Lights, Camera, Action: The Adoption of State Film Tax Credits

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Over the last 20 years, states have adopted tax incentives focused on film production. Louisiana adopted the first state tax incentive program for film production in 1992, and by 2009 such tax incentive programs had expanded to 44 states plus the District of Columbia. The purpose of this paper is to identify the factors that explain the pattern of adoption of state film tax incentive programs. We develop a theoretical framework for analyzing states' decision to adopt these programs that considers both internal characteristics and diffusion. We empirically investigate the timing of states' adoption of film tax incentives using the Cox proportional hazards model with time-varying predictors. The estimates of many of the hazard ratios are consistent with our expectation, although several are statistically insignificant. As expected, the pattern of adoption across states supports the hypothesis that it is a "mimicking" phenomenon. However, we find that fiscal stress results in faster adoption of film tax credits, contrary to expectations, but consistent with the notion that states look at them as a "luxury."

INTRODUCTION

There is a long history, dating back to the early part of the 19th century, of states providing incentives to attract economic activity. However, since the 1960s the number of incentive instruments that states use, and the intensity of their use, has increased (Eisinger 1988). One common instrument is the use of income tax credits, particularly for job creation or investment, either broad-based or targeted to particular industries. Gabe and Kraybill (2002), citing a Council of State Governments document by Chi (1994), report that in 1984, 27 states offered tax incentives for job creation. In a more recent Council of State Government document, Burnett (2011) reports that in 2010, 45 states offered such incentives. On the other hand, Chirinko and

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Wilson (2010) report that the first job creation tax credit was adopted in 1993 and that by 2009, 24 states had such a credit. Regardless of which citation is correct, the evidence shows that states have become increasingly aggressive in using the tax system to provide incentives for job creation.

APPLICATIONS FOR PRACTICE

- The mimicking behavior found in the adoption of Film Production Tax Incentive (FPTI) suggests that in evaluating whether to adopt a tax incentive it should be assumed that other states are likely to also adopt a similar program.
- While economic considerations may be relevant in the decision to adopt tax credit programs, political or lobbying forces may override economic factors
- Policy makers appear to be more confident about experimenting with policy innovations such as FPTIs when their economies are in a fiscally sound environment.

Over the last 20 years, states have adopted a new tax incentive, one focused on film production. Louisiana adopted the first state tax incentive program for film production in 1992, and by 2009 such tax incentive programs had expanded to 44 states plus the District of Columbia. Table A1 lists the states with film production tax credit programs as of 2009 along with their adoption date. Between 1992 and 2002, only six states adopted such an incentive program, but between 2004 and 2009, at least five states adopted a film production incentive program each year, with 2006 being the peak year when 10 states adopted an incentive program.

This raises the relevant question, why did states adopt film production tax incentives (FPTI) and what explains the pattern of adoption? Since the diffusion of film production incentives is a fairly recent phenomenon, it has not yet been previously studied. The current literature on FPTI consists largely of think tank reports examining trends in the adoption of FPTI and the impact of these fiscal incentives on state finances. However, there is yet to be systematic modeling of *why* states adopted FPTIs. The common explanation has been conjectural—that they are for the purpose of economic development.

To address the question of why states adopt FPTI, we develop a theoretical framework of the adoption of FPTI. We then test the implications of that framework by estimating a Cox proportional hazards model of FPTI adoptions. The empirical results provide support for several of the hypotheses derived from the framework, although several of the estimated hazard ratios are statistically insignificant. The paper provides a theoretical framework for analyzing states' adoption of FPTI and is the first to study the adoption of FPTI. The paper also contributes to the broader literature on the adoption and diffusion of state fiscal and economic policies.

Film production tax incentives generally take the form of income tax credits equal to a percentage of in-state expenditures on film production.[1] The principal differences across states in FPTI programs are in what expenditures are eligible, what kind of projects are eligible, the credit percentage, the options for utilizing the credits, and limitations on the aggregate amount of tax credits allowed in a given year. Most states with film tax credits offer credits of 20–30 percent of eligible expenditures, although there are some states with credit rates of 15 percent. In addition to providing an overview of the credits for each state and a link to each state's film office, Film

1. Links to details regarding the film tax credits can be found at http://www.filmproductioncapital.com/index.html

Production Capital ranks each state's film tax credit, from zero stars to five stars (best); we note each state's ranking in Table A1.

To provide some understanding regarding the structure of FPTI programs, we summarize the tax credit program for three states (Georgia, Maryland, and Tennessee), which have different Film Production Capital rankings. Georgia adopted its film tax credit in 2005. Currently, Georgia allows a transferable tax credit of 30 percent;[2] a third of which is for embedding a Georgia logo on approved projects or some other acceptable marketing activity. Since it is quite easy to provide a qualified promotion, the credit rate is essentially 30 percent for films. There is no aggregate cap on the amount of tax credit that can be issued. The Film Production Capital gives Georgia's film credit program five stars, and notes that the 30 percent uncapped credit is one reason. In addition, Film Production Capital notes that there is good vendor and crew depth largely as a result of the fact that Georgia was a regional production hub before it passed its tax incentive program. Furthermore, Georgia's $500,000 per person salary cap does not apply to the production's principal talent employees.

Since its adoption, the Georgia tax credit increased from an initial base credit of 9 percent, plus an additional 3 percent if the activity took place in a less developed Georgia county and an additional 2 percent if the base expenditures in the state exceeded $20 million. Tax credits are available for qualifying projects, including feature films, television series, commercials, music videos, animation, and game development. Animation and game development projects were added since 2005. As with most states, it takes a minimum of $500,000 in spending in Georgia on the project to qualify for a tax credit, but both resident and non-resident workers' payrolls qualify.

According to the Georgia Department of Economic Development (n.d.), in fiscal year 2014, there were 158 feature film and television productions in Georgia. The economic impact in fiscal year 2014 of the industries covered by the film tax credit is reported to be $5.1 billion. It is estimated that the tax credit cost the state $120 million in revenue in FY 2014 (Fiscal Research Center 2014).

Maryland's film tax credit program is given two stars by Film Production Capital. Maryland offers a 25 percent refundable tax credit of direct expenses incurred in-state for films and a 27 percent credit for television projects. The production firm must include a closing credit acknowledging the Maryland Film Office. The firm must spend at least $500,000 in Maryland and at least 50 percent of the filming must occur in Maryland. The major limitation of the Maryland film tax credit is that the total annual credit for any firm is capped, currently at $7.5 million, and thus the maximum expenditures that can receive a credit in a given year is $30 million for films.

Film Production Capital gives Tennessee's film tax credit program only one star. Since Tennessee does not have an income tax, the program is actually a grant equal to 25 percent of resident wages and in-state vendor payments, with a cap of $250,000 per resident. Grants can be taken for feature films, television episodes, television pilots, and (national) television

2. If a firm has no state income tax liability from which to deduct the tax credits, the firm can either deduct the credits from its state personal income tax withholding liability or sell or transfer the tax credits to another Georgia taxpayer (Wheeler 2011).

commercials. Firms must spend at least $200,000. The aggregate grant amount for the entire FPTI program is subject to annual appropriation by the state legislature, and has varied over time.

To provide a perspective on why states adopted film production incentive programs, we start with a brief review of the economic history of the U.S. movie industry.[3] In the early 20th century film production moved west to Los Angeles, a migration that has been attributed to climate (due in part to coal rationing during World War I and the number of sunny days), topography (particularly for shooting Western films), and economic concerns (lack of unions and cheaper real estate) (Lukinbeal 2002). The result was that Hollywood developed an extensive agglomeration of firms and workers associated with the film industry, giving Hollywood a significant competitive advantage over other locations for film production.

Beginning in the 1980s there has been much geographic decentralization of film-shooting activities, with two major factors driving this geographic decentralization. The first was the desire of film producers to find locations that were less costly, driven in part by the growth in television movies and the breakup of the vertically-integrated studio system. The latter led to the rise of independent production companies which were less wedded to the Hollywood locations of major studios; in 1980, 70 percent of feature films were released by the major studios, but by 2000 that had fallen to 41 percent (Scott 2002). The second factor includes the innovations in the generation, storage, and transmission of audiovisual content, the invention of mobile cameras and recording devices, and the new ability to separate various parts of film production. The effect was to make film production much more geographically mobile, leading to a significant increase in on-location filming. Because on-location filming became a much more regular event, many states in the early 1980s set up a film commission whose role is to promote the state's location to film producers. The increased mobility of film production provided an opportunity for states to compete for these film shootings, and as a result state (and foreign) governments begin to provide subsidies to film producers.

As some states have become home to more film productions, they have developed a concentration of workers, businesses, and services that are important to film producers, thereby increasing the attractiveness of these states to film producers. However, while the number of feature films that are shot at locations outside of Los Angeles and New York has increased, their share of features is only between 10 and 15 percent; the bulk of movies are still shot in Hollywood and New York (Lukinbeal 2004).

There is a sizable literature on the economics of the film industry (McKenzie 2012), but studies of the film production tax incentive programs have focused on measuring the benefits and costs of film tax credit programs.[4] There have been no studies that have attempted to explain the adoption of film production tax credits.

We identified two papers that explore the adoption of state economic development incentives. Grady (1987) explores the motivations behind states' competition in providing business

3. For a more complete economic history of film production, see Lukinbeal (2004) and Scott (2002).

4. A list of studies of film tax credits can be found at http://www.denniskintigh.com/film_subsidy.html

inducements. He suggests three possible explanations, weak economic conditions, strong policy subsystems, and diffusion mechanisms (that is, the extent to which neighboring states have adopted incentives). Grady uses a bivariate approach to test these three hypotheses and finds that states enact incentive programs in response to competition within their region but not in response to unemployment or to interest group pressure.

Miller and Richard (2010) consider state adoptions of research and development (R&D) credits. They argue that adoption will depend on the need for economic development, political factors, tax level, and the extent of adoption of R&D credits among states that are neighbors or competitors. Using event history analysis they find that the first three factors play a role, but that competition among other states does not, a result that is contrary to the findings of most other studies of the adoption of state policies.

The rest of the paper proceeds as follows. In the next section we present a theoretical framework of state adoption of FPTI programs. In section Empirical Model And Data, we discuss our approach to the empirical analysis and the data that we use. The empirical results are contained in section Results. A summary and conclusion section completes the paper.

THEORETICAL FRAMEWORK

This paper is related to a lengthy literature exploring the diffusion of state policy innovations.[5] The factors that are thought to affect the adoption of a policy innovation can be divided into two groups, factors that are internal to the state and diffusion (Berry and Berry 1990). The internal determinants include the motivation to adopt the policy, challenges to adoption, and the resources to overcome these challenges (Mohr 1969, p. 114). Boushey (2012) draws on Baumgartner and Jones's (2009) Punctuated Equilibrium Theory to analyze the pattern of diffusion for several policy innovations across the United States. Boushey (2012) notes that among the factors that affect the rate of diffusion are attributes of the policy itself—these include the salience, complexity, and level of public support for the associated policy issue. The diffusion of an economic policy can be due to policy adoption based on copying or competing behavior by neighboring states (Skidmore, Cotti, and Alm, 2013). We incorporate these forces into a theoretical framework of film production tax incentive program adoption.

We assume that the probability that state s will adopt a film production tax incentive (FPTI) at time t, denoted P_{st}, can be expressed as $P_{st} = P(\mathrm{NB}_{st}, X_{st}, S_t)$, where NB is the net benefit

5. Among the policy adoptions that have been considered are: state lotteries (Alm, McKee, Skidmore 1993; Berry and Berry 1990), tax amnesties (Le Borgne 2006), gasoline tax (Berry and Berry 1992), ethanol subsidies (Skidmore, Cotti, and Alm 2013), adoption of the personal income tax (Aidt and Jensen 2009), local option sales taxes (Burge and Piper 2012), fair employment legislation (Chen 2001), prepaid tuition and savings plans (Doyle, McLendon, and Hearn 2010), charter schools (Zhang and Yang 2008), term limits (Scott and Bell 1999), R&D investment tax credit (Miller and Richard 2010), and enterprise zones (Jolley 2010).

from adopting a FPTI program, X is a set of economic, fiscal, social, and political features of the state, and S is the number of other states that have adopted a FPTI program. Within the historic context presented above and to motivate the empirical analysis, consider the following simple theoretical framework of the net benefits from adopting a FPTI program. First, for simplicity, assume that a movie is a well-defined product and that the entire production of a movie takes place entirely in one state.[6] Assume that there are a fixed number of movies that are produced each year, denoted M.[7] Let m_s represent the number of movies produced in state s, so that $\Sigma m_s = M$.

We assume that the cost of producing film f in state s, denoted c_{fs}, differs across states. We also assume that the production cost differs across movies, but the ranking of states by c_{fs} is the same for all movies. We assume that each film has a preferred location characteristic, denoted L_f, while each state has a location characteristic, denoted L_s.[8] The film producer is willing to trade off the quality of location characteristics, that is, $L_f - L_s$, for a lower cost. Let θ denote the subset of states for which c_{fs} is a minimum for any given $L_f - L_s$.

We assume that the choice of location depends only on the differences across states in the cost of production and the location characteristic. Assume that the film producer has a preference function for each film, $F_f = F\left(L_f - L_s, c_{fs}\right)$, such that the film producer will select the state from θ that maximizes F_f. The preference function will differ by film since the desired location characteristic will differ. In general we expect that the larger the cost and the less desirable the location characteristics in a state relative to other states, the fewer movies will be made in that state. Given interstate cost differentials and the location characteristic of states, film producers will allocate the fixed number of movie productions M to the various states. In the absence of any state subsidy, we assume that the choice of location will yield an equilibrium in which $\bar{m}_s$ films are produced in state s, where $\Sigma \bar{m}_s = M$; we assume this is the equilibrium prior to any adoption of FPTI programs.

Consistent with reality we assume that one state, i.e., California, initially dominates the industry. We assume that there are two general types of movies, those that can be shot in a studio, denoted $\mathrm{M^S}$, and those that have to be shot on location because of the need for a certain scenery or climate, denoted $\mathrm{M^L}$. We assume that initially production studios do not exist outside of California, and thus all of the former type of movie are shot in California. As noted above, initially, most movies were shot on the studio lot and thus most of the movies are of the former type. We thus assume that initially the number of the $\mathrm{M^L}$ movies is small.

A state could attempt to attract additional movie productions beyond $\bar{m}_s$, but to do so we assume requires that the state do two things. First, the state has to establish movie industry infrastructure. We need to rule out the possibility that the state could, with no financial consequences, adopt a film subsidy program with no expectation or hope of attracting films. Thus, we assume that there has to be some initial investment such that the state would only adopt

6. This abstracts from the fact that film production consists of several separable steps, such as shooting, post-production, marketing, etc.

7. Essentially we are assuming that state actions do not affect the number of movies produced, only their location.

8. We assume for simplicity that each state has one location characteristic.

the credit if it believed it would attract a sufficient number of new films to make the startup investment worthwhile. Such investment would include a state film office to provide support in identifying locations for filming, obtaining permission to use those sites, acquiring permits, such as for closing streets, maintaining a list of local talent and crew members in the state, etc. In addition, the state would have to market the film subsidy program, evaluate the applications for the credits, audit the accounts of the film producer, etc. We assume that in order to attract any films the state must incur this initial expense, which we denote as E. In addition, there is a constant per film administrative expense beyond the film subsidy, denoted e. We assume that E and e are equal across states.

Second, the state has to provide a film subsidy to overcome the higher cost of filming in the state or the less desirable location characteristic. We assume that the state does this by providing a tax credit per film equal to some percentage of c_{fs}, denoted R_s. Note that R_s can differ across states, but within a state it is the same for all films and is provided to all films produced in the state, including $\bar{m}_s$. Given the distribution of interstate cost differences, the more films that the state would like to attract, the larger must be the value of R_s.

Having a film produced in the state will generate benefits to the state, including additional tax revenue, increased employment and tourism, intangible benefits such as any promotion that the state receives from the film, the enjoyment of seeing film stars, etc. The value of these benefits can differ across states. For example, one state may place a larger value on any additional tax revenue, perhaps because of state fiscal problems, or on additional employment, perhaps because of the loss of other jobs. Likewise, intangible benefits such as the enjoyment of seeing movie stars likely differ across income and demographic groups. We assume that the benefits per film are constant but not equal across states; denote the benefits per film in state s as B_s.

The net benefit, denoted NB_s, for state s from establishing a film production tax credit program thus equals

$$\mathrm{NB}_s = B_s m_s - E - e m_s - R_s\left(\Sigma c_{fs} m^*_{fs} + \Sigma c_{fs} \bar{m}_{fs}\right) \tag{1}$$

where m^*_{fs} $\left(\bar{m}_{fs}\right)$ is the number of new (existing) films of type f shot in state s and m_s is the total number of films shot in state s.

Assume that in the absence of internal forces, the state's objective is to maximize net benefit. The state first has to determine whether net benefit is positive for any value of R_s. If E and $\bar{m}_s$ are large, it is possible that it would not be in the state's interest to adopt a film subsidy. Likewise, states with high costs relative to the desirability of their location are less likely to adopt a film subsidy program since these states would have to adopt large film subsidies in order to attract new films.

The additional films that are now produced in the state with the film tax credit program results in a reduction in the number of films being produced in the other states. Thus, other states may now find it advantageous to also adopt a film tax credit program, with states potentially engaging in a bidding war for movie production.

Consider the case of California, for which $\bar{m}_s$ was initially large. Thus, initially, California would be unlikely to provide an incentive since the costs of providing a tax credit for all of the existing films would be very high. However, as other states adopt film tax credits, resulting in a loss of movie production from California, California might adopt a film tax credit as a defensive action. In fact, this is what happened.

Equation 1 has several implications for the adoption of film tax credits. States with very large $\bar{m}_s$ are not likely to adopt a film tax credit early but are likely to adopt a film tax credit as the number of other states with a film tax credit increases, while states with no film production activity are unlikely to adopt a film tax credit since it suggests that there is no state film office and that the state's cost and location characteristics are dominated by other states. States with higher costs are more likely to adopt a film tax credit, unless the costs are very high. States with weak fiscal or economic conditions are more likely to adopt a film tax credit since that means that B is larger. We expect that intangible benefits will differ by state income and demographic characteristics, although we have no a priori expectations regarding the direction of the effects of these characteristics on the adoption of a FPTI. Finally, we also expect the likelihood of adoption to depend positively on the number of neighboring states that have adopted a FPTI and on other factors, which we discuss in the next section.

EMPIRICAL MODEL AND DATA

We use the Cox proportional hazards regression model to model states' time to adoption of FPTIs.[9] The Cox proportional hazards model is a semiparametric model which makes no assumptions about the distribution of the baseline hazard. Whereas the Cox model affords flexibility with respect to the form of the baseline hazard, it does assume that the model's covariates have a multiplicative effect on this hazard (Cleves, Gould, and Gutierrez 2002, p. 113). Following Cleves, Gould, and Gutierrez (2002, p. 113), we define the hazard rate as follows:

$$h(t|\boldsymbol{x}) = h_0(t)\exp(\boldsymbol{x}'\beta)$$

where $\boldsymbol{x}$ is a set of covariates and the distributional form of the baseline hazard ($h_0(t)$) is left unspecified.[10] We can restate this expression as

$$\ln\left(\frac{h(t|\boldsymbol{x})}{h_0(t)}\right) = x'\beta$$

9. We also tried two parametric models: Weibull Accelerated Failure Time and Loglogistic models but due to their stringent requirement for complete distributional specification, with the risk of model misspecification if we are wrong, we have chosen to err on the side of caution by favoring the Cox proportional hazards model instead. We also found that the Cox proportional hazards model fits the data better.

10. The hazard rate is the rate of adoption of a FPTI program at duration t.

where $\left(\frac{h(t|\boldsymbol{x})}{h_0(t)}\right)$ is the relative hazard (hazard ratio). Thus, $\boldsymbol{x}'\beta$ measures how the covariates change the log of the hazard ratio (see Cleves, Gould, and Gutierrez 2002).

We use an empirical model of state policy innovation that includes both internal factors and diffusion, and that is based on our theoretical framework and the existing literature. We take 1992, the year of first adoption (by the State of Louisiana), as the starting point from which to measure the "time to failure" for states other than Louisiana. In other words, we investigate the time it takes states to follow Louisiana's lead in adopting a FPTI program.

We use a panel data set for all 49 states other than Louisiana covering the period 1992–2010. Each state remains in the data set so long as it is at risk of "failure," that is, of adopting the FPTI. Once a state has adopted a FPTI program, it is no longer at risk of experiencing this event and, as such, drops out of the data set. This results in an unbalanced panel of sample size 691. Because there are many tied failures, we use the exact-marginal method to calculate the conditional probability of tied failures.

Our prior discussion suggested that there are four possible sets of factors that might explain the adoption pattern of film tax credits: 1) states might mimic other states, and in particular "neighboring" states; 2) factors associated with the film industry as suggested by the theoretical framework; 3) factors associated with economic and fiscal stress; and 4) factors associated with intangible benefits. Other studies suggest that political and demographic factors are potentially relevant. Since the adoption of a FPTI is likely driven by factors for the prior year, all of the independent variables, with the exception of the two political variables, are lagged 1 year. Since the political variables are expected to have a contemporaneous effect on the decision to adopt we did not lag them.

The theoretical framework presented in section Theoretical Framework, and the theory of policy diffusion, implies that the probability that a state adopts a film tax credit depends on the existence of a FPTI in neighboring states. Following Case, Hines, and Rosen (1993), we define a neighbor as a state that is similar to the state being considered. To do so, we identify a "neighbor" as a state with a similar film employment to total private sector employment ratio in 1992.[11] In particular, we consider a state a neighbor if its film employment to total private sector employment ratio is within some "distance" of the film employment to total private sector employment ratio of the home state. We measure distance as five times the variance of 1992 film employment to total private sector employment ratios for all states except for California and New York, which were outliers in the data set.[12] This process of determining neighbors resulted in states having up to 11 neighbors but left Georgia, Hawaii, Minnesota, and Vermont with no neighbors. The two outliers, California and New York were defined to be each other's only neighbor. We create the variable denoted *N-Adopt*, which equals the percentage of the state's "neighbors" with a FPTI program in that year.

11. We do not change the definition of neighbor as film employment changes since employment change could be due to the adoption of a FPTI.

12. We tried values of 2, 3, 5, and 10 times the variance. The first three values produced the same set of neighbors for each state. The last value for *a* defined an unreasonably large set of neighbors for many states.

To measure the importance of the movie industry in the state, we use employment in motion picture and video production as a percentage of state private sector employment, denoted *FilmEmp*. As implied by the framework presented above, we expect that states with little employment or with substantial employment in that industry will be slower to adopt a FPTI program. As implied by equation 1, states with no current movie production are likely to be states with either high cost or an undesirable location characteristic, while states with significant movie production activity, for example California, are not likely to adopt a film tax credit since the credit would have to be provided for the existing production activity. However, it is possible that the current employment in the film industry could be a lobbying force for the adoption of a film tax credit, implying that larger initial film industry will lead to early adoption of a film tax credit.

The theoretical framework suggested that a higher cost of film production would lead a state to adopt a film credit in order to compete with states with lower costs. However, states with very high cost are less likely to adopt a FPTI since the size of the credit necessary to make the state competitive will be very high. To reflect interstate cost differences we use the average real wage in manufacturing, denoted *MfgWage*.

We control for the size of the state's population in log form (denoted *LogPop*) and real per capita income, denoted *Inc*. We expect that larger states would be better able to finance the fixed costs associated with FPTI and may be more likely to have desirable film locations, both of which are expected to increase the likelihood that a state will adopt a FPTI program. The effect of per capita income could increase or decrease the time to adoption. As noted above, one of the potential benefits of filming in a state are the intangible benefits, such as watching movie stars. If such intangible benefits make filming a "luxury" good, then states with higher income would adopt FPTI programs more quickly. However, it is also possible that filming is an activity that is more highly desired by lower income households, and thus lower income states would be faster to adopt.

We argued that the value of the benefits from additional films would be positively related to negative economic conditions and the level of fiscal stress faced by the state. We capture economic stress using the percent change in state real per capita income (denoted *ChInc*) and the percent change in state population (denoted *ChPop*). We measured fiscal health (denoted *FisChange*) as the per capita difference between forecasted general fund revenue and actual revenue.[13]

Adopting a film tax credit obviously requires approval by the state government. On the assumption that such approval will be easier if both houses and the governor are Republican, we include a dummy variable (denoted *Republican*) equal to one if the Republican Party controls both houses and the governor's office. Moreover, the state's election cycle is hypothesized to have an effect on the timing of policy adoption; as such, we include a dummy variable (denoted *GovElect*) equal to one in years of gubernatorial elections.

We also suggest that a state might be more favorably disposed to using this new instrument if it has previously adopted similar instruments. As such, we include a count of the number of the

13. We thank Robert Buschman, who graciously provided his calculations of fiscal health, as well as the *Republican* dummy variable.

following three other tax incentives that were already in existence within the state: job tax credit, investment tax credit, and research and development tax credit; this variable is denoted *Credits*.[14]

We control for two demographic variables that may reflect the acceptability by voters of adopting a film tax credit. In particular, we include percent over 65 years of age (denoted *Over65*) and percent with a college degree or more (denoted *College*). Table A2 provides descriptive statistics and the data sources.

RESULTS

In the interest of space we do not present the Kaplan–Meier survival graph, but note that it is concave, and tracks the rate of adoptions as shown in Table A1. We conducted a series of diagnostic checks including the link test for model specification. The *p*-value on the squared linear predictor is 0.252, and thus we cannot reject that the model is correctly specified. We tested the proportional hazards assumption in two ways. First, we interacted each covariate individually with analysis time. In the second test, we interacted each covariate individually with the natural log of analysis time. Across both tests, the smallest p-value for any of the interaction terms was 0.154, indicating statistical insignificance, as did the joint tests for significance. Thus, we cannot reject that our assumption of proportional hazards holds.

Table 1 presents the Cox regression results. Column one contains the results from our main specification. We report "exponentiated coefficients," i.e., the hazard ratios, which are interpreted as the change in the relative hazard for a one unit increase in the covariate, holding the other variables in the model constant. A hazard ratio greater than one indicates an increase in the hazard of failure, hence shorter time to failure (that is, to adoption of a FPTI) and a hazard ratio less than one indicates reduced relative hazard and hence longer survival time.[15]

The hazard ratio for *N-Adopt*, i.e., the percentage of comparable "neighbor" states that have adopted a film tax credit is greater than one (1.017). This result indicates that for a 1 percentage-point increase in the percentage of a state's neighbors that have adopted a FPTI, the hazard of failure increases by 1.7 percent.[16] The median number of neighbors is six, so if one neighbor adopts a FPTI, the increase in the percentage of neighbors with a FPTI is 16.7 percentage points, and thus the hazard increases by 16.9 percent. This neighbor effect is statistically significant at the 10 percent significance level. These results imply that states were mimicking "neighbor" states in adopting their film tax credit, which is consistent with our expectation.

14. We thank Robert Chirinko and Daniel Wilson who kindly provided their data on job tax credits.

15. The hazard ratio equals the log of the coefficient. Statistical significance is a test of whether the hazard ratio differs from 1, which is equivalent to the coefficient being statistically different from zero, either positively or negatively.

16. Because the effect on the hazard ratios is nonlinear, a 10 percentage-point increase in *N-Adopt*, holding the other variables in the model constant, would result in an 18.0 percent increase in the hazard of adopting a FPTI.

The theoretical framework of film tax credit adoption suggested that states with little employment in the industry would be less likely to adopt a film tax credit, while states with large employment would delay adopting a film tax credit. Thus, the effect of *FilmEmp* could increase or reduce the relative hazard. The hazard ratio for *FilmEmp* is less than one, meaning that an increase in the share of film industry employment in total private sector employment lowers the hazard of adoption. The size of the hazard ratio is consistent with the story that states with large film employment are likely to delay adoption of a FPTI program. However, the hazard ratio has a very large standard error. Since the theoretical framework suggested that states with either little or substantial film activity will be slower to adopt a FPTI program, we created a dummy variable equal to one if the *FilmEmp* was greater than the mean of the variable and interacted it with *FilmEmp*. When we include *FilmEmp* and the interaction term in the regression the results are consistent with the hypothesis that increases in *FilmEmp* when *FilmEmp* is small (large) increases (reduces) the speed of adoption, but since neither of the hazard ratios is statistically significant at traditional levels and that they are very highly correlated, we do not report these results.

The theoretical framework suggested that a higher cost of film production would lead a state to adopt a film credit in order to compete with states with lower costs. To measure cost we used *MfgWage*. The hazard ratio for *MfgWage* is below one, contrary to our expectation; however, the result is not statistically significant.

The hazard ratio for the log of population, *LogPop*, is greater than one and statistically significant. This is consistent with our expectations that larger states would be more likely to adopt early since they are better able to cover the fixed costs and may have more film locations.

As discussed above, we suggested that higher real per capita income, *Inc*, could increase or slow the speed of adoption. The hazard ratio for *Inc* is just below 1, indicating that increases in income reduce the hazard of adoption. For instance, a $1,000 increase in real per capita income translates to a 19.1 percent decrease in the hazard of adoption. This result is statistically significant and is consistent with the hypothesis that the intangible benefits of filming are higher for lower income households.

We suggested that if the state was suffering economic stress or fiscal stress then it would be more likely to adopt a film tax credit. The hazard ratio for the percent change in per capita income, *ChInc*, is greater than one, which is inconsistent with our expectation that smaller income growth would speed up adoption, but this result is statistically insignificant. The second economic stress variable is the percent change in population, *ChPop*. The hazard ratio is less than 1, which implies that smaller (larger) population growth will increase (reduce) the speed of adoption, which is consistent with expectations, but the hazard ratio has a very large standard error.

We measure the state's fiscal health, denoted *FisChange*, by the per capita difference between forecasted general fund revenue in a given year less actual revenue in the previous year so that higher values on this variable indicate less fiscal stress or better health. The hazard ratio for *FisChange* is unexpectedly larger than one and statistically significant. The hazard ratio suggests that for a $1 per capita improvement in fiscal health, the hazard of adoption increases by 0.4 percent, so that time to adoption is shortened.

TABLE 1
Results of Cox Proportional Hazards Model

	Hazard ratios								
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Variables	**Base regression**	**Border neighbors**	**% Border neighbors**	**Total film employment**	**Drop high wage states**	**Change in total revenue**	**Change in tax revenue**	**Change in federal revenue**	**Add urban and white**
$N\text{-}Adopt_{t-1}$	1.017[a] (1.95)			1.016[a] (1.86)	1.021[b] (2.23)	1.016[a] (1.83)	1.016[a] (1.91)	1.017[a] (1.93)	1.016[a] (1.83)
$B\text{-}Neighbors_{t-1}$		0.799 (−1.05)							
$PC\text{-}Neighbors_{t-1}$			0.978[b] (−2.15)						
$FilmEmp_{t-1}$	0.305 (−0.92)	0.113[a] (−1.74)	0.102[a] (−1.83)		0.288 (−0.95)	0.408 (−0.74)	0.372 (−0.81)	0.392 (−0.77)	0.378 (−0.74)
$TotFilmEmp_{t-1}$				1.000 (−1.35)					
$MfgWage_{t-1}$	0.957 (−0.42)	0.911 (−0.88)	0.888 (−1.12)	0.941 (−0.58)	1.267 (1.40)	0.941 (−0.60)	0.954 (−0.46)	0.943 (−0.58)	0.984 (−0.14)
$LogPop_{t-1}$	1.933[c] (2.77)	2.228[c] (3.56)	2.329[c] (3.67)	2.027[c] (3.06)	1.990[c] (2.63)	1.448[a] (1.86)	1.488[a] (1.89)	1.430[a] (1.77)	1.539 (1.39)
Inc_{t-1}	1.000[b] (−2.42)	1.000[b] (−2.24)	1.000[b] (−2.33)	1.000[b] (−2.35)	1.000[b] (−2.23)	1.000 (−1.34)	1.000 (−1.45)	1.000 (−1.32)	1.000[c] (−2.67)
$ChInc_{t-1}$	1.039 (0.29)	1.020 (0.16)	1.036 (0.27)	1.033 (0.25)	1.050 (0.35)	1.111 (0.90)	1.059 (0.47)	1.079 (0.63)	1.050 (0.37)
$ChPop_{t-1}$	0.857 (−0.51)	0.869 (−0.47)	0.863 (−0.50)	0.828 (−0.61)	0.858 (−0.46)	0.719 (−1.13)	0.770 (−0.92)	0.762 (−0.94)	0.814 (−0.60)
$FisChange_{t-1}$	1.004[c] (2.90)	1.003[c] (2.80)	1.003[c] (2.67)	1.004[c] (2.92)	1.003[c] (2.66)				1.004[c] (2.97)
$ChRev_{t-1}$						1.049[c] (2.97)			
$ChTaxRev_{t-1}$							1.025 (0.77)		
$ChFedRev_{t-1}$								0.999 (−0.07)	
$Republican_t$	0.663 (−0.96)	0.588 (−1.21)	0.619 (−1.09)	0.648 (−1.01)	1.066 (0.13)	0.674 (−0.94)	0.724 (−0.78)	0.737 (−0.74)	0.769 (−0.60)
$GovElect_t$	0.673 (−0.70)	0.587 (−0.96)	0.629 (−0.82)	0.664 (−0.72)	0.905 (−0.17)	0.707 (−0.61)	0.709 (−0.63)	0.721 (−0.60)	0.669 (−0.70)
$Credits_{t-1}$	0.904 (−0.55)	0.871 (−0.76)	0.841 (−0.97)	0.901 (-0.57)	1.087 (0.43)	0.886 (−0.65)	0.878 (−0.73)	0.887 (−0.68)	0.920 (−0.44)
$Over65_{t-1}$	1.233[a] (1.67)	1.198 (1.49)	1.195 (1.53)	1.219 (1.58)	1.188 (1.23)	1.054 (0.42)	1.066 (0.50)	1.043 (0.32)	1.275[a] (1.83)
$College_{t-1}$	1.263[c] (2.67)	1.220[b] (2.34)	1.219[b] (2.41)	1.257[c] (2.62)	1.190[a] (1.89)	1.112 (1.49)	1.130[a] (1.65)	1.117 (1.50)	1.299[c] (2.84)
$Urban_{t-1}$									1.011 (0.52)
$White_{t-1}$									0.970 (−1.28)
Observations	691	691	691	691	597	691	691	691	691
Log-likelihood	−79.90	−81.14	−79.34	−79.22	−69.29	−81.60	−85.70	−85.98	−78.53

[a] $p < 0.10$.
[b] $p < 0.05$.
[c] $p < 0.01$.
z-statistics in parentheses.

A possible explanation for the unexpected results for *ChInc* and *FisChange* is that states see FPTI programs as a "luxury" and adopt them in good economic and fiscal times. In other words, states do not appear to consider FPTI programs as short-run economic development tools, but perhaps alternatively as a way of generating intangible benefits such as good feelings and publicity.

Regarding political factors, we hypothesize that a state that was controlled by Republicans would be more inclined to adopt a film tax credit. However, the hazard ratio for *Republican* is less than 1, suggesting that Republican-controlled state governments had a 33.7 percent lower hazard of adopting a FPTI than non-Republican-controlled state governments. This result is contrary to expectations, but the coefficient is statistically insignificant. We also included *GovElect*, to capture the political climate. The hazard ratio for the political climate variable is also less than 1 and statistically insignificant.

We also thought that states that had previously adopted other economic development tax credits would be likely to adopt a film tax credit more quickly. To measure this we created *Credits*. However, the hazard ratio for *Credits* is smaller than one but statistically insignificant. We also included, separately, dummy variables for the existence of each of the three credit programs; none of the hazard ratios for the dummy variables was statistically significant. Since they were not statistically significant and none of the other coefficients were materially affected, we do not report the results.

Finally, we include two demographic control variables: the percentage of the population over 65, denoted *Over65* and the percentage of the population with at least a college degree, denoted *College*. The coefficients on *Over65* and *College* are greater than one and statistically significant. We had no expectations regarding the value of the hazard ratios for these variables.

We also tried several alternative specifications—the results are shown in the remaining columns of Table 1.[17] We measure neighbors with FPTI programs in two alternative ways (columns 2 and 3). We measure the number and also the percentage of border states with a film tax credit, denoted *B-Neighbors*, and *PC-Neighbors*, respectively. Both alternative measures of neighbor have the unexpected effect of lowering the hazard of adoption. However, only the percentage measure attains statistical significance. The implication is that states look to similar states, not necessarily border neighbors, in considering the adoption of FPTI programs. In both alternative specifications, *FilmEmp* gains statistical significance while *Over65* loses statistical significance compared to the results in the original model. With the exception of *FilmEmp* and *Over65*, the two alternative specifications both produce results in terms of the hazard ratios on the other variables that are qualitatively similar to the results from the original specification.

FilmEmp was measured as the percentage of total employment in the film sector. As an alternative we used the total employment in the film sector, denoted *TotFilmEmp* (Table 1 column 4). This measure of film industry size has a negligible negative effect on the hazard of adoption and was statistically insignificant. Using this alternative measure of film industry size also resulted in *Over65* losing statistical significance.

As noted above the hazard ratio for *MfgWage* is below 1, contrary to our expectation. We suggested that if a state's cost were very high, it would be less likely to adopt a FPTI. To explore

17. The reported hazard ratios for *Inc* are 1.000 in all of the model, but they do differ beyond the third decimal place.

this we excluded the six states with the highest *MfgWage* in 1993 (Ohio, Washington, Michigan, Indiana, Delaware, and New Jersey). Table 1, column 5 shows that the resulting hazard ratio for *MfgWage* is now greater than one, but remains statistically insignificant.

We use several alternative variables to measure fiscal health (Table 1 columns 6, 7, and 8), including 1) the annual percentage change in total revenue, denoted *ChRev*, 2) annual percentage change in tax revenue, denoted *ChTaxRe*v, and 3) annual percentage change in federal revenue, denoted *ChFedRev*.[18] The hazard ratio for *ChRev* is greater than one and statistically significant, consistent with the results using *FisChange*. The only change from the results using *ChRev* is that the hazard ratios on *Over65* and *College* are no longer statistically significant. The other two alternative measures of fiscal health had effects that were similar to those of the first alternative, however, neither of these measures is statistically significant.

We considered two additional control variables, the percentage of the population that is urban and the percentage of the population that is white (Table 1 column 9). We expect that percent urban is associated with larger intangible benefits and a larger number of desirable film locations, and thus expect the hazard ratio to be greater than one. The coefficient on percent urban is greater than 1, but statistically insignificant. The coefficient on white is less than 1 and statistically insignificant. We had no expectations regarding the value of the hazard ratio for percent white. Including percent urban and percent white causes the coefficient on *LogPop* to become statistically insignificant; however, if we exclude *LogPop*, percent urban becomes statistically significant, a result due no doubt to multicollinearity.

SUMMARY AND CONCLUSIONS

We have considered the time to adoption of state film production tax incentives using a unified model of state innovation that includes both state characteristics and external determinants. The inclusion of external determinants allowed us to model the dynamic pattern of adoption in such a way as to explore the possibility of any diffusion mechanisms that may have been at play. Louisiana was the first state to adopt a FPTI in 1992, after which there was a break of several years before adoptions spread across the states. By 2009, 44 of the states had adopted a FPTI.

We developed a simple theoretical framework in which to consider the factors that might affect the time to adoption of a film tax credit, and tested this framework in an empirical model. The results are supportive of several of the hypotheses, with the direction of the effects of several variables being consistent with our expectations, although not all of the hazard ratios are statistically significant. The results are robust to alternative measures and operationalization of the key variables. The empirical analysis suggests that, consistent with expectations, neighbors' adoption of a FPTI is a significant factor in the timing of adoption by a state. The pattern and timing of adoption does, in fact, reflect a mimicking or beggar-thy-neighbor policy.

Our main measure of fiscal health produced results which showed that the fiscal health variable was a factor in states' time to adoption of a FPTI, but rather than hastening the adoption process for

18. These indicators were constructed using the Government Finance data from the Census Bureau.

states experiencing stress, it hastened the process for healthier states. One possible explanation for this result is that filming is a "luxury good," that is affordable only to states that are fiscally sound, given the potential costs and initial forgone revenues associated with tax incentive programs. However, the extent to which per capita income reflects fiscal health, the fact that the hazard ratio for income is less than one is inconsistent with this explanation. However, the hazard ratio on income is consistent with intangible benefits being higher for lower income households. Several of the variables that reflect the film industry had hazard ratios that were consistent with the theoretical framework, although not all of the hazard ratios were statistically significant.

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APPENDIX

TABLE A1
Adoption Years of State Film Incentive Program

State	Year adopted[a]	Stars awarded[b]
Louisiana	1992	5
Hawaii	1997	3
Minnesota[c]	1997	1
Missouri	1999	0
Virginia[d]	2001	2
New Mexico	2002	3
Florida	2004	3
Illinois	2004	3
Mississippi	2004	3
Pennsylvania	2004	4
South Carolina	2004	3
Georgia	2005	5
Montana	2005	1
New Jersey	2005	2
Oklahoma	2005	2
Oregon	2005	2
Rhode Island	2005	3
Utah	2005	3
Arizona	2006	0
Colorado	2006	1
Connecticut	2006	3
Maine	2006	1
Massachusetts	2006	4
North Carolina	2006	1
South Dakota	2006	0
Tennessee	2006	1
Washington	2006	2
Wisconsin	2006	0
District of Columbia	2007	1
Iowa	2007	0
Kansas	2007	0
New York	2007	3
West Virginia	2007	3
Wyoming	2007	2

(*continued*)

TABLE A1 (Continued)

State	Year adopted[a]	Stars awarded[b]
Alaska	2008	4
Idaho	2008	0
Indiana	2008	0
Kentucky	2008	2
Maryland	2008	2
Michigan	2008	3
Alabama	2009	3
Arkansas	2009	2
California	2009	1
Ohio	2009	3
Texas	2009	3

[a]Luther (2010).
[b]Film Production Capital, http://www.filmproductioncapital.com/ accessed March 19, 2015.
[c]Minnesota program was repealed in 2002 but re-acted in 2006.
[d]Although Virginia passed an incentive program in 2001, it was not funded until 2006.

TABLE A2
Variables and Data Sources

Variable	Description	Mean	Standard deviation	Min	Max	Data source
N-Adopt	Percent of neighbors (similar film industry size) with a film tax credit	6.848	16.082	0	100	Tax foundation
FilmEmp	Film industry employment as a percent of total private sector employment	0.072	0.144	0	1.07	Bureau of Labor Statistics and County Business Patterns
MfgWage	Average real wage in manufacturing	17.673	2.043	13.33	25.12	Bureau of Labor Statistics
LogPop	Log of population	15.001	1.051	13.037	17.406	Bureau of the Census
Inc	Per capita income	34327.81	5565.067	22012.5	53634.6	Bureau of Economic Analysis and Bureau of the Census
ChInc	Percent change in per capita income	1.538	2.002	−4.2	9.43	Bureau of Economic Analysis and Bureau of the Census
ChPop	Percent change in population	1.170	0.951	−0.51	6.24	Bureau of the Census
FisChange	Per capita difference between forecasted general fund revenue in year *t* less actual revenue in year *t*-1	54.873	157.442	−1013.98	2033.1	National Association of State Budget Officers; calculations for 1999–2010 were provided by Robert Buschman
Republican	Dummy variable equal to one if the Republican party controls both houses and the governor's office	0.230	0.421	0	1	Compiled by Robert Buschman from several sources, including Dubin (2007), NCSL, the statistical abstract, and various state legislative, and elections websites

(*continued*)

TABLE A2 (Continued)

Variable	Description	Mean	Standard deviation	Min	Max	Data source
GovElect	Dummy variable equal to one if there is a gubernatorial election in a particular year and zero otherwise	0.258	0.438	0	1	2013 Book of the States, Council of State Governments
Credits	Count of the number of the following other tax incentives that were already in existence within the state: job tax credit, investment tax credit, and research and development tax credit	1.013	0.982	0	3	Job tax credits:Chirinko and Wilson (2010); investment tax credits and R&D credit: Wilson (2007)
Over65	Percent of population over age 65	12.493	1.980	4.2	18.6	Bureau of the Census
College	Percent with a college degree	22.89	4.512	12.54	35.73	Bureau of the Census