

EVOLUTION OF THE NASHVILLE HEALTHCARE INDUSTRY CLUSTER

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ABSTRACT

While healthcare services have driven the development of different sectors of industry clusters, little attention has been paid to healthcare services as an industry cluster. This study analyzes the healthcare industry's evolution in the Nashville Metropolitan Statistical Area (MSA) through the framework of an industry cluster. The cluster evolution is evaluated by analyzing the presence of clustering antecedents and the regional economic benefits through economic data collected from 2004 through 2022.

Clustering antecedents are found in the Nashville healthcare industry (critical companies tied to each other economically surrounded by competing and cooperating companies, local research organizations, university-supported specialized and non-specialized labor pools, an entrepreneurial funding environment, and a commitment by either a local government or industry champion). We conclude that the healthcare industry in the Nashville MSA qualifies as a cluster and has provided increasing economic benefits to the region over the last 18 years.

The healthcare cluster has contributed significant jobs, business revenue, personal income, and state/local taxes to the regional economy, which has only grown over the study period. The number of healthcare establishments has doubled, providing an 80% increase in direct employment within the sector. Direct generated personal income improved by 106% from 2004 inflation-adjusted dollars, and business revenue injected into the regional economy increased to \$36.8 billion, representing a 98% increase from 2004 inflation-adjusted dollars.

Industry clusters generally require a catalyst to form and sustain. In the case of the Nashville Healthcare Industry Cluster, uncharacteristically, the catalyst has not been a government entity but a local membership trade association serving as an industry champion (The Nashville Health Care Council - NHCC). The NHCC has supplemented the typical governmental role in developing industry clusters (e.g., government infrastructure development for logistics clusters) and has been a driving force facilitating networking, collaboration, and development, contributing to a self-sustaining entrepreneurial environment supported by venture capital and local universities providing specialized and nonspecialized labor forces.

This study identifies the Nashville MSA Healthcare Industry as an industry cluster that has provided significant benefits to the regional economy over the last 18 years. It also identifies the NHCC as the driving force behind developing an environment conducive to industry clustering. The success of the Nashville Healthcare Industry Cluster is supported by at least two other regional areas replicating the model with a Health Care Council organization.

INTRODUCTION

Industry clusters have been researched since 1920, when Alfred Mitchell analyzed three conditions conducive to cluster development (Mitchell, 1920). The three criteria identified by Mitchell are labor availability, the existence of specialized suppliers, and the possibility of external “spillovers” (knowledge sharing). Since 1920, there has been much research to refine the cluster definition and provide causes and incubating factors in which industry clusters develop (Isbasoiu, 2006).

Healthcare services have been viewed as a driver of forming and sustaining nonhealthcare industry clusters as a realized benefit in improving community health for the sizeable supporting workforce required. However, healthcare services as clusters have received less attention in the literature, yet there is evidence that various industry participants across multiple verticals can cluster, assuming a driving and instigating force exists. One such example is the healthcare industry in the Nashville Metropolitan Statistical Area (MSA). The Nashville MSA is home to more than 46 major public and private healthcare companies. In addition, seven of the nation’s 15 leading for-profit acute care hospitals and nursing management companies, accounting for approximately 34 percent of the investor-owned hospitals in the United States, are headquartered within the Nashville MSA (Arik and Devi, 2023).

In this study, we seek to analyze the locating of companies from various healthcare verticals within the Nashville MSA in the last 18 years, forming a significant healthcare cluster. We analyze the cluster through the lens of industry cluster development criteria, demonstrating that while less structured than examples of other industry clusters (logistics, biopharmaceutical, financial, or medical device), the healthcare environment within the Nashville MSA qualifies as a cluster driven by a local membership association, The Nashville Health Care Council (NHCC), generating a considerable impact on the local and regional economy and the associated industry environment.

The paper is structured as follows. The next section discusses existing literature concerning industry cluster criteria and what makes an industry cluster, forming the basis of our analysis of the healthcare industry in the Nashville MSA. We then discuss the methodology and data used in the study, resulting in our findings. Finally, we present our conclusions and discuss the implications and limitations of this study.

LITERATURE REVIEW

The review of selected literature concerning industry clusters provides several defining criteria. Porter (1998) defined clusters as “geographically proximate groups of companies and associated institutions in a particular field, linked by commonalities and complementarities.” Subsequently, cluster definitions have been refined to include geographic and spatial clustering of economic activity, relationships between industry sectors, the presence of a central actor, cooperation, competition, and the role of social interaction (Jacobs and De Long, 1996). Rivera, Gligor, and Sheffi (2016) define industrial clusters as “groups of interrelated firms that cooperate and compete to create wealth within a certain geographical area.” Essentially, clusters need a

critical mass of firms located in geographic proximity that are economically tied to each other along with significant financial resources for investment.

There is no agreement concerning a general theory or law of how clusters form (Isbasoiu, 2006). The conditions vary depending on the cluster's type, industry, and geography. However, some criteria have been discussed in the relevant literature. For example, Wolfe & Gertler (2004) propose that clusters can form around one or two critical firms that attract other companies over time. Clusters can also form due to public sector investment, such as research-intensive universities for knowledge-based industries or substantial infrastructure investment for logistics clusters. Another driving factor can be a strong commitment by either local government or an industry champion to provide "leadership, the vision, and the wear-with-all to make industry clusters happen" (Roberts, 1998).

Hallock, Thai, Peszynski, and Chhetri (2018) provided a literature review of the benefits of industry clusters that provide insight into cluster requirements. These authors discussed labor (availability of specialized and non-specialized labor, knowledge spillovers, and technology spillovers) and location or spatial (proximity, collaboration, and networking) as key cluster benefits. Realizing these benefits requires a strong specialized and non-specialized labor pool and an environment that helps initiate and support collaboration and communication opportunities to facilitate knowledge sharing.

While clusters provide regional economic benefits, they can also improve technological and operational innovation resulting from knowledge spillover (Cui, Wang, Xu, & Li, 2022). Various types of organizations, such as government agencies, research institutes, trade organizations, companies, and universities, can contribute to the relationship between regional development and the creation of innovative performance in industry clusters (Kim, Hwang, & Yoon, 2023). Clusters can provide mechanisms for sharing tacit knowledge or knowledge, skills, and abilities learned through experience. This knowledge-sharing occurs as employees shift between cluster members and move into the economic region from other areas (Cooke, 2002). The tacit knowledge-rich environment can also drive companies to locate within a cluster to gain or prevent the loss of such knowledge by retaining access to skilled workers and competencies (Sammorra and Belussi, 2006). Therefore, clusters can attract a highly skilled and knowledgeable workforce that attracts more companies that rely on these skills, further growing the cluster in a self-feeding cycle.

METHODOLOGY AND DATA

Our analysis is based on data collected for 2004, 2008, 2014, and 2022 concerning the healthcare industry in the Nashville MSA. The relevant objectives of this study are the analysis of industry cluster characteristics and the trends, scope, and impact of the healthcare industry cluster on the regional economy, the economic significance to the region of healthcare companies headquartered in Nashville, and the role of the Nashville Health Care Council in promoting the healthcare industry in the Nashville MSA.

The healthcare cluster includes core healthcare providers that provide services directly to healthcare consumers, such as

- Ambulatory Services
- Hospitals
- Nursing Care Facilities
- Physicians

Peripheral healthcare suppliers and supporting companies include related healthcare industries, such as management companies and biomedical research entities providing services to core healthcare providers or the specialized and nonspecialized workforce, such as

- Healthcare Management Organizations
- Consulting Organizations
- Colleges and Universities
- Research Organizations
- Public Health Organizations
- Medical Insurance
- Healthcare Manufacturing and Wholesalers,
- Pharmacies
- Drug Stores
- Ophthalmic Goods

These entities have a direct impact on the economy through employment (total number of full-time employees), personal income (total reported pre-tax payroll), and business sales (total spending of the healthcare cluster to purchase goods and services in the associated economy). There is also an indirect impact referring to employment, business sales, or income generated by the interaction of local businesses with the healthcare industry cluster and by suppliers via business-to-business transactions. For example, a hospital purchases goods and services from local businesses for its operation. This hospital's spending in the local economy means additional jobs, business revenues, and personal income in other sectors. Induced impact refers to the employment, sales, and personal income generated in the local economy by employee spending (Arik and Devi, 2023).

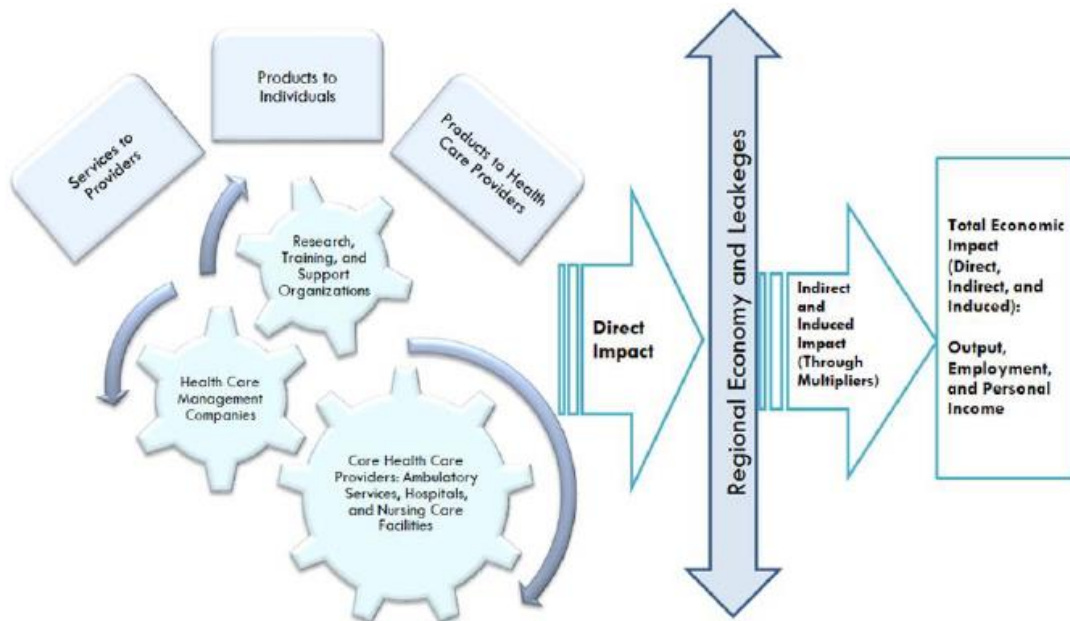
The data used in this study to understand economic impact was collected from multiple sources and used to construct a time-series perspective on healthcare indicators, as detailed in the Appendix of Arik and Devi (2023). Additional data was collected from an NHCC member survey targeting 252 Nashville MSA organization members to understand the impact of the NHCC. The survey included company profile, company operations, and Nashville Health Care Council Impact. One hundred twenty-eight companies accessed the survey, but only 60 responses were usable, representing a response rate of 23.8 percent.

One way to quantify the economic impact of the cluster is to use a counterfactual approach, which removes the whole healthcare industry cluster from the economy and then measures the economic impact of the subtraction on the economy. The conceptual framework of how the cluster impacts the economy is included in Figure 1.

IMPLAN impact modeling software (a predictive model based on regional accounting matrices) was used to measure the impact of the core and peripheral. The IMPLAN model considered the direct employment, business sales, and income generated by the healthcare industry cluster and the additional or secondary impacts of all economic activity related to such

employment and business sales. The indirect and induced effects of the healthcare subsectors were adjusted on each other within the healthcare industry cluster. The study assumed that IMPLAN regional purchasing coefficients (RPCs) represent the current situation, and the differences between 100 percent local purchase and the default model RPCs determine the leakages outside of Nashville. To avoid double-counting, the core healthcare providers were not allowed to stimulate the cluster’s healthcare sector and other subsectors.

Figure 1: Conceptual Framework for Impact Analysis



Source: Authors

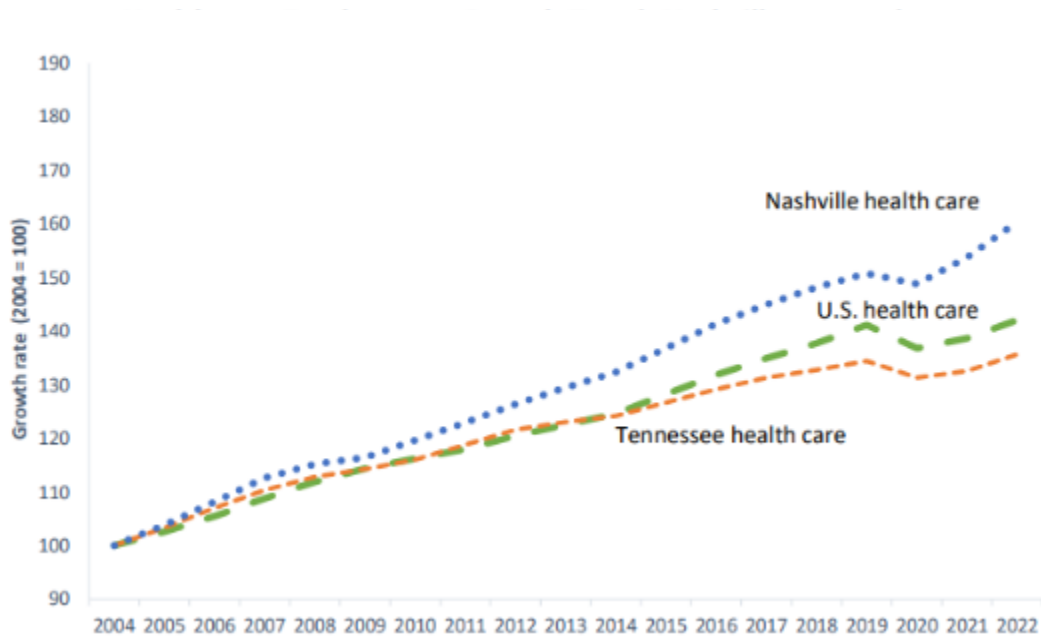
RESULTS

The Nashville MSA healthcare industry has grown significantly over the last 18 years, including companies, employment, and economic impact (refer to Table 1). This growth is significant to study because it has outpaced both Tennessee and national industry growth. One such example (Figure 2) is employment growth, which has outpaced both the Tennessee and national growth rates (Arik and Devi, 2023). Many factors contribute to this growth, including business climate, available venture capital, adequate labor supply, and other opportunities.

Year	Nashville-Based Healthcare Establishments	Industry Cluster Direct Employment (# of Jobs)	Industry Cluster Generated Personal Income (inflation-adjusted to 2022 \$ Billions)	Industry Cluster Direct, Business Revenue Injected into Economy (inflation-adjusted to 2022 \$ Billions)
2004	2,237	94,346	\$9.8	\$18.6
2008	2,703	113,453	\$8.2	\$23.1
2014	4,027	125,918	\$19.7	\$28.6
2022	4,755	170,702	\$20.3	\$36.8

Source: Arik and Penn, 2006; Arik, 2010; Arik, 2015; Arik and Devi, 2023

Figure 2: Healthcare Employment Growth Trend: Nashville versus the U.S. and Tennessee U.S. and Tennessee



Source: Arik and Devi, 2023

Nashville MSA Healthcare Industry as a Cluster

The Nashville MSA healthcare industry supports a cluster definition based on multiple criteria, such as critical companies tied to each other economically surrounded by competing and

cooperating companies supporting various components of the industry; research organizations and university-supported specialized and non-specialized labor pools; an entrepreneurial and robust funding environment; and a commitment by either a local government or an industry champion. (Arik and Devi, 2023). Nashville-based healthcare establishments have increased by 113% to 4,755 in 2022, demonstrating a clear trend toward company attraction to the cluster. In 2022, 17 publicly traded healthcare companies were headquartered in Nashville, and 46 major Nashville-based public and private investor-owned healthcare management companies. These companies represented a global reach across the healthcare industry.

Physical Clustering Linked by Commonalities and Complementarities

The initial impetus for the cluster dates back to the 1960s, with the location of three critical hospital companies in the Nashville area: Hospital Corporation of America (HCA), Hospital Affiliates International (HAI), and General Care Corporation. Each of these companies subsequently instigated hundreds of spinoffs, new companies, mergers, and acquisitions into all aspects of the healthcare industry (A History of Healthcare in Nashville, 2015), evolving into the existing complex network of healthcare cluster companies.

The strong network of healthcare companies and expertise now serves as a strong attractor to new competing, supporting, and complimentary entrants into the cluster. For example, the Center for Medical Interoperability opened its headquarters in Nashville in 2017. The center is a cooperative research and development lab founded by health systems to simplify and advance data sharing among medical technologies and systems. The main criterion for the center's location in Nashville was the proximity to major health systems (Landi, 2018).

Entrepreneurial Environment

The Nashville MSA is home to a robust entrepreneurial environment supporting industry innovation. Starting in the 1960s with the founding of one of the first multi-hospital systems (HCA) to the invention of the ambulatory surgery model credited to Surgical Care Associates (SCA) formed in 1985, the Nashville market has been a leader in healthcare innovation. Much of this entrepreneurial activity can be explained through the social/work network in the Nashville healthcare business community (Carr, Topping, Woodard, & Burcham, 2004). These authors show how an entrepreneur who enters a network establishes contact with multiple nodes (people and companies), providing additional information and lowering transaction costs. The increased entrepreneurial activity leads to more nodes and entrepreneurial activity; "healthcare entrepreneurship creates more healthcare entrepreneurship" (Carr et al., 2004). A strong venture capital fund structure underpins the entrepreneurial environment, contributing over \$370 million in 2022, representing just over 26% of all venture capital activity in the region (Arik and Devi, 2023).

Labor and Public Sector Investment

The Nashville MSA supports the specialized and non-specialized labor supply with two private medical-focused universities, three public universities, four private universities, and an extensive network of smaller private colleges and public community colleges. The three public universities awarded over 8,100 Bachelor's and Master's degrees in the 2019-2020 academic year. (THEC, 2021), and the four private universities awarded just over 7,300 Bachelor's and Master's degrees in 2021. The largest private university is Vanderbilt, a major research and teaching hospital. Additionally, the University of Tennessee and Memphis University are just outside the MSA and supply the healthcare industry labor force.

Industry Champion

The Nashville Health Care Council (NHCC) is an industry association comprising over 300 member organizations catalyzing leadership and innovation (NHCC, 2023; Landi, 2018). This organization is the driving force facilitating networking and collaboration within the healthcare cluster. The NHCC supports leadership with two programs (Fellows Program and Leadership Health Care). The Fellows Program provides a customized curriculum for existing leaders to learn from peers leading top healthcare organizations of all sizes and geographies nationwide (NHCC, 2023). The Leadership Health Care program “provides members unique educational programs and networking opportunities.” The initiative has a membership of more than 500 up-and-coming healthcare industry leaders from hundreds of organizations (NHCC, 2023). The organization provides additional collaboration and networking activities with various events throughout the year. The organization has achieved high levels of success and has served as a model for the Austin Healthcare Council and the Health Care Council of Chicago (Landi, 2018).

The NHCC member survey highlighted the impact of the organization on the cluster. Responding company CEOs indicated 25 ways the NHCC contributes to the entrepreneurial environment in the Nashville MSA. Of the responses, the six most common were networking, connecting players from all sides of the industry: connectivity is related to networking but is highly emphasized in the comments, collaboration, events organized by the Council, training- from the fellows program to other educational activities, and development of educational materials and resources for opportunities and challenges.

Members were also asked to provide three words to describe the contribution the Nashville Health Care Council makes to the growth of the healthcare industry in the Nashville MSA. The top six of the more than 50 distinct responses included collaboration, network, leadership, education, innovation, and connections. The survey responses provide evidence that the NHCC serves as a driving force in facilitating networking and knowledge sharing across the different sectors of the healthcare cluster in this region. While local government participates in cluster development through typical business attraction and retention activities, the NHCC is a key factor contributing to cluster growth.

Nashville MSA Healthcare Cluster Impact on the Regional Economy

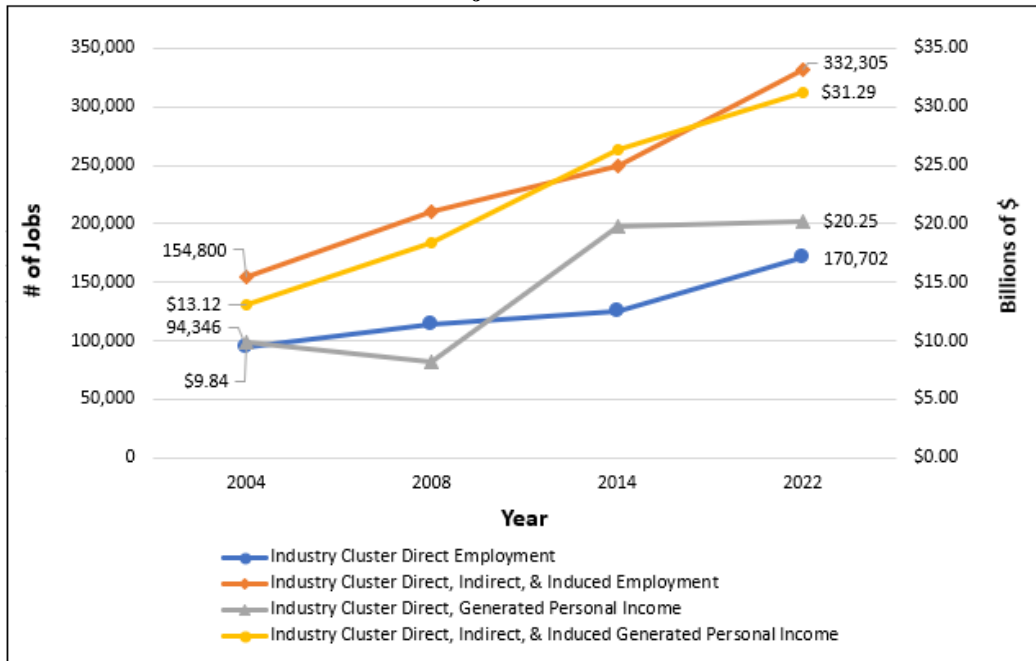
This study found multiple indications of the positive impact of the Nashville MSA healthcare cluster on the regional economy. The impact has grown substantially. Employment is a critical factor for clusters. Healthcare clusters depend on a strong labor market to provide for specialized (medical, patient care, etc.) and non-specialized job roles (support, administration, etc.). Additionally, a critical mass of companies and employees is required to realize the “spillover” effect of knowledge sharing and innovation. The Nashville MSA healthcare cluster has experienced significant employment growth (Just over 80% in direct employment and 115% in direct, indirect, and induced employment).

The cluster has also contributed significantly to personal income in the Nashville MSA. Direct personal income generated by the cluster adjusted for inflation to 2022 dollars has grown by nearly 106% from 2004 to 2022 to \$20.25 billion (refer to Table 2 and Figure 3), representing 23% of the total personal income in the Nashville MSA.

Year	Industry Cluster Direct Employment (# of Jobs)	Industry Cluster Direct, Indirect, & Induced Employment (# of Jobs)	Industry Cluster Direct, Generated Personal Income (inflation-adjusted to 2022 \$ Billions)	Industry Cluster Direct, Indirect, & Induced Generated Personal Income (inflation-adjusted to 2022 \$ Billions)	Percent of the Nashville MSA’s total personal income
2004	94,346	154,800	\$9.8	\$13.1	18%
2008	113,453	211,059	\$8.2	\$18.4	22%
2014	125,918	249,345	\$19.7	\$26.3	26%
2022	170,702	332,305	\$20.3	\$31.3	23%

Source: Arik and Penn, 2006; Arik, 2010; Arik, 2015; Arik and Devi, 2023

**Figure 3: Nashville MSA Healthcare Cluster Employment and Generated Personal Income
Inflation Adjusted to 2022 Dollars**



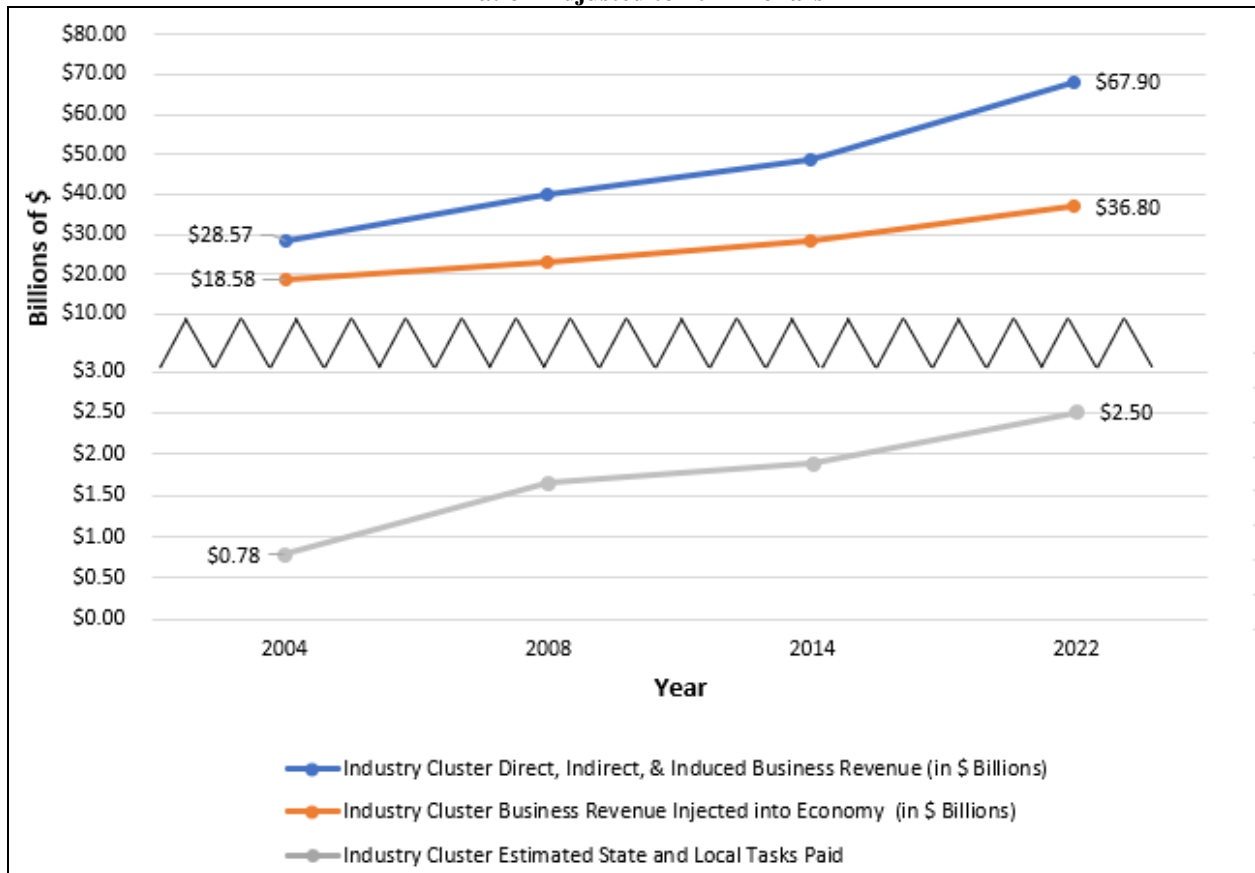
Source: Arik and Penn, 2006; Arik, 2010; Arik, 2015; Arik and Devi, 2023

Turning to the economic impact on the surrounding region, we also find significant evidence of growth. The cluster generated over \$67 billion of business revenue in 2022, representing a 138% increase over 2004 (inflation-adjusted to 2022 dollars). The cluster has also contributed over \$2.50 billion in state and local tax revenue in 2022. Total direct, indirect, and induced business revenue grew from \$28.57 billion in 2004 (inflation-adjusted to 2022 dollars) to \$67.90 billion in 2022 (refer to Table 3 and Figure 4).

Year	Industry Cluster Direct, Indirect, & Induced Revenue (inflation-adjusted to 2022 \$ Billions)	Industry Cluster Business Revenue Injected into the Economy (inflation-adjusted to 2022 \$ Billions)	Industry Cluster Estimated State and Local Tasks Paid (inflation-adjusted to 2022 \$ Billions)
2004	\$28.6	\$18.6	\$0.8
2008	\$40.1	\$23.1	\$1.7
2014	\$48.6	\$28.6	\$1.9
2022	\$67.9	\$36.8	\$2.5

Source: BERC Health Care Industry Nashville MSA Analysis, 2005, 2010, 2015, and 2023

**Figure 4: Nashville MSA Healthcare Cluster Economic Impact
Inflation Adjusted to 2022 Dollars**



Source: BERC Health Care Industry Nashville MSA Analysis, 2005, 2010, 2015, and 2023

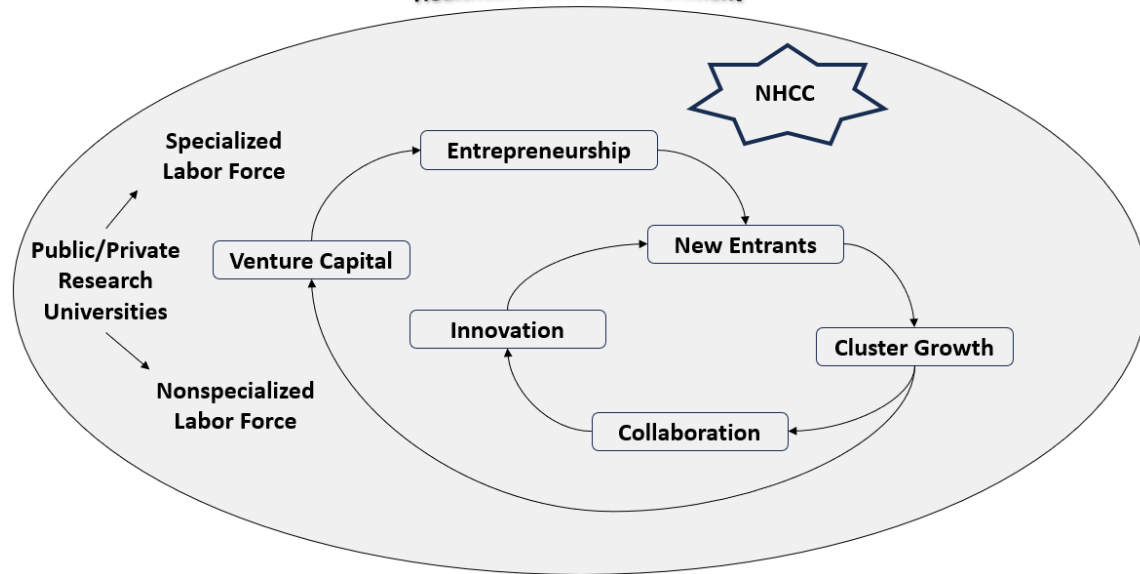
IMPLICATIONS AND LIMITATIONS

Industry clusters are important to a region’s economic growth and participating companies’ associated performance. The Nashville MSA healthcare cluster fosters collaboration and innovation, attracting new entrants. Actual and potential growth, in turn, attracts venture capital that contributes to a robust entrepreneurship environment, further attracting new entrants. The NHCC serves as the conduit and catalyst through actions and programs that cultivate knowledge/technology sharing, collaboration, and networking as part of the cluster environment, adding to public and private university support of the specialized and nonspecialized labor force (refer to Figure 5, illustrating the components of the cluster environment). These components combine to contribute to the growth and sustainability of the healthcare cluster.

The positive historical impact of the Nashville MSA healthcare cluster on the regional economy implies that sustained performance and growth of the cluster contribute significantly to the development of the surrounding economy. As the cluster grows, so will the impact of expanding employment, personal income, and tax revenues. As discussed above, successful

entrepreneurship results in more entrepreneurship. Likewise, the knowledge sharing through company communication and collaboration fostered by the cluster industry champion, in this case, the NHCC, grows the innovation-rich culture, resulting in more companies desiring to locate within the cluster. In the end, a self-sustaining cycle of growth is established.

**Figure 5: Nashville Healthcare Cluster Environment
Healthcare Cluster Environment**



The implications are significant for regions with a high presence of healthcare industry companies. Colocation and collaboration can grow organically, but the NHCC provides an example of how growth can be fostered by focusing on the critical characteristics of industry clusters, specifically collaboration and networking.

In exploring the Nashville MSA healthcare cluster, this paper did not analyze other potential healthcare clusters following the same path. Further research can review the development of the healthcare industry in Austin and Chicago to evaluate the impact of similar industry champion organizations, comparing these regions to Nashville's success. In this manner, the model can be validated and serve as a roadmap for future potential healthcare clusters.

CONCLUSIONS

Healthcare clusters are less researched than other industry clusters, but their impact on regional economies and healthcare services is significant. This study shows the evolution of the economic impact of the healthcare cluster on the Nashville MSA economy through the growth of jobs, personal income, business revenue, and state and local tax contributions to local governments. Our contribution to existing knowledge is identifying the NHCC's role in developing and supporting an environment conducive to cluster growth and sustainability. Other industry clusters, such as logistics clusters, rely extensively on local and state government

funding for infrastructure and other environmental development. While supported by local and state governments through favorable incentives, Nashville's healthcare cluster success is more strongly driven by a robust industry organization dedicated to the service of its participating members.

REFERENCES

- A History of Healthcare in Nashville (2015, August 4). Modern Healthcare. <https://www.modernhealthcare.com/article/20150824/SPONSORED/150829961/a-history-of-healthcare-in-nashville>
- Arik, M. (2010). Health Care Industry Nashville MSA: Its Scope and Impact on the Regional Economy. Middle Tennessee State University, Business and Economic Research Center, Studies.
- Arik, M. (2015). Health Care Industry Nashville MSA 2015 Trends, Scope and Impact on the Regional Economy. Middle Tennessee State University, Business and Economic Research Center, Studies.
- Arik, M. and Devi, R. (2023). Health Care Industry Nashville MSA 2023 Trends, Scope and Impact on the Regional Economy. Middle Tennessee State University, Business and Economic Research Center, Studies.
- Arik, M. and Penn, D. (2006). Health Care Industry Nashville MSA: Its Scope and Impact on the Regional Economy. Middle Tennessee State University, Business and Economic Research Center, Studies.
- Carr, J. C., Topping, S., Woodard, B., & Burcham, M. (2004). Health Care Entrepreneurship in the Nashville Region: Societal Linkages, Change Dynamics, and Entrepreneurial Responses. (Undetermined). *Journal of Applied Management & Entrepreneurship*, 9(1), 49–63.
- Cooke, P. (2002). Regional innovation systems: General findings and some new evidence from biotechnology clusters. *Journal of Technology Transfer*, 27(1), 133-145
- Cui, S., Wang, Y., Xu, P., & Li, L. (2022). Ecological welfare performance, industrial agglomeration and technological innovation: an empirical study based on Beijing–Tianjin–Hebei, Yangtze River Delta, and Pearl River Delta. *Environment, Development and Sustainability*.
- Hallock, S., Thai, V. V., Peszynski, K., & Chhetri, P. (2018). Antecedents and outcomes of logistics cluster benefits – A Delphi panel method. ATRF 2018 - Australasian Transport Research Forum 2018, Proceedings.
- Isbasoiu, G.-M. (2006). Industrial Clusters and regional development: The case of Timisoara and Montebelluna. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.1022310>
- Jacobs, D., & De Man, A.-P. (1996). Clusters, industrial policy, and firm strategy: A menu approach. *Technology Analysis and Strategic Management*, 8(4), 425-438
- Kim, H., Hwang, S.-J., & Yoon, W. (2023). Industry cluster, organizational diversity, and innovation. *International Journal of Innovation Studies*, 7(3), 187-195
- Landi, H. (2018, June 22). In Nashville, a History of Collaboration is Spurring Healthcare Innovation at an Accelerated Pace. Healthcare Innovation. <https://www.hcinnovationgroup.com/population-health-management/article/13030457/in-nashville-a-history-of-collaboration-is-spurring-healthcare-innovation-at-an-accelerated-pace>.
- Mitchell, A. (1920). Principles of Economics (Great Minds Series). Prometheus.
- Nashville Health Care Council. (2023, August). About the Council. <https://healthcarecouncilannualreport.com/#aboutthecouncil>
- Porter, M. F. (1998). Clusters and the New Economics of Competition. *Harvard Business Review*, 77.
- Rivera, L., Gligor, D., & Sheffi, Y. (2016). The benefits of logistics clustering. *International Journal of Physical Distribution & Logistics Management*, 46(3), 242-247.
- Roberts B. (1998): Facilitating Cluster Industry Development. Paper Prepared for the National Conference Sustainable Economic Growth for Regional Australia, 2-3 November, 1998.
- Sammarra, A., & Belussi, F. (2006). Evolution and relocation in fashion-led Italian districts: Evidence from two case studies. *Entrepreneurship and Regional Development*, 18(6), 543-562.

THEC. 2021. Tennessee Higher Education Fact Book 2020-2021.
https://www.tn.gov/content/dam/tn/thehc/bureau/research/other-research/factbook/Fact%20Book%202020-2021_Full%20Draft_Suppressed.pdf