

9-25-2020

Agglomeration Economies: A Literature Review

Kathleen Bolter

W.E. Upjohn Institute for Employment Research, Bolter@upjohn.org

Jim Robey

W.E. Upjohn Institute for Employment Research, jim.robey@upjohn.org

Follow this and additional works at: <https://research.upjohn.org/reports>



Part of the [Labor Economics Commons](#)

Citation

Bolter, Kathleen and Jim Robey. 2020. "Agglomeration Economies: A Literature Review." Prepared for The Fund for our Economic Future (FFEF).

This title is brought to you by the Upjohn Institute. For more information, please contact repository@upjohn.org.

Agglomeration Economies: A Literature Review

Prepared for

The Fund for our Economic Future (FFEF)
4415 Euclid Avenue, Suite 203
Cleveland, Ohio 44103

Prepared by

Kathleen Bolter, PhD
Jim Robey, PhD

Regional and Economic Planning Services
W.E. Upjohn Institute for Employment Research
300 South Westnedge Avenue
Kalamazoo, MI 49007
269-343-5541

June 30, 2020



W.E. UPJOHN
INSTITUTE
FOR EMPLOYMENT RESEARCH

Table of Contents

Key Takeaways.....	3
Introduction	4
Defining Agglomeration	4
Sharing.....	5
Matching.....	5
Learning.....	6
Impacts of Agglomeration.....	6
Scale of Agglomeration.....	7
Conclusion	8
References	10
About the Upjohn Institute.....	14



Key Takeaways

- The benefits of agglomeration economies are best summarized through three mechanisms: sharing, matching, and learning.
- Sharing infrastructure is more efficient for firms. It lowers transportation costs and enables firms to locate in closer proximity to customers.
- Agglomeration results in a larger, deeper, more specialized labor pool which enables workers to better match their skills to the needs of firms.
- Agglomeration creates knowledge spillovers in which firms and workers learn from each other. It also incentivizes investment in human capital because workers and firms are aware they will benefit from improved levels of skill and education.
- The most important drivers of agglomeration are an educated workforce and a skilled labor pool, followed by local input suppliers.
- Knowledge-based industries, where sharing ideas are central to the production process, benefit the most from agglomeration.
- Agglomeration effects occur at many different geographic levels, from the microgeographic (within buildings) to larger regional clusters.

Introduction

Businesses display a strong tendency to locate in specific geographic areas due to various opportunities and constraints for the firm. Shorter distances between firms leads to many economic advantages as a result of the agglomeration of economic activity (Rosenthal & Strange, 2003). Agglomeration can cause positive impacts for a variety of reasons, including knowledge spillovers, efficient allocation of infrastructure, proximity to customers, and a better matching of job opportunities and skills between firms and workers. The agglomeration of economic activity may be industry specific or composed of a variety of industries.

The impacts of agglomeration have been of interest to regional economists for over a century, yielding hundreds of studies focused on the impact of density and clustering. The purpose of this literature review is to provide a definition of agglomeration and outline the primary impacts of agglomeration on regional economies. Additionally, special attention is paid to the impact of agglomeration on firm entry decisions and particular industries, most notably manufacturing. This literature review finds that the impact of agglomeration can occur even on small geographic levels. However, certain conditions, such as a skilled workforce and willingness to invest in necessary infrastructure, increase the impacts of agglomeration.

Defining Agglomeration

Agglomeration refers to the clustering of firms together in a particular geographic area. Agglomeration economies describe the mechanisms that cause employees and firms to co-locate geographically. Agglomeration economies occur when a number of firms producing similar or complementary goods locate near one another, which, in turn, produces positive externalities for those firms (Porter, 1998). There are two primary types of agglomeration economies: those that result from industry concentration (localization economies) and those that result from the density of economic activity in an area (urbanization economies) (Cohen, et al., 2008).

The scope and strength of the impacts of agglomeration economies are determined by what type of agglomeration is created. For example, agglomeration economies that arise from the close proximity and interaction of firms (urbanization), may find the impact of agglomeration declines over distance (Audretsch & Feldman, 2004; van Soest et al., 2006). The benefits of urbanization economies occur because of the cost savings for firms located near other firms in different industries. The implication of this is that due to the size of a place, firms have access to a wide portfolio of goods and services (i.e. accounting, design, legal services) outside of their industry. The benefits of localization economies occur because of the cost savings for firms located near other firms of the same industry. The implication of this is that firms are able to share infrastructure and develop a specialized labor pool for their industry.

The benefits of agglomeration economies can be summarized through three mechanisms: sharing, matching, and learning. Firms receive benefits from sharing facilities, infrastructure,

suppliers, and a labor pool. Firms and workers are better able to match their skills and needs in a larger or more specialized labor pool. In addition, firms can learn about new technologies and business practices more readily in a larger market (Duranton & Puga, 2004).

Sharing

One benefit of agglomeration is the capacity to share infrastructure, which often have fixed costs regardless of the number of users. Larger cities with a higher number of users can utilize infrastructure more efficiently. Both transport and telecommunications infrastructure increase in value as a public investment as the density of the network increases because the large upfront costs incentivize sharing (Giuliano, et al., 2019). Within this framework, a one-time public investment becomes self-sustaining due to agglomeration economies (Kline & Moretti, 2014).

One reason agglomeration produces increases in productivity is because proximity to customers and suppliers reduces transportation costs. Transportation networks are an important determinant of the location decision of firms (Eberts & McMillen, 1999). The new economic geography literature highlights that it is more economically efficient to produce goods downstream near the point of consumption (Glaeser & Kerr, 2009, Ellison, Glaeser, & Kerr, 2010). Improvements in transportation that bring firms closer together both reduce the cost of such infrastructure and enhance the benefits of agglomeration (Eberts & McMillen, 1999).

However, some studies have found that transportation investments may have weakened agglomeration economies by dispersing growth away from denser urban areas (Haughwout, 1999). Transport costs have declined throughout the twentieth century, which has historically been associated with decreases in urban densities (Muller, 2017). Within cities some locations are easier to reach as a result of factors such as better road access, congestion, and distance, which may impact the benefits of living in large agglomerations (Gerritse & Arribas-Bel, 2018).

Matching

Agglomeration economies offer better job opportunities for people with higher levels of education, which offers a better match between workers and their jobs. This is particularly true of urbanized agglomerations; larger cities have a larger labor pool which makes it easier for firms to find qualified workers. Metropolitan areas with higher levels of density and greater levels of human capital stock are the most likely to receive gains from agglomeration. Agglomeration in areas with unskilled workers do not produce the same positive benefits (Abel et. al., 2012). The larger the labor pool, the more diverse and specialized it becomes (Backman & Kohlhase, 2013). Additionally, larger cities disproportionately attract both high- and low-skilled workers. The productivity of high-skilled workers is enhanced by the providers of low-skilled services (Eekhout et al., 2014).

Localized agglomerations have also been shown to benefit from matching. One study in the Cleveland-Akron Consolidated Metropolitan Statistical Area (CMSA) found that industries derive agglomeration economies in shared labor, primarily in the lower-skilled production-related occupations (Fagan, 2000). When a new job is generated in the tradable sector of a local economy, a significant number of new jobs are often estimated to be created in the nontradable sector of the local economy. The greater the concentration of industries, particularly in manufacturing, the higher the multiplier is for new job creation (Kazekami, 2017).

Learning

One of the primary benefits of agglomeration is that it decreases the cost of generating new ideas and exchanging information. Knowledge spillovers occur when close proximity and face-to-face contact among individuals and firms leads to the faster spread of new ideas, which in turn leads to innovation. When information is imperfect, changes quickly, or is not easily codified, agglomeration has been shown to be especially important for enhancing productivity (Storper & Venables, 2004).

Two primary benefits may be occurring in more skilled areas. First, workers are learning from each other more quickly. Second, the rate of technological change may be faster. Together these effects interact to spur the knowledge agglomeration of skilled cities (Glaeser & Resseger, 2010). Employers in larger labor markets are more likely to invest in technology because they know they can find the specialized employees needed to work within the firm. Meanwhile, employees are more likely to invest in human capital because they know that will be valued in the labor market (Acemoglu, 1997).

Across countries and regions, city size is positively correlated with higher levels of productivity (Ahrend et al., 2017). Several studies have shown a positive relationship between productivity and wages and more densely populated areas (Head & Mayer, 2004). One theory for the increased level of productivity is that individuals that live in urban areas are better equipped with skills and educational levels that make the population, on average, more productive (Rosenthal & Strange, 2003). Areas with lower skill levels do not receive the same benefits from agglomeration regarding productivity.

Impacts of Agglomeration

Firm location, and therefore employment location, is shaped by a variety of factors including transportation costs and economies of scale (Niu et al., 2015). The location decision of firms is not determined by population size, but rather by diverse economies with proximity to downstream and upstream firms, and an educated workforce. Firms already in the industry of that firm have also been found to be drivers of location decisions. Agglomeration rates are higher between economically similar industries, which may suggest that both physical proximity and economic linkages play an important role in location decision (Ellison et al., 2010). Rural areas with higher agglomeration endowments can be equally attractive for firms when making location decisions. (Artz et al., 2016).

For first-time foreign entrants into the United States, the agglomeration of skilled workers and potential knowledge spillovers were more attractive in location decisions than specialized suppliers. (Alcácer & Chung, 2014).

The most important mechanism for firm entry into new places is labor market pooling, the extent to which workers possess a specialized knowledge base covering a wide range of topics, followed by input sharing. This is especially true when examining firm choices between larger geographies (between cities) (Jofre-Monseny, et al., 2011). However, this primarily applies to R&D intensive firms. Firms that were less technologically inclined were less attracted to skilled labor pools and specialized suppliers (Alacer & Chung, 2014).

Other scholars have found sectoral specialization is not an important decision for firm entry into certain geographic areas, but rather increases in local demand for products, a more diversified economy, and better qualified labor encourage the entry of firms into particular areas (Holl, 2004). For manufacturing start-ups, local labor pools were the most important determinant of firm location, followed by input suppliers and customer linkages (Glaeser & Kerr, 2009). Manufacturing plants have been found to be more productive in cities with higher human capital (Moretti, 2004).

The impact of density is greatest among knowledge-based industries such as Professional Services, Arts and Entertainment, Information, and Finance, where sharing ideas are central to the production process (Abel et. al., 2012). Workers in information-oriented and technical fields (e.g. science, technology, and engineering) earn higher hourly wage rates when in close proximity to other workers in such fields than workers in less information-oriented and technical fields (Liu, 2017). In the high-tech sector, the number of establishments in an industry is positively associated with increased productivity. However, in the industries with less R&D, the number of establishments matters less (Audretsch & Feldman, 2004). Firms in Construction, Finance and Insurance, Professional Services, and Administrative Services are more likely to locate in economic centers than other areas (Niu et al., 2015).

The availability of locally supplied inputs is an important factor in creating industrial clusters (Overman & Puga, 2009). Manufacturing firms located in areas with many manufacturing establishments in the same industry use more purchased intermediate inputs than similar manufacturing establishments in areas with fewer firms in the same industry (Holmes, 1999). Greater regional diversity of firms has been found to reduce the closure of businesses in the case of economic shock (Power & Ryan, 2019).

Scale of Agglomeration

It is often implicitly assumed that agglomeration economies operate at the “metropolitan level.” However, cities are not monocentric, but rather polycentric and the effects of agglomeration are not uniform across cities. Rather, within cities there may be multiple agglomeration clusters (Agarawal et al., 2012). There is evidence to suggest that agglomeration occurs at many different geographic levels (Giuliano & Yuan, 2019). Within the manufacturing sector, strong localization effects have been found at the zip code level

(Rosenthal & Strong, 2003). It is at the very local level (within cities) that knowledge spillovers become important (Jofre-Monseny, et al., 2011). Agglomeration has been shown to increase wages across medium distances (three to six miles), but not around short distances (less than three miles) (Verstraten et al., 2019).

Even at microgeographic levels, agglomeration has been found to be important. Take, for example, specialized buildings in small business districts that are already specialized such as banking and finance establishments located on Wall Street. When an anchor firm is present in a particular industry, other establishments within a two-block radius of the anchor firm show 15% to 18% higher employment in the anchor firm's industry (Liu et al., 2018). Even within buildings, employment per square foot of office space is higher when the building contains multiple establishments of the same industry on the same floor (Liu et al., 2020).

Improvements in information technology have still created agglomeration economies that operate both broadly and within narrow spatial spaces. There is a benefit to proximity at even smaller levels including the neighborhood, building, and even within building (Rosenthal & Strange, 2019). Agglomeration increases the level of productivity in cities independent of the characteristics of the inhabitants of the city (Ahrend et. al., 2017). However, while this is true on the aggregate, there is significant heterogeneity among firm productivity within cities (Behrens et al., 2014)

Conclusion

Across the various threads of literature, two dominant threads emerge to maximize the benefits for agglomeration. First, the need for a skilled workforce arises for the impact of agglomeration to be felt. Education plays a key role in boosting the opportunities for individuals to move up the economic ladder and is an important driver for creating the skills needed for a robust local labor market. Better educated and trained workers reinforce the benefits of agglomeration, providing a deeper labor pool, employers with workers with needed skills, and a continually learning workforce.

Additionally, investments in the infrastructure needed for agglomeration to occur are increasingly becoming important. The degree to which economic activity is concentrated is a result of transport costs, firm-level economies of scale, and the mobility of the factors of production (Krugman, 1991). Improved transport systems within cities have been found to facilitate the spatial concentration of firms (Ghani, Goswani, & Kerr, 2016). Roads work to enhance productivity in cities by increasing overall employment (Duranton & Turner, 2012). Additionally, investments in transportation work to lower the cost of labor and intermediate goods for firms (Venables, 2007). Improved intercity transportation networks have been found to increase the wages earned in the service sector (Chandra & Thompson, 2000) and boost the wages of skilled manufacturing workers (Michaels, 2008). Investment in infrastructure such as roadways provide an important role in facilitating agglomeration by connecting workers with employment centers and employers with skilled workers.

There are many benefits of agglomeration including increased employment, wages, and productivity. When industries cluster, the productivity of firms located next to each other is enhanced. More recent literature has shown that this clustering is not only beneficial at the metropolitan level; the benefits of agglomeration occur all the way down to the building level. This would suggest that small changes in neighborhood spaces can help spur positive agglomerative effects.

References

- Abel, J. R., Dey, I., & Gabe, T. M. (2012). Productivity and the density of human capital. *Journal of Regional Science*, 52(4), 562-586.
- Acemoglu, D. (1997). Training and innovation in an imperfect labour market. *The Review of Economic Studies*, 64(3), 445-464.
- Audretsch, D., & Feldman, M. (2004). Knowledge spillovers and the geography of innovation. In J. V. Henderson & J.-F. Thisse (Eds.), *Handbook of regional and urban economics: Cities and geography* (Vol. 4, pp. 2713-2739). Amsterdam: North-Holland.
- Agarwal A., Giuliano G., & Redfearn C. L. (2012) Strangers in our midst: the usefulness of exploring polycentricity. *The Annals of Regional Science*, 48, 433-450
- Ahrend, R., Lembcke, A. C., & Schumann, A. (2017). The role of urban agglomerations for economic and productivity growth. *International Productivity Monitor*, (32), 161.
- Alcácer, J., & Chung, W. (2014). Location strategies for agglomeration economies. *Strategic Management Journal*, 35(12), 1749-1761.
- Artz, G. M., Kim, Y., & Orazem, P. F. (2016). Does agglomeration matter everywhere?: New firm location decisions in rural and urban markets. *Journal of Regional Science*, 56(1), 72-95.
- Backman, M., & Kohlhase, J. (2013). *The influence of diversity on the formation, survival and growth of new firms* (Working Paper No. 337). Retrieved from The Royal Institute of Technology Centre of Excellence for Science and Innovation Studies (CESIS) website: <https://www.semanticscholar.org/paper/The-Influence-of-Diversity-on-the-Formation%2C-and-of-Backman-Kohlhase/54576a09a7342ec588a4ac041054e6e5d9193514>
- Behrens, K., Duranton, G., & Robert-Nicoud, F. (2014). Productive cities: Sorting, selection, and agglomeration. *Journal of Political Economy*, 122(3), 507-553.
- Duranton, G., & Turner, M. A. (2012). Urban growth and transportation. *Review of Economic Studies*, 79(4), 1407-40.
- Duranton, G., & Puga, D. (2004). Micro-foundations of urban agglomeration economies. In *Handbook of regional and urban economics* (Vol. 4, pp. 2063-2117). Elsevier.
- Chandra, A., & Thompson, E. (2000). Does public infrastructure affect economic activity? Evidence from the rural interstate highway system." *Regional Science and Urban Economics*, 30(4), 457-90.

- Cohen, J. P., Coughlin, C. C., & Paul, C. J. M. (2019). Agglomeration, productivity and regional growth: production theory approaches. In *Handbook of regional growth and development theories*. Edward Elgar Publishing.
- Eberts, R. W., & McMillen, D. P. (1999). Agglomeration economies and urban public infrastructure. *Handbook of Regional and Urban Economics*, 3, 1455-1495.
- Eeckhout, J., Pinheiro, R., & Schmidheiny, K. (2014). Spatial sorting. *Journal of Political Economy*, 122(3), 554-620.
- Ellison, G., Glaeser, E. L., & Kerr, W. R. (2010). What causes industry agglomeration? Evidence from coagglomeration patterns. *American Economic Review*, 100(3), 1195-1213.
- Fagan, J. H. (2000). Do northeast Ohio's drivers derive competitive advantage from shared labor? *Economic Development Quarterly*, 14(1), 111-125.
- Francis J. 2009. Agglomeration, job flows and unemployment. *The Annals of Regional Science*, 43, 181-198.
- Ghani, E., Goswami, A. G., & Kerr, W. R. (2016). Highway to success: The Impact of the Golden Quadrilateral Project for the location and performance of Indian Manufacturing. *The Economic Journal*, 126(591), 317-57.
- Glaeser, E. L., & Kerr, W. R. (2009). Local industrial conditions and entrepreneurship: How much of the spatial distribution can we explain? *Journal of Economics & Management Strategy*, 18(3), 623-663.
- Glaeser, E. L., & Resseger, M. G. (2010). The complementarity between cities and skills. *Journal of Regional Science*, 50(1), 221-244.
- Gerritse, M., & Arribas-Bel, D. (2018). Concrete agglomeration benefits: Do roads improve urban connections or just attract more people? *Regional Studies*, 52(8), 1134-1149.
- Giuliano, G., Kang, S., & Yuan, Q. (2019). Agglomeration economies and evolving urban form. *The Annals of Regional Science*, 63, 377-398.
- Haughwout, A. F. (1999). State infrastructure and the geography of employment. *Growth and Change*, 30(4), 549-566.
- Head, K., & Mayer, T. (2004). The empirics of agglomeration and trade. In *Handbook of regional and urban economics* (Vol. 4, pp. 2609-2669). Elsevier.
- Holl, A. (2004). Transport infrastructure, agglomeration economies, and firm birth: Empirical evidence from Portugal. *Journal of Regional Science*, 44(4), 693-712.

- Holmes, T. J. (1999). Localization of industry and vertical disintegration. *Review of Economics and Statistics*, 81(2), 314-325.
- Jofre-Monseny, J., Marín-López, R., & Viladecans-Marsal, E. (2011). The mechanisms of agglomeration: Evidence from the effect of inter-industry relations on the location of new firms. *Journal of Urban Economics*, 70(2-3), 61-74.
- Kazekami, S. (2017). Local multipliers, mobility, and agglomeration economies. *Industrial Relations: A Journal of Economy and Society*, 56(3), 489-513.
- Kline, P., & Moretti, E. (2014). Local economic development, agglomeration economies, and the big push: 100 years of evidence from the Tennessee Valley Authority. *The Quarterly Journal of Economics*, 129(1), 275-331.
- Krugman, P. (1991). Increasing returns and economic geography. *Journal of political economy*, 99(3), 483-499.
- Liu, S. (2017). Agglomeration, urban wage premiums, and college majors. *Journal of Regional Science*, 57(4), 611-630.
- Liu, C. H., Rosenthal, S. S., & Strange, W. C. (2018). The vertical city: Rent gradients, spatial structure, and agglomeration economies. *Journal of Urban Economics*, 106, 101-122.
- Liu, C. H., Rosenthal, S. S., & Strange, W. C. (2020). Employment density and agglomeration economies in tall buildings. *Regional Science and Urban Economics*, 103555.
- Michaels, G. (2008). The effect of trade on the demand for skill—evidence from the interstate highway system. *Review of Economics and Statistics*, 90(4), 683-701.
- Moretti, E. (2004). Workers' education, spillovers, and productivity: Evidence from plant-level production functions. *American Economic Review*, 94(3), 656-690.
- Muller, P. (2017). Transportation and urban form: Stages in the spatial evolution of the American metropolis. In G. Giuliano & S. Hanson (Eds.). *The Geography of Urban Transportation* (4th ed., pp 57-85). New York: The Guilford Press.
- Niu, Y., Ding, C., & Knaap, G. J. (2015). Employment centers and agglomeration economies: Foundations of a spatial economic development strategy. *Economic Development Quarterly*, 29(1), 14-22.
- Overman, H. G., & Puga, D. (2009). Labour pooling as a Source of Agglomeration: An Empirical Investigation. CEPR Discussion Papers;
- Porter, M. E. (1998). *Clusters and the new economics of competition* (Vol. 76, No. 6, pp. 77-90). Boston: Harvard Business Review.

- Power, B., Doran, J., & Ryan, G. (2019). The effect of agglomeration economies on firm deaths: A comparison of firm and regional based approaches. *Urban Studies*, 56(16), 3358-3374.
- Rosenthal, S. S., & Strange, W. C. (2003). Geography, industrial organization, and agglomeration. *Review of Economics and Statistics*, 85(2), 377-393.
- Rosenthal, S. S., & Strange, W. C. (2019). *How close is close? The spatial reach of agglomeration economies* (Syracuse University Working Paper). Retrieved from Syracuse University website: <https://ssrosent.expressions.syr.edu/wp-content/uploads/Rosenthal-Strange-JEP-4-15-2020.pdf>
- Storper, M., & Venables, A. J. (2004). Buzz: Face-to-face contact and the urban economy. *Journal of economic geography*, 4(4), 351-370.
- van Soest, D. P., Gerking, S., & van Oort, F. G. (2006). Spatial impacts of agglomeration externalities. *Journal of Regional Science*, 46(5), 881–899.
- Venables, A. J. (2007). Evaluating urban transport improvements: Cost–benefit analysis in the presence of agglomeration and income taxation. *Journal of Transport Economics and Policy*, 41(2), 173–88.
- Verstraten, P., Verweij, G., & Zwaneveld, P. J. (2019). Complexities in the spatial scope of agglomeration economies. *Journal of Regional Science*, 59(1), 29-55.

About the Upjohn Institute

The W.E. Upjohn Unemployment Trustee Corporation was incorporated on October 24, 1932, as a Michigan 501(c)(3) nonprofit corporation, and is doing business as the W.E. Upjohn Institute for Employment Research. The W.E. Upjohn Institute for Employment Research has been conducting economic research and consultation for 75 years, since its founding in 1945.

The Upjohn Institute is governed by a Board of Trustees, which employs a President who is responsible for the overall operation of the Institute. The President of the Upjohn Institute is Dr. Michael Horigan.

The Upjohn Institute currently employs 104 individuals. Upjohn's research and consultation program is conducted by a resident staff of professional social scientists, 12 of whom are Ph.D.-level economists (senior staff). Senior staff is supported by a staff of research analysts and additional support staff. Upjohn also administers the federal and state employment programs for its four-county area through the local Workforce Investment Board. Upjohn also publishes books on economic development, workforce development, and other employment-related topics.

The Ph.D.-level economists have more than 175 years of collective experience, conducting research on a broad variety of economic and employment topics. Their experience includes, but is not limited to, employment program evaluation, labor market dynamics, labor-management relations, employment and training programs, economic and workforce development, income replacement policy, worker adjustment, the role of education in labor markets, employment and compensation, disability, international comparison of labor adjustment policies, site selection experience, and state, regional, and local economic analysis.

The Upjohn Institute also has a Regional Economic and Planning Services team of specialists who provide economic insights and analysis regionally and statewide in Michigan, in other individual states, and nationally. The team has experience in:

- Economic impact analysis
- Fiscal/cost-benefit impact analysis
- Labor market analysis
- Facilitating and conducting effective one-on-one interviews, focus groups, workshops, and charrette sessions in a diverse array of environments
- Economic and workforce development and education strategies
- GIS mapping abilities
- Rural and urban land use and economic development planning services
- Regional data analysis

For questions or information about this report, contact Kathleen Bolter, Regional Research Analyst, bolter@upjohn.org, or Jim Robey, Director of Regional and Planning Economic Services, 269-365-0450, or jrobey@upjohn.org.