Modeling Tax Return on TV, Film, and Digital Media Incentives in Michigan

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Executive Summary

The State of Michigan has offered film and digital media production companies some form of tax credit or rebate since 2008 through the Michigan Film Office (MFO). This incentive program is used by the state government to attract new businesses, stimulate in-state consumption, and help increase government revenues. MFO is seeking a model and methodology to evaluate the cost effectiveness of their incentive program for both the former 2011 tax credit program and 2012 - present cash rebate program.

The MFO contracted Regional Economic Models, Inc. (REMI) to formulate a cost-benefit analysis of the incentive program for the state. By using the production spending data provided by the client as inputs for the REMI PI+ model, a simulation was run in order to gauge how the incentive program has influenced Michigan's tax revenues and economy as a whole.

The 2011 and 2012 programs differ in many ways but the most prominent is a switch from a tax credit to a cash rebate and a reduction in the overall generosity of the incentive. This change increases the speed at which production companies receive their incentive dollars allowing that money to be recycled back into their businesses sooner. The savings from the faster reimbursement goes some way to reducing the losses to the companies from a smaller incentive package.

Separate analyses were carried out for the two programs. The simulations only included the economic impacts of the direct production activity. Therefore they exclude any gains from increased tourism or other secondary effects of more frequent portrayals of Michigan in the arts. Both programs create positive economic impacts in jobs, output, and gross state product. These positive impacts also drive gains in tax revenues. A summary of these results are presented below.

Table 1: Summary Results

Program	Jobs	Output ($Mil)	GSP ($Mil)	Two Year Return (Revenue/Credit $)
2011	9,267	$1,080	$782	$0.24
2012	874	$104	$76	$0.38

Introduction and Background

The State of Michigan has offered film and digital media production companies some form of tax credit or rebate since 2008 through the Michigan Film Office (MFO). This incentive program is used by the state government to attract new businesses, stimulate in-state consumption, and help increase government revenues. MFO is seeking a model and methodology to evaluate the cost effectiveness of their incentive program for both the former 2011 tax credit program and 2012-current cash rebate program.

The MFO has a complete data pool on the detailed in-state production spending and incentives awarded for each television, film, or digital media project. The MFO contracted Regional Economic Models, Inc. (REMI) to formulate a cost-benefit analysis of the incentive program for the state. By using the production spending data provided by the client as inputs for the REMI PI+ model, a simulation was run in order to gauge how the incentive program has influenced Michigan's tax revenues and economy as a whole. The simulation results from PI+ include both demographic and economic impacts of the program on an annual basis.

To facilitate this study, the PI+ model was linked with an Excel-based cost/benefit (C/B) model for the MFO to measure how past and future expenditures from film, television, and digital media production influence Michigan's tax revenues. The model is designed to be easily updatable and to have seamless integration with PI+. It can provide net state government revenues, employment, gross state product, and additional economic changes associated with the incentive program.

The following report begins as a methodology and user guide for the C/B model and concludes with a description of the simulation results of the 2011 and 2012 incentive programs.

Data Collection and Spreadsheet Input

The input data on spending and incentives for each project during the period of 2010-2012 was provided by the MFO. The Input tab of the spreadsheet model follows the format of the data sheets provided by MFO and reflects all expenditure and incentive numbers provided. The current input in the spreadsheets is the summation of all 2011 and 2012 projects. When working on new projects, the user of the spreadsheet model needs to modify the existing data to accurately reflect the specifics of that project.

Data Transformation to REMI Policy Variables

Users' input on all expenditure entries will be automatically translated to policy variables in the C/B model. This automation process is implemented through the embedded Excel formulas. The third tab in the spreadsheet model will present policy variables which will feed the PI+ simulation in the next step. The inputs correspond to two major categories of REMI policy variables, which are industry employment and industry sales. Industry employment is recorded at two sectors from the REMI 70-sector level, which are film and TV production (REMI sector 40 and NAICS 512) and digital media industry production (REMI sector 39 and NAICS 511).

Most of the data entries can be easily mapped to REMI policy variables. For example, lodging is treated as sales in accommodation (REMI sector 61 and NAICS 721) and building rental as sales in real estate (REMI sector 47 and NAICS 531). However, "other expenditure" and "supplemental" do not specifically indicate to which industry the spending is allocated. The Input tab is designed in a way that users can choose from all 66 REMI private non-farm sectors according to their best knowledge of what these expenditures represent. The correspondence between users' input and REMI policy variables are presented in Table 2. All values are either in jobs or nominal dollars.

Table 2: Project Spending - REMI Policy Variable Mapping

Expenditure Category	Policy Variables
MI hires by sector	Adjusted Employment by sector
MI wages by sector	
Lodging	Sales in Accommodation
Building rentals	Sales in Real Estate sector
Food	Sales in Food Services and Drinking Places sector
Equipment rentals	Sales in Rental and Leasing Services sector
Material rentals	
Locations	
Contracted services	Sales in Administrative and Support service
Travel	Sales in retail trade, air transportation, and eight other sectors
Insurance	Sales in Insurance Carriers and Related Activities
Other expenditure	Sales in user selected sector
Supplemental	Sales in user selected sector

Parameters

In the "Parameters" tab, all assumptions and parameters used to transform the original input to policy variables are presented. These parameters are transparently presented and subject to change and update for future applications.

Redistribute Travel Spending

In the PI+ model, travel expenditures are typically redistributed to the policy variable of exogenous final demand in the following sectors: 1) Retail trade; 2) Air transportation; 3) Rail transportation; 4) Transit and ground passenger transportation; 5) Scenic and sightseeing transportation & Support activities for transportation; 6) Rental and leasing services & Lessors of nonfinancial intangible assets; 7) Administrative and support services; 8) Performing arts and spectator sports; 9) Amusement, gambling, and recreation; 10) Accommodation; 11) Food services and drinking places; and 12) Repair and maintenance. Every sector has a fixed ratio of total travel expenditure. This ratio is exogenous to the PI+ model and is determined by historical data.

Because lodging and food are already reported as industry sales in the "Input" tab, the expenditure on travel will be assigned to all sectors above except accommodation and food service. The assigned ratio for each sector is presented in Appendix II.

Average Retail Margin for General Retail Merchants

In the REMI model, the input for retail and wholesale sectors should be the mark-up portion of the sales. Although there are no data entries directly related to retail and wholesale from MFO input, the PI+ model redistributes the expenditure on travel to retail trade and other industry sales. The retail sales from travel expenditures are scaled down to markup value based on average retail margin for general retail merchants from Census (http://www.census.gov/retail/). This assumed ratio of markup values can also be updated based on newly available data.

New Hires and Michigan Wages

New film and TV projects bring new employment to Michigan. Each project has a number of new MI hires associated with it. However, from the input we are not sure how long these workers will be employed. The PI+ model assumes new hires in each sector will have the typical annual work pattern of their industry and thus receive the average annual salary and work at the average productivity of this sector. In other words, one job is assumed to be one job year. However, the average compensation for each project (the total MI compensation divided by MI hires) are in thousands, much lower than REMI's compensation rate for film and TV production, as well as the digital media industry. So the number of new hires has to be weighted to make sure they are on full-year basis. The updated new hires are calculated as total compensation resulting

from the projects divided by REMI's average compensation rate by industry. The adjusted number of new jobs is presented in tab "policy variables".

Effective Tax Rates

The C/B model use effective tax rates to calculate tax revenue. Effective tax rates are calculated by dividing historical revenue[1] by the size of the revenue driver from the REMI baseline forecast. We chose to use the state tax revenue share of gross state product to estimate tax revenues. Gross state product is a measure of net new economic activity and is also known as value-added. As a result of a simulation net new economic activity will increase and the state will receive a share of that activity in tax revenue. The calculated share of GSP going to state revenues is 6.1%. In the spreadsheet model, effective tax rates for 2011 are used as the fixed effective tax rates for other simulation years. However, users can easily update these effective tax rates using similar methodology for future simulations and applications as new data becomes available.

Differences from Previous Studies and Methodologies

The consulting firm of Ernst and Young completed a similar analysis to this one in 2011. There are some methodological differences of note between that study and this one.

- This study uses average compensation rates to find full-year equivalents of short-term hires compared to a share of hours used in the E&Y study. We chose compensation due to the availability of total compensation for both programs (2011 and 2012) and the availability of state- and industry-specific compensation rates in PI+. Thus we were able to calculate transparent ratios that are easily updated with information that will be accessible to MFO staff.
- This study does not include state cost savings from the reduction in unemployment. While these savings do exist, we did not wish to include them due to the essential short-term nature of film production activity. In many cases, like construction workers, the individuals who fill these short-term jobs move from project to project for a period of time and may not be actively seeking employment during expected downtime. Furthermore, if we apply E&Y's methodology to this project, any expected savings would be well under $1 million and thus quite small relative to the scale of the incentive programs.
- This study only includes the revenue going to the state as part of the benefit of the incentive program. The E&Y study includes the sum of state and local tax revenues when calculating the net cost of providing the credit/rebate. While this study does estimate and show limited local revenues, only state revenues are used to calculate the return on the state's cost and net cost because only the state government is bearing the cost of providing the credit/rebate.

[1] Source: Census of Governments, 2011 State and Local Summary Tables by Level of Government: http://www.census.gov/govs/local/

- Lastly, this study uses gross state product (GSP) as the base for the estimation of tax revenues. The E&Y study and other Michigan governmental estimates use personal income as the base. We chose GSP because it represents the total net new economic activity in the state and thus is the most complete measure of the annual value created in Michigan, whereas personal income is a more conservative measure. Personal income is the most commonly used statistic partly because it is the most readily available. State-level personal income is available to anyone through a simple web search. On the other hand, GSP is found in fewer places. Because PI+ calculates GSP, we and MFO have and will have access to it for this and future studies.

Simulation using PI+ and Cost/Benefit Model Results

Using values from the "Policy Variables" tab as the input for regional simulations (the input interface is as follows in Figure 1), we can run a PI+ simulation against the standard regional baseline to see how the projects have changed Michigan's demographic and economic variables. Combined with effective tax rates, the demographic and economic results will be used to calculate tax revenue after implementing these projects.

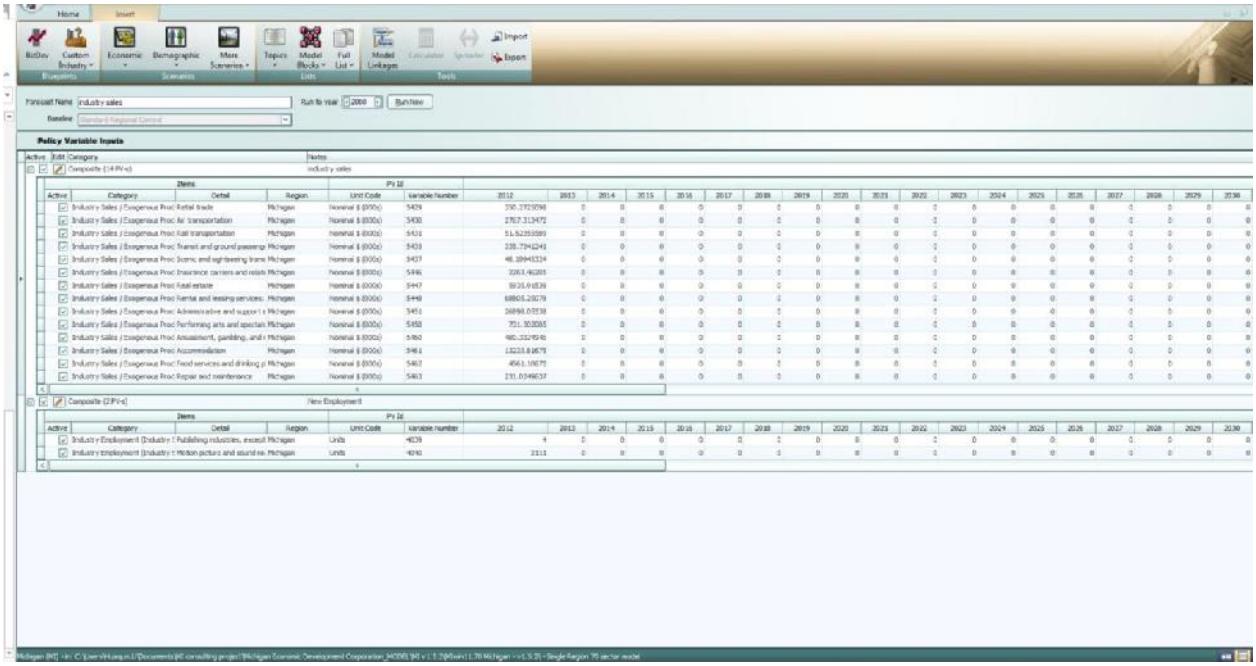

Figure 1: Policy Variable Inputs in PI+

PI+ has a function for generating custom tables. All variables we need for the C/B model are stored in the file "Results.rrt". By putting this file under in the Custom Tables folder found in the REMI folder in the My Documents folder, model users will be able to both view and copy values for all the required variables at once. These values also serve as the input in the "Calculation" tab. Once the inputs for the "Calculation" tab are in place, tax revenues for all tax categories as

well as net tax revenues will be calculated in the same tab. Net tax revenues are the total tax revenues subtracted by the net incentive amount in the "Input" tab. All values in the custom table should be nominal. The PI+ menu provides a unit tool to convert numbers in fixed currency to nominal currency. This process should be completed before transferring data values from the PI+ model into the Excel-based cost/benefit model.

Based on the calculation procedure, the "Results" tab will present net tax revenue for the year when projects are implemented.

Case Studies

REMI used the methodologies described above, coupled with the incentive data provided by the MFO to calculate economic and demographic changes due to the incentive program. The data provided by the MFO was used to estimate tax expenditures and industry activity in 2012. These estimates were then mapped to REMI PI+ policy variables, and a simulation was generated to determine the difference from the 2012 baseline forecast provided within the model. The simulation results are illustrated in the tables below.

For each program, inputs occur only in 2012 while 2013 is shown to capture some of the carryover effects of one-time economic changes. We estimate tax revenues using gross state product. More details are in the Parameters section above.

Previous Incentive Program

The previous film tax credit program ended in 2011. The data provided to REMI by MFO reflects projects from both 2010 and 2011.

The simulation looks at the aggregate of all the projects completed under the auspices of the 2011 credit. These projects are separated by film and television or digital media. The total project spending is approximately $606 million and the net incentive amount is approximately $223 million resulting in a subsidy of approximately 37%. The simulation results are presented in the table below.

Table 3: Simulation Results – Difference from Baseline – 2011 Film Tax Credit Program

Category	Units	2012	2013
Total Employment	Individuals (Jobs)	9,267	85
Private Non-Farm Employment	Individuals (Jobs)	8,361	67
Jobs Multiplier	Total Jobs in 2012/Direct Jobs	2.6	
Gross Domestic Product (GDP)	Millions of Current Dollars	$782.19	$7.91
Output	Millions of Current Dollars	$1,079.94	$12.19
Personal Income	Millions of Current Dollars	$307.31	$37.47
Population	Individuals	1,292	1,086

Not surprisingly, the program's projects create positive economic impacts on Michigan's economy. Nearly 9,300 jobs are created through the aggregate 2010 and 2011 projects along with almost $1.1 billion in output giving us a multiplier of about 1.78 for the $606 million in spending. These economic impacts generate the tax revenues in the table below.

Table 4: Estimated Tax Revenues – Difference from Baseline – 2011 Film Tax Credit Program

Category	Units	2012	2013
Net Cost of Incentive*	Millions of Current Dollars	$223.05	
Non-Michigan Resident Wages*	Millions of Current Dollars	$233.59	
State Government Revenues	Millions of Current Dollars	$47.53	$0.48
Local Gov't (Non-Property Tax)	Millions of Current Dollars	$1.82	$0.02
Pers. Income Tax from Non-MI Wages	Millions of Current Dollars	$5.04	$0.00

*Taken from MFO data and shown as interpretive aid.

Table 5: Return on Credit Dollars and Net Tax Revenues - Difference from Baseline – 2011 Film Tax Credit Program

Category	Two Year Return (Revenue/Credit $)	Net Revenues ($Mil)
State Government Revenues	$0.24	-$170.00

We can see from the above tables that the direct program impacts create 24 cents of tax revenue for every dollar in credits issued.

Current Incentive Program

The current program administered by the MFO issues cash rebates for qualifying expenditures on film, television, and digital media projects. The current program was enacted in 2012 after the conclusion of the old program.

The simulation looks at the aggregate of all the projects completed under the auspices of the 2012 rebate. Given the newness of the program and the length of time projects take, MFO only had data on nine completed projects at the time of the analysis. These projects represent only film and television productions. The total project spending is approximately $44.1 million and the net incentive amount is approximately $13 million resulting in a subsidy of approximately 29%. The simulation results are presented in the table below.

Table 6: Simulation Results – Difference from Baseline – 2012 Film Cash Rebate Program

Category	Units	2012	2013
Total Employment	Individuals (Jobs)	874	6
Private Non-Farm Employment	Individuals (Jobs)	786	5
Jobs Multiplier	Total Jobs in 2012/Direct Jobs	2.1	
Gross Domestic Product (GDP)	Millions of Current Dollars	$75.66	$0.63
Output	Millions of Current Dollars	$104.00	$1.00
Personal Income	Millions of Current Dollars	$29.19	$3.34
Population	Individuals	103	86

While smaller than the impacts of the old program due to the analysis of fewer projects, the current program's projects create positive economic impacts on Michigan's economy. There are 874 jobs created along with $104 million in output giving us a multiplier of 2.36 for the $44.1 million in spending. These economic impacts generate the tax revenues in the table below.

Table 7: Estimated Tax Revenues – Difference from Baseline – 2012 Film Cash Rebate Program

Category	Units	2012	2013
Net Cost of Incentive*	Millions of Current Dollars	$13.05	
Non-Michigan Resident Wages*	Millions of Current Dollars	$14.56	
State Government Revenues	Millions of Current Dollars	$4.60	$0.04
Local Gov't (Non-Property Tax)	Millions of Current Dollars	$0.18	$0.00
Pers. Income Tax from Non-MI Wages	Millions of Current Dollars	$0.31	$0.00

*Taken from MFO data and shown as interpretive aid.

Table 8: Return on Rebate Dollars and Net Tax Revenues - Difference from Baseline – 2012 Film Cash Rebate Program

Category	Two Year Return (Revenue/Rebate $)	Net Revenues ($Mil)
State Government Revenues	$0.38	-$8.10

We can see from the above tables that the direct program impacts create 38 cents of tax revenue for every dollar in credits issued.

Discussion

While there are many structural differences between the two programs, the above tables show that the old program provided a greater subsidy at greater cost to the state. At first glance, the difference in average subsidy rates does not seem that large (37% vs. 29%) but the other metrics reinforce that the current program provides a better return for Michigan. The current program creates a larger output multiplier and nearly a 60% greater return on each credit dollar.

One structural difference that should be noted is the change from a tax credit program to a cash rebate program. This change occurred simultaneously with a decrease in the generosity of the incentive provided and, from the viewpoint of the production companies, serves to decrease some of the losses in incentive dollars. In the previous iteration, the company's money would be tied up through the end of the tax year, the completion of a tax return, and the wait for a refund.

Now the companies receive a cash rebate immediately after the submission and review of the necessary paperwork. The increased speed of incentive payouts means that production companies can put that money back to work faster than before. In other words, due to the time-value of money, companies will accept some lesser amount of money now compared to more money in the future.

The analyses included in this report only capture the economic and revenue impacts directly associated with the production activities. There are other ancillary benefits that are not included in this study due to lack of data and limitation of scope. A few examples follow.

Because the state is issuing the tax credits and rebates, it is only state tax revenues that count toward the cost/benefit calculation. However, local governments will benefit from greater tax revenue without having to front any of the cost of the credits. In Michigan, aggregate local government revenues are approximately half of those of the state. However, nearly 93% of this revenue comes from property taxes which are not likely to be paid by production companies. Nevertheless these projects create activity that results in greater local government tax revenue. The tables above show $210,000 in local government revenues from non-property tax sources for the current program. Because this money comes from activities occurring without local government investment, it is all net positive revenue for local governments.

Another benefit missing from this study is any marginal increase in tourism due to the added exposure Michigan receives through its portrayal on-screen. REMI does not have any data to measure tourism impacts but any additional tourism caused by film portrayals would increase the return on each dollar of the film cash rebate program.

Appendices

Appendix I: REMI PI+ Methodology

REMI used a one-region, 70-sector version of the PI+ model configured to the state of Michigan for this study. PI+ is a fully dynamic, multiregional, computerized model of the state economy. The current version of Michigan PI+ is calibrated to the last history year of 2012. The REMI model relies on four different quantitative methodologies in its framework, which allows them to highlight each other's strengths while compensating weaknesses. These methodologies include:

Input/output tabulation (IO) – IO modeling is sometimes called "social accounting" because it shows the interrelationships between different industries and households in the economy. This includes the flow of goods and services between firms in supply chains, final sales to households, and wages paid to and spent by individuals. These interconnections create

multipliers. The data for the table comes from the Bureau of Labor Statistics (BLS)[2] and the theoretical underpinnings for IO modeling come from the Nobel laureate Wassily Leontief.

Econometrics – The REMI model includes statistical parameters for behavior of firms and households based on historical data. In modeling terms, this is the source of our elasticities and parameters. This includes how actors respond to changes in prices or wages and the "rate of adjustment" from a shock until the economy returns to a new balance.

Computable General Equilibrium – This is a broad class of models. Computable general equilibrium modeling adds market concepts and the principles of equilibrium economics to the REMI algorithm. This includes markets for housing, labor, consumer goods, and importantly, a concept of market shares and competitiveness for businesses. For example, consumers in the state of Massachusetts may demand automobiles, but in all likelihood those cars come from plants in Michigan or the Southeast, or even overseas. This flow of goods and services can change over time, and with it the attractiveness of the state for labor and capital, given changes in economic conditions.

Economic Geography – Geography gives the REMI model a sense of agglomeration, labor pooling, and economies of scale. Labor-intensive industries, such as healthcare or professional services, tend to cluster in urban centers where specialized pools of educated workers are easy to obtain. Manufacturers tend to do the same thing given their tendency to locate near their input suppliers, customers, and transportation hubs. This allows them to lower their costs and increase their productivity.

REMI began as a research inquiry, and the literature behind PI+ is public and oftentimes appears in peer-reviewed journals. These include the *Journal of Regional Science*, *American Economic Review*, and *the Review of Economics and Statistics*.[3] REMI only uses data from public sources. Our references include the Bureau of Economic Analysis (BEA), Bureau of Labor Statistics (BLS), the Census Bureau, and the Energy Information Administration (EIA) at the Department of Commerce and Department of Energy.[4] The REMI model exists in a block structure of simultaneous equations. Each of the five blocks in the figure below adds its own perspective on the economy. Block 1 is final demand and final production; it is the "macroeconomy" in terms of its total aggregates. That includes consumer spending, investment, net exports, government spending, and a subtraction for intermediate inputs in a local area. Block 2 is the business perspective on the economy; sales orders come in from Block 1, and industries have to make production decisions (in terms of hiring workers and investing in capital) to eventually generate their needed output. Block 3 is the demographic portion of the model, which includes births and

[2] For the most recent BLS make and use table, which we then transform into an IO table from there, see, <http://www.bls.gov/emp/ep_data_input_output_matrix.htm>.

[3] For For journal citations from the above publications, see p. 46 of our equations document online, <www.remi.com/download/documentation/pi+/pi+_version_1.4/PI+_v1.4_Model_Equations(2).pdf>.

[4] For a full listing of data sources and types, see our document online of data sources and procedures, <www.remi.com/download/documentation/pi+/pi+_version_1.4/Data_Sources_and_Estimation_Procedures.pdf>.

deaths, how intra-national migration changes a state-level economy over time, and how the regional population chooses to participate in the labor force. Block 4 introduces equilibrium concepts to the REMI model: households appraise the labor market, housing, and the cost of living when making location decisions. For businesses, they make an analogous consideration about their costs for labor, capital, intermediates, and fuel. Block 5 quantifies regional competitiveness, which means how much an area will export and displace imports when competing on a domestic and international marketplace against other states and nations.

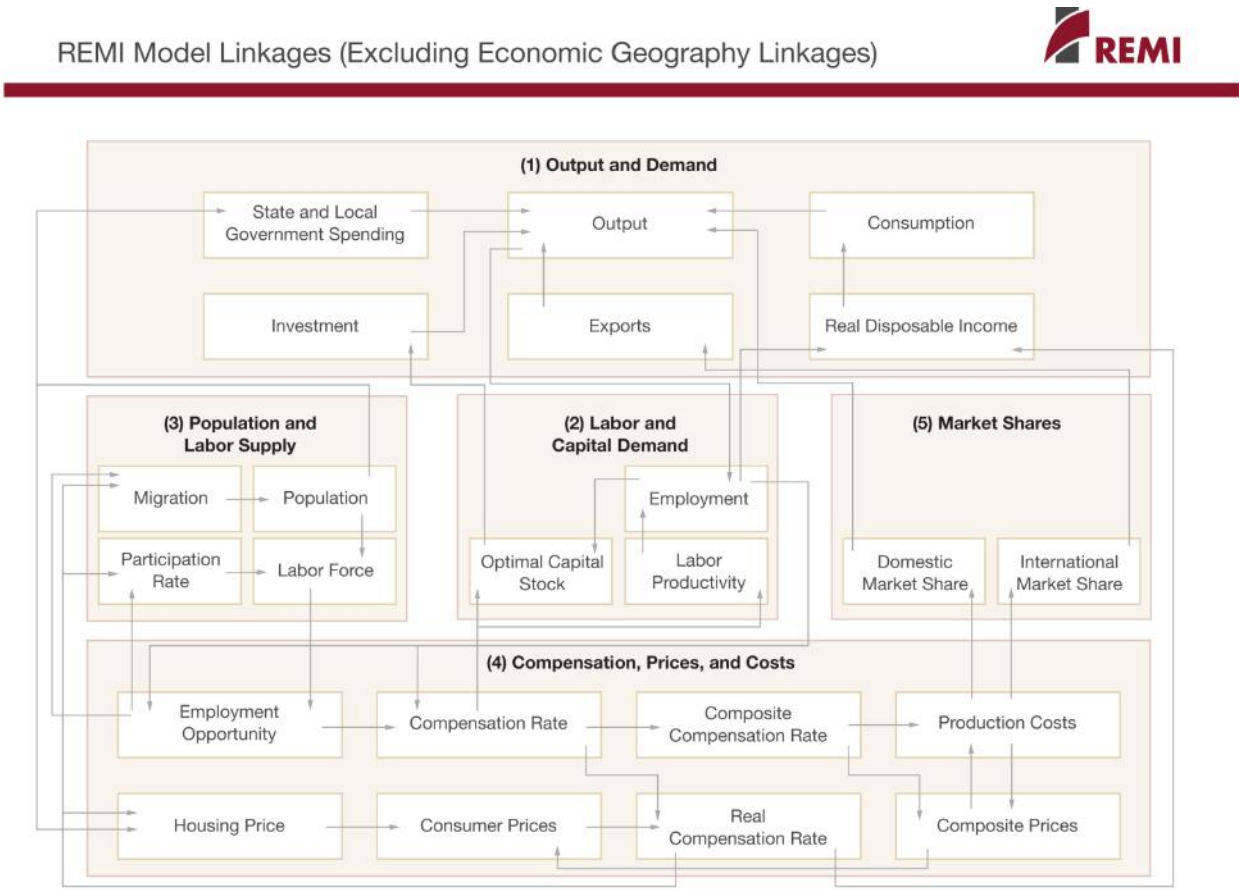

Figure 2: REMI Model Linkages[5]

[5] This is the overall structure of REMI's representation of the state economy. Each rectangle is a "stock," a finite concept such as population or the number of jobs. Each arrow shows an equation that links them together. For example, the population times the participation rate equals the labor force; government spending, plus capital investment, plus net exports, plus consumption, and minus intermediates, then equals GDP.

PI+ has two purposes: forecasting and policy analysis by examining alternative policy scenarios. The model has an underlying forecast based on the government data. To use the model to simulate the demographic and economic change due to the film and media related investment, we introduced "exogenous" changes to the REMI variables as presented in Table 1. They are called "policy variables" in the PI+ system and they represent the direct effect of projects on the Michigan economy. From there, the model automatically passes these changes through the rest of the economic structure until the model system reaches a new equilibrium at some point in the future after adjusting over time

Appendix II: Allocation of Travel Expenditures

Table 9: The Allocation of Travel Expenditures

SECTOR	RATIO
Retail trade	0.131681
Air transportation	0.349553
Rail transportation	0.006508
Transit and ground passenger transportation	0.042408
Scenic and sightseeing transportation; Support activities for transportation	0.006088
Rental and leasing services; Lessors of nonfinancial intangible assets	0.162495
Administrative and support services	0.119037
Performing arts and spectator sports	0.092374
Amusement, gambling, and recreation	0.060673
Repair and maintenance	0.029182