

Modeling Physical Production for Film and TV - Agglomeration Dynamics and Geographical Competition

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Commented [HR1]: See my notes in response to your questions; Please update the problem definition to spell out more details on the production function idea and how to capture that along with allocation of demand and prices for factors of production

The film and television industry has recently undergone a significant shift in physical production away from Los Angeles to alternative hubs like Atlanta, Louisiana, the UK, Toronto, Vancouver, and Prague. Major studio executives publicly attribute this migration to several factors, including but not limited to: 1) More attractive **tax incentives** offered by competing regions. 2) Increasing **labor costs** in Los Angeles, exacerbated by recent labor strikes. 3) The **growth of skill and production capacity** in other locations, making them more viable long-term alternatives. These explanations may have a basis in reality, but they may also be specious arguments designed to further corporate interests. Understanding the dynamics behind this shift is critical for various parties - studios, policymakers and talent alike - who are invested in Los Angeles' production economy.

To begin, building a model that captures the historical growth of production in Los Angeles when it was the singular hub for the entire industry may illuminate industry specific agglomeration dynamics. In the early 1900s, the fledgling creatives found a home in the city, far from where they could be sued by motion-picture camera patent holder Thomas Edison's company. Large, empty spaces, consistent weather and a flow of "westward expansion" capital made the city a viable home for the industry. As pictures found commercial success, technological, financial and physical infrastructural investment increased the scale of productions, while a community of skilled laborers developed new techniques. Audiences around the world consumed the art eagerly, and thus Los Angeles became the only major player in entertainment.

By the end of the 20th century and into the beginning of the 21st, other locations began developing physical infrastructure of their own to try and lure the industry away. Soundstages in London now mirror the California city's in terms of square footage. Visual effects talent in New Zealand and Canada have attained best-in-class reputations. Nearly every film or television show shoots in Toronto or Prague when they need a "New York" backdrop, whereas before they might have built a city street facade on a backlot in Burbank, simply because it's less expensive with tax incentives. Skill pipelines across the world have advanced with the advent of social media. Agglomeration dynamics have begun to kick-in elsewhere - the rest of the world is catching up.

Skill and capacity growth loops are therefore likely at play, along with **cost and incentive loops**. **Labor market effects**, especially as a result of the most recent strikes, have certainly played a role and may have exacerbated a downward cycle. Of course, **financial success of the final product** made in each of these hubs also plays a part in studios deciding where to produce.

Without production, Los Angeles stands to lose its economic cornerstone. Local government and private companies have a few policy levers available to them that interact with the above dynamics:

- **Adjusting Tax Incentives:** How competitive do California's incentives need to be to retain productions and the local economic boon they bring?
- **Investing in Workforce Training:** Can improving skill levels and capacity in LA offset cost disadvantages?
- **Infrastructure Investments:** How does expanding studio space and resources in LA impact production retention?
- **Labor Costs:** What are the long-term effects of wage policies on production location decisions?

At its core, the model will track the movement of productions between locations via stocks, along with the production resources in each location (which includes physical infrastructure like soundstages, along with skill-based infrastructure such as talent pool size and experience):

- **Productions Seeking a Home** (a pool of potential productions)
- **Productions in LA** (productions currently being filmed in Los Angeles)
- **Productions Elsewhere** (productions filmed in competing regions)
- **Production resources** (how capable a location is to handle productions, in terms of physical infrastructure and skill.)

In summary, this model aims to provide insight into the competitive dynamics of film production location decisions and identify policy strategies that could help LA maintain its position as a global production center and will be built with the following iterative design:

1. **Baseline Model** – A simple stock-and-flow structure to explain how LA originally became the dominant production hub, focusing on key growth loops such as skill development and capacity expansion. A key formulation is likely the production function - what effect does the build-up of production resources have on average profitability?
2. **Expansion Model** – Introduce competing locations and model the agglomeration forces that drive productions away from LA.
3. **Policy Exploration** – Simulate different interventions to assess their effectiveness in accelerating or mitigating the trend of production flight from Los Angeles. This can include technological disruptions (digital, AI, etc.) which might “reset” some of the production resource advantages, or cost disruptions (i.e. tax breaks in other locations), which might remove some of the advantages of agglomeration.

For Hazhir - 2 notes in response to yours, which I found very helpful (thank you):

1) I do still feel like tax/financial cost incentives are an important part of this equation beyond just build-up of resources, though they are admittedly probably more difficult to model. I'm not sure if it plays into the profitability idea or not. Do you think it is specifically *not* valuable / too complex to include?

Commented [HR2]: Tax and other incentives are relatively easy to capture: they either show up in reduced prices for some factors of production (e.g. cheaper land for studios), lower taxes off the profits, or top-off investments (e.g. subsidies) for some productions. You can capture one of these (perhaps a subsidy that bankrolls x% of production costs) in your model.

2) Production function and production resources - I am struggling a bit with how these formulations may work. There are sort of two ideas determining production resources, one being investment (from either the government itself in a location i.e. just building soundstages or studios paying for a large production and as a result giving local workforce some experience benefits, but ultimately these ideas are pretty similar) and the other being the average profitability. If a movie filmed in New Zealand ends up being a blockbuster, that's a kind of social proof that adds to the credibility of the location, which acts as a kind of resource in and of itself, while also increasing average profitability. Is average profitability an output of the "production function" / production resources stock, or is it an input, or both?

Commented [HR3]: One way to think about it is the following:
 - think about N (e.g. ≈ 3) factors of production that need to come together for making a good movie, e.g. Labor (L : actors, screenwriters etc), Capital (C : e.g. sets, equipment etc), and Tech (T : e.g. digital assets, AI, programming etc). Each movie's output quality is a function of how good these factors are, compared to a normal level (e.g. L_n, C_n, T_n), so for example $Q = (L/L_n)^{a_L} (C/C_n)^{a_C} (T/T_n)^{a_T}$. It would be useful to assume $a_L + a_C + a_T = 1$ (so they are resembling shares of each factor in production). The total revenue would be a function of quality (e.g. $R = R_n Q^b$) and total costs are based on prices of the factors in that location and their share in production (a values), e.g. $\text{Costs} = p_L a_L + p_C a_C + p_T a_T$. Now profits will be revenue minus costs (and you can add subsidies to that for simplicity).
 The expected profit of the two locations at any time informs what fraction of total demand (for new productions) go to each of the two competing locations (use standard allocation formulations). That creates total demand for each factor of production, which can then inform the expansion, or contraction of those factors (if there is more demand than supply, the factor expands; and vice versa). The gaps between demand and supply also change the prices of each factor (see Sterman's text pp ~815 for a good simple formula for price).
 This should cover much of the core factors you need for the model.

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