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Expanding Downward: Innovation, Diffusion, and State Policy Adoptions of Universal Preschool

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Abstract: Framed within the theoretical framework of policy innovation and diffusion, this study explores both interstate (diffusion) and intrastate predictors of adoption of state universal preschool policies. Event history analysis methodology is applied to a state level dataset drawn from the Census, the NCES Common Core, the Book of the States, and other sources. Significant predictors of policy adoption include greater Democratic control of the state legislature and the prolonged presence of a targeted preschool program. Regional proximity is not found to be a significant predictor of policy adoption. Implications for policy and practice are discussed.
Keywords: universal preschool, early childhood, event history analysis, policy adoption, diffusion

Ampliando Hacia Abajo: Innovación, Difusión y Adopción de Políticas Públicas de Universalización del Preescolar
Resumen: Enmarcado dentro del marco teórico de políticas de innovación y difusión, este estudio explora tanto predictores interestatales (difusión) e intraestatales de adopción de políticas públicas de universalización del preescolar. Metodología de análisis de eventos históricos se aplica a un conjunto de datos a nivel estatal elaborados a partir del Censo, el programa NCES Common Core, el Libro de los Estados, y otras fuentes. Los predictores significativos de la adopción de políticas incluyen un mayor control democrático de la legislatura estatal y la presencia prolongada de un programa

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focalizado de preescolar. La proximidad regional no fue un predictor significativo de la adopción de políticas. Se discuten las implicaciones para la política y la práctica educativa.
Palabras clave: preescolar universal; primera infancia; análisis histórico de eventos; adopción de políticas; difusión

Estendendo Para Baixo: Inovação, Difusão e Adoção de Políticas Públicas de Universalizacao do Pré-escolar

Resumo: Dentro do marco teórico da política de inovação e difusão, este estudo explora os dois preditores interestaduais (difusão) e de adoção intra-estadual de políticas públicas para a universalização do pré-escolar. A metodologia para análise de eventos históricos é aplicada a um conjunto de dados do Censo, el programa NCES Comon Core, O Livro dos Estados, e outras fontes. Preditores significativos da adoção de políticas incluem maior controle democrático do legislativo estadual e a presença prolongada de um programa focalizado de pré-escolar. A proximidade regional não foi um preditor significativo de formulação de políticas. São discutidas implicações para políticas e práticas educativas.
Palavras-chave: pré-escolar universal; primeira infância; análise histórica dos acontecimentos; formulação de políticas; difusão

Introduction

Universal preschool policies lay the groundwork for providing unrestricted access to early childhood education programs without cost to the consumer. Unlike targeted programs such as Head Start, universal preschool programs provide government-funded preschool to all children regardless of economic background, disability status, neighborhood poverty, or other qualifying characteristics. The universal preschool movement has been changing the conversation to one of P-12 rather than K-12 and, in doing so, has presented government entities, chiefly among them states, with the challenge of determining what role they should play in expanding access to public education to an increasingly younger range of children. The impetus for this shift in conversation surrounding the lower bound of public education includes rising costs of childcare, increased maternal labor force participation, rising pressure to generate a workforce capable of taking on the challenges of a changing economy, and issues of equity in education (Marshall & Tucker, 1993; National Center on Education and the Economy, 2006; Zigler, Gilliam, & Barnett, 2011). In addition to these pressures to expand the public education system, there is a growing belief that earlier intervention is key to improving student outcomes. These pressures have resulted in much attention to universal preschool policies, from heavy investments on the part of advocacy groups such as the Pew Charitable Trusts to explicit calls for national expansion from President Obama (Bushouse, 2009; Obama, 2013). To date, however, little empirical work has been done on how such early intervention policies, including those of universal preschool, are being adopted.

Utilizing a theoretical framework of policy diffusion and event history analysis methodology, I attempt to explain the extent to which states' adoptions of universal preschool policies reflect an influence of interstate pressures such as regional neighbor adoption of similar policies as well as intrastate conditions such as political party control or school enrollment. Specific research questions include: 1) Are states that are geographically close to other states with universal preschool policies more likely to adopt universal preschool policies? 2) Are states that pass other early childhood education policies more likely to adopt universal preschool policies? 3) Are states with predominantly Republican legislatures or Republican governors more likely to adopt universal preschool policies? 4) Are states with higher median family income or greater state expenditures on

education more likely to adopt universal preschool policies? 5) Are states with larger school enrollments or larger changes in school enrollment more likely to adopt universal preschool policies?

Universal Preschool

As of 2013, ten states have universal preschool policies as measured by the definition used in this study, namely that at the time of adoption the state intended for the plan to be phased into a universal program. States with universal preschool policies and their adoption years are presented in Table 1.

Table 1
Events Categorized as Universal Preschool Adoption

State	Year	Event
Georgia	1995	Lottery funded preschool begun as a targeted pilot program in 1993 was expanded to universal access in 1995.
New York	1997	Passage of UPK as part of Chapter 436 of the Laws of 1997.
Oklahoma	1998	Passage of a bill eliminating 4's in K and adjusting the school funding formula to include pre-kindergarten. Oklahoma Statute Annotated 18-201.1
Florida	2002	Passage of the Florida Pre-Kindergarten Amendment (Amendment 8) through election ballot approval.
West Virginia	2002	Passage of Senate Bill 247 ("Increasing Salaries for Teachers and Service Personnel") that included universal preschool buried beneath other education legislation.
Vermont	2005	Passage of an amendment to Act 60 that placed preschool into the funding formula.
Illinois	2006	Passage of Preschool for All legislation
Massachusetts	2006	Passage of Universal Pre-Kindergarten (UPK) legislation.
Iowa	2007	Passage of Statewide Voluntary Four-Year-Old Preschool Program (House Bill 877)
Louisiana	2008	Passage of legislation to expand LA4 to a universal program.

Though these ten states have adopted universal preschool policies, not all have fully implemented the program. As of 2012, the percentage of four year olds enrolled in state-provided preschool in these 10 states varied from 14.3% (Massachusetts) to 79.4% (Florida) (Barnett, Carolan, Fitzgerald, & Squires, 2012). While implementation is certainly an important characteristic of a policy, for the purposes of this study attention will be paid to the factors that predict adoption of the policy rather than full implementation.

Theoretical Framework

I utilize the theoretical framework of policy innovation and diffusion theory, which views states as actors that can adopt new policies as a result of both internal stimuli, such as political party control, and external stimuli, such as policy adoption by nearby states (Berry & Berry, 1999). An "innovation" is a policy that is new to a state regardless of how long the policy may have existed in

other states while "diffusion" is the way in which an innovation is transferred through various avenues in society (Berry & Berry, 1999; Walker, 1969). Policy diffusion has been described as "…one government's policy choices being influenced by the choices of other governments" (Shipan & Volden, 2012).

Walker (1969) was one of the first to propose the theory and identified a number of state-level factors that future studies have used to guide their analyses of policy innovation and diffusion. These factors include regional proximity to states with a given policy, measures of political party control, government structure, and other demographic characteristics (Walker, 1969). Though Walker noted both intrastate and interstate factors affecting adoption of policies, he did not provide a method of merging the two categories for analysis.

In the early 1990s, Berry and Berry (1990, 1992) introduced a new method of studying innovation and diffusion theory, namely event history analysis or EHA. Berry and Berry (1990) viewed EHA as a method utilized in other disciplines but under-represented in political science and argued that it represented an improved means of studying policy adoption given that it melds both intrastate and interstate factors. In the interest of including both types of factors in the current study, I will follow Berry and Berry's (1990, 1992) lead by applying event history analysis to the innovation and diffusion of universal preschool policies.

Berry and Berry's (1990) initial analysis generated a surge in the use of event history analysis to examine various policy topics both in and outside of the field of education. Within education, researchers have applied event history analysis to examinations of higher education such as the spread of performance accountability policies and merit based student grant programs (Cohen-Vogel, Ingle, Levine, & Spence, 2008; Doyle, 2006; McLendon, Hearn, & Deaton 2006). At the same time, a parallel use of the method has emerged in the K-12 education literature to study topics such as school choice policy and P-16 councils (Mintrom, 1997; Mokher, 2010; Wong & Shen, 2002).

As the literature on policy diffusion has expanded, a number of studies have explored the mechanisms by which policies diffuse from one polity to another. Karch (2007) identified the following three mechanisms of policy diffusion: learning from earlier adopters, economic competition among proximal entities, and imitation of policies from other actors. Shipan and Volden (2008) added a fourth, namely coercion by higher levels of government. Shipan and Volden (2008) explored and found evidence for these four mechanisms empirically on city adoptions of anti-smoking policies. While the mechanisms of state policy adoption may differ slightly from those of city adoption, the work by Karch (2007) and Shipan and Volden (2008) provides a framework for understanding the multiple mechanisms by which universal preschool policies may diffuse from one state to another. Particularly, states may observe the outcomes of universal preschool in other states and learn from other states' policy experiments. Similarly, states neighboring a state with universal preschool may face economic pressures to compete for residents and new employers by offering an equally attractive early childhood education system. Alternatively, states could be less influenced by outcomes or economic arguments and may simply emulate policies of nearby states for expediency. Such a scenario could be particularly relevant in the case of states that act as regional leaders whom nearby states look to for policy innovations. Finally, states could be influenced by federal policies, though such policies would be less likely to vary by state and therefore are more difficult to test in the context of this study. While I do not attempt to discern the relative contribution of these various diffusion mechanisms, the policy diffusion framework does provide a motivation from which to explore the spread of universal preschool policies. In the next section, I provide an overview of the research on the policy of interest, universal preschool.

Extant Literature

Effects of Targeted and Universal Preschool Programs

The majority of research on preschool to this point has been aimed at assessing outcomes of targeted rather than universal programs. Evidence shows that these programs, such as the HighScope Perry Preschool Project, Head Start, and the Abecedarian Project, generally produce immediate academic gains for students (Abbott-Shim, Lambert, & McCarty, 2009; Casto & Mastropieri, 1986; McKey et al., 1985; Puma, Bell, & Cook, 2005). Despite worries that these academic effects fade out through the early elementary years, research has demonstrated longer term impacts in the form of reduced crime, increased education, and better wages (Barnett, 1992; Belfield et al., 2006; Casto & Mastropieri, 1986; Currie & Thomas, 1995; Ludwig & Miller, 2007; McKey et al., 1985; Milagros, Belfied, Barnett, & Schweinhart, 2005; Puma et al., 2010; Reynolds, 2011). Estimates from the most rigorously studied and most intensive of these targeted preschool programs suggest rates of return on investment of at least seven percent (Heckman, Moon, Pinto, Savelyev, & Yavitz, 2010).

A small body of research on the effects of state run universal preschool programs is emerging and indicates generally positive results. Henry, Gordon, and Rickman (2006) compared Georgia's state run universal program to the federally funded Head Start program. Utilizing propensity score matching, the results suggested that participants in the state preschool program had achievement outcomes that were no worse and, in some cases, better than participants in Head Start (Henry et al., 2006). Utilizing a difference-in-differences approach and NAEP data, Fitzpatrick (2008) assessed the impact of the policy on fourth grade outcomes of academic achievement and grade retention. Unlike Henry et al. (2006), Fitzpatrick explored the impact of participating in preschool for groups other than disadvantaged students. The study identified overall positive effects of universal preschool on fourth grade academic achievement and being on grade level; however, these results did not consistently hold for more advantaged groups of students (Fitzpatrick, 2008).

Expanding beyond Georgia, two studies have utilized regression discontinuity designs to examine universal preschool in other states. Gormley and colleagues (2005; 2008) examined the Oklahoma universal preschool program as implemented in Tulsa and found positive effects of attendance in the state-run preschool program compared to non-attendance and Head Start attendance (Gormley & Phillips, 2005; Gormley, Phillips, & Gayer, 2008). Examining the Massachusetts preschool program as implemented in Boston, researchers found a positive impact of participation on children's mathematics, numeracy, language, and literacy skills (Weiland & Yoshikawa, 2013).

Studies have also explored the impacts of universal preschool on non-academic outcomes though the results remain mixed. Gormley and Phillips (2005) have found universal preschool to have positive effects on participants' motor skills but no impact on socio-emotional outcomes. In contrast, Weiland and Yoshikawa (2013) reported small effects on children's emotional recognition and executive functioning. In another study, Fitzpatrick (2010) found little relation between universal preschool and maternal labor force participation. The positive results found in the early studies and the increased enthusiasm for the policy among policymakers provide an impetus for understanding how and why this policy has been adopted.

Emergence and Expansion of Universal Preschool

The literature currently views the universal preschool movement as a coming together of the public education system and early childhood programs. McCabe and Sipple (2011) describe this movement as an unprecedented "two worlds colliding" to emphasize the contrasting natures of

kindergarten and early childhood education. While kindergarten has been characterized by public control, relatively uniform funding, and a focus on academics, early childhood education has been characterized by a mix of public and private control, varying funding strategies, and more of a focus on care rather than academics (McCabe & Sipple, 2011).

Though these generalizations about the two sectors are fairly accurate, the authors fail to recognize that this "collision" is not unprecedented. Over the last century, the worlds of public education and early childhood education collided over the inclusion of kindergarten itself as a part of the publicly funded education system during the movement for universal kindergarten (Brewer, Gasko, & Miller, 2011). Examining Austin, Texas as a case example, Brewer and colleagues (2011) argued that contextual factors such as a changing economy and shifting demographic environment contributed to the inclusion of kindergarten in the public system and that similar shifts may be contributing to the current universal preschool movement.

Brown and Wright attempted to identify the factors at play in the current policy movement of universal preschool (Brown & Wright, 2011). Framing their analysis in Edelman's theory of political spectacle, they studied the media's framing of universal preschool policies. Notable findings included the use of elements of political spectacle by more liberal leaning policy figures than conservative figures in supporting the policy (Brown & Wright, 2011). Additionally, Brown and Wright (2011) reported that the policy debate predominantly appears on the state and local level. While the methodology utilized by Brown and Wright differs significantly from that proposed in this study, their findings do lend credence to the hypothesis that liberal policymakers and states are more likely to support universal preschool.

At least two studies have used event history analysis to examine early childhood education policy adoption. Mokher (2010) utilized EHA to explore the creation of P-16 councils by states. Specifically, she sought to understand the role that "education governors" play in bringing states to adopt both formal and informal P-16 councils or cross-organization groups that promote cooperation between the traditionally divided levels of the education system. Utilizing data drawn from several sources, Mokher concluded that the presence of an education governor increased the chance for adoption of formal P-16 councils while high total populations and high employment rates increased the chance for adoption of informal P-16 councils (2010). To the extent that a P-16 council may serve as a mechanism for bringing about a policy of universal preschool, Mokher's (2010) work provides grounding for understanding the universal preschool movement.

Dawson (2008) examined the adoption of state preschool policies. Dawson addressed both internal and external factors, specifically looking at measures of regional proximity (diffusion), political makeup, socioeconomic makeup of the state, and education expenditures. Her data followed states from 1978 to 2000 (Dawson, 2008). Dawson found no significant evidence of policy diffusion but did find that political and socioeconomic factors within the state were associated with the adoption of state preschool policies. Specifically, states with more liberal government ideologies were 3.7% more likely to adopt state preschool policies. States with higher levels of poverty and lower levels of females in the workforce were also more likely to adopt the policy.

Dawson's study provides evidence of important variables that may affect the adoption of preschool policies; however, limitations in the data and analysis limit any conclusions that can be drawn regarding policies for universal programs. Specifically, given that her data only included states through the year 2000, only three policy adoptions of universal programs were included in her analysis. The remaining seven adoptions of universal preschool policies took place after the year 2000. In addition, the study did not explicitly consider the type of preschool policy adopted. As a result, any heterogeneity between the adoption of universal and non-universal policies cannot be isolated from the study.

In another study, Karch (2010) explored the allocation of resources to preschool and the formation of freestanding state preschool programs with a particular focus on the impact of existing Head Start programs. Karch found that a greater Head Start presence within a state predicted a lower probability of allocating funds to or forming a freestanding state preschool program. Additional findings included a positive relationship between liberal citizen ideology and the decision to fund preschool as well as a negative relationship between citizen education levels and investments in preschool programs. The negative relationship between Head Start and allocations to state preschool was explained by a policy feedback mechanism in which the existing policy of Head Start prompted supporters to oppose potentially conflicting policies (Karch, 2010).

Outside of this limited body of literature, universal preschool policies have been the subject of little rigorous research. As the debate surrounding universal preschool moves forward, remedying this gap in the literature will be ever more necessary. This study attempts to build on the work of Dawson (2008) and others by using an expanded dataset and specifically focusing on universal preschool policies. Overall, my analyses advance our understanding of the factors that predict states' adoption of universal preschool policies.

Study Hypotheses

I propose the following five hypotheses that assess the relative importance of interstate and intrastate factors on the adoption of universal preschool policies:

> *Hypothesis 1: As more nearby states adopt universal preschool policies, states within that region will become more likely to enact a universal preschool policy.*

Drawing from the literature on policy diffusion (Berry & Berry, 1990; 1992; Shipan & Volden, 2008), Hypothesis 1 suggests that states that are physically closer to other adopters of universal preschool will be more likely to adopt such a policy. Theoretically, multiple mechanisms could drive the adoption of policies by regional neighbors. For instance, regionally proximal states may view each other as economic competitors and see universal preschool as a mechanism for providing higher human capital to their future workforce while also attracting businesses to relocate to the state in order to take advantage of free preschool. Alternatively, state policymakers may be more aware of policies of neighboring states due to overlapping media markets or professional connections and may use this familiarity to borrow policies that they perceive to be working in the nearby state.

> *Hypothesis 2: States that more recently adopted policies related to early childhood education, such as policies of universal kindergarten, compulsory kindergarten, or targeted preschool, will be more likely to enact a universal preschool policy.*

Hypothesis 2 suggests that temporally proximate debates and passage of similar early childhood education policies may serve to soften the policy environment and open policy makers to expanding policies in this sector. For instance, Zell Miller, the governor of Georgia who ushered in universal preschool in that state, served in the legislature during the passage of earlier policies regarding kindergarten. Being exposed to the arguments and political considerations for investment in kindergarten may have prompted his efforts to make similar investments in preschool.

> *Hypothesis 3: States with higher levels of Republican control, as a percentage of the legislature or in the role of governor, will be less likely to enact a universal preschool policy.*

The third hypothesis is consistent with previous literature which suggests that Republican control of government is related to a decreased likelihood of adopting early childhood education policies (Brown & Wright, 2011; Dawson, 2008; Karch, 2010). This hypothesis aligns with the notion that Republican policymakers tend to be less supportive of large government services than their Democratic counterparts.

> *Hypothesis 4: States with a smaller number and rate of growth of preschool-age children will be more likely to enact a universal preschool policy.*

A decreasing presence of elementary age children can result in underutilized education facilities. Combined with pressure to avoid teacher layoffs, such a shift in demographics could potentially open the door for transitioning these resources to serve a younger population of students. For instance, the state of West Virginia had experienced such declining school enrollment prior to its adoption of universal preschool. Bushouse (2009) notes that the financial burdens of adopting universal preschool in this state were significantly decreased due to the existing capacity and the efforts to serve four year olds that were already underway.

> *Hypothesis 5: States with larger and faster growing expenditures on education will be more likely to enact a policy of universal preschool.*

Holding constant the number of students served, a state that has focused policy efforts on education through increasing expenditures may be expected to look for new programs or services, such as universal preschool. Rose (2010) provides the example of New York as a state that initiated state universal preschool during a time of economic upswing only to have its implementation slowed by fiscal downturns. Consistent with this example, Hypothesis 5 suggests that higher expenditures and increases in education expenditures will be related to a greater likelihood that a state adopts a universal preschool policy.

Research Design

Data

The nature of the study required a dataset containing information on a variety of state level and interstate level factors and, consequently, required the merging of several data sources to operationalize the independent and dependent variables of interest. See Appendix for a list of data sources. The final dataset consisted of complete data for forty-six states from the years 1994 through 2009. As in previous event history analysis work on diffusion, Alaska and Hawaii were omitted from the dataset given that their unique regional positions complicate the testing of Hypothesis 1. Nebraska was omitted due to its lack of partisan elections and the presence of a unicameral legislature and the ensuing conflict with testing Hypothesis 3. Finally, Wisconsin was dropped from the dataset due to the long-term presence of universal preschool as a provision of the state's constitution. Given this constitutional provision, Wisconsin may not be viewed as being at risk of adopting the policy; however, because it has not implemented the policy, it also seemed inappropriate to include Wisconsin as having the policy.

The base dataset contained state specific data drawn from the Census (Current Population Survey) and the *Book of the States* including: aspects of states' political climates such as the percentage of Republican legislators, the political part of the governor, the conservatism of the citizens, and so

forth. To this dataset, variables more directly pertaining to K-12 education were added from a number of sources. From the NCES' Common Core of Data (U. S. Department of Education, 2012), I added the number of kindergarten students in the state and state expenditures on P-12 schooling. Finally, I created variables indicating the adoption of policies of universal kindergarten, an explanatory variable of interest, from work by Cascio (2010). Information on adoption of universal preschool policies was drawn from the PreK Now initiative sponsored by the Pew Center on the States as well as the 2011 NIEER State of Preschool publication (NIEER, 2011; PreK-Now, 2014).

Methodology

In identifying states with universal preschool policies, several ambiguities arose. First, some states passed preschool legislation with the intent of expansion to universal status but phased universal status in over a period of time. Others passed legislation that they called universal but that came with income stipulations or limitations that they did not intend to lift in the foreseeable future. This study sought to identify states that had adopted a policy of providing free preschool to all students in the state regardless of income level or other eligibility criteria; however, it was not a requirement that such a policy was immediately implemented given that such immediate large-scale implementation might be both fiscally and logistically infeasible. The identifying element I chose for this study was that at the time of adoption the state intended for the plan to be phased into a universal program.

To identify such states, the 2011 NIEER yearbook and Pre-K Now state profiles were read and the states that passed legislation for a policy of universal preschool were identified. Examining state profiles further, I removed states if the policy passed had limitations on participation by income or other student characteristics (making the program not open to all students). For instance, Missouri, which implemented a sliding scale to charge students, was excluded. I also removed states if the policy as passed did not indicate a goal of expansion to all students. For instance, Pennsylvania and Maine offer programs for four year olds, but their policies did not indicate a goal of expansion to universal access when passed. Alabama, which has an active preschool program and a Governor that has advocated to make the program universal, was excluded because universal expansion was not part of the legislation as originally passed. This process resulted in the identification of the ten states presented in Figure 1. However, the identification of some states may be imperfect due to ambiguities in goals as set out by legislation. Finally, the definition of "universal" may be different in different contexts. For instance, some policymakers, including President Barack Obama in his 2013 State of the Union address, may include policies that charge fees for wealthier families in the definition of universal. Table 1 displays adoption years and the corresponding event counted as adoption of universal preschool.

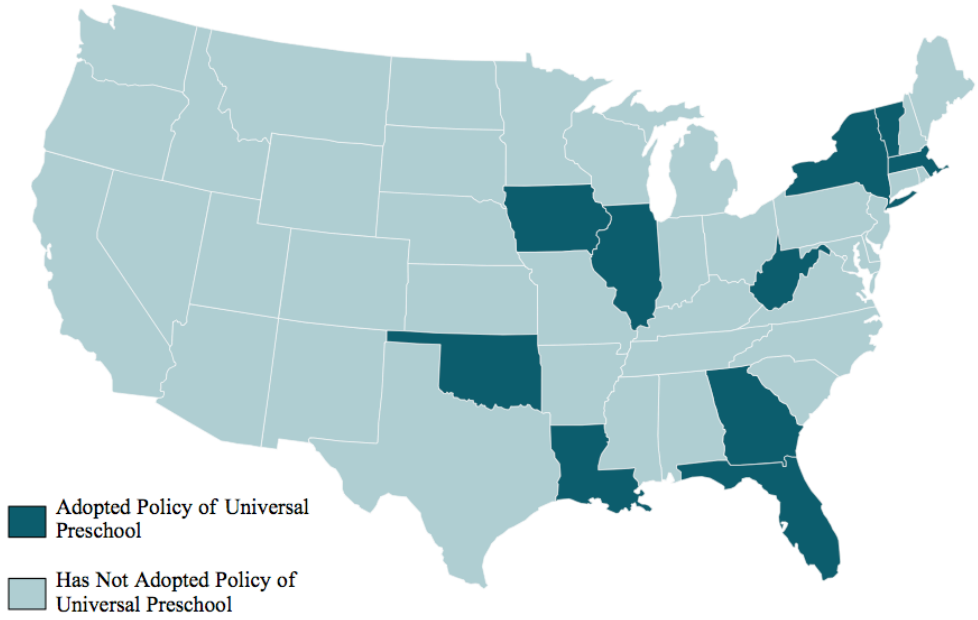

Figure 1. Universal preschool adoption map

Given the time and year structure of the dataset, namely a series of events taking place over time, event history analysis provides a convenient method of examining the relationship between time-varying independent variables and adoption of a policy. Event history analysis, also known as survival analysis, originated as a tool in industry and the biological sciences and has only begun to be applied to the social sciences over the last several decades (Allison, 1984; Lawless, 1982). Event history analysis models provide coefficients that can be used to calculate the probability of an event taking place, in this case the adoption of universal preschool, within a given time frame, in this case a year.

In the event history analysis methodology, the dataset consists of observations for each state at each year until the point that the state experiences the event, namely adoption of a policy of universal preschool. The dataset utilized in this study was restricted to 46 states due to the omission of Wisconsin, Alaska, Hawaii, and Nebraska for reasons previously mentioned. The observations in the dataset began with the year 1994, one year prior to the first state adoption of a universal preschool policy. States were maintained in the dataset until the year they adopted the policy, after which observations for such states were removed from the dataset. For each year, the states that remain in the dataset and have not adopted the policy make up what is known in EHA as the "risk set" (Blossfeld & Rohwer, 2002). These are the states that can be thought to be at risk of experiencing the event of interest. Once a state has adopted the policy, the state was no longer at risk of experiencing an adoption of the policy. The risk set, consequently, began with 46 states and was reduced over time as states adopted universal preschool policies.

Event history analysis involves the modeling of a hazard rate, or the instantaneous probability that a unit, in this case a state, experiences an event, in this case adoption of a universal preschool policy, given that the state has not adopted such a policy up until the given point or year (Allison, 1984; Blossfeld & Rohwer, 2002; Lawless, 1982). In modeling the hazard rate, researchers must choose between several available models. For the purposes of this paper, a Cox proportional hazards model was estimated. A Cox model is a semi-parametric model which means that it does not

define the baseline or underlying hazard rate curve but rather models how the independent variables shift the hazard rate curve up or down, thereby increasing or decreasing the hazard rate (Allison, 1984). The general form of a Cox proportional hazards model is as shown in Equation 1.

$$1)\ h(t \mid x_j) = h_0(t)\exp(B_x x_j)$$

In this model, $h(t \mid x_j)$ represents the dependent variable of interest, namely the hazard rate at a given time of the event taking place. The term $h_0(t)$ represents the underlying or baseline hazard rate. The term x_j represents a series of independent variables that can shift the baseline hazard rate either up or down. In interpreting the coefficients on the independent variables, namely the β_x terms, the event history analysis methodology varies from traditional regression techniques insofar as the statistical significance of coefficients must be compared to a value of one rather than a value of zero. This is because a value of one represents the value at which the baseline hazard rate is not increased or decreased.

Model

The model analyzed for the given study took on the form shown in Equation 2 below.

2) Universal Preschool Adoption = $h_0(t)\exp(\beta_1$(Regional Proximity) + β_2(Univ K Adoption Decade) + β_3(Compulsory Kindergarten) + β_4(Years of Targeted Preschool) + β_5(% Republican Legislature) + β_6(Republican Governor) + β_7(Median Family Income) + β_8(Total Ed Expenditures Lagged) + β_9(% Change in Ed Expenditures Lagged) + β_{10}(# of K Students Lagged) + β_{11}(% Change in # of K Students Lagged))

In Equation 2, the left hand or dependent variable of universal preschool adoption represents the hazard rate of adopting a policy of universal preschool at a given year. The eleven right hand side or independent variables represent variables of interest for the proposed research questions as well as covariates that were controlled for in the model.

Regional proximity was represented by one of three different variables for regional proximity, represented by models 1-3 in the findings. The three operationalizations of regional proximity included the number of states within a Census region that had adopted a policy of universal preschool, the inverse of the shortest distance to a capital of a state that had adopted a policy of universal preschool, and whether a contiguous state had adopted a policy of universal preschool. The second of these differs from the other two in that it takes into account the distance between what might be thought of as the decision making locations, namely the capitals, of the states rather than the proximity of the states themselves. The variables for universal kindergarten adoption decade, compulsory kindergarten, and targeted preschool provided measures of the degree to which previous policies regarding early childhood education have potentially "softened up" the policy environment and thereby predict similar future legislation. The variables for the Republican percentage of the legislature and Republican governor were included to assess the predictive power of the political climate on adoptions of universal preschool policies. Median family income represented the median income for a family of four in the state while the subsequent two variables, total education expenditures and the percent change in total education expenditures from the prior year, represented the financial allocations of the state towards education. Both total education expenditures and the percent change in total education expenditures were lagged by one year to reflect the fact that legislators and other policymakers would not have had the current year's data

available while making policy decisions during that year. All income and expenditure measures were converted to 2009 dollars prior to analysis. The final two variables, number of kindergarten students and the percent change in number of kindergarten students, were lagged for similar reasons. These two variables were included as proxy measures of the number of children that would be eligible for preschool services and the change in this number respectively.

Results

Descriptive Statistics

Table 2 provides a tabular view of the adoption timeline of universal preschool policies. Specifically, the second column delineates the states that have adopted the policy. The distribution of adoptions is fairly evenly spread over the fifteen-year time frame of this study. The final column of Table 3 provides the hazard rate at each year. The hazard rate increases as time progresses representing the increased likelihood that a state remaining in the risk set will adopt the policy.

Table 2
Risk Sets, Hazard Rates, and States Adopting Universal Preschool

Year	States Adopting	Number of Adoptions	Cumulative Adoptions	Risk Set	Hazard Rate
1994		0	0	46	.
1995	GA	1	1	46	0.02
1996		0	1	45	0.02
1997	NY	1	2	45	0.04
1998	OK	1	3	44	0.07
1999		0	3	43	0.07
2000		0	3	42	0.07
2001		0	3	41	0.07
2002	FL, WV	2	5	43	0.11
2003		0	5	42	0.11
2004		0	5	41	0.11
2005	VT	1	6	41	0.14
2006	IL, MA	2	8	40	0.19
2007	IA	1	9	38	0.21
2008	LA	1	10	37	0.24
2009		0	10	36	0.24

Descriptive statistics for the covariates included in the model are shown in Table 3. Descriptive statistics are presented at five-year intervals starting from one year before the first adoption of a policy of universal preschool. The descriptive statistics reported are for those states that remain in the risk set, namely those states that have not adopted a policy of universal preschool. Consequently, the first column, for 1994, represents the original risk set of 46 states while the fourth column for 2009 provides descriptive statistics for the 36 states that remained in the risk set at that year. The variables for regional proximity to a state with a policy of universal preschool increased across the 20-year span as more states adopted the policy.

Table 3
Descriptive Statistics at Five Year Intervals

		1994	1999	2004	2009
Regional Proximity	Census region states with policy (#)	0.00	0.89	1.59	2.76
		(0.00)	(0.90)	(1.82)	(1.95)
	Neighboring state has policy (1 = yes, 0 = no)	0.00	0.35	0.46	0.65
		(0.00)	(0.48)	(0.50)	(0.48)
	Inverse of shortest distance to capital of state with policy (100's of km)	0.00	0.20	0.22	0.30
		(0.00)	(0.15)	(0.15)	(0.28)
Previous Policies	Universal K adoption decade (1 = <1960, 2 = 60's, 3 = 70's, 4 = 80's)	1.89	1.89	1.89	1.89
		(0.99)	(0.99)	(0.99)	(0.99)
	Policy of compulsory kindergarten (1 = yes, 0 = no)	0.28	0.30	0.30	0.30
		(0.46)	(0.47)	(0.47)	(0.47)
	Years since adoption of targeted state preschool	4.52	7.24	10.76	14.67
		(6.78)	(8.54)	(9.98)	(11.30)
Political Climate	Republicans in legislature (%)	41.79	47.96	50.50	47.10
		(14.85)	(14.78)	(14.61)	(14.51)
	Republican governor (1 = yes, 0 = no)	0.39	0.63	0.54	0.43
		(0.49)	(0.49)	(0.50)	(0.50)
Students	# of K students in state for previous year (1000s)	70.91	72.41	73.79	76.66
		(79.01)	(82.01)	(83.69)	(86.59)
	% change in kindergarten population for previous year	1.61	-2.44	2.01	1.33
		(3.07)	(3.18)	(3.86)	(2.23)
Finances	Median household income for 4-person family (1000 $) (2009 dollars)	63.27	71.51	72.03	74.74
		(8.97)	(9.93)	(12.14)	(12.05)
	Total state expenditures for P-12 for previous year (100 millions) (2009 dollars)	71.47	83.64	98.92	108.84
		(79.37)	(92.89)	(114.63)	(123.93)
	% change in education expenditures for previous year (2009 dollars)	1.43	4.52	2.54	0.19
		(2.18)	(1.67)	(2.17)	(2.87)

Note: Means and standard deviations reported.

Cox Regressions

Cox regressions, shown in Table 4, were performed for three different models, each with a different operationalization of regional proximity.

Table 4
Hazard Ratios From Cox Regression Models Predicting Universal Preschool Policy Adoption

	Model 1	Model 2	Model 3
Census region states with policy (#)	1.23		
	(0.44)		
Inverse of shortest distance to capital of state with policy (100's of km)		1.08	
		(2.31)	
Neighboring state has policy (1 = yes, 0 = no)			2.10
			(1.94)
Universal K adoption decade (1 = <1960, 2 = 60's, 3 = 70's, 4 = 80's)	0.48	0.52	0.45
	(0.27)	(0.28)	(0.27)
Policy of compulsory kindergarten (1 = yes, 0 = no)	0.22	0.24	0.27
	(0.24)	(0.28)	(0.30)
Years since adoption of targeted state preschool	1.11^{+}	1.11^{+}	1.12*
	(0.06)	(0.06)	(0.06)
Republicans in legislature (%)	0.93*	0.93*	0.93*
	(0.03)	(0.03)	(0.03)
Republican governor (1 = yes, 0 = no)	1.72	1.76	1.45
	(1.40)	(1.43)	(1.20)
# of K students in state for previous year (1000s)	0.99	0.99	0.99
	(0.02)	(0.02)	(0.02)
% change in kindergarten population for previous year	1.20	1.19	1.18
	(0.14)	(0.14)	(0.14)
Median household income for 4-person family (1000 $) (2009 dollars)	0.92	0.92	0.91
	(0.05)	(0.05)	(0.05)
Total state expenditures for P-12 for previous year (100 millions) (2009 dollars)	1.00	1.00	1.01
	(0.02)	(0.02)	(0.02)
% change in education expenditures for previous year (2009 dollars)	0.89	0.9	0.88
	(0.14)	(0.14)	(0.14)
AIC	77.87	78.2	77.56
BIC	126.70	127.03	126.39
N	626	626	626
# of Events	10	10	10

Note: $^{+}$ shows $p<0.10$, * shows $p<0.05$, ** shows $p<0.01$; Hazard ratios and standard errors reported.

This was done to prevent collinearity between the regional proximity variables. The remainder of the variables were consistent across models. Table 4 displays results of the three Cox regressions. Exponentiated coefficients (predicted hazard ratios) are reported along with their

standard errors. As mentioned previously, the statistical significance of the coefficients is relative to a value of one rather than a value of zero as in a traditional ordinary least squares regression.

Results for the diffusion hypothesis. The first hypothesis suggested that as more nearby states adopted universal preschool policies, states within that region would become more likely to enact a policy of universal preschool. I tested this hypothesis using three different measures of regional proximity. As shown in Table 4, none of the three variables for regional proximity were statistically different than one, indicating that regional proximity does not have significant predictive power for the adoption of universal preschool policies.

Results for policy softening hypothesis. The second hypothesis suggested that states that more recently adopted policies related to early childhood education, such as policies of universal kindergarten, compulsory kindergarten or targeted preschool, would be more likely to enact a policy of universal preschool. The variable for years since adoption of a targeted preschool program is statistically significant at the traditional 0.05 alpha level in the last model, that using a neighboring state as a measure of regional proximity, and marginally significant ($p<0.10$) in the first two models. The coefficient of more than one ($\beta = 1.12$) on years since adoption of a targeted preschool program can be interpreted as meaning that states that adopted targeted programs earlier have an increased hazard ratio of adopting a policy of universal preschool; however, this interpretation must be made cautiously given its lack of traditional statistical significance in two of the models. The other indicators for recent early childhood policy adoptions, namely that for universal kindergarten policy adoption decade or the presence of compulsory kindergarten, were insignificant in all models.

Results for political hypothesis. The third hypothesis stated that states with higher levels of Republican control, as a percentage of the legislature or in the role of governor, would be less likely to enact a policy of universal preschool. The percentage of Republicans in the legislature was statistically significant across models ($\beta = 0.93$, $p < 0.05$). This suggests that, within this model, a higher percentage of Republican legislators predicts a lower hazard ratio of adopting universal preschool or conversely that a higher percentage of Democratic legislators predicts a higher hazard ratio of adopting universal preschool. In contrast, the presence of a Republican governor was not a statistically significant predictor of adoption.

Results for preschool population hypothesis. The fourth hypothesis stated that states with a smaller number and rate of growth of preschool-age children would be more likely to enact a policy of universal preschool. I found no significant relationship between the number of kindergarten students or the rate of change of kindergarten students, both proxies for the size of the preschool population, on adoption of universal preschool policies.

Results for expenditures hypothesis. The fifth hypothesis stated that states with larger and faster growing expenditures on education would be more likely to enact a policy of universal preschool. I find no relationship between state expenditures on education, the change in state expenditures, or median family income on policy adoption.

Sensitivity Analyses

As a means of checking for the robustness of the results to various specifications of the model and methods of analysis, a series of sensitivity checks were conducted on the primary analysis. In order to ensure that the statistically significant findings from the Cox regressions were not specific to a unique combination of covariates, a series of Cox regressions were run in which each of the variables (with the exception of the proximity measures) were taken out of the three models. This method created ten sets of Cox regression runs for each of the three models. The coefficients for years since adoption of targeted preschool remained statistically significant in seven out of the

nine sets (one set omitted for the set in which the variable for universal kindergarten adoption decade was the omitted variable). The coefficients for percentage of the legislature that is Republican remained statistically significant in six out of nine sets. These results provided confidence that the statistically significant findings were not unique to the specific set of covariates chosen for the model.

A second sensitivity analysis was conducted by altering the methodology utilized to answer the research questions. Rather than utilizing a Cox proportional hazards model, logistic regressions were run for each of the three model specifications. The results from the logistic regressions (not shown) largely confirm the results of the Cox proportional hazard models. The percentage of Republicans in the state legislature remained a statistically significant predictor of universal preschool policy adoption in all three model specifications. The coefficients for years since adoption of a state targeted preschool program are in the same direction as those found in the Cox regressions but became statistically significant at the traditional ($p<0.05$) level in all model specifications. The lack of traditional significance in some of the Cox regressions may be attributable in part to large standard errors resulting from the low number of adopters of the policy.

In a third sensitivity analysis, I explored the robustness of the results to the inclusion of the state of Florida. Unlike other adopters of universal preschool, the state of Florida acquired the policy through a voter referendum rather than through legislative action. Consequently, the inclusion of Florida may be deemed inappropriate for testing particular hypotheses such as those pertaining to political party control. Cox proportional hazard models (not shown) run without Florida produced results that align with those including Florida. Specifically, statistically significant ($p<0.05$) coefficients for both Republican control of the legislature and years since adoption of a targeted preschool policy were found even with the exclusion of Florida. Consequently, the results are robust to the exclusion of Florida.

Discussion

The Cox regression results presented suggest relationships between several of the included covariates and the outcome of interest, namely the hazard ratio of adopting a policy of universal preschool. It is important to note that the relationships elucidated by this study should not be construed to be causal in nature. Given the limited number of independent variables included in the model, the possibility of omitted variable bias precludes any statement of causation.

Regarding the proposed hypothesis of the diffusion effect of regional proximity to other states with the policy, the model demonstrated no relationship between regional proximity and the hazard ratio of adopting the policy. This lack of relationship was consistent across all three measures of regional proximity and the various sensitivity analyses. While Figure 1 does show some pairs of neighboring states that have adopted the policy, only 40% of adopting states had a neighboring state with the policy at the time of adoption. Additionally, adopting states are geographically dispersed across the South, Northeast, and into the Midwest rather than being confined to a specific region of the country. Given these results, there does not appear to be evidence of regional diffusion of universal preschool policies at this time. This finding is consistent with a recent meta-analysis that finds a lack of consistent regional diffusion effects in state policy adoption (Mooney, 2001).

Despite this finding, the results do suggest relationships that could be explored further. Specifically, the results suggest that states that adopted policies of targeted preschool earlier are more likely to adopt a policy of universal preschool. This result contrasts with the proposed hypothesis that later adoption of policies related to early childhood education would serve to soften up the policy environment and increase the likelihood of future policies such as those for universal

preschool. It seems, rather, that states that were early actors in adopting such policies are also predicted to be earlier adopters of universal preschool policies. It may be that the long-term presence of a similar policy (targeted preschool) softens the policy environment more than recent legislative and public debate on the merits of early childhood education. This result contrasts with findings by Karch (2010) that long standing preschool policies, particularly Head Start, may predict a lower probability of state investments in preschool. In contrast, this finding suggests that the presence of a more established state preschool program predicts a higher probability of expanding to universal preschool.

This contrasting finding could be operating through several different mechanisms. It is possible that in states with a long running targeted program, Head Start has learned to coexist with the state-run program and therefore does not perceive state provided preschool as a threat to their market share. Given that many of the states with universal preschool integrate existing Head Start programs as a service provider, states with long running targeted programs may have already worked out mechanisms for co-existence with Head Start thereby making expansion of the state program less intimidating.

As was expected, there was a relationship between the political makeup of the state legislatures and the hazard ratio of adopting a policy of universal preschool. Specifically, states with higher percentages of Democrats were more likely to adopt the policy. This is consistent with the idea that Democrats are more likely to champion expanded government programs than Republicans and consistent with findings in the literature (Brown & Wright, 2011; Dawson, 2008; Karch, 2010).

Given the lack of significance on the variable for percentage change in kindergarten population, there seems to be no relationship between changes in the size of the preschool-aged population and the hazard ratio of adopting a policy of universal preschool. This contrasted with the hypothesis that states experiencing a decline in preschool aged children would be more likely to adopt the policy. Finally, no relationship between family or state economic indicators and universal preschool adoption was found. This contrasted with literature that suggested more economically impoverished states would be more likely to adopt the policy (Dawson, 2008).

These results have implications for policymakers and those engaged in the debate surrounding universal preschool. Advocates of universal preschool policies could utilize these results to identify states that are more susceptible to adoption of the policy. Specifically, states that have had a long history of targeted preschool and currently have a large proportion of the state legislature controlled by Democrats would be a promising state in which to focus resources to push for universal preschool.

Conclusions

The results presented in this paper provide groundwork for understanding the relationships between states' characteristics and their likelihood of adopting a policy of universal preschool. While evidence of policy diffusion was not present, several non-causal relationships between intrastate factors and policy adoption were elucidated. Specifically, the percentage of Republicans in the state legislature was a significant negative predictor of the adoption of universal preschool. Additionally, the years since adoption of a targeted preschool program was a significant positive predictor of policy adoption, thereby providing suggestive evidence for a softening of the policy environment through sustained presence of similar programs as being predictive of adoption of universal preschool.

The work presented is limited by a lack of widespread adoption of the policy. With only ten state adoptions of the policy, the study was limited in the number of covariates that could be

included in the model. These limitations may have contributed to the loss of statistically significant findings for the Republican legislature covariate in the one of the logistic regression sensitivity analysis models. While a limiting factor, the application of the methodology of event history analysis to policies with small numbers of adoptions is consistent with its use in the literature and does not take away substantially from its appropriateness (Doyle, 2006).

The questions raised and methods utilized within this study should be reapplied to the study of adoption of universal preschool policies once more states have adopted the policy. Additionally, opportunities exist for exploring other contributors to universal preschool policy adoption through the use of qualitative methodologies and mixed-methods approaches. Finally, the use of the event history analysis methodology to study more established policies of early childhood education such as universal kindergarten and compulsory kindergarten would be worthwhile as they might yield insights into expectations for adoption of future early childhood policies.

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Appendix

Table A1
Variables Utilized in Analysis and Data Sources

Variable Name	Data Source
Census region states with policy (#)	Listing of census regions (U.S. Census Bureau, 2011)
Inverse of shortest distance to capital of state with policy (100's of km)	Latitude and longitude of state capital (U.S. States, 2011).
Neighboring state has policy (1 = yes, 0 = no)	Listing of neighboring states (Frakt, 2011).
Universal K adoption decade (1 = <1960, 2 = 60's, 3 = 70's, 4 = 80's)	(Cascio, 2010)
Policy of compulsory kindergarten (1 = yes, 0 = no)	(Education Commission of the States, 2011; NCES, 2011)
Years since adoption of targeted state preschool	(NIEER, 2011)
Republicans in legislature (%)	(Council of State Governments, 2000; 2010; U.S. Bureau of the Census, 2010)
Republican governor (1 = yes, 0 = no)	(Council of State Governments, 2000; 2010; U.S. Bureau of the Census, 2010)
Median household income for 4-person family (1000 $) (2009 dollars)	(U.S. Bureau of the Census, 2010)
Total state expenditures for P-12 for previous year (100 millions) (2009 dollars)	(U.S. Department of Education, 2012)
% change in education expenditures for previous year (2009 dollars)	(U.S. Department of Education, 2012)
# of K students in state for previous year (1000s)	(U.S. Department of Education, 2012)
% change in kindergarten population for previous year	(U.S. Department of Education, 2012)

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