

The Digitization of the American Economy



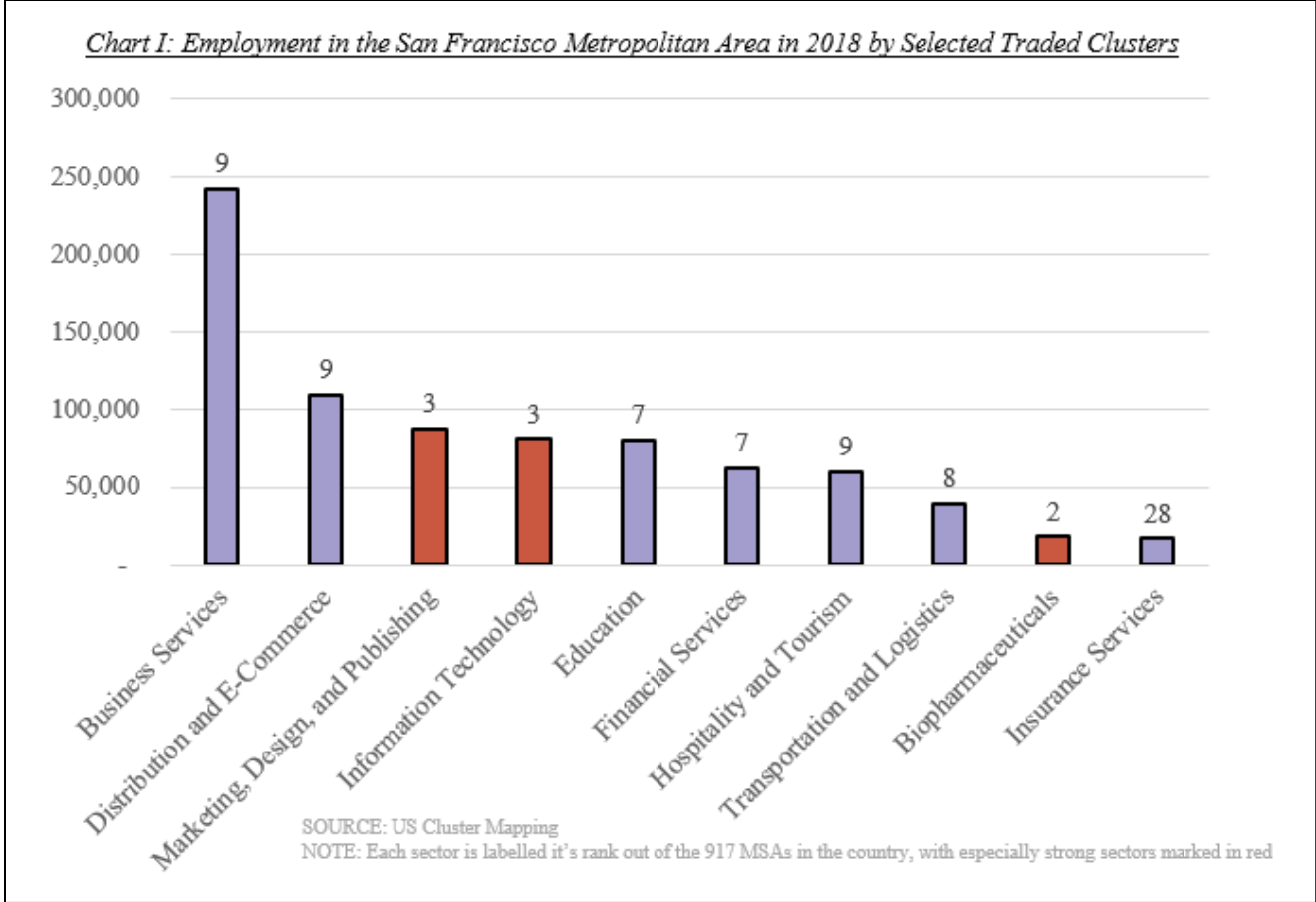
The Federal Reserve Bank of San Francisco , [Taken by Michael Ursino, 4/25/2012](#)

Remote work has been an important component of the labor market for decades (Johns & Gratton, 2013). In the past several years, the practices have allowed some Americans to turn partly virtual positions fully remote as they moved away from the city but kept the job (Eisen, 2019). This was all before the pandemic made working from home a necessity for so many. Some companies have shifted the conversation from the relocation of employees or hiring somebody no one has physically met to whether office space is necessary and if all their work could be done remotely permanently (Cappelli, 2020). What is the driving force behind this potential paradigm shift? I would contend that technological advancements in the past two decades have changed how a foundational part of economic development, the cluster, functions. This post will review how clusters work, assess how technology has changed things, and the potential short to long-term effects.

How do Clusters Work?

In economics, a “cluster” refers to many interrelated industries that have sited in the same region (Porter, 1998). This phenomenon was first described in Michael Porter’s seminal article “Clusters and the New Economics of Competition” (Moretti, 2013; Porter, 1998; Appendix). Porter identified three Broad Benefits (BB) that facilities gain by siting in clusters: they make companies more efficient, foster

innovation, and create new businesses. Cluster occupants may exchange employees, use one another's outputs to reduce transportation costs, and hold meetings to discuss their joint efforts (Moretti, 2013). All of this allows businesses in the cluster to operate as though they were a larger organization with greater economies of scale without going through the merger process (Kenton, 2021).



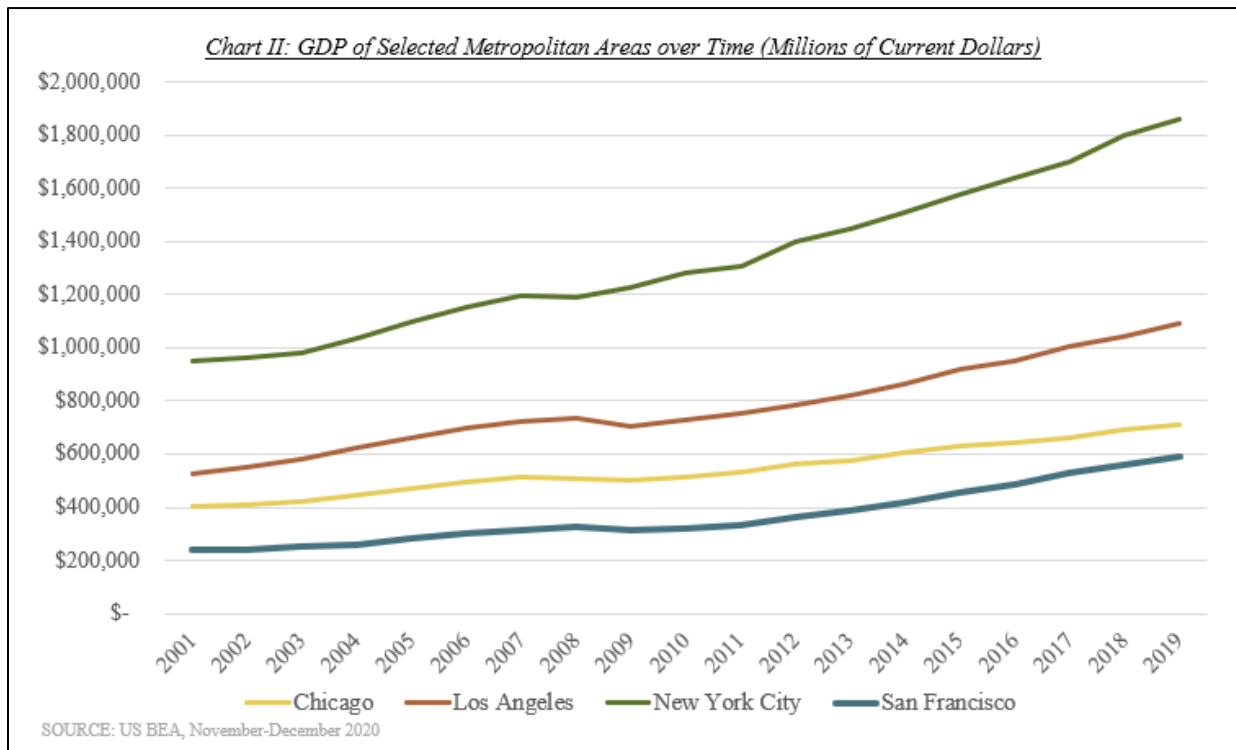
Clusters in the San Francisco Metropolitan Area

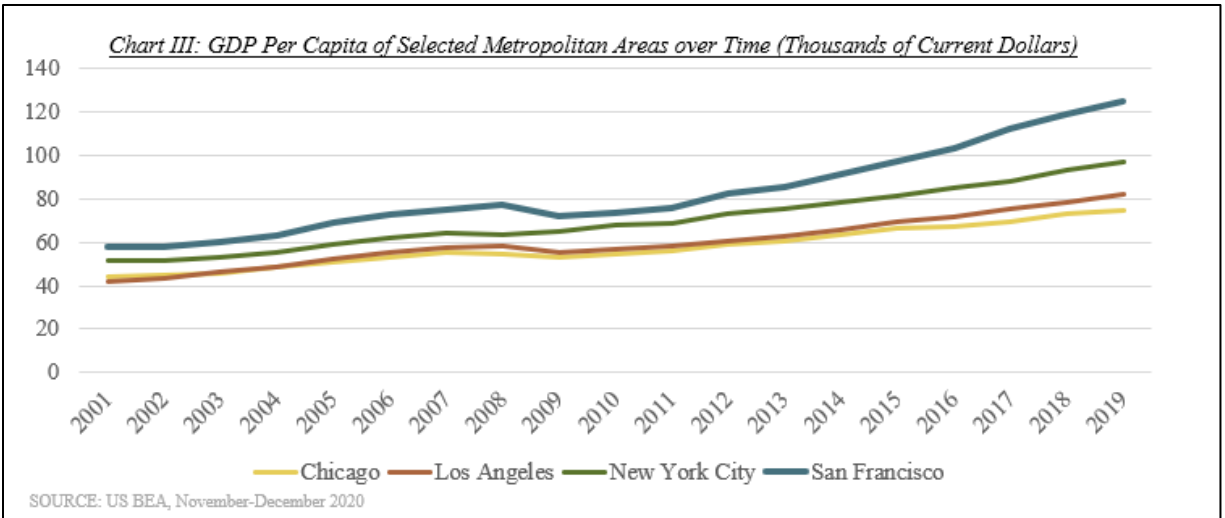
The strength of clusters can be tracked by calculating and comparing Location Quotients (an estimate of a region's efficiency in an industry relative to another region based on employment levels) (Froeschle, 2005; Chart I). The SF region is a national leader in nine different sectors because of the clusters in the area, and the effect of being this specialized can be seen with metrics besides the Location Quotient (Chart I). The region generates less economic activity than the three largest metropolitan areas in the country, but its GDP Per Capita (a measure of an economy's productive efficiency) is higher than all three (Charts II-III).

The SF region has continued this strong economic growth despite major issues, from its greatly expensive cost of living to some businesses and investors leaving (Economist, Sep. 2018). As a result, other regions are becoming more competitive with SF (Economist, Sep. 2018). What this might mean for the SF region will be discussed in a later section.

What has Changed?

These benefits are just as important as they were in 1998 and are still made through businesses associating with one another. What has changed is that technology now allows companies to engage in cluster-like behavior with other companies that aren't in the same region. Many developments could be highlighted as contributing to this, but I will focus on two. The first and less important of the two is improvements in the logistics and transportation sector, as practices like just-in-time shipping were pioneered before '98, and many of its new improvements are closely tied to the second point: internet and technology (Radziwill, 2010). To put advancements in technology and the internet into perspective, when Porter wrote the article in 1998, people were still using dial-up internet, and the idea of streaming movies on pocket-sized phones was unthinkable (Murphy, 2019).





The best way to assess what has changed is to address each of the BBs individually while retaining the organization Porter used. For instance, he split the “Clusters and Productivity” benefit into several sub-benefits, which the assessment will follow. Many of the sub-benefits, plus the “Clusters and Innovation” BB, translate to the digital context relatively well because they are more based around communication, exchanging information, and the supply chain. Some of their relevant developments and the way they emulate cluster benefits have been summarized in Table I. The sub-benefits “Complementarities” and “Access to Institutions and Public Goods,” in addition to the “Clusters and New Business Formation” BB, are more complicated and thus don’t translate as well. They will be discussed in greater detail.

Clusters & Productivity

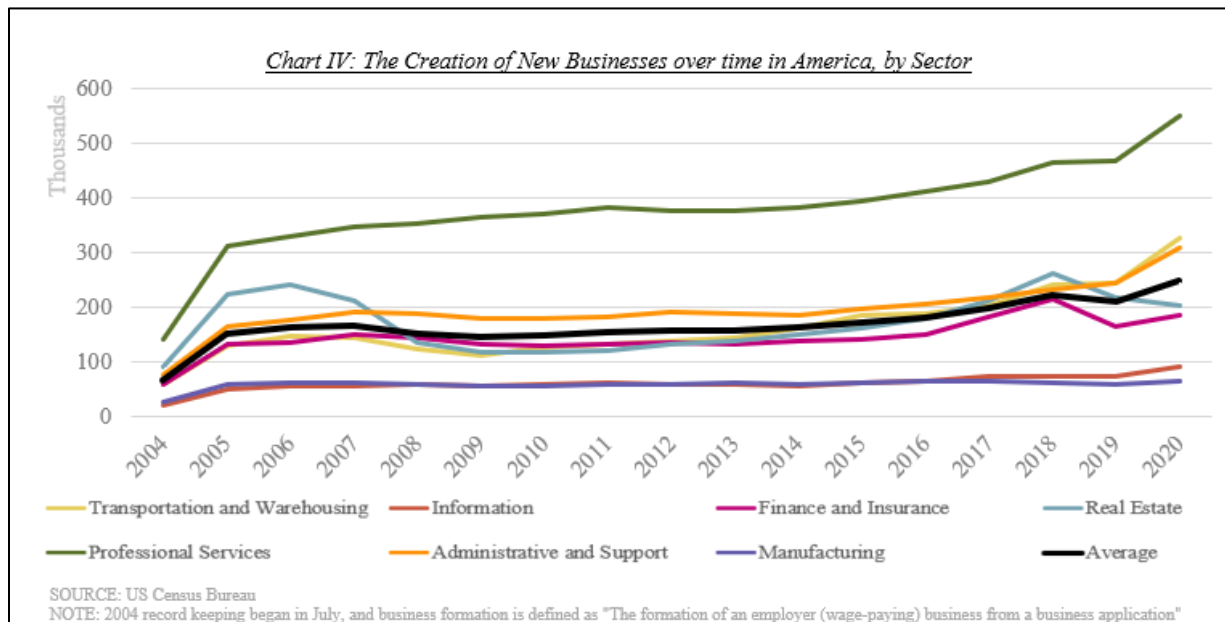
Complementarities: Porter described this as cluster members complementing one another beyond providing access to economies of scale, like how Italy has been home to much of the world’s fashion expertise for so long it has become synonymous with the word. This benefit is largely cultural and dependent on customers knowing that the businesses are linked. This connection is clear if they are in the same region but less apparent if it is only virtual.

Access to Institutions and Public Goods: When multiple businesses with similar needs are in a cluster, it becomes more affordable to use specialized infrastructure as the costs can be shared amongst them and potentially the local government. The cluster might also pull from a local college with training programs tailored to their needs. The expansion of the labor market through internet job boards partly covers the latter, but infrastructure and capital are highly location-dependent.

Table I: Summary Table of Translatable BBs

Broad Benefit	Sub-Benefit	Relevant Developments since 1998	How do the developments change things?
Productivity	Better Access to Employees	Video conferencing software and internet job boards	<ul style="list-style-type: none"> • Employees are able to communicate "face-to-face", even at a distance • The labor pool has expanded of potential employees has expanded to cover the whole country
	Better Access to Suppliers	Artificial Intelligence (AI) aided logistics and automated distribution centers (Matthews, 2020)	<ul style="list-style-type: none"> • AI can make complicated connections humans can't to predict shifts in customer demand and optimize truck routes • Automated systems make fewer mistakes than humans and lower costs in the long run
	Access to Specialized Information	Video conferencing software and cloud data storage	<ul style="list-style-type: none"> • Video calls enable representatives from the two businesses to establish the relationship necessary to share the information, and cloud storage makes it very convenient to share large files
	Better Motivation	Video conferencing software and collaborative software like slack	<ul style="list-style-type: none"> • Enable employees to develop the sense of community necessary to form motivational rivalries at a distance
Innovation	N/A	Video conferencing and collaborative software, and logistical improvements	<ul style="list-style-type: none"> • The software enables employees to make the connections necessary to understand how consumer demand is shifting, and potential emerging options to meet it • Logistical improvements makes it easier for a company to source specialized inputs to develop the new goods and services

Chart IV: The Creation of New Businesses over time in America, by Sector



Clusters and New Business Formation: A cluster can often create a positive feedback loop by forming new businesses, which further solidifies its footing. This results from current gaps in the market being more apparent in clusters, and the necessary inputs from skilled workers to physical assets are nearby.

In creating new online businesses, this is more applicable to service-based industries rather than ones that produce goods. This could be verified by surveying recently opened businesses about what led them to open, how much of their workforce is permanently remote, and whether they associate with other companies virtually.

A more indirect method of examining data from the Census Bureau was used to see if service-based sectors generate more new businesses over time relative to the manufacturing sector. This is true for some, chiefly the Professional Services and Administrative and Support sectors (Chart IV). The Information sector has been relatively stable in forming new businesses, largely because the “tech giants” like Alphabet and Apple can outcompete smaller companies for talented workers (Economist, Sep. 2018, Chart IV). Interestingly, all of the selected sectors are currently forming new businesses much faster than usual (Table II). A significant number of the new businesses are undoubtedly based either partly or entirely on the internet, but whether they engage in virtual cluster behavior is unclear. If most are still in business two years from now, that would suggest that some might have joined virtual clusters, although that would also be an indirect measure.

What Does this Mean?

In the Long Run

It is unlikely that a significant number of companies will take to being purely remote once the pandemic is over – at least immediately. While it varies between employees and companies, many have found that the situation makes things significantly more difficult for them, from training new employees to collaborating (Cutter, 2020). Institutional inertia will also make many offices return to “business as normal,” regardless of whether or not transitioning to remote work would be beneficial (Heinrich & Schwardt, 2013). Companies might gain mild virtual cluster benefits by communicating with businesses outside their region more often than they did previously, and virtual work will certainly be more commonplace (Cappelli, 2020).

A more significant change is that each cluster’s importance will lower since companies can gain many of the benefits from having a physical presence there without formally establishing one. This might be capitalized on by sending part of the office to the “virtual region” to make personal connections with key companies, but the employees do all their work remotely. It could be a useful way to “test the waters” of a potential facility before making the commitment and breaking ground. This could also mean that the SF region will really start weakening if it does not get its exorbitantly high cost of living under control (Economist, Sep. 2018).

*Table II: Business Generation in January and February
Relative to the Average for that Month from 2005-2020, Ranked*

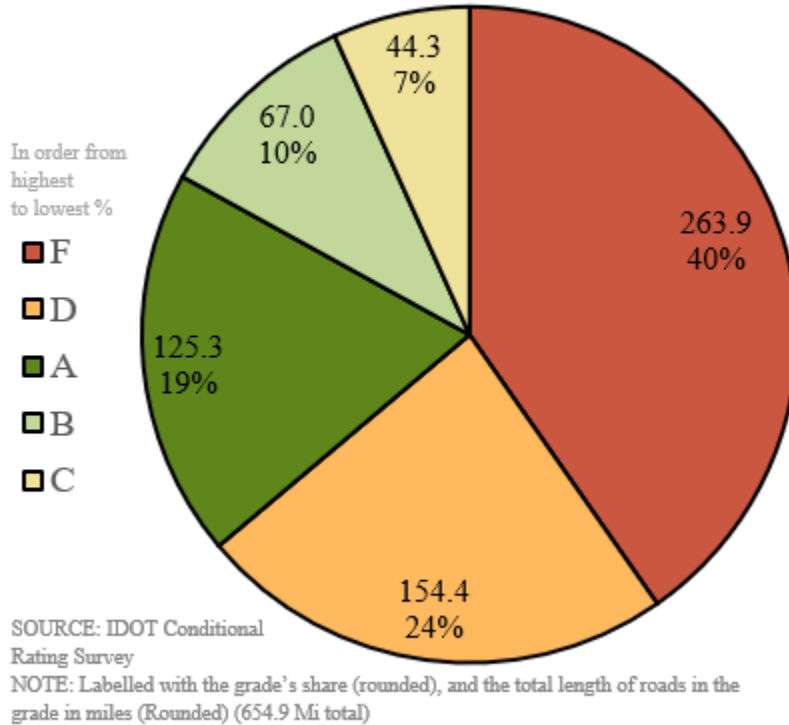
Sector	Year Range	Month	
		January	February
Transportation and Warehousing	2021	40,656	34,948
	2005-2020 Average	13,669	13,577
	Change Between Previous Years and 2021	297.4%	257.4%
Average	2021	27,511	24,457
	2005-2020 Average	13,975	14,134
	Change Between Previous Years and 2021	196.9%	173.0%
Administrative and Support	2021	31,847	27,438
	2005-2020 Average	15,841	16,260
	Change Between Previous Years and 2021	201.0%	168.7%
Information	2021	9,836	8,652
	2005-2020 Average	4,986	5,030
	Change Between Previous Years and 2021	197.3%	172.0%
Finance and Insurance	2021	22,599	20,467
	2005-2020 Average	11,976	12,211
	Change Between Previous Years and 2021	188.7%	167.6%
Professional Services	2021	56,419	51,850
	2005-2020 Average	31,981	32,184
	Change Between Previous Years and 2021	176.4%	161.1%
Real Estate	2021	23,863	21,550
	2005-2020 Average	14,529	14,743
	Change Between Previous Years and 2021	164.2%	146.2%
Manufacturing	2021	7,355	6,292
	2005-2020 Average	4,843	4,934
	Change Between Previous Years and 2021	151.9%	127.5%

SOURCE: US Census Bureau

NOTE: Colors in the table have been coordinated with those in Graph IV

Companies might eventually change how they site facilities and enable large portions of their employees to live across the country if they decide that reducing costs and virtual cluster benefits are preferable to the old arrangement (Smith, 2021).

Chart V: The Total Mileage of Major Regional Roads, by Grade



One of the major hurdles to rural investment and cluster development, reliable internet connectivity, might be solved (Crist, 2021). Elon Musk's company, Starlink, hopes that internet access through a network of satellites will be more reliable than traditional infrastructure, which is cost-prohibitive to build and maintain in rural areas (Crist, 2021). Musk says that it will be widely available in 2022, but given his track record of inaccurate estimates, it is best to think of it in the long term (Crist, 2021; Rapier et al., 2019). If Starlink proves to be successful, businesses in the SCIRPDC region will have a stronger connection to virtual cluster benefits. Suppose companies change their siting patterns and that rural internet becomes more reliable. In that case, more business may come to the region and boost local tax revenue, but some significant hurdles remain. Two of the primary concerns are providing businesses with skilled employees and transportation infrastructure. First, attracting and retaining skilled workers has been a growing issue across the Midwest (Steimel, 2015). While part of the facility's workforce might be virtual, there is no reason to build the facility if the labor pool doesn't have the experience or numbers to run it. Second, according to the Illinois Department of Transportation's Conditional Road Survey, the major roads that serve the region are in a state of serious disrepair. Nearly two-thirds of them were graded either a "D" or "F," and the problems are distributed relatively evenly between the counties (Map I, Chart V).

Appendix: What is a Region?

There are many ways to define the borders of a region, but a common option are the metropolitan areas delineated by the Office of Management and Budget (Census, 2020). Metropolitan areas are defined as “a core area containing a substantial population nucleus, together with adjacent communities having a high degree of economic and social integration with that core” (Census, 2020).

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Written by: Joshua Harris, SCIRPDC, 2021

