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The Platform Economy and Geography: Restructuring the Space of Capitalist Accumulation

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ABSTRACT

The platform economy and its leading firms, such as Amazon, Facebook, and Google, are reorganizing the geography of value creation and capture on both a local and global scale. This paper argues that economic geographers have underappreciated the implications of the platform on space. First, we demonstrate the concentration of platform giants in terms of location on the US West Coast, and in terms of their market share in various services, such as search, maps, and online sales. Platforms are simultaneously intermediaries, two-sided markets, data aggregators, and leading users of artificial intelligence (AI). Second, we use a labor taxonomy to demonstrate the extensive reach of these platforms in terms of the labor markets that they serve and shape. To illustrate these changes in the geography of value creation, we present case studies of Amazon and Google Maps to show their effects on the location of economic activity. Third, we elaborate on our contention that platforms are at once intermediaries and data hubs. AI is likely to reinforce the power of these platform leaders because they have the largest datasets, the most computational power, enormous teams of the best AI researchers, and vast reservoirs of capital that they can use to make acquisitions. We conclude by identifying areas for future research and calling upon economic geographers to consider the implications of the platform economy in reshaping the space of economic activity.

Keywords: Amazon, geography, Google Maps, labor, platform economy, power

1. Introduction

Digital online platform firms are reorganizing the geography of how value is created and who captures it and where. This essay reflects upon the meaning for geography of the emergence of the digital platform as the organizational center for an increasing amount of economic activity. The platform economy is recasting spatial relationships, which will certainly generate—and, perhaps, has already generated—a new spatial fix that reflects the geographic location of key firms (Harvey, 1981). Platforms are a new organizational form based on a relationship between the platform and the ecosystem of firms dependent upon the platform, and users who interact and transact through it. This is giving rise to what many have termed the "platform economy" (Kenney & Zysman, 2016) or "platform capitalism" (Srnicek, 2017). These platforms, with their large amount of data, are the leaders in using AI to optimize their business models, as their operations are a combination of algorithm-driven processes and, of course, human decision-making.

In section 2, we review economic geographic thinking about digitization and suggest that the literature has largely focused on websites and software but has not distinguished between them and online digital platforms. Section 3 discusses how platforms are reorganizing work. Section 4 poses the question of whether the adoption of platforms in the business-to-business domain is different from their adoption in the business-to-consumer field, explored further in case studies of Amazon and Google Maps. In section 5, we conclude that economic geographers and planners dramatically underestimate the impact of the platform economy on the spatial organization of labor markets and competition.

2. Digital Platforms and Economic Geography

The online digital platforms (hereafter, platforms) that concern us here act as *intermediaries* connecting people and objects to people or objects. Platforms have been defined in a variety of ways (Parker et al. 2016; Evans et al. 2008). According to Annabelle Gawer (2014: 1239), "platforms are evolving organizations or meta-organizations that: (1) federate and coordinate

constitutive agents who can innovate and compete; (2) create value by generating and harnessing economies of scope in supply or/and in demand side of the markets; and (3) entail a modular technological architecture composed of a core and a periphery." For this reason, platforms have powerful generative potential—that is, they give developers the ability to create new output, structures, or behavior (Zittrain, 2008).

Platforms provide users with various social and technical boundary resources, such as application programming interfaces (APIs) that provide access to data, software development kits, and various templates that dramatically lower the cost of use (Gawer, 2009; Ghazawneh & Henfridsson, 2013). To be successful, a platform must attract and connect a combination of users (e.g., those using Facebook), customers, service or product providers, advertisers, and other actors, who collectively form the platform's ecosystem (Caillaud & Jullien, 2003; Parker & Van Alstyne, 2005). A platform can be as "simple" as Google Search, connecting a searcher with a site; Facebook, which connects people to other people and delivers their information to advertisers; or Amazon, which sells not only directly to customers but, more important, through its Marketplace matches customers with connected third-party vendors. Each of these functions is optimized using AI, and, as AI improves, will further integrate it into the platform's core algorithms and businesses.

Economic geographers have studied the impacts of digital technology, but most of this research was undertaken during or after the internet bubble in the 1990s (Castells, 2000; Malecki, 2002; Zook, 2000). After the collapse of this bubble, interest in the geographic consequences of digital technology largely waned, though Rob Kitchin and Martin Dodge (2011) argued that software, through its ubiquity and indispensability in an increasing number of activities, was blurring or even determining the use of space. Bruno Moriset and Edward Malecki (2009: 271) concluded that the "main effect of IT-enabled informational ubiquity is to provide individuals, enterprises, and communities, wherever on Earth, with a greater choice for shaping an enterprising future." Their conclusion was prescient and suggested that digital technology allows a greater dispersion of

economic activity and increases the ability of producers to reach ever-more distant consumers—effectively, a liberation of commerce from the previous bonds of the friction of spatial discoverability.

Moriset and Malecki (2009) believed that the internet would change the role of distance and thereby affect the organization of capitalism, a perspective that was not shared by all geographers. For example, Matthew Zook and Taylor Shelton (2016: 9) were more skeptical, concluding that, although the changes due to the internet were "significant, they are best characterized as a reconfiguration or intensification of existing structures and processes, rather than a wholesale creation of new forms of economic organization that are somehow qualitatively distinct from previous eras." Reiterating this position, Zook and Mark Graham (2018: 382) conclude from a study of how travelers game airline frequent-flier programs that some analyses "have over-emphasized" the power of software and code. The prevailing view regarding the constitutive powers of software and code was that, though important, the changes reinforced existing business structures and arrangements.[1]

Some labor researchers also share the view that the changes wrought by the internet are incremental. For example, in 2018, the International Labour Organization concluded that "work on these platforms resembles many long-standing work arrangements, merely with a digital tool serving as an intermediary" (Berg et al., 2018: xvi). Their conclusion is accurate in the same way as the fact that the introduction of the moving assembly line did not change the fact that workers in factories were employed and received payment for their labor time. Yet the assembly line allowed the reorganization of production, created entirely new work categories, and led to a new geography of capitalist accumulation and transformed consumption patterns.

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[1] In contrast, their earlier paper on Google Maps and Google Earth suggested that the power of these digital platforms was far greater as they could frame action (Zook & Graham, 2007).

Although economic geographers have made great progress in analyzing the relationship between space, digitalization, and the role of networks, they have paid less attention to the fact that some key internet firms are not just websites or even massive multinational corporations but, rather, are platforms connecting massive numbers of users/customers with service providers, advertisers, or other users. In other words, they have been less concerned with the power wielded by these platforms and thus have missed the impacts on the spatial organization of this new way of organizing the economy. In contrast, Koen Frenken et al. (2018) suggest that platform dynamics are a new institutional logic, neither markets nor hierarchies; instead, they are organizational forms that reroute an increasing portion of economic (and political and social) activity through digital platforms (van Dijck et al., 2018). Whether this is understood as new institutional logic or, to revert to the terms of the regulation school of political economy, as a new regime of accumulation, the platform economy is already reshaping the geography of economic activity (see also Langley & Leyshon, 2017).

In capitalist economies, the apex platform giants have increasingly become the central firms. For example, in October 2019, the five US platform giants, Apple, Amazon, Facebook, Google, and Microsoft, along with the Chinese firms Tencent and Alibaba, constituted seven of the ten most valuable firms in the world. They, as well as some sectoral platform firms, such as Booking, Expedia, and Snapchat, are intermediaries that are organizing, reorganizing, and even transforming a host of industries (Parker et al., 2016; van Dijck, 2013). This paper does not cover the largest single internet market in the world, China, because it is largely self-contained, though a similar dynamic is underway there (Jia, Kenney, & Zysman, 2018). Digital platforms are increasingly inserting themselves into industry value chains and labor markets and thereby transforming them and the location of value capture (regarding labor, see Kenney and Zysman 2019a; Kenney, Rouvinen, & Zysman, in press; on entrepreneurship, see Cutolo & Kenney, 2019). Not only are platforms organizing markets by disintermediating incumbents and providing opportunities for new entrants but, in many respects, they have become private regulators (Bearson et al., 2019).

3. Locating Power in the Platform Economy

Digital platforms have developed enormous power through their role as an intermediary and connective agent. That intermediary role, in this digital era, makes platforms data hubs and data aggregators. Through data aggregation, big data supports the application of algorithmic analytics, popularly associated with machine learning and loosely labeled AI. Arguably, data aggregation facilitated by platforms is the core of data-driven services and a data economy at least as much the set of analytic algorithms. AI is essentially statistical inference using sophisticated new algorithms, grouped as machine learning and deep learning (see, e.g., Marcus and Davis 2019; BRIE 2019). Indeed, today's AI software is only effective in particular narrow applications. Consequently, we keep focus on platforms as intermediaries and data aggregators, rather than on the particular analytic tools such as AI.

The orchestration of that power is concentrated, whereas its consequences are dispersed. The reach of these platform firms is vast and perhaps rivaled only by the giant petroleum firms, such as Standard Oil, Royal Dutch Shell, and British Petroleum, at the peak of their power. However, in contrast to the oil industry giants, these platforms have a virtual presence and can integrate into their business logic anyone with a computational device and telecommunications access.

In this section, we illustrate concentration that has two components and one result. The *first* component is that in each sector, one or two firms control most of the market, and the dominant players are constantly expanding into adjacent markets. The *second* component is that the headquarters of these platform giants are overwhelmingly concentrated in the San Francisco Bay Area (SFBA) and Seattle—resembling the role of Detroit in car production in its heyday, though for the entire world outside China. This means that the logic of the platform economy is largely dictated by the business imperatives and ideology of the West Coast and that an increasing share of global wealth is being rerouted to these two locations.

In **Figure 1,** we list the platforms outside China with 300 million or more active monthly users. Because the global telecommunications infrastructure already exists—in particular, smart phones— these platforms can add users at an astonishing speed. For example, Google launched Drive in 2012, and by 2018 it had one billion users. Other than the 1.4 billion people located in China, who are largely unavailable to the Western platform giants, much of the rest of the world have the potential to be connected, and, in theory, each connected user can be monetized.

Figure 1:

Their reach and dominance have many implications. For example, Google Search, which has more than 80% of the market outside of China, is available in 149 languages, and Google Translate covers 103 languages. If Google, as the librarian of the internet, cannot find a website, then, in many respects, the website does not exist. Similarly, if Google Maps (GM) cannot find a business, in important respects, it does not exist (for a perspective on GM, see Graham & Zook, 2011). In some respects, Google has the power to ratify the existence of a location or business. In turn, Facebook controls the world's social communications, whereas LinkedIn (owned by Microsoft) is the main professional social network.

Compared to traditional industrial businesses, the markets in which these firms operate are highly concentrated. For example, despite great consolidation in industry, auto-making still has 14 players of a significant size (excluding China), the oil industry has at least 6 large private firms (and many more if national firms are counted), and steelmaking has an even larger number of giant corporations. In contrast, as **Table 1** shows, the markets for digital platforms are very concentrated. Outside China, the market comprises only one dominant search engine, one or two dominant social media sites, one dominant e-book seller, one or two dominant online merchants, one dominant mapping program, two smart phone operating systems, and three online travel sites.

Table 1 about here

The geographic concentration, as mentioned earlier, is even greater than the sectoral concentration (see Table 1), if we omit China, which has its own platform giants. The few significant platform firms whose headquarters are not on the West Coast participate in vertical markets, such as travel and music. Moreover, these sectors are experiencing encroachment from the platform giants. For example, in music, YouTube is far larger than Spotify, and, recently, Google Travel has gained market share in the travel industry.

The success of Silicon Valley startups in securing a dominant position in the digital platforms is, in part, a function of the fact that this region dominated the earlier wave of internet commercialization (Kenney, 2003; Mowery & Simcoe, 2002). Seattle has three leading platform firms—Microsoft, Expedia, and Amazon—making it the other pole of the internet industry. In the most recent wave of investment, made possible by the adoption of the smart phone, Silicon Valley venture capitalists invested great sums in firms such as Airbnb, Lyft, Slack, Uber, and Zoom in the hope that they would disrupt and dominate particular market segments (Kenney & Zysman, 2019b). The leadership of firms in these two regions in developing and applying big data, AI, and advanced computation continues into 2020.

There also was an ideological aspect, as Silicon Valley firms, in particular, nurtured a culture that Mark Zuckerberg articulated as "moving fast and breaking things," while venture capitalists suggested that entrepreneurs should "not ask for permission but, rather, forgiveness." This was motivated by the belief that a new platform could be created to dominate a particular market, and it would benefit from network dynamics and result in a winner-take-all outcome (Shapiro & Varian, 1998). Assuming this outcome meant that the overarching goal was to "tip the market." After the market was tipped, legal and consumer objections could be addressed from a position of strength. These beliefs were not simply ideological, as **Table 1** indicates in nearly all sectors for a specific service, one or two firms control more than 50% of the market and, in many cases, more than 75%

of it. This market concentration, it was hoped, would give successful platforms an opportunity to secure monopoly profits.

These platforms have often replaced activities that were previously local and then centralized them in the "cloud." Consider, for example, one of the earliest platforms, San Francisco–based Craigslist. It posted classified advertising at no cost to the user, charging only for employment listings, thereby siphoning classifieds from local newspapers and in the process decimating one of their mainstay sources of income. Similarly, the rise of online travel agencies, such as Expedia and Booking.com, enabled them to control approximately 39% of all online bookings (Kelly, 2017), thereby taking business from local travel agents. Amazon, discussed later in more detail, has sparked an ongoing shakeout in brick-and-mortar retail globally (LaVecchia & Mitchell, 2016). Finally, Google, the global giant, is increasingly important in finding merchants locally, forcing them to advertise on its platform and thereby extracting value from the local market and centralizing it.

4. The Geography of Work and Value Creation in the Platform Economy

New paradigm-shifting technologies often have reshaped the geography of labor and work. In keeping with Zook and Graham, some geographers concluded, perhaps correctly at the time, that the locational impacts of "e-commerce remains bound by geography to a far greater extent than is often suggested" (Wrigley, 2000:309). What Wrigley could not see is that what was e-commerce in 2000 would evolve into multi-sided digital sales platforms. The platform economy has ushered in a complex division of labor that affects the geography of work and value creation. We illustrate this by adding spatial considerations to a taxonomy of the types of work generated by platforms (see **Table 2**) and briefly explore the implications of this division of labor for the reorganization of the space of work.

Table 2 about here

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The entrepreneurial and managerial core of these firms is concentrated in their home bases, SFBA and Seattle. Although these firms operate globally and have enormous staffs in cities such as Bangalore, Dublin, London, and New York, their total headcount is concentrated in these two areas. This elite, which Neff (2012) calls "venture labor," works directly for the platform and is expected to work long hours in opulent environments, receiving excellent pay and benefits. The wealth generated by these firms and the compensation, in particular, in the form of capital gains have dramatically affected the composition and character of their host cities, in particular, the SFBA and Seattle (McNeill, 2016).

These core employees are augmented by a huge number of largely invisible contract employees, some of whom work side-by-side with them. Others work at anonymous facilities in close proximity to the headquarters and remotely, while still others work at home or anywhere else around the globe. Recent estimates suggest that the platform giants have as many contractors working for them as regular employees—or more (on Google, see, e.g., Wakabayashi, 2019). Employed by various labor-contracting firms, these workers perform tasks that range from on-site manual work to coding, content moderation, and AI training. Many of the contractors handling the most mentally grueling tasks, such as content moderation, are located in developing countries (Gillespie, 2018).

One of the powerful impacts of these platforms is how they vastly expanded the market, in terms of geographic reach, and allow far more people to transact. This contributes to the transformation of physical retail such that sales are relocated from mall stores to warehouses and individual residences, while logistics is being reformulated (discussed in greater detail in the section on Amazon).

Platforms have also been introduced for service provision, both in person and remotely. The in-person provision of paid services has often been inappropriately termed "the sharing economy" (Schor, 2016). The best-known in-person service providers are firms such as Uber, DoorDash, and

GrubHub. Uber and Lyft have become significant components of urban mobility systems and have

changed how many think about transportation. Similarly, on-demand food and next-day package

delivery faces increasing expectations. The immediate spatial impacts include the contribution of

these services to even greater traffic congestion and redirecting riders from taxis, rental cars, and

mass transit (Erhardt et al., 2018; Rayle et al., 2016).

Platforms such as Upwork, Freelancer, and Fiverr enable anyone with a project that can be

done remotely to hire freelancers located anywhere (see, e.g., Huws, 2016; Huws et al., 2018;

Popiel, 2017). These platforms provide labor for well-defined tasks, including training AI software

and search engine optimization. Although Upwork is headquartered in the SFBA, the headquarters

of these labor platforms do not appear to be concentrated.

Platforms such as the Apple Appstore, Google Play, YouTube, and Twitch provide

independent developers, creators, and influencers with the opportunity to create virtual goods that

will be consigned to a platform for monetization. In 2018, the Apple App store, based on the

iPhone, paid $34 billion to its developers (Kelleher, 2018); Android's Google Play store spent half

that amount. In 2018 YouTube is estimated to have earned $9.5 billion to $14 billion, and if 55%

is shared with its content creators, they would have received between $5.2 billion and $7.7 billion

(Iqbal, 2019). These digital platforms form a global market for creators, yet those creators are

concentrated in a few places. For example, Los Angeles has attracted many of the most prominent

YouTubers and has spawned an ecosystem of suppliers of services to creators, both in Los

Angeles and globally. That city is also the location of the largest video-blogger convention,

Vidcon (Craig & Cunningham, 2019). App developers are concentrated in San Francisco, Beijing,

Tokyo, and Seoul (Pon, 2016). Although creators can be based anywhere, geography continues to

have a centripetal attraction in this apparently "space-neutral" activity.

The final two categories, website producers and user-generated content, are the basis of one

of the most powerful and transformative platform firms, Google. The advent of the internet meant

that all organizations everywhere had to build websites; it is impossible to calculate the human labor power that has gone into building them. However, for that work to have value, the website must be discoverable. Quite simply, this means that income is generated by every search in which Google places an advertisement. Regardless of whether that search takes place in Bangkok, Kankakee, or Berlin, Google receives income.

The final category is user-generated content, which is offered to platform users (Terranova, 2000). At the most basic level, the very use of a platform generates data (Huberty 2015), which, in addition to content generated and uploaded by users, forms the core of many platform business models.

The geography of value creation and capture is in fundamental flux, as the integration of businesses into platform ecosystems continues. Built upon the ubiquitous networks that Castells (2010) documents, the scale, pervasiveness, and reach of platforms are accompanied by a remarkably granular localness. At the local level, firms are dependent upon Google Search and Google Maps, Yelp, and Facebook to attract customers, and to do this they must buy advertising, thereby transferring value from the local economy to the platform.

5. Cases Studies: Amazon and Google Maps

In this section, we use two case studies to illustrate the complex and multi-scalar ways in which digital platforms are reorganizing the geography of economic activity. Although the results reported here are partial and temporary, their impacts are profound and still underestimated.

5.1. Amazon: The Economic Geography of a Platform Giant

In this section, we explore the ramifications of the Amazon business model for the space of economic activities. In some respects, Amazon confirms Cairncross's (1997) claim that the internet results in the death of distance, as customers can order online and have their purchase delivered the next day. Further, it is building a logistics infrastructure that allows it to use code to orchestrate space and time as competitive weapons, in ways that have significant implications for

the spatial organization of cities (Dodge & Kitchin, 2011). Some of the story is well known, but taking the developments as a whole reveals the concentration of control, the dissolution of sectoral boundaries, and the global reach. More recently, Amazon has begun applying AI and machine learning to all its activities and the data it collects. Recently, it has begun to offer AI software to its Amazon Web Services customers.

Amazon has become the largest online retailer and will soon overtake Walmart as the world's largest retailer in terms of gross merchandise value sold. In economic terms, approximately 10% of all US retail sales are transacted online, and Amazon and its third-party vendor Marketplace are responsible for approximately 40% of them. The movement of sales to online enables the process and locations for fulfilling customers' orders to be reorganized. This, in turn, changes the location of employment and the types of employees needed. Instead of having purchases made at physical stores to which customers travel in person, purchases are made online and delivered to customers anywhere from a warehouse normally located on the city's outskirts—not downtown and not in a shopping mall. The spatial impacts of Amazon's multidirectional expansion are explored below.

5.1.1. Transforming Amazon from and Online Retailer to a Platform

In 1995, Amazon was established in Seattle as an online bookseller and used Ingram Books, a book distributor, to handle logistics. In 2000, Amazon introduced its Marketplace, providing third-party vendors with a sales platform in return for paying Amazon a commission. Removing the need for a physical store or place of business, empowered anyone to become a retailer, as even a spare bedroom could become the "headquarters" for a "shop." This third-party marketplace grew rapidly, as vendors from around the world began to use Amazon, igniting a positive feedback loop by attracting more customers and vendors. By benefiting from network effects, Amazon became the dominant shopping website, with a huge selection at various price points. In 2018, one study found that 38% of Amazon's sellers were located in China, an increase from 24% in 2016. Moreover, the state with the largest number of Amazon sellers was California, with 22% of total

sellers—many of whom sold items made in China (Marketplace Pulse, 2019). By providing any seller with direct access to customers, Amazon enabled customers to bypass legacy retailers. The Amazon Marketplace became the ultimate emporium.

5.1.2. Logistics: Geography of Fulfillment

Initially, Amazon depended upon third parties for logistics functions. In 1997, it opened its first warehouses, one in Seattle and one in Delaware to serve the East Coast. In 1999, it opened other warehouses, including one in Fernley, Nevada, largely to serve the rapidly growing California market (MWPVL International, 2019). Amazon took advantage of the interstate commerce clause in the US Constitution, which says that a shipping firm is not required to collect taxes on goods shipped interstate, creating a powerful subsidy for online retailers, as the uncollected taxes largely covered the cost of shipment (Einav et al., 2014). In addition, US federal law also dictated the location of Amazon's warehouses, because having a presence of some kind in a state meant that it would then have to collect taxes on all products shipped into that state. As it grew and shipped more merchandise, it needed to increase the number of distribution centers, which presented Amazon with a conundrum: it could expand in the states where it already had distribution centers, but expansion into other states would force it to begin charging sales tax.

In response to pressure from states and local vendors and increasing volumes, in 2005 Amazon's strategy changed. It launched Amazon Prime, which promised free two-day delivery anywhere in the US, replacing tax benefits with rapid, free delivery. Amazon Prime locked in customers and drove even higher volumes. However, this made delivery a significant cost, so Amazon began to concentrate on lowering the cost of logistics, which drove changes in the location of Amazon's distribution centers. As seen in **Figure 2**, facilities were soon established outside all major population centers, as shown by the green and purple dots. This logistics shift, which dramatically accelerated in the 2010s, created even greater pressure for rapid delivery, to sustain the enormous success of Amazon Prime.

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Amazon rapidly built out its warehousing footprint, nationally and globally. Last-mile delivery was contracted to the US Postal Service (USPS), UPS, and FedEx in the US (and their equivalents elsewhere). As the volume grew, Amazon was able to demand better shipping and warehousing rates. These rates were much lower than those that Amazon Marketplace sellers could get from shippers, which led Amazon to launch "Fulfillment by Amazon" (FBA). The legacy shippers had relatively high wages and, of course, some level of profits, so this had labor implications. Thereupon, fulfillment became one of Amazon's highest costs, and to address this, in 2015, Amazon introduced Amazon Flex, which engaged "independent contractors" to use their own vehicles to deliver packages from Amazon or Amazon-contracted warehouses. Extending this contractor-based delivery system, in 2018, Amazon purchased 20,000 Mercedes-Benz delivery vans that it sold to local "entrepreneurs" who wished to start local delivery businesses (Stevens, 2018). These contractors would then "hire" or contract with subcontractors to staff the delivery vans, thereby removing the "contracting" responsibility from Amazon. However, all the contractors' activities are monitored in real time, which allows Amazon to further integrate and bring its supply chain under direct algorithmic control. Moreover, by using contractors who were not paid high wages or given good benefits, Amazon thereby lowers costs (Hempstead, 2019).

Amazon's effort to build a supply chain expanded to include directly contracting long-haul trucks to move goods. It began leasing planes and established a delivery hub in Hebron, Kentucky—in close proximity to the UPS hub in Louisville, Kentucky, and the FedEx hub in Memphis, Tennessee. Finally, in 2016, it received a license from maritime authorities to become an importer shipper from China (Chamlou, 2018). Coordinating this expanding network of "captive" contracted logistics operations is accomplished with overwhelming computational power and software. The contractors are dispatched on particular routes controlled and monitored

by computer with worker productivity goals algorithmically set, monitored, optimized, and continually increased.

This logistics system with two-day and often same-day delivery gives Amazon a competitive advantage over its competitors, such as Walmart and eBay. Moreover, rapid delivery is offered in an increasing number of countries. At the same time that Amazon is building its own logistics system, it is contracting with FedEx, UPS, and the USPS for delivery. Similarly, it contracts with warehouse logistics providers such as Dynamex, even as it competes with them and resells their services to Marketplace sellers. Because of Amazon's large proportion of US online sales, it has more supply chain data than any other retailer or logistics provider, giving it enormous insight into the physical and virtual dimensions of the logistics chain.

The final important geographic impact comes from Amazon's offering Marketplace vendors FBA. By providing fulfillment services, it increases its warehouse and delivery volume, thereby decreasing costs. Another important effect of FBA was the growth of Chinese sellers, as it allowed their products to have the same two-day Prime shipping as domestic sellers. The Chinese sellers shipped their products to the Amazon warehouse in the US or Europe, from which the orders would be fulfilled, thus disguising the business location of a seller in China. According to Marketplace Pulse (2019), "almost all top Chinese sellers use FBA, while only 75% of top US-based sellers do." As Amazon increases the throughput in its logistics system, it can increase its economies of scale and scope, reinforcing its considerable advantages, and facilitating its entry into yet other markets.

The regional development implications of the movement of sales to online are difficult to capture because the local employment effects have not been studied much. The first obvious result is the transformation of the physical, shop–based retail sales model that is leading to the "hollowing out" of many shopping centers and main street shopping areas (Semeuls, 2018b). The jobs in those locations are gradually being replaced with warehousing and delivery positions,

many of them held by contractors whose place of employment is on the urban periphery. Second, the Amazon logistics system has pioneered an all-encompassing digital Taylorist work process. Finally, this puts pressure on wages and working conditions at retailers and logistics firms.

5.1.3. Globalizing the Model

In contrast to earlier firms that had to invest significant resources to build a global presence, online retailers have a placeless nature, and from its inception, Amazon attracted customers from around the world. To quote its 1997 public offering prospectus, "Through March 31, 1997, Amazon.com had sales of more than $32 million to approximately 340,000 customer accounts in over 100 countries." As its overseas customer base grew, Amazon established foreign subsidiaries. The decision to invest in an overseas operation was simplified, in part, as Amazon was already shipping merchandise to other countries and thus had knowledge of the market and its logistic system.

Amazon established its first overseas subsidiaries in 1998, when it purchased online booksellers in the UK and Germany (Kotha et al., 2001), rapidly followed by France, Japan, and Canada. In foreign markets (other than China), if it entered organically, it did so by using local distributors and the existing domestic logistics infrastructure, but invariably it later built its own distribution system (see **Figure 3**). For example, in Japan, Amazon entered initially by shipping purchases from the United States. It contracted with Japanese logistics firms for fulfillment. Later, it established its own warehouses and, more recently, began contracting with individual delivery drivers (Miyajima, 2019). In Germany, Amazon built warehouses and a delivery network, but after numerous strikes at its warehouses, much of the further growth in warehouses was in Poland, where labor is cheaper and less organized (Goettig, 2017). In 2013, Amazon entered the Indian market by building a fulfillment network and remains locked in a struggle for market share with an Indian firm, Flipkart, which was purchased by Walmart. It entered China in 2004 through the

acquisition of a Chinese firm, though it has largely failed at sales within China because of competition from Alibaba.

Figure 3 about here

As in any international business model transfer, Amazon has faced some difficulties, one of the greatest of which is the differing organization of labor-management relationships. In Europe, where workers have greater rights, Amazon has experienced many strikes and work stoppages (Business & Human Rights Resource Centre, 2018). In India, the government decided that Amazon cannot be both a vendor and a platform for third-party sellers (Vincent, 2019)—a concern increasingly expressed in the United States and Europe—as the platform often competes with its own complementors (on the US situation, see Khan, 2017).

These recent reactions, from labor actions and logistics issues in Japan, to the lack of traction in China, and the Indian government's rulings regarding the organization of platform markets, suggest that although Amazon's international expansion was accomplished easily at first, it may be meeting with reassertion of local particularities. Amazon's model might be challenged in the future by investigations at the level of the European Union, national competition authorities, and municipal governments, but at present the reactions to Amazon remain nascent.

5.1.4. The Amazon Story Synthesized

Amazon's impacts on labor are multifaceted. First, clerks in shopping malls are being displaced by workers, workers in warehouses are being augmented or replaced by robots and last-mile delivery drivers are being converted to contractors. In the logistics system, UPS, USPS, and FedEx drivers are threatened with replacement by Amazon's badly paid contractors. Local businesses may be displaced, as is happening with many retailers, and concomitantly the revenues from consumer spending and control are transferred from the community to Amazon's headquarters. Second, at the global level, the powerful national and even international retailers

now face a global competitor that benefits from winner-take-most economics, leading to global concentration and similar effects in the countries where it operates.

Third, the status of the third-party vendors on Amazon has only recently begun to receive attention in the press and among regulators. Because of the sheer volume of purchases it processes, Amazon has significant leverage for extracting a greater share of sales prices from its third-party vendors. These vendors should, in fact, be understood as "platform-dependent entrepreneurs" (Cutolo & Kenney, 2019), as Amazon controls nearly every facet of their online business operations.

Amazon's management ethos and drive toward automation and algorithmic monitoring to accelerate the pace of work are affecting labor standards in logistics. Finally, Amazon separates its workforce between a salaried white-collar elite employed in offices and a far larger number of temporary workers, labor contractors of all kinds, and full-time workers employed in grueling algorithmically monitored conditions.

Amazon's continual entry into new markets extends pressure on prices and thus wages to more market segments and locations. Initially, it competed only with bookstores and other online booksellers before evolving to compete with nearly every retailer, online and offline. It then entered book publishing and began to compete with established publishers, putting powerful pressure on them to lower book prices. When it built warehouses, it began competing with distributors and then various logistics firms. In addition, it introduced products such as Amazon Basics that competed with its own third-party vendors. Given its dominance, it threatens yet other industries, such as automobiles, insurance, and even segments of health care.

Amazon's business model is a powerful engine for increasing spatial inequality. The inequality occurs through the destruction of local retailing, the inherent characteristic of its Marketplace in putting downward pricing pressure on its third-party vendors, and its logistics chain using third-party vendors who are paid far less than incumbents, and the relentless

warehouse automation, which leads to fewer jobs per dollar of retail sales. In regional development terms, Amazon is likely to decrease local employment and, contribute to a further hollowing out not only of downtown retail, but also suburban shopping centers, as the anchor tenant department stores collapse into bankruptcy. It is noteworthy that, despite its importance, few geographers have explored the implications of Amazon's rise.

5.2. Google Maps

Google, with its suite of software services, is also transforming economic and spatial relationships. The ability of users to interact directly with online mapping tools, such as GM, led some geographers to argue that a "neogeography," which was synonymous with a "bottom-up" democratization of mapping (Eisnor, 2006; Turner, 2006), was emerging. Whereas Google Search has long been recognized as a way of extracting value, GM has become a powerful platform for reorganizing economic activity to capture value. GM (and its pale copy, Apple Maps) is transforming the lived experience of geographic space and the competitive dynamics in a wide variety of industries.

The significance of a digital map as a platform has not been sufficiently appreciated. As a platform, the successful mapping program has the typical platform benefits of winner-take-most dynamics, multi-sided markets, lock-in, user-generated data, and the formation of ecosystems in which complementors help create value. Like other successful platforms, GM provides APIs to allow users to contribute content as well as to allow GM to be embedded in myriad other digital applications, adding value to them while providing GM with information about the use of the applications.

Maps, though important in the era of desktop computing, have become a vital service in the smart-phone era, for both users and service providers. Maps, of course, are a representation of geography, and, as Craig Dalton (2013) observes, have been associated with the power of governments for administering land tenure and a myriad of other applications. GM holds 80% of

the US market, becoming both a platform and a spatial reference source. To paraphrase Dalton, in spatial terms, the map denotes existence and being "on the map" is mandatory for any entity wishing to be found. GM enables sovereign power over spatial existence to move to a for-profit firm that uses this power to increase its own profits.

This paper is not the place to examine the evolution of GM, which continually adds features such as street view, aerial maps, public transport schedules, pedestrian information, hiking trails, the ability to hail an Uber, remembering your parking place, and locating a potential partner on Tinder. GM keeps evolving, even adding features based on innovations by its users. The key to GM's success is that, almost immediately after its introduction, users began to create mashups using the maps. Their user-generated content was so interesting and valuable that, in June 2005, Google began to allow users to integrate the GM API into their websites and applications. This decision was critical because it allowed users to add value and innovate on GM and, in effect, to begin its transition to a platform. This functionality was offered free to any website, commercial or non-commercial, that was accessed fewer than 25,000 times a day. Such generous terms led GM to be adopted quickly. In 2013, the GM API was the most used API in the world, with over one million users (Google, 2013). In June 2018, Google announced that all users had to create a Google billing account, though small-scale users would get a $200 per month credit. In this way, every website with a Google Map embedded in it was transformed into a potential Google customer.

Because GM is embedded in websites, Google receives information every time a user of those sites clicks on the embedded map, providing locational data on that user. This creates two potential revenue streams for Google. First, the website's owner, the merchant, pays Google for the user's click on the map. Second, the click is evidence of that user's interest, giving Google a target for advertisements.

GM has become ubiquitous. The largest volume of information is, almost certainly, that of the location of all Android users (and iPhone users who use GM). However, in economic and competitive power terms, GM's embeddedness in the applications and operations of other firms is an indication of its ubiquity and power. In the travel business, for example, Google's competitors (as Google now has direct travel booking and local business rating systems)—Yelp, Booking.com, Expedia, and others—use GM, so they are providing map search data directly to Google, while paying it for that use. In addition, between January 1, 2016 and December 2018, Uber paid GM approximately $58 million for use by its drivers and for route visualization by customers (Lyft does the same). Effectively, these firms are now dependent upon GM for a core technology. Thus, if Google enters a market, it can do so armed with significant prior knowledge based on information from GM.

Maps are also an important input in legacy industries. For example, an increasing proportion of the value of an automobile is in its software, data-processing, and communication capabilities. Today's automobiles cars are laden with sensors, whether cameras or mechanical, temperature, and an increasing variety of other sensors. Most automakers have resisted the integration of GM as their default on-board navigation system. However, Google Maps is increasingly gaining traction as Fiat-Chrysler, General Motors, the Renault-Nissan-Mitsubishi Alliance, Ford, and other automakers bow to consumer wishes and sync their navigation systems with it or adopt it as the default. In an effort to offer an alternative to Google Maps, in 2015, the German automakers— BMW, Daimler Benz, and Volkswagen—as a consortium, purchased Nokia Maps for $3 billion. At the same time, Google Maps is also increasingly embedded in truck routing software, and therefore Google is receiving information in real time about a truck's location while the maps application is in operation. If autonomous trucks become a reality, Google Maps are likely to be at the core of their operations. Conversely, this increasing adoption of Google Maps in transportation industries could make it the de facto standard, establishing lock in that provides Google with an opportunity to extract rents or even become the default software for all operations.

Generativity is a characteristic provided by platforms, and its results can integrate new actors into the ecosystem (on generativity, see Zittrain, 2008). For example, insurance claims adjusters can use Google Street View to reconstruct an automobile accident scene without visiting the location, thereby saving time. GM and Street View are integral to Pokémon Go and a variety of other place-based games (Holly, 2018). Another independent third-party application on GM is Plane Finder, which locates planes in the skies over the US. The significance is that all these innovations make GM more valuable. Cutolo and Kenney (2019) point out that Google can integrate innovations directly into its map or other offerings.

Another important geographic and community impact of GM is that it has become part of the hegemonic local information package that allows Google to integrate local firms more tightly into its advertising machine. Because search for local service providers, such as plumbers, electricians, and locksmiths, is increasingly through Google, it has become the intermediary for service provision, replacing newspapers, television, radio, yellow pages, etc. The result is that local service providers must buy advertising from Google to attract customers. As with Amazon, this revenue is extracted from the community and centralized. Effectively, Google can leverage the granularity it has achieved with GM and the use by consumers of Google Search to levy a "tax" on a location. Obviously, this brief discussion of the increasing hegemony of GM on "location" itself and its increasing integration into all kinds of location-dependent activities is incomplete and tentative.

6. Concluding Remarks

If, as we believe, we are in midst of a reorganization of the economy on the basis of platforms, a parallel reorganization is likely to affect the spatial relationships in capitalist economies similar to the one triggered in the US by the transition of cutting-edge capitalism to a mass production/mass consumption political economy centered in the Midwest. Our general discussion of the reach and power of the platform giants suggests that, at the global scale, the

power to extract value is highly concentrated in a few firms located on the US West Coast. Previously, countries had leaders in key sectors such as steel, automobiles, and chemicals, but in the platform economy (excluding China), this is not the case. In platform terms, most businesses are dependent upon platforms and become consumers or merchants transacting on and taxed by the platform. Simultaneously, business sectors such as retail, logistics, publishing, advertising, and entertainment, whether in the US or elsewhere, are profoundly challenged by the platform giants and are experiencing a transfer of value to the platforms, with global-scale implications for capital accumulation.

Our case studies of Amazon and GM explored two platforms with very different dynamics, though both are rerouting commerce in ways that centralize power while decentralizing the ability to participate in the economy. We demonstrated the impact of these two platforms at different scales, in which GM, in particular, has an impact at the scale of the individual, while Amazon has reorganized retail geography at the regional level.

We suggest fruitful areas for future research into the interaction between platforms and geography:

1. If digital platforms are a new stage in the development of capitalist economies, then a discussion about where the power and value will be concentrated and what the leverage points are for ensuring that marginalized groups can participate or capture some of the new value being created is critical.

2. The global reach of these dominant platforms already affects international development. Earlier claims suggested that the ability to access news and information from around the world would increase the flow of knowledge globally and contribute to development, but it is not clear whether these claims are valid. Conversely, few attempts have been made to measure the amount of value that these platforms extract from users in developing countries or, in fact, developed countries. Finally, we know these platforms concentrate

global wealth into a few regions, but less is known about why these firms are clustered this way.

3. This paper introduces a preliminary taxonomy of platform-organized labor and value creation. The location of remote "gig" work has already received significant attention, with an outpouring of research on the impacts of on-demand transportation and Airbnb. Similarly, research has been done on the geography of crowd-funding platforms that can be used to raise money for various purposes, including entrepreneurial ventures. Yet far less attention is paid to the impacts of the mega-platforms, with almost no research on the geography of platform-dependent entrepreneurs.

4. The geographic implications of the Amazon business model are broad in scale and scope, but little academic or geographical study has been conducted on its implications for spatial organization. Perhaps, this is because, with a few notable exceptions, geographers have had little interest in logistics, other than in the value chain (e.g., Gereffi et al. 2005).

5. GM has become a ubiquitous representation of geographic space and enabling technology for many other firms. It enables while it constrains and provides Google with a powerful tool for observing the activity not only of direct users but also of firms that have embedded it in their APIs and websites. A more political economically informed study of how the representation of space has been repurposed for capital accumulation, value extraction, and inter-platform competition seems vitally necessary. The implications of the near-monopoly power of GM are only now being glimpsed and deserve far more research by those interested in how space and capital accumulation interact.

AI will be a powerful new tool for these platforms. The ability of the platform giants to create huge data sets, mobilize massive computing power, and hire the most capable engineers suggests that AI will only increase the efficiency, effectiveness, and growth of the existing platform giants. AI seems likely to reinforce the power of the giant platforms to sift

through their data streams in search of new patterns and sources for decision-making, rather than being a vehicle for their disruption.

From a pragmatic or policy perspective, at the regional or sub-national level, increased awareness of the impacts of platforms is necessary to design viable development policies. The old strategy of attracting big-box stores for the sales-tax benefits is no longer feasible. Further, recruiting Amazon warehouses with great tax benefits is unlikely to generate significant employment, as Amazon is investing heavily in warehouse automation. At the national level, determining the correct policy to use for controlling the power of platform firms is critical. Geographers and planners can make an important contribution to the policy debate by developing a better understanding of how these dominant digital platforms are organizing and transforming the space of economic activities.

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Tables and Figures

Table 1: Estimated Current Market Share for Various Platforms, Most Recent Estimate, and Firm Location

Estimated Marketshare for Various Platforms, Various Years, and Location

Service/Firm	Platform Giants							Vertical Firms												Other
	Amazon	Apple	Facebook	Google*	Microsoft	Mozilla	Yahoo!	IBM	Pinterest	Twitter	Snapchat	Dropbox	Box	Netflix	eBay	Expedia	Priceline	Uber	Lyft	
Search (US, 2018)	0	0	0	86.2	5.6	0	7.1	0	0	0	0	0	0	0	0	0	0	0	0	1.1
Email (US, 2017)	0	0	0	83.5	4.2	0	6.9	0	0	0	0	0	0	0	0	0	0	0	0	5.4
Browser (Smartphone, US, 2018)^	0	31.1	0	49.3	9.5	5.4	0	0	0	0	0	0	0	0	0	0	0	0	0	4.7
Browser (G, 2018)^	0	14.8	0	60.6	2.7	5	0	0	0	0	0	0	0	0	0	0	0	0	0	16.9
Browser (PC, ex-C, 2018)^	0	3.2	0	77.2	4.1	12.4	0	0	0	0	0	0	0	0	0	0	0	0	0	3.1
Social media (G ex C 2018)	0	0	66	8	0	0	0	0	12.5	8.8	0	0	0	0	0	0	0	0	0	4.7
Messaging (US, 2018)***	0	0	50.8**	10.8*	0	0	0	0	0	0	20.1	0	0	0	0	0	0	0	0	18.3
Online Video (US, 2016)	0	0.6	0	78.8	0.9	0	0.6	0	0	0	0	0	0	8	0	0	0	0	0	11.1
E-book Sales (US 2018)	83	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
Travel (G, Q3 2017)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	46	0	0	24
Desktop OS (US, 2018)	0	19.3	0	4.6	73.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.7
Smartphone OS (G, 2018)	0	20.7	0	76.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.7
Smartphone OS (US, 2018)	0	49.1	0	50.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5
Advertising (US, 2018)	2.7	0	19	37.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	41.1
Cloud Services (G, 2018)	33	0	0	6	13	0	0	8	0	0	0	0	0	0	0	0	0	0	0	40
File Sharing (G, 2018)	0	0	0	31.3	8.3	0	0	0	0	0	0	29.4	19.6	0	0	0	0	0	0	11.4
Online Retail (US, 2018)	49.1	3.9	0	0	0	0	0	0	0	0	0	0	0	0	6.6	0	0	0	0	59.6
Maps (US, 2018)	0	12.6	0	79.1*	0	0	1.2	0	0	0	0	0	0	0	0	0	0	0	0	0
Ridesharing (US 2018)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	~70	~30	0

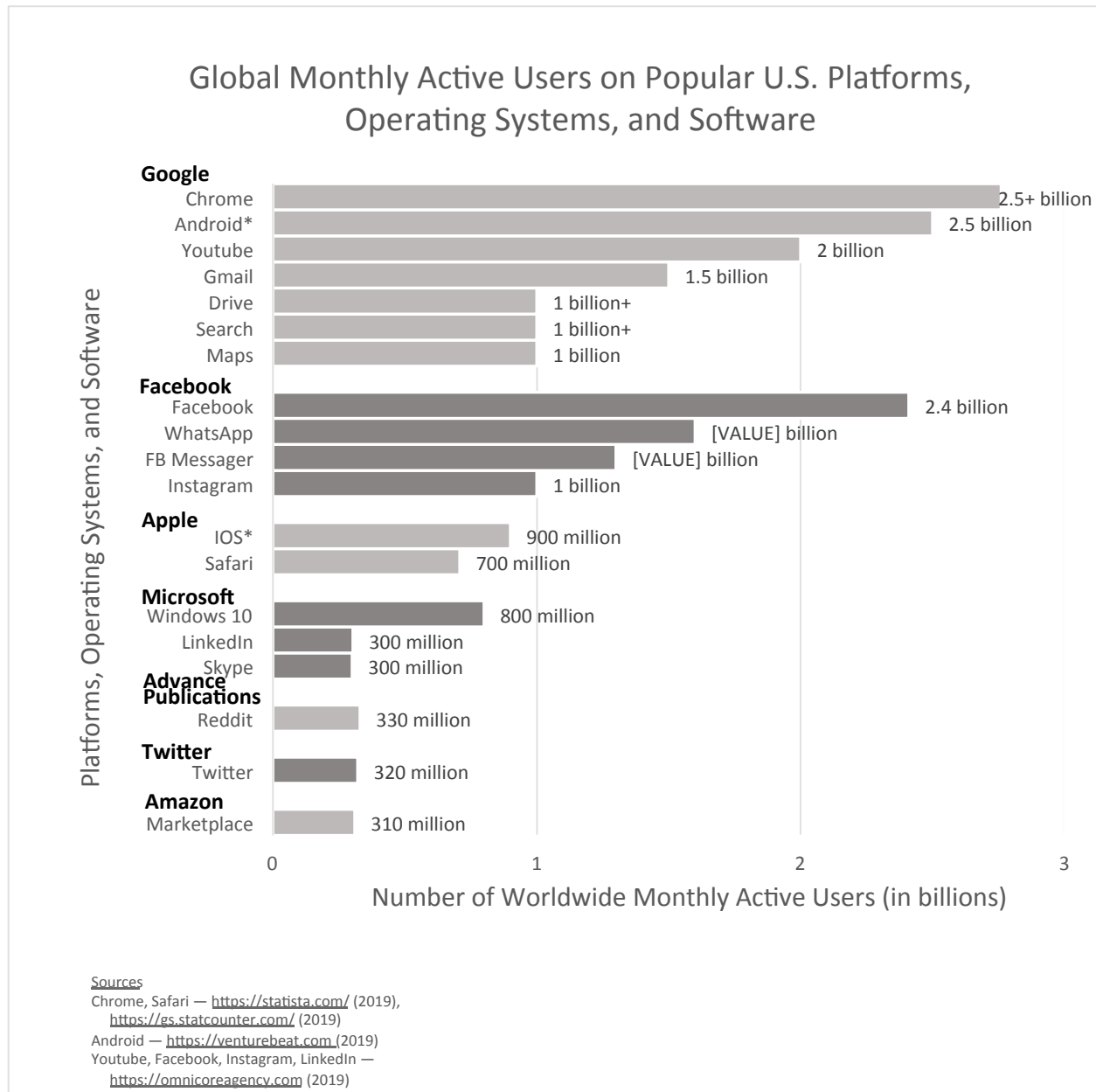| Source: Various	Legend	
* All Google sites including YouTube	light gray = Silicon Valley	
** Messenger and WhatsApp	dark gray = Seattle	
*** Users may use multiple services	no shade = Other	
^ Multiple estimates		

Table 2: Labor Force Taxonomy and Location of Value Creation in the Platform Economy

Type of work and compensation	Employment type	Typical examples	Headquarters location	Labor location	Value creation process
Platform firm					
Venture labor: salary and stock options; stable	Full time	Google, Amazon, Facebook, Snap, Airbnb	Silicon Valley and Seattle	Silicon Valley and global	Create and maintain platform
Contractors to platform firm: salary or by task; precarious	Full or part time	Dynamex, LeapForce, Cognizant	Proximate and global	Proximate and global	Various but usually routinized
Platform-dependent work					
Market intermediation: by sales; precarious	Independent, compensated by sales revenue	Amazon, Craigslist, eBay, Etsy, Booking.com, Expedia, Airbnb	Silicon Valley, Seattle, New York	Global	Sell products online
In-person service provision: precarious and compensated by gig	Service contracted through platform	Uber, Lyft, PostMates, GrubHub	Silicon Valley	Global but proximate	Provide services, monetize assets
Remote service provision: precarious and compensated by gig	One-time project contract	Upwork, Fiverrr, InnoCentives, AMT	Silicon Valley	Global	Project work
Digital content creation: by share of sales or advertising	Independent, by sales	YouTube, Apple App Store, Google Play, Twitch, Spotify	Silicon Valley and other locations	Global, some clustering of creators, e.g., YouTubers in Los Angeles	Content creation and sale online
Platform-monetized content					
Internet website producers: salary or contract; varies widely	Employed or contractors	All organizations with a website	Silicon Valley	Global	Build websites, etc., for their organization
User-generated content: use of platform; free content	Uncompensated labor	Google, Facebook, Yelp!, Snapchat	Silicon Valley and other locations	Global	Contribute content from which value is

creation					extracted

Source: Adapted from Kenney and Zysman (2019a).

Figure 1: Global Monthly Active Users on Various U.S. Platforms

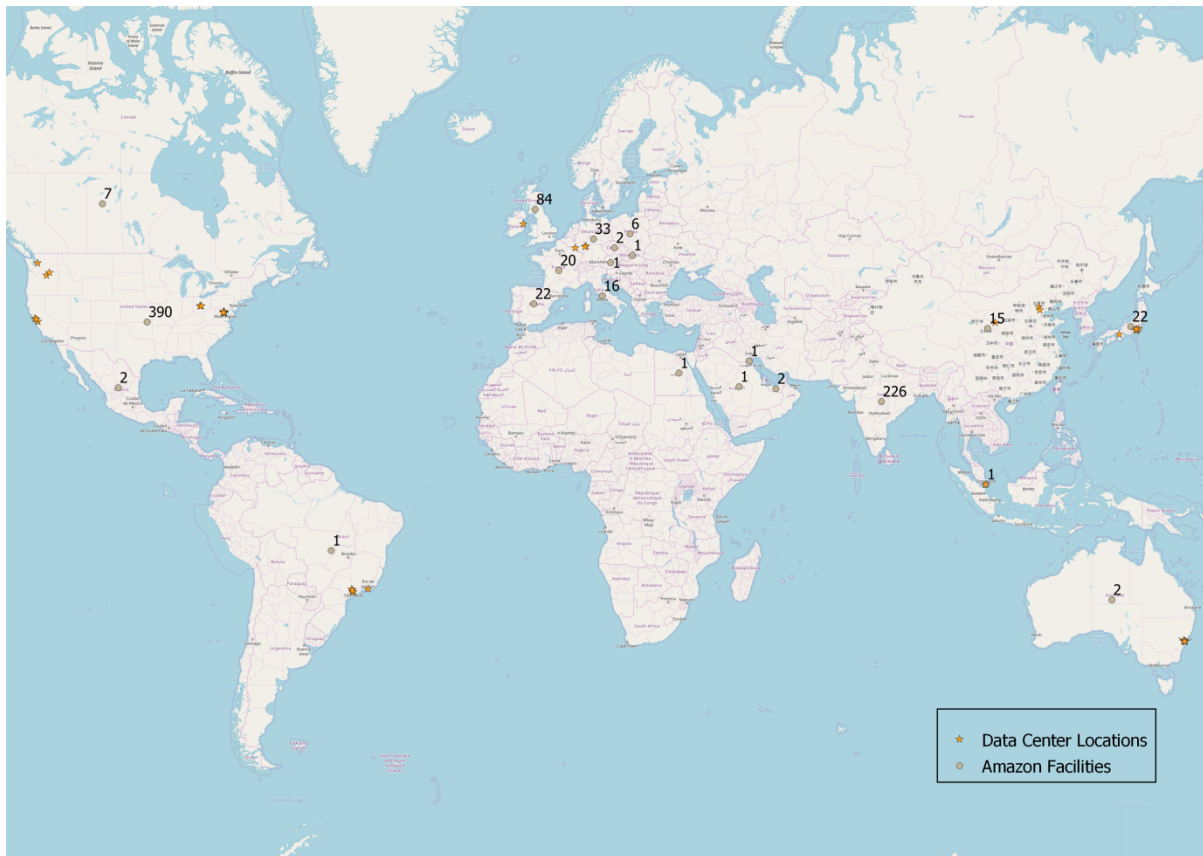Global Monthly Active Users on Popular U.S. Platforms, Operating Systems, and Software

* Active devices

Sources: Chrome, Safari: https://statista.com/ (2019), https://gs.statcounter.com/ (2019); Android: https://venturebeat.com (2019); Youtube, Facebook, Instagram, LinkedIn: https://omnicoreagency.com (2019).

Figure 2: U.S. Locations of Amazon Logistics Facilities and Data Centers by Year of Opening, 1997-

2021
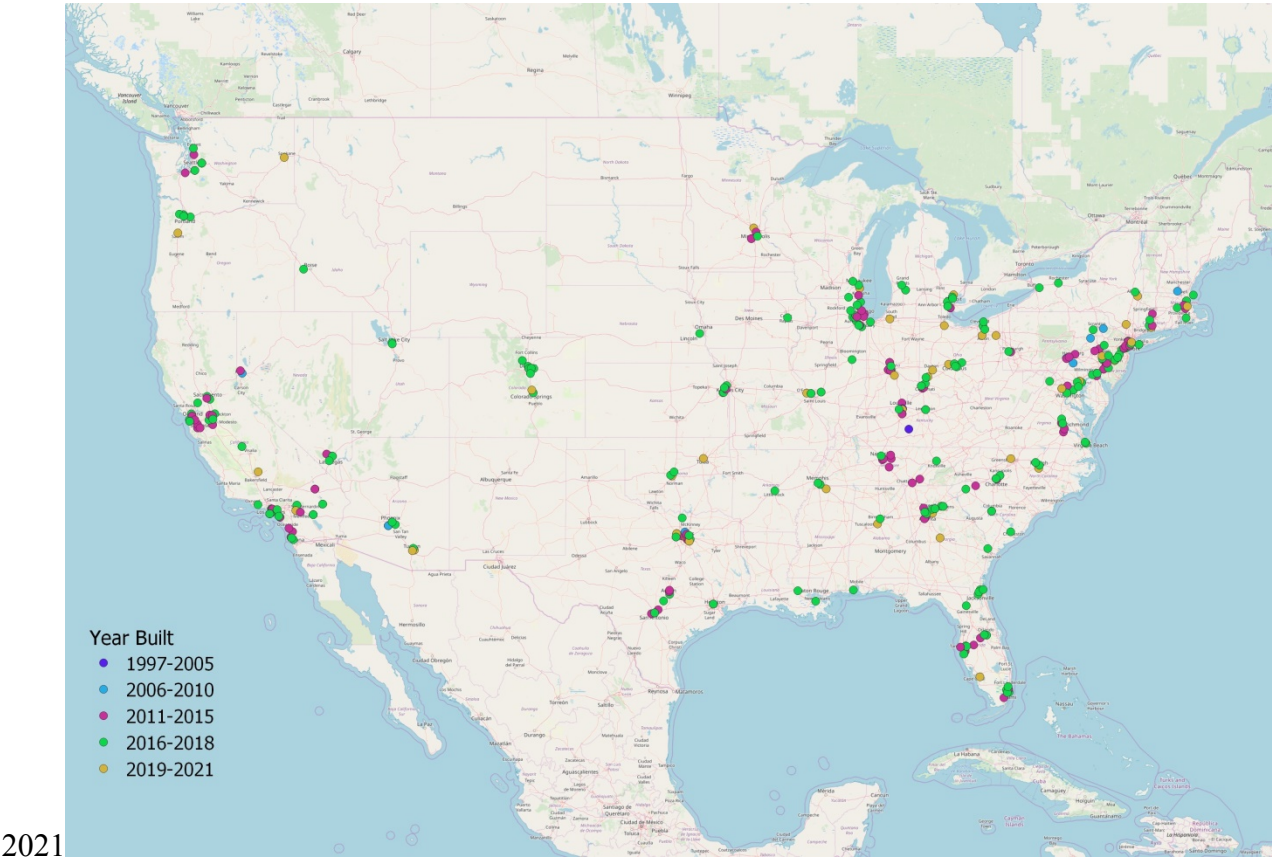
Source: Adapted from MWPVL International, 2019.

Figure 3: The Number and Location of Amazon Logistics Facilities and Data Centers Globally

Source: Adapted from MWPVL International, 2019.