0.23 | 15796 | 0 | 1 |
| Institutional Grants (in thousands) | 3030.56 | 11491.82 | 20502 | 0 | 317069.5 | 2625.79 | 11979.43 | 8399 | 0 | 317069.5 |
| % Institutional Grants | 0.15 | 0.23 | 20496 | 0 | 1 | 0.15 | 0.24 | 8393 | 0 | 1 |
| Nr. of Receivers Institutional Grants | 189.5 | 482.91 | 40520 | 0 | 28598 | 183.45 | 384.87 | 15927 | 0 | 5161 |
| % Receivers Institutional Grants | 0.30 | 0.35 | 40093 | 0 | 1 | 0.32 | 0.36 | 15795 | 0 | 1 |
| Federal Grants (in thousands) | 4266.63 | 13898.04 | 40957 | 1.02 | 1017004.38 | 3276.09 | 7658.09 | 16007 | 1.39 | 247704.56 |
| % Federal Grants | 0.60 | 0.33 | 40957 | 0 | 1 | 0.58 | 0.34 | 16007 | 0 | 1 |
| Nr. of Receivers Federal Grants | 248.60 | 779.18 | 40528 | 0 | 85068 | 192.10 | 324.01 | 15929 | 0 | 9095 |
| % Receivers Federal Grants | 0.50 | 0.24 | 39983 | 0 | 1 | 0.47 | 0.24 | 15764 | 0 | 1 |
| Total Applications | 2747.07 | 5268.49 | 19707 | 0 | 61545 | 2474.49 | 4186.37 | 8188 | 0 | 34950 |
| Female Applications | 1694.99 | 2974.31 | 19127 | 0 | 33256 | 1527.22 | 2395.24 | 8057 | 0 | 18440 |
| Male Applications | 1334.82 | 2479.72 | 19066 | 0 | 28289 | 1174.9 | 1921.52 | 8012 | 0 | 18062 |
| Total Enrollment | 4044.77 | 9700.41 | 43339 | 3 | 380232 | 3342.01 | 6373.84 | 16971 | 3 | 100334 |
| Full-Time Enrollment | 2290.95 | 5733.85 | 41381 | 1 | 314308 | 1870.25 | 3407.84 | 16178 | 1 | 48890 |
| Full-Time First-Time Degree Seekers | 555.13 | 1132.73 | 40540 | 1 | 41299 | 474.84 | 796.13 | 15938 | 1 | 12681 |
| White Enrollment | 2392.18 | 5034.73 | 43337 | 0 | 149864.00 | 2117.77 | 4138.21 | 16971 | 0 | 74341 |
| Hispanic Enrollment | 451.16 | 2323.16 | 43337 | 0 | 83818 | 241.47 | 700.69 | 16971 | 0 | 9620 |
| Black Enrollment | 474.55 | 1589.25 | 43337 | 0 | 67888 | 426.58 | 1310.89 | 16971 | 0 | 31339 |
| Non-Resident Enrollment | 141.54 | 618.24 | 43337 | 0 | 22823 | 109.9 | 395.32 | 16971 | 0 | 10440 |
| Share of Students with Loan | 50.54 | 31.71 | 39995 | 0 | 100 | 54.29 | 30.52 | 15765 | 0 | 100 |
| Carnegie Classification | 3.41 | 1.20 | 31976 | 1 | 6 | 3.34 | 1.21 | 12427 | 1 | 6 |
| Medical Degree Institution | 1.97 | 0.18 | 43135 | 1 | 2 | 1.96 | 0.19 | 16891 | 1 | 2 |
| Flagship Institution | 0.01 | 0.10 | 43345 | 0 | 1 | 0.01 | 0.10 | 16972 | 0 | 1 |
| Institution Has Hospital | 1.98 | 0.14 | 35524 | 1 | 2 | 1.98 | 0.12 | 13952 | 1 | 2 |
| Institutional Control | 1.95 | 0.82 | 43345 | 1 | 3 | 1.97 | 0.80 | 16972 | 1 | 3 |
| Institutional Sector | 4.17 | 2.60 | 43345 | 1 | 9 | 4.14 | 2.64 | 16972 | 1 | 9 |
| Land Grant Institution | 1.98 | 0.15 | 43345 | 1 | 2 | 1.98 | 0.15 | 16972 | 1 | 2 |
| Historically Black College | 1.98 | 0.14 | 43345 | 1 | 2 | 1.98 | 0.12 | 16972 | 1 | 2 |
| Hispanic Serving Institution | 0.01 | 0.09 | 43345 | 0 | 1 | 0 | 0.06 | 16899 | 0 | 1 |
| Tuition Reliance | 0.65 | 0.33 | 43137 | 0 | 2.08 | 0.67 | 0.31 | 16699 | 0 | 1.14 |
| Total Expenditures (in thousands) | 91693.17 | 360413.08 | 42376 | 0.71 | 10079773 | 71189.09 | 233191.73 | 16670 | 43.75 | 4854814.5 |
| In-State Tuitions | 11136.23 | 9703.61 | 30092 | 0 | 67106.16 | 12586.51 | 10405.2 | 12014 | 0 | 48891.78 |
| Out-of-State Tuitions | 13520.57 | 8543.73 | 30093 | 0 | 67106.16 | 14763.91 | 9121.26 | 12014 | 0 | 48891.78 |
| **Socio-economic and Geographic Variables (at the county level)** | | | | | | | | | | |
| Population (in thousands) | 895.22 | 1707.47 | 42587 | 2.42 | 9951.69 | 687.24 | 1162.85 | 16851 | 5.26 | 5328.77 |
| Personal Income | 41861.86 | 10366.23 | 42587 | 16919.24 | 101262.99 | 44039.82 | 12484.48 | 16851 | 18555.13 | 87688.19 |
| Latitude | 38.03 | 5.06 | 43345 | 19.7 | 64.84 | 39.93 | 3.24 | 16972 | 27.91 | 47.92 |
| Longitude | -91.07 | 15.41 | 43345 | -159.35 | -67.28 | -83.95 | 11.98 | 16972 | -123.32 | -70.45 |
| Surface Area | 19.87 | 17.71 | 43345 | 0.03 | 271.25 | 12.78 | 10.43 | 16972 | 0.03 | 65.18 |
| **Sample** | | | | | | | | | | |
| Number of States | 50 | | | | | 47 | | | | |
| Number of Counties | 1237 | | | | | 310 | | | | |
| Number of Institutions | 3968 | | | | | 989 | | | | |
| Number of County Pairs | | | | | | 226 | | | | |

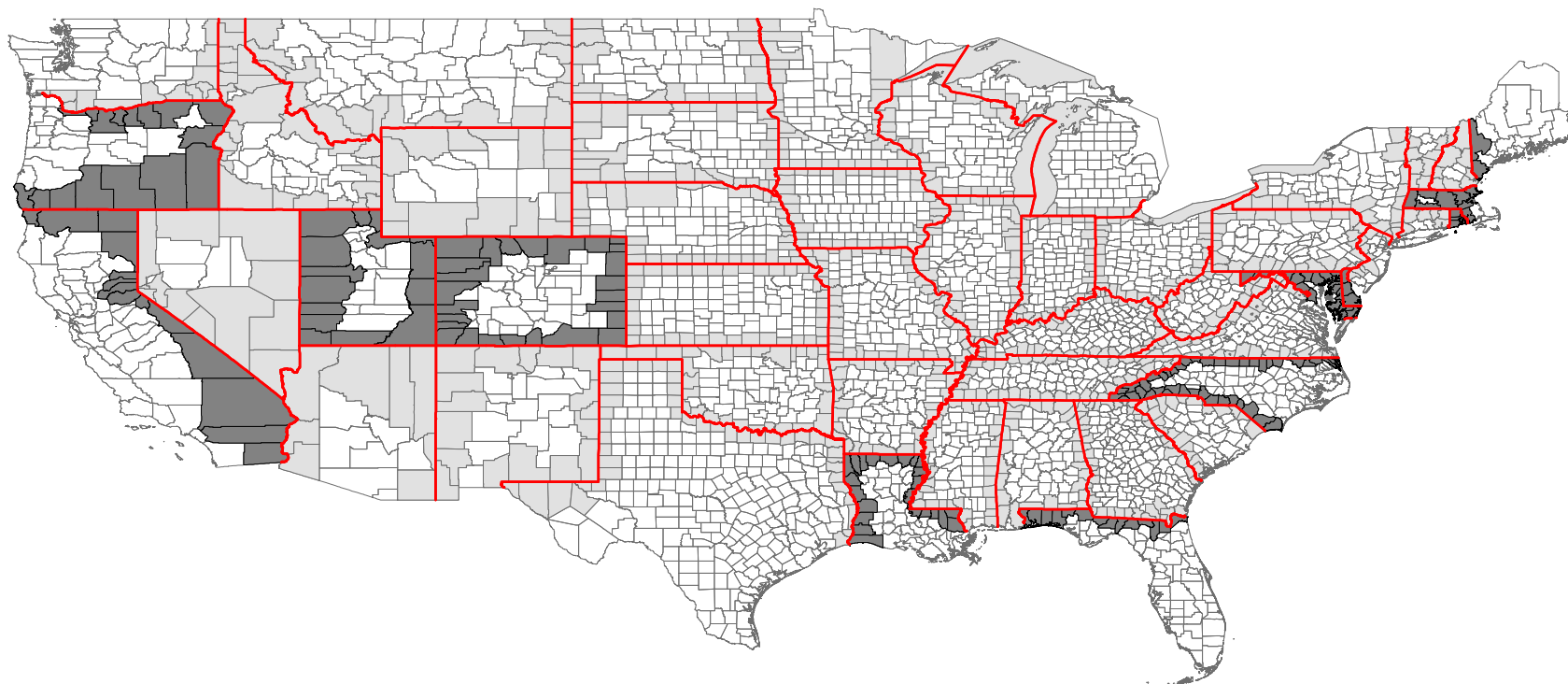*Note:* Financial variables are at constant 2012 U.S. dollars.

Figure A3: Geographical Distribution of Adjacent Counties along U.S. State Borders in 2015. The darker shade indicates states with preregistration.

## Table A8: Preregistration and State Grants - All-County Sample

|  | State Grants | % State Grants | Recipients | % Recipients |
|---|---|---|---|---|
|  | (1) | (2) | (3) | (4) |
| Preregistration | 0.267* | 0.034 | 0.172*** | 0.060*** |
|  | (0.138) | (0.024) | (0.060) | (0.018) |
| County FE | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |
| State Time Trend | Yes | Yes | Yes | Yes |
| R-squared | 0.650 | 0.538 | 0.791 | 0.542 |
| Observations | 18980 | 18979 | 22770 | 22769 |

*Note:* State-level clustered standard errors are in parentheses. Significance levels: * 10%, ** 5%, *** 1%. All regressions also control for: 1) Institutional Variables: Full-Time First-Time Degree Seekers, Non-Resident Enrollment, White, Hispanic, and Black Enrollment, Share of Students with Loan, Carnegie Classification, Institutional Control and Sector, Medical Degree, Flagship, Has Hospital, Land Grant, and Hispanic Serving Institution, Historically Black College, Tuition Reliance, Total Expenditures, In-State and Out-of-State Tuitions; 2) Socioeconomic and Geographic Variables at the county level: Population, Personal Income, Latitude, Longitude, and Surface Area.

## Table A9: Preregistration and Applications

|  | Applications | Female Applications | Male Applications |
|---|---|---|---|
|  | (1) | (2) | (3) |
| Preregistration | 0.128** | 0.193** | 0.030 |
|  | (0.060) | (0.079) | (0.105) |
| County FE | Yes | Yes | Yes |
| Border-County Pair-Year FE | Yes | Yes | Yes |
| R-squared | 0.909 | 0.852 | 0.751 |
| Observations | 4604 | 4604 | 4604 |

*Note:* State and border-segment level clustered standard errors are in parentheses. Significance levels: * 10%, ** 5%, *** 1%. All regressions also control for: 1) Institutional Variables: Full-Time First-Time Degree Seekers, Non-Resident Enrollment, White, Hispanic, and Black Enrollment, Share of Students with Loan, Carnegie Classification, Institutional Control and Sector, Medical Degree, Flagship, Has Hospital, Land Grant, and Hispanic Serving Institution, Historically Black College, Tuition Reliance, Total Expenditures, In-State and Out-of-State Tuitions; 2) Socioeconomic and Geographic Variables at the county level: Population, Personal Income, Latitude, Longitude, and Surface Area.

## Table A10: Summary Statistics - Individual-Level Data

|                                              | Mean  | Std. dev. | Obs.   | Min. | Max. |
|----------------------------------------------|-------|-----------|--------|------|------|
| **Registration Reforms**                     |       |           |        |      |      |
| Preregistration                              | 0.09  | 0.28      | 698844 | 0    | 1    |
| Online Registration                          | 0.09  | 0.28      | 698844 | 0    | 1    |
| EDR                                          | 0.14  | 0.35      | 698844 | 0    | 1    |
| **Electoral Variables**                      |       |           |        |      |      |
| Voting                                       | 0.62  | 0.49      | 698844 | 0    | 1    |
| Registering                                  | 0.79  | 0.41      | 698844 | 0    | 1    |
| Registering at School, on Campus and Hospital| 0.20  | 0.40      | 306782 | 0    | 1    |
| Duration of Residence at Current Address     | 5.96  | 1.62      | 691724 | 1    | 7    |
| **Socioeconomic Variables**                  |       |           |        |      |      |
| Age 18-24                                    | 0.11  | 0.31      | 698047 | 0    | 1    |
| Age 25-44                                    | 0.35  | 0.48      | 698141 | 0    | 1    |
| Age 45-64                                    | 0.35  | 0.48      | 698141 | 0    | 1    |
| Age 65-90                                    | 0.19  | 0.39      | 698141 | 0    | 1    |
| Sex                                          | 1.53  | 0.50      | 698844 | 1    | 2    |
| Black                                        | 0.09  | 0.29      | 698828 | 0    | 1    |
| Hispanic                                     | 0.07  | 0.25      | 696321 | 0    | 1    |
| Citizenship                                  | 1.45  | 1.15      | 697360 | 1    | 5    |
| Marital Status                               | 2.66  | 2.09      | 698071 | 1    | 6    |
| Metropolitan City Status                     | 2.16  | 1.11      | 698844 | 0    | 4    |
| Educational Attainment, 1990                 | 11.58 | 2.95      | 698844 | 1    | 18   |
| Family Income                                | 10.44 | 3.91      | 635152 | 1    | 16   |
| Household Tenure                             | 1.26  | 0.47      | 698844 | 1    | 3    |
| Employment Status                            | 18.52 | 11.55     | 698844 | 10   | 36   |
| Labor Force Status                           | 1.67  | 0.47      | 698844 | 1    | 2    |

*Note:* Sample confined to individuals who report voting and/or registering.

**Proof of Proposition.** Let $\mathcal{V}^i(q_{\mathcal{I}}, q_{\mathcal{C}}) := \mathcal{U}^i(q_{\mathcal{I}}) + \delta - \mathcal{U}^i(q_{\mathcal{C}})$ denote the difference in utility that an individual belonging to group $i \in \{y, o\}$ achieves by voting for candidate $\mathcal{I}$ rather than candidate $\mathcal{C}$, with $\delta$ denoting a popularity shock attached to $\mathcal{I}$ vis-à-vis $\mathcal{C}$. The individual's voting behavior is described as follows:

$$
\text{if} \begin{cases} c \leq |\mathcal{V}^i(q_{\mathcal{I}}, q_{\mathcal{C}})|, \text{ vote for} \begin{cases} \mathcal{I} \text{ when } \mathcal{V}^i(\cdot) \geq 0 \\ \mathcal{C} \text{ when } \mathcal{V}^i(\cdot) < 0 \end{cases}, \\ c > |\mathcal{V}^i(q_{\mathcal{I}}, q_{\mathcal{C}})|, \text{ abstain} \end{cases}
$$

where $c$ is a random variable drawn from a uniform distribution $G^i$ on $\left[0, \overline{c}^i\right]$ with $\overline{c}^y > \overline{c}^o$. Conditional on $\delta$, the share of voters within group $i$ is equal to $\pi^i := G^i(|\mathcal{V}^i(q_{\mathcal{I}}, q_{\mathcal{C}})|)$. Thus, the total number of votes obtained by $\mathcal{I}$ is $\pi_{\mathcal{I}} := \alpha\pi_{\mathcal{I}}^y + (1 - \alpha)\pi_{\mathcal{I}}^o$ with $\pi_{\mathcal{I}}^i = \pi^i$ if $\mathcal{V}^i(\cdot) \geq 0$ and $0$ otherwise. Similarly for $\mathcal{C}$, $\pi_{\mathcal{C}} := \alpha\pi_{\mathcal{C}}^y + (1 - \alpha)\pi_{\mathcal{C}}^o$ with $\pi_{\mathcal{C}}^i = \pi^i$ if $\mathcal{V}^i(\cdot) < 0$ and $0$ otherwise. Under a majority rule, a candidate wins the election if and only if the largest number of voters vote for her. Assuming $\delta$ uniformly distributed on $[-(1/2) + \phi, (1/2) + \phi]$, the probability that $\mathcal{I}$ wins the elections is $p_{\mathcal{I}}(q_{\mathcal{I}}, q_{\mathcal{C}}) :=$ $\Pr(\pi_{\mathcal{I}} \geq \pi_{\mathcal{C}})$, which is equal to:

$$
\frac{1}{2} + \phi + \frac{\alpha}{\alpha + (1 - \alpha)(\overline{c}^y/\overline{c}^o)}(\mathcal{U}^y(q_{\mathcal{I}}) - \mathcal{U}^y(q_{\mathcal{C}})) + \frac{(1 - \alpha)(\overline{c}^y/\overline{c}^o)}{\alpha + (1 - \alpha)(\overline{c}^y/\overline{c}^o)}(\mathcal{U}^o(q_{\mathcal{I}}) - \mathcal{U}^o(q_{\mathcal{C}})).
$$

By symmetry, the probability of $\mathcal{C}$ winning is $p_{\mathcal{C}}(q_{\mathcal{I}}, q_{\mathcal{C}}) := \Pr(\pi_{\mathcal{I}} < \pi_{\mathcal{C}}) = 1 - p_{\mathcal{I}}(q_{\mathcal{I}}, q_{\mathcal{C}})$. Candidates simultaneously choose a policy platform $q$ in order to maximize the expected rent from being in office. Formally, for candidate $\varsigma$:

$$
\max_{q_\varsigma} p_\varsigma(q_{\mathcal{I}}, q_{\mathcal{C}}) \cdot R_\varsigma,
$$

subject to the budget constraint $(\tau_\varsigma - D(\tau_\varsigma))\omega = e_\varsigma + R_\varsigma$ for $\varsigma \in \{\mathcal{I}, \mathcal{C}\}$. We denote by $\mu_\varsigma$ the Lagrangian multiplier associated with the public budget. Using the functional forms $\mathcal{U}^y(q_\varsigma) := (1 - \tau_\varsigma)\omega^y + (\lambda e_\varsigma/\alpha)$ and $\mathcal{U}^o(q_\varsigma) := (1 - \tau_\varsigma)\omega^o$ yields the following first-order conditions with respect to $\tau_\varsigma$, $e_\varsigma$, and $R_\varsigma$, respectively:

$$
\tau_\varsigma : 0 = -\frac{\alpha\omega^y + (1 - \alpha)(\overline{c}^y/\overline{c}^o)\omega^o}{\alpha + (1 - \alpha)(\overline{c}^y/\overline{c}^o)}R_\varsigma + \mu_\varsigma(1 - D'(\tau_\varsigma))\omega,
$$

$$
e_\varsigma : 0 = \frac{\lambda}{\alpha + (1 - \alpha)(\overline{c}^y/\overline{c}^o)}R_\varsigma - \mu_\varsigma,
$$

$$
R_\varsigma : 0 = p_\varsigma(q_{\mathcal{I}}, q_{\mathcal{C}}) - \mu_\varsigma.
$$

Eliminating the multipliers from the first-order conditions yields the following Euler conditions for fiscal policies:

$$\lambda = \frac{1}{1 - D'(\tau_\varsigma)} \left( \alpha \frac{\omega^y}{\omega} + (1 - \alpha) \frac{\overline{c}^y}{\overline{c}^o} \frac{\omega^o}{\omega} \right) \tag{1}$$

and

$$p_\varsigma(q_\mathcal{I}, q_\mathcal{C}) = \frac{\lambda}{\alpha + (1 - \alpha)(\overline{c}^y/\overline{c}^o)} R_\varsigma. \tag{2}$$

Eqs. (1) and (2) embed the tradeoffs implicit in the intergenerational and political conflicts discussed in the text. Using (1) and assuming without loss of generality that $D(\tau_\varsigma) = \tau_\varsigma^2/2$, the equilibrium wealth tax rate is equal to:

$$\tau_\varsigma^* = \begin{cases} 1 - \frac{1}{\lambda} \left( \alpha \frac{\omega^y}{\omega} + (1 - \alpha) \frac{\overline{c}^y}{\overline{c}^o} \frac{\omega^o}{\omega} \right) & \text{if} \quad \lambda > \alpha \frac{\omega^y}{\omega} + (1 - \alpha) \frac{\overline{c}^y}{\overline{c}^o} \frac{\omega^o}{\omega}, \\ 0 & \text{if} \quad o/w. \end{cases}$$

The equilibrium electoral rents are determined by solving (2) for both candidates and are equal to:

$$R_\mathcal{I}^* = \frac{1}{\lambda} \left( \frac{1}{2} + \frac{1}{3}\phi \right) \left( \alpha + (1 - \alpha) \frac{\overline{c}^y}{\overline{c}^o} \right),$$

$$R_\mathcal{C}^* = \frac{1}{\lambda} \left( \frac{1}{2} - \frac{1}{3}\phi \right) \left( \alpha + (1 - \alpha) \frac{\overline{c}^y}{\overline{c}^o} \right),$$

where $R_\mathcal{C}^* > 0$ if $\phi < \overline{\phi} := \frac{3}{2}$. Plugging $\tau_\varsigma^*$ and $R_\varsigma^*$ into the public budget constraint, the equilibrium education expenditures are as follows:

$$e_\mathcal{I}^* = \frac{\omega}{2} \left( 1 - \frac{1}{\lambda^2} \left( \alpha \frac{\omega^y}{\omega} + (1 - \alpha) \frac{\overline{c}^y}{\overline{c}^o} \frac{\omega^o}{\omega} \right)^2 \right) - \frac{1}{\lambda} \left( \frac{1}{2} + \frac{1}{3}\phi \right) \left( \alpha + (1 - \alpha) \frac{\overline{c}^y}{\overline{c}^o} \right),$$

$$e_\mathcal{C}^* = \frac{\omega}{2} \left( 1 - \frac{1}{\lambda^2} \left( \alpha \frac{\omega^y}{\omega} + (1 - \alpha) \frac{\overline{c}^y}{\overline{c}^o} \frac{\omega^o}{\omega} \right)^2 \right) - \frac{1}{\lambda} \left( \frac{1}{2} - \frac{1}{3}\phi \right) \left( \alpha + (1 - \alpha) \frac{\overline{c}^y}{\overline{c}^o} \right),$$

where $e_\mathcal{I}^* > 0$ if $\lambda > \underline{\lambda} := \frac{\varkappa_1 + \sqrt{\varkappa_1^2 + \varkappa_2^2}}{\omega}$ with $\varkappa_1 := \left( \frac{1}{2} + \frac{1}{3}\phi \right) \left( \alpha + (1 - \alpha)(\overline{c}^y/\overline{c}^o) \right)$ and $\varkappa_2 := \alpha\omega^y + (1 - \alpha)(\overline{c}^y/\overline{c}^o)\omega^o$. The equilibrium probability that $\mathcal{I}$ wins the election is:

$$p_\mathcal{I}(q_\mathcal{I}^*, q_\mathcal{C}^*) = \frac{1}{2} + \frac{1}{3}\phi$$

and $p_\mathcal{C}(q_\mathcal{I}^*, q_\mathcal{C}^*) = 1 - p_\mathcal{I}(q_\mathcal{I}^*, q_\mathcal{C}^*)$. Define $e^* := p_\mathcal{I}(q_\mathcal{I}^*, q_\mathcal{C}^*) e_\mathcal{I}^* + p_\mathcal{C}(q_\mathcal{I}^*, q_\mathcal{C}^*) e_\mathcal{C}^*$ as the average education expenditure. Replacing $e_\varsigma^*$ and $p_\varsigma(q_\mathcal{I}^*, q_\mathcal{C}^*)$ and using $\omega^y = \sigma\omega/\alpha$ and $\omega^o =$

$(1 - \sigma)\,\omega/\,(1 - \alpha)$, we obtain:

$$e^* = \frac{\omega}{2}\left(1 - \frac{1}{\lambda^2}\left(\sigma + (1 - \sigma)\frac{\overline{c}^y}{\overline{c}^o}\right)^2\right) - \frac{1}{\lambda}\left(\frac{1}{2} + \frac{2}{9}\phi^2\right)\left(\alpha + (1 - \alpha)\frac{\overline{c}^y}{\overline{c}^o}\right).$$

The following comparative statics results hold:

$$\frac{\partial e^*}{\partial \overline{c}^y} = -\frac{1}{\lambda\overline{c}^o}\left(\frac{\omega(1 - \sigma)}{\lambda}\left(\sigma + (1 - \sigma)\frac{\overline{c}^y}{\overline{c}^o}\right) + (1 - \alpha)\left(\frac{1}{2} + \frac{2}{9}\phi^2\right)\right) < 0,$$

$$\frac{\partial^2 e^*}{\partial \phi \partial \overline{c}^y} = -\frac{4}{9}\frac{1 - \alpha}{\lambda}\frac{\phi}{\overline{c}^o} < 0,$$

$$\frac{\partial^3 e^*}{\partial \alpha \partial \overline{c}^y} = \frac{1}{\lambda\overline{c}^o}\left(\frac{1}{2} + \frac{2}{9}\phi^2\right) > 0,$$

$$\frac{\partial^2 e^*}{\partial \sigma \partial \overline{c}^y} = \frac{\omega}{\lambda^2\overline{c}^o}\left(\left(\sigma + (1 - \sigma)\frac{\overline{c}^y}{\overline{c}^o}\right) + (1 - \sigma)\left(\frac{\overline{c}^y - \overline{c}^o}{\overline{c}^o}\right)\right) > 0.$$

Finally, we determine the equilibrium turnout rate. The increase in utility of the young and the old are, respectively:

$$\mathcal{V}^y\left(q_{\mathcal{I}}^*, q_{\mathcal{C}}^*\right) = -\frac{2}{3}\left(1 + \frac{1 - \alpha}{\alpha}\frac{\overline{c}^y}{\overline{c}^o}\right)\phi + \delta, \tag{3}$$

$$\mathcal{V}^o\left(q_{\mathcal{I}}^*, q_{\mathcal{C}}^*\right) = \delta. \tag{4}$$

The shares of the young and the old who decide to vote are $\pi^i = \left(1/\overline{c}^i\right) \cdot \left|\mathcal{V}^i\left(q_{\mathcal{I}}^*, q_{\mathcal{C}}^*\right)\right|$ for each $i$, which implies the following turnout rate for the young:

$$\mathbb{E}_\delta\left[\pi^y\right] = \frac{1}{\overline{c}^y}\left(\frac{1}{4} + \phi^2\left(1 - \frac{4}{3}\left(1 + \frac{1 - \alpha}{\alpha}\frac{\overline{c}^y}{\overline{c}^o}\right)\left(2 + \frac{1 - \alpha}{\alpha}\frac{\overline{c}^y}{\overline{c}^o}\right)\right)\right),$$

with $\partial\mathbb{E}_\delta\left[\pi^y\right]/\partial\overline{c}^y < 0$. ∎

## C.1. STATE-LEVEL DATA

*A. Registration Reforms:* The main source of information on registration reforms is the National Conference of State Legislatures (ncsl.org). For each state, we collect data on the year of enactment of the following four reforms: Preregistration, Online Registration, EDR, and NRVA. For each reform, we construct a dummy variable which takes value 1 if the reform has been implemented in a given state and year, and 0 otherwise.

*B. Electoral Variables:* The following variables (variable definitions are in parentheses) are obtained from Dave Leip's Atlas of U.S. Presidential Elections (uselectionatlas.org): Year of Mandate (years since the last gubernatorial election), Democratic Governor (dummy for whether the governor is a Democrat), Democratic President (dummy for whether the President is a Democrat), Democratic Governor and President (dummy for whether both the governor and the President are Democrats). From the same source, we also obtain data on gubernatorial turnout, which we divide by the voting-eligible population from the United States Elections Project (electproject.org) to construct the variable Gubernatorial Turnout Rate. Incumbent (dummy for a governor currently running for a second term) and Governor Runs Next Election (dummy for a governor that will run again) are obtained from the Center on the American Governor (governors.rutgers.edu/testing/wp-content/uploads/2014/09/Incumb_Chart_Word_2013.pdf). Finally, the variable Political Competition is based on the Herfindahl Index, which is constructed using the Democratic, Republican, Independent, and Other Party voting shares obtained from the website Our-Campaigns (ourcampaigns.com). Since Louisiana is the only state with a jungle primary system for gubernatorial elections, i.e., all candidates appear on the same ballot regardless of political affiliation, we attribute to each party the votes received by its candidate in the runoff election. If no runoff election is held, we instead attribute to each party the sum of votes received by all of its candidates.

*C. Fiscal Variables:* Annual financial data on the activity of state governments is obtained from the Annual Survey of State and Local Government Finances conducted by the U.S. Census Bureau (census.gov/govs/local). Data is available for the period 1977-2014 and downloaded from the State & Local Government Finance Data Query System (slfdqs.taxpolicycenter.org/) at constant 2014 U.S. dollars per capita. Since electoral variables are available starting from 1980, we delimit the sample to the period 1980-2014. We report variable codes in parentheses. The expenditure data we employ is for direct expenditure (i.e., all expenditure other than intergovernmental expenditure). We utilize Total Expenditure (E001), which is the sum of all direct expenditure, and Current Expenditure

(E004), which includes all direct expenditures other than capital outlays. The ratio of the latter to the former yields the variable Share of Current Expenditure. The analysis focuses on Total Education Expenditure (E024), which includes expenditure on schools, colleges, and other educational institutions (such as those for handicapped individuals), as well as educational programs for adults and other special classes. Total Education Expenditure is classified by character, as Current Operating Expenditure (E025) and Capital Outlay Expenditure (E026), and by function, as Elementary-Secondary Education Expenditure (E027) and Higher Education Expenditure (E030). Elementary-Secondary Education Expenditure comprises payments for teaching, support services, and other activities of local public school systems, for kindergarten through high school. Higher Education Expenditure pays for the activities of institutions of higher education operated by the state. Other types of expenditure include: Public Welfare Expenditure (E090), which is comprised of support to the needy, such as Old Age Assistance; Health and Hospital Direct Expenditure (E052), which includes general public health spending; Total Assistance and Subsidies (E009), which consists of cash contributions and subsidies to individuals; Unemployment Compensation Expenditure (E137), which is comprised of unemployment compensation payments. On the revenue side, we use Total Taxes (R05), Total Federal Intergovernmental Revenue (R32), and Total Debt Outstanding (D01).

*D. Socioeconomic Variables:* Data on Population (in thousands) and Personal Income are taken from the Bureau of Economic Analysis (bea.gov). We define the variables Median Age, Share of 16-25, Share of Blacks, and Share of Whites using population data on age and race obtained from the Surveillance, Epidemiology, and End Result (SEER) program of the National Cancer Institute (seer.cancer.gov/popdata). Information on Post-Secondary Enrollment (in thousands) is taken from the National Center for Education Statistics (nces.ed.gov). The Unemployment Rate is published by the Bureau of Labor Statistics (bls.gov). Educational Attainment, which reflects the share of the population with a high school diploma, and Inequality (defined as a Theil Index) are taken from U.S. State-Level Income Inequality Data - Mark W. Frank (shsu.edu/eco_mwf/inequality.html).

## C.2. HIGHER EDUCATION INSTITUTION-LEVEL DATA

*A. Preregistration:* The main source of information is the National Conference of State Legislatures (ncsl.org).

*B. Institutional Variables:* The data source is the Integrated Postsecondary Education Data System (IPEDS) provided by the Delta Cost Project Database maintained by the National Center for Education Statistics (nces.ed.gov/ipeds/deltacostproject). IPEDS

consists of three matched datasets covering three different waves: 1987-2012, which includes over 2100 institutions; 2002-2012, which includes almost 3900 institutions; and 2007-2012, which includes almost 4400 institutions. We focus on the 2002-2012 wave. The main variables are defined as follows: Total Student Aid is the sum of all grants at constant 2012 U.S. dollars; State Grants includes scholarships and fellowships funded by the state; Institutional and Federal Grants are analogous expenditures funded by the institutions and the federal government; % State, Institutional and Federal Grants are created by dividing by Total Student Aid; % Recipients is the Number of Recipients of State, Institutional, and Federal Grants divided by the number of full-time first-time degree seekers. Other variables used include the number of Total, Male, and Female Applications, Full-Time Enrollment, Enrollment by Race (White, Hispanic, and Black), Non-Resident Enrollment, and the Share of Students with Loan. Variables related to institutional characteristics are: Carnegie Classification (a ranking of all U.S. colleges and universities that grant degrees, with reference to the 2010 Collapsed Edition), Medical Degree Institution, Flagship Institution, Institution Has Hospital, Institutional Control (a categorical variable that takes values from 1 to 3 for public, private not-for-profit, and private for-profit institutions, respectively), Institutional Sector (a categorical variable that takes values from 1 to 9 and combines Institutional Control with three levels of education: 4-year and higher, 2-but-less-than-4-year, less than 2-year), Land Grant Institution (institutions originally designated to receive state benefits originating from federally controlled land to support the teaching of practical skills), Historically Black College, and Hispanic Serving Institution. Financial information includes Tuition Reliance (net tuition share of operating revenues), Total Expenditures (the sum of operating and non-operating expenses and deductions in the current year), and In-State and Out-of-State Tuition and Fees for full-time undergraduates.

C. *Socioeconomic and Geographic Variables:* Data on Population (in thousands) and Personal Income is taken from the Bureau of Economic Analysis (bea.gov). Latitude, Longitude, and Surface Area are obtained from the Cartographic Boundary Shapefiles - Counties maintained by the U.S. Census Bureau (census.gov/geo/maps-data/data/cbf/cbf_counties).


## C.3. INDIVIDUAL-LEVEL DATA


A. *Registration reforms:* The main source of information is the National Conference of State Legislatures (ncsl.org).

B. *Electoral Variables:* We obtain information on voting and registration at the individual level from the Current Population Survey (CPS) conducted by the U.S. Census

Bureau (census.gov/programs-surveys/cps). CPS data was downloaded from IPUMS (cps.ipums.org).[61] The CPS is a monthly survey that focuses on labor market outcomes, although its Voting and Registration Supplement (census.gov/topics/public-sector/voting) provides information biannually after each November election. Our sample covers the period 1996-2014. The variable Voting is a dummy for whether an individual in a given state and year has voted in the previous November election. Registering and Registering at School, on Campus or at Hospital are coded analogously. Duration of Residence at Current Address is a categorical variable which takes values from 1 to 7 (1=less than 1 month, 2=1 to 6 months, 3=7 to 11 months, 4=1 to 2 years, 5=3 to 4 years, 6=5 years or longer, 7=do not know).

*C. Socioeconomic Variables:* Family Income, i.e., household's total combined income during the past 12 months, is taken from the NBER CPS Supplement (nber.org/data/current-population-survey-data); it is reported according to 16 brackets (less than $5000, 5000 to 7499, 7500 to 9999, 10000 to 12499, 12500 to 14999, 15000 to 19999, 20000 to 24999, 25000 to 29999, 30000 to 34999, 35000 to 39999, 40000 to 49999, 50000 to 59999, 60000 to 74999, 75000 to 99999, 100000 to 149999, 150000 or more). The other variables are obtained from IPUMS CPS, whose November Supplement also provides information on individual characteristics of the respondents. The set of dummy variables Age 18-24, Age 25-44, Age 45-64, and Age 65-90 reflects the age groups of the survey respondents. Dummy variables are also used to identify individual characteristics, such as Sex, Black, and Hispanic. Citizenship is a categorical variable that takes values from 1 to 5 (1=native born in U.S., 2=native born in Puerto Rico or U.S. outlying area, 3=native born abroad of American parent(s), 4=foreign born U.S. citizen by naturalization, 5=foreign born not a citizen of the U.S.). Marital Status is a categorical variable that takes values from 1 to 6 (1=married spouse present, 2=married spouse absent, 3=widowed, 4=divorced, 5=separated, 6=never married). Metropolitan Status is a categorical variable that takes values from 0 to 4 (0=not identifiable, 1=not in metro area, 2=central city, 3=outside central city, 4=central city status unknown). Educational Attainment is a categorical variable that takes 15 values (1=no school completed, 4=1st-4th grade, 5=5th-8th grade, 6=9th grade, 7=10th grade, 8=11th grade, 9=12th grade - no diploma, 10=high school graduate or GED, 11=some college - no degree, 13=associate degree - occupational program, 14=associate degree - academic program, 15=bachelors degree, 16=masters degree, 17=professional degree, 18=doctorate degree). Housing Tenure is a categorical variable that takes values from 1 to 3 (1=owned or being bought by a household member, 2=rented for cash, 3=occupied without payment of cash

[61]See Flood, S., M. King, S. Ruggles, and J. R. Warren, 2015. Integrated Public Use Microdata Series, Current Population Survey: Version 4.0. Minneapolis: University of Minnesota.

rent). Employment Status is a categorical variable that takes 7 values (0=at work, 12=has job - not at work last week, 21=unemployed - experienced worker, 22=unemployed - new worker, 32=NILF - unable to work, 34=NILF - other, 36=NILF - retired). Labor Force Status is a categorical variable that takes values 1 or 2 (1=not in the labor force, 2=in the labor force).

# Supplementary Material (Not For Publication)

This section presents supplementary material. Appendix D provides information on the preregistration legislation. Appendix E investigates the hypothesis of voters electing policies in the context of preregistration.

<center>APPENDIX D. PREREGISTRATION LAWS</center>

For each state that has enacted preregistration bills, we present information on the legislative process and its sources. We also include information on the gender, demographic, and partisan composition of the state legislature, made available respectively by the Center for American Women and Politics (cawp.rutgers.edu) and the National Conference of State Legislatures (ncsl.org/research/about-state-legislatures/partisan-composition and ncsl.org/research/about-state-legislatures/who-we-elect-an-interactive-graphic.aspx).[62]

**California** Assembly Bill 30, concerning the authorization of persons of 16 years of age to preregister to vote, was introduced by Curren Price, a Democratic Assemblyman, on December 1, 2008. The bill was approved with a 22-15 vote in the Senate on September 3, 2009 and with a 50-28 vote in the Assembly on October 9, with Democratic support only. On October 11 Republican Governor Arnold Schwarzenegger signed the bill into law. See leginfo.legislature.ca.gov for the official source.

In the year the preregistration law was approved, the Assembly was composed of 51 Democrats and 29 Republicans, and the Senate of 26 Democrats and 14 Republicans. Of the total of 33 women, 20 were members of the Assembly and 13 of the Senate, and 28 of them were Democrats. Women represented 27.5% of total legislators compared to the corresponding national figure of 24.3% for the same year. The average age of legislators was 54.75 compared to the national average of 55.65. Governor Schwarzenegger was elected for his second and last term in 2006.

**Colorado** House Bill 1135, concerning the authorization of persons of 16 years of age to preregister to vote, was introduced by Jonathan Singer, a Democratic Representative, together with a group of Democratic co-sponsors, in 2013. The bill received bipartisan support in the House, where it was approved with a 37-28 vote on March 12, and in the Senate, where it was approved with a 20-15 vote on April 19. On May 10 Democratic Governor John W. Hickenlooper signed the bill into law. See leg.state.co.us for the official source.

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[62]Data on the demographic composition of state legislatures is available only for 2009 by age group and for 2015 for mean age. We thank Karl Kurtz from the National Conference of State Legislatures for sharing the data with us.

In the year the preregistration law was approved, the House was composed of 36 Democrats and 29 Republicans, and the Senate of 19 Democrats and 16 Republicans. Of the total of 41 women, 28 were members of the House and 13 of the Senate, and 29 of them were Democrats. Women represented 41% of total legislators compared to the corresponding national figure of 24.2% for the same year. Governor Hickenlooper was elected for his first term in 2010.

**Delaware** House Bill 381, concerning the authorization of persons of 16 years of age to preregister to vote, was introduced by Valerie Longhurst, a Democratic Representative, together with another Democratic co-sponsor, on April 28, 2010. The bill received bipartisan support in the House, where it was approved with a 27-9 vote on May 6, and in the Senate, where it was approved with a 14-6 vote on July 1. On September 8 Democratic Governor Jack Markell signed the bill into law. See legis.delaware.gov for the official source.

In the year the preregistration law was approved, the House was composed of 24 Democrats and 17 Republicans, and the Senate of 15 Democrats and 6 Republicans. Of the total of 16 women, 8 were members of the House and 8 of the Senate, and 10 of them were Democrats. Women represented 25.8% of total legislators compared to the corresponding national figure of 24.5% for the same year. Governor Markell was elected for his first term in 2008.

**District of Columbia** Council Bill 18-035, concerning the authorization of persons of 16 years of age to preregister to vote, was introduced by the Democratic Chairman of the Council, Vincent C. Gray, on June 16, 2009. The bill was unanimously approved with 13 votes in favor on November 3. Democratic Mayor Adrian Fenty signed the bill into law on November 30. See lims.dccouncil.us for the official source.

In the year the preregistration law was approved, the Council was composed of 11 Democrats and 2 Independents. The 3 women were all Democrats. Mayor Fenty was elected for his only term in 2006.

**Florida** House Bill 0537, concerning the authorization of persons of 17 years of age or with a valid Florida driver's license, i.e., fifteen years of age, whichever occurs earlier, to preregister to vote, was introduced by David Rivera, a Republican Representative, together with a bipartisan group of co-sponsors, on January 23, 2007. The bill received bipartisan support in the Senate, where it was approved with a 37-2 vote on April 27 and was unanimously approved in the House on May 3. On May 21 Republican Governor Charlie Crist signed the bill into law. See archive.flsenate.gov for the official source.

In the year the preregistration law was approved, the House was composed of 42 Democrats and 78 Republicans, and the Senate of 14 Democrats and 26 Republicans.

Of the total of 37 women, 27 were members of the House and 10 of the Senate, and 22 of them were Democrats. Women represented 23% of total legislators compared to the corresponding national figure of 23.5% for the same year. Governor Crist was elected for his first term in 2006.

**Hawaii** Senate Bill 280, concerning the authorization of persons of 16 years of age to preregister to vote, received support from Democratic Lieutenant Governor Benjamin J. Cayetano in 1993. The bill was approved in the Senate and in the House. Democratic Governor John D. Waihee signed the bill into law in the same year. See www.nyujlpp.org/wp-content/uploads/2012/11/Michael-P.-McDonald-Matthew-Thornburg-Registering-the-Youth-Through-Voter-Preregistration.pdf.

In the year the preregistration law was approved, the House was composed of 47 Democrats and 4 Republicans, and the Senate of 22 Democrats and 3 Republicans. Of the total of 18 women, 12 were members of the House and 6 of the Senate, and 16 of them were Democrats. Women represented 23.7% of total legislators compared to the corresponding national figure of 20.5% for the same year. Governor Waihee was elected for his second term in 1990.

**Louisiana** House Bill 501, concerning the authorization of persons of 16 years of age to preregister to vote, was introduced by Wesley T. Bishop, a Democratic Representative, on February 27, 2014. The bill received bipartisan support in the House, where it was approved with a 86-11 vote on March 31, and was unanimously approved in the Senate on May 6. On May 22 Republican Governor Piyush Jindal signed the bill into law. See legis.la.gov for the official source.

In the year the preregistration law was approved, the House was composed of 44 Democrats, 59 Republicans, and 2 Independents, and the Senate of 13 Democrats and 26 Republicans. Of the total of 18 women, 14 were members of the House and 4 of the Senate, and 13 of them were Democrats. Women represented 12.5% of total legislators compared to the corresponding national figure of 24.3% for the same year. Governor Jindal was elected for his first term in 2011.

**Maine** House Bill 1528, concerning the authorization of persons of 17 years of age to preregister to vote, was introduced by Jarrod S. Crockett, a Republican Representative, on April 28, 2011. The bill was approved by both the House and the Senate on June 7. On June 14 Republican Governor Paul LePage signed the bill into law. See lldc.mainelegislature.org for the official source.

In the year the preregistration law was approved, the House was composed of 72 Democrats, 78 Republicans, and 1 Independent, and the Senate of 14 Democrats, 20 Republicans, and 1 Independent. Of the total of 54 women, 46 were members of the

House and 8 of the Senate, and 33 of them were Democrats. Women represented 29% of total legislators compared to the corresponding national figure of 23.7% for the same year. Governor LePage won the election in 2010 for his first term.

**Massachusetts** House Bill 4072, concerning the authorization of persons of 16 years of age to preregister to vote, was introduced by Aaron Michlewitz, a Democratic Representative, on November 20, 2013. The bill received bipartisan support in the House, where it was approved with a 142-10 vote on November 20, and in the Senate, where it was unanimously approved with a 38-0 vote on May 15, 2014. On May 22 Democratic Governor Deval Patrick signed the bill into law. See malegislature.gov for the official source.

In the year the preregistration law was approved, the House was composed of 131 Democrats and 29 Republicans, and the Senate of 36 Democrats and 4 Republicans. Of the total of 50 women, 38 were members of the House and 12 of the Senate, and 43 of them were Democrats. Women represented 25% of total legislators compared to the corresponding national figure of 24.2% for the same year. Governor Patrick won the election for his second term in 2010.

**Maryland** House Bill 217, concerning the authorization of persons of 16 years of age to preregister to vote, was introduced by Jon S. Cardin, a Democratic Representative, together with a bipartisan group of co-sponsors, on January 22, 2010. The bill was approved with a 97-43 vote in the House on March 25 and with a 41-5 bipartisan vote in the Senate on April 7. On May 4 Democratic Governor Martin O'Malley signed the bill into law. See mgaleg.maryland.gov for the official source.

In the year the preregistration law was approved, the House was composed of 104 Democrats and 36 Republicans, and the Senate of 33 Democrats and 14 Republicans. Of the total of 59 women, 49 were members of the House and 10 of the Senate, and 47 of them were Democrats. Women represented 31.4% of total legislators compared to the corresponding national figure of 24.5% for the same year. Governor O'Malley was elected for his first term in 2006 and re-elected in 2010.

**North Carolina** House Bill 908, concerning the authorization of persons of 16 years of age to preregister to vote, was introduced by Wayne Goodwin, a Democratic Representative, together with a group of Democratic co-sponsors, on March 31, 2009. The bill was approved with a 32-3 vote in the Senate on August 7 and with a 107-6 vote in the House on August 10, with bipartisan support. On August 28 Democratic Governor Beverly Perdue signed the bill into law. See ncga.state.nc.us for the official source.

In July 2013, preregistration was rescinded by House Bill 589. In July 2016, the Fourth Circuit Court of Appeals struck down House Bill 589 on racial discrimination grounds.

In December 2016, the State turned to the Supreme Court but it dismissed the petition in February 2017. Members of the State General Assembly objected to the dismissal and moved to be added as a petitioner in the case. On May 15, 2017, the Supreme Court denied review in the case (brennancenter.org/legal-work/north-carolina-naacp-v-mccrory-amicus-brief).

In the year the preregistration law was approved, the House was composed of 68 Democrats and 52 Republicans, and the Senate of 30 Democrats and 20 Republicans. Of the total of 44 women, 38 were members of the House and 6 of the Senate, and 30 of them were Democrats. Women represented 25.9% of total legislators compared to the corresponding national figure of 24.2% for the same year. The average age of legislators was 62.52 compared to the national average of 55.65. Governor Perdue was elected for her first term in 2008.

**Oregon**  House Bill 2910, concerning the authorization of persons of 17 years of age to preregister to vote, was introduced by Peter Buckley, a Democratic Representative, in 2007. The bill received bipartisan support in the Assembly, with only one opponent. Democratic Governor Ted Kulongoski signed the bill into law. See fairvote.org/gov-kulongoski-oks-voter-pre-registration-bill.

In the year the preregistration law was approved, the House was composed of 31 Democrats and 29 Republicans, and the Senate of 19 Democrats and 11 Republicans. Of the total of 28 women, 19 were members of the House and 9 of the Senate, and 20 of them were Democrats. Women represented 31.1% of total legislators compared to the corresponding national figure of 23.5% for the same year. Governor Kulongoski was elected for his first term in 2002.

**Rhode Island**  House Bill 5005, concerning the authorization of persons of 16 years of age to preregister to vote, was introduced by Edwin R. Pacheco, a Democratic Representative, together with a bipartisan group of co-sponsors, on January 6, 2009. The bill received bipartisan support in the House, where it was approved with a 56-10 vote on March 10, and in the Senate, where it was approved with a 31-4 vote on June 30. On July 9 Republican Governor Donald L. Carcieri vetoed the bill and on January 5, 2010 the General Assembly overrode the executive veto with more than a three-fifths majority. On the same day, House Bill 5005 became law without the Governor's signature. For voting results, see votesmart.org/bill/9879/26810/voter-pre-registration, and see status.rilin.state.ri.us for the official source.

In the year the preregistration law was approved, the House was composed of 69 Democrats and 6 Republicans, and the Senate of 33 Democrats, 4 Republicans, and 1 Independent. Of the total of 25 women, 17 were members of the House and 8 of the Senate, and they were all Democrats. Women represented 22% of total legislators compared to

the corresponding national figure of 24.5% for the same year. Governor Carcieri won the election in 2006 for his second and last term.

**Utah** House Bill 340, concerning the authorization of persons of 16 years of age to preregister to vote, was introduced by Jon Cox, a Republican Representative, on February 17, 2015. The bill received bipartisan and unanimous support in the House, where it was approved with a 71-0 vote on March 3, and in the Senate, where it was approved with a 20-0 vote on March 12. On March 24 Republican Governor Gary R. Herbert signed the bill into law. See le.utah.gov for the official source.

In the year the preregistration law was approved, the House was composed of 12 Democrats and 63 Republicans, and the Senate of 4 Democrats and 23 Republicans. Of the total of 16 women, 10 were members of the House and 6 of the Senate, and 10 of them were Democrats. Women represented 15.4% of total legislators compared to the corresponding national figure of 24.6% for the same year. The average age of legislators was 59 compared to the national average of 55.57. Governor Herbert took office in 2009 following the resignation of Governor Huntsman, and won the 2010 special election, as well as the 2012 and 2016 elections.

## APPENDIX E. COMPOSITION OF STATE LEGISLATURES

In this appendix, we run a set of tests to determine how the characteristics of state legislatures change with the introduction of preregistration laws. First, we use data on legislator ideology and polarization drawn from Aggregate State Legislator Shor-McCarty Ideology Data (americanlegislatures.com/data) for the period 1993-2014 to test for changes toward a more liberal composition of the state legislatures in the post-reform period. A legislator's ideology is measured by the pattern of bills she cosponsors with other members. A negative value corresponds to a liberal legislator, and a positive value to a conservative one. Polarization in state legislatures is measured by the distance between the Republican and Democratic median ideologies. In Models 1-6 of Table E1, we regress legislator ideology aggregated at a chamber level on preregistration, controlling for state and year fixed effects as well as a state linear time trend. In Model 1, we restrict the analysis to the House and in Model 2 to the Senate. Models 3 and 4 are restricted to the legislator ideology among Democrats in each of the two chambers and Models 5 and 6 among Republicans. In none of the cases does preregistration have a significant effect, with the single exception of Model 5, where preregistration shows a statistically significant and positive effect for Republicans in the House. This result suggests that pre-registration may have led to a more conservative ideology among Republicans who, on average, are more likely to oppose budget decisions in favor of public education. Hence,

if the mechanism of voters electing policies is the driving one, we would expect a negative impact of preregistration on education expenditure since legislators become more conservative. This result is however not confirmed by the estimates in Section 4, which are indeed consistent with Model 1 in which the overall effect of preregistration on legislator ideology in the House is not statistically significant. When in Models 7 and 8 we look at the effect of preregistration on polarization in the House and Senate, respectively, we also find no statistically significant relations.

Table E1: Preregistration, Ideology, and Women

| | Ideology | | | | | | Polarization | | Women |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Preregistration | -0.010 | 0.098 | 0.037 | -0.028 | 0.082*** | 0.022 | 0.045 | 0.050 | 0.006 |
| | (0.112) | (0.107) | (0.028) | (0.028) | (0.024) | (0.048) | (0.029) | (0.062) | (0.005) |
| State FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| State Time Trend | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| R-squared | 0.862 | 0.856 | 0.983 | 0.967 | 0.985 | 0.956 | 0.983 | 0.962 | 0.958 |
| Observations | 902 | 914 | 902 | 914 | 902 | 914 | 902 | 914 | 350 |

*Note:* State-level clustered standard errors are in parentheses. Significance levels: * 10%, ** 5%, *** 1%. The dependent variables are as follows: House Ideology (Model 1), Senate Ideology (Model 2), House Ideology among Democrats (Model 3), Senate Ideology among Democrats (Model 4), House Ideology among Republicans (Model 5), Senate Ideology among Republicans (Model 6), House Polarization (Model 7), Senate Polarization (Model 8), Share of Women in the Legislature (Model 9).

Second, we estimate the impact of preregistration on the gender composition of the House and Senate using data on the share of women in state legislatures collected by the National Conference of State Legislatures for the period 2009-2015. The hypothesis to test is that a more liberal tendency in the two chambers following the passage of preregistration should result in a larger number of elected female representatives, who are more likely to share liberal views (Chattopadhyay and Duflo, 2004). However, after controlling for state and year fixed effects together with a state linear time trend, the results show no discernible difference in gender composition of the legislature between states with and without preregistration, as shown in Model 9.

Finally, we exploit data on the average age of state legislators for the year 2015 and data on the number of legislators by age group for the year 2009 to test whether preregistration led voters to elect younger representatives. To this end, we regress the average age of legislators in 2015 on the number of legislators within age groups in 2009, while controlling for preregistration. The coefficient associated with the preregistration dummy

is 0.005 and not statistically significant. Hence, trend breaks in average age distribution following the implementation of preregistration are not likely to be present. Results are not reported for brevity. Overall, this suggestive evidence fails to corroborate the view that voters elect policies.

# References

[1] Chattopadhyay, R., and E. Duflo, 2004. Women as Policy Makers: Evidence from a Randomized Experiment in India. *Econometrica* , 72, 1409-1443.

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