

Roadmap for the Washington Region's Economic Future: Seven Key Economic Clusters



November 24, 2015



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**Roadmap for the Washington Region’s Economic Future:
Seven Key Economic Clusters
Inforum Report**

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Executive Summary

Successful cities exploit their comparative advantages by attracting innovation, talent, and funding by enabling connections within natural and existing “clusters” of entrepreneurs, businesses, non-profit assets, universities, and regional governments. Even when they are a small share of the economy, these dynamic sectors can become important drivers of overall regional growth. It is important, therefore, for regional policy makers to identify comparative advantages and to understand how they can be nurtured within the global economy.

It is often argued that metropolitan centers around the world are in transition towards “knowledge economies,” which leverage information, medical, and other new technologies to drive economic dynamism and growth. The Washington DC Metropolitan Area (WMA) economy has long been on this trajectory, and it already possesses fundamental ingredients to excel in the global environment.

As the national capital region, the WMA will always contain core world-class expertise for advocacy activity, media and information channels, and travel and tourism. Moreover, numerous private-sector information technology and business operations firms have developed around federal operations and now call the region home. The main assets of these clusters are large, educated, and experienced pools of management consultants and computer systems professionals. Other centers of knowledge include formidable science, business, financial, and international expertise, including the large influence of foreign embassies, think tanks, and multilateral institutions.

In this report we identify and quantify seven industry “clusters” that can drive the Washington region’s growth and development over the next decade. Clusters include: Advocacy; Information and Communication Technology; Science and Security Technology; Biological and Health Technology; Business and Financial Services; Media and Information; and Business and Leisure Travel.

Detailed industry and occupational employment data are used to identify advanced industrial clusters already established within the regional economy. The clusters were chosen for their employment levels and job quality, growth potential, high wages, and natural location in the WMA. We find, not surprisingly, that the region’s competitive advantages are precisely in the sectors which have hitherto developed mostly under federal funding. The trick will be to use the region’s many institutional assets to facilitate a “pivot” of a talented and experienced work force toward more non-federal activities.

Table E-1: The Seven Clusters – Jobs and Wages

Cluster		Washington Metro Area			Location Quotient
		2014 Jobs	2003-14 Job Growth	2014 Avg Wage	
Advocacy	ADV	115,731	19%	76,097	3.5
Information and Communications Technology	ICT	204,489	5%	97,216	2.7
Science and Security Technology	SST	123,785	19%	90,211	1.8
Biological and Health Technology	BHT	55,396	25%	88,324	2.0
Business and Financial Services	BFS	190,128	39%	88,813	1.8
Media and Information	MAI	35,745	-20%	73,450	1.5
Business and Leisure Travel	BLT	85,919	-1%	45,457	1.1
Total of Seven Clusters	TOT	811,193	15%	84,028	2.0
Washington Metro Area	WMA	2,973,337	9%	62,213	

Source: JobsEq and Inforum calculations

Table E-1 shows the seven clusters accounted for more than 800,000 jobs in the DC Metro area in 2014, more than a quarter of the region’s total of nearly 3 million jobs. Employment in the clusters grew by 15 percent between 2003 and 2014, compared to 9 percent for the regional economy as a whole. Over half of the employees in these seven clusters are in high-education and knowledge occupations. For example, both Computer and math professionals and Management staff account for approximately 150,000 employees within the seven clusters; Business operations professionals (82,000) are the next highest categories, followed by media (46,000), financial (45,000), and engineering (43,000).

The final column of Table E-1 is the location quotient for each cluster. A cluster location quotient (LQ) is the share of that industry’s jobs in the region divided by the share of that industry’s jobs in the national economy. A LQ exceeding 1.0 indicates a regional concentration, and presumably a comparative advantage for the industry. A location quotient of more than 2.0 means that the regional share of the industry’s employment is twice as large as the national share. WMA shows a significant regional concentration in all the clusters, especially in Advocacy and Information and communications technology. The lowest LQs are in Media and information and Business and leisure travel.

Current cluster concentrations does not guarantee future success, however. Federal discretionary defense and nondefense expenditures will continue to grow slowly, so accelerated growth in the region will depend on boosting competitiveness in new markets. This is only possible by nurturing vital components of the clusters listed above.

In examining the future for the seven WMA clusters through 2025, we generated two employment scenarios for each of the key clusters and then for the WMA as a whole. The first scenario posits that each cluster successfully diversifies into other non-federal markets and employment growth in knowledge-based sectors exceeds projections of national growth for the

same industries. The second scenario assumes that the clusters are not able to find sources of growth beyond the federal government. In this case, WMA employment lags national growth in the key sectors and overall economic and employment growth fall to the national average and perhaps less.

Table E-2: Forecasts for Job Growth in the Seven Clusters and WMA, 2014 – 2025

		Washington Metro Area					
		History		Successful Diversification		Business as Usual	
Cluster		2014 Jobs	2003-14 Growth	2025 Jobs	2014-25 Growth	2025 Jobs	2014-25 Growth
Advocacy	ADV	115,731	19.0%	138,868	20.0%	122,303	5.7%
Information Communications Technology	ICT	204,489	5.5%	224,872	10.0%	213,621	4.5%
Science and Security Technology	SST	123,785	19.0%	147,104	18.8%	135,707	9.6%
Biological and Health Technology	BHT	55,396	25.1%	67,929	22.6%	58,388	5.4%
Business and Financial Services	BFS	190,128	39.0%	269,053	41.5%	218,851	15.1%
Media and Information	MAI	35,745	-20.1%	41,667	16.6%	36,292	1.5%
Business and Leisure Travel	BLT	85,919	-1.3%	91,512	6.5%	87,807	2.2%
Total of Seven Clusters	TOT	811,193	14.6%	981,005	20.9%	872,969	7.6%
Washington Metro Area	WMA	2,973,337	9.3%	3,402,570	14.4%	3,092,270	4.0%
United States	USA	152,077,125	5.1%	166,505,562	9.5%	166,505,562	9.5%

Source: JobsEq and Inforum forecasts

Table E-2 provides the results of this exercise, displaying three sets of job levels and growth rates for each cluster. The first two columns provide the number of 2014 jobs and the employment growth for each cluster for the eleven years from 2003 to 2014. Total employment in the seven clusters grew by 14.6 percent over 2003 to 2014, helping to drive overall WMA job growth by 9.3 percent, compared to 5.1 percent growth in the national economy.

The second two columns show the results of the Successful Diversification scenario with 2025 job levels and job growth from 2014 to 2025. In the eleven years from 2014 to 2025, employment in the previously fast-growing clusters are expected to grow at about the same rate as the past eleven years. ICT grows a bit faster than the previous period. Unlike the historical period, MAI and BLT employment is expected to grow. Total employment in the sectors rises by 20.9 percent and total regional employment increases by 14.4 percent. This figure for job growth is similar to many current forecasts of the WMA over the next decade, suggesting that these forecasts already assume successful diversification.

The last two columns of the table show the more pessimistic case where WMA employment growth in the key knowledge-based clusters is much slower, obtaining only 7.6 percent growth from 2014 to 2015. In this scenario, total regional employment growth over the next eleven years is dragged down to 4.0 percent, compared to 9.5 percent in the nationwide economy.

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Chapter 0: Overview

Introduction

The economic development model of the early 21st century can be characterized with the paradoxical statement: “In a global economy, all economics is local.” Economists are used to modeling individual consumers, firms, government, and industries, but the so-called “new economic geography” places more emphasis on the spatial dimension. In particular, economists such as Michael Porter show how developments in individual metropolitan areas determine economic growth and shape economic development.² Successful cities exploit their comparative advantages by attracting innovation, talent, and funding by enabling connections within the natural and existing “clusters” of entrepreneurs, businesses, non-profit assets, universities, and regional governments.³ Even when they are a small share of the economy, these dynamic sectors can provide important spillovers that help drive overall regional growth. It is important, therefore, for regional policy makers to identify comparative advantages and to understand how they can be nurtured within the global economy.

It is often argued that metropolitan centers around the world are in transition towards “knowledge economies,” leveraging information, medical, and other new technologies to drive economic dynamism and growth. On this trajectory for some time, the Washington DC Metropolitan Area (WMA) economy already possesses fundamental ingredients to excel in the global environment.

The WMA is the center for the U.S. federal government, politics, non-profits, and non-governmental organizations. As the national capital region, the WMA will always contain core world-class expertise for advocacy activity, media and information channels, and travel and tourism. Moreover, numerous private-sector information technology and business operations firms have developed around federal operations and now call the region home. The main

¹ The authors of this report are Jeff Werling, Jeff Lemieux, and Troy Wittek. Jeff Werling can be contacted at werling@econ.umd.edu and 301 405-4607.

² See for example: <http://www.isc.hbs.edu/competitiveness-economic-development/Pages/default.aspx>

³ See: Brad McDearman and Ryan Donahue, “The 10 lessons from global trade and investment planning in U.S. metro areas,” Report of the Brookings Metropolitan Policy Program, May 27, 2015 (<http://www.brookings.edu/~media/Research/Files/Reports/2015/05/26-10-lessons-exports/TenLessons.pdf?la=en>), and Richard Florida, “The Boom Towns and Ghost Towns of the New Economy,” *The Atlantic*, October 31, 2013 <http://www.theatlantic.com/magazine/archive/2013/10/the-boom-towns-and-ghost-towns-of-the-new-economy/309460/>

assets of these clusters are large, educated, and experienced pools of management consultants and computer systems professionals. Other centers of knowledge include formidable science, business, financial, and international expertise, including the large influence of foreign embassies, think tanks, and multilateral institutions.⁴

Federal discretionary defense and nondefense expenditures will continue to grow slowly, so accelerated growth in the region will depend on boosting competitiveness in new markets. Fortunately, these knowledge-based industry clusters are precisely those in the best position to take advantage of new opportunities in private markets, state and local administration, and in international markets. Moreover, the clusters themselves are not self-contained, but exist within ecosystems which include suppliers, customers, partners, universities, and various levels of government. Each ecosystem spurs new and innovative businesses that address the challenges faced by the community, and each of the WMA clusters benefit by tight links with other core clusters of the region. The critical mass of knowledge activities creates a complex but competitive regional economic base.

In this report we identify and quantify seven industry “clusters” that can drive the Washington region’s growth and development over the next decade. Detailed industry and occupational employment data are used to identify advanced industrial clusters already established within the regional economy. The clusters were chosen for their employment levels and job quality, growth potential, high wages, and natural location in the WMA. We find, not surprisingly, that the region’s competitive advantages are precisely in the sectors which have hitherto developed mostly under federal funding. The trick will be to use the region’s many institutional assets to facilitate a “pivot” of a talented and experienced work force toward more non-federal activities.

The following economic clusters are identified:

(1) Advocacy (ADV) DC is a logical setting for advocacy organizations, ranging from well-established lobbying firms and trade associations to philanthropic foundations to startup grassroots organizations. Much of the nation’s social science research is supported by these entities, and much of that activity is conducted within the Beltway.

(2) Information and Communications Technology (ICT) The federal government has attracted a large number of information and communication technology companies and professionals to the area. A large and sophisticated ICT sector is particularly important in the global economy since it supports other regional industries via spillovers of technology and productivity.

(3) Science and Security Technology (SST) Proximity to the national defense, intelligence, and space sectors has enticed science and security technology firms to the region. This advanced technology cluster has important new opportunities for growth, and their presence provides

⁴ Richard Florida, “The Truth About D.C.’s Growing Knowledge-Based Economy, The Atlantic City Lab, October 13, 2013, <http://www.citylab.com/work/2013/10/truth-about-dcs-growing-knowledge-based-economy/7317/>

important spillovers for other clusters in the metropolitan area. Moreover, the strong local ICT cluster contains particular expertise in cyber-security and so will be intimately linked with SST.

(4) Biological and Health Technology (BHT) The region's role in health financing and research comes through the Centers for Medicare and Medicaid Services (CMS), the National Institutes of Health (NIH), and the Federal Food and Drug Administration (FDA). These organizations provide a continuing catalyst for new biological and health research performed at universities and private labs throughout the region. One of the most significant efforts will revolve around health information technology, another area where the ICT sector becomes important.

(5) Business and Financial Services (BFS) A large WMA management consulting presence has developed supporting the federal government, and most of this sector will continue in this role. But these organizations also bring specific knowledge to the markets of the global economy. Given it is the home of many important institutions such as the World Bank, the IMF, and the Federal Reserve Board, Washington will continue to play an important role in global finance.

(6) Media and Information (MAI) Washington will always be a primary source for the nation's news and information. Despite a market shift from print to digital publications, the WMA remains a hub for world-class documentary, advocacy, and political media and information firms. All global print and electronic networks compete and collaborate within an ecosystem using cutting-edge technology and talented and powerful global actors.

(7) Business and Leisure Travel (BLT) The WMA's professional environment, rich history, and national landmarks make it a natural destination for business and leisure travel. Tourists contribute to building new downtown hotels and large development projects such as the National Harbor, venues which become world-class attractions for business and other groups. Moreover, the cluster supports a large network of suppliers and complementary businesses that expand naturally with national income growth.

Concerning the process of discerning specific clusters and placing employment within such sectors, we should note that there is extensive overlap among the seven clusters examined here and with several other sectors of the economy. Cluster definitions are heavily influenced by detailed government statistical classifications, which sometimes masks the differences among activities in the same firm and sometimes underappreciates the connections between workers of different firms and industries.⁵ Moreover, many individual firms can play important roles in several clusters. For example, Northrup Grumman is headquartered in Falls Church, VA but has extensive aerospace, information systems, and business process operations within the WMA. Several large accounting, finance, and consulting firms are also included in multiple clusters, as are scientific research centers. In the final analysis, solid regional growth requires success across many firms, sectors, and sub-regions in multiple knowledge-based clusters.

⁵ The detailed industry employment data is the BLS Quarterly Census of Employment and Wage (QCEW) compiled and modified for missing data into the JobsEq data base created by Chmura Economics & Analytics.

Jobs and Wages

The seven clusters accounted for more than 800,000 jobs in the DC Metro area in 2014, more than a quarter of the region’s total of nearly 3 million jobs (see Table 0-1).⁶ Employment in the clusters grew by 15 percent between 2003 and 2014, and average salaries were approximately \$84,000 (median wages were about \$70,800).

Table 0-1: The Seven Clusters – Jobs and Wages in Washington Metro Area

Cluster		Washington Metro Area			Location Quotient
		2014 Jobs	2003-14 Job Growth	2014 Avg Wage	
Advocacy	ADV	115,731	19%	76,097	3.5
Information and Communications Technology	ICT	204,489	5%	97,216	2.7
Science and Security Technology	SST	123,785	19%	90,211	1.8
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Business and Financial Services	BFS	190,128	39%	88,813	1.8
Media and Information	MAI	35,745	-20%	73,450	1.5
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Total of Seven Clusters	TOT	811,193	15%	84,028	2.0
Washington Metro Area	WMA	2,973,337	9%	62,213	

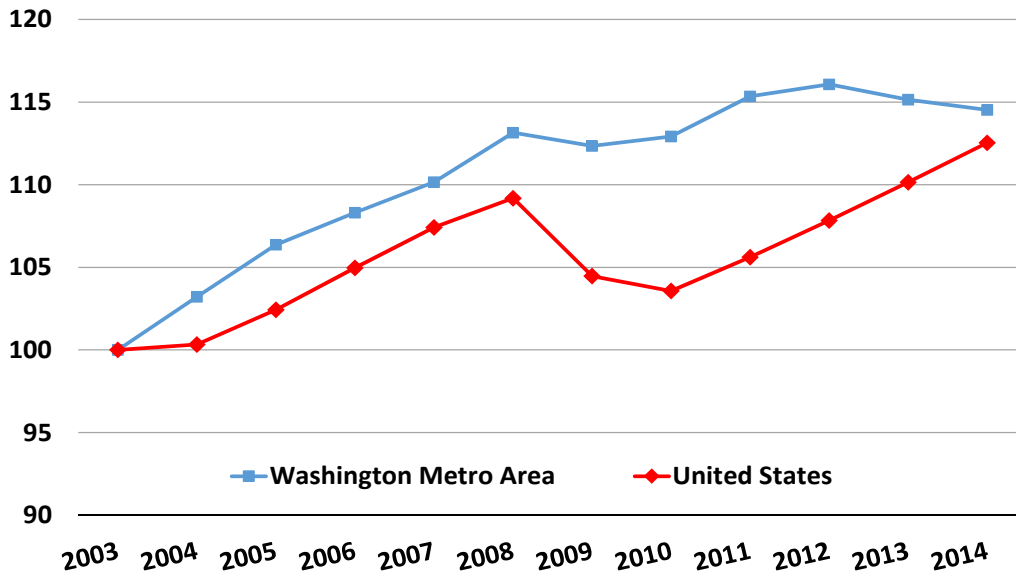
Source: JobsEQ and Inforum Calculations

The largest sectors were ICT and BFS with roughly 200,000 jobs each. ADV and SST both exceeded 100,000 jobs. BFS was the fastest growing sector, as employment increased by 39 percent between 2003 and 2014. BHT grew by 25 percent and ADV and SST tied for third fastest, with 19 percent growth during the period. The clusters with the highest average wages were ICT (\$97,000) and SST (\$90,000), with average wages in the BHT and BFS sectors also above \$88,000 in 2014.

Comparing WMA employment growth with the national equivalent shows that regional employment outpaced national employment in the seven clusters from 2003 through 2011. In the three years since, WMA employment in the sectors has been essentially flat, while national job growth has been quite brisk since the recovery started in 2011.

⁶ Consistent with the industry data, the total WMA jobs comes from the QCEW. This estimate for non-farm wage employment does not capture a substantial portion of regional employment, and it is generally lower than other regional employment figures. The Bureau of Economic Analysis (BEA), for example, estimates total full time and part time non-farm employment at about 4 million in 2014.

**Figure 0-1: Growth of Seven Clusters Total Employment, WMA vs. USA.
Index = 100 in 2003**



Source: JobsEQ and Inforum Calculations

Over half of the employees in these seven clusters are in high-education professions (see Table 0-2). For example, both Computer and math professionals and Management staff account for approximately 150,000 employees within the seven clusters; Business operations professionals (82,000) is the next highest category, followed by media (46,000), financial (45,000), and engineering (43,000).

As a result, WMA wages are considerably higher than average national compensation in comparable occupations. Table 0-3 shows the comparison in median wages, which are less skewed by a few high earners than average wages. The WMA to USA differential ranges from 71 percent higher for ADV professionals (wage ratio = 1.71), to 40 percent for ICT employees, to just 27 percent for BLT workers. To be fair, the cost of living is much higher in the DC metro area than in many other parts of the country. According to the Census Bureau, in 2010, cost of living index in the WMA was about 38 percent higher than the national average, a comparison particularly affected by housing costs.⁷ Adjusted for the cost of living, real median wages in the WMA ICT and BLT sectors were near the national average. Overall, real compensation for jobs in the seven clusters was 15 percent greater than the national median rate in the same clusters.

⁷ We computed the DC area cost of living from the 2010 Census data as reported in the 2012 Census Statistical Abstract. For 2010, the DC-Arlington metro area had a cost of living index of 140.5 relative to a national figure of 100.0. The Bethesda-Silver Spring-Frederick metro area's cost of living index was 130.5, just over 30 percent higher than average. Accounting for the population in both sub-areas, we computed that the weighted average cost of living for the whole DC metro area is roughly 38 percent higher than the national average. 2010 DC Area Cost of Living Index from Census.gov: <https://www.census.gov/compendia/statab/2012/tables/12s0728.pdf>

Table 0-2: The Seven Clusters - Key Washington Job Occupations, 2014

Occupation	ADV	ICT	SST	BHT	BFS	MAI	BLT	Total
Management	29,582	41,133	24,266	11,017	35,542	5,527	10,069	157,136
Business Operations	9,465	9,239	21,050	4,145	34,827	721	3,031	82,478
Financial	3,965	5,968	4,948	1,564	25,889	797	1,690	44,821
Computer & Math	7,514	92,325	16,355	5,709	23,328	2,510	1,644	149,385
Engineering	2,664	7,735	12,904	2,311	16,666	479	721	43,480
Science	13,978	601	9,823	11,415	3,751	159	454	40,181
Community Service	8,666	210	466	1,229	385	0	119	11,076
Legal	2,429	1,041	2,794	1,749	1,924	297	427	10,661
Education	1,485	1,463	804	418	1,200	2,695	2,220	10,286
Media	11,568	3,525	3,602	1,368	9,397	10,318	6,968	46,746
Healthcare Provider	1,227	302	843	2,096	1,854	9	111	6,441
Other Occupations	23,188	40,945	25,930	12,373	35,365	12,233	58,466	208,501
Washington Metro Area	115,731	204,489	123,785	55,396	190,128	35,745	85,919	811,193

Source: JobsEq and Inforum calculations

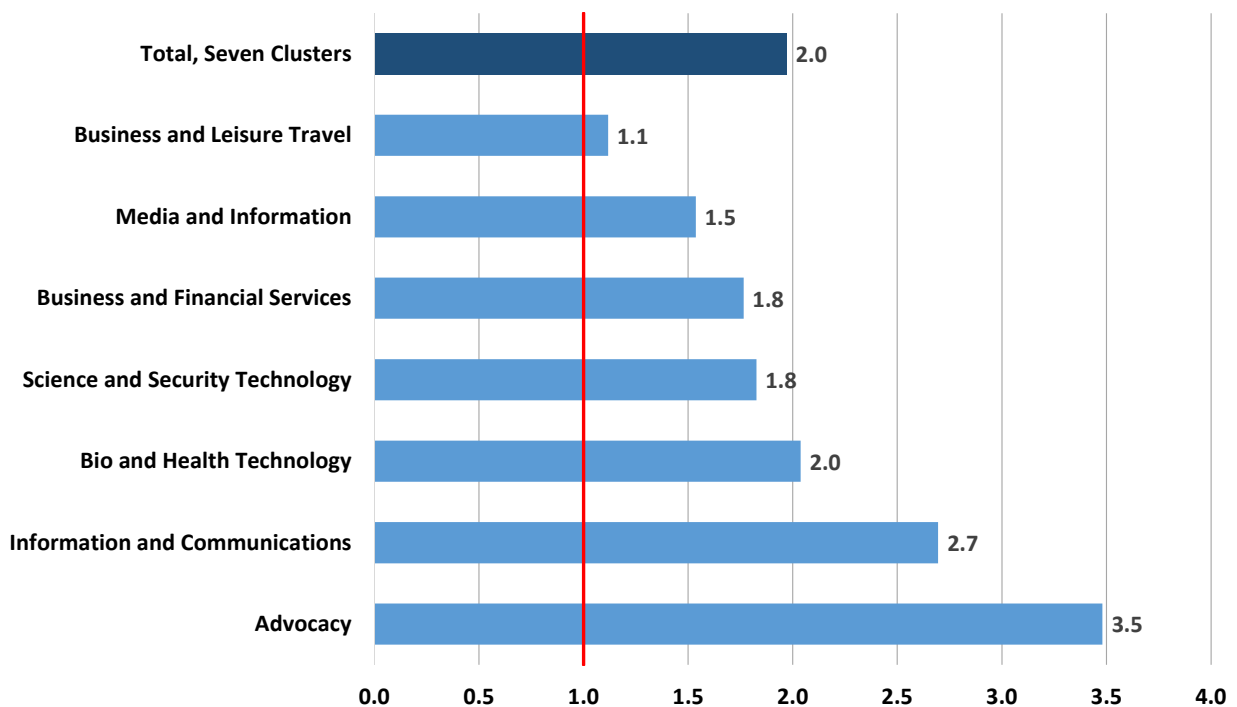
Table 0-3: The Seven Clusters -- Median Wages in the WMA compared to the USA, 2014

Cluster	symbol	WMA Median Wage	USA Median Wage	Ratio WMA to USA	COLA* ratio
Advocacy	ADV	60,000	35,000	1.71	1.24
Information and Communications Technology	ICT	87,000	62,000	1.40	1.01
Science and Security Technology	SST	78,000	50,000	1.56	1.13
Bio and Health Technology	BHT	80,000	50,000	1.60	1.16
Business and Financial Services	BFS	71,000	45,000	1.58	1.14
Media and Information	MAI	60,000	36,000	1.67	1.20
Business and Leisure Travel	BLT	33,000	26,000	1.27	0.92
Total of Seven Clusters	TOT	70,809	44,423	1.59	1.15

The “Location Quotient”

The location quotient highlights each cluster’s concentration in DC, relative to the rest of the nation. A cluster location quotient (LQ) is the share of that industry’s jobs in the region divided by the share of that industry’s jobs in the national economy. A LQ exceeding 1.0 indicates a regional concentration, and presumably a comparative advantage for the industry. A location quotient of more than 2.0 means that the regional share of the industry’s employment is twice as large as the national share. Figure 0-2 shows the location quotients for the seven clusters in 2014. In each case, the WMA enjoys a significant regional concentration, especially in Advocacy and Information and communications technology. The lowest LQs are in Media and information and Business and leisure travel.

Figure 0-2: The Seven Clusters: WMA Location Quotients, 2014



Source: JobsEQ and Inforum Calculations.

The following chapters display the individual cluster definitions by component industry employment and compare their recent growth with comparable national performance. Location quotients by industry for 2014 are also shown, along with an analysis of each cluster’s “inputs,” “outputs,” and inter-relationships, as well as analysis of opportunities and risks for future growth.

Chapter 1: Advocacy (ADV)

a) Definition

The Advocacy (ADV) cluster is made up of private sector employers at research and polling organizations (think-tanks), labor unions and trade associations, public and private foundations, and social and religious organizations. The primary mission of such entities is to influence societal outcomes by lobbying government, conducting research, and assembling coalitions. Some advocates are employed by individual firms, many others work for business, labor, or professional associations. Some are dedicated to narrow issues or particular industries, others provide more encompassing services.

Each of these activities consist of component sectors which are identified using NAICS (North American Industry Classification System) industry codes, and which we quantify with employment and payroll data from the Quarterly Census of Employment and Wages (QCEW). Table 1-1 shows the jobs across the various sectors comprising the ADV sector for the Washington Metro Area (WMA) and for the United States (USA) for 2003 and 2014. The table displays employment in levels and in total growth between 2003 and 2014. The final column contains the 2014 employment location quotients, which show the relative concentration of the industry within the WMA region. Location quotients (LQ) exceeding 1.0 indicate a regional concentration of the industry. The overall LQ of 3.5 shows that the WMA has a strong comparative concentration on the nationwide ADV industry. Figure 1-1 illustrates how the LQ varies by industry.

Although many law firms do substantial advocacy work and have high average compensation levels, we excluded offices of lawyers from our cluster analysis. This was simply due to the assumption that most law offices in the WMA were not primarily engaged in advocacy.

b) Description

Total WMA employment for the overall industry surpassed 115,000 in 2014. The largest sectors were: Social advocacy organizations (22,000 jobs); Professional organizations (19,000); Business associations (18,000); and Social science research jobs (nearly 15,000). The LQ for these sectors was highest in Social science research (11.0), followed by Professional organizations (10.8), Business associations (7.0), and Social advocacy organizations (6.7). The WMA's proximity to the seat of government naturally attracts advocacy resources, but entities within the cluster accomplish much more than lobbying and influence. Many trade associations, for instance, focus on the development and diffusion of industry standards for new technologies and business processes, while others work on training and education, including high level executive development. Nonprofit foundations, think tanks, and universities add to the stock of knowledge concerning economic, business, health, technological, and other social issues. Washington is the natural home for the headquarters of religious organizations and other social

coalitions. Indeed, the area has developed a deep and talented ecosystem of professionals working on many and varied issues, and thus the WMA continues to attract professional growth far beyond the most commonly identified lobbying or trade associations.

**Table 1-1: Employment in the Advocacy Cluster
2003 and 2014**

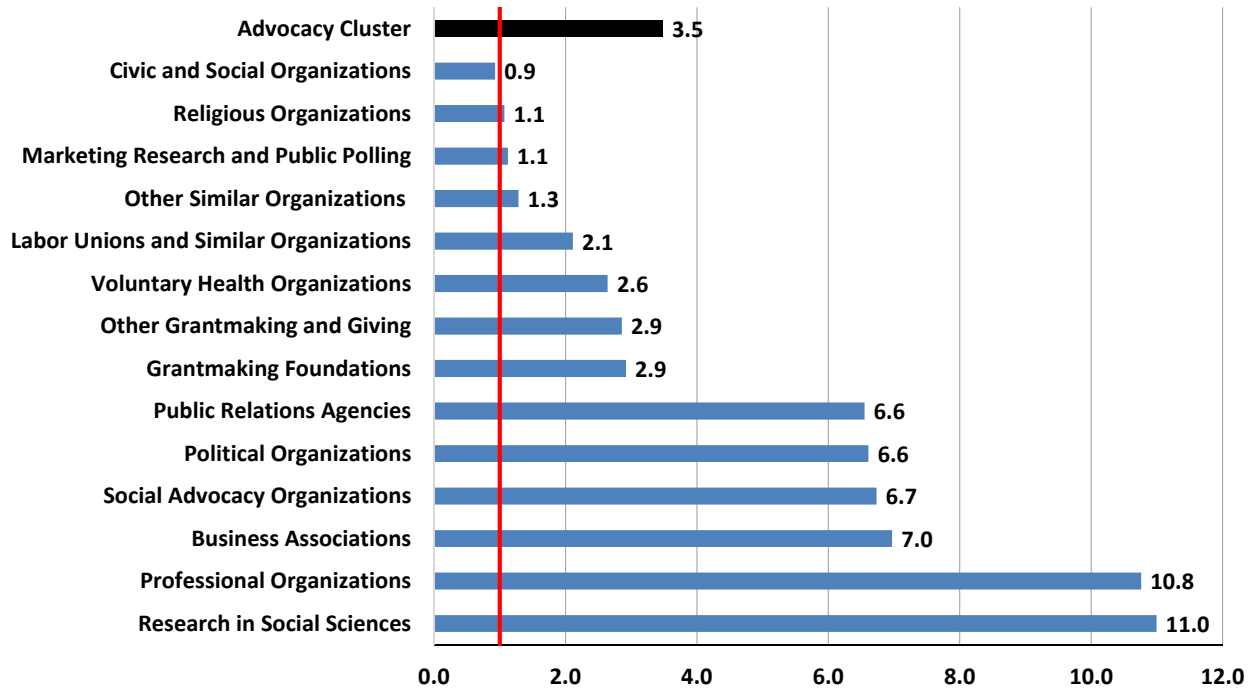
Industry	WMA Employment			USA Employment			LQ
	2003	2014	Growth 2003-14	2003	2014	Growth 2003-14	
Research in Social Sciences	11,205	14,546	30%	67,392	60,761	-10%	11.0
Public Relations Agencies	6,608	7,992	21%	46,016	56,035	22%	6.6
Marketing and Public Opinion Research	3,209	2,467	-23%	106,068	100,994	-5%	1.1
Religious Organizations	4,002	4,335	8%	172,669	186,000	8%	1.1
Grantmaking Foundations	1,899	3,914	106%	41,689	61,565	48%	2.9
Voluntary Health Organizations	1,685	2,280	35%	40,049	39,617	-1%	2.6
Other Grantmaking and Giving Services	1,842	2,311	25%	55,992	37,150	-34%	2.9
Social Advocacy Organizations	12,548	22,468	79%	109,264	153,254	40%	6.7
Civic and Social Organizations	8,790	8,058	-8%	420,227	397,845	-5%	0.9
Business Associations	17,577	18,084	3%	120,164	119,171	-1%	7.0
Professional Organizations	16,529	19,297	17%	72,513	82,370	14%	10.8
Labor Unions and Similar Organizations	6,607	5,300	-20%	139,178	115,227	-17%	2.1
Political Organizations	1,418	1,746	23%	6,230	12,132	95%	6.6
Other Similar Organizations	3,296	2,933	-11%	87,660	104,892	20%	1.3
Advocacy (ADV)	97,217	115,731	19%	1,485,110	1,527,012	3%	3.5

Source: JobsEq and Inforum calculations

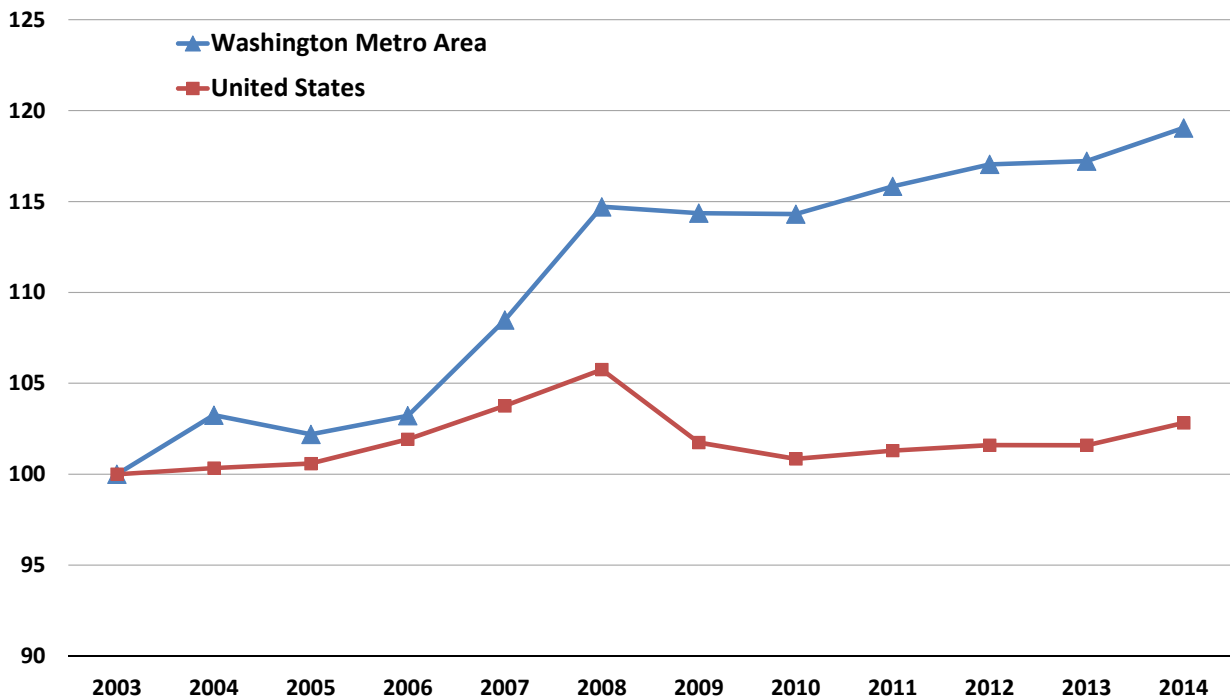
Table 1-1 shows that the fastest growing large sectors within the Advocacy cluster are Social advocacy organizations (+79% between 2003 and 2014), Social science research (+30%), and Professional organizations (+17%). Jobs at Business associations were virtually flat, holding at roughly 18,000 throughout the 2003-2014 period. Among the smaller sectors within the cluster, employment at Grantmaking foundations grew the most rapidly, with employment doubling from 1,900 jobs in 2003 to 3,900 in 2014 (+106%). Other sectors with strong employment growth include Voluntary health organizations (+35%), Other grantmaking and giving services (+25%), Political organizations (+23%), and Public relations agencies (+21%).

For the whole cluster, Table 1-1 also shows that the growth of overall WMA ADV employment between 2003 and 2014 was 19 percent, compared to national ADV employment growth of only 3 percent. Advocacy jobs are thus shifting toward the WMA. However, Figure 1-2 shows that gap between regional and national advocacy employment occurred mostly in the 2006-2010 period, while the difference between regional and national job growth has leveled off in recent years.

**Figure 1-1: Location Quotients for the Advocacy Sector
2014**



**Figure 1-2: Employment Growth for the Advocacy Cluster
Washington Metro Area vs. National 2003-2014, Index =100 in 2003**



The work of Advocacy requires substantial education, skills, knowledge, and experience. Employees typically have advanced degrees in law, business, social sciences, or technical sciences. The ADV sector in the WMA therefore contains a significant proportion of high value occupations, particularly in management (\$105,000 average salary) and business operations (\$73,000), but also in less expected fields such as science (\$80,000), computers and math (\$86,000), and engineering (\$94,000). Public relation specialists are classified in the “entertainment” occupation category (\$66,000), along with other media-related occupations.

Table 1-2 shows the full occupational breakdown. Compared to the economy as a whole, the WMA has large concentrations of science jobs (LQ = 6.8) and computer and math occupations (LQ = 6.7) in advocacy. These jobs are the core drivers of research that support advocacy efforts and can overlap with or contribute to other important clusters in the regional economy. These occupations are also highly paid. While the average wage in Washington DC is \$62,000 per year, jobs in the ADV cluster average over \$76,000 per year.

Table 1-2: Occupational Makeup of Advocacy Cluster

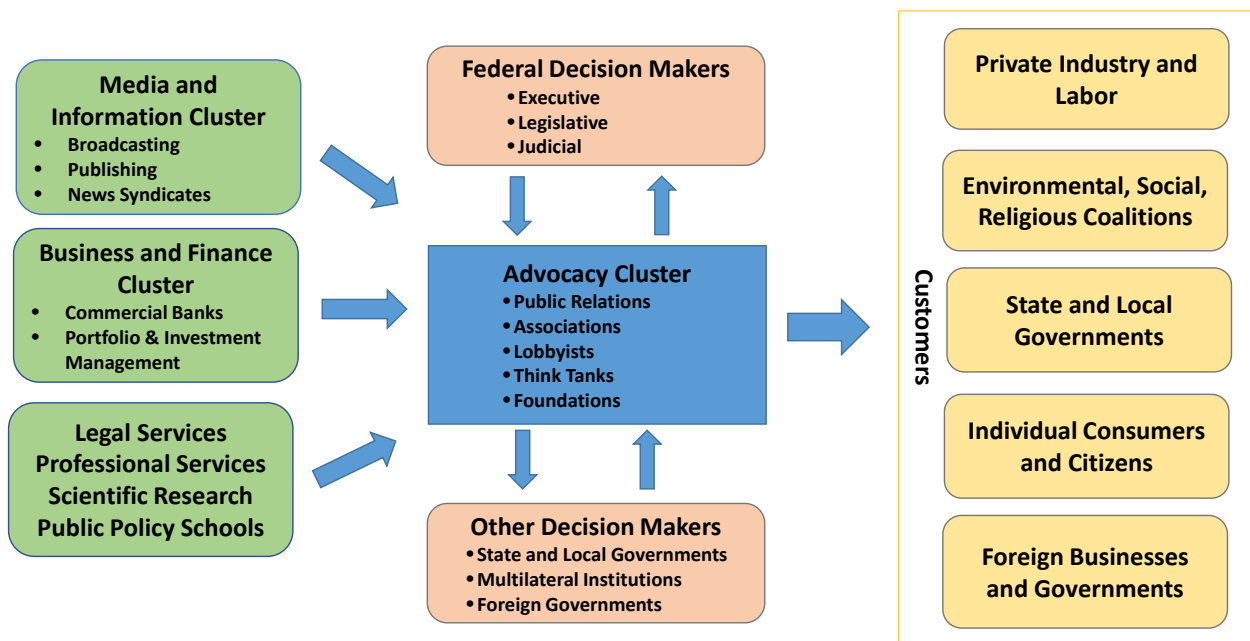
Occupation	WMA Employment			USA Employment			2014 LQ
	2014	%	Avg Wage	2014	%	Avg Wage	
Management	29,582	26%	104,645	255,297	17%	83,222	5.3
Office & Administrative	16,182	14%	46,531	269,466	18%	29,747	2.8
Science	13,978	12%	80,485	94,098	6%	65,675	6.8
Entertainment	11,568	10%	65,623	160,480	11%	35,223	3.3
Business Ops	9,465	8%	73,152	73,555	5%	61,794	5.9
Community Service	8,666	7%	54,839	276,035	18%	37,391	1.4
Computer & Math	7,514	6%	86,360	51,529	3%	71,075	6.7
Financial	3,965	3%	76,348	32,701	2%	59,687	5.6
Engineering	2,664	2%	93,550	25,719	2%	80,142	4.8
Other	12,147	10%	58,090	288,133	19%	33,054	1.9
Advocacy (ADV)	115,731	100%	76,097	1,527,012	100%	47,902	3.5

Source: JobsEq and Inforum calculations

c) Ecosystem

Figure 1-3 displays the ecosystem of the Advocacy cluster. The ultimate consumers of advocacy services include private industry and labor, various social coalitions, state and local government, and foreign businesses and government. The advocacy organizations themselves work together with federal decision makers in all three branches of government. They also connect their clients to decision makers in other levels of U.S. government, multilateral institutions such as the World Bank and IMF, and foreign governments through their embassies. Important suppliers to the Advocacy cluster include Media and information, Business and financial services, and other professional services such as lawyers, social scientists, and hard science researchers. Moreover, the WMA hosts several world-class public policy, national defense, and diplomatic service graduate schools. These institutions contribute research and knowledge talent to the Advocacy sectors, particularly to research foundations and think tanks.

Figure 1-3: Ecosystem of the Advocacy Cluster



d) SWOT Analysis

Strengths:

- Proximity of Federal government creates natural location for advocacy, think tanks, business associations, and charitable activities.
- Strong existing infrastructure and talented, experienced labor force. Revolving door between government and advocacy strengthens the regional presence of the cluster.
- Several world class public policy, national security, and foreign service schools.

Weaknesses:

- Rising distrust of political process with Washington DC at the center of such ire.
- High cost of labor, real estate, and commuting.

Opportunities:

- Advocacy remains a growth industry.
- Federal government role in economy and society generally increases over time.
- Advocacy for state, local, and especially international issues should expand.

Threats:

- The potential reduction of discretionary Federal spending and smaller government involvement in the economy means that demand for lobbying shrinks with the overall pie.

Chapter 2: Information & Communications Technology (ICT)

a) Definition

The Information and Communications Technology (ICT) cluster is comprised of three major types of activities:

1. Hardware and software providers
2. Telecommunications and data processing
3. Computer programming, design, and other services

Each of these activities consist of component sectors which are identified using NAICS (North American Industry Classification System) industry codes, and which we quantify with employment and payroll data from the Quarterly Census of Employment and Wages (QCEW).

Table 2-1 shows the jobs across the various sectors comprising the ICT sector for the Washington Metro Area (WMA) and for the United States (USA) for 2003 and 2014. The table displays employment in levels and in total growth between 2003 and 2014. The final column contains the 2014 employment location quotients, which show the relative concentration of the industry within the WMA region. Location quotients (LQ) exceeding 1.0 indicate a regional concentration of the industry. The overall LQ of 2.7 shows that the WMA has a strong comparative concentration on the nationwide ICT industry. Figure 2-1 illustrates how the LQ varies by industry.

b) Description

Total WMA employment for the overall industry approached 205,000 in 2014. Over 70% of cluster employment, or 143,000 jobs in 2014, is in two specific sectors: Computer programming and Computer systems design services. The LQ for these private sector computer programming and design jobs are 2.6 and 5.3, respectively. Mostly, this is the army of experienced private-sector IT professionals who develop and maintain federal information systems. While the federal business will remain, revenue growth will require that many of these folks will need to “pivot” to work in other markets.

An important characteristic of the ICT cluster is rapid labor productivity growth. Table 2-1 shows that at both the regional and national levels, employment in most of the component industries fell significantly from 2003 through 2014, even as the production in many of these industries rose. However, the two industries that have experienced an increase in employment, at least at the national level, are also the largest in terms of employment: computer programming services and computer system design services. These two industries also require the highest skill levels within the cluster, including education and experience.

**Table 2-1: Employment in the Information and Communications Technology Cluster
2003 and 2014**

Industry	WMA Employment			USA Employment			2014 LQ
	2003	2014	Growth 2003-14	2003	2014	Growth 2003-14	
Hardware and Software Providers							
Computer and Peripherals Wholesalers	9,216	7,970	-14%	250,674	225,856	-10%	1.6
Software Publishers	9,913	6,349	-36%	237,277	311,135	31%	0.9
Telecommunications and Data Processing							
Wired Telecommunications Carriers	36,116	20,207	-44%	786,422	606,134	-23%	1.5
Wireless Telecommunications Carriers	3,557	1,929	-46%	189,902	156,585	-18%	0.6
Satellite Telecommunications	1,193	903	-24%	17,206	9,164	-47%	4.5
Telecommunications Resellers	2,610	1,390	-47%	158,527	54,808	-65%	1.2
All Other Telecommunications	3,513	2,016	-43%	37,890	27,488	-27%	3.4
Computer Programming, Design, and Other Services							
Data Processing, Hosting, Related Services	11,423	11,005	-4%	285,268	281,626	-1%	1.8
Custom Computer Programming Services	47,816	43,204	-10%	490,035	774,636	58%	2.6
Computer Systems Design Services	55,921	99,903	79%	448,393	859,079	92%	5.3
Computer Facilities Management Services	2,487	2,028	-18%	60,198	58,334	-3%	1.6
Other Computer Related Services	9,081	6,845	-25%	113,554	104,830	-8%	3.0
Computer Training	995	742	-25%	20,922	14,937	-29%	2.3
Information and Communications Tech (ICT)	193,839	204,489	5%	3,096,269	3,484,613	13%	2.7

Source: JobsEq and Inforum calculations

**Figure 2-1: Location Quotients for the Information and Communications Technology Sector
2014**

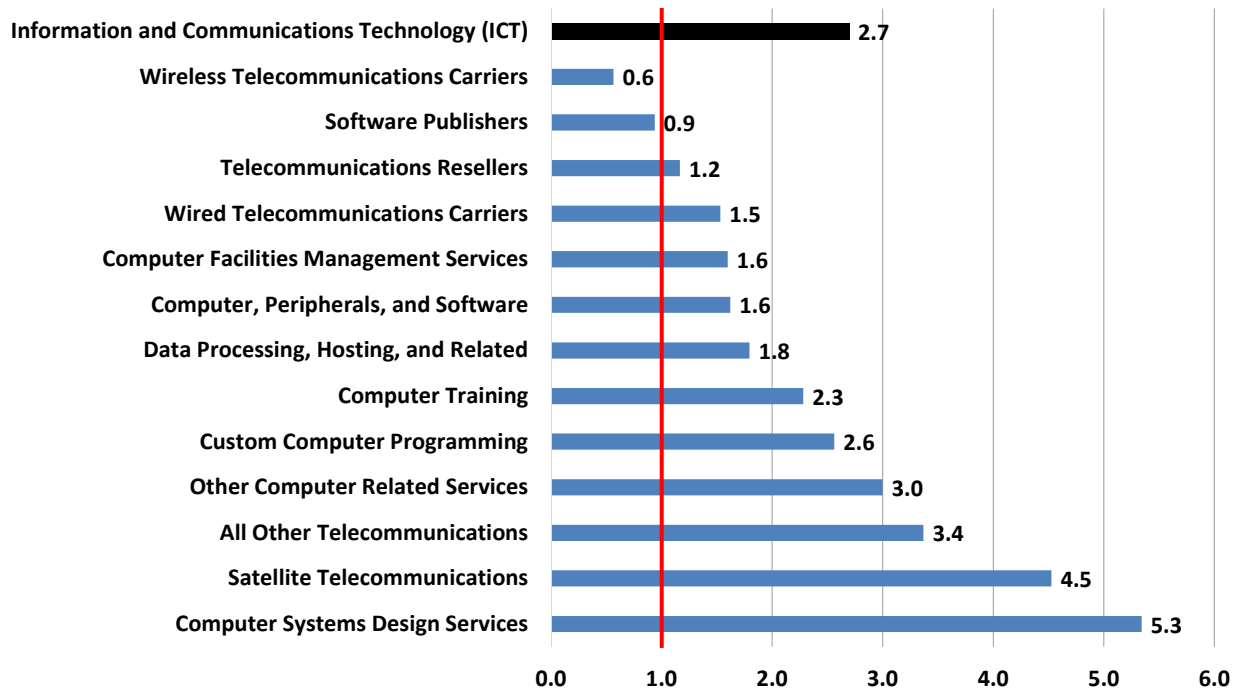
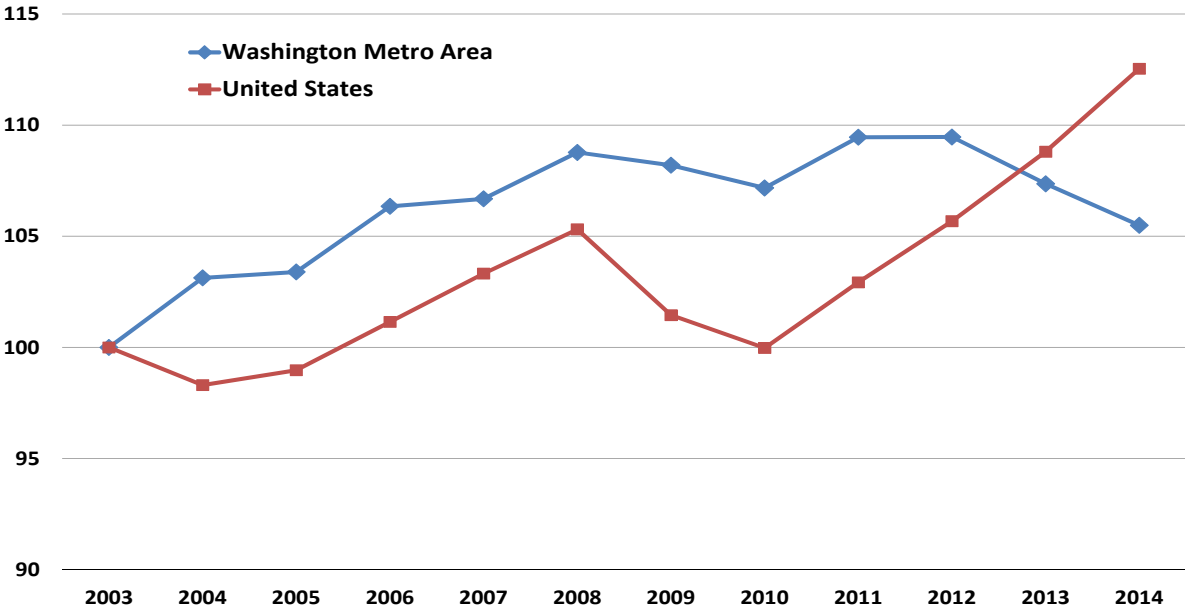


Table 2-1 also shows that the growth of WMA ICT employment over 2003 to 2014 was 5 percent, while national ICT employment experienced growth of 13 percent. Given high productivity growth, declines in employment levels are difficult to interpret. In this instance, these are probably just signaling efficiency gains and rapid technological advancement characteristic of a thriving ICT sector. The WMA still showed a solid gain in the computer design industry. Moreover, Figure 2-2 illustrates that regional employment in the cluster outpaced the national employment, but started to lose ground since 2012 as a direct result of lower federal expenditures, especially on the defense side.

**Figure 2-2: Employment Growth for the Information and Communications Technology Sector
Washington Metro Area vs. National 2003-2014
Index =100 in 2003**



The ICT sector in the Washington Metro area contains a significant proportion of high value occupations, especially computer systems programmers, developers, engineers, analysts, and managers. Table 2-2 shows the occupational breakdown. Compared to the economy as a whole, the WMA has larger concentrations of computer and math occupations. These occupations serve as the core drivers of technical advancement, not only in the ICT industry, but in other important clusters in the economy. These occupations are also highly paid. While the average wage in Washington DC is \$62,000 per year, jobs in the ICT cluster average over \$97,000 per year.

Table 2-2: Occupational Makeup of Information and Communications Technology Sector

Occupation	WMA Employment			USA Employment			2014 LQ
	2014	%	Avg Wage	2014	%	Avg Wage	
Computer & Math	92,325	45%	91,879	1,216,941	35%	74,339	3.65
Management	41,133	20%	131,281	596,594	17%	108,852	3.31
Office & Administrative	17,316	8%	60,597	454,710	13%	40,511	1.83
Sales	13,988	7%	116,245	382,143	11%	84,928	1.76
Business Ops	9,239	5%	89,594	128,345	4%	75,382	3.46
Engineering	7,735	4%	90,239	126,609	4%	80,080	2.94
Install & Repair	7,023	3%	62,196	270,058	8%	53,420	1.25
Financial	5,968	3%	83,388	67,100	2%	74,431	4.28
Other	9,762	5%	88,238	242,112	7%	54,638	1.16
Information and Communications Technology (ICT)	204,489	100%	97,216	3,484,613	100%	74,000	2.70

Source: JobsEq and Inforum calculations

c) Ecosystem

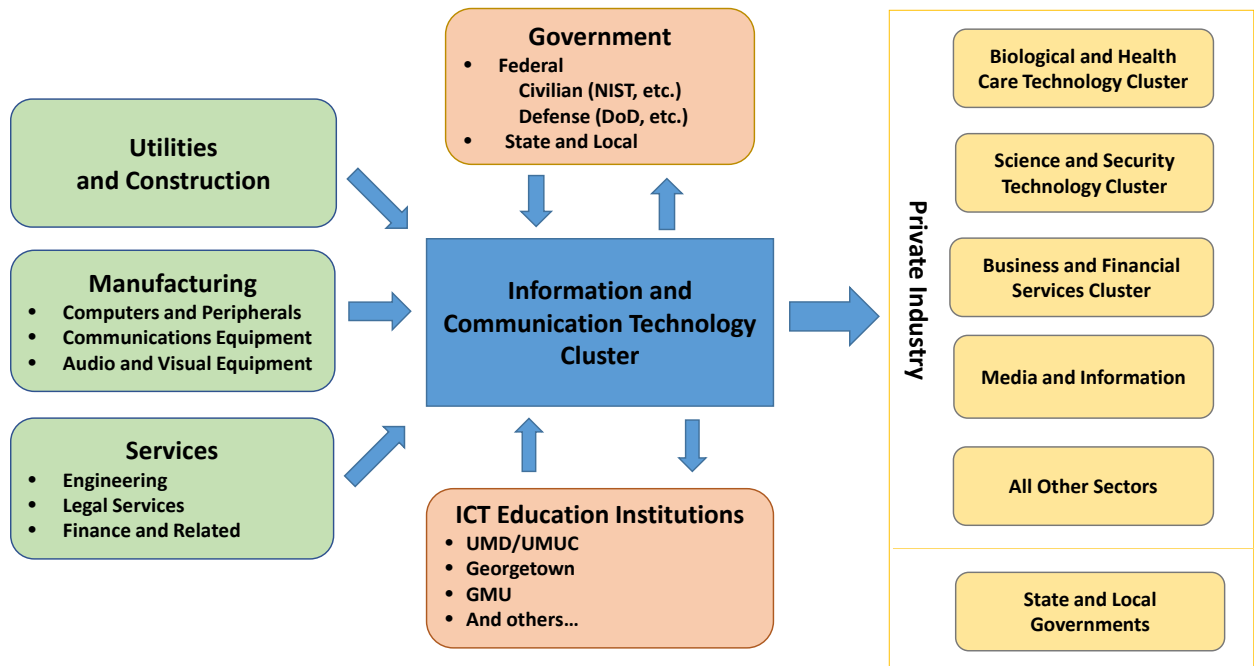
Figure 2-3 displays the ecosystem of the ICT cluster, highlighting the major supplying sectors, the primary customers, and complementary institutions such as universities and the federal government. For example, on the upstream side information technology and telecommunications are dependent on manufactured hardware and the advancing technology within. Telecommunications invest in the construction of distribution and other facilities.

The ICT sector also needs basic research and specialized talent, and sources of both – Universities – should be nearby the basic industry. The WMA is home to several universities with nationally recognized ICT-related programs. These academic institutions are maintaining relevancy by offering courses in burgeoning fields such as cyber-security, electronic health records (health and nursing informatics), and data mining.

Indeed, many of the WMA IT programmers and designers actually work on projects in other fields, especially health information, cyber-security, and business services. A robust localized ICT cluster is necessary to complement strengths in other sectors. It is very common for technological and entrepreneurial “spin-offs” that start with IT talent to migrate to other sectors.

Finally, though it may not be the source of growing business, the federal government will remain an important advantage for the WMA ICT cluster because several agencies who are responsible for the development and governance of information technology and telecommunication are located nearby. These institutions include the National Institute for Standards and Technologies (NIST), the Federal Communications Commission (FCC), and the Department of Homeland Security (DHS).

Figure 2-3: Ecosystem of the Information and Communications Technology Cluster



d) SWOT Analysis

Strengths:

- Important regional customers in other clusters, especially health care, science and security technology, and business and financial services.
- A large existing concentration of experienced computer programmers and systems engineers.
- Well-developed telecommunications infrastructure.
- University of Maryland Computer Science ranked #15 in US News and World Report.

Weaknesses:

- Current dependence on Federal contracting which is growing slowly.
- High cost of labor and real estate.

Opportunities:

- Fastest growing national industries such as health care, security, and education have great needs for computer systems that will help expand their businesses while streamlining operations to cut costs.

Threats:

- Several regions also have strengths in ICT and they are actively nurturing the cluster for growth (Silicon Valley, Austin TX, etc.)

Chapter 3: Science and Security Technology (SST)

a) Definition

The Science and Security Technology (SST) cluster is made up of three major types of activities:

1. Aerospace and Other Defense Manufacturing
2. Scientific Research and Services
3. Security and Emergency Services

The second category includes Space research and technology, and most of the employment consists of federal employees at NASA's Goddard Space Flight Center in Maryland.

Each of these three activities consist of component sectors which are identified using NAICS (North American Industry Classification System) industry codes, and which we quantify with employment and payroll data from the Quarterly Census of Employment and Wages (QCEW). Table 3-1 shows the jobs comprising the SST sector for the Washington Metro Area (WMA) and for the United States (USA) for 2003 and 2014. The table displays employment in levels and in total growth between 2003 and 2014. The final column is the 2014 employment location quotients, which show the relative concentration of the industry within the WMA region. Location quotients (LQ) exceeding 1.0 indicate a regional concentration of the industry. The overall LQ of 1.8 shows that the WMA has a strong comparative concentration on the nationwide SST industry. Figure 3-1 shows how the LQ varies by industry.

b) Description

Total WMA employment for the overall industry approached 124,000 in 2014. The largest WMA component industries are Engineering services at 43,000 jobs, Investigation and security services at 33,000 jobs, and Scientific research and development at 26,000 jobs.

While the region is home to headquarters and branch offices of several aerospace firms, the LQ for manufacturing is low. This is because the employees of these firms tend to provide engineering, computer and business services and are therefore categorized in those respective clusters. The actual manufacturing, meanwhile, takes place in other parts of the country.

Engineering services, Scientific research and development, and Space research and technology (which mostly includes research at NASA) are included in the SST cluster. Each of these have high LQs at 2.0, 2.7, and 10.5 respectively. When paired with Environmental and other scientific consulting, these industries are a core competitive strength for the WMA.

Table 3-1 shows that at both the regional and national levels, employment in most of the component industries rose significantly from 2003 through 2014. The fastest-growing industry within the SST cluster was Environment and scientific consulting, which grew by 163 percent in

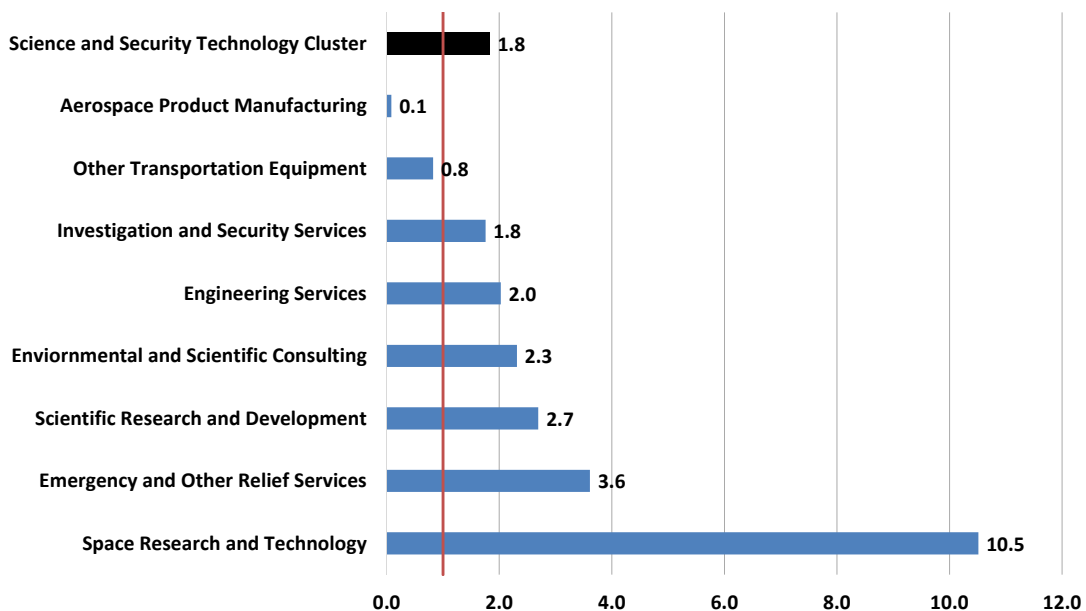
the WMA, climbing from 5,600 jobs in 2003 to nearly 15,000 in 2014. The largest category, Engineering services, grew slowly (3%) from 41,000 jobs in 2003 to just under 43,000 in 2014. More rapidly growing major industries in the SST cluster included Space research and technology (+31%), Investigation and security services (+28%), and Scientific research and development (+9%).

**Table 3-1: Employment in the Science and Security Technology Cluster
2003 and 2014**

Industry	WMA Employment			USA Employment			2014 LQ
	2003	2014	Growth 2003-14	2003	2014	Growth 2003-14	
Aerospace Manufacturing							
Aerospace Product and Parts Manufacturing	2,039	853	-58%	441,182	490,384	11%	0.1
Other Transportation Equip. Manufacturing	65	110	71%	8,445	6,128	-27%	0.8
Scientific Research and Services							
Engineering Services	41,382	42,786	3%	805,454	970,770	21%	2.0
Environmental and Scientific Consulting	5,639	14,824	163%	120,576	294,481	144%	2.3
Scientific Research and Development	24,145	26,423	9%	377,002	450,967	20%	2.7
Space Research and Technology (NASA)	3,092	4,065	31%	17,358	17,763	2%	10.5
Security and Emergency Services							
Investigation and Security Services	25,626	32,716	28%	709,166	856,440	21%	1.8
Community Emergency, Relief Services	2,368	2,008	-15%	28,596	25,542	-11%	3.6
Science and Security Technology (SST)	104,357	123,785	19%	2,507,779	3,112,474	24%	1.8

Source: JobsEq and Inforum calculations

**Figure 3-1: Location Quotients for the Science and Security Technology Cluster
2014**



Despite a great expansion in defense spending, WMA employment growth in the SST cluster has been only moderate over the past decade. Table 3-1 also shows that the growth of WMA SST employment over 2003 to 2014 was 19 percent, compared to national SST employment growth of 24 percent. Figure 3-2 shows that regional employment in the cluster was comparable to national growth in the cluster, losing ground only since 2012 as a result of lower federal expenditures, especially on the defense side.

**Figure 3-2: Employment Growth for the Science and Security Technology Sector
Washington Metro Area vs. National 2003-2014
Index =100 in 2003**

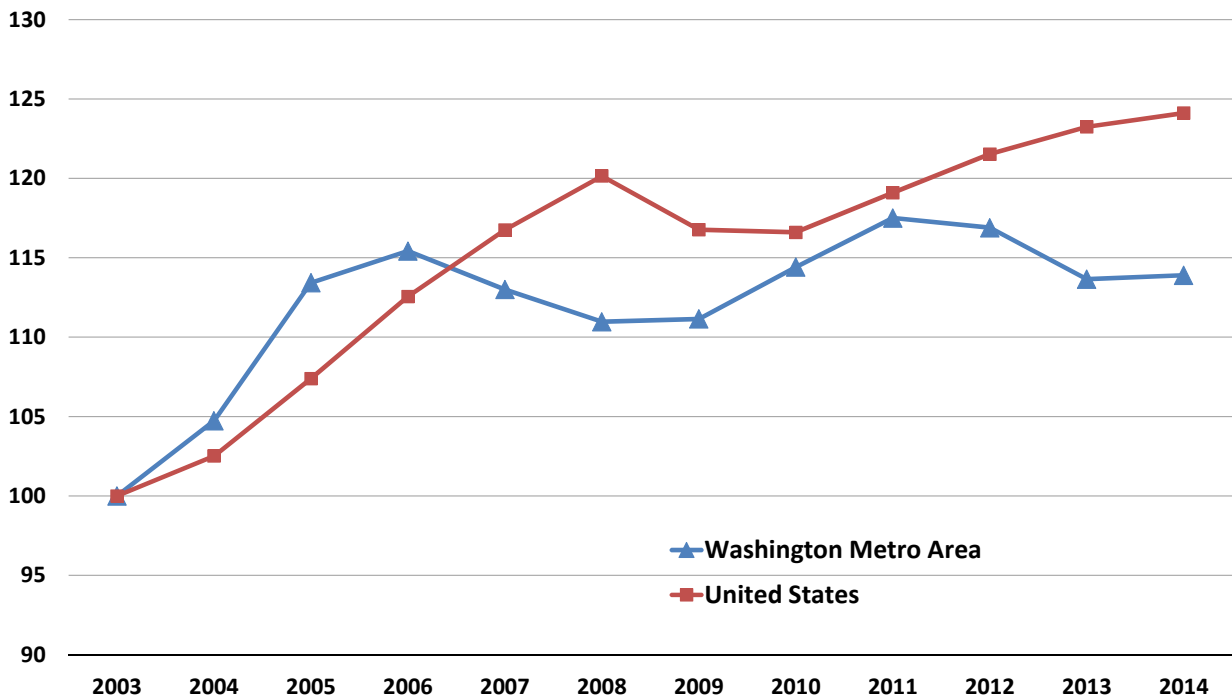


Table 3-2 shows the occupational breakdown. The SST sector in the WMA contains a significant proportion of high value occupations, especially managers, business analysts, computer programmers, engineers, and scientists. The occupational LQs above 1.0 indicate that the WMA has larger concentrations of these occupations relative to the national economy. These occupations are also highly paid, underscoring their value to the region. While the SST national average annual wage is about \$64,000, SST jobs in the WMA pay an average over \$90,000.

Table 3-2: Occupational Makeup of the Science and Security Technology Sector

Occupation	WMA Employment			USA Employment			2014 LQ
	2014	%	Avg Wage	2014	%	Avg Wage	
Management	24,266	19.6%	123,908	475,941	15.3%	98,800	2.3
Business Operations	21,050	17.0%	88,888	363,547	11.7%	70,628	2.7
Computer and Math	16,355	13.2%	96,985	185,478	6.0%	82,093	4.1
Engineering	12,904	10.4%	91,797	533,843	17.2%	73,901	1.1
Office and Administrative	12,198	9.9%	61,728	385,444	12.4%	40,237	1.5
Science	9,823	7.9%	86,923	169,469	5.4%	64,662	2.7
Protective	8,664	7.0%	46,496	300,188	9.6%	28,855	1.3
Financial	4,948	4.0%	84,914	75,639	2.4%	72,360	3.0
Other	13,577	11.0%	80,160	622,926	20.0%	51,545	1.0
Science and Security Technology (SST)	123,785	100.0%	90,211	3,112,474	100.0%	64,135	1.8

Source: JobsEq and Inforum calculations

c) Ecosystem

Figure 3-3 displays the SST ecosystem, showing the major supplying sectors, the primary customers, and complementary institutions such as universities and the federal government. The various interdependent actors and activities make up a particularly diverse ecosystem. On the upstream side, defense and science entities are dependent on a wide variety of manufactured hardware and the advancing technology within those products. In particular it uses goods such as advanced materials, computers, aerospace components and other transportation equipment, and navigation instruments.

The SST cluster is intimately linked with the Information and communications technology (ICT) sector, as the industries exchange technology, software, workers, capital and even working locations. The two clusters are further drawn together in cyber-security efforts and for developing “Big Data” applications which will drive big economic and social changes in coming years.

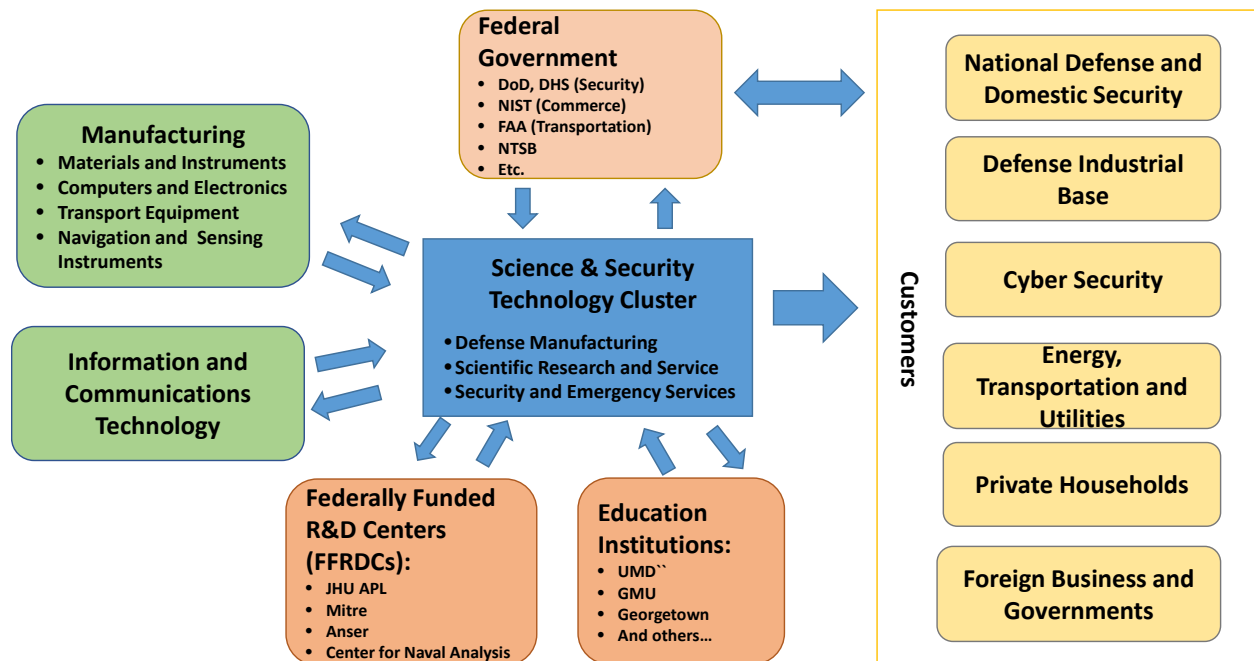
The SST cluster is strengthened by its close proximity to several world-class universities located in the region. For example, the University of Maryland’s aerospace engineering program was recently ranked as the 9th best in the country. Additionally, organizations known as Federally Funded Research and Development Centers (FFRDCs) provide invaluable human and information capital to the SST cluster. One such FFRDC, MITRE, offers objective analysis on a variety of security topics including counter-terrorism, cyber-security, and air-traffic control systems. This research is directly used by the DoD, DHS, and other government agencies.

Looking further downstream, though it may not be the source of fast growing business, the federal government will remain a primary customer of the WMA SST cluster. Government agencies related to security (DoD, DHS), commerce (NIST), and transportation (FAA, NTSB) all

require the services provided by Science and security technology firms. The demand for these products will remain strong.

There are substantial alternative opportunities as well. Other markets for security and science goods and services include those for private industry especially manufacturing, transportation, and utilities. State, local, and foreign governments are another important possibility. More attention to the consumer is also warranted, especially for education, health and entertainment products.

Figure 3-3: Ecosystem of the Science and Security Technology Cluster



d) SWOT Analysis

Strengths:

- A large existing concentration of experienced computer programmers and systems engineers.
- The major players within cluster possess large pools of financial, manufactured, and human capital resources.
- Strong government and private demand for technology-based products. For instance, a strong commercial aerospace market will help relieve the pressure of lower defense spending.

Weaknesses:

- Current dependence on Federal defense contracting, which is projected to grow slowly.
- High cost of labor, real estate and commuting.
- Federal restrictions on technology exports sometimes impedes business.

Opportunities:

- Cutting edge technologies such as self-driving cars, space exploration and nano-technology can lead economic growth and change.
- Defense industry can shift focus to new products, including data analytics, unmanned combat vehicles, and ISR (Intelligence, Surveillance, and Reconnaissance).
- Emerging markets for defense goods and services in Southeast Asia and parts of Middle East
- Growing important of earth-observing technology, both scientific and defense related.

Threats:

- Reduction of federal spending for defense, space and other basic research could impede progress across technologies.
- Rapid growth in technical prowess in other nations, especially cybersecurity, space exploration and biotechnology will spur new competition for local SST firms and workers.

Chapter 4: Biological and Health Technology (BHT)

a) Definition

The Washington Metro Area's (WMA) Biological and Health Technology (BHT) cluster includes federal employees. Federal funding of health research and development through the National Institutes of Health (NIH), the Center for Disease Control (CDC), and other agencies helps to foster relationships with private sector firms and non-profits which strive to find cures for diseases and improve the effectiveness and value of health care services. Moreover, the federal government will continue to play a large role in the administration of health care markets through the Center for Medicare and Medicaid Services (CMS) and the Food and Drug Administration (FDA). Therefore, when defining the BHT cluster, we include relevant federal employees as part of the work force, including researchers at NIH and regulators at FDA. We also include Veterans Affairs (VA) medical employees because of their large influence on health care all around the country.

The cluster definition for BHT consists of component sectors identified using NAICS (North American Industry Classification System) industry codes, and quantified with employment and payroll data from the Quarterly Census of Employment and Wages (QCEW) from the Bureau of Labor Statistics. Table 4-1 shows the jobs across the various sectors comprising the BHT sector for the WMA and for the United States (USA) for 2003 and 2014. The table displays employment in levels and in total growth between 2003 and 2014. The final column lists the 2014 employment location quotients, which show the relative concentration of the industry within the WMA region. Location quotients (LQ) exceeding 1.0 indicate a regional concentration of the industry. The overall LQ of 2.0 shows that the WMA has a strong comparative concentration on the nationwide BHT industry. Figure 4-1 shows how the LQ varies by industry.

Importantly, we did not include employment in local hospitals or offices of physicians as part of the BHT cluster. Of course, some of the doctors and nurses in area health facilities are actively doing research and helping development new cures and methods. However, most of the jobs in the Hospital and Physician sectors were non-research clinical, and thus were not unique or special to the DC area. This exclusion does not mean these professionals are not important to the cluster however. As customers, suppliers, and collaborators with the research community, local health providers play a vital and evolving role in the march of health technology progress within the region and globally.

b) Description

Biological and Health Technology employment in the WMA exceeded 55,000 in 2014. The sector is dominated by Public Health Administration jobs. In particular, employment at NIH approaches 18,000 and has a LQ of 43.3, indicating an intense clustering of this function in the

WMA. Likewise, the Food and Drug Administration (FDA) has a major presence in the region, with nearly 13,000 jobs in 2014, up 59 percent from 8,000 jobs in 2003. Other sectors include Biotechnology research and development (6,000 jobs; LQ of 1.9) and Administration of Veterans' Affairs (5,000 jobs; LQ of 4.8).

Table 4-1 shows that the fastest growing sectors within the BHT cluster are very small industries such as Biological Product Manufacturing (+179% between 2003 and 2014) and In-Vitro Diagnostic Substance Manufacturing (+90%).

Table 4-1 also shows that overall BHT employment in the WMA grew by 25 percent between 2003 and 2014. Meanwhile, national BHT employment experienced growth of just 7 percent. Specialty health technology and public health jobs are thus shifting toward the Washington area. Figure 4-2 illustrates this phenomenon, showing that the gap between regional and national BHT employment has continued to widen in recent years.

**Table 4-1: Employment in the Bio and Health Technology Cluster
2003 and 2014**

Industry	WMA Employment			USA Employment			2014 LQ
	2003	2014	Growth 2003-14	2003	2014	Growth 2003-14	
Manufacturing							
In-Vitro Diagnostic Manufacturing	659	1,255	90%	13,964	22,504	61%	2.6
Biological Product Manufacturing	947	2,645	179%	25,693	28,327	10%	4.3
Other Manufacturing	1,079	1,496	39%	549,836	535,506	-3%	0.1
Wholesaling and Distribution	1,503	1,307	-13%	187,090	210,088	12%	0.3
Research and Development							
Private Sector Biotechnology	7,993	6,166	-23%	124,797	146,469	17%	1.9
National Institutes of Health	17,123	17,848	4%	18,112	18,932	5%	43.3
Centers for Disease Control	594	591	-1%	8,348	9,859	18%	2.8
Federal Administration							
Food and Drug Administration (FDA)	8,060	12,818	59%	11,664	16,795	44%	35.1
Agency Healthcare Quality and Research (AHRQ)	289	289	0%	326	326	0%	40.7
Administration of Veterans' Affairs (VA)	3,826	5,473	43%	25,265	52,242	107%	4.8
Other Public Health Programs	2,192	5,507	151%	202,856	207,383	2%	1.2
Biological and Health Technology (BHT)	44,265	55,396	25%	1,167,951	1,248,430	7%	2.0
Memorandum:							
Health Care Practitioners and Staff	81,690	119,025	46%	4,875,490	6,749,000	38%	
Hospitals	71,211	79,688	12%	5,393,108	6,051,582	12%	

Source: JobsEq and Inforum calculations

Figure 4-1: Location Quotients for the Biological and Health Technology Cluster (BHT) 2014

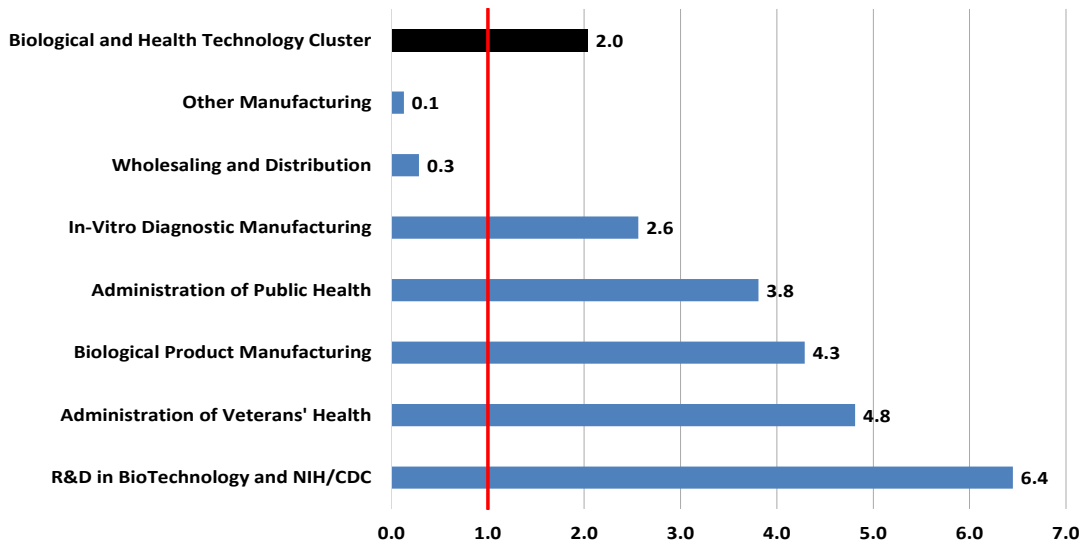
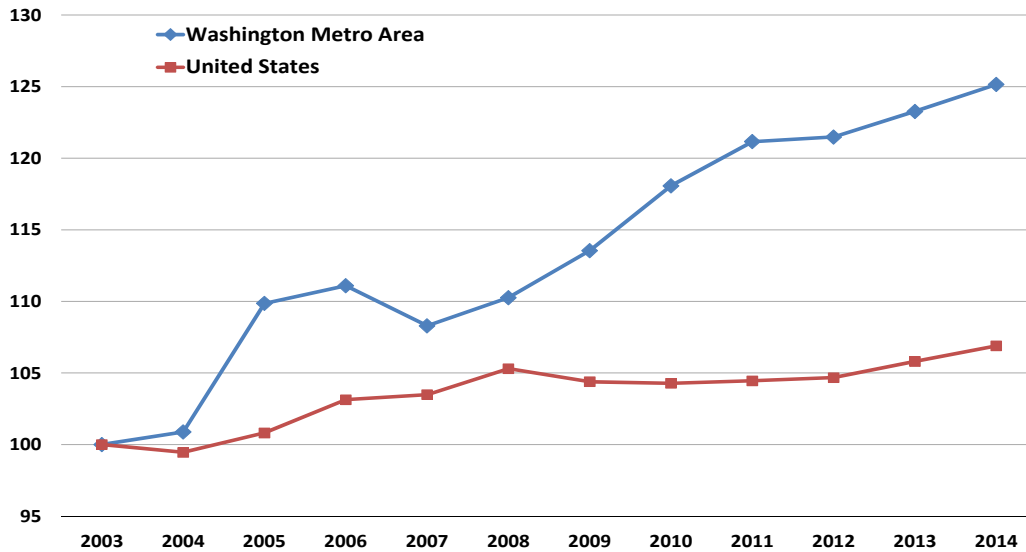


Figure 4-2: Employment Growth for the Biological and Health Technology Cluster Washington Metro Area vs. National 2003-2014
Index, 2003 = 100



Unlike other government activities, federal employment and research opportunities in the BHT sector are likely to continue to expand. Budgets for the NIH and other health-related agencies, including the Centers for Medicare and Medicaid Services, the Agency for Healthcare Research

and Quality, and the Veterans Affairs health division, are usually better funded and less affected by year-to-year appropriations than funding for non-health federal agencies.

The BHT sector in the Washington Metro area contains a significant proportion of high value occupations. The average wage in Washington DC is \$62,000 per year; jobs in the BHT cluster average over \$88,000 per year. Table 4-2 shows the full occupational breakdown. The largest occupational category is Science, with more than 11,000 jobs and an average salary of \$85,000.

Other key occupations are Management (\$118,000 average salary) and Computers and math (\$94,000), as well as in smaller occupational categories such as legal (\$109,000), and engineering (\$91,000). Compared to the economy as a whole, the WMA has large concentrations of Science (LQ = 4.0) and Computer and math occupations (LQ = 4.0) in biological and health technology.

Table 4-2: Occupational Makeup of Biological and Health Technology Cluster

Occupation	WMA Employment			USA Employment			2014 LQ
	2014	%	Avg Wage	2014	%	Avg Wage	
Science	11,415	21%	84,826	130,277	10%	73,728	4.0
Management	11,017	20%	117,780	180,068	14%	112,752	2.8
Office & Administrative	7,180	13%	60,353	206,790	17%	41,249	1.6
Computer & Math	5,709	10%	94,374	65,360	5%	78,927	4.0
Business Ops	4,145	7%	88,117	61,800	5%	74,848	3.1
Engineering	2,311	4%	91,432	60,148	5%	78,257	1.8
Healthcare Practice	2,096	4%	76,441	53,261	4%	65,074	1.8
Sales	2,089	4%	108,122	94,406	8%	92,937	1.0
Legal	1,749	3%	108,669	14,915	1%	103,441	5.4
Financial	1,564	3%	84,967	28,925	2%	74,393	2.5
Other	6,119	11%	60,309	352,479	28%	38,672	0.8
Bio and Health Technology (BHT)	55,396	100%	88,324	1,248,430	100%	65,961	2.0

Source: JobsEq and Inforum calculations

c) Ecosystem

Figure 4-3 displays the ecosystem of the BHT cluster. Health care demand accounts for almost 18 percent of all spending in the economy. These expenditures occur mostly from health care providers, hospitals, and drug and equipment manufacturers, but they are ultimately spread across many industries including retailing, medical suppliers, information technology providers, and business services. Downstream are the health providers, especially physicians' offices, ambulatory care facilities, hospitals, and ultimately the individual person.

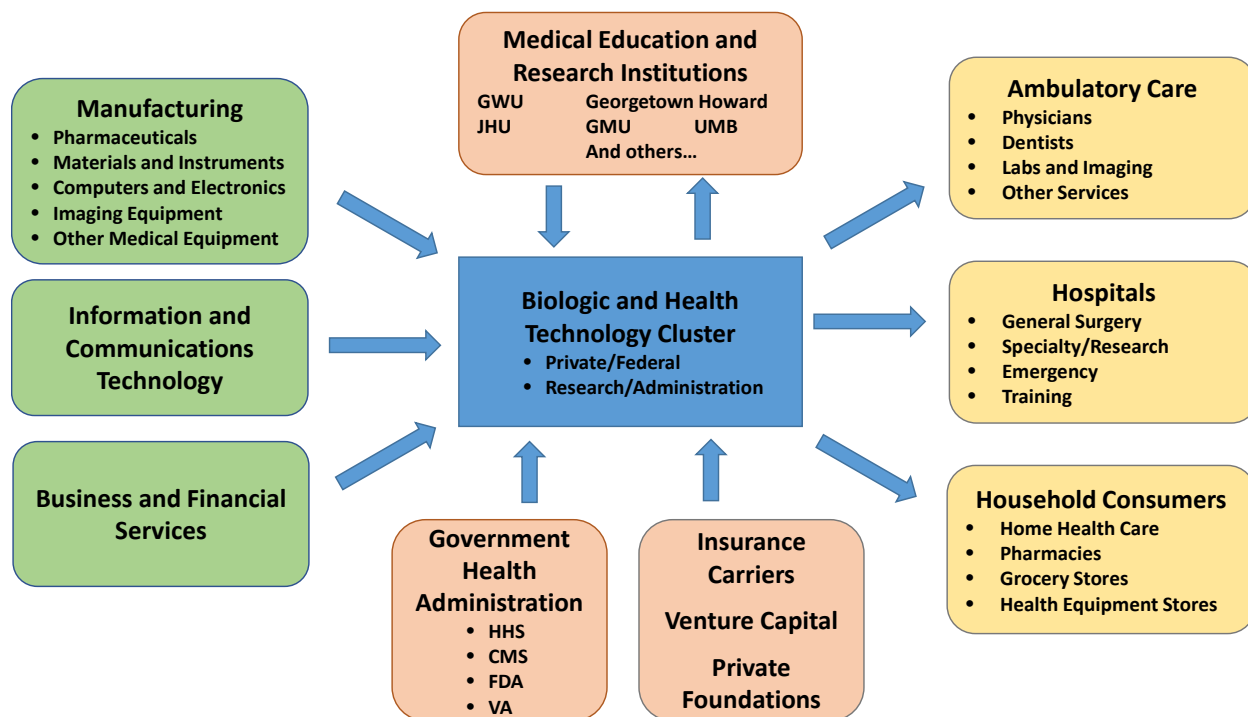
In the middle of this vast operation, the BHT cluster helps provide critical technological advancements which improve the standard of health care around the world. The NIH leads the effort, providing grants to private and academic researchers who often also work as

practitioners in local facilities. NIH research funding has grown from approximately \$28 billion in 2003 to \$36 billion in 2014.⁸

Many of the characteristics of the U.S. health care system are changing rapidly. A major transformation will involve the compilation and use of electronic health and financial records for improving the efficiency and effectiveness of the industry. Information technology and Business and financial services will be crucial partners in this process of administering the U.S. health system, a task which remains centered in the WMA in any case.

To date, the largest financiers of such research have been pharmaceutical and medical equipment makers, the federal government, and private foundations. In coming years, venture capital and new medical breakthroughs should drive increases in biological and medical research. Indeed, a recent projection by CMS sees medical research growing by an average of 4.6 percent per year over the next decade (2014 to 2024).⁹

Figure 4-3: Ecosystem of the Bio Health Technology Cluster



⁸ Micah Hartman, Anne B. Martin, David Lassman, Aaron Catlin, the National Health Expenditure Accounts Team, National Health Spending In 2013: Growth Slows, Remains In Step With The Overall Economy, *Health Affairs* (December 2014).

⁹ Sean P. Keehan, Gigi A. Cuckler, Andrea M. Sisko, Andrew J. Madison, Sheila D. Smith, Devin A. Stone, John A. Poisal, Christian J. Wolfe and Joseph M. Lizonitz, National Health Expenditure Projections, 2014–24: Spending Growth Faster Than Recent Trends, *Health Affairs* (July 2015).

d) SWOT Analysis

Strengths:

- Strong public sentiment for continued federal involvement in medical research.
- Prevailing national support for federal involvement in the administration of health care through Medicare, Medicaid, the Veterans Health Service among other roles.

Weaknesses:

- Health care research is currently highly dependent on the federal government and pharmaceutical firms.

Opportunities:

- Health care is very income elastic, so demand for new cures will continue to grow faster than overall income growth.
- Notwithstanding increased demand for health services, there are also important forces that will encourage new health technologies and industry processes that can reduce the cost of health care.
- Health research and development could be a fertile ground for venture capital, though regulatory policy is very important in this regard.

Threats:

- Other federal priorities may restrict research and government health coverage.
- Regulatory overreach stymies progress in prescription drugs and medical devices.

Chapter 5: Business and Financial Services (BFS)

a) Definition

The Business and Financial Services (BFS) cluster has been a one of the largest and most steadily growing sectors in the Washington Metro Area (WMA) over the last decade. The cluster's largest component is Management, scientific, and technical consulting services, which accounts for approximately 80,000 jobs in the region. In the past, this sector has been derisively labeled "beltway bandits." Over the past couple of decades, the sector has shifted from being a peripheral facilitator of the federal government, to become a key element of government and corporate operations within and beyond the region.

Component sectors of the BFS cluster are identified using NAICS (North American Industry Classification System) industry codes, which we quantify with employment and payroll data from the Quarterly Census of Employment and Wages (QCEW). We used linked data from the American Community Survey (ACS) to map occupations and wages of employees in each cluster. Table 5-1 shows the jobs across the various sectors comprising the BFS cluster for the Washington Metro Area and for the United States (USA) for 2003 and 2014. The table displays employment in levels and in total growth between 2003 and 2014. The final column is the 2014 employment location quotients, which show the relative concentration of the industry within the WMA region. Location quotients (LQ) exceeding 1.0 indicate a regional concentration of the industry. The overall LQ of 1.8 shows that the WMA has a comparative concentration on the nationwide BFS industry. Figure 5-1 illustrates how the LQ varies by industry.

b) Description

Table 5-1 shows that WMA employment for the BFS cluster totaled more than 190,000 in 2014. The sector's largest component, Management, scientific, and technical consulting had a LQ of 3.9 in 2014, indicating an intense clustering of this function in the Washington Metro Area. Employment in this component sector grew 58 percent in the WMA between 2003 and 2014.

Other large sectors include Management of companies and enterprises (38,000 jobs and 35% growth between 2003 and 2014) and Accounting, tax, and payroll services (30,000 jobs and 32% growth). Smaller sectors include Architectural services (9,000 jobs), Other professional and technical services (9,000 jobs in 2014, nearly double the 2003 level), Nondepository credit intermediation (8,000 jobs, 62% employment growth, and a LQ of 15.2), and Insurance and employee benefit funds (6,000 jobs).

**Table 5-1: Employment in the Business and Financial Services Cluster
2003 and 2014**

Industry	WMA Employment			USA Employment			2014 LQ
	2003	2014	Growth 2003-14	2003	2014	Growth 2003-14	
Finance							
Nondepository Credit Intermediation	5,188	8,387	62%	19,152	25,409	33%	15.2
Securities and Commodity Exchanges	408	387	-5%	9,249	6,977	-25%	2.5
Insurance and Employee Benefit Funds	5,908	6,420	9%	52,562	53,839	2%	5.5
Other Investment Pools and Funds	354	340	-4%	33,343	40,021	20%	0.4
Business Services							
Accounting, Tax, and Payroll Services	23,098	30,390	32%	838,312	967,571	15%	1.4
Architectural Services	9,253	8,730	-6%	182,756	168,487	-8%	2.4
Specialized Design Services	3,222	3,034	-6%	121,055	127,150	5%	1.1
Mgmt, Scientific, and Technical Consulting	50,354	79,567	58%	608,370	947,816	56%	3.9
Other Professional and Technical Services	4,663	9,230	98%	59,754	153,423	157%	2.8
Management of Companies and Enterprises	28,333	38,343	35%	1,660,108	2,153,668	30%	0.8
Employment Services	6,057	5,300	-12%	300,867	303,046	1%	0.8
Business and Financial Services Cluster	136,838	190,128	39%	3,885,527	4,947,406	27%	1.8

Source: JobsEq and Inforum calculations

**Figure 5-1: Location Quotients for the Business and Financial Services Cluster
2014**

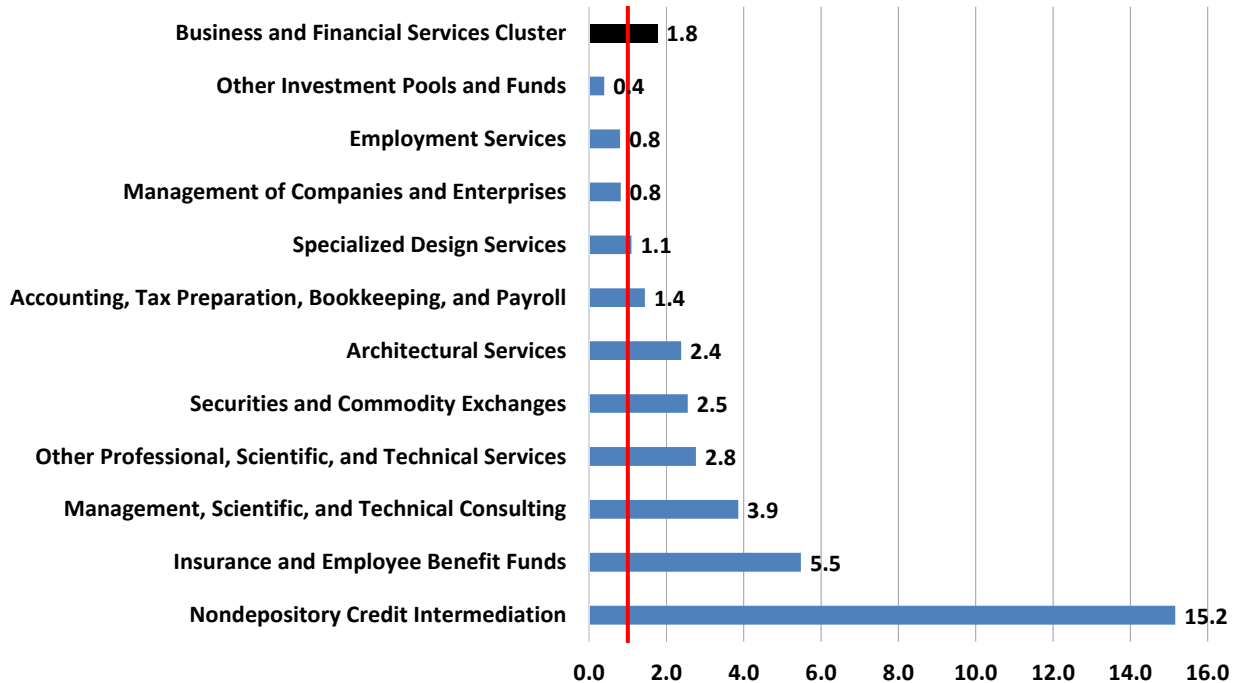
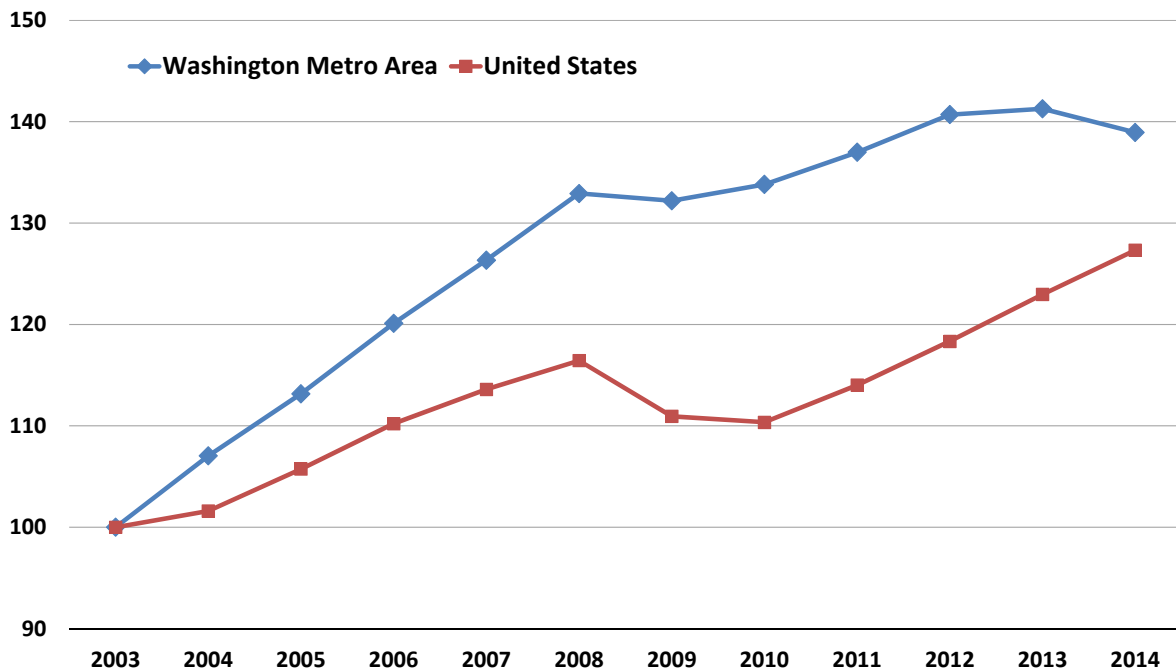


Table 5-1 also shows that overall BFS employment in the Washington Metro Area grew by 39 percent between 2003 and 2014. Meanwhile, national BFS employment only expanded by 27 percent. Figure 5-2 shows the gap between regional and national BHT employment growth widened between 2003 and 2010, but has narrowed slightly in recent years.

**Figure 5-2: Employment Growth for the Business and Financial Services Cluster
Washington Metro Area vs. National 2003-2014
Index =100 in 2003**



The BFS sector in the Washington Metro Area contains a significant proportion of high value occupations. The largest occupational category is Management with nearly 36,000 jobs and an average salary of \$125,000. Other key occupational categories are Business operations (35,000 jobs, average salary of \$90,000), Finance (26,000 jobs, average salary of \$91,000), Computer and math (23,000 jobs, average salary of \$96,000) and Engineering (17,000 jobs, average salary of \$87,000). Smaller occupations within the BFS cluster also had high wages, including Science (\$96,000) and Sales (\$95,000). Compared to the national economy, the WMA has a particularly large concentration of Computer and math occupations (LQ of 4.2) in the BFS cluster.

Overall, jobs in the BFS cluster had an average salary almost \$89,000 per year, compared with a WMA overall average salary of \$62,000 per year. Nationally, BFS related occupations had an average annual wage of just \$65,000. Table 5-2 shows the full occupational breakdown.

Table 5-2: Occupational Makeup of Business and Financial Services Cluster

Occupation	WMA Employment			USA Employment			2014 LQ
	2014	%	Avg Wage	2014	%	Avg Wage	
Management	35,542	18.7%	124,940	758,572	15.3%	103,486	2.2
Business Ops	34,827	18.3%	89,639	515,522	10.4%	69,681	3.2
Financial	25,889	13.6%	90,591	778,328	15.7%	75,897	1.6
Computer & Math	23,328	12.3%	96,208	262,117	5.3%	82,084	4.2
Office & Administrative	22,733	12.0%	50,276	918,854	18.6%	35,087	1.2
Engineering	16,666	8.8%	86,851	479,843	9.7%	68,941	1.6
Entertainment	9,397	4.9%	47,896	315,400	6.4%	33,909	1.4
Sales	5,589	2.9%	95,100	315,614	6.4%	91,018	0.8
Science	3,751	2.0%	96,406	70,839	1.4%	62,197	2.5
Other	12,406	6.5%	64,487	532,318	10.8%	36,102	1.1
Business and Financial Services (BFS)	190,128	100.0%	88,813	4,947,406	100.0%	65,287	1.8

Source: JobsEq and Inforum calculations

c) Ecosystem

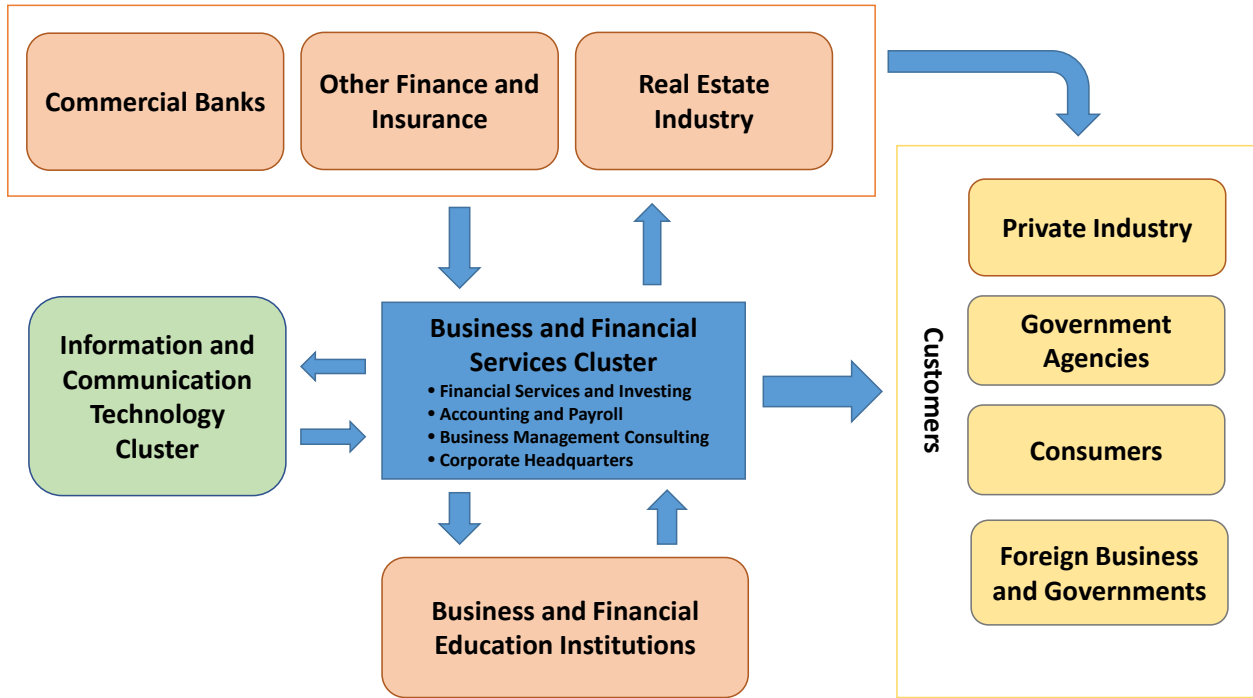
Figure 5-3 displays the BFS cluster ecosystem, listing its suppliers, complementary institutions, and customers. As with nearly all modern business activity, BFS relies heavily on the Information and communication technology cluster. These computers, phones, software, and IT services help to improve BFS productivity.

Distinct, but related industries such as commercial banks and real estate are both buyers and sellers of the Business and financial services cluster. These industries are not explicitly part of the BFS cluster because they are mostly dedicated to serving the local economy. However, that is not to say they are not important to the health of the sector, since they are both integrated suppliers and customers of the cluster. For example, local commercial banks work with business consultants, insurance funds, and other market makers to pursue their local business. Local and export businesses support and train the same pool of local talent, and new technology and practices are disbursed from the movement of these local workers.

Indeed, a local pool of highly educated professionals is invaluable to any industry. The BFS cluster benefits from an abundance of such individuals due to numerous nationally-recognized universities. Local students can learn skills by obtaining internships at BFS related firms in the region. Companies can reward these skills by offering a full-time position after graduation.

Customers of Business and financial services range from individual consumers, private industry, to all levels of government. This diverse customer base will provide a certain amount of stability in the years to come.

Figure 5-3: Ecosystem of the Business and Financial Services Sector



d) SWOT Analysis

Strengths:

- A large pool of talent in the region helps firms hire the best and brightest minds available.
- Economies of agglomeration will enable the BFS cluster to take advantage of spillovers with other clusters in WMA.
- The wide variety of end consumers should help provide stability in the event one part of the economy struggles.

Weaknesses:

- WMA's high cost of living and congested infrastructure may turn off some professionals.

Opportunities:

- An intensification of "macro-prudential" regulation of the financial sector will expand opportunities to professionals with expertise in such regulation, especially former federal employees that can assist firms with compliance.
- Diversify by continuing to add foreign government and private industry clients. This will help insulate companies from domestic economic downturns.
- Business and financial service firms can partner with the ICT cluster to use "Big Data" in an effort to increase productivity and security. For example, new types of business intelligence software and data mining techniques will help firms to identify previously unseen patterns to bolster profits.

Threats:

- If U.S. government budgets are slashed and are smaller consumers of Business and financial services, there is less of a reason for firms to stay in region.

Chapter 6: Media and Information (MAI)

a) Definition

The Media and Information (MAI) cluster comprises media of all forms: books, magazines, newspapers, radio, television, internet publishing, and news services and libraries. It does not include telecommunication services such as wireless service providers, internet service providers, and data processing services. Thus, the MAI cluster is mostly centered on the creation and dissemination of news and entertainment content, but not necessarily on the technical infrastructure on which that content is received and read.

Each of these activities consist of component sectors which are identified using NAICS (North American Industry Classification System) industry codes, and which we quantify with employment and payroll data from the Quarterly Census of Employment and Wages (QCEW). Table 6-1 displays the jobs across the various sectors comprising the MAI cluster for the Washington Metro Area (WMA) and for the United States (USA). The table shows employment in levels and in total percentage growth between 2003 and 2014. The final column is the 2014 employment location quotients, which show the relative concentration of the industry within the WMA region. Location quotients (LQ) exceeding 1.0 indicate a regional concentration of the industry. The overall LQ of 1.5 shows that the WMA has a comparative concentration of the MAI industry, perhaps only surpassed by places like New York City, but more than the vast majority of media centers. Figure 6-1 illustrates how the LQ varies by industry.

b) Description

WMA employment for the Media and information cluster was approximately 36,000 in 2014. Table 6-1 shows that overall employment in the local MAI cluster fell by 20 percent between 2003 and 2014. The national MAI related industries fared slightly better, only declining 16 percent. However, the fall of employment reflects not a declining industry, but a rapidly growing and changing one. Employment in both the WMA and the USA is a story of print (declining rapidly) vs. electronic (growing) media. New media and information channels have greatly enhanced labor productivity in the industry. Looking forward, the cluster is ushering in the “Big Data” era for information collection, distribution, and analysis. This presents important opportunities to firms and workers in the sector.

Jobs at Newspaper publishers, the largest MAI related industry in the WMA, fell from approximately 10,000 in 2003 to 6,000 in 2014, a drop of 38 percent. Similarly, Book printing employment fell from 4,000 to 2,000 over the same period (-49%). Periodical publishers also experienced significant job losses, slipping from 7,000 to 5,000 (-28%). Employment in the combined categories for television, radio, cable, and libraries were generally flat over the 2003 to 2014 period, and jobs increased in the Internet publishing and broadcasting sector (+30%).

**Table 6-1: Employment in the Media and Information Cluster
2003 and 2014**

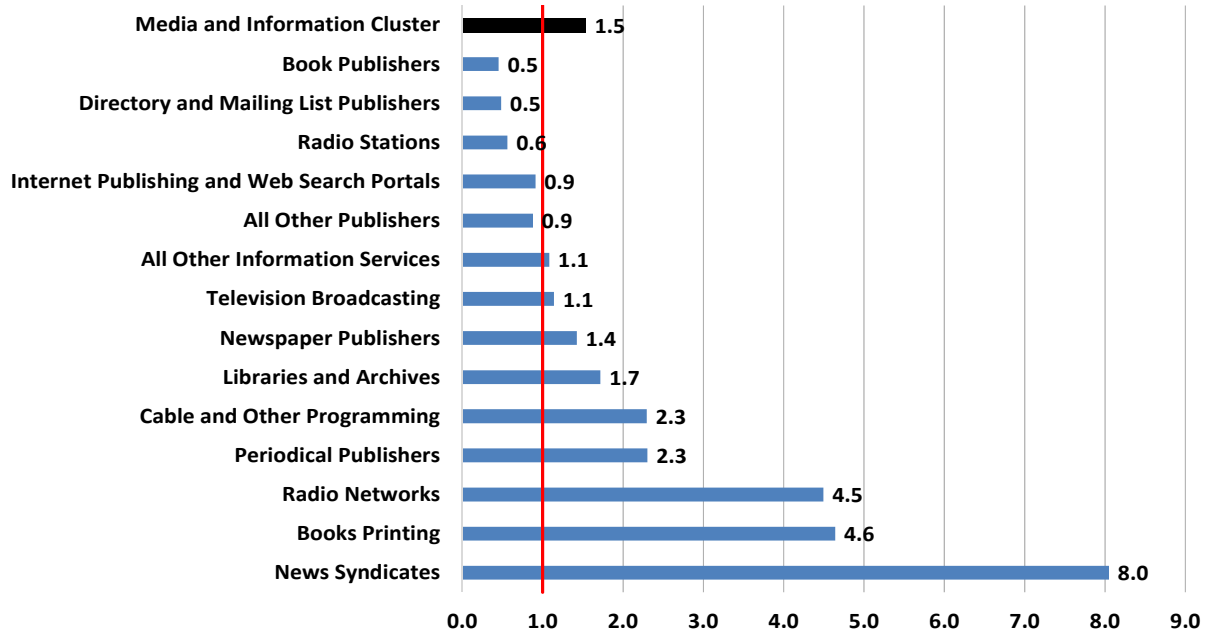
Industry	WMA Employment			USA Employment			2014 LQ
	2003	2014	Growth 2003-14	2003	2014	Growth 2003-14	
Print Publishing							
Books Printing	4,401	2,223	-49%	36,831	22,003	-40%	4.6
Newspaper Publishers	10,154	6,263	-38%	382,689	201,995	-47%	1.4
Periodical Publishers	7,148	5,168	-28%	149,081	103,046	-31%	2.3
Book Publishers	1,080	636	-41%	81,025	64,612	-20%	0.5
Directory and Mailing List Publishers	838	273	-67%	47,957	25,942	-46%	0.5
All Other Publishers	485	299	-38%	31,821	15,629	-51%	0.9
Broadcasting							
Radio Networks	1,656	1,900	15%	23,871	19,421	-19%	4.5
Radio Stations	1,308	866	-34%	85,827	71,065	-17%	0.6
Television Broadcasting	3,772	3,240	-14%	130,240	130,510	0%	1.1
Cable and Other Subscription Programming	2,684	3,136	17%	85,634	62,766	-27%	2.3
Other Information Services							
News Syndicates	2,011	2,102	5%	9,642	11,994	24%	8.0
Libraries and Archives	6,383	6,067	-5%	159,920	162,135	1%	1.7
Internet Publishing, Broadcasting, Search	2,469	3,206	30%	41,015	161,730	294%	0.9
All Other Information Services	352	365	4%	11,324	15,493	37%	1.1
Media and Information Cluster (MAI)	44,741	35,745	-20%	1,276,877	1,068,341	-16%	1.5

Source: JobsEq and Inforum calculations

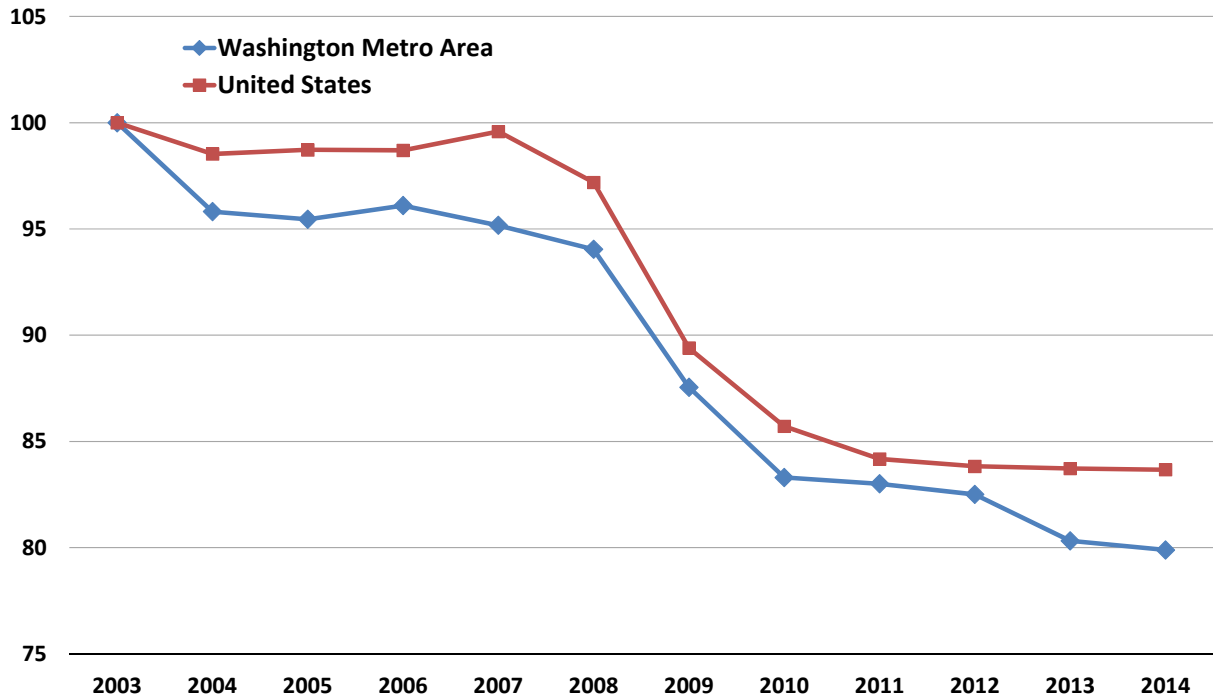
Despite the decline in employment, the WMA has a high location quotient for book printing (LQ = 4.6), newspaper publishing (LQ = 1.4), and periodical publishing (LQ = 2.3), due to the area's natural location as a national center for news and events.

Figure 6-2 shows that Media and information employment growth was nearly identical in the WMA and nationally, indicating that trends in productivity and media consumption choices are affecting the sector uniformly.

**Figure 6-1: Location Quotients for the Media and Information Cluster
2014**



**Figure 6-2: Employment Growth for the Media and Information Technology Cluster
Washington Metro Area vs. National 2003-2014
Index =100 in 2003**



The MAI sector in the WMA contains a significant proportion of high value occupations, particularly in Management (\$122,000 average salary) and Entertainment (\$77,000), which includes newscasting, public relations, and other occupations related to content production.

Table 6-2 displays the full occupational breakdown. Compared to the national economy, the WMA has higher concentrations of entertainment (LQ = 2.5), computer and math (LQ = 2.3), and educational occupations (LQ = 2.3) in the Media and information cluster. While the average wage in Washington DC is \$62,000 per year, jobs in the MAI cluster average over \$73,000 per year.

Table 6-2: Occupational Makeup of Media and Information Cluster

Occupation	WMA Employment			USA Employment			2014 LQ
	2014	%	Avg Wage	2014	%	Avg Wage	
Entertainment	10,318	28.9%	77,130	188,771	17.7%	50,736	2.5
Management	5,527	15.5%	122,381	143,432	13.4%	85,678	1.8
Office & Administrative	3,951	11.1%	40,800	189,341	17.7%	29,764	1.0
Sales	2,874	8.0%	70,365	117,914	11.0%	52,172	1.1
Production	2,785	7.8%	48,128	162,023	15.2%	35,157	0.8
Education	2,695	7.5%	50,541	54,197	5.1%	30,255	2.3
Computer & Math	2,510	7.0%	83,137	50,786	4.8%	70,137	2.3
Transportation	1,133	3.2%	26,673	34,703	3.2%	24,552	1.5
Install & Repair	1,113	3.1%	48,757	53,955	5.1%	39,989	0.9
Other	2,839	7.9%	79,738	73,218	6.9%	62,912	1.8
Media and Information (MAI)	35,745	100.0%	73,450	1,068,341	100.0%	48,744	1.5

Source: JobsEq and Inforum calculations.

c) Ecosystem

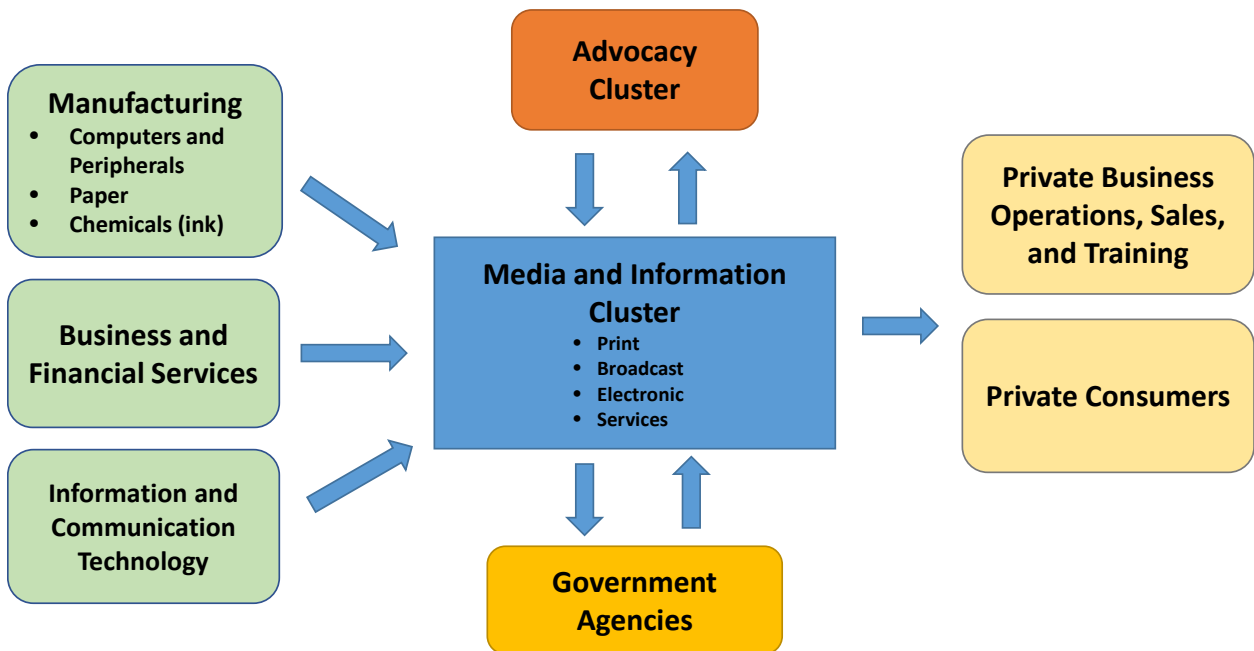
Figure 6-3 displays the ecosystem of the MAI cluster, listing its suppliers, complementary institutions, and consumers. While on a decline, traditional forms of print media still require manufactured goods such as paper and ink. Regardless of distribution method, all MAI firms utilize computers and other electronics to produce their products. Business and financial services are purchased to finance operations and to sell advertising. Another cluster spillover occurs when the Information and communication technology (ICT) cluster is leveraged to deliver MAI's broadcasts and publications.

In a large sense, the federal government is the raw material for the media and information in Washington. Moreover, the advocacy cluster are simultaneously suppliers and purchasers of the MAI cluster. Both sectors consume the latest information possible in order to stay current in the region's rapidly changing political and social landscape. They also supply content to MAI

firms to direct their message, whether it be a piece of legislation or support for a particular cause, to their intended audience.

Private industry relies on the Media and information cluster to supply them with up-to-date news. While this may take the form of print, online publications, or television broadcasts, it helps businesses make informed decisions. In addition to news, private consumers also purchase entertainment from the MAI cluster.

Figure 6-3: Ecosystem of the Media and Information Cluster



d) SWOT Analysis

Strengths:

- All major news outlets have a large presence in the region due to the proximity of various government agencies, foreign embassies and other key institutions. As a natural media center, the WMA will always contain a critical mass of companies and skilled employees.
- The Washington Metropolitan Area has also become a center for documentary, non-profit, science-oriented, and public interest web-based content production, including video, audio, and narrative content, particularly targeting social media and public opinion.
- The Newseum, the Library of Congress, U.S. Archives.

Weaknesses:

- The WMA is big in the print publication industry, which continues to decline as electronic alternatives become much more ubiquitous. Radio and television broadcasting will also face stiff competition from Internet-based products.
- The relatively high cost of living makes it more difficult for some companies and employees to be based out of the WMA. This is especially true for types of media that do not require a physical closeness to Capitol Hill.

Opportunities:

- Build on the Silver Spring-based cluster of content providers: the American Film Institute, the Silver Spring Documentary Festival, and Docs in Progress.
- Create a center for research into which types of political advertisements and outreach content actually works, so that the DC Metro area can grow as a smart producer of political content.

Threats:

- Most of the web-based content production does not necessitate a geographic clustering of people; it can be done remotely with high speed internet access and cloud-based file sharing services. Geographic proximity can be useful for creativity, but it is not essential for production in the future.

Chapter 7: Business and Leisure Travel (BLT)

a) Definition

As the nation's capital, Washington DC is a natural hub for conferences and conventions, high-level meetings, lobbying, and tourism. The region also serves as a major destination for activism-related travel, as protesters choose to make their voices heard in the nation's social and political epicenter. The region complements this natural advantage with historic sites, museums, monuments and other infrastructure designed to attract visitors from around the world.

The Business and Leisure Travel (BLT) cluster is a stable and large source of jobs for the Washington Metro Area (WMA). It includes accommodation and transportation services, especially air transport. Entertainment, sporting events, museums, and parks are also in the sector. The cluster definition does not include restaurants and bars. Although those services are very important to the travel and conference industry, we assumed that most of the activity of food and drinking places serves local customers, not tourists or business travelers.

Component sectors are identified using NAICS (North American Industry Classification System) industry codes, and which we quantify with employment and payroll data from the Quarterly Census of Employment and Wages (QCEW). Table 7-1 shows the jobs comprising the BLT sector for the WMA and for the United States (USA) for 2003 and 2014. The table shows employment in levels and in total percentage growth between 2003 and 2014. The final column is the 2014 employment location quotients, which show the relative concentration of the industry within the WMA region. Location quotients (LQ) exceeding 1.0 indicate a regional concentration of the industry. The overall LQ of 1.1 shows that the WMA has a slight comparative concentration on the nationwide BLT industry. Figure 7-1 illustrates how the LQ varies by industry.

b) Description

Table 7-1 shows that total WMA employment for the BLT cluster is split among Transportation, Entertainment, and Accommodation. The number of jobs in the cluster approached 86,000 in 2014. The sector's largest employers are Hotels (41,000 jobs) and Air transportation (11,000 jobs). Other BLT related industries include Museums (10,000 jobs) and Air travel support (6,000 jobs).

The fastest growing major sectors within the BLT cluster are Air travel support (+45% between 2003 and 2014) and Promoters of arts and sports (+15%). Interestingly, shrinking jobs sectors include Air transportation (-26%) and Spectator sports (-21%). For air transportation, the jobs decline reflect a national trend of very high labor productivity growth. However, jobs in the spectator sports industry are not declining nationwide. The major sector of the BLT cluster with

**Table 7-1: Employment in the Business and Leisure Travel Cluster
2003 and 2014**

Industry	WMA Employment			USA Employment			2014 LQ
	2003	2014	Growth 2003-14	2003	2014	Growth 2003-14	
Transportation							
Air Transportation	14,569	10,735	-26%	504,955	419,830	-17%	1.2
Taxi and Limousine Service	1,894	1,907	1%	66,499	79,374	19%	1.1
Charter Bus Industry	723	885	22%	32,775	29,867	-9%	1.4
Sightseeing Transportation	231	683	196%	27,936	31,857	14%	1.0
Support for Air Transportation	3,840	5,582	45%	194,118	223,095	15%	1.1
Travel Arrangement Services	4,760	3,892	-18%	240,078	198,926	-17%	0.9
Other Support Services	2,327	2,440	5%	48,813	50,372	3%	2.2
Entertainment							
Performing Arts Companies	3,903	3,633	-7%	122,112	116,330	-5%	1.4
Spectator Sports	3,483	2,759	-21%	135,891	137,960	2%	0.9
Promoters of Arts and Sports	2,491	2,860	15%	79,869	129,018	62%	1.0
Museums, Historical Sites, etc.	9,130	9,562	5%	201,593	233,759	16%	1.9
Traveler Accommodation	39,734	40,980	3%	1,737,610	1,880,064	8%	1.0
Business and Leisure Travel Cluster (BLT)	87,086	85,919	-1%	3,392,249	3,530,452	4%	1.1

Source: JobsEq and Inforum calculations

the highest location quotient is museums and historic sites (LQ = 1.9), reflecting the presence of Smithsonian museums, the Capitol Building, the Washington Monument, and countless other attractions. The overall LQ of 1.1 reveals that the WMA does not have a particular national concentration of BLT, especially when compared to more dedicated business and travel destinations such as New York, Chicago, Las Vegas, Orlando, or San Francisco. Nonetheless, the sector's large footprint and strong linkages mean that it must be an important component in the region's economic future.

Table 7-1 also shows that the growth of overall BLT employment in the Washington Metro Area between 2003 and 2014 was relatively flat, with a growth rate of minus 1 percent, compared to national BLT employment growth of 4 percent. Figure 7-2 illustrates that the gap between regional and national BLT employment continued to widen in recent years. This mismatch does not necessarily mean that the sector is losing competitiveness or even that it is shrinking. Figure 7-3 shows that the number of visitors to the WMA has risen steadily since 2009 and this growth promises to continue. To the extent that low cluster employment growth reflects a change in the composition and high productivity growth within the sector, it is a favorable development.

Figure 7-1: Location Quotients for the Business and Leisure Travel Cluster, 2014

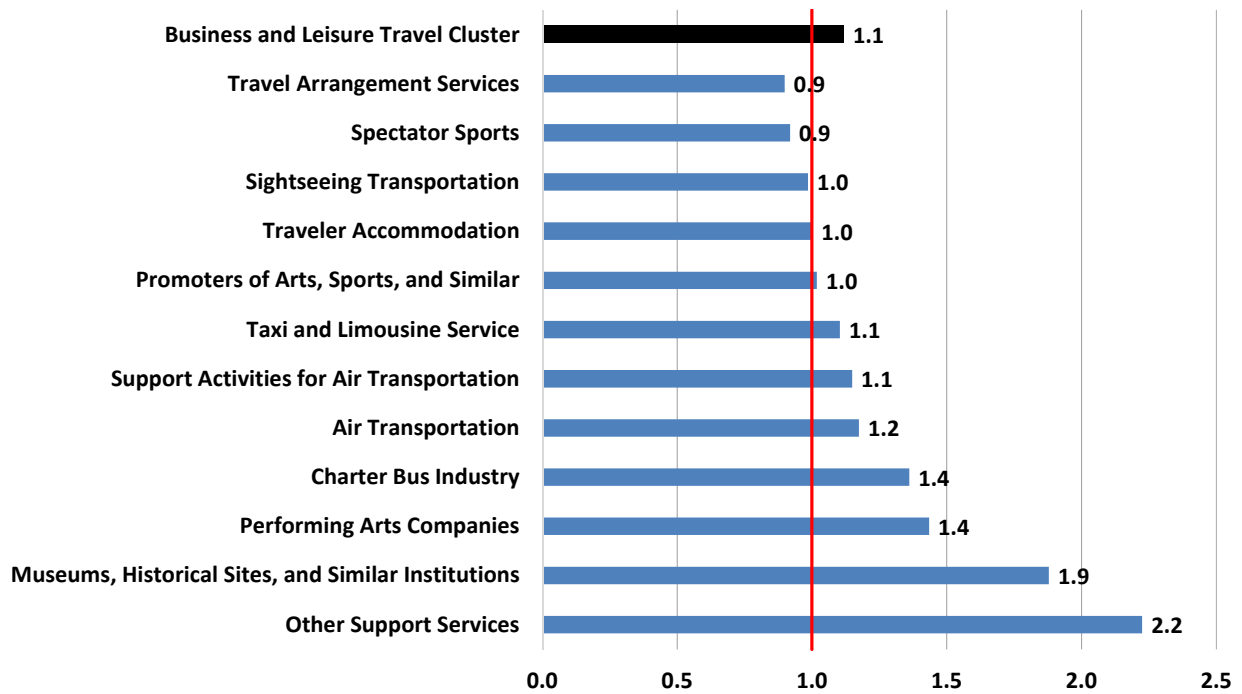
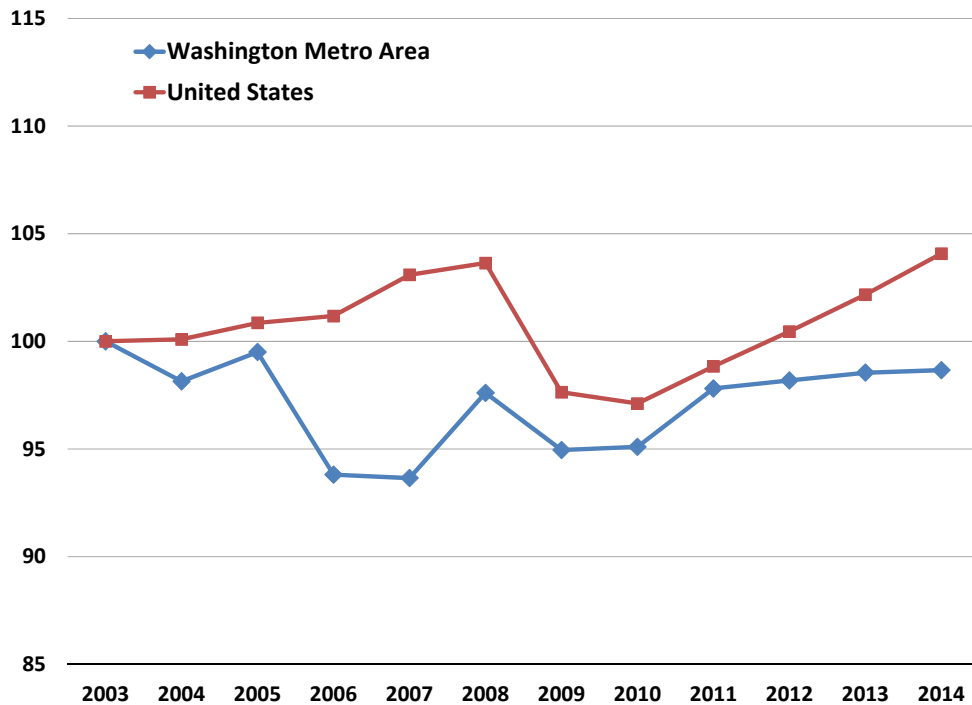
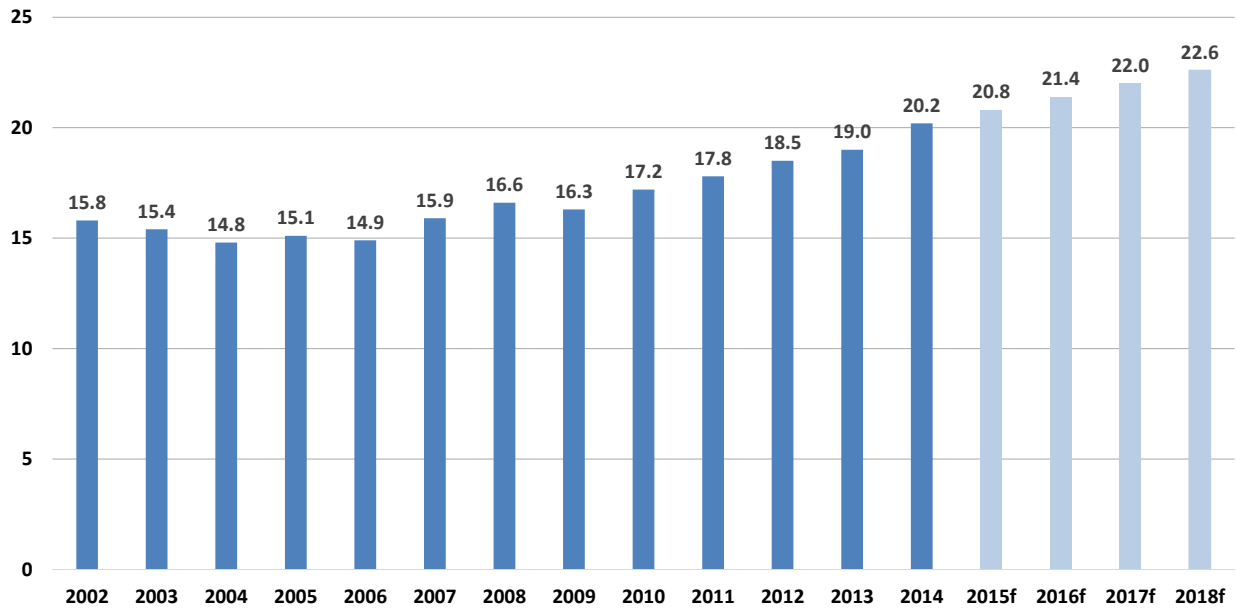


Figure 7-2: Employment Growth for the Business and Leisure Travel Cluster, Washington Metro Area vs. National, 2003-2014
Index = 100 in 2003



**Figure 7-3: Total Washington Metro Area Visitor Volume, 2002-2014 and forecast
Millions of Visitors**



Sources: Destination DC, IHS Global, D.K. Shifflet & Associates, Travel Market Insights, National Travel & Tourism Office, International Trade Association, Department of Commerce

Table 7-2 shows that the BLT cluster in the Washington Metro Area has an average wage of \$45,000 per year. This lags behind both the area’s average annual wage (\$62,000) and an average within the seven clusters. The largest occupational category is Transportation, with more than 17,000 jobs and an average salary of \$37,000. Table 7-2 displays the full occupational breakdown.

Other key occupations are Office and administrative (11,000 jobs; \$36,000 average wage), Management (10,000 jobs; \$84,000 average wage), Cleaning and maintenance (9,000 jobs; \$24,000 average wage) and Entertainment (7,000 jobs; \$32,000 average wage). Location quotients in the BLT by occupation are generally near 1.0, indicating approximately the same intensity nationwide. While wages in the BLT cluster are relatively modest, these occupations are critical for ensuring WMA’s status as a top tier business and leisure travel destination. Additionally, interactions with other clusters have far-reaching effects.

Table 7-2: Occupational Makeup of Business and Leisure Travel Cluster

Occupation	WMA Employment			USA Employment			2014 LQ
	2014	%	Avg Wage	2014	%	Avg Wage	
Transportation	17,292	20.1%	36,807	773,993	21.9%	37,423	1.0
Office & Administrative	10,836	12.6%	35,524	566,151	16.0%	29,320	0.9
Management	10,069	11.7%	83,641	364,410	10.3%	66,913	1.3
Cleaning & Maintenance	8,739	10.2%	24,151	372,342	10.5%	19,333	1.1
Entertainment	6,968	8.1%	32,232	301,891	8.6%	25,269	1.1
Food Prep & Serving	5,874	6.8%	32,538	216,212	6.1%	24,146	1.2
Sales	4,537	5.3%	54,694	193,731	5.5%	38,054	1.1
Personal Care	3,928	4.6%	27,658	166,574	4.7%	24,221	1.1
Business Ops	3,031	3.5%	63,602	70,479	2.0%	53,525	2.0
Install & Repair	3,005	3.5%	58,287	158,460	4.5%	47,202	0.9
Protective	2,358	2.7%	36,491	71,314	2.0%	27,547	1.5
Other	9,283	10.8%	66,232	274,896	7.8%	48,781	1.6
Business and Leisure Travel (BLT)	85,919	100.0%	45,457	3,530,452	100.0%	36,211	1.1

Source: JobsEq and Inforum calculations

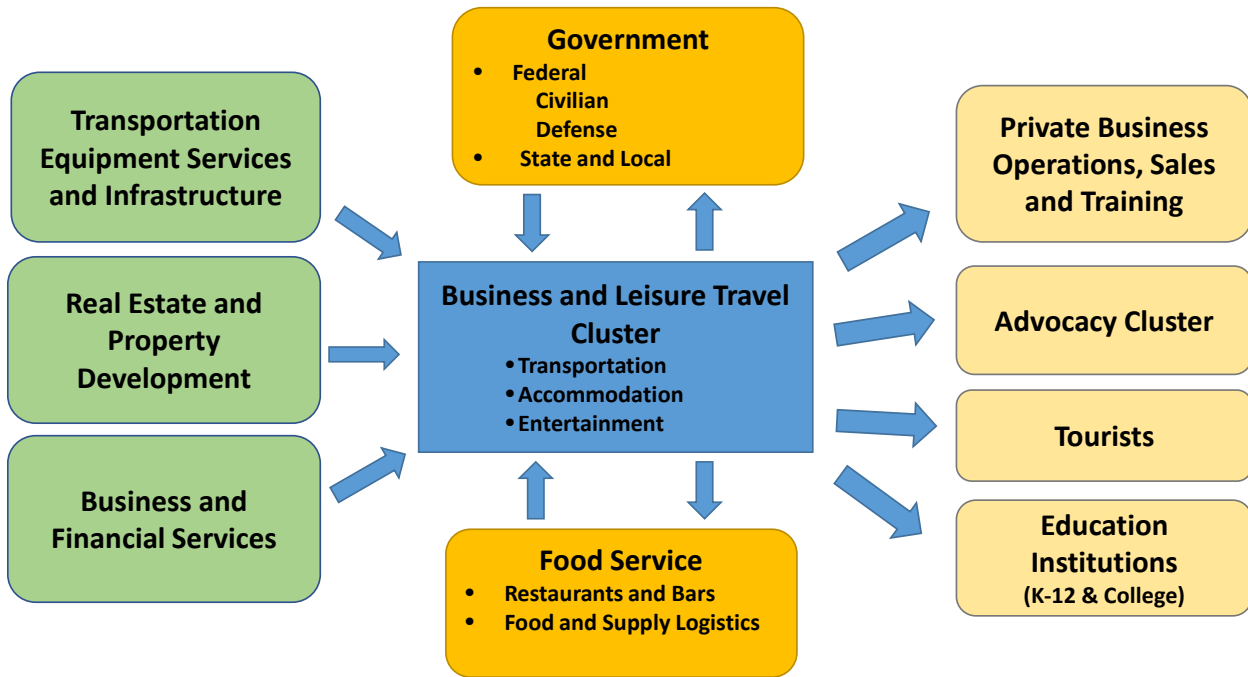
c) Ecosystem

Figure 7-3 displays the BLT cluster ecosystem. Supplying industries include transportation equipment manufacturers, infrastructure, construction, and maintenance. Planes, buses, and trains utilize WMA’s electric grid, airports, roads, and rail. Real estate developers make important investments in BLT related properties with the assistance of financial services firms. The food service and restaurant industries are not explicitly included in the BLT cluster but they are closely intertwined with it. Travelers and local residents alike patronize these businesses either directly at restaurants and snack bars, or indirectly through hotels and entertainment locales.

State and local governments play a large role in developing and maintaining the infrastructure and other amenities that makes the WMA an attractive travel destination. Providing a business friendly environment means perceiving the sector as a little less of a piggy bank and a little more as a job generator. In Washington, federal government investment and administration are also vital, especially concerning the up-keep and operations of its parks, museums, roads, and other facilities.

The Business and Leisure Travel cluster serves all types of other customers. While federal government sponsored travel has declined in recent years, it still remains an important customer. An improved budget situation could boost government travel and training in the near future. On a related note, state and local government budgets are already expanding which could result in more school travel and field trips.

Figure 7-3: Ecosystem of the Business and Leisure Travel Cluster



The region also contains headquarters or primary executive branches for several large and growing businesses. One of the biggest source of customers comes through the Advocacy cluster. Locally headquartered trade associations, think-tanks, foundations, and political and social and religious organizations host a variety of events from small-scale same day fly-ins to large-scale and week-long conventions and trade shows. Business travel is on an upswing and the coming general election should lead to increased activity in the immediate term.

Finally, the WMA remains a top destination for both domestic and foreign tourists. Within the next few years, renewed global income growth should provide a significant boost to the sector.

d) SWOT Analysis

Strengths:

- The national capital region is a magnet for visitors at all times.
- A large endowment of natural, cultural, and political attractions, including popular and world class federal and private sector museums.
- The WMA has a good backbone for local intercity (NYC, Philadelphia, Baltimore, Boston, Richmond) rail service.
- Airports and links to them are also good, and will improve greatly after the construction of the Silver Line.

Weaknesses:

- High incidence of automobile congestion in city, suburbs, and on main arteries.
- The Washington Metro is crumbling and is becoming unreliable, and even unsafe. Regional leaders need to take this situation very seriously.
- The region's high and variable cost of living makes it difficult for low wage employees to live close to their jobs, especially those in the prime business areas.

Opportunities:

- A regional branding campaign can include a component for boosting Washington travel and tourism.
- Current transit systems could be greatly improved and extended to boost the accessibility of business centers and tourist attractions.
- The High Occupancy and Tolls (HOT) lanes on the Dulles Toll Road, the Beltway and I-95 in Northern Virginia were financed via a Public-Private Partnerships (PPP). The company has collected tolls for over two years now, including almost one year for the I-95 stretch. State and local highway agencies need to evaluate whether this project can be a model for necessary upgrades to other local highways.
- Adding more bike sharing (ex: Capital Bikeshare) stations makes for a more visitor-friendly city by removing cars from the already congested streets.

Threats:

- Sea level rise will threaten low-lying WMA infrastructure. Regional barriers to flooding will need to be hardened to 1 meter sea level rise by 2050 and 2 or more meters by 2080. This prospect means that some very large infrastructures might need to be moved and/or rebuilt. For example, the Ronald Reagan Washington National Airport has a runway just 10.3 feet above sea level, and it is classified as vulnerable to a high storm surge.¹⁰ As sea level rises, the airport could be moved or else a floodgate and pumping system could be installed on the Potomac south of the Wilson Bridge. Either way, the required investment will be huge.

¹⁰ National Climate Assessment and Development Advisory Committee, *Climate Change Impacts in the United States: The Third National Climate Assessment*, 2014.

Chapter 8: The Seven Clusters Forecast

Long term economic growth requires innovative technological development and application. Moreover, most new technology is developed and adapted in just a few leading “knowledge-based” ecosystems and within geographic concentrations where such sectors cluster. As a result, economic growth can be unevenly distributed across industries and regions. To grow above average in the 21st century, metropolitan areas will need to contain and nurture vital components of the leading technology clusters. For the WMA, the seven leading clusters discussed in this report were chosen for their natural advantage in the capital city, technological prowess, linkages to other sectors, high wages, and growth potential. Crucially, and as demonstrated, these sectors also have an existing concentration within the WMA.

Current cluster concentrations do not guarantee future success, however. The global and national economies are incredibly dynamic, and capital and labor resources are footloose. Other regions are working to increase their attractiveness for these same sectors, and the technology frontier itself shifts continuously and extensively, sometimes eliminating previous industry or regional advantages. The history of economic development is littered with companies which lost the technology race, and regions that were slow to adapt to the changes it wrought.

In examining the future for the seven WMA clusters through 2025, we generated two employment scenarios for each of the key clusters and then for the WMA as a whole. The first scenario assumes that each cluster reduces dependence on federal spending and successfully diversifies into other markets. For this projection, we generate cluster-specific regional employment projection equations driven with corresponding regional and industry-level employment forecasts from IHS Economics. These forecast indicators show regional employment growth in knowledge-based industries significantly exceeding projections of national growth for the same industries. Given that IHS’s federal government spending and employment growth is much weaker in the coming decade compared to the 2001 to 2011 period, this regional projection implies that the regional knowledge-based industries successfully diversify. We call this the “Successful Diversification” or SD scenario.

The second scenario assumes that the clusters are not able to find sources of growth beyond the federal government. This alternative uses industry-level national employment projections to drive the forecasts for WMA cluster employment. Over the past few years, WMA employment increases has lagged national growth in these key sectors. If local increases cannot consistently beat national ones, then the regional advantages are dissipated and overall economic and employment growth will fall, at best, to the national average. This is the “Business as Usual” or BAU alternative.

Table 8-1 provides the results of this exercise, displaying three sets of job levels and growth rates for each cluster. The first two columns provides the number of 2014 jobs and the employment growth for each cluster for the eleven years from 2003 to 2014. As explained in

previous chapters, job growth was quite variable across clusters, with four clusters experiencing rapid growth (including ADV, SST, BHT and BFS), one seeing slow growth overall but more rapid increases in the most skilled jobs (ICT), and two clusters where regional employment actually contracted. Total employment in the seven clusters grew by 14.6 percent over 2003 to 2014, helping to drive overall WMA job growth by 9.3 percent, compared to 5.1 percent growth in the national economy.

The second two columns show the results of the Successful Diversification scenario with 2025 job levels and job growth from 2014 to 2025. In the eleven years from 2014 to 2025, employment in the previously fast-growing clusters are expected to grow at about the same rate as the past eleven years. ICT grows a bit faster than the previous period. Unlike the historical period, MAI and BLT employment is expected to grow. Under this favorable scenario, total employment in the sectors rises by 20.9 percent, notably faster than from 2003-2014.¹¹ Total regional employment increases by 14.4 compared to 9.5 percent for the economy as a whole. This figure for job growth is similar to many current forecasts of the WMA over the next decade, suggesting that these forecasts already assume successful diversification.

The last two columns of the table show the Business as Usual case where WMA employment growth in the key knowledge-based clusters is much slower, obtaining only 7.6 percent growth from 2014 to 2015. In several cases, such sluggish growth is actually similar to performances in recent years. It will continue if WMA workers and firms are not more successful in developing a more diversified portfolio of private, government, and foreign customers. In this scenario, total regional employment growth over the next eleven years is dragged down to 4.0 percent, compared to 9.5 percent in the nationwide economy.

Table 8-1: Forecasts for Job Growth in the Seven Clusters and WMA, 2014 – 2025

		Washington Metro Area					
		History		Successful Diversification		Business as Usual	
Cluster		2014 Jobs	2003-14 Growth	2025 Jobs	2014-25 Growth	2025 Jobs	2014-25 Growth
Advocacy	ADV	115,731	19.0%	138,868	20.0%	122,303	5.7%
Information Communications Technology	ICT	204,489	5.5%	224,872	10.0%	213,621	4.5%
Science and Security Technology	SST	123,785	19.0%	147,104	18.8%	135,707	9.6%
Biological and Health Technology	BHT	55,396	25.1%	67,929	22.6%	58,388	5.4%
Business and Financial Services	BFS	190,128	39.0%	269,053	41.5%	218,851	15.1%
Media and Information	MAI	35,745	-20.1%	41,667	16.6%	36,292	1.5%
Business and Leisure Travel	BLT	85,919	-1.3%	91,512	6.5%	87,807	2.2%
Total of Seven Clusters	TOT	811,193	14.6%	981,005	20.9%	872,969	7.6%
Washington Metro Area	WMA	2,973,337	9.3%	3,402,570	14.4%	3,092,270	4.0%
United States	USA	152,077,125	5.1%	166,505,562	9.5%	166,505,562	9.5%

¹¹ Recall that the 2003 to 2014 growth rates include the Great Recession which took a big bite out of employment across all industries and regions. The forecast through 2025 do not assume a business cycle of similar amplitude.

Figure 8-1: WMA Employment in Advocacy Cluster, 2001-2025
Thousands of Jobs

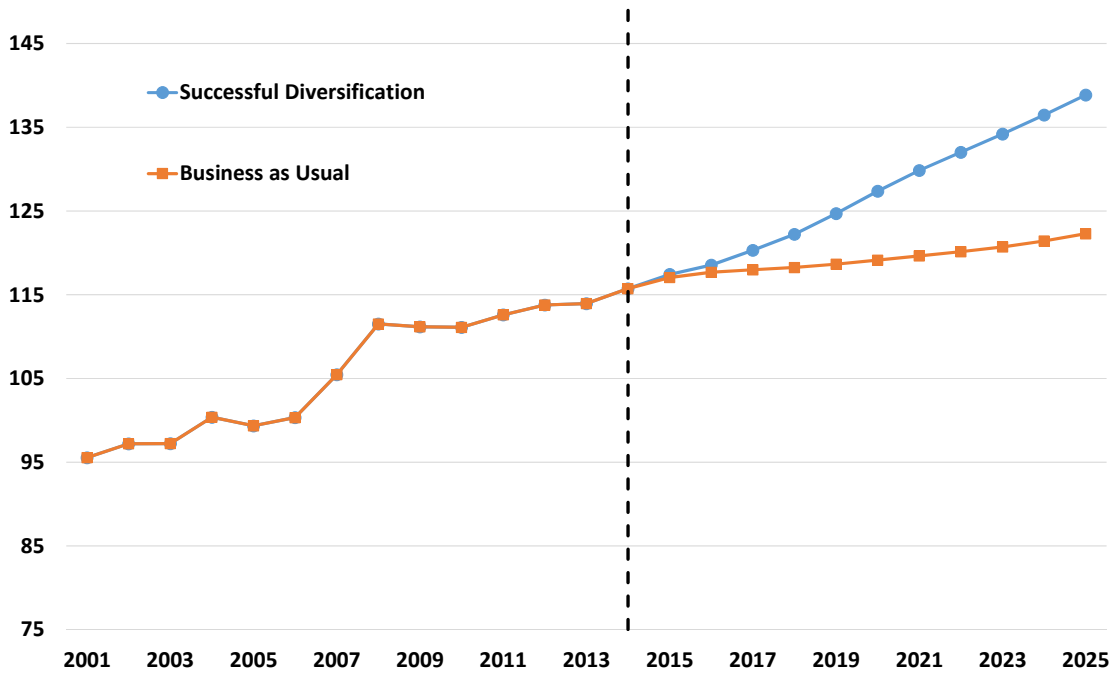


Figure 8-2: WMA Employment in Information & Communications Technology Cluster, 2001-2025, Thousands of Jobs

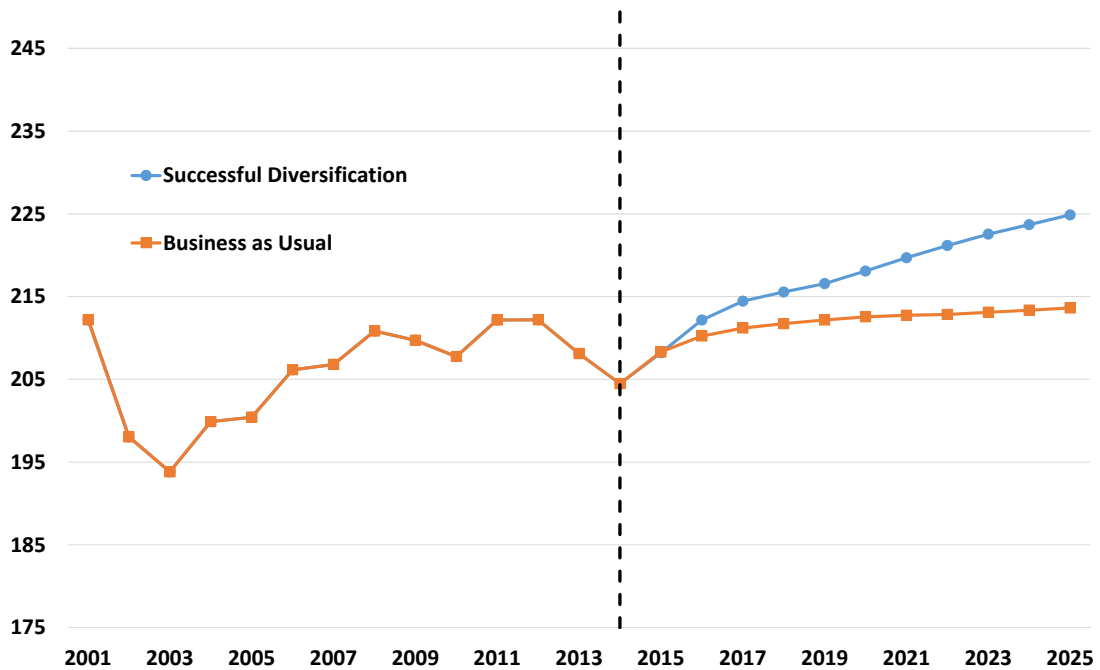


Figure 8-3: WMA Employment in Science and Security Technology Cluster, 2001-2025
Thousands of Jobs

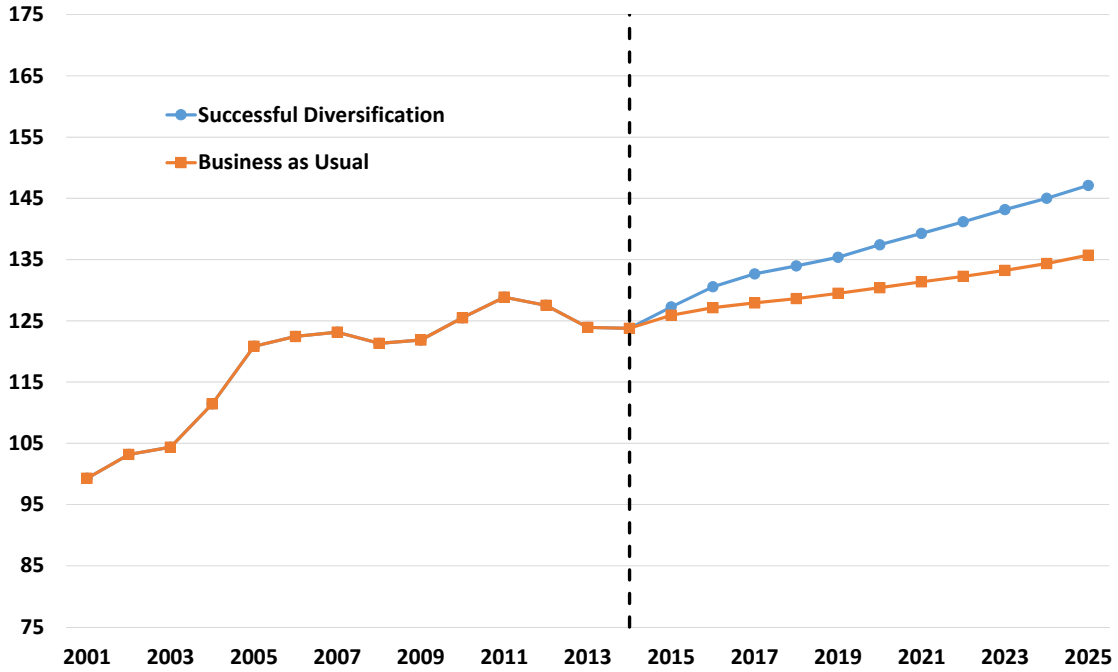


Figure 8-4: WMA Employment in Biological and Health Technology Cluster, 2001-2025
Thousands of Jobs

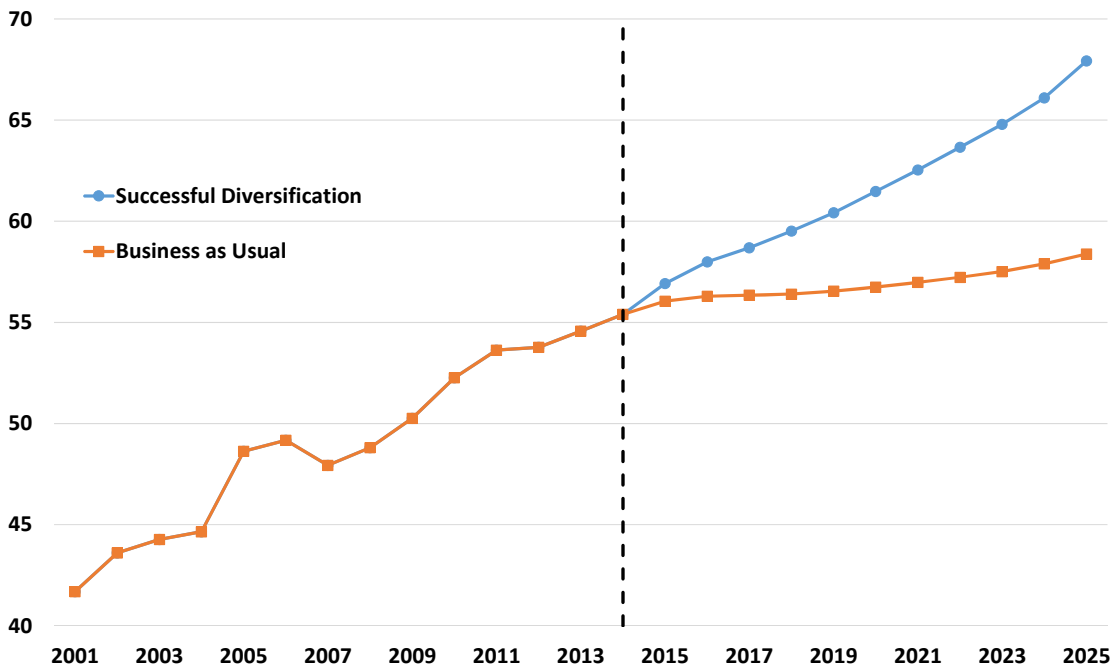


Figure 8-5: WMA Employment in Business and Financial Services Cluster, 2001-2025
Thousands of Jobs

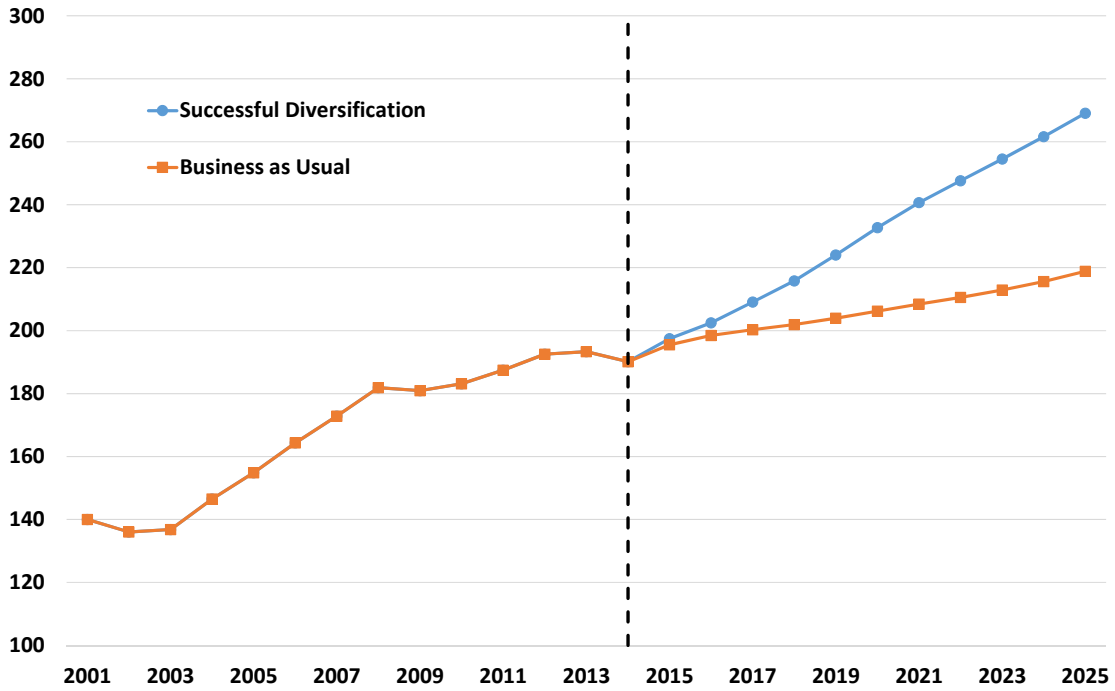


Figure 8-6: WMA Employment in Media and Information Cluster, 2001-2025
Thousands of Jobs

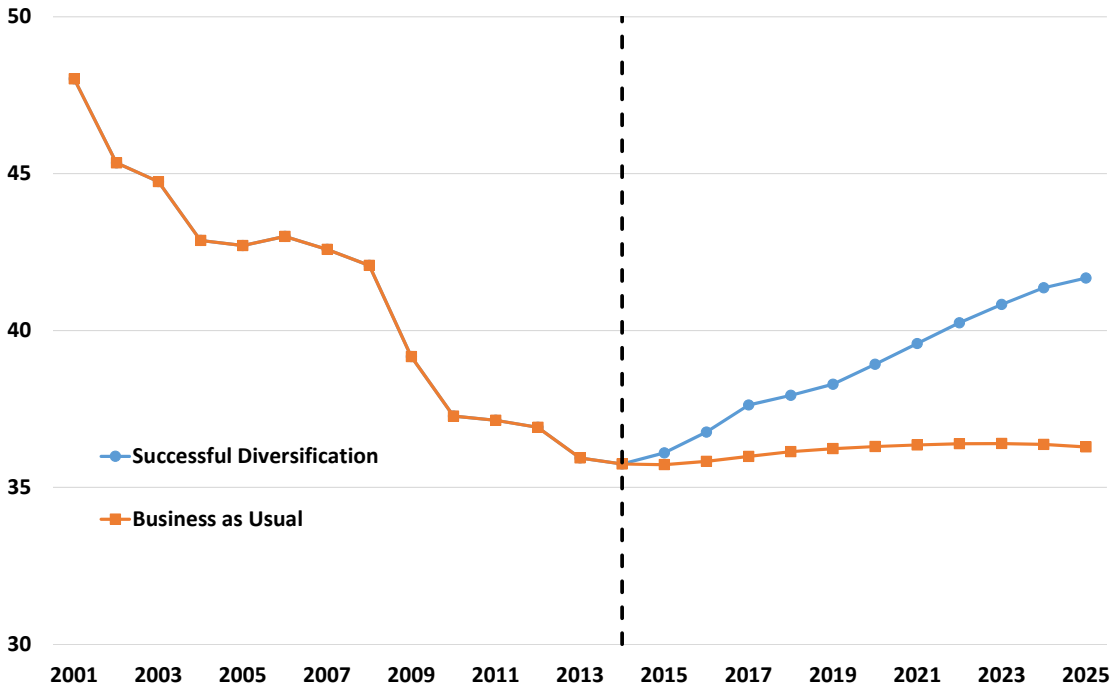


Figure 8-7: WMA Employment in Business and Leisure Travel Cluster, 2001-2025
Thousands of Jobs

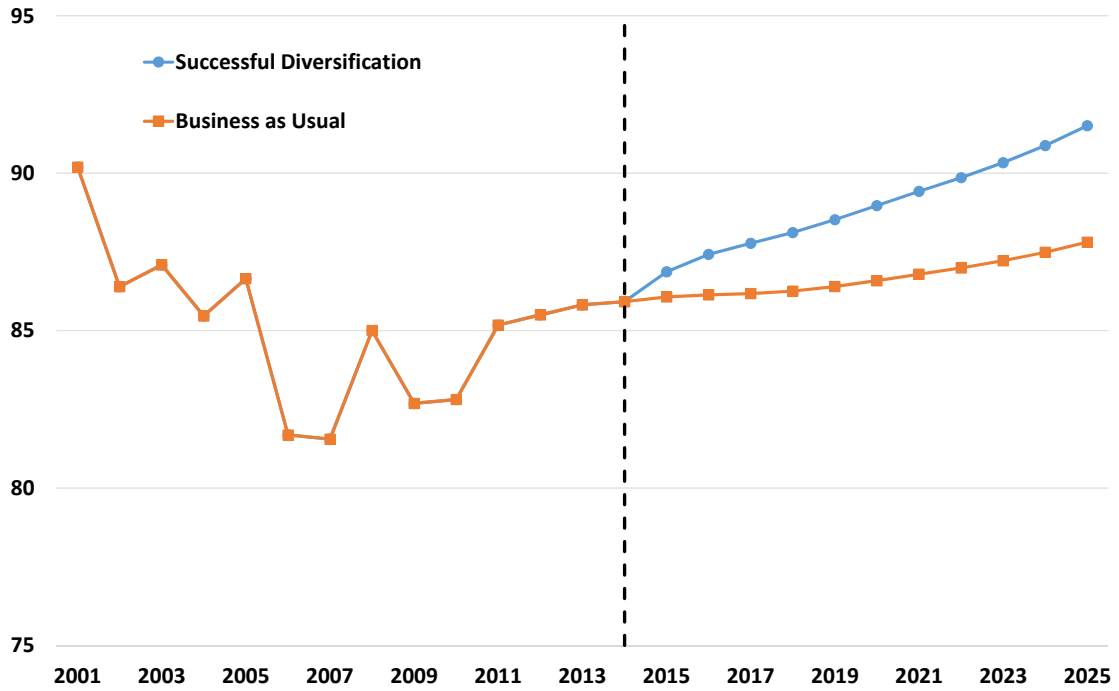


Figure 8-8: WMA Employment, Seven Cluster Total, 2001-2025
Thousands of Jobs

