

Analyzing the Effect of Film Production Tax Incentive Programs on Location Representation in the American
Film Industry

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Introduction

The 2016 movie *Moonlight* won three Oscars (including Best Picture) and grossing \$67 million dollars off of a \$4 million budget (*Moonlight 2016*). It also broke barriers in representation as both the first LGBT film and the first movie with an all-black cast to win Best Picture. One uncommon form of representation is that *Moonlight* was both set and filmed in Miami. A lot of movies produced in recent times are filmed in one state and set in another. One of the primary reasons for this phenomenon of films being produced in one state and set in another is the tax incentives that states provide to film productions. These incentives let production companies write off some amount of their production budget, effectively making filming in certain states significantly cheaper. Examining tax incentive programs can provide a look at how production locations are determined in the film industry. This literature review will discuss the spread and efficiency of state tax incentives for film productions in the U.S.

Adoption Rate of Film Tax Incentives by States

State film tax incentives involve a variety of cost-saving measures: reduced income taxes, exemption from lodging and sales taxes, partial refunds for the cost of employing in-state workers, etc. (Hall, Bandyopadhyay, and Mowat 2015, 164). “Film tax incentives” in this paper refer to a package of different cost-saving measures film productions can receive for filming in a particular state. Louisiana was the first state to adopt film tax incentives in 1992, with 39 states having some film tax incentive program by 2014 (Hall, Bandyopadhyay, and Mowat, 164). Interestingly, Sewordor and Sjoquist (2016) placed this number at 44 states (plus Washington D.C), in 2009, which shows that some states have removed their film tax incentive programs between 2009 and 2014 (6).

Sewordor and Sjoquist (2016) created a theoretical framework to predict when a state might adopt film tax incentives. The model they created accounts for the net benefit of the incentives, a plethora of indicators that describe the economic culture of the state, and the number of other states that have enacted similar programs (Sewordor and Sjoquist, 10). As well, the authors accounted for the preferences of filmmakers, such as lower costs and the physical characteristics of a place to predict how many films will locate their production in a state. From their results, the authors surmised that a state is more likely to adopt film tax incentives if a neighboring state with a has previously adopted similar incentives (19). For example, if Oklahoma had recently adopted a film tax incentive program, Kansas would be more likely to adopt a similar program in the future. States seem to be reactionary rather than proactive in the adoption of these policies, starting with larger states that can cover the startup costs of these programs and spreading year-by-year to surrounding states trying to stay competitive in the film production industry.

Stephanie Leiser (2017) corroborated Sewordor and Sjoquist’s findings using a mixed-methods study, meaning she studied this issue both qualitatively and quantitatively. Through interviews, the history of film tax incentives provided the qualitative side, discussing how these policies spread through the U.S. One of the interviewees, when asked about competition between states, said, “If you’re not on the top of these incentives—if you’re not the best state—then you might as well not be in the business” (258-259). This means that states do not strongly consider the geographical neighbors so much as they care which states have the strongest incentive programs. As Leiser stated, “the coefficient for the neighbor’s variable suggests that increased adoptions among neighbors reduce the hazard of adopting film incentives” which means that states are less likely to adopt film tax incentive programs if neighboring states have already enacted their own film tax incentives. The other main factor in adopting the film tax incentive programs was the size of the state’s currently existing film industry (Leiser 2016, 263; Sewordor and Sjoquist 2014). Leiser posited that this is partially due to the connections that

state officials make from film productions. “The interviews from Washington, Michigan, and Mississippi further suggest the film industry also served as the conduit for the diffusion of state film incentives. In all three interview states, the industry played a major role in advocating for legislation and forging ties with influential policy makers” (Leiser 2016, 263). Since more productions leads to more connections, the likelihood of the state ratifying tax incentives increases.

Effectiveness of Film Tax Incentives

“Effectiveness” could mean that a policy brings in as much money as states pay out in incentives, or that the program garners a significant return on investment like two times as much money as the state must pay, or that it creates new jobs within the state. Michael Thom (2016) identified four areas to determine the efficiency of film tax incentive policies: how many jobs are in the motion picture industry, the wages for those jobs, the amount of money made from film production in a state, and what percent of nationwide films were produced in a state (36-37). He analyzed what type of incentive the state offered, such as tax breaks that can lead to refunds, or tax credits that can be sold to other companies, and how long the film tax incentive program had been active in the state. He found different types of incentives had different effects on the film industry, however at best these policies have a minor positive impact in a state. Tax breaks that can be transferred between companies created a sustained increase in the number of jobs in that state industry but had no impact on the wages, whereas refundable credits had a temporarily positive effect on wages (Thom 2016, 42). He cited an analysis of Louisiana’s program that “found that the state’s popular incentive program has resulted in a net loss of anywhere from US\$13,000 to over US\$20,000 per job created” (42). Thom concluded that states should focus more on the current effectiveness rather than simply assuming that these programs will start bringing in money down the line. Thom believed that legislators in Louisiana need to look at alternative forms of film tax incentives now instead of continuing to lose money year after year.

Louisiana was the first state to adopt these policies in 1992 (Sewordor and Sjoquist 2016, 6). The Louisiana Department of Economic Development contracted Loren C. Scott & Associates (2017), an economic consulting firm, to perform an analysis of the economic impact of the film tax incentives provided by Louisiana. For 2016, Scott & Associates found that the economic impact of film tax incentive programs on household income has an upper bound of approximately \$900 million and a lower bound of approximately \$677 million (Scott 2017, 11 & 13). The lower bound adjusted for the salaries of actors, directors, writers, etc. since workers in those professions were not likely to reside in Louisiana permanently. Later in the article, it is stated that “In 2015, it is estimated the film production program resulted in a net loss of \$207.2 million in state revenues. In 2016, this loss rose to \$219.4 million.” (Scott 2017, 14). Since the state’s net loss on tax credits increased from 2015 to 2016, Scott & Associates suggested capping the number of claims that can be made by production companies and providing incentives for companies that create permanent jobs instead of temporary employment in the state.

Other states would not necessarily receive the same benefits as Louisiana from continuing their film tax incentive programs. McIntire (2014) noted that Louisiana has a unique environment considering it had no film productions when these programs started and now sits only behind California and New York for the highest number of film productions (234). She notes that “Unlike states such as California and New York that were epicenters of film production prior to the state incentive program boom in the 2000s, Louisiana is not giving away credits to companies that would have located to and filmed in the state anyway” (McIntire 2014, 234-235). In comparison, states like Michigan and New Mexico have recently scaled back the amount of tax credits they provide to film productions. McIntire found that Michigan went from \$115 million to \$25 million in tax rebates and credits provided and New Mexico limited the total value of their incentives to a rolling \$50 million

cap, meaning any money spent past the \$50 million detracts from the allowance for the next year. After years of allowing the revenue loss from film tax incentives to go uncapped, states are now starting to rein them in.

The Motion Picture Association of America (2016) [MPAA] released a statement in which they refuted the findings of Michael Thom's (2016) paper. As the primary trade organization for the film industry, the MPAA argued that Thom's methodology was incorrect. First, they stated that the difference between transferable tax credits and refundable tax credits are negligible and treating them separately was a mistake on Thom's part. The MPAA also took issue with how Thom defined a film industry job. Thom's paper defines jobs to include "movie theater and sound recording industry jobs." (1) The MPAA did not believe that these should be factored in as those jobs would not be affected by changes in film tax incentives. They concluded by noting that if Thom's work had undergone review from experts in the public policy field that the study's methodological flaws would have been noticed and the paper would not have been published. The MPAA failed to note that since Thom had his article published in an academic journal, it did go through a peer review process.

Joseph Bishop-Henchman (2016) of the Tax Foundation penned an article to refute the claims from the MPAA's statement by defending Thom's paper. Bishop-Henchman wrote that there is an actual difference between transferable and refundable tax credits since transferable credits create brokerage jobs that facilitate the transfer of tax credits between film production companies in the state (1). In their article, the MPAA claimed that Thom did not account for the size of the film industry in New York and California, but Bishop-Henchman noted that Thom had an entire section of his paper that discussed those states as outliers and found that removing them did not change the effects of the policies. He concluded by stating that the MPAA's final statement does not hold water as Thom's paper was published in peer-reviewed journals and therefore was examined by public policy experts before it was printed.

Modern Perception of Filmmaking

Since the adoption and rise of film tax incentives, discussions around the topic of the film industry focus less on the art and more on the economic impact of the production. Jennifer Vanderburgh (2016), a film and media studies professor, coined the term "tax credit thinking" to refer to the "way of thinking that tends to focus on economic benefits when justifying why films and film industries are important to places and to people" (139). She specifically discussed how this mindset has dominated conversation in the film production industry in Canada, but tax credit thinking is also the norm in the U.S. Nova Scotia's film industry had been providing tax incentives for productions from outside of the province, bringing into question what local filmmaking means in today's world. She stated that "largely American films that disguise their production locations (e.g., *The Scarlet Letter* (1995), *Dolores Claiborne* (1995), *Leaving Las Vegas* (1995), and *Titanic* (1997)), are considered here to be examples of "local filmmaking," alongside more quintessentially "local" screen projects that have stories identifiably rooted in NS [Nova Scotia]" where the term "disguise their production locations" refers to the practice of filming in a location and then stating that it is a different location in the universe of the film (139). Local filmmaking seemed to refer to the jobs created by film production in an area rather than alluding to the act of making a film about a specific region. Vanderburgh lamented the move towards economically-minded filmmaking as cultural goals fall to the wayside. The Nova Scotia Film Tax Credit was eliminated in 2015 and saw an immediate upheaval in the province as filmmakers moved productions to less costly regions (Vanderburgh 2016, 136). The cultural importance of Nova Scotia filmmaking might also fade away as fewer filmmakers choose to represent the province in their works due to the lack of tax incentives. Tax credit thinking might make sense economically but ignoring the cultural benefits of film can create issues for local governments. Since film productions are mobile, a production receiving tax breaks from a state government

does not guarantee that said money will be spent in that state, generating less revenue for local businesses than expected.

Conclusion

The film industry continues to grow and consolidate every year as fewer and fewer production companies become responsible for the highest grossing films. In 1997, nine studios were responsible for the top twenty grossing films; by 2017, that number had dropped to five (*2017 Domestic Grosses*). Those five studios (Buena Vista, Warner Bros., Universal, Fox, and Sony) also gain a larger share of the benefits from film production tax incentives as blockbuster budgets skyrocket. This is an issue for states that continue to give tax breaks and credits to the five major film production studios. These companies do not spend enough in the state they have received the incentive from for the state to see any positive economic benefit. While the effectiveness of state film tax incentive programs is not fully agreed upon, the current consensus amongst economics and policy experts is that these incentives provide little to no benefit to the states while the film studios gain massive tax write-offs. The current policies for film production tax incentives must be reexamined as the savings consolidate.

States should consider which behaviors they want to incentivize with the tax benefits they deliver. As it stands, the films that gain the most from these incentives are massively budgeted films that heavily eat into tax revenue for the state while—most of the time—not even representing the state itself within the narrative of the film. Cultural goals driving incentivization programs for the filmmaking industry could lead to a radical shift in the industry in both economic and cultural spheres. Films that positively represent a state could increase tourism rates while also creating jobs within the state for the production, which could help a state both economically and culturally. The current structure of film production tax incentives provides little evidence of economic benefit and definite signs of cultural detriment. It is time to look into changing the structure of these policies in order to maximize economic benefit while revitalizing the important cultural element of filmmaking.

Hypothesis

The next step is to find a way to analyze local representation in films as it relates to state film tax incentives. Firstly, the measure of the local representation in a film that will be used is a binary variable, called “local representation”, that measures whether a film’s primary state of production matches with the film’s setting. Primary state of production refers to the U.S. state a film was primarily produced in and the film’s setting refers to the U.S. state or country in which the film’s story primarily takes place. Local representation will be classified as a 1 if the primary state of production and the setting state are the same, whereas a film’s local representation will be classified as a 0 if the primary state of production and the setting state differ. For the measure of state film tax incentives, the rating of states by tax incentive programs from Film Production Capital (2016) serves as a good measure of the “best tax incentive jurisdictions for production.” My hypothesis is that the rating of a state’s film tax incentive program has a positive effect on the amount of local representation in a film for that state.

Methodology

Since the local representation variable is binary, it must be analyzed with a logistic regression instead of ordinary least squares regression. Logistic regression is a method that works under the same principles as ordinary least squares regression, with the main difference that instead of predicting the actual value of the dependent variable, it predicts the probability of a binary variable equaling 1. To perform this, a mathematical

formula is used to create a representation of the odds of the binary variable and transform that representation to create a variable that can be analyzed using regression methods. The initial equation for the logistic regression is as follows:

$$(1) \text{logit}(p) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \varepsilon$$

$$(2) \text{logit}(p) = \ln(p / [1-p])$$

Where p is the probability that the Y variable (location representation) is equal to 1, $1 - p$ is the probability that the Y variable is equal to zero, and \ln is the natural logarithmic function. Equation 2 is the explanation of what is being predicting: $p / 1 - p$ is the odds of a 1 for the Y variable, and applying the logarithmic function transforms it into a variable that spans all real numbers. Equation 1 is the regression equation that will serve as my predictor of the *logit* function. β_0 is the intercept, what the function predicts $\text{logit}(p)$ would be if all X's were equal to zero. X_1 - X_5 are the predictor variables, and β_1 - β_9 are the corresponding beta coefficients that represent the relative strength of each variable. ε is the error value that represents the effect of any variables not included in the regression model.

The data for this analysis will consist of movies released from 2015 to 2017 that played in at least 1000 theaters in the U.S. The range of three years will ensure a good amount of data points, while the floor of 1000 theaters will ensure that the films in the data reached a national audience. Box Office Mojo will serve as the source of theater counts since they accurately list those counts in an accessible fashion by year. There are some restrictions to which films will be included from that subset to ensure that all of the data is relevant to state film tax incentives. First, films that have fictional settings, such as fantasy or science-fiction films that take place in different universes, will not be in the final data set. Since there is no way for those films to truly represent their production location, it makes more sense to leave those films out of the data. As well, films primarily shot outside of the U.S. will not count either since the ratings by Film Production Capital do not include rankings for film tax incentive programs outside of the U.S. Lastly, since animated films are only produced inside animation studios, those data points will not be considered in this analysis.

Variables

The previous sections have explained the thought process behind the left-hand side of the equation, the *logit* function. However, attention must be paid to the right side of the equation to make sure the predictors should be included in the equation. The model for this analysis has five right-hand side variables: X_1 , the independent variable; and X_2 - X_9 , the control variables. Not all of these variables will end up in the final model considering some are different methods of describing the same phenomenon. The table below provides a brief introductory description to each of the variables.

Table 1

Variable Name	Name in Data Sheet	Description	Expected Effect	Source
X_1	tax_rating	Rating of state film tax incentive programs with respect to the production company	+	Film Production Capital

X ₈	high_tax	Binary Variable that is set to 1 if the film was produced in a state with a tax incentive rating of 4 or 5	+	Film Production Capital
X ₂	pct_film_workers	Percent of workers employed in the film industry in a state	+	Bureau of Labor Statistics
X ₆	q_rev_share	The percent of statewide revenue produced by film production by quarter	+	Bureau of Labor Statistics
X ₃	state_pop	Population of the production state	+	United States Census Bureau
X ₄	indep	Binary variable that is set to 1 if the film is independent	+	IMDB
X ₇	f_ind	Binary Variable that is set to 1 if the film was produced in California or New York	+	Box Office Mojo
X ₅	prod_budget	Listed production budget of the film	-	Box Office Mojo

To start, the independent variable for the analysis is the rating of state film tax incentive programs created by Film Production Capital. As aforementioned, Film Production Capital created a ranking of each state's film tax incentive program that scales from zero to five based on how much of a tax break the film production company can receive. The higher the rating, the higher percentage of tax breaks a production company can potentially receive on a project. The distribution of this variable will likely be left-skewed once data is collected since production companies are more likely to film in states with higher ratings for their film tax incentives. This variable is expected to have a positive correlation with the dependent variable. Since films with higher ratings create larger film industries in the state they are in, it is more likely that filmmakers from those states will want to create movies with their home state in mind. From the table above, X₂ is a variable directly derived from X₁. X₂, if included in the final model, would take the place of X₁ and would test whether states with high ratings for their film tax incentive programs are correlated with location representation and would be predicted to have a positive effect as well.

The first control variable measures the percent of workers in a state that are in the film industry. This variable will be calculated using data from the Bureau of Labor Statistics by taking the number of film workers in the state and dividing it by the total number of private industry workers in that state. This will be calculated for the year and month that production of the film started. The percent of workers in a state that are in the film industry should have a positive impact on the number of films that display location representation for a similar reason as the independent variable. States that have a high percentage of workers in the film industry should be more likely to create films that are set in the states they are from. This would lead to an increase in the odds of location representation in film. X₆ (q_rev_share) serves a similar purpose, controlling for the size of the film industry in the state. The main difference is that X₆ is measured as a ratio of the quarterly revenue for the film industry in a state by the quarterly revenue for private industries in the state on the whole. Since X₂ and X₆ describe the same function, X₆ should have the same positive effect as X₂.

Next, the control variable that measures the population in the state that the film was produced in. This information will come from the United States Census Bureau and will be assigned to films by year of production for that film. This variable is expected to have a positive effect on the odds of location representation in films produced in a state. The reasoning behind the positive effect is that states with more

people get more attention, have more people living in them, etc., and therefore should see more films produced and set in those states.

The next control variable is a binary variable that measures if a film is independent or not, with a 1 assigned to films that are independent and a 0 otherwise. But what is an independent film? The Independent Film and Television Alliance offers this definition of an independent film: “An ‘independent film or television program’ is financed primarily outside of the six major U.S. studios” (1). The Maya Academy of Advanced Cinematics elaborates on the six major studios and their impact. “The ‘Big Six’ collectively command approximately 80 – 85 percent of US & Canadian box office revenue. These ‘Big Six’ are: 20th Century Fox, Warner Bros., Paramount Pictures, Columbia Pictures, Universal Pictures & Walt Disney Pictures” (2014). This definition gives a solid understanding of how to code this variable, with films from the ‘Big Six’ receiving a 0 and all others receiving a 1. This variable is expected to have a positive effect on the location representation in film. Independent cinema tends to have lower budgets and less ability to masquerade one location as another. Therefore, it’s more likely for an independent film to create stories that allow them to shoot on location rather than creating unneeded expenses.

The next variable is a simple dummy variable meant to control for a major part of the industry. X_7 (f_ind) is a binary variable that controls for films produced in New York and California. If the film was produced in New York or California this variable is set to one, otherwise, it is set to zero. This control is necessary since California and New York had established large film industries before states began to adopt film tax incentives. Since a lot of films are made in these states, they tend to have disproportionately many films set in those states. Because of that, this variable should have a positive effect on location representation.

Lastly, the control variable that finishes the estimation model is the production budget of a film. The production budget of a film can be tricky since advertising costs are not included, however, these advertising costs are never posted and cannot be analyzed. Box Office Mojo is the most accessible source for this information as it prominently features the production budget on film’s individual page. Importantly, this variable is not necessarily covered by the previous variable that distinguished independent cinema from studio cinema as the budgetary amounts in each category as there still exists a significant amount of variance in budgets. This variable is expected to have a negative effect on the amount of location representation in film. As budgets increase, the ability to masquerade a film’s production location as a different location increases. This means higher budgets lead to more instances of film production locations not matching the film’s primary setting location.

Results

Table 2 below is the output from SAS detailing the correlation between the variables listed above. This was produced by using the command “proc corr” and listing out all of the variables. SAS split the table in two when converting to an RTF file, so the table is presented in two parts. Part 1 is the left half of the output and Part 2 is the right half of the output.

Table 2 Part 1

Pearson Correlation Coefficients, N = 149 Prob > r under H0: Rho=0					
	Loc_Rep	Prod_Budget	State_Pop	Pct_Film_Workers	Q_Rev_Share
Loc_Rep	1.00000 0.1832	-0.10964 0.1832	0.34678 <.0001	0.21090 0.0098	0.24934 0.0022
Prod_Budget	-0.10964 0.1832	1.00000	-0.19514 0.0171	-0.10520 0.2016	-0.13468 0.1015
State_Pop	0.34678 <.0001	-0.19514 0.0171	1.00000	0.83996 <.0001	0.87391 <.0001
Pct_Film_Workers	0.21090 0.0098	-0.10520 0.2016	0.83996 <.0001	1.00000	0.97244 <.0001
Q_Rev_Share	0.24934 0.0022	-0.13468 0.1015	0.87391 <.0001	0.97244 <.0001	1.00000
Tax_Rating	-0.39067 <.0001	0.13453 0.1019	-0.31154 0.0001	-0.28998 0.0003	-0.37327 <.0001
Indep	0.00458 0.9558	-0.30137 0.0002	-0.04714 0.5681	-0.05127 0.5346	-0.02126 0.7969
F_Ind	0.36243 <.0001	-0.12718 0.1222	0.85232 <.0001	0.89675 <.0001	0.90985 <.0001
high_tax	-0.37135 <.0001	0.06966 0.3986	-0.26078 0.0013	-0.29724 0.0002	-0.35380 <.0001

Table 2 Part 2

Pearson Correlation Coefficients, N = 149 Prob > r under H0: Rho=0				
	Tax_Rating	Indep	F_Ind	high_tax
Loc_Rep Loc_Rep	-0.39067 <.0001	0.00458 0.9558	0.36243 <.0001	-0.37135 <.0001
Prod_Budget Prod_Budget	0.13453 0.1019	-0.30137 0.0002	-0.12718 0.1222	0.06966 0.3986
State_Pop State_Pop	-0.31154 0.0001	-0.04714 0.5681	0.85232 <.0001	-0.26078 0.0013
Pct_Film_Workers Pct_Film_Workers	-0.28998 0.0003	-0.05127 0.5346	0.89675 <.0001	-0.29724 0.0002
Q_Rev_Share Q_Rev_Share	-0.37327 <.0001	-0.02126 0.7969	0.90985 <.0001	-0.35380 <.0001
Tax_Rating Tax_Rating	1.00000	-0.04646 0.5737	-0.45853 <.0001	0.82071 <.0001

Pearson Correlation Coefficients, N = 149 Prob > r under H0: Rho=0				
	Tax_Rating	Indep	F_Ind	high_tax
Indep	-0.04646 0.5737	1.00000	-0.10416 0.2062	-0.00282 0.9728
F_Ind	-0.45853 <.0001	-0.10416 0.2062	1.00000	-0.41681 <.0001
high_tax	0.82071 <.0001	-0.00282 0.9728	-0.41681 <.0001	1.00000

The main goal of analyzing the variables using “proc corr” is to see if any of our variables are multicollinear, meaning that one variable can be linearly predicted by another variable in the model. If two or more variables are multicollinear, all but one must be removed from the regression model. All of the relationships between variables show some correlation, but most of them have low correlation with each other. Two of the relationships between variables do show signs of multicollinearity that should be investigated further, with one of them having more than two multicollinear variables.

The first relationship to note is that four of the nine variables appear to be multicollinear: The percentage of film workers in a state, the population of a state, the quarterly share of revenue for the film industry by state, and whether the film was produced in New York or California. Each of these variables has a correlation coefficient > 0.8, meaning some of the variables must be dropped from the model. The binary variable for New York or California productions can be easily dropped since the other variables would account for the large film industries in those states. Between the remaining three variables, the percentage of film workers in a state has a lower correlation coefficient on average across the other variables in the model. Therefore, the percentage of film workers in a state will stay in the model while the population of a state and the quarterly share of revenue will be dropped from the model.

The other correlation relationship that approaches multicollinearity is that of the tax rating and the binary that distinguishes high and low tax ratings. This fundamentally makes sense since the binary variable is a direct reflection of information contained in the tax rating. Because of their high correlation, these two variables should not be used in the model together. While theoretically either variable could be used in the final model, using the tax rating makes more sense since it can control for high tax ratings the way the binary would while adding more flexibility to the model.

Regression

The first model, show below, was a logistic regression model that used the tax rating, the production budget, the percent of film workers in a state, and whether the production studio was independently funded to predict the likelihood of the binary variable for location representation equaling one. This logistic regression was calculated with the “proc logistic” command in SAS.

Table 3

Testing Global Null Hypothesis: BETA=0			
Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	26.1175	4	<.0001
Score	24.7524	4	<.0001
Wald	22.3552	4	0.0002

Analysis of Maximum Likelihood Estimates						
Parameter		DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept		1	2.9161	0.9062	10.3558	0.0013
Tax_Rating		1	-0.8165	0.2092	15.2367	<.0001
Prod_Budget		1	-3.78E-9	5.188E-9	0.5305	0.4664
Pct_Film_Workers		1	68.7418	67.4436	1.0389	0.3081
Indep	1	1	-0.0541	0.2000	0.0731	0.7869

The first part of the table measures the significance of the entire model using three different chi-square tests. All three tests have a p-value of less than 0.01, meaning this model is statistically significant. However, by looking at the second part of the table, it is clear that only the tax rating is a significant predictor in this model. Against expectations, the coefficient for the tax rating is negative, meaning a higher tax rating correlates with less location representation. After some tinkering with this model by substituting the four multicollinear variables from before (pct_film_workers, q_rev_share, state_pop, and f_ind), the binary variable controlling for the film industries was a significant part of the model, as shown in Table 4.

Table 4

Testing Global Null Hypothesis: BETA=0			
Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	30.9426	4	<.0001
Score	29.3478	4	<.0001
Wald	26.2416	4	<.0001

Analysis of Maximum Likelihood Estimates						
Parameter		DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept		1	2.1437	0.8784	5.9556	0.0147
Tax_Rating		1	-0.6321	0.2148	8.6605	0.0033
Prod_Budget		1	-2.78E-9	5.222E-9	0.2826	0.5950
F_Ind		1	0.5434	0.2275	5.7057	0.0169
Indep	1	1	0.00881	0.2051	0.0018	0.9657

As with the previous model, testing the null hypothesis using chi-square tests shows this model is statistically significant on the whole. Looking at the analysis of maximum likelihood estimates, this model is similar to the previous except for the binary variable accounting for the film industries of New York and California is statistically significant. Since it's coefficient estimate is positive, this model shows that films produced in New York or California significantly increase the likelihood of location representation. As with the previous model, the tax rating has a negative effect on the likelihood of location representation, however it's coefficient is lower in this model. For the last model, "proc logistic" was used again to create a logistic regression, this time without the insignificant variables from the previous two models (prod_budget and indep).

Table 5

Testing Global Null Hypothesis: BETA=0			
Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	30.6053	2	<.0001
Score	29.0791	2	<.0001
Wald	26.0823	2	<.0001

Analysis of Maximum Likelihood Estimates					
Parameter	DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept	1	2.0628	0.8604	5.7473	0.0165
Tax_Rating	1	-0.6415	0.2139	8.9894	0.0027
F_Ind	1	0.5506	0.2238	6.0512	0.0139

This limited model confirms what the previous models have shown while ending with both variables in the model having a significant effect. The tax rating's coefficient is negative and the binary variable's coefficient is

positive as was the case in the other two models. The intercept's coefficient is also significant, another indicator that this model predicts the likelihood of location representation significantly well.

Conclusion and Policy Implications

The results of the logistic regression not only did not align with the hypothesis of this research, they in fact provided evidence for the opposite of that hypothesis. According to the regression results, film productions in states with higher tax ratings are less likely to have location representation. While not anticipated originally, this outcome does make sense. For example, a production company want to make a movie that takes place in Florida and is faced with the choice of producing it in Florida, which has a tax rating of 3, or Georgia, which has a tax rating of 5. Most times, the production company would choose to produce in Georgia to save more money, leading to states like Georgia being less likely to have location representation. However, a flaw in this thinking is while it is less likely for a state like Georgia to have location representation over the same number of productions, which these regressions assumed, since Georgia has more productions in total, more total films feature location representation in Georgia than in most states. This is a methodological issue that can be addressed in future study, potentially by accounting for the tax rating of the setting state or by controlling for the number of total productions in a state. Another methodological issue is accounting for foreign film production. While this study did not look into film production by U.S. companies that took place outside of the U.S., future research should attempt to account for these films. The main issue that stopped foreign productions from being included in this research was that the company that made the film tax incentive program rankings that were extensively used did not apply ratings to any foreign countries, only the U.S. states. To get around this, it could be viable to use the interest rate of tax credits that countries or states offer as a predictor or to use those interest rates to estimate what foreign countries' tax incentive program rankings would be. Lastly, many films simply don't specify their location within their narrative. For the purposes of this research, films with an unspecified setting were not included in the analysis, however future research should look into these films more. It is very interesting that many films will choose to not name the setting, rather than simply setting the movie where it was filmed, which allows the room for insightful research to see why these films choose to represent no real place.

From the results of this analysis, the best policy steps for states would be to roll back current film tax incentive programs. This could be accomplished in different ways, such as lowering the interest rate on tax breaks, lowering the cap for the number of claims that can be made in a certain period, or even altogether eliminating the tax incentive programs on the whole. Even though the results from the statistical analysis in this paper are significant, making policy changes based off this information would be rash. Considering the methodological flaws stated previously, this paper and the analysis results within should be seen as a starting point for additional research into the topic.

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