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State Regulation of Assisted Reproductive Technology

Jonathan J. Morgan

A thesis submitted to the faculty of
Brigham Young University
in partial fulfillment of the requirements for the degree of

Masters of Sociology

Marie Cornwall, Chair
John P. Hoffmann
Lance D. Erickson

Department of Sociology
Brigham Young University

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ABSTRACT

State Regulation of Assisted Reproductive Technology

Jonathan J. Morgan

Department of Sociology

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State regulation of assisted reproductive technology (ART) has been occurring since the inception of earlier technological advances such as artificial insemination to aid human reproduction. I provide a brief overview of the current regulation of ART in the U.S. and the literature on state regulation. Unlike previous studies of ART regulation which use content analysis or case studies of individual state laws I estimate ART regulation for the entire U.S. by using a series of random effects logistic regression models for the time period 1995-2006. To my knowledge this is the first quantitative analysis of ART regulation. I test the hypothesis that the demand for ART is an important predictor of ART legislation in the U.S. Other hypotheses derived from the ART literature were also tested in the analysis. Results indicate that demand for ART is the most influential factor in predicting ART legislation from 1995-2006. Additionally, educational attainment of a state's population and the percentage of married couple households with children in each state may have a direct effect on the demand for ART and an indirect effect on ART regulation.

Keywords: assisted reproductive technology, ART, reproduction, state regulation, legislation

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Introduction

Scientific discovery along with technological innovation now allows parents to choose the sex of their child, helps infertile couples conceive, allows individuals to donate gametes, and provides new strategies for manipulating the way human life is created and how children are introduced into families (Henig 2004; Markens 2007; Mundy 2007; Shanley 2001; Spar 2006).

The use of reproductive technology increases third party transactions in the reproductive arena and increases the likelihood that disputes between individuals using these technologies and those providing services will arise. Examples include: paternity/child support disputes when a couple divorces and neither or only one parent has a biological relationship to the child, paternity disputes between contracting couples and sperm/egg donors or surrogates seeking custody, and malpractice suits against fertility clinics who wrongfully place a couple's embryos into the womb of another woman (Mundy 2007; Shanley 2001). In short, reproductive technology introduces many new actors into the process of human conception. Infertility specialists, egg donors, sperm donors, and gestational surrogates constitute new actors to the reproductive process who often have separate interests than the contracting couple (Kranz 2003, Mundy 2007, Henig 2004). Partly as a result of new contractual opportunities, but also out of concern for the best interest of the child, the state has become increasingly concerned with third party transactions and the increasing use of these technologies which has increased rapidly over the last twenty years. Many state legislatures have debated the role the state should play in regulating these technologies to protect their constituents who use these technologies and the children who result from them.

There are two distinct purposes of this thesis. The first is to address how states in the U.S. are currently regulating assisted reproductive technology (ART). Second, to explore the factors

that predict whether a state will or will not regulate ART. There have been few studies in the social sciences addressing regulation of assisted reproductive technologies; even fewer studies have developed statistical models of states' regulatory behavior. I will address the current regulatory landscape of ART in the United States and then proceed by using a sequential logistic regression model to assess state regulation of ART years 1995-2006. Both of these objectives offers context to the regulatory landscape of ART and highlights the profound implications ART regulation is having on the family as an institution and on the family structure.

Background

Reproductive Technology

Reproductive technology is a significant new development in the process of family formation and parenting. The use of reproductive technologies has allowed for the separation of intercourse and reproduction, enabling infertile couples as well as gay and lesbian couples to have children. At the same time, assisted reproductive technology means more familial relationships are formed through market transactions such as *in vitro* fertilization, sperm donations, and surrogacy (Henig 2004; Markens 2007, Mundy 2007: Spar 2006).

Legal and medical frameworks constitute the two major approaches available for understanding and defining ART. According to strict medical definitions, artificial insemination refers to the manipulation of sperm in order for a woman to conceive, a doctor or non-professional places semen into the woman's vagina or uterus with a syringe, facilitating contact with an egg aiding fertilization(Kokiasmenos and Mihalich, 2004; Sangha 2005). Medical usage defines assisted reproductive technology (ART) as technology that manipulates both gametes (sperm and egg) to facilitate conception.

Some common methods of ART are *in vitro* fertilization (IVF), gamete intrafallopian transfer (GIFT) and zygote intrafallopian transfer (ZIFT) (Kokiasmenos and Mihalich, 2004; Sangha 2005). The technical difference between IVF, GIFT, and ZIFT is based on where fertilization takes place and where the two gametes (egg and sperm) are placed so fertilization occurs, inside the woman's body (GIFT) or outside (IVF and ZIFT) (Mundy 2007).

Legal definitions of reproductive technology use the term assisted reproduction to refer to artificial insemination, IVF, GIFT, ZIFT, gestational surrogacy and other reproductive procedures (American Bar Association 2008). Legal code sees assisted reproduction as any means to conception which bypasses sexual intercourse (see American Bar Association 2008; Crokin 2005; Kokiasmenos and Mihalich. 2004; Manning 2004; Robertson 2004a; Sangha 2005; Storrow 2006; Synder and Brynn 2005 for examples of how legal codes and legal professionals use these terms).

Since many ART procedures are used in conjunction with one another, (e.g. artificial insemination or IVF to impregnate a surrogate), regulating one form of technology without affecting the use of another is difficult. Therefore, I prefer to use the legal definition of ART because it encompasses all possible procedures to assist in conception. For this reason I examine all state laws that regulate artificial insemination, assisted reproductive technologies, and surrogacy, since all of these technologies provide for conception by using technology and do not depend on sexual intercourse in order to create human life.

State Regulation

The state has gradually taken over from the church the right to legitimize familial relationships as the population in the United States has grown and society has become more complex (Cott 2002). Additionally, the state has become a mediator in determining child well-

being and paternity rights in cases of divorce, adoption proceedings, and more recently, disputes involving assisted reproductive technology (Friedman 1995; Shanley 2001, Markens 2007). The state's involvement in private life has increased as it has sought to puzzle over moral issues in behalf of its citizens (Skocpol 1985, 2008). Such moral issues often involve an individual's rights to establish or dissolve familial relationships (Cott 2002; Roe v. Wade 1973; Skocpol 1985, 2008). Although the state attempts to abstain from regulating the private lives of its citizens it has become a powerful social actor in modern society (Scott 1998) in determining, sanctioning, and dissolving familial relationships as well as ensuring child well-being (Cott 2002; Friedman 1995; Shanley 2001). In the case of ART some of the measures states have taken to protect its citizens' reproductive interests include: mandating insurance coverage of infertility treatments, stipulating terms and conditions for surrogacy contracts, guaranteeing paternity for a husband whose wife undergoes artificial insemination with a donor's sperm, severing egg and sperm donor's parental rights, and various other measures (see Kokiasmenos and Mihalich, 2004; Sangha 2005).

The Current Regulatory Landscape in the United States

Currently in the United States there is only one federal law regulating ART: the *1992 Fertility Clinic Success Rate and Certification Act* (CDC 2009b). The act was passed to help infertile couples determine their reproductive options through ART and compare clinics to one another. Due to the many clinics in the United States, the great expense of ART, and the varying success clinics have in achieving conception, couples often found it difficult to compare clinic success rates (CDC 2009b). The *Fertility Clinic Success Rate and Certification Act* required the CDC to start collecting data on clinics and their success rates as well as instituted a model certification program for fertility clinics to assure medical standards were being met (CDC

2009b). The *1992 Fertility Clinic Success Rate and Certification Act* does not establish any penalties for clinics that do not report their rates except to list them in the yearly report as non-reporting clinics. Therefore, the act does not create sanctions to encourage every clinic to report its success rates (Markens 2007; Mundy 2007; Spar 2006). There is no other regulation of ART at the federal level in the United States.

All other laws regulating ART occur at the state level and vary for each state. The majority of states have gradually entered the debate on reproductive technology and passed some laws regulating ART (see Figure 1 and Figure 2). Many states stipulate that ART must be performed by medically licensed professionals, sever egg and sperm donors' paternity claims (based on their biological relationship) to children conceived via ART, outline paternity for couples who use ART, require insurance companies to provide coverage for infertility treatments, and stipulate terms for gestational surrogacy contracts (Kokiasmenos and Mihalich 2004; Sangha 2005, see Figure 3 and 4).

[Figure 1]

[Figure2]

[Figure 3]

[Figure 4]

Some states require gestational surrogacy contracts that need to be met for a surrogacy arrangement to occur (see Table 1). When regulating surrogacy many states choose to ban gestational surrogacy outright instead of regulating it through gestational surrogacy contracts (Markens 2007, see Table 2).

[Table 1 Here]

[Table 2 Here]

While there are a variety of laws used by states to regulate ART many states choose not to regulate ART at all and leave “regulation” to medical societies and other professional organizations within the reproductive market (Kokiasmenos and Mihalich 2004; Markens 2007; Mundy 2007; Sangha 2005). While there are several forms of ART and different regulations by the state research on state regulation of ART can be divided into three distinct categories: regulatory policy research, legal research and social science research. Each of these areas should be considered by social scientists to get a better understanding of the state’s role in regulating ART.

Regulatory Policy Research

Increasing use of assisted reproductive technology and the constant addition of new technologies has brought reproductive technology to the forefront of legislative debates (Markens 2007). Regulatory policy research compares national legislation of various countries in an attempt to bring their legislative solutions to bear in the United States (see Johnson 2006; Ouellette et al. 2005; Robertson 2004b). Unfortunately, due to the rapid development of assisted reproductive technology there has not been much research done on state regulation of this technology (Bioethics Commission 2004). One of the major reasons the federal government has not taken a more active regulatory role in ART is due to the lack of information on these technologies. The President’s Bioethics Commission conducted a study on the state of ART regulation in the United States in 2004 and stated that before any regulatory commission is formed in the United States or before further legislation is passed more information is needed about the effects of these technologies on the children conceived through them and the individuals who use these technology to conceive.

Regulation of reproductive technology has been debated in several western countries and the majority of these countries have national laws to regulate these technologies (Johnson 2006; Ouellette et al. 2005). The United States is more difficult to study than other western countries because it has no national legislation regulating reproductive technology except the *1992 Fertility Clinic Success Rate and Certification Act* (Kranz 2002). Thus, it is up to each state to take their own stance on this technology (Markens 2007; Spar 2006; Shanely 2002). Therefore to give a complete and accurate picture of regulatory policy in the United States and compare it to other nations is difficult.

Much of the national debate about regulation focuses on ethical issues surrounding the use of assisted reproductive technologies (Johnson 2006). Scholars have argued that the United States should create national legislation similar to regulatory practices found in other western countries such as the United Kingdom (Johnson 2006; Ouellette et al. 2005). National regulation would create laws that would be applicable in every state. The United Kingdom's regulatory commission evaluates new reproductive technology and regulates acceptable uses for this technology (Ouellette et al. 2005). The United Kingdom's policy is the most stringent in the world. This commission licenses fertility clinics and research facilities. Australia and other western countries have taken a moderate view of the technology by passing national laws but Australia does not monitor reproductive technology to ensure the laws are being followed (Johnson 2006; Ouellette et. al. 2005).

Due to the lack of national laws regulating assisted reproductive technology in the United States, regulatory policy research does not adequately address how reproductive technology is regulated in the United States nor can the unique environment of the United States be easily fitted to other countries' ART regulatory policies. Under a federalist system, the regulation of

private life is left to the states. ART is often associated with stem cell research and fears that stem cells may be used to clone humans (Johnson 2006; Spar 2006). The ethical concerns expressed over the possibility of cloning body parts and humans in the U.S. have superseded attention to the thousands of children conceived using ART every year¹. This paper recognizes the difference between experimental uses of this technology and uses which help individuals create families. However, I focus solely on the latter in this paper. Discussions of the experimental uses of ART are outside the scope of this paper. Additionally, in the United States private life affairs are typically the responsibility of the states so ART used for conception is more a state issue while funding for embryonic research would be more likely to be regulated by the federal government.

Legal Research

Research on the regulation of ART through legislation is most prevalent in legal research. While the majority of the legal research is focused on giving overviews of current regulation in the United States it also covers case law which affects how legal professionals view regulation (Crokin 2005; Kokiasmenos and Mihalich. 2004; Manning 2004; Robertson 2004a; Sangha 2005; Storrow 2006; Synder and Brynn 2005). In many judicial decisions judges hearing disputes involving ART have stated that regulation is insufficient and legislatures need to consider the increased legislation to aid judges in their decisions and inform citizens of the ramifications in using ART (American Bar Association 2008; Kindregan and Snyder 2008). In *In re Marriage of Buzzanca*, 61 Cal. App. 4th 1410, the justice Robert D. Monarch stated,

We join the chorus of judicial voices pleading for legislative attention to the increasing number of complex legal issues spawned by recent advances in the field of assisted reproduction. Whatever merit there may be to a fact-driven case-

¹ In 2006 ART resulted in the birth of nearly 55,000 children in the U.S. (CDC 2006).

by-case resolution of each new issue, some over-all legislative guidelines would allow the participants to make informed choices and the courts to strive for uniformity in their decisions.

In response to such pleas the American Bar Association's (ABA) section on family law began to study legal issues involving ART in 1988 and worked to create proposed legislation for states to adopt (Kindregan and Snyder 2008). In 2008 the Model Act Governing Assisted Reproductive Technology was completed by the family law section. Their purpose was to resolve disputes over ART (American Bar Association 2008; Kindregan and Snyder 2008). The Model Act can be adopted by state legislatures in whole or in part to regulate all or just one particular ART procedure if a state has already passed laws regulating a specific procedure (American Bar Association 2008). One of the greatest concerns for legal professionals and judges is that ART creates complex issues where similar cases are given contradictory ruling (Kindregan and Snyder 2008). Without uniform decisions precedent cannot be set and perhaps this is the issue that lawyers fear the most, an issue so complex that facts and contracts cannot lead to predictable results. However, many legal professionals do not see reproductive technology disputes as synonymous with uncertainty but as outliers in the bigger picture of family law (Robertson 2009). The debate over ART and the government's role in regulating the technology has been the primary focus within legal research.

Legal research covers an immense range of issues from equality to access to ART for racial groups and gays and lesbians, embryo donations and adoption, to surrogacy and posthumous reproduction; however, the majority of the legal scholars can at least agree on one thing, ART is not going away and neither are the complications that often arise because of its use (Appleton 1990; Kindregan and McBrien 2005; Roberts 1996, 1999; Robertson 2004a).

Social Science Literature: Markets, Media and Public Policy

While research on ART within the social sciences is sparse, the research, like legal research, attempts to illustrate problems that can arise from the use of ART. Additionally, social science research has generally focused on state regulation of ART by observing interactions that states have with other social institutions such as the market and mass media (Markens 2007; Spar 2006). Therefore it is important to consider the states interactions with other institutions when examining the regulation of ART.

Spar (2006) investigated the market-state relationship and posited that state legislatures may hesitate to regulate reproductive technology because they would have to admit that a baby market exists in the United States. A “baby market” implies that in one way or another we are currently selling babies in the United States, and if not babies then services that directly result in the conception of children (Spar 2006). Since legislatures do not want to condone a baby market the regulation of ART falls to the judiciary to handle disputes involving ART on a case by case basis. If the state fails to treat ART as a market, infertile couples are more likely to be taken advantage of by reproductive specialists. Reproductive specialists cannot meet the demand for children successfully, which results in specialists selling false hope instead of services that have a high probability of producing a child (Spar 2006). Additionally state regulation is needed to set definitions for acceptable practices and protect all parties involved in utilizing these technologies. Spar stated that the goal of regulation is to, “Embed the market in an appropriate political and regulatory context, to impose the rules that will enable the market to produce the goods we want—happy, healthy children—without encouraging the obvious risks. (Spar 2006 p. 197).” Spar’s (2006) study helped expand prior research by including in the analysis the market-

state relationship and demonstrated that the market has a significant influence on the state and its regulatory stance toward ART.

Markens (2007) studied the regulation of surrogacy in New York and California and found that interactions between newspaper coverage of surrogacy and the legislatures' reaction created each state's regulatory stance for reproductive technology. The newspapers in New York identified surrogacy with "baby selling" technology while newspapers in California saw surrogacy as resolving the "plight of infertile couples" (Markens 2007). Thus, the interaction between the legislatures and the newspapers resulted in California and New York coming to different conclusions as to how surrogacy should be regulated based on the framing the newspapers gave to the practice of surrogacy.

Maule and Schmid (2006) studied the courts in California and cases involving ART. Although this study used court cases that have come before California courts, it is merely illustrates possible problems that can arise from the use of this technology; it does not focus on causal explanations that explain why California does or does not regulate reproductive technology.

Need for Further Research

Maule and Schmid's (2006) study both expand the research on state regulation by analyzing the judicial branch's response to ART through a case study of ART disputes in California. Marken's (2007) also expanded the literature on ART regulation by including the influence the state newspapers had on ART regulation in her analysis. However, these two studies are limited in their scope by focusing on only one or two states; this begs the question as to the variation in state response to assisted reproductive technology for the other states in the U.S. Individual case studies for a single state or comparison between two states cannot fully

account for the differences in state laws across the entire United States. Thus, a general survey approach predicting legislation for all fifty states and the District of Columbia helps us see how regulation varies between states and what factors precipitate regulation in the nation as a whole.

Whether assisted reproductive technology is considered from a regulatory policy perspective, as a market in need of regulation, or as a policy matter influenced by the mass media and legal community, each of these areas highlight the need for a comprehensive investigation of ART legislation in all fifty states and the District of Columbia. Past studies do not include in their analyses all states or all assisted reproductive technologies nor do they attempt to predict legislative trends using quantitative methods; this paper fills these two gaps in the literature.

Although regulation of ART may be influenced by institutions (e.g. markets and media) or given consideration by recommendations of professional associations (e.g. American Bar Association) enacting any legislation is a difficult process at the state level. Therefore it is beneficial to briefly summarize the influence that institutions and social movements may have on the policy process.

Social Movement Influences on the Policy Process

The level of the state's involvement in private life is heavily influenced by the capacity of the state to successfully regulate private life as well as the need for the state to address social issues which its constituents are concerned about (Cott 2002; Skocpol 1985, 2008). Additionally, legislative bodies have many issues to consider and not all of them have sufficient political or social support to make it on the agenda due to intense competition with other issues (Ripley 1985). Thus, with so many groups vying for the attention of legislative bodies the limited capacity of the state to address every issue creates intense competitions between social movements (Ripley 1985). Furthermore, there is a great difference between an issue being put on

a legislative agenda and a bill passing by both houses; therefore, outcomes at different levels of the legislative process may indicate how important an issue is to the state legislature (Ripley 1985).

Along with competition for spots on the legislative agenda, movements often have diverse sub-groups that compete over the framing of the issue and definition of the problem. These different ways of framing the issue creates further challenges for a movement's survival and effectiveness in achieving its legislative goals (Ripley 1985; Soule and King 2008). In short, competition between various movements and from within the movement itself makes gaining a legislature attention a difficult task (Ripley 1985). It is even more difficult to maintain legislature's interests in an issue through the entire policy process (King, Cornwall and Dahlin 2005).

In policy process studies it is often presumed that the legislative arena is composed of various social movements vying for legislative attention. ART is a unique case where there is no formalized social movement competing for state legislatures to pass or not pass ART regulation. Rather the state has become involved in ART regulation for other reasons: the rapid increase in ART use, the development of new ART procedures over the past three decades, and most importantly its interest in children's health and well-being (ABA 2008; Markens 2007; Shanley 2001; Spar 2006). Without the active framing of social movements the limited regulation of ART may not be seen as a significant social problem worthy of legislative attention.

Hypotheses

Although many factors have been posited as predictors for ART legislation in case studies and in content analyses of ART laws, none of these studies have tested these hypothesized factors. To my knowledge this is the first paper attempting to predict ART

legislation using statistical models. For this reason I test three hypotheses of my own (i.e. hypotheses 1-3) which measure the demand for the ART market and attempt to verify four hypotheses from the literature on ART regulation (i.e. hypotheses 4-7).

Hypothesis 1

As ART use has increased, the likelihood that legislatures pass ART legislation has increased. With thousands of children being born from ART each year it is difficult for the government to ignore the ramifications ART has on the children's lives (President's Council on Bioethics 2004). Furthermore, the more ART is used the more likely it is for ART disputes to occur, making state intervention through the court system necessary. In order to test the association between increased use and the likelihood of legislation, I use number of ART cycles per 1000 as an indicator of demand.

H1: The greater the number of ART cycles per 1000, the more likely a state will be to regulate ART in subsequent years.

Hypothesis 2

Spar (2006) explored the states interaction with ART from the notion of a "baby market" within the United States. The "baby market" does not function like other markets in the United States. Infertile couples' desires to have children will exceed any monetary value that the "baby market" can place on ART. The *1992 Fertility Clinic Success Rate and Certification Act* was passed in large part because the cost of ART is so great. The government wanted to help couples make a more informed decision before paying so much to attempt to have children via ART (CDC 2009b). Spar argues that state regulation is necessary so that infertile citizens will not be exploited economically in their quest to conceive. Since ART is very expensive it is an option that is more accessible to the upper and middle classes and not as accessible to the working class

and those living in poverty. However, looking at the sheer cost of ART is an overly simplified notion of demand. Education is a better predictor of demand in part because of its high correlation with income, but also because ART is a highly complex way to have children which is difficult to access without education. Educated individuals know how to access complex social systems (e.g. medical and health insurance establishments) and government agencies which provide information for those who use ART. Additionally, increased education is often associated with a delay in marriage and childbirth which creates a greater demand for ART since fertility rapidly declines for women throughout their life course (Mundy 2007). Therefore educated individuals will be better able to afford ART, better understand the procedures and the institutions that administer ART, and will be more likely to need ART due to delays in childbirth. Education is associated with greater use of ART.

H2: The higher the educational attainment of a state's populous (measured as percent of adults age 25 and older with a bachelor's degree) the more likely that state will use ART in subsequent years.

Hypothesis 3

Delay in marriage, the decline in the number of children per household, out of wedlock birth and the rise in single parent households over the past few decades has led some scholars to believe that the family is in decline in the U.S. (Popenoe 1993). However the increased use in ART would suggest that perhaps the family is not in decline but rather the strategies used to form families are changing. Hypothesis 3 tests the notion that the decline in the percent of households that are married couple households with children is associated with ART legislation. Since ART is a relatively new way to increase the diversity of family formation strategies, states with

populations that value family life may be more likely to restrict the use of ART than states that do not.

H3: States that have a higher percentage of households that are married couple households with children are more likely to use ART in subsequent years.

Each of my hypotheses looks at ART legislation from the perspective of demand. In other words, hypothesis 1 tests how the demand for ART influences ART legislation while hypotheses 2 and 3 test how educational attainment and the percentage of married couple households in states influence the demand of ART itself, thus indirectly influencing ART legislation. The last four hypotheses, derived from the literature, (1-4) are testing the direct effect of the number of ART court cases, the number of ART newspaper articles, the number of neighboring state ART laws, and the democratic leaning of states on ART legislation. To better understand how I am conceptualizing the factors that influence ART legislation refer to figure 5.

[Figure 5]

Hypothesis 4

Judges, the American Bar Association, and other legal professionals have asked state legislatures to pass legislation that would set case law precedent and help justices decide what constitutes a child's best interest when deciding a case involving ART and paternity disputes (ABA 2008; Markens 2007; Spar 2006). Therefore, I would expect ART court cases to affect the legislative rate of ART laws within a state by increasing legislation. Hypothesis 4 tests the claim that increased disputes coming before the judiciary encourages legislatures to regulate ART.

H4: The more ART cases that come before a state's court system the more likely that state is to regulate ART through legislation in subsequent years.

Hypothesis 5

Markens (2007) points out that much of the legislative decision making concerning ART is heavily influenced by the newspapers portrayal of ART. Markens also demonstrated that increased newspaper coverage of an issue leads to increased attention given to that issue by the legislature. Thus, the more newspaper coverage given to ART the more likely a state is to address ART and codify its official stance by passing laws. Hypothesis 5 tests whether the positive association between newspaper coverage of ART opportunities and issues and ART legislation that Markens found in her study of New York and California holds true across all states and the District of Columbia.

H5: The greater the number of ART newspaper articles published in a state the greater the likelihood that ART laws are passed by the state legislature in subsequent years.

Hypothesis 6

States are often seen as experimental labs for policy. Often one of the first courses of action for a legislature when looking at an issue is to see what laws other states have passed on the same issue (Ripley 1985). States that share geographical borders generally have more in common with one another than states that do not share borders and are across the country from one another. Hypothesis 6 is a test of whether states influence each other when it comes to ART legislation.

H6: States that have neighboring/bordering states that have passed ART legislation will be more likely to pass ART legislation in subsequent years.

Hypothesis 7

State politics are often dominated by political party preferences derived from the conservative or liberal beliefs their citizens' hold. The conservative or liberal ideologies of these

states have influenced states' stances on such issues as abortion, birth control and other reproductive issues (Kranz 2002). The more conservative a state is the more likely it is to regulate ART by restricting its uses for certain demographic groups (i.e. gays, lesbians and single individuals wanting to use ART).

H7: Politically conservative states will be more likely to pass ART laws than politically liberal states in subsequent years.

Methods

This study uses time series data gathered for the years 1995-2006 to estimate the likelihood of ART legislation. I used random effects models that are appropriate for time series data because they take into account panel level variance as well as adjusting the standard errors appropriately (King, Cornwall, & Dahlin 2005; Petersen 1993). Other studies have used random effects models to take into account variation over time and between states when modeling legislative processes (King, Cornwall, & Dahlin 2005). I used Hausman's specification test to determine that a random effects model was a better fitting model than a fixed effects model. Variance inflation factors (VIF) were used to detect multicollinearity within the data collected, which was not an issue for the measures included in this study.

The data were collected from the following sources: the *Lexis-Nexis Academic* database, the CDC's *Assisted Reproductive Technology Success Rates National Summary and Fertility Clinic Reports* for the years 1995-2006², State estimates from the census's webpage census.gov, the U.S. Elections Atlas and congressional election results from the U.S. House of Representatives clerk's office (CDC 2009b; U.S Elections Atlas 2010; U.S. House of Representatives 2010).

² 1995 was selected as the starting year because this is first year the CDC started collecting data on fertility clinic success rates in accordance with the *1992 Fertility Clinic Success Rate and Certification Act*. 2006 is the most recent year data from the CDC is available.

Data and Measurements

One of the dependent variables, ART legislation, is a dichotomous variable indicating whether or not ART legislation was passed for each year beginning in 1995 through 2006. The data were gathered using *Lexis-Nexis Academic*. Laws regulating ART were found by searching all state codes and the District of Columbia's legal codes for the years 1995-2006 under the terms: artificial insemination, assisted reproduction, ART, and gestational surrogacy³. Searches for ART laws were screened for content; those that were not relevant to ART and human reproduction were dropped from the sample (i.e. cases/laws on artificial insemination of cattle, animal breeding, and surrogacy where surrogate referred to cases/laws on guardianship of foster children, etc. instead of ART).

Data on the second dependent variable, number of ART cycles,⁴ was available from the CDC's *Assisted Reproductive Technology Success Rates National Summary and Fertility Clinic Report* (CDC 2009). This is used as a measure of demand for reproductive technology. Data are available from 1995-2006. Values for this variable ranged from 0 to 13,043. Because the variable was highly skewed, I normalized its distribution by taking the square root of the number of ART cycles. I determined that this transformation would best normalize the distribution after using Tukey's (1994) ladder of powers to compare possible transformations. This variable is an indicator of demand for an ART market within each state year. It is also used as an independent variable in models designed to predict ART legislation.

³ These three terms were selected due to their extensive use within legal definitions. Artificial insemination and assisted reproduction are widely used in state annotated codes to refer to all ART in general whereas gestational surrogacy is broken down into its own category for state annotated codes. I considered other terms such as sperm, eggs, and infertility however these terms were not useful in identifying ART laws.

⁴ A cycle is a complete round of ART treatment. For example, a round of IVF includes the retrieval of gametes, fertilization of the gametes to create an embryo, and then the placement of the embryo into the womb.

I searched for ART court cases for each state and the District of Columbia over the time period 1995-2006 using the *Lexis-Nexis Academic* database. This independent variable called ART court cases is used to approximate the effect of the judiciary on the state legislatures. It is a count of ART court cases coming before a state's judiciary in each state year.

One other independent variable comes from Lexis-Nexis: the number of ART newspaper articles which appear each year in a state over the 1995-2006 time period. I searched for articles on ART court cases and legislation using the same search terms I used to find existing laws and cases involving ART. The number of newspaper articles addressing ART is coded for number of articles for a given state year. This variable is used to estimate the influence of newspaper coverage on ART legislation.

Educational attainment is drawn from U.S. Census data. The educational attainment variable is the percentage of a state's total population twenty-five and older with a bachelor's degree or more. The percent of married couple households with children is also drawn from census data. These variables will help measure the influence of educational attainment and the percent of married couple households with children have on the number of ART cycles.

I collected measures for states democratic leaning from states electoral college results for presidential elections in the years 1992, 1996, 2000, and 2004 as well as the results of the 1994, 1998, 2002 and 2006 congressional returns. These data come from the U.S. Elections Atlas, which tracks election results for every presidential election within the United States, and the congressional returns recorded by the office of the Clerk of the U.S. House of Representatives (U.S. Elections Atlas 2010; U.S. House of Representatives 2010). The democratic leaning variable is a dichotomous variable coded 0=Democrat 1=Republican. Due to electoral votes going to just one party for presidential elections I followed the same pattern in coding states

democratic leaning for years with congressional races (e.g. if the democratic party won 4 congressional races and the republican party won 3 I coded that state democrat). I used only the presidential election results to code a state's democratic leaning for years where both presidential and congressional races were held.

The last variable in the model is a legislative proximity variable coded for the number of ART laws passed from 1995-2006 in neighboring states. I call this variable neighbor state ART laws. The variable controls for the effects that neighboring states often have on one another when considering legislative issues. "Neighboring" states are states that share geographical borders with each other.

Since the models assume that legislatures are reacting to various factors and then passing legislation I lagged each of the independent variables in the models by one year. In the model predicting ART cycles, I used a random effects linear regression model since the dependent variable is continuous and normally distributed after the square root transformation. In the model predicting legislation, I use a random effects logistic regression model since the dependent variable is dichotomous

Results

Table 3 reports the descriptive statistics for the independent variables. Table 4 reports the results from an OLS regression looking at what predicts the demand for ART; this regression is used to test hypotheses 2 and 3. Table 5 reports the results from a series of random effects logit models estimating the likelihood of ART legislation. Models 1 and 2 test hypotheses (1-3) while model 3 tests the hypotheses I derived from the literature (1-4).

As a test of what influences ART demand, I estimate an OLS regression model using educational attainment and the percent of married couple households with children to predict the

number of ART cycles (hypotheses 2-3; see table 4). I used the same square root transformation for the number of ART cycles that I used in models 2 and 3. I lagged educational attainment and the percent of married couple households with children by one year as I did in the previous analysis. Both of the demand variables have a direct effect in predicting the number of ART cycles for the time period 1995-2006; however, only educational attainment is statistically significant. Educational attainment has a positive effect on the number of ART cycles, while the percent of married couple households with children has a negative effect on the number of ART cycles. By comparing this model with model 1 in table 5 it appears that educational attainment and the percent of married couple households with children influence demand for ART, and may therefore indirectly influence ART legislation through their effects on demand for ART.

[Table 3]

[Table 4]

In table 5, model 1 tests for a direct effect of educational attainment and the percent of married couple households with children on the likelihood of ART legislation in any given year for a state. Neither of the independent variables are statistically significant. From model 1 it does not appear that educational attainment and the percentage of married couple households with children directly influence ART legislation.

In table 5, model 2 adds the number of ART cycles, my measure of ART demand, into the model. Educational attainment and the percent of married couple households with children do not obtain statistical significance in model 2. As expected, both of these variables remain poor direct predictors of ART legislation. However, the number of ART cycles is a statistically significant predictor of ART legislation and has a positive effect on ART legislation. The number of ART cycles is the only variable that increases the odds of ART legislation. This

confirms my first hypothesis and suggests that demand for ART is an important factor in predicting legislative action.

In table 5, model 3 ART court cases, the number of ART newspaper articles, neighboring state ART laws and states democratic leaning are considered to test the hypotheses found within the ART literature as well as the previous predictors from model 2. None of the variables in the model are statistically significant in the model. Unlike the previous model the number of ART cycles is no longer statistically significant; this suggests that model 2 is a better predictor of ART legislation than model 3, and that something about the other variables attenuates the effects of ART cycles on ART legislation. The effects for the number of ART newspaper articles and a state's democratic leaning are both positive and are consistent with my hypotheses. However, ART court cases and neighbor state laws are both negatively associated with ART legislation, contrary to my hypotheses.

[Table 5]

Discussion

The results presented here indicate that ART demand (measured as the number of ART cycles) is the most effective predictor of ART legislation. Only the number of ART cycles significantly increased the odds of ART legislation. Legislatures are more likely to respond to an increase in the demand for ART in their state than other predictors. Additionally, my theoretical model on the demand for ART and ART legislation shows that educational attainment and the percentage of married couple households with children indirectly affect ART legislation when mediated through the number of ART cycles. These three variables are important factors in predicting states' stances toward ART.

The greater the educational attainment of a state's citizenship, the more likely ART demand will increase. Increased educational attainment may result due to individuals and couples delaying childbirth in favor of educational opportunities which results in a greater likelihood of fertility problems. Therefore, highly educated state populations may be more likely to utilize ART. Additionally, educated populations are more likely to afford the expense associated with ART procedures and understand the complex medical and legal terminology associated with ART. Lastly highly educated state populations may have a better understanding of how to access the social systems that inform ART and administer its procedures.

The use of ART is lower in states that have a higher percentage of married couple households with children (although this association was not statistically significant). The percent of married couple households with children is sensitive to both delayed marriage and lower fertility. This may also be an indicator that populations in these states value the traditional family form over alternative family formations. This in turn may make it more likely for people in these states to use ART. However, more research is needed on this issue as the results are not conclusive.

Contrary to hypotheses 4-7, the likelihood of ART legislation in the U.S. does not result from an increase in the newspaper coverage of ART, an increase in ART court cases, states' political leanings, or neighboring states passing ART laws. Rather an increase in the odds of ART legislation is due to the demand for ART. It is important to note, however, that once I introduced these other variables in the model, the association between ART cycles and ART legislation was no longer statistically significant. Thus, more research is needed to determine why this occurs. It may be due to a complex association between ART demand, newspaper coverage, a state's conservative nature, or some other factor.

Contrary to one of the major hypotheses I derived from the ART literature the increase in ART court cases did not increase the odds of ART legislation. Further investigation is needed however into the effect of judiciary's and legal organizations (such as the ABA) pleas have on the passing of ART legislation. As for the number of ART court cases there may not be a sufficient number of legal disputes coming before the courts to cast ART as a significant social problem worthy of legislative attention.

Markens (2007) argued that the newspaper coverage of ART significantly influenced the legislation of ART in the cases of New York and California (Markens 2007). However, when I analyzed the effect of newspaper coverage on ART legislation for each state and the District of Columbia I found no evidence to support Markens's findings for the U.S. as a whole.

Spar's (2006) study on the ART market drew increased attention to various complications the "baby market" may cause for parties involved in ART. Spar suggested that the baby market's high demand would give the market staying power and therefore increase the need for state regulation to ensure that the children produced from this market are healthy and happy. Spar's contention about the ART market and the demand it is placing on legislatures to regulate ART are supported by my findings.

Conclusion

Thus far the literature within the social sciences on the regulation of ART has been limited to cases studies, regulatory policy studies and content analyses of state legal codes and their possible implications; however, in my review of the ART literature I have yet to find a statistical analysis of ART regulation. This study has proven to be fruitful in testing hypotheses posited in the ART literature and an avenue for advancing theoretical frameworks used to understand ART and the state's role in regulating these technologies. Continued investigation of

ART should continue using statistical models to advance our understanding of ART regulation. Furthermore, the demand for ART merits additional investigation in future studies due to its value as a significant predictor in ART legislation. Predictors of demand such as educational attainment and the percentage of married couple households with children and their relationship need to be used as a base line in understanding why demand is a significant predictor of ART legislation.

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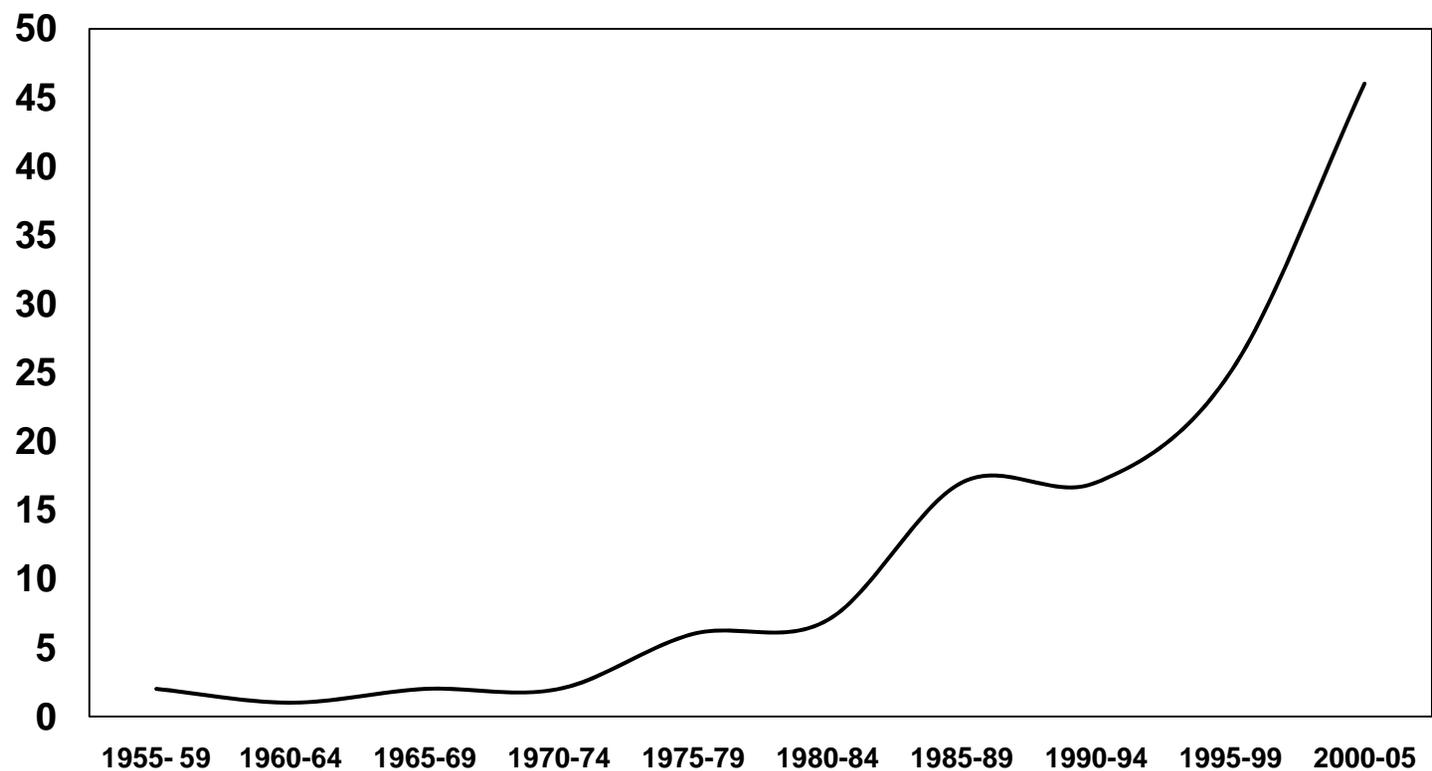
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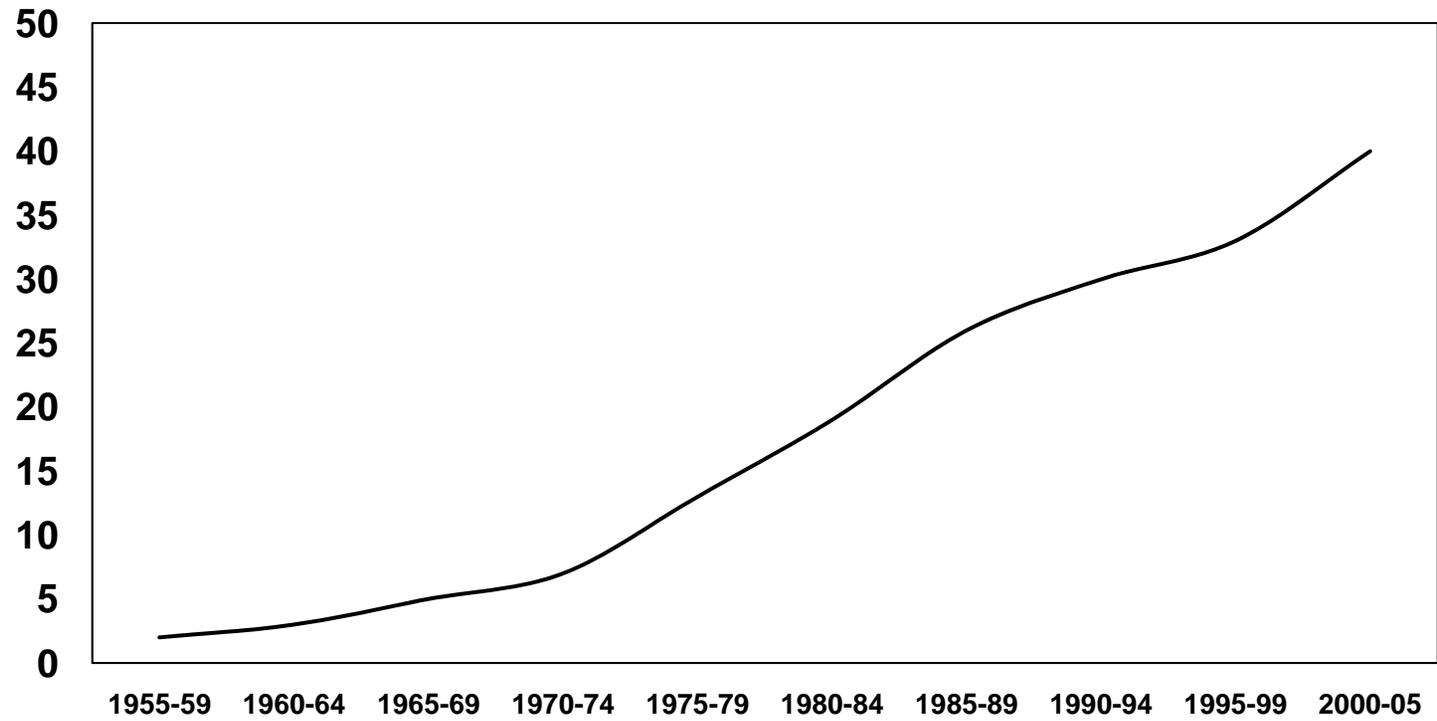
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Figure 1: Number of ART laws passed by states 1955-2005



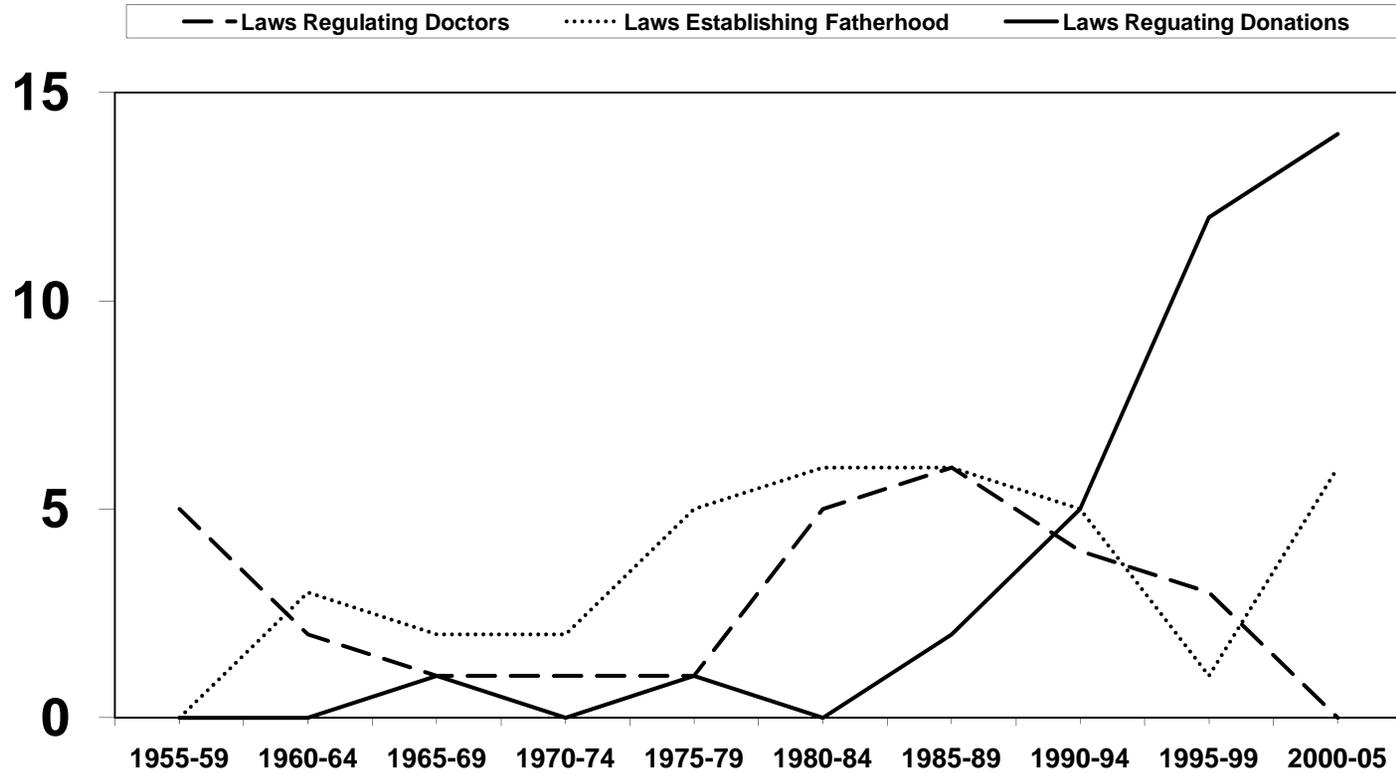
Source: LexisNexis Academic search for ART laws from 1955-2005 using search terms artificial insemination, assisted reproduction and gestational surrogacy.

Figure 2: Cumulative Number of States Regulating ART 1955-2005



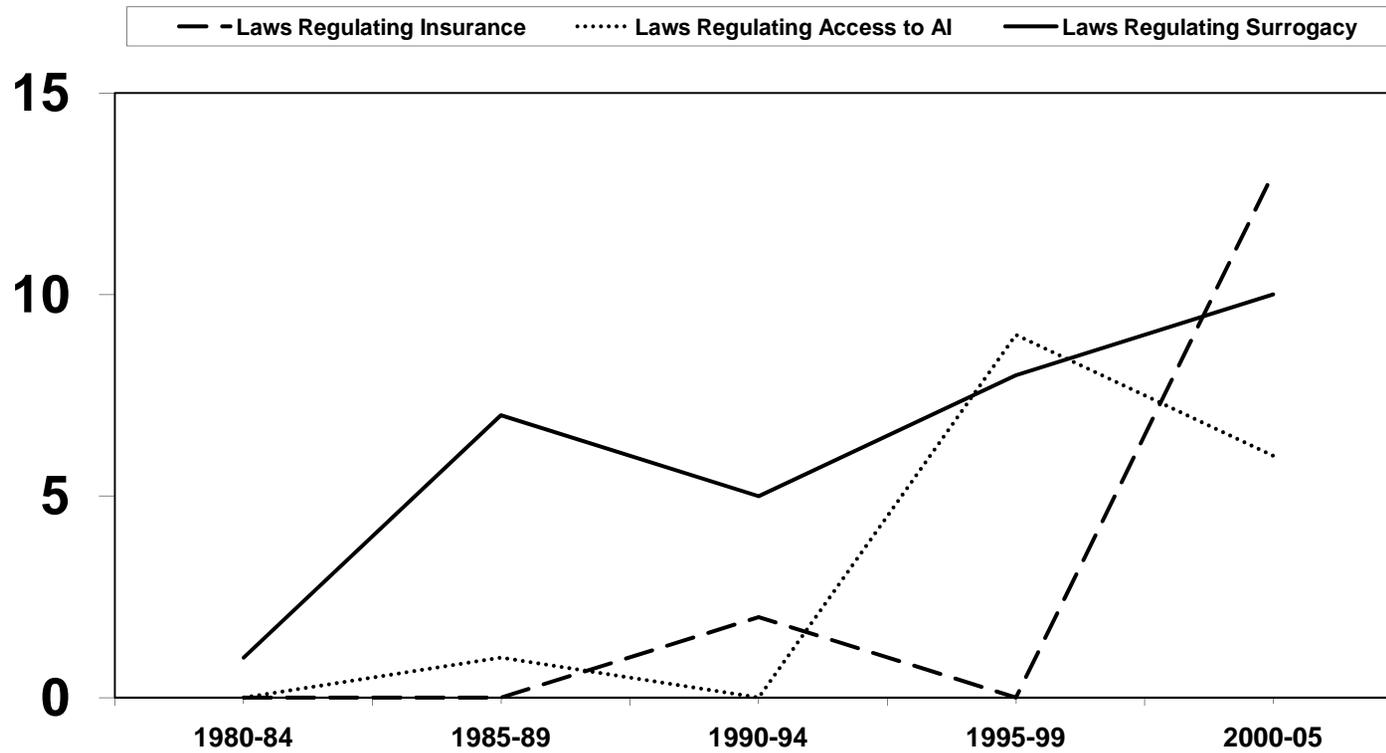
Source: LexisNexis Academic search for ART laws from 1955-2005 using search terms artificial insemination, assisted reproduction and gestational surrogacy.

Figure 3: Number of ART Laws Regulating Doctors, Establishing Paternity, and Gamete Donations 1955-2005



Source: LexisNexis Academic search for ART laws from 1955-2005 using search terms artificial insemination, assisted reproduction and gestational surrogacy.

Figure 4: Number of ART Laws Regulating Insurance, Access to Artificial Insemination and Surrogacy 1980-2005



Source: LexisNexis Academic search for ART laws from 1955-2005 using search terms artificial insemination, assisted reproduction and gestational surrogacy. Unlike ART laws in figure three there were no ART laws prior to 1980 regulating insurance, access to artificial insemination and surrogacy.

Figure 5: Model for the Effects Variables have on ART Legislation

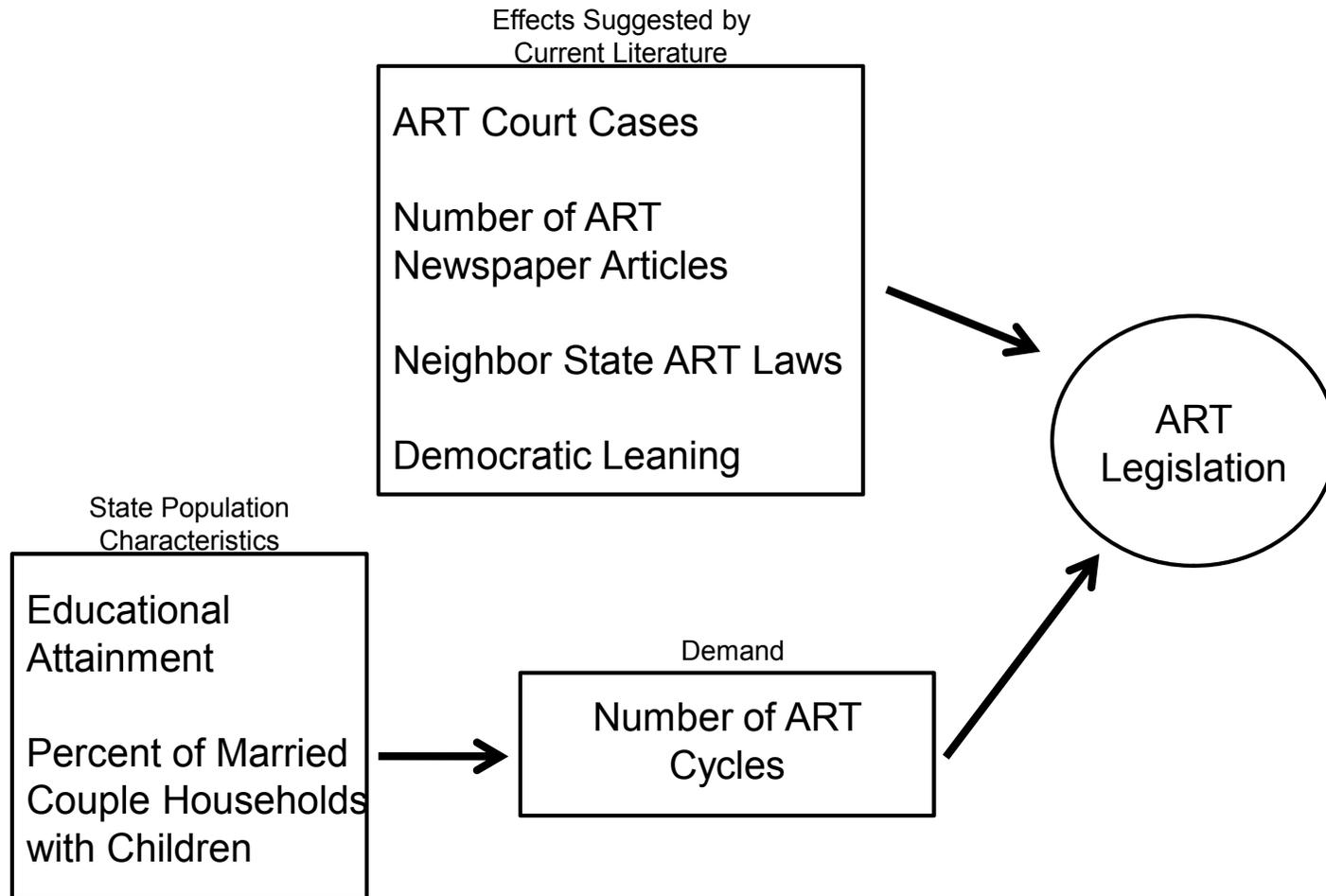


Table 1: Requirements for Surrogate Mothers in States that Require Gestational Surrogacy Contracts

State	Age Requirement	Husband's Consent Required if Married	Can be Compensated	Cannot be Compensated Beyond Medical Expenses	Must Have Given Birth to Own Child
Florida	18	N	N	Y	N
Illinois	21	Y	Y	--	Y
Nevada	18	Y	N	Y	N
New Hampshire	21	Y	N	Y	Y
Texas	18	Y	N	Y	Y
Utah	21	Y	Y	--	Y
Virginia	18	Y	N	Y	Y
Washington	21	Y	N	Y	Y

Source: LexisNexis Academic search for ART laws from 1955-2005 using search terms artificial insemination, assisted reproduction and gestational surrogacy

Table 2: States that Ban Gestational Surrogacy and States that Require a Contract for Gestational Surrogacy to be Legal

Contracts Required	Bans Contracts
Arkansas	Arizona
Florida	District of Columbia
Illinois	Indiana
Nevada	Kentucky
New Hampshire	Louisiana
Texas	Michigan
Utah	Nebraska
Virginia	New York
Washington	North Dakota
California*	
Wyoming*	

Source: LexisNexis Academic search for ART laws from 1955-2005 using search terms artificial insemination, assisted reproduction and gestational surrogacy.

*Both California and Wyoming have laws stating that gestational surrogacy contracts are not illegal and that contracts are not required for gestational surrogacy to be practiced within the state.

Table 3: Descriptive Statistics for Independent Variables Used in Models Estimating ART Legislation from 1995-2006

Variables	Observations	Mean	S.D.	Min-Max
Number of ART cycles (in 1000s)	561	1402	2118.5	0-13.043
Educational attainment	561	26%	5.8%	14.6-60.1%
Percent of married couples households with children	561	48%	2.8%	39.59-59.63%
ART court cases	561	.075	.325	0-3
Number of ART newspaper articles	561	1.219	2.450	0-22
Neighbor state ART laws	561	.470	.697	0-4
Democratic Leaning	561	.560	.497	0-1

Table 4: OLS Regression Model Measuring the Effects of Educational Attainment and the Percent of Married Couple Households with Children on the Number of ART Cycles 1995-2006

Variables	β	S.E.
Educational attainment	1.4316***	.1577
Percent of married couple households with children	-.4270	.3286
R-squared	0.1288	
Adjusted R-squared	0.1257	
N	561	

*p < .05 **p < .01 ***p < .001

Table 5: Random Effects Logit Models Measuring the Effects of Independent Variables on ART Legislation 1995-2006

Variables	Model 1			Model 2			Model 3		
	Odds Ratio	S.E.	Z-Value	Odds Ratio	S.E.	Z-Value	Odds Ratio	S.E.	Z-Value
Educational attainment	1.0407	.0218	0.057	1.0224	0.2380	0.95	1.0275	.2516	1.11
Percent of married couple households with children	1.0215	.0471	0.644	1.0229	.0494	0.47	1.0121	.0501	0.24
Number of ART cycles				1.0132*	.0056	2.36	1.0114	.0074	1.54
ART court cases							.8446	.3459	-0.41
Number of ART newspaper articles							1.0468	.0576	0.83
Neighbor state ART laws							.7752	.1673	-1.18
Democratic leaning							1.2601	.3888	0.75
Log-likelihood	-199.285			-196.605			-195.209		
N	561			561			561		
*p < .05 **p < .01									