

Accounting for Student Success: An Empirical Analysis of the Origins and Spread of State Student Unit-record Systems

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Abstract This event history analysis explores factors driving the emergence over recent decades of comprehensive state-level student unit-record [SUR] systems, a potentially powerful tool for increasing student success. Findings suggest that the adoption of these systems is rooted in demand and ideological factors. Larger states, states with high proportions of students of traditional college-going age, and states subject to federal civil-rights monitoring, were more likely to adopt SUR systems, suggesting influences of demands posed by size and legal constraints. In addition, states with more liberal citizen ideology were more likely to adopt the systems. Interestingly, the strength of private colleges and universities in a state worked against the adoption of SUR systems, suggesting that privacy and autonomy concerns were important deterrents to adoption. The results of this analysis illuminate the factors that inhibit and enhance SUR systems' organizational and philosophical acceptance, and thus ideally can contribute to future policymaking in this arena.

Keywords State policy · Database systems · Student success · Accountability · Policy adoption

Introduction

Integrated, inclusive, longitudinal student-level data systems have long been a virtual holy grail for many educators and policymakers seeking to improve postsecondary students' chances for educational success. Large numbers of students disappear from institutional rolls from year to year (Adelman et al. 2003; Ewell et al. 2003; Goldrick-Rab 2006), for

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destinations usually unknown to those institutions and policymakers. When only institution-level data are available, it is impossible to know which of a school's departed students have dropped out of higher education altogether, and which have simply gone on to complete their educations elsewhere. For this reason, it is hard for institutions and policymakers at the state and federal levels to ascertain students' rationales and destinations, and thus determine whether existing policies should be reformed. Programmatic databases, such as those compiled for a state merit-aid program, cannot redress the problem, because they tend to be specialized, limited to program participants, and unconnected to many aspects of student careers. Periodic national surveys tend to be insufficiently timely and inclusive to address many student-success issues.¹ Clearly, educational leaders, policymakers, and analysts can benefit from a capacity to comprehensively track large numbers of students as they move from enrollment in one institution to enrollment elsewhere, full-time employment, or other activities.

Accordingly, many policymakers and postsecondary leaders have urged the development of student unit-record [SUR] systems. Employing a *consumerist* rationale, US Secretary of Education Margaret Spellings (2006) has focused on the marketplace benefits of SUR databases, stating that her agency would work to build a database "capable of addressing concerns such as: How much is this school really going to cost me? How long will it take to get my degree?" SUR systems can also aid policymakers' efforts to promote access, choice, and persistence for all students. Employing this *equity* rationale, a recent annual report of the State Higher Education Executive Officers (SHEEO 2006) stated that "Many of the questions about student progress and success can only be addressed with unit record data that report on students' activity regardless of where and when they attend college." Finally, there is a *managerial* rationale: student unit-record data can efficiently integrate information systems for philosophically related but operationally distinct programs, can reduce data duplication, and can limit fraud and abuse in student-aid systems.

Why, then, are SUR data not already available to all key stakeholders in higher education? For one thing, these systems raise technical and cost concerns, especially in the developmental stage but also in the ongoing maintenance of a database necessary to adequately capture the postsecondary careers of students (Ewell et al. 2003; NCES 2005).²

The most prominent resistance to SUR systems, however, has arisen out of anxieties about whether government should have access to these kinds of data and about how such data might be used. These concerns stem not only from philosophical and political objections to "Big Brother" data accumulation but also from worries over the dangers of potentially breached personal data systems. The stance of the National Association of Independent Colleges and Universities [NAICU] (2007a) regarding a national student-record database is illustrative:

The most significant concern is its threat to student privacy. We do not believe that simply enrolling in college should trigger permanent entry into a federal registry, and we fear that the existence of such a massive registry will prove irresistible to future demands for access to the data for non-educational purposes.

¹ Importantly, sampling limitations limit the utility in this domain of the otherwise very valuable national longitudinal surveys of the National Center for Education Statistics, precluding studying state-level questions and questions relating to racial-ethnic and socioeconomic sub-populations.

² Focusing on prospects for a national SUR database, Ewell et al. (2003), using work by Adelman (1999), estimate that 10 years of data would be necessary to encompass the educational careers of an adequate proportion of US students.

In support of this stance, NAICU cites results from a commissioned national poll, conducted in June 2006 by Ipsos Public Affairs. The poll found that “By a factor of more than two to one (68–27%), Americans think that enough information is already collected at the college and university level. They believe that dredging for more data would be a breach of students’ privacy that could result in the misuse of their personal information” (NAICU 2007b). In addition, the poll respondents expressed worries over the ultimate returns to such data aggregation: “Sixty percent of Americans believe that collecting individual student data is costly, intrusive, and does not address a pressing public policy issue” (ibid.). NAICU argues that these sentiments “have been echoed in editorials and student newspapers throughout the country and are reflected as well by the prohibition against the implementation of a student unit record data system in higher-education legislation approved by the House of Representatives in March 2006” (NAICU 2007a).

Partly in response to such concerns at the national level, some analysts have urged consideration of a bottom-up rather than top-down approach to the problem (Bailey 2006). That is, a more feasible goal might be working toward construction of a national database through the progressive integration of SUR databases from the fifty states. It is those state databases that are the focus of the present analysis.

Study Purpose and Conceptualization

The number of SUR databases has grown notably since the first systematic national survey of state systems (Russell 1999). Now, at least 40 states have SUR systems in place, giving them some capacity to track students moving from one institution to another within state boundaries (Ewell and Boeke 2007). All of these databases contain, at minimum, basic information on enrollment, major, degrees granted, race/ethnicity, and gender (i.e., the core data elements sought annually in the federal IPEDS data collection) for all students enrolled in public institutions. Some states adopted some form of a SUR system over three decades ago, while others did so only in recent years, and some continue to resist altogether. Yet, virtually nothing systematic is known about the origins and the spread of these programs across the states. In the current climate, with arguments for improved understanding of student success often centering on improving databases (e.g., see Bailey 2006; Spellings 2006), it is important to build empirical knowledge of the forces driving governments toward or away from student unit-record data. This is so for several reasons.

First, understanding the conditions associated with state adoption of SURs may better equip institutional leaders to anticipate potential policy change in their own states. Although leaders and institutions may be unable to directly influence most of the factors within their states that spur the creation of new governmental policies for higher education, appreciating the conditions under which such change is most likely to occur may permit them to more effectively influence the substance and the timing of debates surrounding adoption of those policies. From a more conceptual perspective, analyzing the factors associated with the spread of SUR databases affords researchers an exceptional opportunity to test how well theories of governmental behavior “travel” in the domain of higher education, where until very recently such theorizing had largely been overlooked. Because not all states have adopted SURs, inevitably questions arise as to which factors drove certain states to adopt these policies at the times at which they did. The determinants of state policy for higher education have begun attracting substantial, new scholarly attention (e.g., Doyle 2006; Lowry 2007; McLendon and Hearn 2007; McLendon et al. 2006; Weinstein and Krause 2006). To what extent does the growth of SURs align with what the

field is learning about the factors driving other state postsecondary policies? To what extent do SURs stand as an anomalous case of policy adoption? Our work adds to emerging research in this vein by focusing on state adoption of policies holding important implications for students, institutions, and states.

Our study hypotheses were directed toward understanding the dynamics of whether and when individual states would adopt SUR systems. Our conceptualizing draws on three closely related but distinct bodies of research literature: the comparative-state politics literature (e.g., Barrilleaux et al. 2002; Soss et al. 2001), the literature on state policy innovation and diffusion (Berry and Berry 1990, 1992, 2007), and the growing body of related empirical work on factors associated with adoption by state governments of various *postsecondary* policies (e.g., Doyle 2006; Hearn and Griswold 1994; McLendon et al. 2006; McLendon et al. 2005; Zumeta 1996).

Based on this literature, we propose an explanatory model with four components, reflecting four sources of potential influence on SUR adoption. Hypotheses 1–3 focus on *socioeconomic* factors influencing SUR initiation: to what extent do the state's size, population distribution, and economic conditions drive this innovation? Hypotheses 4–6 focus on *structural and legal* factors: to what extent is SUR adoption influenced by the strength of the state's private higher-education sector, the nature of the state's postsecondary governing arrangements, and federal legal pressures concerning segregation in colleges and universities? Hypotheses 7–9 focus on influences stemming from state *political* systems: how does SUR adoption relate to citizens' governmental ideologies, citizens' partisan voting patterns, and the party composition of state government? Finally, hypothesis 10 focuses on the potential *diffusion context* surrounding state decision making on SUR systems: how might a state's regional neighbors influence its adoption of this innovation? The research and professional literature suggests specific directions for each of these 10 hypothesized relationships.

Hypothesis 1: States with large populations will be more likely to initiate SUR systems

Populous states may need SUR systems to deal with the complexities of greater enrollments and greater arrays of institutions. States with larger populations also tend to adopt policies and programs of greater technical sophistication (Berry and Berry 2007). SURs, with their heavy demands of information collection, may be viewed as one such kind of state policy.

Hypothesis 2: States with high proportions of citizens aged 18–24 will be more likely to initiate SUR systems

States with younger populations may tend to invest more heavily in policies directed to ensuring those populations are well educated and employed. Because SUR systems may improve students' chances for postsecondary success and eventual occupational placement, they may attract greater support in such states.

Hypothesis 3: States with weak economic climates will be more likely to initiate SUR systems

Economic conditions, as indicated by such factors as gross state product per capita, can shape state policy initiation (e.g., Berry and Berry 1990), and in higher education, economic disadvantages appear to be associated with some forms of policy experimentation (Mingle 1983; McLendon et al. 2006).

Hypothesis 4: States with high proportions of students in private institutions will be less likely to initiate SUR systems

Among the more outspoken opponents of SUR systems are some leaders of private institutions, who express concerns over impending governmental threats to student privacy and institutional autonomy (e.g., see NAICU, 2007a,b). It follows that SUR establishment may be less likely in states with proportionately large independent-college sectors.

Hypothesis 5: States that employ consolidated governing boards will be more likely to initiate SUR systems Consolidated governing boards represent the most centralized form of higher-education governance, and often have greater staff and analytic resources than their counterparts in coordinating boards and state planning agencies (McGuinness 1997; McLendon 2003; Zumeta 1996). Perhaps as a consequence, centralized systems appear to generate more policy innovation (Doyle 2006; Hearn and Griswold 1994; McLendon et al. 2005). Thus, states with more centralized governance may be more likely to innovate in data integration in the pursuit of student success.

Hypothesis 6: States that have been subject to federal litigation for maintaining segregated higher-education systems will be more likely to initiate SUR systems States whose higher-education systems were judged segregated and unequal over the years since the 1950s faced greater challenges than others in documenting the success, or lack of it, of African-American and other students (Ewell et al. 2003). These states were required to submit periodic reports to the Office of Civil Rights on their progress toward integrating their public colleges and universities. Because SUR systems enhance states' capabilities to provide such documentation, those states may have been especially likely to adopt such systems.

Hypothesis 7: States whose citizen ideology is more liberal will be more likely to initiate SUR database systems in higher education Broadly speaking, political ideology may be understood as a coherent and consistent set of orientations or attitudes toward politics (Berry et al. 1998). States with more liberal citizenries—understood as the citizenry's mean position on a liberal-conservative continuum of the electorate in a state—historically have been prone to support more generously funded social services and bigger government (e.g., Barrilleaux et al. 2002; Berry et al. 1998). These states also tend to engage in more policy innovation (Berry and Berry 2007). Extending this logic, we believe that more ideologically liberal states also may be more likely to support the building of an encompassing database to track student progress.

Hypothesis 8: States in which popular support for Libertarian presidential candidates is greater will be less likely to initiate SUR systems The most persistent objection to SUR systems has come from those worried over threats to individual privacy. No political party is more attentive to privacy issues than the Libertarian party, so states with greater affinity for the party may be especially resistant to the privacy threats inherent in SUR systems.

Hypothesis 9: States with Republican control of legislatures and the governorship will be more likely to initiate SUR systems Partisan strength can influence state policy outcomes (Alt and Lowry 2000; Berry and Berry 1990; Squire and Hamm 2005; Wong and Langevin 2006). Republicans may be not only more suspicious of public bureaucracy but also more oriented to efficiency and accountability in government programs (McLendon et al. 2006). Thus, states with Republican-controlled legislatures and governorships may be more likely to adopt SUR systems.

Hypothesis 10: States whose regional neighbors have already adopted a SUR system will themselves be more likely to adopt one Presumably propelled by regional associations and other formal and informal informational and peer contacts, state-to-state diffusion effects have been shown to occur in higher education (Doyle 2006; Doyle et al. 2005; McLendon et al. 2005). Data-system innovations might also diffuse along regional lines. That is, states whose regional neighbors have already enacted a SUR system may be more likely to do the same.

Research Design

Event history analysis [EHA] was used to examine the factors that influence the timing of a state's adoption of a SUR system. Although this analytic technique originated in the biomedical sciences, social scientists in fields such as political science increasingly have utilized event history models to understand the occurrence of dynamic social phenomena (e.g. Berry and Berry 1990; Mooney and Lee 1995). Event history analysis has also been incorporated into the study of state adoption of certain education policies, including performance-accountability initiatives in higher education (McLendon et al. 2006), merit-based student grant programs (Doyle 2006), prepaid tuition and college savings plans (Doyle et al. 2005), charter school legislation (Renzulli and Roscigno 2005; Wong and Langevin 2005; Wong and Shen 2002), and school choice measures (Mintrom 2000). Event history analysis provides several advantages over traditional logistic regression models by allowing for the analysis of time-dependent variables, taking explicitly into account the length of time until the event occurs, and providing an estimate of the risk of an event occurring at any given time period (DesJardins 2003; Bennett 1999; Box-Steffensmeier and Jones 2004; Box-Steffensmeier and Bradford 2004).

The sample for the analysis includes a total of 42 states. Alaska and Hawaii were omitted due to their geographic isolation, which precludes the analysis of the effects of regional diffusion. Nebraska was omitted since the effects of partisan control of the government could not be tested due to the state's unicameral legislative system. California was excluded from the analysis because it adopted a SUR in 1970, and longitudinal data for the values of many of the independent variables were not available for the year of adoption. Lastly, Maine, North Dakota, West Virginia, and Wyoming could not be included in the analysis because accurate information was not available regarding the exact year of SUR adoption.

The data for the dependent variable, the year in which each state first adopted a SUR system, were collected from a student unit-record survey conducted by Peter Ewell and his colleagues at NCHEMS (Ewell and Boeke 2007). These databases all share at least three common characteristics: (1) they contain electronic records for every student in at least one sector of public institutions in the state, (2) they represent "snapshots" at specific periods of time, typically a semester or quarter of the academic year, and (3) they are centrally maintained by the state or each institution submits its own records to one electronic system. Although the type of information in each database may differ slightly, at a minimum all "databases can consistently track students on the basis of seven core pieces of information: enrollment (at a given institution), degree awarded, program/major, sex, race/ethnicity and date of birth" (Ewell et al. 2003, p. 3). In the event that the exact year of policy adoption was unclear, state and system officials were contacted to verify the information.

The independent variables used in this analysis reflect the 10 hypotheses presented earlier in the paper: total population (logged), percentage of the population aged 18–24, GSP per capita (logged), percentage of higher-education enrollments in private institutions, a dichotomous variable for whether the state had a consolidated governing board, a dichotomous variable for whether the state was under federal litigation for segregated higher-education systems,³ citizen ideology (Berry et al. 2004), percentage of votes for a

³ The variable for federal litigation is a time-invariant indicator because data for the exact year in which the desegregation lawsuit began and OCR monitoring ended were not readily available. Although it would have been preferable to have time-varying values for this variable, the indicator does provide valid information on the pressures faced by these states. States with strong indications that they were about to come under federal scrutiny and states just released from federal scrutiny are arguably just as sensitive as states under formal scrutiny, perhaps even more so, to the need for data gathering and dataset construction of this kind.

Libertarian presidential candidate in the most recent national election, unified Republican control of the government, and the number of neighboring states with a SUR system.

The data for these variables were collected from a variety of reliable secondary data sources, such as the Bureau of Economic Analysis and the Inter-University Consortium for Political and Social Science Research (ICPSR). Table 1 provides a description of each of these variables with the source of the data.

For our event of interest, we accepted the minimal SUR definition employed by Ewell and Boeke (2007) in their comprehensive survey: an integrated data system containing core IPEDS student data at the individual level and giving a state the capability to track students across at least the public institutions in the state. Time is measured discretely as the year in which a state first adopted a SUR system. Our data set begins in 1973, when Texas and Wisconsin first adopted a SUR system, and continues until a total of 33 states had adopted systems in 2005. States that had not yet adopted a SUR system by the end of the observation period are right censored observations. Event history analysis uses information about both censored and non-censored cases to predict the risk of event occurrence at a point in time.

The dependent variable expresses the duration of time in years (t) until a state (i) adopts a SUR system. First, we calculated the survival function, representing the probability that a unit will “survive” (or fail to experience the event) longer than time t (Box-Steffensmeier and Jones 2004; Box-Steffensmeier and Bradford 2004; DesJardins 2003; Singer and Willett 2003). Next, we calculated the hazard function, our primary dependent variable of interest. The hazard function represents the instantaneous rate of change in the probability of experiencing an event at time t , conditional upon “survival” up to the specified period of time. For our analysis, the hazard function indicates the probability that a state without a SUR system would adopt one in a particular year, given its values of the independent variables that influence change.

Because the probability that a state adopts a SUR system may change over time as these policies become more popular, the risk of experiencing the event must be allowed to vary in different time periods. In order to account for these changes over time, we used a specific type of event history model known as the Cox proportional hazards model. The Cox model focuses on the relationship between the outcome and the covariates of theoretical interest, without the need for specifying the functional form of the duration dependence (Box-Steffensmeier and Jones 2004). For each year of the analysis, any state that has not yet adopted a SUR system is included in the “risk set” of observations that are eligible to have an event at that point in time. Information about the order of the events is used to estimate the conditional probability that a state will adopt a SUR system for each time period, given the number of states at risk and the values of those states on important covariates. Maximum partial likelihood estimation is used to calculate the parameter estimates using information about these ordered failure times to predict the likelihood of observing the data that we have in fact observed. These estimates characterize how the hazard distribution changes as a function of the covariates, without making any assumptions about the underlying nature or shape of the baseline hazard rate.

“Tied” events occur when multiple states adopt a SUR in the same year. Since maximum partial likelihood estimation uses information about the rank ordering of failure times, tied events make it difficult to determine which states should be included in the risk set because the exact order in which the events occurred is undetermined. In this analysis, the exact discrete method was used to construct the partial likelihood estimates when tied events occurred. This method assumes true discrete time by calculating all of the possible risk sets at each tied failure time. Although this technique is still an approximation of the

Table 1 Variable descriptions and sources

Variable	Description	Source
State adoption of a student unit-record [SUR] system	Dummy variable (yes = 1; no = 0) indicating whether a state adopts a student unit record [SUR] system in this year. These systems all: (1) contain electronic records for every student in at least one sector of public institutions in the state, (2) represent “snapshots” at specific periods of time, and (3) are centrally maintained by the state or each institution submits its own records to one electronic system. At a minimum all databases can consistently track students on the basis of seven core pieces of information: enrollment (at a given institution), degree awarded, program/major, sex, race/ethnicity and date of birth	Ewell and Boeke (2007); Personal communication with state and system officials
Total population (logged)	Annual measure of total population (logged)	Census/Southern Regional Education Board [SREB], yearly totals and decennial census Census/SREB
% Population aged 18–24	Annual measure of the percentage of the total population between the ages of 18 and 24	Census/SREB
GSP per capita (logged)	Annual measure of the gross state product per capita (logged)	Bureau of Economic Analysis
% Higher education enrollments in private institutions	Annual measure of the percentage of higher education enrollments in private institutions	National Center for Education Statistics/SREB
Consolidated governing board	Dummy variable (yes = 1; no = 0) indicating whether the state has a consolidated governing board	McGuinness' <i>State Structures Handbook</i> and Education Commission of the States [ECS]
States under federal litigation for segregated higher-education systems	Dummy variable (yes = 1; no = 0) indicating whether the state was subject to federal litigation for maintaining segregated higher-education systems	Southern Educational Foundation (1995, 1998)
Citizen ideology	Index of citizen ideology; continuous variable with higher values indicating higher levels of liberalism	Berry et al. (2004) data from the Inter-University Consortium for Political and Social Research (ICPSR)
% Libertarian vote	Four-year measure of the percentage of votes for a Libertarian candidate in the last presidential election	Leip's <i>Atlas of US Presidential Elections</i> , at http://uselectionatlas.org/RESULTS/index.html
Unified republican control of government	Dummy variable (yes = 1; no = 0) indicating whether the republican party controlled both chambers of the legislature and the governorship in the state	Klamer data at <i>State Politics & Policy Quarterly</i> [SPPQ] data archive, Book of the States, Council of State Governments
Diffusion of SUR system	Number of neighboring states with a SUR system	Authors' calculations using data from the dependent variable and maps

actual order in which the events occurred, it provides an accurate estimate as long as a large number of ties do not occur in a single time period (Box-Steffensmeier and Jones 2004). In our sample, less than 10% of states adopted a SUR in any 1 year.

The final model for the adoption of a SUR system can be expressed as:

$$h_i(t) = h_0(t) \exp(\beta'x),$$

where $h_i(t)$ is the proportional hazard of adopting a SUR system for state i in year t , and $\beta'x$ is the matrix of regression parameters and covariates (Box-Steffensmeier and Jones 2004; Hosmer and Lemeshow 1999). The coefficients are exponentiated to make it easier to interpret them substantively in the form of hazard ratios. A hazard ratio greater than one indicates that the risk of adopting a SUR increases as the values of the covariate increase, indicating that the state is more likely to adopt a SUR. Conversely, a hazard ratio of less than one indicates that the risk of adopting a SUR decreases as the values of the covariate increase, indicating a longer time to event.

The Cox model is a “proportional hazards” model, which means there is an assumption that the ratio of the hazard rates between any two observations or groups is constant over time. In order to test this assumption, Schoenfeld residuals were calculated to determine whether the effect of any of the covariates changed disproportionately over time (Grambsch and Therneau 1994). The results indicated that there is no evidence that any of the variables in our final model violated the proportional hazards assumptions. Additional diagnostic methods were conducted including an assessment of the overall model fit using Cox–Snell residuals and an examination of the deviance residuals to identify any outlier values.

Findings

Table 2 presents descriptive data for the independent and dependent variables in the analysis during 1973 and 2005 for the 42 states in our sample. Citizen ideology remained

Table 2 Descriptive statistics for the sample ($N = 42$ states)

Variable	1973		2005	
	Mean	Standard deviation	Mean	Standard deviation
State adoption of a student unit-record [SUR] system	0.05	0.22	0.00	0.00
Total population (logged)	14.91	0.94	15.27	0.88
% Population aged 18–24	12.61	0.84	9.85	0.64
GSP per capita (logged)	10.15	0.12	10.58	0.16
% Higher-education enrollments in private institutions	21.98	12.50	24.17	12.20
Consolidated governing board	0.33	0.48	0.33	0.48
States under federal litigation for segregated higher-education systems	0.33	0.48	0.33	0.48
Citizen ideology	46.42	16.64	48.96	12.71
% Libertarian vote	0.01	0.02	0.29	0.19
Unified republican control of government	0.17	0.38	0.63	0.50
Number of neighboring states with a SUR system	0.14	0.35	3.05	1.53

relatively stable with a value just below the middle of the conservative-liberal continuum in both years, and the average percentage of votes for a Libertarian presidential remained less than 1%. The variable that indicated the greatest change during this time period was unified Republican control of the government. Republicans had control of both chambers of the legislature and the governorship in 17% of states in 1973 and 63% of states in 2005. The percentage of higher-education enrollments in private institutions increased slightly from 22.0% to 24.2% during this time. In both years, approximately one-third of states had a consolidated governing board and one-third of states had been subject to federal litigation for maintaining segregated higher-education systems. In terms of demographic characteristics, the average total state population increased slightly over time, while the percentage of the population aged 18–24 declined from 12.6% to 9.9%. Economically, state wealth increased slightly over time as indicated by the rise in the GSP per capita. The descriptive statistics also indicate that by 2005, states had an average of approximately 3 neighboring states that had adopted a SUR system.

Table 3 lists the states that adopted a SUR system during each year of the analysis, the number of states in the risk set at each time period, the survivor function, and the hazard rate. Over time, the survivor function declines at a fairly steady rate with no more than four states adopting a SUR in a single year. The final survivor function of 0.214 indicates that only 21% of the states in the sample had not adopted a SUR system by the end of 2005. The hazard rate provides an estimate of the likelihood that a state without a SUR would adopt one in a particular year. In all years the hazard rate is less than 6%, indicating that there was no sudden time period in which there was a rapid change in the likelihood of adopting a SUR. As illustrated in Fig. 1, the hazard rate peaks around the mid-1990s, and then begins to decline slightly. This decline results from the process of censoring, rather than the event process itself. Over time as more states adopt SUR systems, the number of states remaining to adopt SURs declines, so the likelihood of adopting a SUR system in a given year also declines.

Table 4 presents the results of event history analysis using the broadest definition of SUR system, as defined in the previous section. While political party strength, governance arrangements, economic conditions, and actions in neighboring states seem irrelevant to the adoption of these systems,⁴ contrary to our initial expectations, a number of our hypotheses were upheld.

Viewing the results as a whole, we infer two major themes in the effects: “demand” influences and “ideological” influences. The significant “demand” influences uncovered suggest that the adoption of SUR systems may be driven by states’ needs for more data on their postsecondary education systems. First, controlling for other factors, states with larger overall populations have been more likely to adopt SUR systems. Larger states may face additional complexities as they attempt to track and serve great numbers of students across multiple institutions and systems, and may be particularly likely to benefit from integrated databases. Next, the percentage of the population aged 18–24 is positively associated with the adoption of an SUR system. Since states may need to allocate a greater proportion of their resources to higher education if there is a relatively large college-age population, they

⁴ To explore the possibility that states may be responding to changing trends in these characteristics over time, we tried different specifications of several independent variables in our model. Since support for Libertarian candidates likely begins prior to an election, we substituted the percent Libertarian votes in the last presidential election with values from the 2 years leading up to and 2 years following each election. Also, as the growth or decline of GSP per capita may affect a state’s economy slowly over time, we tried using a 1-year lag and a 3-year moving average for this variable. In all models the results were essentially unchanged.

Table 3 States adopting a student unit record [SUR] system with Kalpan–Meier survivor function and hazard rate

Year	States adopting SUR systems	Number of adoptions	Cumulative adoptions	Risk set	Survivor function	Hazard rate
1973	TX, WI	2	2	42	0.952	0.003
1974		0	2	40	0.952	0.000
1975		0	2	40	0.952	0.000
1976		0	2	40	0.952	0.000
1977	MD, OK	2	4	40	0.905	0.003
1978	NC	1	5	38	0.881	0.002
1979	IN	1	6	37	0.857	0.002
1980	KY	1	7	36	0.833	0.002
1981		0	7	35	0.833	0.000
1982		0	7	35	0.833	0.000
1983	GA, IL, MN	3	10	35	0.762	0.007
1984	MS	1	11	32	0.738	0.003
1985	FL, MA, NJ	3	14	31	0.667	0.008
1986		0	14	28	0.667	0.000
1987	CO	1	15	28	0.643	0.003
1988	CT, LA, MO, NY	4	19	27	0.548	0.015
1989		0	19	23	0.548	0.000
1990	OR	1	20	23	0.524	0.004
1991	TN	1	21	22	0.500	0.005
1992	VA	1	22	21	0.476	0.006
1993	AR, SC	2	24	20	0.429	0.012
1994	NM, WA	2	26	18	0.381	0.014
1995		0	26	16	0.381	0.000
1996		0	26	16	0.381	0.000
1997		0	26	16	0.381	0.000
1998	AL, AZ, OH, SD	4	30	16	0.286	0.051
1999	UT	1	31	12	0.262	0.016
2000	NV	1	32	11	0.238	0.019
2001		0	32	10	0.238	0.000
2002	KS	1	33	10	0.214	0.031
2003		0	33	9	0.214	0.000
2004		0	33	9	0.214	0.000
2005		0	33	9	0.214	0.000

may be especially concerned about monitoring student careers and outcomes. Third, states facing desegregation litigation have been especially likely to establish SUR systems. These states faced strict monitoring from the Office of Civil Rights and may have needed better mechanisms for tracking enrollment and retention rates for students of color in order to meet legal requirements.

The graph of the smoothed hazard function in Fig. 2 illustrates the relative magnitude of the effect of each of these “demand” influences. The solid line indicates changes over time in the hazard function of an “average” state, representing an observation with average

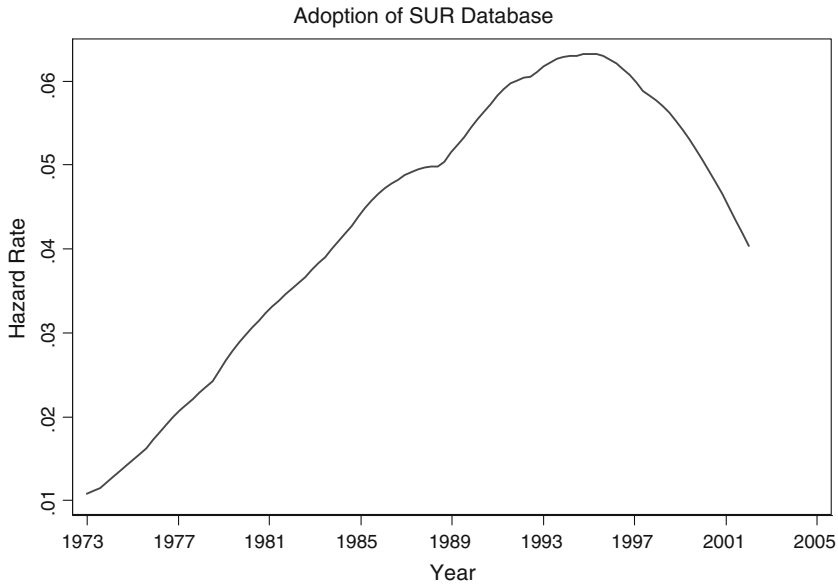


Fig. 1 Smoothed hazard rate

Table 4 Results from Cox proportional hazard model for state adoption of a SUR system (standard errors in parentheses)

	Coefficient	Exp (Coefficient)
Total population (logged)	0.96** (0.30)	2.62**
% Population aged 18–24	0.77** (0.25)	2.16**
GSP per capita (logged)	1.59 (1.66)	4.89
% Higher education enrollments in private institutions	−0.07** (0.02)	0.93**
Consolidated governing board	0.74 (0.59)	2.09
States under fed. litigation for segregated higher-education systems	1.66** (0.63)	5.27**
Citizen ideology	0.05* (0.02)	1.05*
% Libertarian vote	−0.85 (0.76)	0.43
Unified republican control of government	−0.02 (0.77)	0.98
Number of neighboring states with a SUR system	−0.41 (0.24)	0.67
Log likelihood	−74.92	
Likelihood ratio	34.68	
Degrees of freedom	10	
Sample size	42	

* $p \leq 0.01$, ** $p \leq 0.01$

values for all of the independent variables in the analysis. The various dotted lines indicate how the estimated hazard rate changes, given hypothetical values of each of the demand characteristics. The demand characteristic with the greatest effect on the hazard of adopting a SUR is the dichotomous variable indicating whether the state was subject to federal litigation for maintaining a segregated higher-education system. On average, the

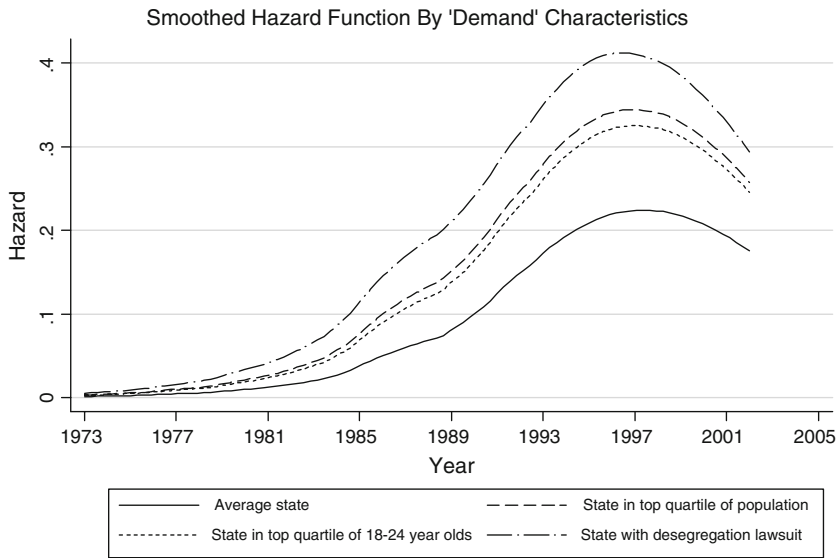


Fig. 2 State adoption of a SUR system

hazard of adopting a SUR system is 5.3 times greater for states with a desegregation lawsuit compared to states without a lawsuit. In addition, states in the top quartile of total population and states in the top quartile of the percentage of the population aged 18–24 both have a similar effect in magnitude on increasing the likelihood that a state will adopt a SUR system in a given year. The graph also illustrates that the difference in the hazard rate appears to be proportional between groups with these different demand characteristics over time, as assumed in the Cox proportional hazards model.

The significant “ideological” influences uncovered suggest that, to the extent ideology is involved in decisions regarding SUR systems, it appears to be reflected in how states resolve the tension between their citizenry’s underlying public-policy values and the interests of private higher education in preserving institutional autonomy. Our findings indicate that states whose underlying citizen ideology is more liberal have been more likely to establish a SUR system than more conservative states. Yet interestingly, the expressed partisan political preferences of the population did not appear to influence decision-making regarding SUR systems: neither unified Republican control of government nor popular support for Libertarian presidential candidates affected SUR system adoption.

While underlying liberal values were positively associated with initiating SUR systems, the strength of private colleges and universities in a state worked in opposition to such systems. As hypothesized, states with greater proportions of students enrolled in private institutions have been less likely to initiate a SUR system. This finding may signal either ideological or demand-based sentiment. Perhaps ideologically based interest-group opposition from private institutions to SUR systems may have been successful in thwarting their initiation. Alternatively, because the benefits of SUR systems shrink to the extent that large numbers of students remain absent in the database, and because only a handful of states thus far have been able to incorporate significant data for students in private institutions into their SUR systems (Ewell and Boeke 2007), it may be that policy leaders perceive the returns to investing in start-up, public-institutions only, SUR systems insufficient in states with small public-institution enrollments.

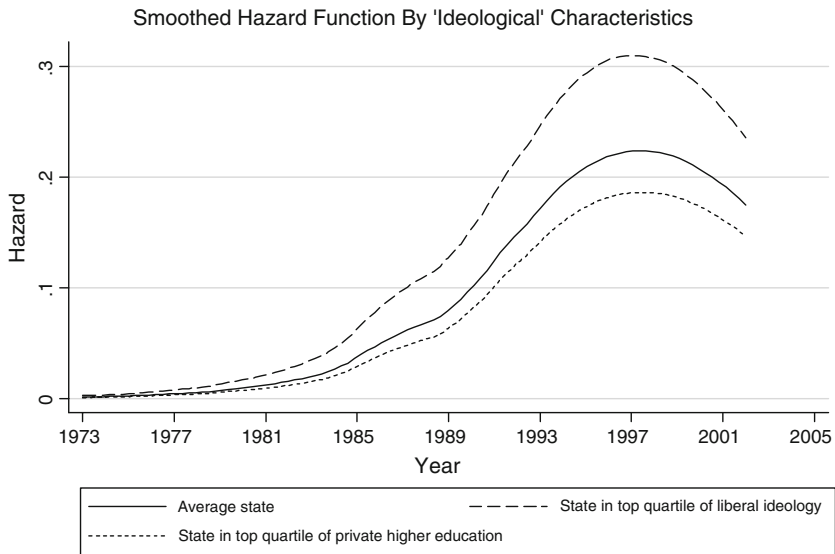


Fig. 3 State adoption of a SUR system

Figure 3 illustrates the relative magnitude of the effect of each of these “ideological” influences by comparing the hazard rate for an “average state” to states with hypothetical values for each of the ideological characteristics. As indicated in the graph, the likelihood of adopting a SUR system in any given year is smaller for states in the top quartile of enrollments in private higher education relative to the “average” state. A one percent increase in higher-education enrollment in private institutions leads to an estimated 6.6% decrease in the hazard of adopting an SUR, holding other factors constant. In addition, states in the top quartile of values for liberal ideology have a relatively greater risk of adopting a SUR compared to an “average state.” The graph also indicates that the ratio of the hazard rates between states with these different ideological characteristics is constant over time, which is consistent with the proportional hazards assumption.

Beyond the adoption of *any* SUR system lies the question of the particular kind of SUR system adopted. As noted earlier, the analysis presented in Table 3 adopted the broadest operationalization of a SUR presented in the work of Ewell and Boeke (2007). What might be the implications for our analysis, however, of *alternative* definitions of SUR systems, moving beyond the minimal criteria?

Two elaborations of SUR datasets merit empirical attention in future studies on this topic. First, 14 of the 40 states with SUR systems incorporate what Ewell and Boeke (2007) suggest is a full range of information, encompassing sex, race/ethnicity, date of birth, geographic origin, high school attended, high school graduation date, program/major, financial aid, full-time/part-time status, credits attempted, credits earned, cumulative GPA, and degree awarded. What factors might drive a state to invest in building such a comprehensive system?⁵

Second, the most ambitious and potentially most useful SUR systems incorporate data for students in *both* public and private institutions. This scope provides state policymakers

⁵ In the present study, this analysis was precluded because no available data identify the dates of modifications and expansions in state SUR systems.

a far more complete picture of student pathways and success (Hearn and Anderson 1989, 1995). At the same time, it is potentially the most difficult to achieve, given private-college leaders' resistance to these systems (noted earlier, and empirically supported in our results). Which states then, have achieved some measure of integration across the public and private institutions in their states? As of Ewell and Boeke's survey (2007), 17 states incorporated at least some data from independent institutions into their SUR systems, a gain of five states since 2002. Of those 17 systems, only seven incorporate data from all independent colleges and universities in their states. What factors might drive a state to commit to efforts to secure private institution participation in SUR database development?

Implications

For SUR advocates, the movement toward building integrated unit-record databases promises significant breakthroughs supporting some longstanding goals of researchers, leaders, and policymakers. Bailey (2006, p. 10), for example, has stated that,

These data sets offer consistent unit record longitudinal data across public institutions and, in some cases, private institutions, within states. Sample sizes are also large enough to allow analyses of individual institutions, and in large states there are enough colleges to provide significant variation in college policies and practices. Moreover, it is also possible to collect data on college practices to supplement the more superficial measures found in IPEDS. Linking these data to the cross-sectional surveys such as NSSE [the National Survey of Student Engagement] and CCSSE [the Community College Survey of Student Engagement] could offer important new insights.

Bailey focuses mainly on the need to integrate various data sources in the service of institutional policies affecting postsecondary student success. SUR advocates also note the benefits of three related forms of data integration. First, many states are moving toward building integrated unit-record data for P-12 education (Redden 2007). P-12 preparation is critical to postsecondary success, and these state efforts are focusing on such indicators as unique statewide student identifiers connecting student data across key databases across years; student-level enrollment, demographic and program participation information; the ability to match individual students' test records from year to year to measure academic growth; information on untested students and the reasons they were not tested; a teacher-identifier system with the ability to match teachers to students; student-level transcript information, including information on courses completed and grades earned; student-level college readiness test scores; student-level graduation and dropout data; a state data-audit system assessing data quality, validity and reliability; and, most importantly for the present analysis, building capabilities to match student records between the P-12 and higher-education systems (National Data Quality Campaign 2007). Achieving these goals at the P-12 level could arguably serve students both before and during their postsecondary years.

Second, students' chances for success may benefit from not only better integrated local data systems but also better coordination between individual states and federal data systems. As St. John et al. (2001), have argued, simultaneous and more comprehensive knowledgability about students' financing status in institutional, state, *and* federal systems can help direct student-aid awards more precisely toward serving student success. Notably, effective federal policymaking depends on knowledgability about students' status in state systems, and about the various policy linkages between federal and state policies of different kinds.

Finally, advocates argue that cross-state data integration can have significant benefits: because single-state SUR systems cannot address the dynamics of student migration in and out of state (NCES 2005), they provide imperfect information on the factors shaping student attainments. Crossing the frontier to multi-state SUR systems will be a daunting challenge. Ewell and Boeke (2007) note that, as of their survey, only five states secured data from neighboring states to allow consideration of patterns of student mobility. Given the currently lagging support for a federal SUR system, integrating state systems at the regional or consortial level appears to be a more achievable goal.

What, in fact, are the prospects for building a national SUR database by accretion, that is, sector by sector and state by state? Inclusive longitudinal student data could potentially serve prominent quality and accountability agendas (Miller and Ewell 2005; National Commission on Accountability 2005), and calls for unit-record data are increasing, but resistance to such systems at the national level continues to be strong among privacy advocates and others.⁶ In this context, support for state-level SURs appears to be the key to change, so it is important to understand the factors favoring the emergence of state SUR systems.

Toward that end, it is regrettable that currently available data do not allow the assignment of adoption dates to SUR systems of different extensiveness. Importantly, were data available on adoption dates for the extensive systems that incorporate and integrate data on a wide range of factors, including age, sex, and race/ethnicity enrollment histories, grades, credit accumulation, program/major, financial aid awards, and degree awards, it would be possible to more precisely discern key factors in the adoption of partial and extensive SUR systems. Because no adoption dates were available here for the various potential elements of SUR systems, the dependent variable for the analysis was necessarily operationalized in a more inclusive way.⁷

The analysis here nevertheless does provide intriguing results. The findings suggest that the emergence of state unit-record systems flows from a complex combination of demographic, structural, and ideological forces that lie, to some degree, beyond the capacity of policymakers to influence very directly. The factors that appear to have been shaping state policy trajectories appear to be deeply rooted in the organizational, societal, and cultural complexions of states. From a social-scientific standpoint, this is not necessarily a limitation: evidence on the social, political, and economic bases of an event is important in and of itself for building fundamental knowledge about the workings of central institutions in the society. Along these lines, event history analyses of the kind undertaken here have been contributing importantly to recent developments in the fields of political science and sociology (Berry and Berry 2007; Box-Steffensmeier and Bradford 2004; DesJardins 2003; McLendon et al. 2006; Singer and Willett 2003; Strang 1994).

But the present analysis was not aimed toward that level of contribution alone. While most of the influential factors uncovered in the present study indeed may lie largely beyond policymakers' immediate control, this research provides some new, across-state evidence hinting at how policymakers have framed SUR debates, and how they might frame future debates on these issues. While state and institutional leaders may be unable to change their citizenries' underlying ideological predispositions, for example, they may nonetheless be

⁶ See Hearn (2006) for a review of some of the issues on both sides of the student unit records debate.

⁷ According to Ewell and Boeke (2007), such "super" SUR systems may be found in at least one post-secondary system in 18 states, including California, Florida, Kansas, North Dakota, Ohio, and South Carolina. It is unclear, however, how much of the data collected in these current systems was also gathered when SURs were first initiated in these states.

able to use those predispositions to shape policy discussions in ways that support desired policy ends. Thus, knowing that liberal ideology is associated with SUR adoption, institutional leaders may wish to argue for SURs in terms that help mobilize liberal leaders and citizens toward active support. SURs, in this framing, can be seen to represent valued government action in helping ensure social well-being, equity, and fair market competition.

It should be noted that some prospective policy developments are central to the future of SUR systems. Specifically, that future depends significantly on the resolution of some ambiguities across the states in the legal interpretation of the national Family Educational Rights and Privacy Act [FERPA]. The Act, passed in 1974, requires schools to obtain formal permission from the student or parent before releasing any student educational data. As Ewell et al. (2003) note, FERPA has been interpreted variously by states' attorneys general, sometimes allowing construction of SUR databases and sometimes restricting such efforts. Institutions and states violating FERPA provisions become vulnerable to the withholding of all federal funding (ibid.). Clearly, states and institutions will be reluctant to participate in the construction of SUR systems at the state, regional, and national levels if they perceive substantial financial or legal risks, so any policymaker efforts to lessen the ambiguities in this arena will enhance public debates concerning SUR database construction.

Resolving legal questions addresses only one of the questions surrounding adopting these policies, however. Ideally, the analysis presented here will provide a useful addition to knowledgability regarding the core influences shaping state SUR systems. These systems are increasingly being touted as foundational for emerging national efforts to improve student success, so it seems essential for advocates and opponents alike to understand better what factors inhibit and enhance their organizational and philosophical acceptance, as well as their ultimate utility.

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