

Economic and fiscal impacts of the Michigan film tax credit

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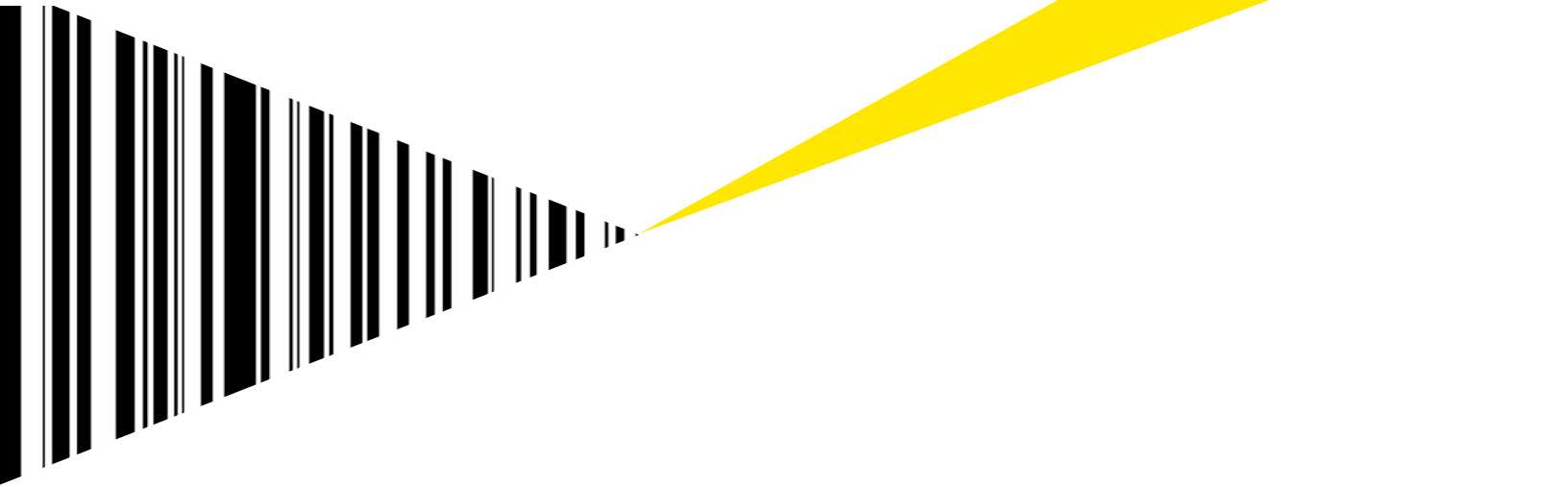
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Executive summary

In April 2008, the Michigan film production tax credit was enacted to attract film productions to the state, create jobs, and develop Michigan's film industry. The program provides a refundable tax credit equal to 30% to 42% of qualifying production expenses incurred during any phase of production for films and television series produced in Michigan. This analysis presents estimates of the economic and fiscal impact of productions qualifying for the Michigan film tax credit program in 2009 and 2010 based on aggregate production data provided by the Michigan Film Office.

The focus of the Michigan film tax credit program is to grow the Michigan economy by attracting increased film production activity (including feature films, television productions, and other qualifying motion picture production) to the state. Accordingly, this analysis focuses on the effectiveness of the program in creating private sector benefits including additional Michigan jobs, income, and economic activity. The analysis does not attempt to compare the credit program to the impact of other economic development programs or state expenditure programs more generally. The following sections present key findings from the analysis.

Film production spending and accrued credits

- As shown in Table ES-1, Michigan film productions qualifying for the credit program spent an estimated \$209.3 million and earned \$73.0 million in credits in 2009, equal to 35% of total production spending.
- In 2010, spending by qualified film productions increased significantly to \$322.6 million, which generated an estimated \$117.2 in film credit costs, equal to 36% of total Michigan production spending.

**Table ES-1. Summary of expenditures and credits
for qualifying productions, 2009-2010 (\$mil)**

| | 2009 | 2010 |
|--|----------------|----------------|
| Qualifying expenditures | | |
| Resident: | | |
| Labor compensation | \$42.8 | \$66.9 |
| Purchases | 58.7 | 101.1 |
| Non-resident: | | |
| Labor compensation | 90.2 | 131.2 |
| Total qualifying expenditures | \$191.6 | \$299.2 |
| Per diem expenses* | 17.7 | 23.4 |
| Total production expenditures | \$209.3 | \$322.6 |
| Expenditures impacting Michigan economy** | \$119.1 | \$191.4 |
| Film tax credits earned | \$73.0 | \$117.2 |
| Effective tax credit rate on total expenditures | 34.9% | 36.3% |

*These payments are provided to non-resident employees for their meal expenses while working in Michigan, generating significant in-state economic impact. However, these costs are not eligible for the credit.

**Includes resident labor compensation and in-state purchases, and certain non-qualifying Michigan expenditures

Note: Amounts may appear not to sum due to rounding

Source: Ernst & Young estimates based on Michigan Film Office data

Impact on statewide economic output:

- As shown in Table ES-2, \$119.1 million of the total \$209.3 million of expenditures associated with film productions in 2009 were direct payments to Michigan residents and business. These direct production company payments to Michigan residents and businesses generated significant indirect economic activity (an estimated \$190.2 million). Combining the direct and indirect impacts, film productions qualifying for the credit generated an estimated \$309.3 million of total Michigan economic output in 2009. In other words, for each dollar of direct spending on Michigan film labor and in-state purchases, total spending in Michigan increased by \$2.60. (See full report and appendices for more information on this estimate.)
- Film production activity resulting from the credit program increased significantly in 2010, increasing Michigan economic output by an estimated \$503.0 million, including \$191.4 million of direct spending by film productions and \$311.7 million of additional indirect and induced economic impacts on other Michigan businesses.

Impact on Michigan resident employment:

- Michigan film productions employed 5,390 residents in 2009 and 5,606 residents in 2010 as actors, producers, crew members, and in other positions, spreading the benefits of the film credit program across a large number of Michigan residents. The average film production lasted 90 days in 2009 and 89 days in 2010, meaning that each of the resident employees of a production would be employed for roughly one-third of the workdays in a year on any single film production. Moreover, an individual employee may not work every production day.
- Taking into account the portion of a year worked by a typical film production employee on each production, film productions qualifying for the credit generated an estimated 797 full-time-equivalent jobs in 2009. This direct employment created an estimated 1,834 additional indirect jobs in other Michigan industries, resulting in a total employment impact of 2,631 jobs in 2009.
- In 2010, qualified film productions resulted in an estimated 3,860 total additional jobs in Michigan, a 47% increase over the prior year.

Impact on Michigan resident income:

- Film productions paid Michigan residents \$42.8 million in wages and salaries in 2009, approximately \$53,700 per full-time-equivalent employee. In addition, the increased activity of hotels, suppliers, restaurants, retailers, and other businesses caused by film production activity created an additional \$66.2 million of indirect Michigan resident income, resulting in a total state resident income impact of \$108.9 million in 2009.
- In 2010, qualified film productions made \$66.9 million of direct payments to Michigan residents and generated an additional \$105.6 million of indirect income earned by residents, resulting in a total impact on Michigan resident income of an estimated \$172.5 million – a 58% increase over the prior year.

Table ES-2. Estimated economic impact of the Michigan film tax credit, 2009 and 2010

| | Direct Impact | Indirect Impact | Total Impact |
|-------------------------------|---------------|-----------------|--------------|
| 2009 Productions | | | |
| Economic output (\$mil) | \$119.1 | \$190.2 | \$309.3 |
| Resident labor income (\$mil) | \$42.8 | \$66.2 | \$108.9 |
| Resident employment (FTE) | 797 | 1,834 | 2,631 |
| 2010 Productions | | | |
| Economic output (\$mil) | \$191.4 | \$311.7 | \$503.0 |
| Resident labor income (\$mil) | \$66.9 | \$105.6 | \$172.5 |
| Resident employment (FTE) | 1,039 | 2,822 | 3,860 |

Note: Amounts may appear not to sum due to rounding

Source: Ernst & Young estimates based on Michigan Film Office data and Michigan IMPLAN economic model

Impact on state and local taxes

- State and local taxes generated by qualified film productions, their employees, and other affected businesses reduce the public sector cost of the credit program by returning a significant amount of tax revenue to Michigan governments. Due to the interaction between state and local governments in funding services, the benefit of additional local government tax revenue is an important part of the film credit program's impact.
- As shown in Table ES-3, state and local tax collections resulting from qualified Michigan film productions totaled an estimated \$19.5 million in 2009, including an estimated \$15.2 million in state tax revenue and \$4.3 million in local tax revenue. (See full report and appendices for additional detail on calculation.)
- In 2010, the estimated tax impact from qualified film productions grew 59% to \$30.9 million, including \$24.2 million of state taxes and \$6.8 million of local taxes.
- The new film employment may also reduce state unemployment benefit costs. For example, if the new film production employees were unemployed before working on the qualified productions and that a portion of those employees was receiving unemployment benefits from the state, the reduction in unemployment benefit expenditures would be \$4.3 million in 2009 and \$6.7 million in 2010. Using an assumption based on the economy-wide experience in Michigan, if employees hired by the film productions were unemployed at the same rate as the general Michigan workforce (13.6% in 2009 and 13.1% in 2010), the reduction in unemployment benefits would be \$0.6 million in 2009 and \$0.9 million in 2010. Given Michigan's current borrowing to fund its unemployment insurance system, this represents a significant savings to the state if it reduces general fund expenditures.

Table ES-3. Estimated tax impact of Michigan film productions qualifying for the tax credit, 2009 and 2010 (\$mil)

| State taxes | 2009 | 2010 |
|--|-------------------------|-------------------------|
| Individual income tax | | |
| Residents | \$3.5 | \$5.6 |
| Non-residents | 3.7 | 5.4 |
| Michigan business tax | 0.5 | 0.9 |
| General sales tax | 5.2 | 8.7 |
| Property tax | 0.7 | 1.1 |
| Other taxes | 1.6 | 2.5 |
| Total state taxes | \$15.2 | \$24.2 |
| Local taxes | | |
| Individual income tax | | |
| Residents | \$0.2 | \$0.3 |
| Non-residents | 0.3 | 0.4 |
| Property tax | 3.7 | 5.8 |
| Other taxes | 0.2 | 0.2 |
| Total local taxes | \$4.3 | \$6.8 |
| Total state and local taxes | \$19.5 | \$30.9 |
| Credit redemption fees (0.5% of credits) | \$0.4 | \$0.6 |
| Total taxes and fees | \$19.9 | \$31.5 |
| Reduction in unemployment benefit expenditures | \$0.6 to \$4.3 | \$0.9 to \$6.7 |
| Total taxes, fees, and expenditure reductions | \$20.5 to \$24.2 | \$32.4 to \$38.2 |

Note: Amounts may appear not to sum due to rounding
Source: Ernst & Young estimates

Comparing the cost and benefits of the film tax credit

- The film tax credit generated significant impacts on Michigan economic output and employment in 2009 and 2010. Table ES-4 summarizes key economic impacts of the program and compares those impacts to the estimated cost of the program during the same period.
- In 2009, qualified production activity earned credits of \$73.0 million and generated an estimated \$20.5 million in additional state and local taxes, credit redemption fees, and unemployment benefit expenditure reductions, offsetting the cost of the credit. Subtracting the additional taxes and other fiscal benefits from the cost of the credit, the net cost of the credits earned on qualified production activity in 2009 was an estimated \$52.5 million. For 2010, the net cost was an estimated \$84.7 million. The additional state and local taxes, fees, and unemployment benefit expenditure reductions returned \$0.28 of fiscal benefits for each dollar of credit earned during 2009 and 2010.
- Comparing the estimated net cost of the film tax credit to the additional economic activity created by the qualified film productions shows that each dollar of net film tax credit cost in 2009 generated an additional \$5.89 of Michigan economic output (sales of Michigan businesses). In 2010, this ratio increased to \$5.94 of higher sales for each dollar of net film tax credit cost.
- In 2009, qualified film production activity generated an estimated 2,631 full-time equivalent jobs for Michigan residents. The net cost of the credit during that period was an estimated \$52.5 million, meaning that the estimated net cost of each job created to Michigan state and local governments was \$19,954. In 2010, the net cost per job was an estimated \$21,950.
- Comparing the impact on resident income to the cost of the credit shows that for each dollar of net credit cost, there was an estimated \$2.07 of additional resident income created in 2009. In

2010, there was an estimated \$2.04 of Michigan resident income created for each dollar of net credit cost.

- It is important to note that the budgetary impact of the film tax credit in 2009 and 2010 was significantly less than the credits earned in those years. In 2009, credits claimed totaled \$34.6 million and in 2010 credits claimed totaled \$60.4 million. Comparing the credits claimed in each year with the estimated tax impact from qualified production activities in those years, the net state and local budgetary cost was \$14.1 million in 2009 and \$28.0 million in 2010.

Table ES-4. Comparison of Michigan film tax credit cost and benefits, 2009 and 2010

| | 2009 | 2010 |
|---|-----------------|-----------------|
| Credits earned by qualified productions (\$mil) | \$73.0 | \$117.2 |
| less: new taxes, fees, and UI benefit reductions (\$mil) | -20.5 | -32.4 |
| Net credit cost to Michigan public sector (\$mil) | \$52.5 | \$84.7 |
| State and local taxes, fees, and unemployment benefit reductions per dollar of credit | \$0.28 | \$0.28 |
| New full-time-equivalent jobs created for Michigan residents | 2,631 | 3,860 |
| Net Credit cost per additional Michigan resident job | \$19,954 | \$21,950 |
| Impact on statewide sales of businesses (\$mil) | \$309.3 | \$503.0 |
| New Michigan business sales per dollar of net credit cost | \$5.89 | \$5.94 |
| Impact on income (earnings) of Michigan residents (\$mil) | \$108.9 | \$172.5 |
| Additional resident income per dollar of net credit cost | \$2.07 | \$2.04 |
| Note: Actual cost of credits claimed during year | \$34.6 | \$60.4 |

Note: amounts may appear not to sum due to rounding
Source: Ernst & Young estimates based on Michigan Film Office data

Other benefits of the Michigan film credit

The film production tax credit generated additional benefits in 2009 and 2010 that are not reflected in the economic and fiscal impact results:

- In addition to productions qualifying for the film credit, there are additional productions that have been retained in Michigan due to the growth of film industry infrastructure and resources in Michigan. The economic and fiscal impacts of these productions are not included in the credit but represent significant Michigan spending and jobs.
- Relative to many other industries, the film industry is clean. Moreover, the growth of the film industry in Michigan does not increase public sector costs of environmental remediation associated with the growth of polluting industries.
- The economic downturn depressed sales of many Michigan businesses so significantly that many were forced to declare bankruptcy. The film credit helped many Michigan suppliers avoid bankruptcy or closure.

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Introduction

In April 2008, the Michigan legislature enacted the Michigan film production tax credit to attract film productions to the state with the goal of creating jobs and developing Michigan's film industry into one of the state's growth industries. Since the inception of the credit program, film production in Michigan has significantly increased and several new studio projects have been announced. The additional employment and spending related to film production activity due to the credit occurred during a period in which Michigan employment declined by 9%, presenting a sharp contrast to the overall economic conditions in Michigan.

This analysis presents estimates of the economic and fiscal impacts of the Michigan film tax credit program. The analysis differs from other analyses of the Michigan film tax credit program in several important respects:

- Because the goal of any economic development program is to generate new jobs and economic activity, these metrics are the focus of the analysis. The cost of the program is an important consideration, so the analysis also presents estimates of the net cost to Michigan's state and local governments after accounting for the additional taxes generated by film production activity and related indirect economic effects. Several metrics are presented to assist in the comparison of the costs and benefits of the credit, such as cost per new job and cost per dollar of economic activity.
- For each dollar of Michigan state tax collections, local governments collected \$0.52 in FY07-08.¹ However, despite the significance of local taxes in Michigan, they are often overlooked in analyses of the impact of state economic development programs. This analysis includes the benefit to local communities of the increase in local tax collections, which is an important outcome of any economic development program and should not be overlooked.
- Tabulations of film production spending related to the film credit program often include only expenditures that received the credit. This study incorporates estimates of the spending by qualified productions on which no credit was paid. For example, payments by film productions to their non-resident employees for per diem living expenses while working in Michigan do not qualify for the credit but generate significant Michigan economic activity in restaurants and other businesses where these per diems are spent.²

¹ According to the U.S. Census Bureau, State and Local Government Finances, 2007-2008

² Per diem payments are not eligible for the credit unless they are subject to Michigan individual income tax.

The Michigan Film Production Tax Credit

Productions qualifying for the tax credit include any media or multimedia production created for distribution in any digital media format, film, or video tape to the general public in two or more states. Certain productions are ineligible to receive the credit and include those with obscene content, news telecasts or sporting events, political advertising, radio programs, game or talk show programs, weather programs, and award shows or gala events.

For expenditures to qualify for the credit, the production must be approved by the Michigan Film Office. Any expenditure incurred prior to receiving official approval from the state is not eligible for the credit. Since the film production tax credit is established as a statute under the Michigan Business Tax (MBT), productions must file an MBT return with the state of Michigan along with the certificate of approval in order to redeem the credit. After the return is processed, the production will receive the full amount of the credit less a 0.5% redemption fee.

Once a production is approved by the state of Michigan, expenditures that qualify for the credit can be incurred during any phase of production. Qualifying production expenditures include payments to Michigan resident businesses or individuals, as well as non-resident above-the-line labor compensation up to \$2 million per person. The program provides a refundable tax credit of 42% of all resident expenditures and non-resident above-the-line labor expenditures incurred in designated “core communities,” and a refundable tax credit of 40% of all resident expenditures and non-resident above-the-line labor expenditures incurred elsewhere. Additionally, the program provides a refundable tax credit of 30% of non-resident below-the-line labor compensation up to \$2 million per person.

Purchases of goods or services from non-resident Michigan businesses do not qualify for the credit program. The credit program does not provide any preferential tax rates or exemptions to qualifying productions.

Data and assumptions

Aggregate film production data for 2009 and 2010 were provided by the Michigan Film Office. Data for 2009 reflect productions that occurred in 2009, including several not originally reported in the Film Office’s 2009 annual report. The 2010 productions are based on preliminary data reported to the Film Office. Total expenditures were disaggregated into spending on labor and non-labor. Expenditures on labor were disaggregated into payments to residents and non-residents, while expenditures on non-labor were reported in the following expense categories: lodging, building rentals, food, equipment and material rentals, locations, travel, contracted services, insurance, and other miscellaneous expenses.

Key parameters for which productions were missing data were estimated based on averages for productions with complete data. See Appendix A for information regarding the assumptions and calculations used to estimate values for these key parameters.

Table 1 provides a summary of the expenditures and credits for qualifying productions in 2009 and 2010. Film productions qualifying for the credit program in Michigan spent an estimated \$209.3 million and earned \$73.0 million in credits in 2009. In 2010, spending by qualified film productions significantly increased to \$322.6 million, which generated an estimated \$117.2 million in film credit costs. For both years, the effective tax credit rate on qualified expenditures by film productions was approximately 35%.

Table 1 also reports the estimated amount of per diems received by non-resident employees. Based on data from qualifying productions with completed audits from prior years, EY assumed a weekly per diem of \$392 per non-resident employee. See Appendix A for more detailed information on the estimation of these non-qualifying expenditures. Data on other non-qualifying expenditures, such as production-related expenditures for goods and services purchased from non-resident businesses and individuals were not available and were not included in the analysis.

In addition to the Michigan expenditures described above, qualified productions also incurred costs related to location scouting and production before they were approved for the credit. Films also typically incur audit and other administrative costs that are not approved for the credit. Because these costs are incurred before or after the production period analyzed in this report, they are not included. However, each of these costs represents spending in Michigan and contributes to employment and economic activity in Michigan.

Note that above-the-line labor costs include payments to actors, directors, and producers. Below-the-line labor costs include the costs of crew members.

Table 1. Summary of expenditures and credits for qualifying productions, 2009 – 2010 (\$mil)

| | 2009 | 2010 |
|--|----------------|----------------|
| Qualifying expenditures | | |
| Resident | | |
| Labor compensation (40-42% credit rate) | \$42.8 | \$66.9 |
| Non-labor purchases (40-42% credit rate) | | |
| Equipment and material rentals | 24.4 | 48.7 |
| Other | 6.6 | 10.0 |
| Contracted services | 6.3 | 7.8 |
| Lodging | 5.8 | 10.2 |
| Travel | 4.3 | 5.3 |
| Locations | 4.2 | 7.3 |
| Insurance | 3.1 | 5.1 |
| Food | 2.7 | 4.8 |
| Building rentals | 1.3 | 1.7 |
| Non-resident labor compensation | | |
| Above-the-line labor (40-42% credit rate) | 52.8 | 80.1 |
| Below-the-line labor (30% credit rate) | 37.4 | 51.1 |
| Total qualifying expenditures | \$191.6 | \$299.2 |
| Per diems* | 17.7 | 23.4 |
| Total production expenditures | \$209.3 | \$322.6 |
| Expenditures impacting Michigan economy** | \$119.1 | \$191.4 |
| Credit cost | \$73.0 | \$117.2 |
| Effective tax credit rate on total expenditures | 34.9% | 36.3% |

*These payments are provided to non-resident employees for their meal expenses while working in Michigan, generating significant in-state economic impact. However, these costs are not eligible for the credit.

** Includes resident labor compensation and purchases, and certain non-qualifying expenditures

Note: Amounts may appear not to sum due to rounding

Source: Ernst & Young estimates based on Michigan Film Office data

Table 2 summarizes the key parameters used to estimate the employment impacts in this analysis. Michigan film productions employed 5,390 residents in 2009 and 5,606 residents in 2010 for production-related positions. Note that while film productions are instructed to exclude extras from the reported employment numbers, some productions may have reported extras as employees. For several films, employment numbers were adjusted to remove extras reported by the production. The average film production lasted 90 days in 2009 and an estimated 89 days in 2010, suggesting that each resident employee was employed by any single film production for approximately one-third of the workdays in a year. Moreover, throughout the duration of a single production, employees may have also not worked every day.

To account for the nature of employment in the film production industry, the total number of resident employees is adjusted to reflect full-time-equivalent employees (FTEs). Using data from other jurisdictions that track the number of hours worked by film production employees during a production period, EY estimated that the average film production employee works slightly less than 40% of a full-time schedule, equal to approximately 3 hours per day, on average. Assuming each full-time employee works for nearly 40% of the duration of the production, film productions generated an estimated 797 full-time-equivalent jobs in 2009. The average annual compensation associated with each full-time-equivalent job was approximately \$53,700 in 2009. In 2010, film productions generated an estimated 1,039 full-time-equivalent jobs at an average annual compensation of approximately \$64,400.

Table 2. Summary of key employment parameters, 2009 – 2010

| | 2009 | 2010 |
|---|-------------|-------------|
| Average duration of production (days) | 90 | 89 |
| Resident employment: | | |
| Number of individuals employed | 5,390 | 5,606 |
| Estimated full-time-equivalent employees (FTEs) | 797 | 1,039 |
| Estimated average salary | \$53,700 | \$64,400 |

Source: Ernst & Young estimates based on Michigan Film Office data

Methodology

Economic impact estimation approach

The economic impacts of film productions participating in the tax credit program are described here as direct, indirect, and induced impacts. The direct impacts are based on data provided by the Michigan Film Office and assumptions described in the prior section. The indirect and induced impacts described below were estimated using the IMPLAN economic model of the Michigan economy. (For a discussion of the IMPLAN economic model and comparison with other available models, see Appendix E.)

Measures of economic impact

The impact of qualified film productions is measured as the change in several economic metrics:

- **Economic output:** For most industries, economic output is equivalent to sales. This is the broadest measure of economic activity and includes payments to labor and capital, as well as the value of goods and services purchased from other companies.
- **Labor income:** Labor income reflects the compensation earned by employees of film productions and other business affected by film activity in Michigan. This measure includes wage and salary payments, benefits, and certain other non-wage compensation.
- **Employment:** Employment reported in this analysis is described as full-time equivalents. For the film industry, full-time equivalent employment assumes a 40-hour work week. In some industries, a full time employee may work more or less than 40 hours per week.

For each of these metrics, direct, indirect, and induced economic impacts were estimated. The estimation approach is described below.

Direct economic impacts

The direct economic impact of the Michigan film tax credit includes the spending, income, and employment associated with qualified film productions in 2009 and 2010.

- Direct impact on economic output is equivalent to total film production spending on Michigan labor, goods, and services. These include above and below-the-line payments to resident labor, purchases of goods and services from Michigan businesses, and per diems received by non-resident employees, which impact the Michigan economy.
- Direct income impacts are equal to the total wages and benefits earned by resident employees who are employed by Michigan film productions. Payments in the form of wages and fringe benefits to non-resident employees are not included in the economic impact estimates because the analysis assumes that these payments have a lower economic impact compared with payments to Michigan residents.
- Direct employment impacts are equal to full-time-equivalent resident employment associated with qualified Michigan film productions.

Indirect economic impacts

Indirect economic impacts arise from the purchase of goods and services from Michigan businesses that support the film industry. As film productions purchase goods and services from Michigan businesses, these businesses expand operations and hire additional employees to support the increased level of activity. For example, if a film production purchases catering services from a Michigan catering company, that business may hire additional employees to service the film production. Similarly, if film productions in Michigan purchase transportation services from Michigan companies, these companies will hire additional drivers, creating additional Michigan employment and economic activity.

- Indirect impacts are modeled as purchases of goods and services by film productions from Michigan businesses that support the film industry, such as businesses that provide lodging, building rentals, food services, equipment and material rentals, locations and travel services, other contracted services, and insurance. The additional sales of goods and services to non-resident film production employees during their stay in Michigan are also included in the indirect economic impacts.
- Indirect income impacts are estimated using the IMPLAN model and reflect the total wages and fringe benefits earned by employees of the indirectly affected businesses.
- Indirect employment impacts are modeled in IMPLAN as the employment generated from film activity in the supplier businesses.

Induced economic impacts

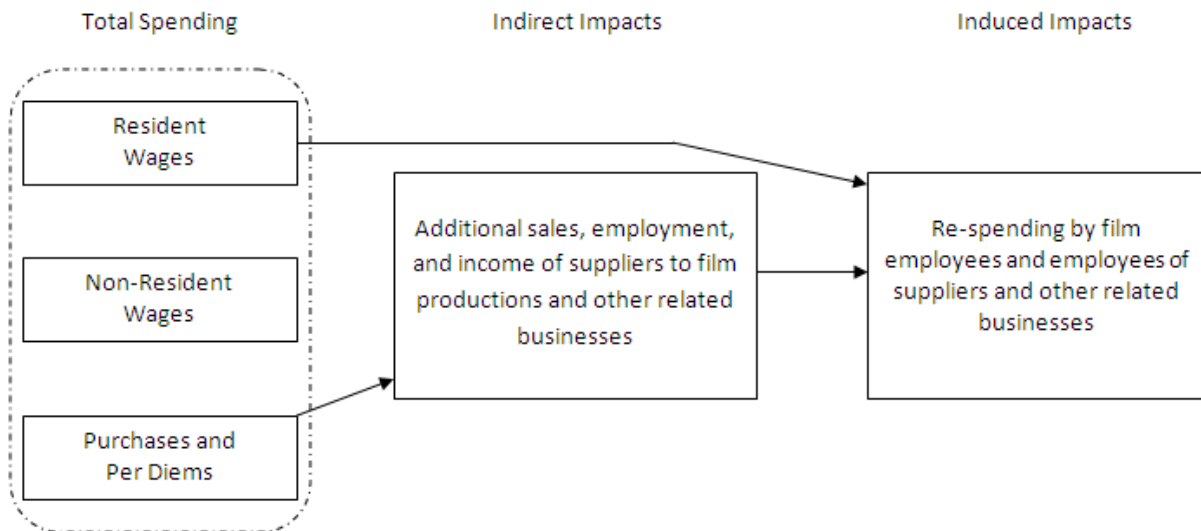
Consumer spending resulting from an increase in employees' personal income creates 'induced impacts.' This spending by crew members, make-up artists, actors, and other employees generates additional economic activity as Michigan's retailers and service providers expand to meet this additional demand for goods and services. For example, crew members working on Michigan film productions earn additional income from their jobs, which may be spent at a local retailer. To support the additional sales generated by the higher incomes earned by these crew members, the local retailer may need to employ an additional sales clerk. In the aggregate, these additional positions at retailers and similar businesses (restaurants, service providers, etc.) represent the induced economic effect.

- Induced spending impacts are modeled in IMPLAN as the consumer spending resulting from the increase in personal income of employees of both the businesses that directly support the film industry in Michigan and the businesses that indirectly support the film industry in Michigan by supporting those businesses that directly support the film industry in Michigan. Furthermore, consumer spending resulting from the increase in personal income of resident employees of the film productions is modeled as an induced spending impact.
- Induced income impacts are modeled in IMPLAN as the total wages and fringe benefits earned by employees of the businesses at which film employees and employees of indirectly affected businesses spend their income.

- Induced employment impacts are modeled in IMPLAN as the employment generated by the spending of income earned by employees of film productions and indirectly affected businesses.

Figure 1 shows the relationship of the different components modeled in IMPLAN as described above to estimate the indirect and induced impacts.

Figure 1. Illustration of IMPLAN modeling approach for Michigan film productions



To simplify the presentation of results, in the discussion of the results, indirect and induced impacts are combined and presented together as ‘indirect impacts’.

Tax impact estimation approach

The increased level of state economic activity due to the film tax credit generates additional Michigan state and local tax collections. The tax impact of film productions participating in the tax credit program is also described as direct, indirect, and induced impacts. Direct tax impacts are the taxes paid by film productions or their employees to state and local governments. Indirect and induced tax impacts are the taxes paid by suppliers and other related businesses that expand as a result of film production activity, and employees of those suppliers and other businesses.

The majority of the tax impacts were estimated based on historical ratios of tax collections to personal income in Michigan. This method of estimating the fiscal impacts assumes that the economic activity resulting from film productions in Michigan generates additional tax revenue in the same proportion as observed historically in Michigan. See Appendix C for more detailed information on these calculations.

The estimate of the direct individual income tax impact from resident film employees was based on the estimated average salary of a full-time equivalent employee and a calculated effective individual income tax rate considering Michigan personal exemptions. Similarly, non-resident film employees are assumed to generate an additional direct individual income tax impact. The

indirect and induced individual tax impacts were estimated based on historical ratios of individual income tax collections to personal income in Michigan. See Appendix C for more detailed information about the estimation of the individual income tax impacts.

The estimate of the direct sales tax impact resulting from film production activity was based on the estimated expenditures on taxable materials and services and state and average local sales tax rates. The indirect and induced sales tax impacts were estimated based on historical ratios of sales tax collections to personal income in Michigan, as data on the purchases of goods and services of businesses that support the film industry were not available. See Appendix C for more detailed information about the estimation of the sales tax impacts.

Additional benefits considered

Additional benefits resulting from the film credits include the reduction in unemployment benefit expenditures to the extent that the film production employees were unemployed prior to working on the qualified productions. See Appendix D for detailed information about the estimate of reduced unemployment benefit expenditures associated with film production activity.

Economic and tax impacts of the film tax credit program

Economic impacts of Michigan film production activity in 2009 and 2010

Table 3 presents the economic impact of Michigan film production activity in 2009 and 2010. The direct, indirect, and total economic impacts are described using three measures of economic impact:

- **Economic output:** Direct payments to Michigan residents and businesses totaled \$119.1 million in 2009. These payments generated significant indirect economic activity totaling an estimated \$190.2 million. Combining the direct and indirect impacts, film productions qualifying for the credit in 2009 generated an estimated \$309.3 million of total Michigan economic output. In other words, for each dollar of spending on Michigan resident labor and purchases, total spending in Michigan increased by \$2.60. Film production activity resulting from the credit program increased significantly in 2010, with a total Michigan economic output impact of \$503.0 million.
- **Resident labor income:** Film productions paid Michigan residents \$42.8 million in compensation in 2009, approximately \$53,700 per full-time equivalent employee. Increased activity of hotels, suppliers, restaurants, retailers, and other businesses as a result of film production activity generated an additional \$66.2 million of indirect Michigan resident income, resulting in a total state resident income impact of \$108.9 million in 2009. Film production activity generated an estimated total Michigan resident income impact of \$172.5 million in 2010, a 58% increase over the prior year.
- **Employment:** Film productions qualifying for the credit generated an estimated 797 full-time-equivalent jobs in 2009. This direct employment created an estimated 1,834 additional indirect jobs in other Michigan industries, resulting in a total employment impact of 2,631 jobs in 2009. An estimated 3,860 total additional jobs were created in Michigan as a result of film production activity in 2010, a 47% increase over the prior year.

Table 3. Estimated economic impact of the Michigan film tax credit, 2009 and 2010

| | Direct Impact | Indirect Impact | Total Impact |
|-------------------------------|--------------------------|----------------------------|-------------------------|
| 2009 Productions | | | |
| Economic output (\$mil) | \$119.1 | \$190.2 | \$309.3 |
| Resident labor income (\$mil) | \$42.8 | \$66.2 | \$108.9 |
| Resident employment (FTE) | 797 | 1,834 | 2,631 |
| 2010 Productions | | | |
| Economic output (\$mil) | \$191.4 | \$311.7 | \$503.0 |
| Resident labor income (\$mil) | \$66.9 | \$105.6 | \$172.5 |
| Resident employment (FTE) | 1,039 | 2,822 | 3,860 |

Note: Amounts may appear not to sum due to rounding
Source: Ernst & Young estimates based on Michigan Film Office data and Michigan IMPLAN economic model

Table 4 presents the indirect employment impact of Michigan film production activity in 2009 and 2010 by industry group. In each year, the top 5 industry groups, food services, business services, rentals and repairs, personal services, and retail, account for approximately 80% of the indirect employment impact. Note that the impacts shown in the table include the indirect and induced impacts.

Table 4. Indirect employment impact by industry group, 2009 and 2010

| | 2009 | 2010 |
|-----------------------|----------------------------|----------------------------|
| Industry | Indirect Employment | Indirect Employment |
| Food services | 487 | 741 |
| Business services | 369 | 524 |
| Rentals and repairs | 273 | 406 |
| Personal services | 240 | 373 |
| Retail | 137 | 212 |
| Professional services | 85 | 175 |
| Accommodations | 67 | 114 |
| Manufacturing | 43 | 65 |
| Transportation | 38 | 58 |
| Wholesale | 32 | 54 |
| Information services | 26 | 40 |
| Other | 38 | 60 |
| Total | 1,834 | 2,822 |

Note: Amounts may appear not to sum due to rounding.
Source: Ernst & Young estimates based on Michigan Film Office data and Michigan IMPLAN economic model

Tax impacts of Michigan film production activity in 2009 and 2010

State and local taxes generated by qualified film productions reduce the public sector cost of the credit program by returning a significant amount of tax revenue to the Michigan government. Table 5 presents the estimated tax impacts at the state and local level resulting from film activity

in Michigan in 2009 and 2010. These estimated tax impacts include the estimated taxes paid by businesses and their employees.

The direct state tax impact of film productions in 2009 was \$10.2 million. Combined with indirect state tax impacts of \$5.0 million, an estimated \$15.2 of state taxes resulted from film production activity in 2009. The estimated total state tax impact of qualified film productions in 2010 was \$24.2 million, an increase of 59% over the prior year.

The total local tax impact from film productions activities in 2009 was \$4.3, including \$1.9 million of direct local taxes and \$2.4 million of indirect local taxes. The estimated total local tax impact of qualified film productions in 2010 was \$6.8 million, an increase of 58% over the prior year.

The total state and local tax impact from film production activities in 2009 was an estimated \$19.5 million, while the estimated total state and local tax impact from film production activities in 2010 was \$30.9 million.

Table 5. Estimated tax impact of the Michigan film tax credit, 2009 and 2010 (\$mil)

| State | 2009 | | | 2010 | | |
|------------------------------------|---------------|-----------------|---------------|---------------|-----------------|---------------|
| | Direct Impact | Indirect Impact | Total Impact | Direct Impact | Indirect Impact | Total Impact |
| State | | | | | | |
| Individual income tax | | | | | | |
| Residents | \$1.7 | \$1.8 | \$3.5 | \$2.7 | \$2.9 | \$5.6 |
| Non-residents | 3.7 | 0.0 | 3.7 | 5.4 | 0.0 | 5.4 |
| Corporate income tax | 0.2 | 0.3 | 0.5 | 0.3 | 0.5 | 0.9 |
| General sales tax | 3.7 | 1.5 | 5.2 | 6.3 | 2.5 | 8.7 |
| Property tax | 0.3 | 0.4 | 0.7 | 0.4 | 0.7 | 1.1 |
| Other taxes | 0.6 | 0.9 | 1.6 | 1.0 | 1.5 | 2.5 |
| Total state taxes | \$10.2 | \$5.0 | \$15.2 | \$16.1 | \$8.0 | \$24.2 |
| Local | | | | | | |
| Individual income tax | | | | | | |
| Residents | \$0.1 | \$0.1 | \$0.2 | \$0.2 | \$0.1 | \$0.3 |
| Non-residents | 0.3 | 0.0 | 0.3 | 0.4 | 0.0 | 0.4 |
| Property tax | 1.4 | 2.2 | 3.7 | 2.2 | 3.5 | 5.8 |
| Other taxes | 0.1 | 0.1 | 0.2 | 0.1 | 0.2 | 0.3 |
| Total local taxes | \$1.9 | \$2.4 | \$4.3 | \$2.9 | \$3.8 | \$6.8 |
| Total state and local taxes | \$12.1 | \$7.4 | \$19.5 | \$19.1 | \$11.9 | \$30.9 |

Note: Amounts may appear not to sum due to rounding
Source: Ernst & Young estimates

Reduction in unemployment benefit expenditures in 2009 and 2010

To the extent that film production employees were unemployed prior to working on the qualified productions, an additional fiscal impact of the film credit program is the reduction in unemployment benefit expenditures by the state. Table 6 presents a range of the estimated reduction in unemployment benefit expenditures resulting from the film credit based on two scenarios.

Assuming that all film production employees were unemployed prior to working on the qualified film productions and that a portion of those employees was receiving unemployment benefits from the state, the reduction in unemployment benefit expenditures total an estimated \$4.3 million in 2009 and \$6.7 million in 2010. Alternatively, if employees hired by the qualified film productions were unemployed at the same rate as the general Michigan workforce, the reduction in unemployment benefits total an estimated \$0.6 million in 2009 and \$0.9 million in 2010.

Table 6. Estimated savings in unemployment benefits expenditures, 2009 and 2010 (\$mil)

| Range of estimated reduction in unemployment benefits expenditures | 2009 | 2010 |
|---|-------------|-------------|
| Estimated benefit cost reduction – high impact scenario | \$4.3 | \$6.7 |
| Percentage of new jobs filled by unemployed workers | 100% | 100% |
| Estimated benefit cost reduction – low impact scenario | \$0.6 | \$0.9 |
| Percentage of new jobs filled by unemployed workers | 13.6% | 13.1% |

Source: Ernst & Young estimates

Costs and benefits of the Michigan film tax credit

The film tax credit generated significant economic impacts in 2009 and 2010. Table 7 summarizes key economic impacts of the program and compares those impacts to the estimated cost of the program.

In 2009, qualified production activity earned credits of \$73 million and generated an estimated \$20.5 million in additional state and local taxes, credit redemption fees, and unemployment benefit expenditure reductions that offset the cost of the credit. Subtracting these Michigan public sector fiscal benefits from the credit cost, the net cost of the credits earned on qualified production activity in 2009 was an estimated \$52.5 million. Similarly, the net cost of credits earned on qualified production activity in 2010 was an estimated \$84.7 million. The additional state and local taxes, fees, and unemployment benefit expenditure reductions returned \$0.28 of fiscal benefits for each dollar of credit earned during 2009 and 2010.

Comparing the estimated net cost of the film tax credit to the additional economic activity created by the qualified film productions suggests that each dollar of net film tax credit cost in 2009 generated an additional \$5.89 of sales by Michigan businesses (economic output). In 2010, this ratio increased to \$5.94 of new sales for each dollar of net film tax credit cost.

Comparing the estimated net cost of the film tax credit to the additional resident labor income resulting from qualified film production activity suggests that each dollar of net film tax credit cost in 2009 generated an additional \$2.07 of Michigan resident labor income. In 2010, the credit generated an estimated \$2.04 of Michigan resident income for each dollar of credit cost.

In 2009, qualified film production activity generated an estimated 2,631 full-time equivalent jobs for Michigan residents, implying that the estimated net cost to Michigan governments of each job created was \$19,963. In 2010, this ratio increases to an estimated net cost of each job of \$21,950.

It is important to note that the budgetary impact of the film tax credit in 2009 and 2010 was significantly less than the credits earned in those years. In 2009, credits claimed totaled \$34.6 million and in 2010 credits claimed totaled \$60.4 million. Comparing the credits claimed in each year with the estimated tax impact from qualified production activities in those years, the net state and local budgetary cost was \$14.1 million in 2009 and \$28.0 million in 2010.

**Table 7. Comparison of Michigan film tax credit cost and benefits, 2009 and 2010
(\$mil unless otherwise noted)**

| | 2009 | 2010 |
|---|-----------------|-----------------|
| Credits earned by qualified productions | \$73.0 | \$117.2 |
| Less: | | |
| Total state and local taxes | \$19.5 | \$30.9 |
| Credit redemption fees | \$0.4 | \$0.6 |
| Reduction in unemployment benefit expenditures* | \$0.6 | \$0.9 |
| Total new taxes, fees, and expenditure reductions | \$20.5 | \$32.4 |
| Equals: Net credit cost from production activity | \$52.5 | \$84.7 |
| State and local taxes, fees, and unemployment benefit reductions per dollar of credit | \$0.28 | \$0.28 |
| Impact on statewide sales of Michigan businesses | \$309.3 | \$503.0 |
| New Michigan business sales per dollar of net tax credit cost | \$5.89 | \$5.94 |
| Impact on income (earnings) of Michigan residents | \$108.9 | \$172.5 |
| Additional resident income per dollar of net tax credit cost | \$2.07 | \$2.04 |
| Additional full-time equivalent jobs created for Michigan residents | 2,631 | 3,860 |
| Net credit cost per additional resident job (\$units) | \$19,963 | \$21,950 |
| Note: Actual cost of credits claimed during year | \$34.6 | \$60.4 |

*Note: This estimated impact assumes the proportion of jobs filled by unemployed workers was equal to the statewide unemployment rate
Source: Ernst & Young estimates based on Michigan Film Office data

Appendix A: Data and assumptions

The analysis presented in this study relies on data provided by the Michigan Film Office for productions occurring in 2009 and 2010. The majority of this data was provided by qualified productions on film tax credit applications. Some productions did not report complete data or improperly reported values for certain items (number of people hired, for example). The adjustments that were made to correct these omissions and errors are described below.

Key parameters for which productions were missing data were estimated based on averages for productions with complete data. Table A-1 presents the average ratios used to estimate values for those film productions with missing data on production days, hires, and Michigan above-the-line wages in 2009. For example, for films missing the number of production days, total spending was divided by \$40,999, the average spending per production day for the sample of 2009 productions used in the analysis. Similar calculations were performed for films with missing wage and employment information.

Table A-1. Imputation factors applied to missing data, 2009

| Missing value | Imputation Factor | Calculated Value for Imputation Factor | Applied To |
|-----------------|---------------------------------------|--|-------------------|
| Production days | Total spending / Production day | 40,999 | Total spending |
| Hires | MI Labor spending / MI Hire | 7,206 | MI Labor spending |
| MI ATL wages* | MI ATL as a share of total ATL wages* | 9% | Total ATL wages |

Source: Ernst & Young estimates based on Michigan Film Office data.

*ATL is an acronym for "above-the-line," which includes actors, directors, producers and certain other types of labor costs.

Table A-2 presents the average values used to estimate missing data on wages and non-labor expenditures in 2010.

Table A-2. Imputation factors applied to missing data, 2010

| Missing value | Imputation Factor | Calculated Value for Imputation Factor | Applied To |
|-----------------|--|--|-----------------|
| Total BTL wages | Total BTL wages as a share of total spending | 37% | Total spending |
| MI BTL wages | MI BTL as a share of total BTL wages | 53% | Total BTL wages |
| MI ATL wages* | MI ATL as a share of total ATL wages | 9% | Total ATL wages |

*Estimate based on 2009 data, because data for 2010 were unavailable

Source: Ernst & Young estimates based on Michigan Film Office data.

For certain productions in 2010, detailed information for expenditures on goods and services purchased from Michigan businesses was not available. The spending distribution shown in Table A-3 was used to estimate this data when missing.

Table A-3. Detailed distribution of spending on Michigan goods and services, 2010

| Distribution of total resident non-labor expenditures by detailed expense category | |
|---|-----|
| Lodging | 10% |
| Building rentals | 2% |
| Food | 5% |
| Equipment rentals | 28% |
| Material rentals | 20% |
| Locations | 7% |
| Travel | 5% |
| Contracted services | 8% |
| Insurance | 5% |
| Other | 10% |

Data on non-qualifying expenditures, such as production-related expenditures for goods and services purchased from non-resident businesses and individuals were not available. EY estimated per diems received by non-resident employees, which are assumed to impact the Michigan economy. Information needed to estimate other non-qualifying expenditures was not available so that spending was not included in the analysis.

Data on the number of non-resident employees eligible to receive per diems were not available. Using data from other jurisdictions that track the number of non-resident above-the-line labor employed by film productions, EY estimated an average of 11 non-resident above-the-line employees hired by each qualifying Michigan film production reporting non-resident above-the-line labor costs. Film productions that indicated no non-resident above-the-line labor costs were assumed to employ zero above-the-line non-residents. Reported total non-resident below-the-line labor costs for each year were used to determine the number of non-resident below-the-line employees hired by qualifying Michigan film productions. Assuming that non-resident below-the-line labor received an average salary equal to the average salary of Michigan resident below-the-line labor for each year, EY estimated a total of 697 non-resident below-the-line employees for 2009 and 793 non-resident below-the-line employees for 2010.

Based on information from qualifying productions with completed audits from prior years, EY assumed a weekly per diem of \$392 per non-resident employee. The total value of per diems received by non-resident employees was an estimated \$17.7 million in 2009 and \$23.4 million in 2010.

Appendix B: Methodology

There are two common methods for estimating the economic impact of the operations of the film industry. The first method is to rely on the IMPLAN economic model's built-in data describing the levels of employment, intermediate input purchases, and employee compensation for the film industry based on state economic data and national averages. This approach uses standard economic "multipliers" for the film industry, which convert an estimate of industry output or employment into other measures of the direct and indirect economic activity. For instance, given \$1 million of total output by the film industry, the model would provide estimates of direct employment by film productions and income earned by film employees. Then, based on the average spending of film productions nationwide on goods and services, like catering, set materials, hotels, and services, the model would estimate the indirect impacts on other businesses.

This approach is limited by its reliance on state and national average production data that does not reflect the actual data observed for Michigan film productions that qualify for the credit. For example, by definition the qualifying production spending on purchased goods and services must originate in Michigan to qualify for the credit. In contrast, IMPLAN would typically assume that approximately 50% of a film's purchases of goods and services would be imported from other states and would not generate Michigan economic activity. Similarly, productions qualifying for the credit have a different distribution of spending on purchased goods and services than those qualifying for the credit. To overcome these limitations, this analysis uses an expenditure approach to estimate the economic impacts.

Table B-1 presents the expenditures used to calculate the indirect and induced impacts resulting from direct film production expenditures. The expenditures represent purchases of goods and services by film productions from various industries. Non-resident expenditure of per diems is assumed to be used for meals (food) only. Each general expenditure category is followed by the representative IMPLAN industry used to model the impacts in parenthesis.

The expenditures defined as contracted services and other miscellaneous expenses were divided equally into the following expense categories based on the magnitude of purchases from the IMPLAN model of the Michigan film industry not already included in the generally-defined expense categories: advertising and related services, software and blank audio and video media mass reproduction services, management, scientific, and technical consulting services, employment services, legal services, automotive equipment rental and leasing services, all other miscellaneous professional, scientific, and technical services, and truck transportation services.

Table B-1. Film production expenditures modeled in IMPLAN, 2009 and 2010 (\$mil)

| Expense category (IMPLAN industry) | 2009 | 2010 |
|--|--------|--------|
| Food and per diems (Food services and drinking places) | \$20.4 | \$28.2 |
| Materials rental (General and consumer goods rental) | 16.4 | 20.1 |
| Equipment rental (Commercial and industrial machinery and equipment rental) | 8.0 | 28.6 |
| Lodging (Hotels and motels, including casino hotels) | 5.8 | 10.2 |
| Building rentals and locations (Real estate establishments) | 5.5 | 9.1 |
| Travel services (Travel arrangement and reservation services) | 4.3 | 5.3 |
| Insurance (Insurance carriers) | 3.1 | 5.1 |
| Contracted services and other expenses (Advertising and related services) | 1.6 | 2.2 |
| Contracted services and other expenses (Software, audio, and video media for mass reproduction) | 1.6 | 2.2 |
| Contracted services and other expenses (Management, scientific, and technical consulting services) | 1.6 | 2.2 |
| Contracted services and other expenses (Employment services) | 1.6 | 2.2 |
| Contracted services and other expenses (Legal services) | 1.6 | 2.2 |
| Contracted services and other expenses (Automotive equipment rental and leasing) | 1.6 | 2.2 |
| Contracted services and other expenses (Other misc. professional, scientific, technical services) | 1.6 | 2.2 |
| Contracted services and other expenses (Truck transportation services) | 1.6 | 2.2 |

Source: Ernst & Young estimates based on Michigan Film Office data.

A simulated change in labor income in IMPLAN is used to estimate the additional induced impacts resulting from the payments to Michigan film production labor. This approach uses IMPLAN's built-in distribution of household spending and marginal propensity to consume for households to estimate the additional demand for goods and services in Michigan created by the spending by employees of film productions.

Appendix C: Tax impacts

Tax impacts on state and local governments were estimated by multiplying the estimated impact on labor income by the ratio of historical tax collections to statewide personal income. Table C-1 presents the data on state and local tax collections in 2008, statewide personal income in 2008, and the effective tax rates used in the analysis.

Table C-1. State and local tax collections and statewide personal income, 2008 (\$mil)

| Resident personal income | | 353,296 |
|---------------------------------|------------------------|---|
| State | Tax collections | As a percent of Michigan personal income |
| Property | \$2,264 | 0.64% |
| Sales and gross receipts | | |
| General sales | 8,226 | 2.33% |
| Selective sales | | |
| Motor fuel | 995 | 0.28% |
| Alcoholic beverage | 139 | 0.04% |
| Tobacco products | 1,076 | 0.30% |
| Public utilities | 21 | 0.01% |
| Other selective sales | 1,464 | 0.41% |
| Individual income | 7,181 | 2.03% |
| Michigan Business Tax | 1,778 | 0.50% |
| Motor vehicle license | 893 | 0.25% |
| Other taxes* | 461 | 0.13% |
| Total state tax revenue | \$24,498 | 6.93% |
| Local | Tax collections | As a percent of Michigan personal income |
| Property | \$11,862 | 3.36% |
| Selective sales | | |
| Alcoholic beverage | 6 | 0.00% |
| Tobacco products | 6 | 0.00% |
| Public utilities | 62 | 0.02% |
| Other selective sales | 208 | 0.06% |
| Individual income | 461 | 0.13% |
| Other taxes* | 223 | 0.06% |
| Total local tax revenue | \$12,829 | 3.63% |

*Other taxes exclude revenues from the death and gift tax, document and stock transfer tax, and severance tax
Source: 2008 Annual Surveys of State and Local Government Finances, U.S. Census Bureau;
BEA State Annual Personal Income

Note that this approach is not used to estimate the direct individual income and sales tax impacts. The direct individual income tax impact was estimated using an effective tax rate of 4.06%. This effective tax rate corresponds to an average income of approximately \$53,000, after subtracting the Michigan personal exemption. For indirect income tax impacts, a 2.7% effective tax rate was used, reflecting average earnings of approximately \$27,000.

A similar calculation is made for the direct local individual income tax impact, resulting in an effective local individual income tax rate of 0.30%. The direct sales tax impact was estimated by applying the state sales tax rate of 6% to expenditure items subject to tax in Michigan.

Appendix D: Impact on unemployment benefit expenditures

Additional benefits resulting from the film credits include the reduction in unemployment benefit expenditures to the extent that the film production employees were unemployed prior to working on the qualified productions.

An individual's estimated weekly benefit amount equals the highest amount of wages paid in any base period quarter multiplied by 4.1%. Michigan allows for individuals to work part-time while receiving unemployment benefits so long as the combination of wages and weekly benefits do not exceed 1.5 times his or her estimated weekly benefit amount.

Data from the Michigan Unemployment Insurance Agency (UIA) indicate that unemployed residents were compensated with a total of 9.5 million weeks of unemployment insurance in 2009, totaling an estimated \$2.7 billion in benefits paid. Thus, the average estimated weekly benefit received per unemployed resident in 2009 was approximately \$285.

Full-time-equivalent Michigan film production employees earned an average annual salary of \$53,700 in 2009, or approximately \$1,033 per week. Assuming that film production employees work part-time at nearly 40% of the available hours of the production, the weekly wage received by resident film employees is an estimated \$413, which would reduce their unemployment benefits to \$15 per week -- a net reduction in benefit payments of \$270 per week. 39% of the unemployed Michigan workforce is currently eligible to receive benefits. Assuming that 39% of the new employees were receiving unemployment benefits before being hired, Michigan film production activity would reduce unemployment benefits by \$4.3 million in 2009 and \$6.7 million in 2010. Alternatively, if employees hired by the qualified film productions were unemployed at the same rate as the general Michigan workforce (13.6% in 2009 and 13.1% in 2010), the reduction in unemployment benefits total an estimated \$0.6 million in 2009 and \$0.9 million in 2010.

Appendix E: The IMPLAN economic model

The economic and fiscal impacts of Michigan film productions were estimated using a detailed input-output model of Michigan. The economic input-output model identifies the complex flows from producers to intermediate and final consumers within a region. The model uses data describing purchases of commodities and services by industries, compensation paid to employees, and total value added to estimate the impact of film production spending on other industries.

The economic multipliers in this study were estimated using the IMPLAN input-output model. IMPLAN is used by more than 500 universities and government agencies to estimate the economic and fiscal impacts of new investments and changes in demand, employment, and industry output.

Total effects can be calculated either as direct and indirect effects, or as direct, indirect, and induced effects. This analysis includes direct, indirect, and induced economic effects. Direct effects are production changes associated with the immediate effects or final demand changes. Indirect effects are production changes in backward-linked industries caused by the changing input needs of directly affected industries (for example, additional purchases to produce additional output). Induced effects are the changes in regional household spending patterns caused by changes in household income generated from the direct and indirect effects and are included in the estimated impacts presented in this study.

Purchases for final use (final demand) drive the model. Industries producing goods and services for final demand purchase goods and services from other producers. These other producers, in turn, purchase goods and services. This buying of goods and services (indirect purchases) continues until leakage from the region (imports and value added) stops the cycle. These indirect and induced effects (the effects of household spending) can be mathematically derived. The resulting sets of multipliers describe the change of output for each and every regional industry caused by a one-dollar change in final demand for any given industry.

There are several economic models available that can be used to estimate the overall economic impact of Michigan film productions on the Michigan economy. This study uses the IMPLAN model, but could have also relied on the Regional Economic Models, Incorporated (REMI) model or the RIMS-II model from the Bureau of Economic Analysis. The IMPLAN and RIMS-II economic models are built on standard multipliers that assume constant relationships in the state economy.

The REMI economic model is primarily used to simulate the expected dynamic adjustments in a state economy in response to policy changes. The model accounts for changing price levels, population levels, and other factors that result from the direct activity being modeled with the responses occurring over a number of years in the future. This study estimates the policy impact of film productions that occurred in 2009 and 2010. The IMPLAN model actually provides greater detail for estimating state economic impacts in this situation. In addition, for relatively small changes in a regional economy, this sort of dynamic adjustment is generally not significant and would not have a material impact on the results. Therefore, the IMPLAN model was selected for use in this analysis.