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Strategies for Growing the Pittsburgh Media Cluster

Kevin Klowden and Kristen Harris with Michael Cheng-Yi Lin

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ABOUT THE MILKEN INSTITUTE

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EXECUTIVE SUMMARY

For decades, Pittsburgh has thrived as a strong regional center of media innovation and content creation, and as the setting for popular movies and television shows including *Silence of the Lambs* and *Mr. Rogers' Neighborhood*. Pittsburgh's media milestones include the establishment of America's first commercial radio station and its first public television station. In addition, Pittsburgh has built upon its roots in media and technology, establishing the Pittsburgh Film Office in 1990, as well as key drama, computer arts, and cinema programs at respected local universities. However, other states and international film locations have not been idle. Competition to host film and television productions has become increasingly fierce as more states, as well as foreign countries, have created tax incentives for film productions and also have built modern production facilities and launched programs to train students for film and television careers. Today, a metropolitan area must offer producers more than just low costs. A deep pool of skilled local talent, state-of-the-art soundstages and related facilities, and support services all are part of the package that filmmakers expect and require. Pittsburgh already has a strong technology and media base that gives it a significant foundation to build on. Further, due to institutions such as the Pittsburgh Film Office, well-regarded local unions and public institutions, the metro has a very strong reputation as an accessible and friendly location. But in order to compete at a national and international level, Pittsburgh needs a coordinated strategy and united stakeholders to build on the metro's comparative advantages and develop an entertainment and technology cluster that can compete at the next level. Pittsburgh must attract and retain the best human capital and develop an up-to-date media infrastructure in order to build a media and technology cluster that can compete with cities such as Atlanta, New Orleans, Toronto, and even New York.

Pittsburgh's reputation as a center of innovation has enabled the city to attract the technology underpinnings for a strong media cluster. Carnegie Mellon University's Entertainment Technology Center and key infrastructure investments have not only allowed Pittsburgh to attract firms such as Google, Apple, and Walt Disney Imagineering, but also to create a number of technology and media startups.

To draw a roadmap for the development of a sustainable and globally competitive Pittsburgh media cluster, we held numerous in-depth discussions with stakeholders in Pittsburgh and Hollywood. Three points were emphasized repeatedly: Develop and retain a skilled film-production workforce, or "crew," large enough to simultaneously support multiple productions; improve infrastructure and create focal points for the media cluster through smart development; and, finally, work with the state of Pennsylvania to establish a long-term commitment to and sustained level of film incentives. By taking those insights and tying them to historical data and economic analysis, this report will focus on the advantages the Pittsburgh region enjoys and how they can be leveraged to develop a permanent, growing media and entertainment cluster. The report focuses specifically on the three key areas highlighted by both the stakeholders and our research.

Human Capital: Highly regarded programs at Carnegie Mellon University, the University of Pittsburgh and Point Park University give Pittsburgh a significant advantage over many other centers of production. These universities produce numerous graduates not only in drama and filmmaking, but also in essential related fields such as motion capture, robotics, graphics, and programming. Unlike other cities, Pittsburgh does not need to develop new training programs for aspiring filmmakers, but instead must create a coordinated strategy to retain the graduates already produced locally. Far too many Pittsburgh graduates are forced to move to other cities to find steady work because of the limited opportunities that exist when an insufficient number of entertainment productions are produced in the metro. Pittsburgh's workforce—both film crews and production service providers—enjoys a strong reputation in Hollywood. Partly for this reason, at the moment Pittsburgh's crew base is on an upswing, with one of the highest number of skilled union employees in years. However, to attract and retain more skilled workers, a strong investment in the local infrastructure is needed to ensure that the workforce remains fully employed.

Infrastructure: For Pittsburgh to consistently lure large-scale film and television projects, it is essential for the metro to have sufficient capacity to house and support a number of productions year-round, and not just when the weather is good. This requires the capacity to host not only major films, but also television productions. Both typically require multiple soundstages and a varied number of vendors to provide services throughout the productions. Although Pittsburgh has the core of this capacity, with facilities such as WQED, 31st Street Studios, NEP Broadcasting, Savage Visual Effects, and others, its capacity pales in comparison to rivals such as Toronto and Atlanta, and, in some cases, even Philadelphia. A developed infrastructure, with purpose-built facilities, would not only be vital in securing a steady flow of productions, but would also allow key firms and new startups to cluster together and provide a broader economic impact for the entire metro.

Incentives: Although the ability to create a thriving cluster in Pittsburgh is largely predicated on the first two factors, multiple stakeholders noted that sustained investment in retaining human capital and building infrastructure requires a stable commitment to film production incentives. Currently, Pennsylvania's incentives are renewed annually, and the amount of money available is not consistent from year to year. These factors severely limit the metro's ability to attract multi-year productions such as television shows. This issue, which affects the entire state, provides an opportunity for Pittsburgh stakeholders to unite and make their voices heard at the state level.

Clusters are critical because they develop into innovation hubs through the competition and synergy of having a number of companies and talented people in one location focused on one industry. A cluster helps to make a region unique by building on a local comparative advantage to generate opportunities for job creation and private investment. In a consistently evolving media environment with new players such as Netflix and Hulu utilizing new technologies, having a strong concentration of talented production employees and technology innovators in a strong cluster is a significant advantage. In addition to the observations of key stakeholders and participants, this roadmap includes an analysis of data that shows why a concerted effort is needed to attract and retain workers in media and entertainment. It also demonstrates the need for greater investment in the local infrastructure and illustrates how direct employment in the entertainment sector creates jobs in the broader economy. The benefits of a strong media cluster can be directly found in how film productions impact the local economy. Using methodology from the U.S. Bureau of Economic Analysis,[1] we estimate that 107 new jobs are created for each $10 million spent on productions in the Pittsburgh metro. This translates into a broader impact of $12.7 million in total economic activity.

As Pittsburgh grows its cluster, it will develop more effective mechanisms for attracting and retaining productions and the economic impact will increase not only through greater investment, but also by stimulating more local activity for each dollar invested. In addition to the three key elements listed as our core recommendations, one other factor is important: to have an effective and unified policy. It is essential that the Pittsburgh Film Office, which has experience unifying such efforts, and key local stakeholders develop a coordinating body to unify efforts on human capital, infrastructure, and dealing with the state on incentives. Pittsburgh has a window of opportunity to build a media technology cluster that will be a true global competitor. As we explain in the following pages, this will require a commitment by local stakeholders to create a strong environment in which film productions can thrive and be sustained.

1. RIMS, Regional Industrial Multiplier System

INTRODUCTION

> There is a history of filmmaking in Pittsburgh, which is very helpful. There is certainly an openness of wanting people to come there. And in recent years, in chatting with people that have been in Pittsburgh, there is a reputation of having a very good experience. And in our business when you get that kind of momentum going, we all talk to each other very quickly. And therefore, there is a good reputation in Pittsburgh right now, which gives us the openness to come in and explore and look at it as well.
>
> —Jay Roewe, Senior Vice President, West Coast Productions,HBO

Pittsburgh, the home of distinguished companies such as U.S. Steel and Westinghouse, has a long history of business innovation. In the early 1900s, Pittsburgh emerged as a key industrial center, ranking among the 10 most populous U.S. cities. The population peaked in 1950 at 676,806,[2] with a surrounding regional population of 2,213,236,[3] before entering a period of gradual decline. The population stood at 305,841 in 2013,[4] with the surrounding region having 2,360,867 people.[5] Although perceptions of Pittsburgh as a victim of the changing national economy persisted during the second half of the 20th century, a positive transformation has taken place in the 21st, stabilizing the population and reinvigorating the creative community. In recent decades, downtown Pittsburgh has undergone a revival, largely through investments by various organizations including the including the Pittsburgh Cultural Trust, the Pittsburgh Downtown Partnership and several foundations, non-profits, and private developers. The renaissance has included the arts and entertainment district, Market Square, and new residential and commercial development.[6] These positive changes have helped Pittsburgh consistently rank as one of the nation's most livable cities. This vibrancy is reflected in the local film and television industries, which today are building on a proud entertainment history.[7]

Pittsburgh is home to the world's first commercial radio station, KDKA, and the first public television station, WQED. The latter began broadcasting in1954 and continues to produce new local content, including *Conversation@WQED*, *Pittsburgh 360*, and *4802*.[8] For many years, WQED brought the nation *Mister Rogers' Neighborhood* and other nationally syndicated educational content. The related Fred Rogers Company still produces children's programs for the Public Broadcasting System, including *Daniel Tiger's Neighborhood, Peg + Cat*, and *The Odd Squad*. The first theater devoted exclusively to movies, the Nickelodeon, opened in Pittsburgh in 1905. The city's movie production legacy reaches back to the 1914 silent serial *The Perils of Pauline* and includes modern classics such as George Romero's 1968 *Night of the Living Dead*.

2. U.S. Bureau of the Census (1998), "Population of the 100 Largest Urban Places: 1950," https://www.census.gov/population/www/documentation/twps0027/tab18.txt (accessed March 24, 2015).
3. Demographia, "Top 50 U.S. Metropolitan Areas in 1996: Population from 1950," http://www.demographia.com/dm-usmet-fr50.htm (accessed March 24, 2015).
4. U.S. Census Bureau, "Pittsburgh (city) QuickFacts," http://quickfacts.census.gov/qfd/states/42/4261000.html (accessed March 24, 2015).
5. The total population for Pittsburgh metro area is from the 2013 American Community Survey 1-Year Estimates.
6. Tierney, John (2014), "How the Arts Drove Pittsburgh's Revitalization," http://www.theatlantic.com/business/archive/2014/12/how-the-cultural-arts-drove-pittsburghs-revitalization/383627/ (accessed February 26, 2015).
7. Carnegie Library of Pittsburgh, "Downtown: Nickelodeon," http://www.clpgh.org/exhibit/neighborhoods/downtown/down_n71.html (accessed February 25, 2015).
8. WQED Multimedia, "history," http://www.wqed.org/about/history.php (accessed February 25, 2015).

The Pittsburgh Film Office, established in 1990, has been a key element in the growth in film production. Since its establishment, the PFO has attracted films and television shows generating $1 billion in economic activity in the Pittsburgh region.[9] The office acts as an intermediary between Hollywood and local entities by providing information about locations, services, and crew availability and by coordinating support among local government and businesses. Not long after the office's establishment, Pittsburgh was selected as the location for the critically acclaimed 1991 thriller *The Silence of the Lambs*. The Pittsburgh Film Office has continued its success, attracting both TV and movie productions, including *Unstoppable, The Dark Knight Rises*, *Jack Reacher*, and *The Fault in Our Stars*. With the PFO's leadership, the area has established a reputation for responsiveness and friendliness toward filmmakers and studios.

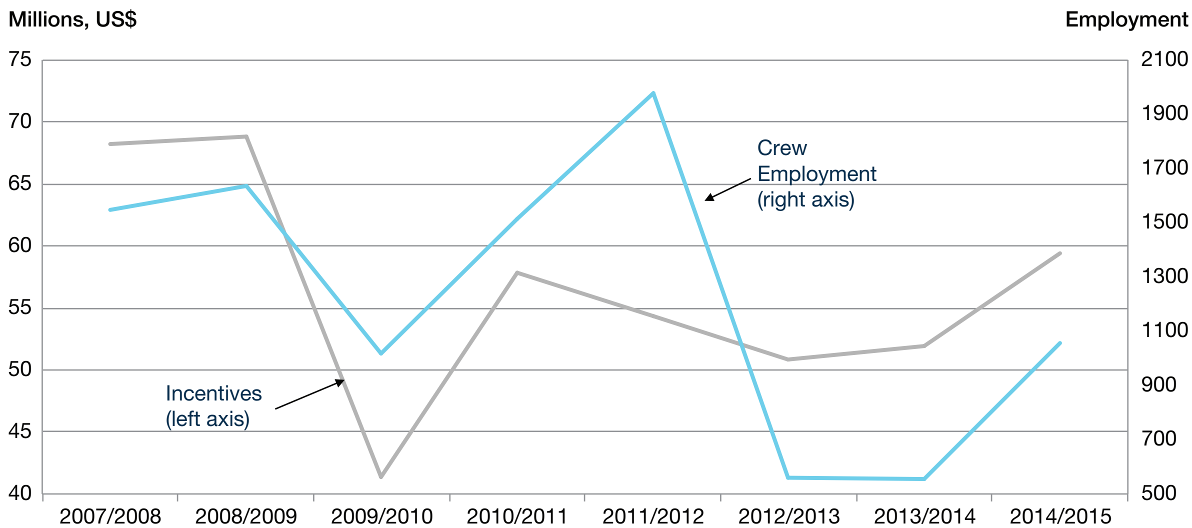
Pittsburgh has also begun to focus on entertainment technology. The city is home to Animal, Savage Visual Effects, and one of three Disney Research labs in the U.S. All of this technological development has occurred in the past 15 years. The new technology and increase in major productions create significant opportunities for growth in both infrastructure and employment. However, competition from states and foreign countries with more generous tax incentives has made it difficult for the region to maintain entertainment employment.

The correlation between tax incentives and jobs can be seen in the metro's employment history. Canada introduced one of the first and largest national film incentive programs in 1997 to attract U.S. film and television productions. In 1998, Pittsburgh lost eight feature films to Canada, resulting in an economic loss to the metro of more than $12 million; in 1999 the loss rose to more than $21 million.[10] By 2002, other U.S. states, including Louisiana and Georgia, began offering competitive incentives. Movie and television producers began to base location choices largely on the availability of tax breaks, which help filmmakers mitigate risk and secure financing. To stem the loss of entertainment jobs, the state of Pennsylvania in 2004 created a $10 million production grant program, but other states introduced more enticing incentives. Employment losses continued until the Legislature introduced a $75 million tax credit in 2007. The incentive included an additional $5 million that could be shared among productions using a qualified local facility, such as a soundstage.[11] In addition, Pennsylvania offered $15 million in aggregate credits for "above-the-line" costs, which include the salaries paid to leading actors, directors, and key personnel.

Pennsylvania's incentives are administered on a fiscal-year basis, so examining activity according to the state's fiscal calendar best explains the strong relationship between employment and the amount of money allocated to the film incentive program.

9. Website of the Pittsburgh Film Office
10. Pittsburgh Film Office
11. Pittsburgh did offer a small ($10 million) incentive before 2007.

Figure 1. Incentive funds affect Pittsburgh's film industry employment



Source: Pittsburgh Film Office

After several years of fluctuations in the film tax credit, annual allocation changed from $75 million to $42 million before settling in FY2011 at $60 million, where it has remained. This renewed commitment prompted a resurgence in film industry employment. Hiring fell in FY2013 because of budget problems that prevented the state from allocating the full $60 million and because Philadelphia claimed a bigger share of available funds. In FY2010, productions in Pittsburgh claimed over $37 million in incentives, but in FY2013 film projects in the metro received less than $22 million. The lower amount of incentive funds handed out at the state level reduced activity in FY2014 as well. However, Pittsburgh appears to be on a growth trajectory in FY2015. Data for the year to date, which do not yet include recent films such as *Concussion* and *Meet the Coopers*, illustrate Pittsburgh's potential when incentives are available. The rise in activity demonstrates that Pittsburgh is slowly improving its ability to offer the crew and infrastructure needed to support multiple features. Growth in the workforce, both in skill and numbers, must occur in tandem with infrastructure improvements and policy changes to sustain new growth.

Stakeholder Engagement

In January 2015, the Milken Institute met with various stakeholders in Pittsburgh and Los Angeles. The purpose of these meetings was to receive direct feedback on the key strengths and weaknesses of the Pittsburgh media landscape, as perceived by studio executives and producers who film in the metro and local stakeholders who are fundamentally responsible for staffing, housing, facilitating, and providing services to movie and television productions. The Los Angeles meetings included stakeholders from Legendary Entertainment, Lions Gate Entertainment, Sony Pictures, and HBO. The Pittsburgh meetings included representatives from local foundations, banks, universities, unions, vendors, studio space, and postproduction. In essence, the two sets of stakeholders represented both the demand and supply side of Pittsburgh's entertainment industry. Their perspectives helped spotlight growth opportunities. Three topics emerged as the main concerns for both groups: growth and retention of human capital, infrastructure development, and incentive legislation. At the heart of each of these topics, stakeholders noted that in order for Pittsburgh to thrive in film production, it must develop a strong, sustainable concentration of people and facilities. In other words, the city must develop, expand, and strengthen its media and entertainment cluster.

The entertainment workforce in Pittsburgh is viewed as competent and highly regarded by studios in California. However, Hollywood stakeholders said it lacks the depth needed when multiple projects film at the same time. This is an issue for every city except Los Angeles and New York, which have large crews developed over decades of high-volume production. Even so, the skill of the local workforce and the local union pay scales—lower than those in larger cities—make Pittsburgh attractive. One Hollywood stakeholder, Ed Lammi of Sony, lauded the Pittsburgh crew for its dedication and work ethic. “They’ve got the greatest folks who will pour their heart and soul into working for you,” Lammi said. “The other thing is the economics of working there are sometimes extremely friendly.” Other advantages include a strong theater community that provides a pool of talented actors to round out casts. Addressing crew depth, Pittsburgh stakeholders pointed out that crew and talent retention is a problem because there isn’t enough work to keep people employed on a year-round basis. Further, local universities produce far more skilled graduates than the local industry can absorb. These problems are exacerbated by state unemployment rules that make it difficult for seasonal workers—a category that includes many film industry workers—to qualify for benefits. As a result, they find it difficult to remain in Pennsylvania.

> One advantage that Pittsburgh has is that we do have a wonderful base of actors here. And that’s one thing that people that come from New York and L.A. don’t really realize until they get here. I think the acting talent pool is one of the best in the country besides New York, L.A., maybe Chicago. I think that it’s because of the wonderful theater community we have, wonderful training, Carnegie Mellon, Point Park.
> —Nancy Mosser, Owner, Nancy Mosser Casting

Infrastructure has improved in Pittsburgh, but more development is necessary if the metro is to become competitive with other centers of film and television production. Feedback from the Hollywood stakeholders regarding infrastructure was varied. Some pointed to the need to upgrade existing soundstage facilities, while others suggested investment in purpose-built soundstages, which are designed specifically to accommodate the artistic and logistical needs of movie and television producers. Some local stakeholders also discussed the superiority of a purpose-built soundstage over converted industrial space. However, most of the local stakeholders agreed that organizations are unwilling to invest in entertainment infrastructure without a long-term state commitment to tax incentives, which now must be funded each year by the Legislature. The certainty of a multi-year incentive program would be more likely to lead to infrastructure expansion. There also was concern among Hollywood stakeholders that the metro doesn’t have enough vendors offering support services to the industry. Stakeholders in Pittsburgh emphasized that the metro is home to several world-class vendors that serve the film and television industries nationwide. However, they acknowledged that the number of vendors hasn’t kept up with the increase in filming.

Infrastructure development must be accompanied by the creation of a technology and media cluster that leverages the city’s position as a tech innovator. Melding local expertise in areas such as motion capture and visual effects with filmmaking would help attract productions and create jobs both for film crews and for university graduates. Pittsburgh stakeholders also stressed the need for an information center to promote and market the metro as a film location and match studios with local companies, crew, and actors. This could be achieved by expanding the Pittsburgh Film Office.

The topic that was most discussed by both sets of stakeholders in every meeting was tax incentives. The stakeholders in Hollywood stressed that incentives are a primary factor in choosing film locations. With so many states offering incentives, there is little reason to film in a state or city where they are not available. The current tax credit offered by Pennsylvania plays a crucial role in both the number and size of the projects filmed in Pittsburgh. Stakeholders from Hollywood and Pittsburgh agreed that tax breaks are what initially interest production companies in a region. The next level of analysis focuses on the aesthetic characteristics of the location—whether it meets the creative needs of the story. The availability of local film crews and their expertise were noted as vitally important, as was the infrastructure. One Pittsburgh stakeholder further said that once the crew and infrastructure were deemed adequate, other options, such as a regional film fund, would become a consideration. However, the local fund is seen as irrelevant if the other elements are not in place.

> There is a subset, especially our visual effects artists, our animators, our 3D effects artists, who have the option of going into visual effects in films or into games. They have almost identical skill sets. It just depends where they're going to apply those. A good contingent of the entertainment technology program CMU graduates are very interested in film, visual effects, and gaming. A lot of them would be very interested in sticking around for internships or full-time employment, but there aren't a lot of options here for visual effects unless your company is Schell Games.
>
> —Chuck Hoover, Vice President of Production, Schell Games

ANALYSIS OF PITTSBURGH TALENT AND CREW

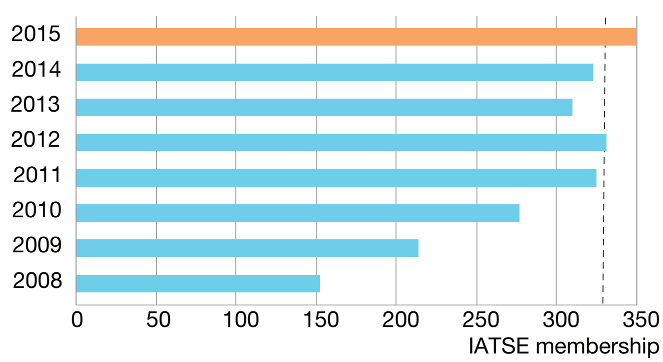
Pittsburgh has a strong pipeline of students trained in film-related fields at local universities. Carnegie Mellon University offers a master's degree in entertainment industry management and trains students in the latest technologies to explore, experiment, and collaborate on games, designs, and stories at its Entertainment Technology Center. The University of Pittsburgh offers undergraduate and graduate degrees in film studies, and Point Park University offers a degree in cinema arts. However, as noted previously, many graduates cannot find local work. Fred Johnson, of Point Park, said that only a quarter of the school's graduates in film-related fields find consistent movie or television work in Pittsburgh. Johnson said, "We have approximately 300 students studying cinema production, screenwriting, and animation and visual effects. We produce probably somewhere around 600 student films a year, meaning three-minute to 15-minute shorts. Of the 300 total students in the program, probably about 75 graduate per year. I would say half stick around locally. Half end up going home, to L.A. or New York. And of the half that stay, half of them find regular employment doing production work. Many who move to L.A. or New York are also successful in finding work in the industry."

Retaining local talent should be a priority because crew depth is a major factor in a studio's decision on film location. Despite the outward migration of talent, the Pittsburgh workforce has been growing and gaining experience. This can be attributed in part to studios' reluctance to bear the cost of maintaining large, out-of-state crews on location. The extra costs include housing, meal stipends, and other benefits that aren't required for local workers. Another reason is that the growing number of movies and TV shows filmed in the area simply requires a larger workforce. When incentives were first introduced in Pittsburgh in FY2007, the area had a difficult time meeting the demand for skilled workers for large productions, forcing producers to bring in out-of-state workers from major film centers, primarily California and New York. As a result, local workers made up less than 50 percent of the crew on a typical production. In recent years, the percentage of Pittsburgh workers on film crews has risen 10 percent to more than 55 percent of total crew membership.

Figure 2. Locals continue to make up a larger share of total employment in Pittsburgh productions since 2009

Source: Pittsburgh Film Office

Figure 3. Local IATSE membership grows as entertainment base grows



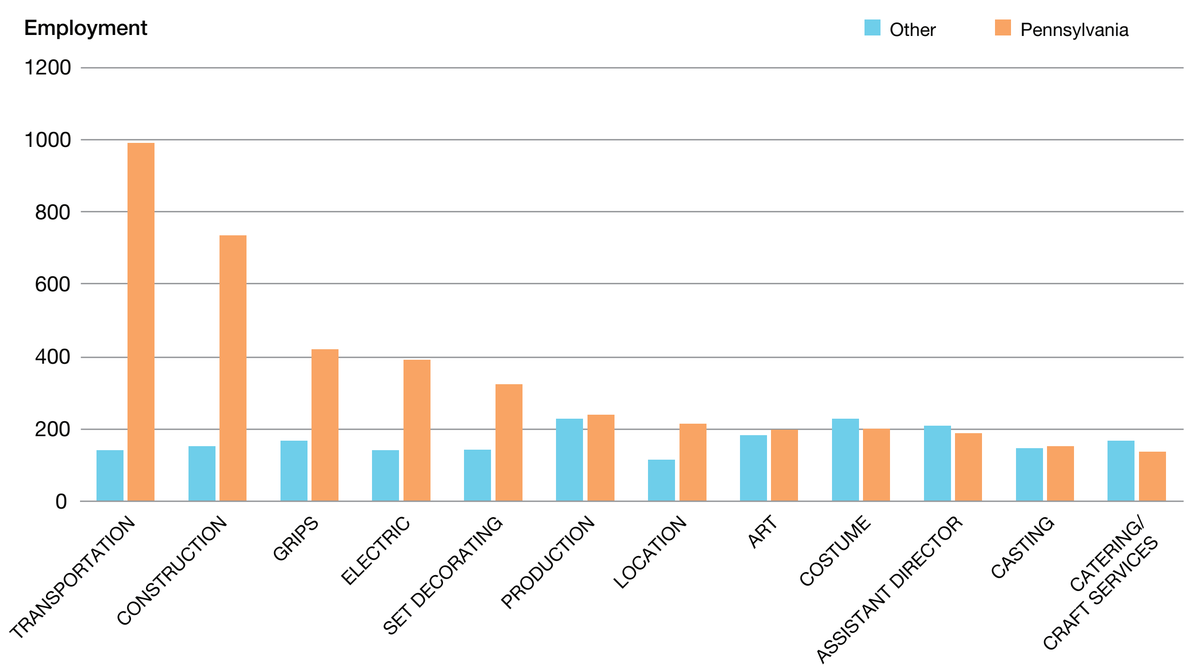
Source: Pittsburgh Film Office

Beginning in 2008, membership in the International Alliance of Theatrical Stage Employees Local 489 grew steadily until 2013, when distribution of tax credit funds was restricted because of state budget problems. A corresponding decline in production likely forced some members to stop paying union dues, which meant they were dropped from union rolls. Union membership rose the next year as incentive funds were restored. Local 489 added 32 members in April 2015, bringing membership to an all-time high of 349 members. Local 489 is one of the few IATSE locals still open to new members, making Pittsburgh a desirable location for people looking to join a union crew. The larger the union, the more productions Pittsburgh will be able to support without creating strain on local workers or on production companies' labor budgets.

Krista Salera of the McQuillan Group pointed out that when incentives were introduced in Pennsylvania, "The percentage of PA qualifying spend (in terms of money spent on local wages and production-related costs that qualified for the tax credits) was much lower than it is now. Much bigger portions of the budgets are PA-qualified, so they are finding the resources here in Pennsylvania. I know even looking at the accounting staff [on Pittsburgh productions], at the beginning they were bringing everybody in from out of state because they didn't have people who were experienced. But now we're seeing a lot of local hires."

One barrier for crew members is the state's unemployment benefits program, which penalizes seasonal workers. Many film workers earn most of their annual income in the one or two quarters of the year when film work is available. Those who make most of their annual income in a single quarter do not qualify for unemployment benefits, making it difficult to survive the gaps between film-production work. Because the safety net of unemployment benefits is not available to experienced film workers, they move to states with different unemployment laws.

Figure 4. Comparison of local and out-of-state hires for higher-paid film production jobs (Sum of employment by job from 2005-2014)

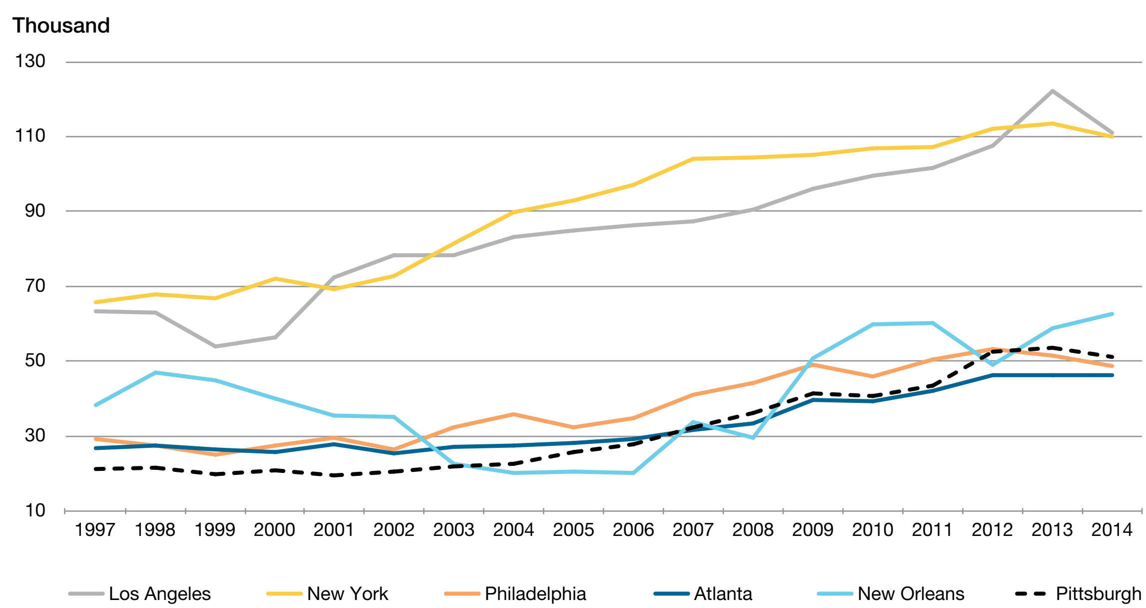


Source: Pittsburgh Film Office

Although local workers make up a growing percentage of film crews, they usually aren't hired for higher-level, and higher-paying, jobs. Instead, they are concentrated in categories such as transportation, construction, lighting, electrical, and set decorating (Figure 4). Outsiders, primarily from New York and California, typically are chosen for key creative positions such as director, producer, writer, and cinematographer, as well as lower-rung jobs which require higher levels of skill, such as camera and postproduction work. This is true in every state, except California and New York, that hosts film production. Typically, the top creative jobs are filled long before a location is chosen and are won through networking or as a result of reputations built in Hollywood and New York. The good news is that Pittsburgh talent is getting a larger percentage of mid-range jobs in categories such as location scouting, art, costumes, assistant director, and casting. There is hope that, as local talent builds stronger relationships with studios, doors to some of the top-paying positions will open. Some locals advance in the ranks by taking jobs in California or New York to develop contacts and prove their skills. For those who remain in Pittsburgh, involvement in local independent films can provide an opportunity to gain additional experience. Both large-scale and independent productions are necessary to build a diverse and deep crew.

Despite the inconsistency in employment, Pittsburgh has seen steady growth in wages for motion picture and video industry workers (NAICS 5121). The pay-per-employee estimates listed below are calculated by dividing total wages paid in the motion picture and television industries by the number of people employed. Before incentives were introduced in Pennsylvania, the annual wage per employee was about $30,000. After incentives came into play, the figure rose to about $50,000. This measure reflects both higher skill levels, which enable workers to demand more pay, and a shift from part-time employment to full-time. This indicates that the region has greater crew depth and that more people are relying on the film industry for income. By comparison, Atlanta has a larger number of film industry workers, but wages for certain positions are lower there. Pay is highest in Los Angeles and New York, which also have the highest volumes of production and supply most of the talent for top-paying positions.

Figure 5. New York and California are home to the most highly paid talent in entertainment



Sources: Bureau of Labor Statistics, Moody's Analytics

ENTERTAINMENT INFRASTRUCTURE AND MEDIA CLUSTERS

Soundstages and Studios

Infrastructure, such as soundstages and the related facilities and services needed for set building or on-site post production, is indispensable. When selecting a locale, production teams choose places with sufficient infrastructure to fill production needs locally.

There are four major studios within 50 miles of downtown Pittsburgh (Table 1). In terms of space available for production, they range in size from 4,600 square feet to 330,000 square feet. The number of soundstages offered by each ranges from one to six. Pittsburgh lags its peer cities in studio capacity and in facilities to house support services. Atlanta, by contrast, has about 30 studios within a 50-mile radius of the city. One of the key factors repeatedly cited by production companies that have filmed in Pittsburgh is the need for enough large soundstages and space to accommodate the longer-term, multi-season needs of television production. Television productions become long-term renters of studio space, forcing movie productions to find new space for their short-term shoots. If no space is available for a long-term rental, television productions move elsewhere. If Pittsburgh is going to build a competitive entertainment cluster, the city's filmmaking infrastructure needs to be improved.

Table 1. Studios around downtown Pittsburgh

Studio Name	Year Founded	Facility Size (sq. ft.)	Number of Soundstages & Studio Size
31st Street Studios	2011	330,000	6 soundstages (7,500 sq. ft. - 50,000 sq. ft.)
Pittsburgh Studios	2013	778,000	2 stages (30,000 sq. ft. each)
The Stage of Pittsburgh (Island Studios)	2008	12,000	1 soundstage (7,000 sq. ft.)
WQED	1954 (went on the air) 2008 (Renovated)	10,025	3 studios (Studio A: 6,400 sq. ft.; Studio B: 2,400 sq. ft.; Studio C: 1,225 sq. ft.)

Sources: 31st Street Studios, North Shore Studios, Pittsburgh Film Office, ProductionHUB.com, the Stage of Pittsburgh (Island Studios), WQED

Purpose-built soundstages are greatly preferred over refurbished industrial space, and their availability plays a role in studios' choice of locations. They feature column-free, soundproof space, large loading docks, drive-in access, air-conditioning and heating, as well as state-of-the-art electrical and Internet connections. Purpose-built soundstages also have space for offices, set construction, vendors, and secondary services. A central hub will encourage production companies to choose Pittsburgh over other locations and will facilitate simultaneous productions that can keep the area's workforce busy. The growth of local vendors and secondary services will also be crucial in attracting big-budget productions that employ a larger number of people. The success of Atlanta, Vancouver, Toronto, and Wellington, New Zealand, was augmented by the construction of new soundstages. The stories of these cities' rise to prominence highlight the importance of infrastructure.

Wellington, New Zealand invested in purpose-built Stone Street Studios to house its major productions, including *The Lord of the Rings* films, *King Kong*, *The Hobbit*, and *Avatar*.[12] Likewise, other cities throughout the world have worked to develop purpose-built sound studios. UK-based Pinewood Studios Group (the leading provider of studio

12. Stone Street Studios, http://stonestreetstudios.co.nz/ (accessed February 27, 2015).

and related services worldwide in both film and television[13]) operates and oversees purpose-built soundstages in Atlanta and Toronto. Local Toronto financer Rose Corp.[14] and the city of Toronto developed former brownfield space near the city's docks to build Filmport Studios. In order for the studio to gain recognition and trust, Filmport entered into a management agreement with Pinewood. Under Pinewood's leadership, the studio has become the top soundstage in Toronto. Today Pinewood Studios Group continues to develop and manage Pinewood Toronto Studios, which features the largest purpose-built soundstage in North America.[15] The development of purpose-built infrastructure demonstrates a significant local commitment and enhances a city's ability to attract and maintain a larger share of production by providing a broader range of facilities in one place.

Toronto's investment in infrastructure development with Pinewood and Cinespace Film Studios helped the Ontario region reclaim the title of "Hollywood North" from Vancouver.[16] Pinewood Toronto Studios began construction of three soundstages and additional office space in 2013. When completed, the expansion will add over 300,000 square feet to the more than 500,000 square feet already available and create thousands of film-related jobs, adding to Ontario's 30,000 direct and spinoff jobs in film and television.[17]

Pinewood was more involved from the start in Atlanta, with help from local funders like Home Depot, the city of Atlanta, and River's Rock, a trust owned by the Cathy family, which established the Chick-fil-A fast-food chain. Under Pinewood's management, the studio has won international regard while capitalizing on Georgia's generous tax incentives and the city's central location.[18] It is noteworthy that Pinewood has not established a studio in North America without buy-in from local investors and local government. The Atlanta studio's first feature, *Ant-Man*, completed filming in 2014. Pinewood Studios Atlanta has plans that entail more than soundstages. The project, slated to be completed in 2022, will eventually include 1.95 million square feet with studios; 1,345 residential units; and more than 312,000 square feet of office space, hotels and other commercial and institutional space.[19] Pinewood Atlanta provides examples of the ancillary services that production companies require. On-site vendors include companies that provide performing animals, furniture, equipment, and car rental; caterers; special event managers; and a waste-disposal firm. There is even a Home Depot store that carries building supplies and hardware items frequently sought by film crews and whose use is, in fact, encouraged for on-site productions.

Louisiana has also seen major infrastructure development. Baton Rouge-based Digital FX has the largest post-production facility in the region. New Orleans is home to the nation's first LEED (Leadership in Energy and Environmental Design) certified studio, Second Line Stages. Millennium Studios, in Shreveport, is a 70,000-square-foot facility that features two soundstages, production offices, a construction mill, a special-effects mill, and a world-class visual-effects studio. The facility employed 70 graphic artists following the opening.[20] Millennium Studios is in Shreveport's Ledbetter Heights area, a part of the city that had been losing businesses and people for decades.

13. Pinewood, About US http://www.pinewoodgroup.com/about-us (accessed May 3, 2015).
14. Pinewood Eyes Filmport Complex, Variety http://variety.com/2009/film/news/pinewood-eyes-filmport-complex-1118002200/ (accessed May 17, 2015).
15. Mega Stage Pinewood Toronto Studios | Canada studio soundstage, http://www.pinewoodgroup.com/our-studios/canada/pinewood-toronto-studios/stages/mega-stage (accessed March 24, 2015).
16. http://www.thestar.com/entertainment/movies/2013/03/22/torontos_film_and_television_industry_soars_to_new_heights.html
17. http://www.pinewoodgroup.com/our-studios/ontario-canada/news/pinewood-toronto-studios-unveils-three-new-sound-stages
18. Kevin Klowden, Priscilla Hamilton, and Kristen Keough, "A Hollywood Exit," Milken Institute, February 2014.
19. http://www.ajc.com/news/business/fayette-movie-studio-becoming-a-blockbuster/nkLGH/
20. http://archive.shreveporttimes.com/article/20110401/NEWS01/104010310/Shreveport-s-Millennium-Studios-debuts

Albuquerque lacks Pittsburgh's entertainment history as well as its varied architecture and scenery, but the New Mexico city has managed to secure a strong commitment from the state to support the development of a local employment base and infrastructure that includes a significant number of production-related vendors. Albuquerque Studios employs about 15 people as studio staff, but there can be anywhere from 400 to 1,000 people working there during filming.[21] Built in 2007 and expanded in 2009, Albuquerque Studios allowed the metro to provide the soundstage space for *The Avengers*. Albuquerque Studios has eight purpose-built soundstages, ranging from 18,000 to 25,000 square feet each. Nearby, 1-25 Studios offers five soundstages and a green-screen facility for visual effects. There are other facilities in nearby Santa Fe.

Albuquerque has demonstrated that a city can carve out a consistent and sustainable role as a mid-level center of production. Even though some efforts failed—Sony Imageworks closed its visual-effects studio there in 2012—the metro became home to several multi-season television programs, including *Breaking Bad* and the spinoff, *Better Call Saul*. This segment of the entertainment business, which provides steady employment to local crews, until very recently has eluded Pittsburgh.

When considering infrastructure in Pittsburgh, it is worth mentioning in-state competitor Philadelphia. Although Table 2 lists only the four Philadelphia studios qualified for the extra 5 percent film tax credit, the total number of studios in Philadelphia surpasses that of Pittsburgh. In addition, Philadelphia has better transportation connections. Daily train service connects Philadelphia with New York, a source of talent and other support for filming. Additionally, Philadelphia offers more direct flights to and from Los Angeles. Philadelphia also benefits from its proximity to the state capital, Harrisburg.

Table 2. Studios (qualified facilities for film tax credit) around Downtown Philadelphia

Studio Name	Year Founded	Number of Sound Stages & Studio Size
Center City Film & Video	1978	4 studios (800 sq. ft., 900 sq. ft., 2,464 sq. ft., 4,851 sq. ft.)
Invincible Pictures/Philadelphia Soundstages	2006	2 studios (Studio A: 3,000+ sq. ft.; Studio B: 2,500+ sq. ft.)
QVC Inc./Studio Park	1997	58,000+ sq. ft. studio space
Sun Center Studios	2011	3 soundstages (each with 20,000 sq. ft.)

Sources: Center City Film & Video,[22] Flying Kite,[23] Greater Philadelphia Film Office,[24] Invincible Pictures/Philadelphia Soundstages,[25] QVC Inc./Studio Park,[26] Sun Center Studios [27]

Support Services

Pittsburgh will need to offer better facilities and more support services such as camera rental locations, caterers, accountants specializing in entertainment, and visual-effects and post-production vendors to draw productions away from Philadelphia, Atlanta, Toronto, Albuquerque, and New Orleans. Infrastructure and services are especially important considering that there are few direct flights to Pittsburgh from other major cities.

21. http://www.abqjournal.com/57631/abqnewsseeker/updated-albuquerque-studios-has-new-owner.html
22. Center City Film & Video, Facilities, http://www.ccfv.com/ (accessed February 18, 2015).
23. Flying Kite, Neighborhood Innovation, http://www.flyingkitemedia.com/features/theneighborhood0208.aspx (accessed February 19, 2015).
24. Pennsylvania Film Office, Film Tax Credit Approved Qualified Facilities, http://filminpa.com/wp-content/uploads/2014/11/Film-Tax-Credit_QualifiedProductionFacilityAPPROVED_2014-1.pdf (accessed February 18, 2015).
25. Philadelphia Soundstages, studios, http://philastudios.com/ (accessed February 18, 2015).
26. OVC, Studio Tour, http://www.qvc.com/VisitTour.content.html (accessed February 19, 2015).
27. Sun Center Studios, Who We Are, http://www.suncenterstudios.com/scs/Home.html (Accessed February 17, 2015).

Providing close and easy proximity to all the necessary vendors and services should be a priority for the region. In addition to studios and crew, the completion of a film or television project requires auxiliary services such as animation, audio/video production, event production, advertising/marketing, makeup, catering, and transportation, as well as studios and crew. Some of these services are available in Pittsburgh; however, local vendors are relatively few in number compared with competitors. Table 3 compares the total establishments involved in motion picture and video production in Albuquerque, Atlanta, and Pittsburgh. While Albuquerque experienced a decline in film-related businesses from 2008 to 2012, both Atlanta and Pittsburgh enjoyed steady growth in these services. For example, Pittsburgh had 50 companies providing services 2012, compared with 291 in Atlanta.

Table 3: Development of new businesses shows sustainable growth

Total Establishments Involved in Motion Picture and Video Production			
	Pittsburgh	Atlanta	Albuquerque
2012	50	291	33
2011	48	271	36
2010	48	268	38
2009	41	260	38
2008	41	263	38

Source: County Business Patterns

Pittsburgh is home to several companies that provide production-support services on a national or international level. Haddad's Inc. has been in the Pittsburgh area since 1954, providing portable dressing rooms, honey wagons (toilets), and offices to over 2,200 films, TV productions and commercials.[28] NEP Broadcasting is the leader in mobile production, providing the production trucks, facilities, and equipment needed for on-location events. The company, the first to offer this service, operates satellite offices in Australia and the UK. NEP's founder built the first on-location production truck to shoot Penn State football games for WNEP television.[29] After breaking off from WNEP in 1986, NEP has assembled the largest fleet of mobile-production vehicles in the world. Its trucks are used to broadcast some of the world's biggest events, including the Super Bowl, the Academy Awards, the Olympics, and the FIFA World Cup.[30] These examples show that Pittsburgh is home to companies that contribute to—and benefit from—the global film and television industries.

An "intangible" infrastructure—marketing support that can promote all of the city's assets to filmmakers in a single, appealing package, an advisory council to coordinate development, recruit business, and maximize impact to the local economy when productions come in—also is needed. According to Stan Muschweck, CEO of StandOut Marketing, "The Pittsburgh Film Office does a wonderful job of attracting people here with the budget that they have, but they don't have a huge budget for marketing. The city, when it markets itself, markets conventions and hotels and stuff like that, but who's marketing the fact that there's such a wonderful realm of talent, and such wonderful facilities, and such wonderful people growing up and staying in business that have mentors to learn from?" It is important for Pittsburgh to speak to studios with a united voice. The film office is well-positioned to become the primary point of contact to attract productions and optimize the experience of filmmakers who work in the city. As Pittsburgh's entertainment industry grows, the Pittsburgh Film Office will need to grow as well to help fully utilize the city's assets.

28. Haddad's, About Haddad's, http://www.haddadsinc.com/about.php (accessed February 24, 2015).
29. NEP Broadcasting, Why NEP, http://www.nepinc.com/why_nep/overview (accessed February 24, 2015).
30. "NEP Acquires Stock of New Century Productions," Reuters, January 8, 2008 (retrieved June 6, 2011).

Entertainment and media clusters throughout the U.S. have strong advisory councils or film offices with a diverse set of stakeholders working as a unified force to provide information and grow the film industry in their area. For example, Los Angeles has FilmLA,[31] which has developed various advisory councils specifically to engage stakeholders and coordinate with them on important issues such as regulation and infrastructure. Atlanta has a similar advisory group in the Georgia Production Partnership (GPP), comprising individuals and companies working to build the state's entertainment industry. The GPP is considered a key voice of the industry in Georgia and works to support the Georgia Film, Music & Digital Entertainment Office, its staff, and Advisory Board.[32] A similar advisory group, working in conjunction with or as an extension of the Pittsburgh Film Office, that can grow in size and voice with the entertainment industry would greatly help unify the Pittsburgh entertainment industry and create a path to success.

> Film and many other creative industries now overlap. There is a network effect between new creative industries, from social media and games to film, the maker movement and integrative design. We're looking at this network also from the university point of view, in terms of education. When we try to get an EA or a major games company to actually put offices here, or some of the bigger social media companies like Facebook to consider coming here, part of what is being considered by all players is the network effect with similar companies; and all these companies are looking for similar type of new employee. They are looking for a generation of tech-savy creatives that are interested in dynamic forms of expression and employment. What we should be thinking about is, how do we put in place incentives in Pittsburgh to get a cluster of creative industries. The cluster effect will facilitate the location of major economic activity in creative industries in Pittsburgh.
>
> —Thanassis Rikakis, Professor, Vice Provost for Design, Arts & Technology, joint appointment in the Schools of Design and Music, Carnegie Mellon University

Entertainment and Technology Cluster

In addition to the jobs directly involved in film and TV production, the industry increases demand for transportation, dry cleaning, retail services, hospitality, and catering. This ripple effect has already been seen in Pittsburgh's services industry. Production also draws on technology-related industries that are necessary to produce the equipment, software, and technology needed to complete a modern-day movie.

> Because it is one thing to have tech there; it's another to have a tech specific for exactly what we do.
>
> —Eric Hedayat, VP, Physical Production, Legendary Pictures

Pittsburgh can stand out as a filming location by integrating the region's comparative advantages in technological innovation, research and development, and education with the needs of the entertainment business. Studios look for technologies that improve the audience's experience, and Pittsburgh already has the tools to give the area an edge in this facet of the business. Today's top movies often rely as much on technology as acting. Pittsburgh already has an information-technology and analytical-instruments cluster, which has seen significant growth in the development

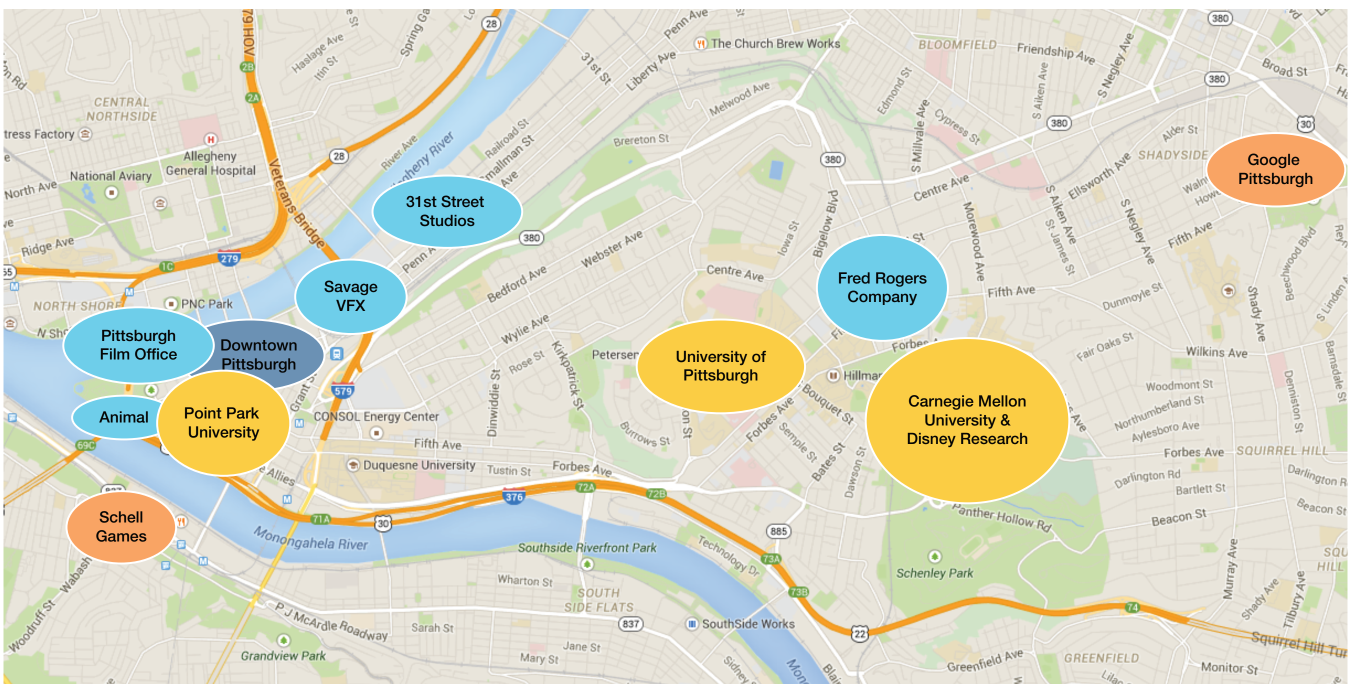
31. Film L.A., About, http://www.filmla.com/about.php (Accessed May 23,2015).
32. GPP, Georgia Production Partnership, http://www.georgiaproduction.org/ (Accessed June 5,2015).

of medical equipment, creating over 1,500 jobs since 1998. However, in the same cluster, audio and video equipment employment has fallen by 1,700 since 1998.[33] A focus on entertainment technology may help restore employment in this field.

Development of highly skilled ancillary clusters in Pittsburgh will require citywide commitment to investment and increased infrastructure development. In the broader employment picture, the advantage of developing the cluster is that it provides a direct opportunity to not only attract and retain talent in technology and entertainment, but also to train or retain workers for related support positions. These might include areas such as logistics, physical support, and food services, such as the planned restaurant at 31st Street Studios.[34] Pittsburgh already has a number of core technology-related companies and human capital centers that can provide the foundation of a broader tech-media cluster, but it needs to take steps to fully leverage them.

The city is home to one of the three Disney Research laboratories located outside of California. Disney established a lab in Pittsburgh to take advantage of Carnegie Mellon University, which boasts one of the "country's top five graduate programs in computer science." The university is particularly strong in robotics, computer vision, human-computer interaction, speech understanding, and machine learning.[35] The collaboration is producing innovations in robotics and motion capture, a key technology in modern filmmaking. Some of its current projects include motion capture from body-mounted cameras, modeling and animating eye blinks, and humanoid robot calibration.[36]

Figure 6. Current status of entertainment and technology cluster in Pittsburgh



Source: Google Maps

33. http://www.clustermapping.us/region-cluster/information_technology_and_analytical_instruments/economic/pittsburgh_new_castle_pa
34. Pittsburgh Post-Gazette, "31st Street Studio Reeling in Big Flicks," http://www.post-gazette.com/ae/movies/2015/01/25/31st-Street-Studio-reeling-in-big-flicks/stories/201501070002 (accessed March 24, 2015).
35. Disney Research, Research Labs, http://www.disneyresearch.com/research-labs/ (accessed February 24, 2015).
36. http://www.disneyresearch.com/research-labs/disney-research-pittsburgh/

Google opened offices in Pittsburgh in 2006 and Savage Visual Effects opened in 2012. Demonstrating the viability of an effects house in Pittsburgh, Savage has done work on big productions including *Gone Girl, Lucy*, and the television series *House of Cards*. These companies joined Animal, which focuses on TV commercials and was founded in 2001, and Schell Games, which opened in 2002 and focuses on cutting-edge interactive experiences. All these industries have overlap and create a workforce with skills that are valued in entertainment. These high-tech companies have chosen Pittsburgh as their home because of the well-trained students graduating from Pittsburgh's universities, but alone they are not enough to serve as the core of a full-fledged entertainment cluster. Some partnerships between entertainment and technology companies already exist in Pittsburgh. The Fred Rogers Company films its programs in Toronto because of the city's strength in animation and because the capacity to perform the work at the scale needed is not currently present in Pittsburgh. However, the company used Schell Games to develop interactive online content for *Daniel Tiger's Neighborhood,* an animated program for preschoolers. The success of the *Daniel Tiger's Neighborhood* website set a precedent that prompted PBS to create better online content, including gaming, for young children.

In addition to physical space, the development of a broader cluster requires a coordinated strategy in the public and private sectors to connect technology and entertainment companies. Three cities in particular provide clear examples of best practices for Pittsburgh to emulate: Atlanta, Toronto, and Los Angeles. While neither Atlanta nor Toronto can match the size and depth of Los Angeles' creative community, each has utilized smart economic development, incentives, and infrastructure investment to combine its emerging entertainment hub with related tech-based industries.

In Atlanta, significant connections developed between technology and entertainment since Georgia began offering tax incentives, in part because digital entertainment is eligible for a 30 percent tax break available for film and television production. According to Georgia Power Community & Economic Development, digital media is one of the state's fastest-growing industries, with over 40,000 workers. The labor force has been augmented by nearly 7,000 recent graduates from engineering, programming, digital media, and computer design programs at local universities, community colleges, and vocational training schools.[37] Atlanta's cluster of digital media employers includes Bento Box Entertainment, Big Nerd Ranch, Cartoon Network, Eyes Wide Games, Razorfish, Wireframe Interactive, and Xaviant. This concentration of companies means that production companies filming in Atlanta can choose from a larger selection of partners and vendors and that graduates of local institutions are more likely to stay in the area because of the potential for advancement.

Toronto has become a popular alternative for Los Angeles-based studios looking for locations where they can benefit from generous incentives without sacrificing access to state-of-the-art technical services. Because of the mix of local and national incentives that are available, Toronto is ranked eighth among the world's best locations for startups.[38] These new companies create jobs and technology that profit the entire city and help to create the critical mass of media and technology companies needed for a thriving cluster. The entrepreneurial energy in Toronto has also attracted large companies such as Cisco Systems, which recently chose to locate some operations there. Toronto has increasingly been successful in attracting visual effects and video game companies as well. Toronto has a wealth of VFX and animation talent, including Arc Productions, Spin VFX, Soho VFX, Intelligent Creatures, Mr. X, and Snowball Studios. This has allowed the city to boost its appeal to filmmakers by offering a deep level of services.

37. Georgia USA, Georgia Power, "Digital Media a Top-Growing Industry in Georgia," http://www.georgia.org/wp-content/uploads/2013/09/DigitalMedia_trifold_2014.pdf (accessed February 24, 2015).

38. Canadian Business, "Innovation: Make Toronto the Startup Capital of the World," http://www.canadianbusiness.com/technology-news/make-toronto-the-startup-capital-of-the-world/ (accessed February 24, 2015).

"Silicon Beach" is the name given to the geographic area that is home to many of the technology companies in the Los Angeles area. Initially, the title referred to the beach communities of Santa Monica and Venice, but more recently it has expanded to include nearby Playa Vista, and its impact now stretches to Hollywood, downtown Los Angeles, and surrounding areas. Silicon Beach has distinguished itself from Silicon Valley by becoming a nexus of entertainment technology, hosting not only established firms such as Electronic Arts, Google, and Amazon, but also launching such rising stars as Snapchat. In addition to the availability of venture capital, the rise and growth of Silicon Beach is based on two major factors. The first is the entertainment industry's increasing reliance on technical effects to enhance films and the significantly increased demand for online content—much of which is generated in the area. Second, world-class universities, including the California Institute of Technology, the University of California, Los Angeles, and the University of Southern California, provide a deep business, filmmaking, and technology talent pool. In other words, the key to success for Silicon Beach was that it recognized its local legacy by taking advantage of Hollywood's entertainment ecosystem and the talent pool from major universities in the region.

Pittsburgh possesses similar resources to those found in Atlanta, Toronto, and Los Angeles. Universities including Carnegie Mellon, Point Park, and the University of Pittsburgh offer entertainment-related programs as well as technical expertise with potential applications for film and television production. These resources are augmented by the presence of Google and Disney Research, both of which were originally on the Carnegie Mellon campus, although Google has now relocated off campus to Bakery Square. Pittsburgh's academic and research facilities, combined with Pittsburgh's established record as a film location, form the foundation for an entertainment cluster. Of course, Pittsburgh should not aim to become another Toronto, Atlanta, or Silicon Beach. Instead, Pittsburgh must identify its regional comparative advantages, such as advanced innovations in computer technology, depth of local investors and foundations, unique architecture and geography, and cost advantages to shape the appeal and value of its entertainment-technology cluster and build it to a truly competitive and self-sustaining level.

Pittsburgh has had success developing specific technology clusters through programs that facilitate growth in the technology sector. Programs that encourage tech startups, utilize technology developed at local universities, and bring large tech companies into the city all contribute to a highly skilled workforce. Innovation Works, a publicly funded economic development organization, is the single largest investor in seed-stage companies in the Pittsburgh region. Fifty-eight percent of the companies in Innovation Works' portfolio have an affiliation with Carnegie Mellon or the University of Pittsburgh.[39] The Pittsburgh Life Sciences Greenhouse also funds startups based on local innovation and ideas. Digital Greenhouse, which recently merged with other organizations, assisted 83 companies, creating 3,182 jobs, and attracted $571 million in follow-up capital.[40] Life Sciences Greenhouse has helped more than 400 companies, creating or retaining 1,800 direct positions and affecting 12,000 jobs in the region.[41] These publicly funded investors have helped build and develop local clusters in digital technology and life sciences.

Local universities comprise Pittsburgh's greatest assets for developing an entertainment-technology cluster. With Carnegie Mellon and the University of Pittsburgh leading the way, south western Pennsylvania has attracted over $1 billion in research annually for projects that generate world-class innovation and opportunities for commercialization of new technologies.[42] To support commercialization, the state established a tax incentive program that qualifies young organizations for salable credit based on revenue increases. The sale of credits generates non-dilutive capital for the young firms to expand. For more mature technology-focused companies,

39. www.innovationworks.org
40. http://www.digitalgreenhouse.com/
41. http://www.plsg.com/about/
42. Research Commercialization Programs, universityeda.org

various public and private accommodations were made for research and development. Continued growth in computer sciences and life sciences will occur due to the quality talent and low operational costs of Pittsburgh compared with other regions of the country.

Public-private partnerships will be crucial in developing large-scale entertainment infrastructure, as demonstrated in Atlanta, Toronto, and Albuquerque. Pittsburgh can draw on a history of well-planned, successful developments such as the Pittsburgh Technology Center. The center, home to tech companies including Ansaldo STS and National Cyber Forensics, is the product of a collaboration among the Urban Redevelopment Authority of Pittsburgh, Regional Development Industrial Corporation (RIDC), Carnegie Mellon University, the University of Pittsburgh, and several other regional and state partners. By working together, the stakeholders transformed a former coke works once used for steelmaking into a technology hub, now the home of eight buildings with high-tech tenants.[43] RIDC built the Robert Mehrabian Collaboration Innovation Center (CIC) on land next to Carnegie Mellon in a similar collaboration. The center, meant to be an extension of the Pittsburgh Digital Greenhouse initiative, was designed as an incubator for companies created through university-related technology. The proximity and ties to the university fostered easy cooperation between university research and development and commercial endeavors. The center was the first home to Google when the company arrived in Pittsburgh in 2006. The property is now solely owned by the university and hosts operations for Disney, Apple, and Intel, among others.[44] CIC creates opportunities for Carnegie Mellon students to find high-paying jobs in Pittsburgh after graduation. The establishment of these technology-focused facilities has played a key role in the creation of a clustering effect within the metro.

A similar network of investor support, innovative research, and talent will enable a new cluster in entertainment technology to develop and grow throughout the Pittsburgh region. The entertainment industry values innovation. If producers are able to develop the deep relationships that the other industries have with local investors and universities, a natural cluster is likely to develop and expand.

43. http://ridc.org/view-property/pittsburgh-technology-center/

44. http://ridc.org/view-property/cic/

THE PENNSYLVANIA FILM TAX CREDIT'S EFFECT ON PITTSBURGH

As mentioned, location choices are based, in large measure, on the availability of incentives. Hollywood and local stakeholders stressed the importance of having policies and legislation that foster incentives that are in line with developing infrastructure and building crew depth. Incentives are available in so many states and foreign countries that there is little reason for a studio to film in places where they are not available. The growth of Pittsburgh's entertainment industry is dependent on incentives.

Pennsylvania offers a 25 percent tax credit to films that spend at least 60 percent on qualified expenses. Projects eligible for the program are: feature films, television films, TV talk or game show series, TV commercials, and series pilots or single episodes intended as programming for a national audience. An additional 5 percent credit is available to productions filmed in a "qualified facility" designated by the state. The Film Tax Credit also allows up to $15 million credit per project for "above-the-line" actors wages. This contrasts with unrestricted allocations for above-the-line credits in Georgia and Louisiana. This element of production incentives is important because it helps states secure high-profile, big-budget features that inject large amounts of money into the local economy and build the reputation of the local entertainment workforce. Pennsylvania's tax credit program began in 2004, when the Legislature authorized $10 million in incentives to take effect in 2005. In FY2007, the cap was raised to $75 million, spurring rapid growth in film production. The incentive cap was adjusted several times before the state settled on the current level of $60 million per fiscal year. Pennsylvania tax credits are funded annually, which creates uncertainty about their availability for long-term projects.

> The most critical piece that is lacking is the lack of permanence of the tax rebates, creating a sense of uncertainty regarding the incentives. Also, while the film crews are experienced and knowledgeable, there currently aren't enough crews to handle multiple productions.
>
> —Thomas Tull, CEO, Legendary Pictures

Credits lower the cost of production and enable production companies to mitigate risk. Equally important, producers can use the promise of a transferable text credit as collateral to secure financing. In 2002, only five states had incentive programs, and these were small, totaling just $1 million. By 2010, 40 states were offering incentives worth $1.396 billion.[45] Computer-generated visual effects have made it easier for Hollywood to base location decisions on the availability of tax incentives. Careful framing of a scene and digital enhancements can make Toronto look like New York or let Louisiana pass for Hawaii. In the 2012 science-fiction film *Chronicle*, Cape Town, South Africa, was convincingly transformed into Seattle. This ability has to some degree diminished the importance of finding a physical setting that conforms to the storyline.

45. McDonald, Adrian H. (2011), "Down the Rabbit Hole: The Madness of State Film Incentives as a 'Solution' to Runaway Production," *Journal of Business Law*. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1495091 (accessed February 26, 2015).

Table 4. Film incentive programs

State	Max. % of Total Qualified Expenses (2014)	Cap (2014)	Starting Year	Annual Tax Credit Cap Change
PA	25% + 5% (qualified facility)	$60 million	• Enacted: 2004 • Revised: 2007	• $10 million (2005-2007) (grants through DCED) • $80 million (2007-2008) ($5 million in grants and $75 million in Film Tax Credit through DCED) • $75 million (2008-2009) • $42 million (2009-2010) • $60 million (2010-2015)
CA	25%	$100 million	• Enacted: 2009 • Revised: 2014	• $100 million (2009-2014) • $230 million (2015-2016) • $330 million (2016-2020)
GA	30%	No cap	• Georgia • Entertainment Industry Investment Act signed into law: 2008	
LA	30% + 5% (if Louisiana residents hired)	No cap	• Enacted: 2002	
NM	25% + 5%	$50 million	• Started: 2002	• $1.2 million (2002-2003) • $3.4 million (2003-2004) • $2.1 million (2004-2005) • $8.6 million (2005-2006) • $16.6 million (2006-2007) • $45.6 million (2007-2008) • $76.4 million (2008-2009) • $65.9 million (2009-2010) • $54.7 million (2010-2011) • $50 million (2011-2015)
NY	30%	$420 million	• Launched: 2004	• $25 million (2004-2005) • $60 million (2006-2007) • $65 million (2008) • $75 million (2009) ($350 million additional credit) • $420 million (2010-2019)
OH	25% / 35%	$5 million/ Project	Created: 2009	• $10 million (2010-2012) • $20 million (2012-2014)

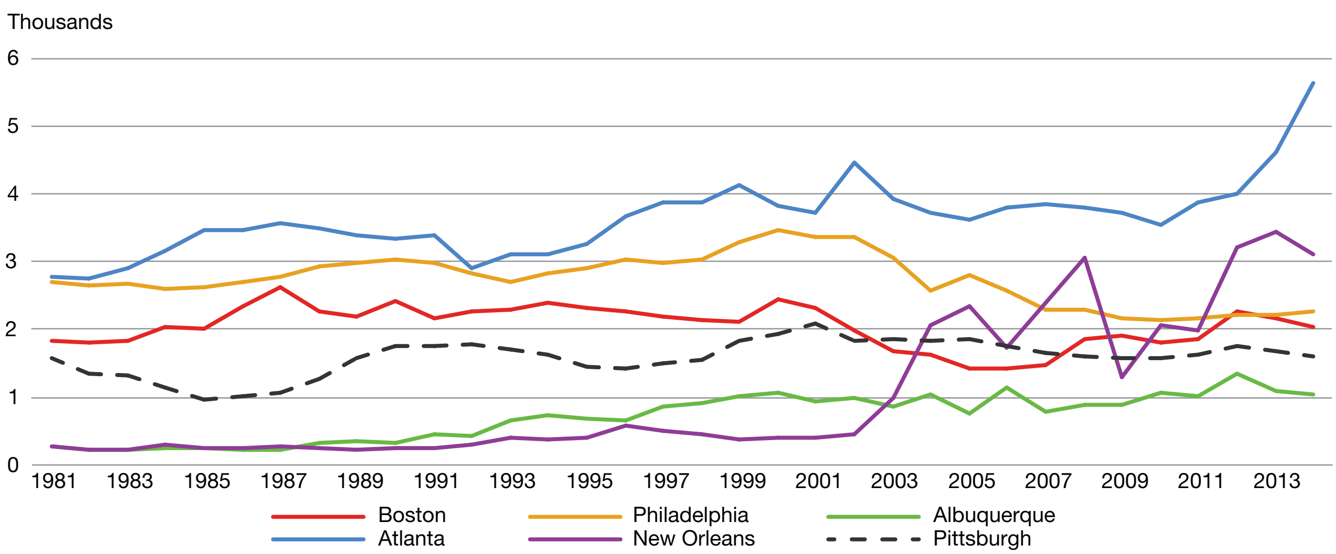
Sources: California Film Commission,[46] City and County of San Francisco,[47] FBT Film & Entertainment,[48] Georgia Production Partnership,[49] Greater Philadelphia Film Office,[50] Louisiana Economic Development,[51] New Mexico Film Office,[52] Pittsburgh Film Office, PolitiFact,[53] Statehouse News Bureau[54]

46. California Film Commission, California Film and Television Tax Credit Program, http://www.film.ca.gov/res/docs/pdf/Incentives%20Documents/CFCGuidelines%20March%202014.pdf (accessed February 19, 2015).
47. City and County of San Francisco, Film, SF, California Film and Television Tax Credit Program http://filmsf.org/index.aspx?page=95 (accessed February 19, 2015).
48. FBT Film and Entertainment, Louisiana Film Tax Incentive Programs, http://www.fbtfilm.com/louisiana-film-info/film-incentives/ (accessed February 19, 2015).
49. Georgia Production Partnership, Highlights of the 2008 Georgia Entertainment Industry Investment Act, http://www.georgiaproduction.org/gpp-news-room/highlights-of-the-2008-georgia-entertainment-industry-investment-act/ (accessed February 19, 2015).
50. Greater Philadelphia Film Office, About the PA Film Production Tax Credit Program, http://www.film.org/Philadelphia/public/gpfo/taxcredits/18 (accessed February 19, 2015).
51. Louisiana Economic Development, Motion Picture Investor Tax Credit, http://www.opportunitylouisiana.com/page/motion-picture-investor-tax-credit (accessed February 19, 2015).
52. New Mexico Film Office, Film/Media Production Statistics, http://www.nmfilm.com/Incentive_Frequently_Asked_Questions.aspx; http://nmfilm.com/uploads/files/FILM%20PROD%20STATS%20-%20MASTER%20FY03%20-%20FY11%2012_22_11.pdf (accessed February 19, 2015).
53. Tampa Bar Times PolitiFact, “Gary Johnson Says Tax Breaks Made New Mexico the Second Hollywood.” http://www.politifact.com/truth-o-meter/statements/2011/jul/15/gary-johnson/gary-johnson-says-tax-breaks-made-new-mexico-secon/ (accessed February 19, 2015).
54. State News Bureau, “Lawmakers Want to Double Film Tax Credit, Saying It’s Paying Off All Over Ohio,” http://statenews.org/story_page.cfm?id=16255 (accessed February 19, 2015).

> Creatively it has to fit the right world. The finances are very important, especially in television more than anything else these days. And all the places that we go, pretty much, have tax incentives. New York, Atlanta, Albuquerque, Chicago, and the two Canadian cities, and they're all based upon incentives.
>
> —Ed Lammi, Executive Vice President of Physical Production, Sony Pictures Television

Incentives are organized differently in every state, and film infrastructure investment often correlates with the kind of incentives a state has established. The way incentives are instituted and the ability of a state to build a crew base, provide infrastructure, and make filming easy are important factors in building up the entertainment industry. Comparing Pittsburgh with other locations provides perspective on the region's progress and what it must do to improve. No regional governments have control over state incentives, but they do have the ability to help ensure that crew is available, infrastructure is built, and that the area maintains a good rapport with the film industry. As Pittsburgh develops its competitive advantages, it is essential to understand what other key metros have done to develop their own edge, or, in some cases, to squander it.

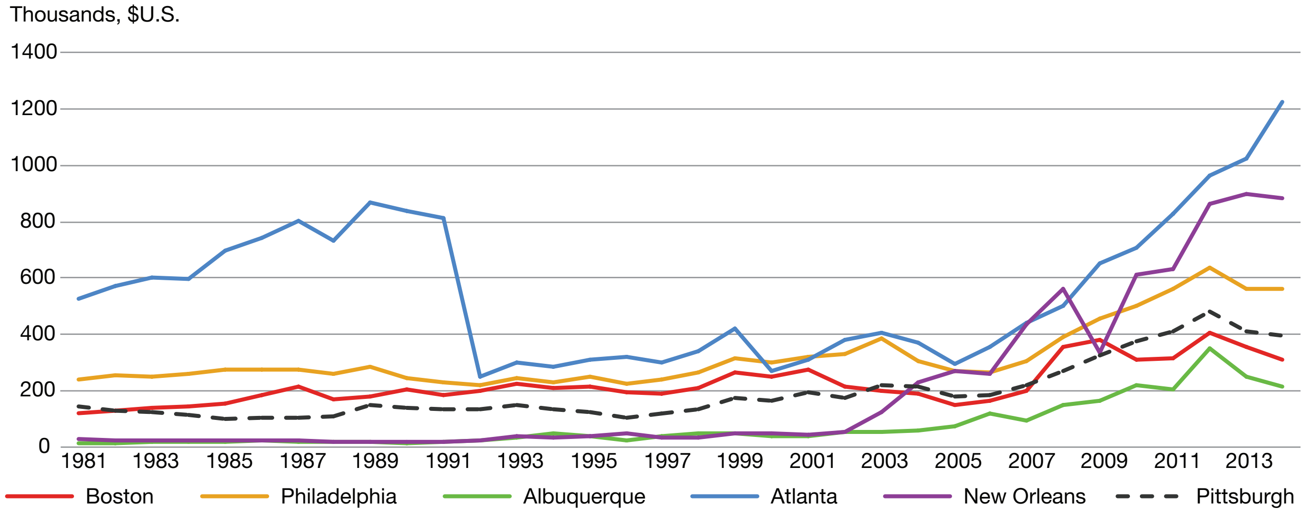
Figure 7. Atlanta's growth in film industry employment skyrockets compared with other cities



Sources: Bureau of Labor Statistics, Moody's Analytics

Film industry employment in Pittsburgh stopped falling when Pennsylvania tax incentives were introduced in 2007, replacing the state's earlier grant program (Figure 7). However, the cap on the amount of money available and the requirement of annual allocation by the Legislature have prevented rapid growth like that seen in Atlanta and New Orleans. However, Pittsburgh's positive reputation has helped it maintain employment levels better than Boston and New Orleans in recent years. Albuquerque is very similar to Pittsburgh in terms of incentives; however, Pittsburgh's architecture, history, larger size and population, trained workforce, theater community, and surrounding industries have resulted in higher employment levels. Albuquerque's advantage is that New Mexico has maintained incentives over an extended period, demonstrating a commitment and consistency that instills confidence in studios considering the state as a location. Albuquerque also benefits from being New Mexico's main production hub, whereas Pittsburgh must compete with Philadelphia for incentive dollars.

Figure 8. Entertainment employment GDP of Pittsburgh compared with competitors



Sources: Bureau of Labor Statistics, Moody's Analytics

Note: Real GDP in NAICS 5121

> With the success of the Film Tax Credit program, the amount of projects, new money, and jobs that come to the region each year has increased like we said it would. The issue that we face now is that without Pennsylvania making a long-term commitment to the program of at least five years, there is too much uncertainty for new businesses and long-term projects to open in our region. It is difficult for a business to make the kind of investment necessary to be successful without knowing what the Film Tax Credit program will look like down the road. With a long-term commitment of at least five years, you would start to see development of both the industry and the infrastructure because there would be a certainty that there is going to be enough work to maintain the business. People need certainty to commit the resources necessary to open these businesses in the commonwealth.
>
> —Dawn Keezer, Director, Pittsburgh Film Office

In terms of total output, or real GDP in entertainment employment (NAICS 5121), Pittsburgh and Philadelphia perform better than competitors except Atlanta and New Orleans. Both rival cities benefit from uncapped state incentives (Figure 8). This means that Pennsylvania's incentive dollars create a higher overall economic output than those allocated in Boston and Albuquerque. Pennsylvania requires 60 percent of filming to be done in the state to qualify for incentives, a level that forces producers to do a majority of production work in the state rather than use out-of-state locations and firms for supplemental work. This output growth was consistent until some incentive funds were held back in FY2013.

North Carolina provides a cautionary tale of what to avoid. The state began offering film incentives in 2005, building on its reputation, and experienced crews developed in the 1980s and 1990s on films such as *Dirty Dancing* and *Forrest Gump.* Incentives were uncapped at 25 percent of the in-state spend with a minimum spend of $250,000. The uncapped incentives brought in major productions including *Iron Man 3* and *The Hunger Games.* The year-over-year consistency of the incentive also brought television productions including CBS' *Under the Dome*, Fox's *Sleepy Hollow*, and Cinemax's *Banshee.* With the steady flow of productions, the state developed a large workforce and infrastructure.

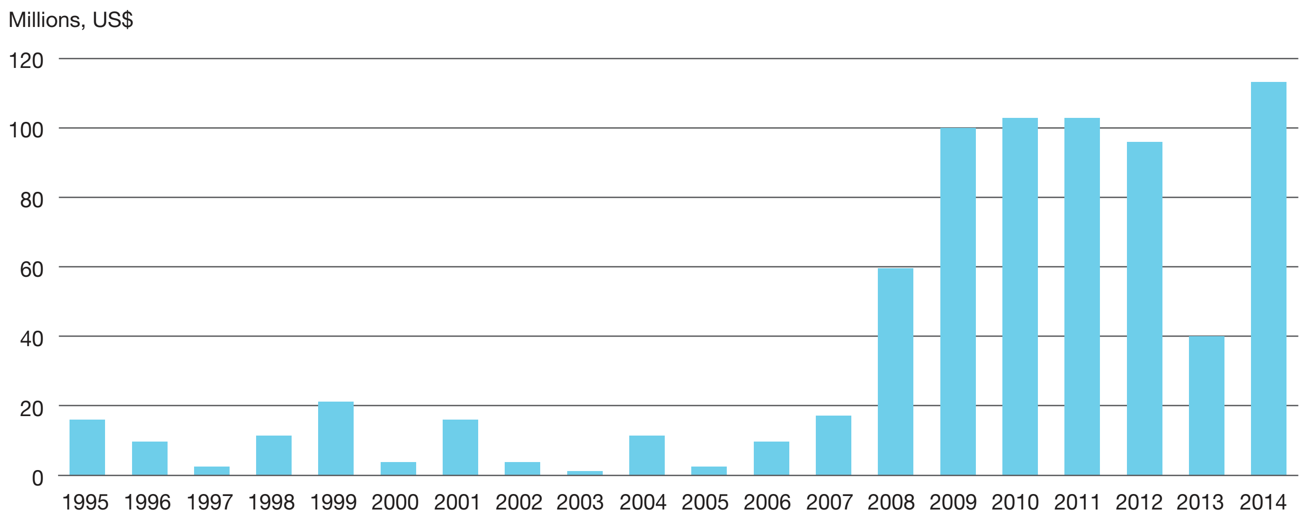
In January 2015, legislators slashed incentives from an uncapped program that distributed over $60 million in 2013 to a capped $10 million grant. The cutback was part of a broad legislative mandate to reduce taxes across all industries. The reduction led to a mass exodus of productions from the state, including subsequent *Hunger Games* installments. At the current level of funding, North Carolina will cease to be a prominent filming location for major studio productions. It is also losing most television productions because half of the $10 million grant has already been designated to *Under the Dome*. The producers of *Banshee* have relocated to Pittsburgh. Most people employed by the entertainment industry in North Carolina are looking for work outside of the state.

Incentives or tax credits are necessary to attract production when infrastructure and a crew base are adequate. The draw of free money in other locations is too alluring for productions to stay in an area without incentives.

ECONOMIC IMPACT OF THE ENTERTAINMENT INDUSTRY IN PITTSBURGH

The economic impact of incentives goes beyond the wages paid to those employed in the film industry. Productions spend money for food, lodging, props, costumes, set construction materials, rentals, and numerous other services. Spending in these categories is listed in economic impact questionnaires collected by the Pittsburgh Film Office at the conclusion of each production. These numbers represent money injected directly into the local economy by film companies and do not include a multiplier effect. Over four consecutive calendar years, 2009-2012, direct spending was about $100 million annually (Figure 9). Totals fell sharply in 2013 because the total $60 million in statewide incentives was not fully distributed.

Figure 9. Economic impact of film productions in Pittsburgh



Source: Pittsburgh Film Office

Note: Economic impact is measured by the dollar amount inflow to Pittsburgh.

Spending in Pittsburgh's entertainment industry has a ripple effect throughout the economy. This can be measured using the Regional Input-Output Modeling System (RIMS II). RIMS, created by the U.S. Bureau of Economic Analysis, measures the ripple effect of specific economic activities. It illustrates that Pennsylvania film production incentives create new economic activity that extends into other industries. This is demonstrated by the lower output and employment before the incentives were created and subsequent declines after they were reduced.

Table 5. Filming has effects on larger Pittsburgh economy

Industry	Economic impact for each dollar spent	Number of jobs created per million dollars spent
5121 Motion picture and video industries	1.2737	10.7032
Economic gains due only to incentive money (25% of required 60%)		
$30,000,000	$38,211,000	409
$60,000,000	$76,422,000	818
$120,000,000	$152,844,000	1636
Economic gains due to additional required investment (remaining 35%)		
$40,500,000	$51,584,850	552
$81,000,000	$103,169,700	1,104
$162,000,000	$206,339,400	2,208
Minimum total investment (combined 60% spent in PA)		
$70,500,000	$89,795,850	961
$141,000,000	$179,591,700	1,922
$282,000,000	$359,183,400	3,844

Sources: Bureau of Labor Statistics, Milken Institute

The Final Demand multipliers are presented on a per-dollar basis. The final demand output yields the total output impact based on one dollar spent in the motion picture and video industries, whereas the employment effect measures job creation based on dollars spent. For the entertainment industry in Pittsburgh, every dollar that is spent produces $1.27 for the overall economy. In addition to the increase in output to the local economy, for every million dollars spent in entertainment, almost 11 jobs are created. Entertainment is a very labor-intensive industry, an employment an effect over 10 is high compared with industries such as computer systems design services (9.97), scientific research and development services (8.25), and oil and gas well drilling (6.57). As shown in Table 7, the state money invested in the entertainment industry, after the minimum requirements for receiving incentives are met, more than doubles the economic impact of the original tax incentive. Incentives are good job creators. They produce unionized blue-collar and professional opportunities for a variety of people. Entertainment and filming have a ripple effect that benefits a wide range of businesses, including construction, real estate, catering, software development, and robotics. Creating a tech-media cluster would create a diverse range of high- and low-skilled jobs.

RECOMMENDATIONS AND CONCLUSION

Pittsburgh has demonstrated over the past two decades an ability to survive and thrive as a mid-level center for filmed entertainment, while at the same time continuing to build its overall reputation as a center of technology and innovation. Creating a media and entertainment cluster of companies and facilities is vital to the retention of talented local university graduates and attracting and retaining firms essential to expanding and sustaining a larger film and media presence. In order for Pittsburgh to expand the local sector into a robust cluster, it is essential that the metro coordinate efforts across multiple jurisdictions to develop and retain local human capital and link key skills underlying a media and technology cluster. The Pittsburgh Film Office, perhaps with a revised mission, would be the logical center for organizing such a cluster similar to those in Los Angeles, New York, and Atlanta. The city also must develop a full supporting infrastructure to house the expanding cluster and provide a more complete solution for building and retaining local employment. In addition, due to the current level of interstate and international competition, it is vital that local leaders work with state lawmakers to develop certainty in the state film incentives. To reflect the feedback from the stakeholders, and the conclusions reached in the data, we are grouping recommendations into three categories: human capital and clustering, infrastructure investment, and working with the state on incentives. Pittsburgh's ability to grow and sustain its role in filmed entertainment requires an effective cluster with sufficient skilled workers, dedicated structures and organizations, and consistent state funding to ensure that the metro can fulfill its potential.

Human Capital and Clustering

Collaborate with key local institutions and firms to integrate the expanding media presence more fully with the local technology cluster by integrating universities and technology firms more fully into the entertainment sector.

- Integrated facilities for entertainment and technology disciplines will provide an opportunity for the commingling of ideas and content as seen in locations such as Silicon Beach, San Francisco, and Vancouver. Integration will also provide the ability to build satellite campuses and facilities linking local universities directly to media and technology firms.

Develop a comprehensive solution for the retention of local talent produced by the metro's film schools and other entertainment-related university degree programs.

- Expand union apprenticeship opportunities and establish a system for matching local university students seeking internships to companies where they can gain experience and hone their skills.
- Encourage universities and media/technology companies to share facilities in order to increase opportunities for incubating and launching locally based firms.

Attract and develop more support firms and related businesses to bolster local investment.

- Build dedicated facilities to house support services, such as specialty dry cleaners and caterers near soundstages, and offer incentives to hire local workers. This has been a significant factor in the success of Atlanta, New Orleans, and other leading metros. Having dedicated local services provides a boost to local employment and helps attract television programs and other long-term productions. Furthermore, attracting and retaining service providers creates an opportunity for workforce training and employment in sectors that stretch beyond areas traditionally considered part of either media or technology.

Infrastructure

Develop a coordinated effort to invest in and expand the physical infrastructure for filmmaking in Pittsburgh.

- In order to facilitate year-round productions in Pittsburgh, and in particular facilitate a higher level of television programming, it is essential to expand the number of soundstages and specialty facilities for films, television, and commercials. The current level of available space can support only a limited number of full-scale productions.

- Facilitate the construction of dedicated locations and facilities for post-production work, prop construction, and green screens. As television and movie producers increasingly concentrate productions in one location, the ability to handle multiple aspects of filmmaking becomes a key competitive advantage. Facilities in Atlanta, Albuquerque, New York, Toronto, and London all have moved toward providing resources beyond soundstage space.

- Ensure that facilities meet the standards required to qualify for the additional 5 percent tax credit in the state incentive program and that they are managed by firms with strong Hollywood connections. One of the key advantages for soundstages in London, Atlanta, Toronto, New York, Albuquerque, and even Philadelphia is leadership with deep film industry ties. Although Atlanta's Pinewood facility is largely owned and funded by local investors, managers have leveraged Pinewood's globally recognized brand to attract productions and significant investments in supporting services and secondary infrastructure.

Create a stakeholder advisory group to develop and maintain a unified media and entertainment strategy.

- The advisory group would coordinate development of physical infrastructure along with efforts to recruit businesses and educational partnerships to utilize the space.

- Financial, workforce development, and educational resources could be directly informed through this body in order to maximize their impact both on the local community and in attracting outside partners.

- External communication and marketing efforts would be aligned by the advisory group to create a unified effort for promoting the metro as well as messaging production companies and other interested groups.

Incentives

Work with the Pennsylvania Legislature to develop a consistent long-term strategy for film incentives that provides predictability and increased capacity for firms.

- Push for the establishment of at least a five-year commitment by the state to the film incentive program. Perhaps the single most cited concern of producers who have filmed in Pittsburgh is the tremendous uncertainty created by the current parameters of the Pennsylvania film incentives. Uncertainty in film incentives has created disruptions in numerous states and metros, but in Pittsburgh it directly impacts the ability to attract projects that require longer-term planning, particularly in television.

- Determine a politically feasible and fiscally sustainable level at which the state should fund film credits and ensure that unutilized credits are returned to the available credit pool. Having certainty in the level of funding will further assist the ability to attract productions.

Pittsburgh's ability to further grow and leverage its entertainment industry involves effort in several areas. The city already has seen direct benefits from soundstages, services, visual effects, and animation facilities in the area. The metro's comparative advantage comes from being able to harness a strong creative community and link it to the city's highly regarded universities and its tremendous capacity for technological research. Although the current environment for film and television production is directly affected by the state's tax incentive structure, the ability to leverage the credits into higher levels of local employment is directly tied to development of a broader infrastructure to support filmmaking. If Pittsburgh is able to develop and retain local talent, and construct the facilities necessary to meet the demands of film and television production, it will see significantly greater long-term benefits and gain an advantageous position for retaining production should the industry at some point move away from dependence on tax incentives. Pittsburgh has made significant strides. What is required, more than anything, is the ability to unite the disparate actors in both media and technology and capitalize on the work already done and elevate the metro into a more significant national and international center for filmmaking.

APPENDIX: STAKEHOLDERS

We would like to thank those who attended and provided input for this paper from the Pittsburgh entertainment community.

Group 1: Wednesday, January 21, 2015; 10 a.m. - 12 p.m.

Name	Title	Company
Deborah Acklin	President and CEO	WQED Multimedia
Jake Witherell	Chief Operating Officer	Schell Games
Drew Davidson	Director	Entertainment Technology Center at Carnegie Mellon University
Chris Breakwell	President and CEO	31st Street Studios/Gateway Entertainment Studios
Fred Johnson	Assistant Vice President for Academic and Student Affairs	Point Park University
Cyndi Casteel	Founder and Vice President	Studio C
Mike Ceoffe	President	Teamsters Local Union 249
Kevin McQuillan	Principal	The McQuillan Group
Krista Salera	Principal, Director of Accounting and Assurance	The McQuillan Group
Chuck Hoover	Vice President of Production	Schell Games
Cassie Eccles	Secretary-Treasurer	IASTE Local Union 489
Zane Weiner	Producer	Independent Producer

Group 2: Wednesday, January 21, 2015; 2 p.m. - 4 p.m.

Name	Title	Company
Russ Streiner	Chairman of the Board, Pittsburgh Film Office, and Producer	Pittsburgh Film Office
David Case	President and CEO	PMI
Kathy Dziubek	Executive Producer	Animal
Mike Killen	Director	Animal
Peter Argentine	Producer	Argentine Productions
Per Argentine	Editor	Argentine Productions
Brain Hartman	Independent Producer	Producer
Latrenda Leonard	Deputy Chief of Administration and Operations	Office of the Mayor, City of Pittsburgh
David Hartman	Executive Vice President and General Manager	PMI-TV
Dorothy Davis	Member, Board of Directors, Chair - Women's Initiative at Eckert (WIE)	Eckert Seamans Cherin & Mellott
John Luff	Consultant	HD Consulting
Rick McMaster	Business Executive	
Mark Fallone	Director/Producer	Phenomenon Post
Adrienne Wehr	Producer/Actress	
Andy Kelemen	Producer/Editor	

Group 3: Thursday, January 22, 2015; 2 p.m. - 4 p.m.

Name	Title	Company
Chip Eccles	Business Manager	IATSE Local Union 489
Carl Kurlander	President and CEO	Steeltown Entertainment
Wendy Owens	Director of Finance and Administration	Steeltown Entertainment
Brian Lysell	Executive Director Ohio-Pittsburgh	SAG/AFTRA Pittsburgh-Ohio President
Chelsea Danley	Contract Administrator	SAG/AFTRA
Donna Belajac	President	Donna Belajac Casting
Nancy Mosser	Owner	Nancy Mosser Casting
Mike Matesic	President and CEO	Idea Foundry
George Hoover	Chief Technology Officer	NEP
Lisa Smith-Reed	Independent Producer	Producer
Rep. Paul Costa	Representative	PA House of Representatives
David Haddad	President	Haddad's
Thanassis Rikakis	Vice Provost for Design, Arts and Technology	Carnegie Mellon University
Casey LaRocco	Film Tax Credit Committee	IATSE Local Union 489
Eddie Edwards Jr.	Of Counsel	Dinsmore & Shohl
Tim McNulty	Associate Vice President of Government Relations	Carnegie Mellon University
Mike "Bubba" Matesic	President	IATSE Union Local 489
Tom Casey	President/Creative Director	Home Run Pictures
Mike Gasaway	Writer/Director	
Stan Muschweck	Founder and Owner	StandOut Marketing and Advertising

ABOUT THE AUTHORS

Kevin Klowden is managing director of the California Center at the Milken Institute, where he also serves as a managing economist. He specializes in the study of technology-based economic development, transformation of human capital, and investment of infrastructure on economies at both regional and national levels. He profiles the role of demographic and spatial factors (the distribution of resources, business locations, and movement of labor) and how these are influenced by public policy and in turn affect regional economies. Klowden has been the lead author of numerous studies on California's economy, in addition to co-authoring several national and regional publications on the role of high technology, infrastructure, and the life sciences in the economy. He has addressed technology-based development in publications such as "*2014 State Technology and Science Index,*" "*California's Position in Technology and Science*," and "*North America's High-Tech Economy*" as well as location-specific studies on Arkansas and Arizona. Klowden has been a leading voice on the impact of the filmed entertainment industry in California, and has spoken extensively on the subject.

He is the lead author of multiple publications on the subject, including "A Hollywood Exit: What California Must Do to Remain Competitive in Entertainment—and Keep Jobs," "Fighting Production Flight: Improving California's Filmed Entertainment Tax Credit Program," "Film Flight: Lost Production and Its Economic Impact in California," and "*The Writers' Strike of 2007-2008: The Economic Impact of Digital Distribution*." He is also the lead author of "*Strategies for Expanding California's Exports*," which focused on the vital role trade and exports play in the state economy and its underperformance relative to the country over the past decade. He has also written on the role of transportation infrastructure in economic growth and job creation in reports such as "*California's Highway Infrastructure: Traffic's Looming Cost*" and "*Jobs for America: Investments and Policies for Economic Growth and Competitiveness*," as well as in publications such as *The Wall Street Journal* and the *Los Angeles Times*. Additionally, he coordinated the Milken Institute's two-year Los Angeles Economy Project, seeking public-policy and private-sector solutions to challenges the region faces amid a growing unskilled labor pool. Klowden is a frequent speaker on state economic and fiscal issues and has served on multiple advisory boards on business growth, economic development, and infrastructure. He holds graduate degrees from the University of Chicago and London School of Economics.

Kristen Keough Harris is a research analyst at the Milken Institute. Her research focuses on regional economics and demographics. Keough's most recent projects include "California's Position in Technology and Science" (2013) and "A Hollywood Exit: What California Must Do to Remain Competitive in Entertainment—and Keep Jobs" (2014). She also speaks on keeping California competitive in science and technology in a global economy. Before joining the Milken Institute, Keough interned for the nonprofit Strategic Actions for a Just Economy in South Los Angeles and worked at the Center for Economic Research and Forecasting at California Lutheran University. Keough received a master's degree in quantitative economics and a bachelor's degree in political science and economics, with a math minor, both from Cal Lutheran.

Michael Cheng-Yi Lin is a research analyst at the Milken Institute. His current research focuses on human capital as well as community, urban, and regional planning and development. Prior to joining the institute, Michael was a teaching associate at the University of Southern California in the areas of urban and regional economics, informal housing, policy and program evaluation and quantitative methods and analysis. Michael's articles have been published in such academic outlets as the *Annals of Regional Science*, and he has published two book chapters about community planning and shrinking cities. He was also involved in writing several policy reports on green buildings, sustainable community development, and informal housing. His current working papers explore the relationship between talented individuals and urban development. He has also participated in peer reviews for academic journals. Michael received a Ph.D. in policy, planning, and development with a specialization in urban economics from USC. He earned a master's degree in urban design and a bachelor's degree in architecture, both from the National Taipei University of Technology in Taiwan.

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