

Examining *Mapping Amazon*

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In the United States, the debate about whether or not government should subsidize projects and corporations goes back to the very beginning, with roots in the questions of the role of government and powers granted to it. Despite debate then and now, history and current events show that government has never-the-less engaged in providing subsidies to commercial enterprises (Gates, 2003). Such subsidies are often referred to as “economic development” or “corporate welfare,” depending on the viewpoint of the commenter. Baughman et al. (2001) suggest a commonly accepted definition: “any action by local, state or federal government that gives a corporation or an entire industry a benefit not offered to others.” Subsidies may come in the form of tax breaks on equipment, property, purchases, or profits; low-interest loans and grants; discounts on utilities; and government funded improvements to infrastructure that benefit only the entity receiving the subsidy (Baughman et al., 2001).

Watchdog group Good Jobs First (GJF) has examined the distribution and use of economic subsidies since its creation in 1998, though founder Greg LeRoy’s experience with the subject begins in the mid-80s (Good Jobs First, n.d.). Indeed, GJF has used GIS and maps extensively in its projects as a tool of analysis, but also as a powerful method of graphically illustrating the effects of subsidies on communities and workers (Esri, 2010).

It is not surprising that Amazon.com, Inc. (Amazon), with its globally recognized name and incredible growth, has and continues to receive subsidies from local, state, and federal levels of government. As of November 2022, Amazon has been awarded \$5.1 billion according to Good Jobs First (2022). First in 2020, with

an update in 2021, GJF has used Esri's [ArcGIS Story Maps](#) to examine the subsidies given to incentivize Amazon to build facilities and create local jobs. In *Mapping Amazon 2.0: Where the Online Giant Locates Its Warehouses and Why*, GJF proposes that these subsidies are unnecessary, and are in fact “wasteful” of state and local financial resources, because Amazon will locate its facilities according to logistical necessity **regardless** of subsidies and incentives. This claim is supported by a number of quotations from industry pundits, including Amazon's vice president of North American operations who states that the most important factor in locating a fulfillment center is improving shipping speed for Prime membership customers (Good Jobs First, 2021). GJF further illustrates Amazon's decision making with a series of maps intended to show that Amazon's distribution facilities are located near larger populations of Prime customers, and near major highways and airports. Locations such as these are logistically favorable, offering quick delivery to the majority of Prime customers and easy access for the fleet of trucks that carry packages across the country.

There are a total of 14 maps used in *Mapping Amazon*. All of these can be zoomed except the few orthoimages.

- 1 showing the location of all US Amazon facilities designated by type (accompanied by a short animation of the facilities built each year).
- 1 choropleth of all US counties symbolized by median household disposable income, and overlaid with Amazon facility locations.
- 1 choropleth of census tracts symbolized by median household disposable income, but focusing on New York-Philadelphia-Baltimore area, with an additional area highlighting a 20-minute “driveshed” from Amazon facilities.
- 1 choropleth of all US counties symbolized by estimated number of Prime subscribers, and overlaid with Amazon facility locations.
- 1 choropleth of census tracts symbolized by estimate number of Prime subscribers, but focusing on Los Angeles area, with an additional area highlighting a 20-minute “driveshed” from Amazon facilities.
- 1 showing major highways and Amazon facilities in the general New England area.
- 3 orthoimages of select amazon facilities annotated to show the close proximity and short drive time to a highway or airport.

- 1 showing all US Amazon airport hubs, major cargo airports, and Amazon warehouses.
- 3 orthoimages of Amazon facilities, with a small “transportation” style inset map on side. These are select examples of exceptionally excellent locations for Amazon, despite which received subsidies.
- 1 of the Opportunity Zones created across the US in 2018 by Pres. Trump, overlaid with Amazon locations built after April 2018 symbolized by whether or not the facility is within an Opportunity Zone.

The use of a “driveshed,” or what Esri calls the “service area” solver among their network analyst solvers (Esri, n.d.-c), to create a region within a 20-minute drive is an excellent choice and clearly demonstrates the coverage Amazon has achieved with its facilities. A traditional fixed-distance buffer would have been inappropriate because trucks must travel on roads and *time* is more important than distance for speedy delivery.

Unfortunately, although the choropleth maps have a legend indicating what color is “high” or “low,” there is no indication what range of values specify each class. For the purposes of the project, such a detail probably is not necessary to illustrate the point of the story map, but may help stem concerns that GJF has manipulated the classes to bias the map in its favor. Additionally, some of the text accompanying the maps reference the national median—a potentially useful *natural break* in the classes—but it is unclear if the maps use this as a breakpoint or not (Monmonier, 2005).

The two maps with a driveshed overlay have a poor color choice for the regions within the driveshed, and it is very difficult to make a value comparison between the regions inside the driveshed and those outside (Figure 1). The text alongside these maps does mention “[c]olors outside the highlighted area have been dimmed and may not appear exactly like the legend below” (Good Jobs First, 2021), but the difference is more than just dimming—they are different palettes. Furthermore, the legend for the outside region shows a smooth color ramp while the legend for the inside region shows a categorized color ramp. A final issue is that the two choro-



Figure 1: Two separate palettes for inside and outside the driveshed.

pleth maps of Prime subscribers show *raw data* or *counts* instead of a *ratio* (i.e. Prime customers per 1000 people). This can cause viewer interpretation errors due to the differing sizes of enumeration units (e.g. counties), and counts often simply reflect differences in the *population* of the enumeration units instead meaningful geographic variation of the data (Monmonier, 2005; Heyman et al., n.d.). The map of median household disposable income does not use a ratio either, but instead uses a *measured variable* which can be compared directly (Dougherty & Ilyankou, 2021). Despite these issues, all the maps together emphasize the crux of GJF’s argument—that the locations Amazon chooses for its facilities are very well situated to provide optimal service to its Prime customers.

Data for the maps of this project come from primarily two sources, and the acquisition of it demonstrates additional geospatial technology. The primary data for the project is the locations of Amazon facilities. GJF has obtained this data from the logistics consulting company MWPVL. On MWPVL’s website are tables with the addresses of Amazon’s various buildings (MWPVL, 2022), but it is probably safe to assume GJF contacted MWPVL and bought access to the data. With a \$5,000 per year subscription MWPVL can supply more detailed information than they show on their website, which they have spent more than \$1 million developing over the

last 15 years (M. Wulfraat, personal communication, November 16, 2022). Still, it is possible that even this enhanced data does not include a coordinate for each facility, and therefore GJF may have used geocoding to create the feature class shown on the maps. Using ArcGIS Pro, I geocoded a sample of the facility addresses shown on MWPVL's website, and although a few were difficult for the [ArcGIS World Geocoding Service](#) to locate, I found the Amazon information to be accurate.

The second source for *Mapping Amazon*, used in the choropleth maps of *median household disposable income* and *households with Prime subscriptions*, is Esri's data service. It offers a variety of prepared demographic, economic, and environmental data, among others (Esri, n.d.-b), and In ArcGIS Pro it is available through the "enrich" analysis tool. The Bureau of Economic Analysis (2022) describes disposable income as "personal income minus personal current taxes." Esri documents that their estimates account for federal, state, social security, and federal retirement payroll taxes, but not property taxes on owner-occupied houses, and includes data from the Census Bureau's Annual Social and Economic Supplement of the Current Population Survey (ASEC) (Esri, 2022b). The households with Prime subscriptions estimate is part of Esri's "Market Potential" subset of data, and incorporates data from the [MRI-Simmons Survey of the American Consumer](#) and *Doublebase* surveys, the latter itself being a combination of four consumer surveys (Esri, 2022a).

Although this project is not a heavily "geospatial project" in that does not use any cutting-edge remote sensing technology or some amazing new algorithm, it does have social impact because it could inform both elected officials and the general public about "wasted" subsidies and possibly help give them tools to resist pressure from subsidy-seeking businesses. The crux of GJF's argument in this story map is that Amazon's decisions are not affected by the incentives offered. In addition to the statements quoted as proof in the story map, there is a wealth of other evidence supporting this position generally among businesses (McCarthy, 2018; Jones & Zip-

perer, 2018; Matkin, 2010; Brubaker, 2003). Indeed, though the \$5 billion in total subsidies Good Jobs First (2022) counts for Amazon is a shockingly large amount in the eyes of the public, it is only 1% of the \$500 billion in revenue that Amazon might earn **just** in 2022 (The Wall Street Journal, 2022, based on 2021). If this \$5 billion is assumed to have been collected in the 10 years since 2012, the year GJF states Amazon created a “tax-break office,” it becomes so insignificant that it could not possibly be a major consideration for Amazon. Never the less, Amazon (and others) will of course accept what it is offered.

Not only will Amazon accept, but it will actively play localities against each other. The near-ubiquitous use of subsidies by governments to “lure” businesses, governments’ relative inaccessibility to expert financial and legal council, and the political (instead of economic) nature of decision making put governments in a weak bargaining position against business in a zero-sum subsidy “bidding war” (McCarthy, 2018; Matkin, 2010; Enrich, 2002). Furthermore, businesses often withhold information about their decision making from the public, sometimes going so far as to require non-disclosure agreements of government officials as seen in Amazon’s HQ2 selection process (Braumann, 2020; McCarthy, 2018; Carr & Hesse, 2022). This bidding war is so engrained that even Esri describes how to use ArcGIS to pit two towns against each other while performing a site selection analysis (Esri, n.d.-a).

Although GJF’s story map *Mapping Amazon* makes a compelling argument against subsidies for Amazon specifically using maps as a graphic illustration, I think it hints at another avenue for governments to take in avoiding “wasteful” incentives. Recently, incentive packages have come with requirements so that businesses are rewarded only if the economic benefits, such as job retention and creation, are realized to the locality, and such performance based incentives can provide a measure of accountability and oversight (Armus, 2022; Kenyon et al., 2017). But perhaps the key to ending bidding wars and wasteful subsidies is information. GJF shows many

examples where it is fairly obvious that Amazon *must* locate a facility in a particular place. Though governments are not privy to the internal processes of private business, it may be possible for them to use their resources, including GIS, to create models of site selection similar to those used by business. Armed with their own intelligence of the “battlefield,” they may be in a stronger position to resist a business’s threat to relocate. The ease with which such information can be shared now may help “enemy” governments realize and resist the game that drains both their coffers.

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