Washington Research Council

Economic Profile

October 25, 2012

Washington's Prosperity Depends on Vibrant Tech Sector

Briefly

Washington's vibrant tech cluster has had a strong, positive effect on the state economy. The sector accounts for nearly two-thirds of Washington's job growth since 1990 and more than half of the growth in employee compensation. Major tax revenues generated by the sector grew 219 percent, to $2.9 billion in 2011.

The tech industry mitigated the effects of the national recession here, showing relatively stable income and employment patterns, even during the sharpest economic downturn in more than half a century.

Other states and regions witness the success of states with strong innovation clusters and strive to replicate it. They offer incentives, make education and infrastructure investments that the sector finds essential, and provide start-up assistance in the form of incubators and accelerators.

While Washington's cluster may appear secure, policymakers should not be complacent. The state has advanced several key initiatives important to the innovation economy, including tax incentives, STEM investment, and the Washington Opportunity Scholarship. These strategies, however, do not differentiate Washington from other states.

While Washington's incentive programs are generally consistent with good tax policy, "good tax policy" does not always guide the actions of our competition. States focusing on long-term cluster strategies are often willing to forego tax revenues far in excess of expected short-term returns. And businesses will respond. Location decisions are driven by many factors, but profit-and-loss calculations are always important.

Washington has been fortunate. The state's tech cluster has generated significant economic growth, created thousands of jobs, cushioned the recession, and spurred investment in critical infrastructure and higher education. The growth here not only has been consistent with good public policy, including tax policy, but it has also provided the intellectual and economic foundation to support an enhanced quality of life.

In a little more than three decades, explosive growth in technology has transformed the economic landscape. Washington-based tech firms were present at the beginning. The critical moment is generally traced to Microsoft's relocation to this state in 1979, a decision that made Seattle the anchor for one of the world's most successful information technology clusters. Since then, however, the innovation cluster has burgeoned far beyond the company and IT.

In the 1980s, McCaw Cellular Communications (later merged into AT&T) made the Seattle metro area a national leader in telecommunications. Internet retail giant Amazon, drawn by the area's dynamic IT community, launched in Seattle in 1994. The strength of these and other technology firms—their spinoffs and the new ideas they inspire—contributed to Washington's enviable, but not unassailable, global leadership in the innovation economy.

Since 1990, the tech sector has been responsible for 62.9 percent of the state's job growth, 54.7 percent of employee compensation growth and 33 percent of personal income growth. Direct tech

Typos corrected 1/29/14

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employment has grown from 94,500 to 202,600 over the 22-year period, while indirect and induced jobs have grown from 262,743 to 580,594. The combined tech employment growth has been 119.3 percent, compared with a growth in the underlying economy of 14.1 percent. Since 1994, direct, indirect and induced sales and business and occupation (B&O) tax revenues from the sector have increased by 219 percent, from $0.9 billion to $2.9 billion in 2011.

Regional Transformation

As Enrico Moretti writes in *The New Geography of Jobs*, the region's eventual prominence was far from inevitable.

> In 1979, Seattle was not an obvious choice for a software company. . . . Far from being the high-flying hub it is today, it was a struggling town. . . . it was bleeding jobs every year. It had high unemployment and no clear prospects for future growth. It was closer to today's Detroit than to Silicon Valley (Moretti 75).

No longer.

Washington's tech cluster has flourished. *Cyberstates 2011*, a snapshot of the high-tech industry produced by the TechAmerica Foundation, reports that in 2010 Washington ranked tenth in the nation in high-tech employment and third in average wages (James and Leary 84).

University of Washington professor William Beyers reports that tech employment has "expanded from 96,000 covered private sector jobs in 1974 to 384,434 private sector jobs in 2011, an increase of 300 percent," half again the 206 percent overall employment growth (Beyers i).

Defining the Tech Sector

Defining the sector can be problematic. TechAmerica's report includes any industry that is a

> maker/creator of technology, whether products or services. The definition does not include wholesale or retail trade, industries that are primarily dedicated to selling technology products as opposed to making/creating the technology.

The TechAmerica definition includes 52 North American Industrial Classification System (NAICS) six-digit industries, which "fall into two broad categories: high-tech manufacturing and high-tech services." Beyers, meanwhile, defines "high-tech" to include sectors with "at least 16.2 percent of their employment engaged in research and development occupations, equivalent to twice the state average for all industries."

In Washington, significantly, the Beyers definition includes aerospace; Boeing is the state's largest private sector employ-

Table 1: Our Definition of the Tech Sector

NAICS	Industry
334	Computer and electronic product manufacturing
3359	Other electrical equipment and component manufacturing
454111	Electronic shopping
454112	Electronic auctions
5112	Software publishers
516	Internet publishing and broadcasting ('90-'06)
517	Telecommunications
518	Data processing, hosting and related services
51913	Internet publishing and broadcasting, and web search portals ('07-'11)
54133	Engineering services
54138	Testing laboratories
5415	Computer systems design and related services
54171	R&D in the physical, engineering, and life sciences

Chart 1: Washington's Tech Sector Jobs in 2011

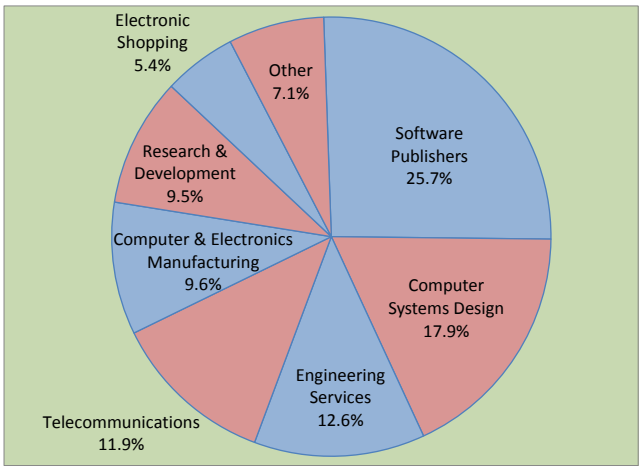
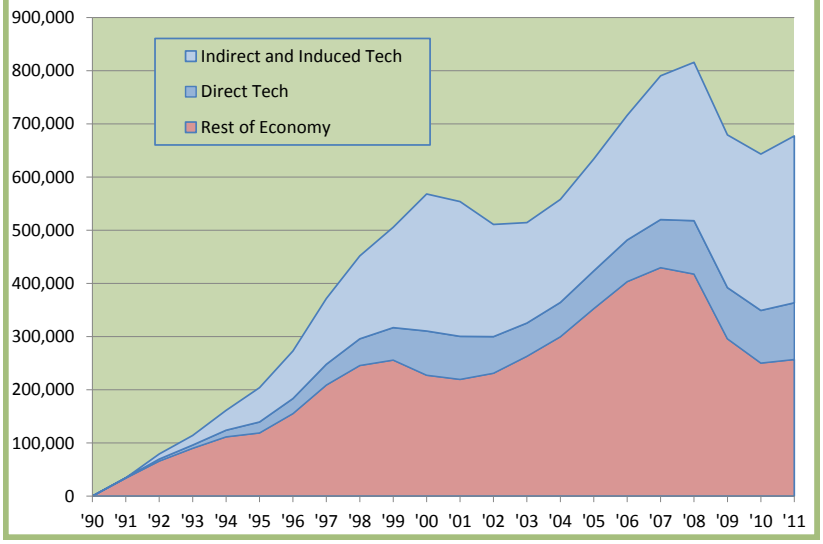


Chart 2: Job Growth 1990 to 2011



er. With aerospace in, he finds that the concentration of tech employment here is 47 percent higher than the national average. With aerospace out, the concentration remains highly significant, at 31 percent above the national average. In 2009, the ex-aerospace concentration was just 20 percent above the average.

In this report, the Washington Research Council adopts a tech definition that excludes aerospace, while using many of the industrial classifications common to the Beyers and TechAmerica reports.

Our definition of the tech sector includes the 13 NAICS groupings shown in Table 1. This definition is in substantial agreement with TechAmerica's *Cyberstates* definition. The major differences are our inclusion of electronic shopping and electronic auctions.

Washington's wage and salary employment in these industries totaled 200,244 in 2011. As Chart 1 shows, one quarter of these jobs were in software publishers, 18 percent were in computer systems design, 13 percent were in engineering services and 12 percent were in telecommunications.

In comparison, 2011 employment in the Beyers-defined technology-based industries was much greater, 387,173. Aerospace accounts for about one-half of this difference.

Washington's Successful Innovation Cluster

In comparing regional economies it's become common to think of industrial clusters. Moretti writes of the competitive advantages to a region stemming from the "forces of agglomeration"—the labor force, specialized services, and knowledge spillovers reinforcing a successful cluster (Moretti 24).

The Information Technology and Innovation Foundation (ITIF), which ranked Washington No. 2 on its *2010 State New Economy Index*, underscores the nature of that lead: "Washington scores high due not only to its strength in software . . . and aviation . . ., but also be-

Chart 3: Share of Jobs 1990

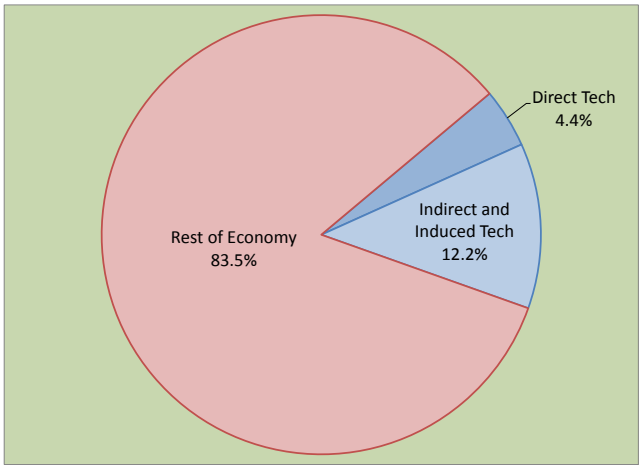
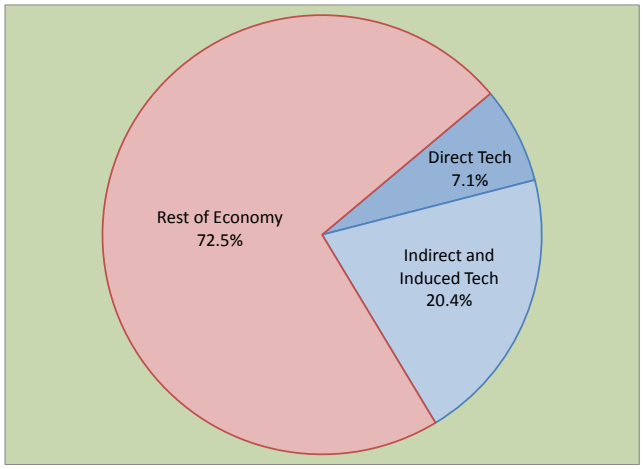


Chart 4: Share of Jobs 2011



cause of the entrepreneurial hotbed of activity that has developed in the Puget Sound region, and very strong use of digital technologies by all sectors" (Atkinson and Andes 12).

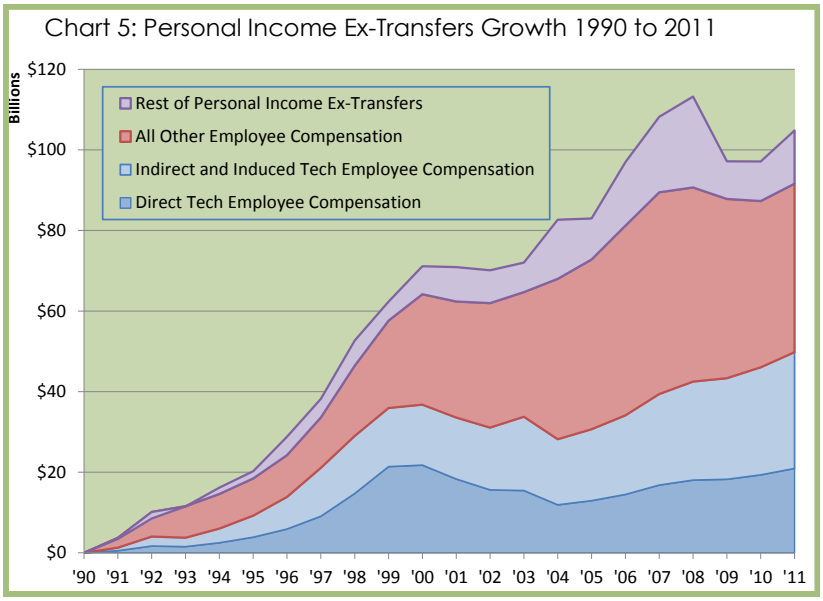
The state's emergence as a national leader in technology—what ITIF calls the "new economy"—confers a comparative advantage. As Moretti writes, "Cities with the right sectors and with workers who have the right skills are strengthening their position, while others are losing ground. It is a tipping-point dynamic" (Moretti 146). Regions that have built successful industry clusters can capitalize on the forces of agglomeration, as incumbent employers attract talent and investment.

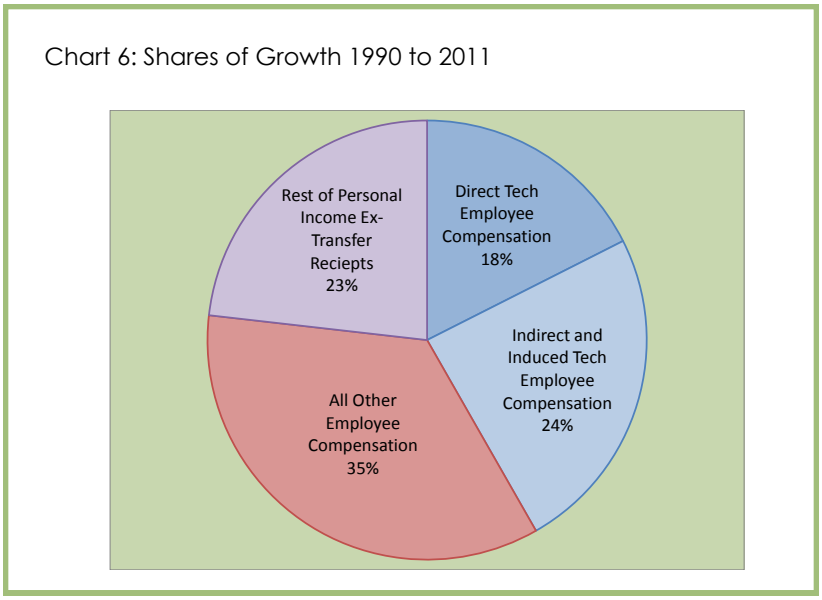
Yet, he adds, "None of this should be an argument for complacency" (Moretti 148).

In an intense global economy, state and regional leaders must always be mindful of the competition. Public policies should recognize risks and reinforce assets. As we show later in this report, across the U.S. states are vying to replicate Washington's extraordinarily vibrant tech economy. They market aggressively, nurture homegrown entrepreneurs, invest in infrastructure and higher education, and provide seed capital. These strategies are working. The competition is never static.

Economic history is a story of creative destruction. American cities have seen once dominant industrial clusters decline or relocate. Technological change, shifting consumer tastes, better products, obsolescence, and new competitors drive change. The new heart of the American automobile industry—now the American/German/Japanese auto industry—clusters in the Southeast. The Rust Belt once glittered. Los Angeles can no longer boast of a vibrant aerospace industry, while Seattle and, yes, Charleston, South Carolina, look to a thriving future. Even Hollywood has seen film production go global, with Vancouver B.C. home to a successful filmmaking cluster.

The following section demonstrates the magnitude of the employment, income





and tax revenue the innovation sector has contributed to Washington over the decades. Immediately following we examine the strategies pursued by other states hoping to replicate Washington's success. Their experience suggests policies that will preserve and strengthen this state's tech cluster.

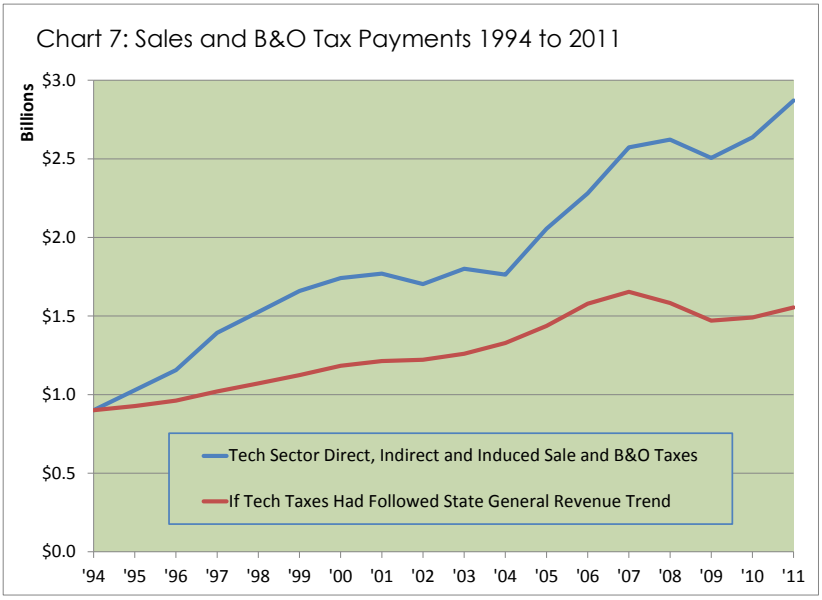
Economic Impact Analysis

The impacts of the tech sector on jobs and incomes in Washington can be grouped into three categories: direct, indirect, and induced impacts. The direct impacts occur in the sector itself—the jobs of those working in the sector and the compensation they receive. The indirect impacts include the jobs and wages of Washington firms that supply goods and services to the tech sector. The indirect impacts also include the jobs and wages of suppliers' suppliers; of the suppliers' suppliers' suppliers; and so on up the supply chain. Finally, the induced impacts include the jobs and wages at firms that provide goods and services (e.g., groceries, dry cleaning, banking) to workers holding the direct and indirect jobs.

The relationship between the direct impacts and the indirect and induced impacts are captured by multipliers. Our analysis will use multipliers from the Beyers study to estimate the indirect and induced impacts.

In 2011, the tech sector, as we define it, directly provided 200,244 jobs in Washington state. This is an increase of 114 percent from the 93,709 jobs that the sector provided in 1990. The total number of jobs in the state economy increased by a much smaller 32 percent from 1990 to 2011, so that the tech sector's share of jobs increased from 4.4 percent to 7.1 percent.

Using the jobs multipliers from the 2012 Beyers study, the tech sector supported 574,801 indirect and induced jobs in 2011, an increase of 120 percent from the 260,862 such jobs in 1990. Indirect and induced tech sector jobs were 12.2 percent of state em-



ployment in 1990 and 20.4 percent in 2011.

The input-output model used by Beyers does not capture any indirect or induced impacts due to capital expenditures linked the to sector. For this reason, the estimates of indirect and induced employment impacts we present understate the full impact. Firms in the sector directly make significant capital expenditures in the state. In telecommunications, for example, AT&T spent more than $1.5 billion during 2009–2011 upgrading wireless and wireline networks in the state. Besides equipment investments such as this, growth in the sector has been the source of a considerable amount of construction activity to provide offices and housing for the sector's expanding workforce and their families.

Wage and salary income from tech-sector jobs totaled $21.8 billion in 2011; including benefits, total compensation from tech sector jobs was $27.5 billion. Compensation from the indirect and induced jobs due to the tech sector was $37.6 billion. Adjusted for inflation to 2011 dollars, compensation from the direct, indirect and induced tech sector jobs grew by $49.8 billion from 1990 to 2011. Compensation from all other jobs in the state economy grew by $41.8 billion.

Chart 7 shows our estimates of the B&O tax, and sales tax revenues generated by tech sector activity. In addition to the taxes directly paid by the firms in the sector on their revenues (B&O taxes) and purchases (sales taxes), our estimates include tax payments of firms up the supply chain. For example, if an office supply company sells 10 reams of paper to a firm in the sector, the B&O tax paid on that sale is included in our calculation. Likewise, if the office supply firm purchases services from an accounting firm, a portion of the B&O tax paid by the accounting firm from the sale of those services is also captured in our calculation. Our estimates include sales taxes paid by employees of the tech sector as they spend their wages as well as a portion of the sales taxes paid by employees of upstream suppliers. For example, if 10 percent of the sales of the office supply firm's sales are to the tech sector, 10 percent of the sales taxes paid by its employees are included in our calculation.

We estimate that state B&O tax revenue attributable to the tech sector grew from $315 million in 1994 to $1.02 billion in 2011. State and local sales tax revenue attributable to the sector grew from $585 million to $1.86 billion over the period. For B&O and sales taxes combined, the $1.97 billion gain over the period represented an increase of 219 percent. For comparison, had these B&O and sales tax revenues grown at the same rate that overall state general revenues grew, the gain would have been just $653 million (73 percent).

Peer States

In this report, we look closely at five states recognized for their strong tech clusters: California, Massachusetts, New York, Texas, and North Carolina. The first four rank among the top five "Cyberstates" on one or more benchmarks in TechAmerica's annual ranking (James and Leary). Each of the states also feature regions identified as "leading high-tech metros" by economist Richard Florida (Florida). North

Carolina is home to two of the top ten leading metros.

California

For decades, California has been synonymous with innovation and technology, with most attention focused on the Silicon Valley tech cluster. The state leads the nation with 931,040 tech jobs, more than double that of second place Texas and more than five times that of Washington, according to *Cyberstates*. Between 2009 and 2010, however, the state also led the nation in tech employment decline, losing 18,100 jobs.

The Milken Institute's *State Technology and Science Index 2010* ranks California fourth. California lags, however, in some of the components that make up the overall ranking. According to the report, "Most troubling for California is the falloff in recent graduates in the sciences, engineering, and biomedical fields" (DeVol et al 5).

Joel Kotkin, an authority on demographic and economic trends, recently wrote, "The remarkable confluence of engineering prowess, marketing savvy and, perhaps most critically, access to startup capital may have created the greatest gold rush of our epoch, but the Valley at the end of 2011 employed 170,000 fewer people than in 2000. . . . one has to wonder if [Silicon Valley's] dominance will diminish. . . . the Valley may soon need to consider what it must do to compete with the many other regions that are inexorably catching up with it" (Kotkin a).

Among the reasons for California's fall from vitality, according to Kotkin, is an overextended and unsustainable public sector. He cites a "combination of high taxes and intrusive regulation coupled with a miserable education system—the state's students now rank 47th in science achievement—and a rapidly deteriorating infrastructure" (Kotkin b).

Carl Guardino, head of the Silicon Valley Leadership Group, confirmed the concern to the Austin (Texas) Statesman. After identifying the region's strengths—venture capital, a deep R&D talent pool, and three world-class universities—Guardino acknowledged, "The scary part for us, which we have to address, is once (companies) hit 100 employees, they're often looking for places outside Silicon Valley as they continue their growth. That's where we move into issues in our playbook that we need to address" (Zehr).

In one respect, the state has chosen to compete—California offers incentives. According to the Governor's Office of Business and Economic Development, California has a 15 percent research and development (R&D) credit for in-house research expenses and a 24 percent R&D credit for contract research. California also offers enterprise zone tax credits. There are 42 enterprise zones, including San Francisco, San Jose, and Sacramento. The credits include: $37,440 or more in tax credits per qualified employee hired, up to 100 percent net operating loss carry-forward, sales tax credits on purchases of machinery, and upfront expensing of certain property.

In June 2012, Advanced Call Center Technologies decided to open a new facility (with the potential for 2,000 jobs) in Sacramento. The Sacramento Area Commerce and Trade Organization says the decision was influenced by ". . . the availability of a qualified workforce, and the benefits of locating in an Enterprise Zone" (SACTO).

In 2010, the state started the Innovation Hub (iHub) initiative, to improve competitiveness through partnerships, economic development and job creation in certain research clusters. There are currently 12 iHubs, including the BioSF iHub in San Francisco, whose focus is biotechnology. It provides incubation facilities and guidance for early-stage companies.

California's Employment Training Panel funds worker training targeting "firms threatened by out-of-state and international competition" (ETP). Priority industries for FY 2011–12 include information technology services and biotechnology and life sciences.

While Silicon Valley will continue to benefit from its strong, embedded tech

Support for R&D:

California has a 15 percent R&D credit for in-house research and a 24 percent R&D credit for contract research.

cluster, the public policy uncertainty, high costs and restrictive regulation continue to cause outmigration of desirable jobs. The proffered incentives may slow the decline, but they appear to be unable to reverse the trend.

Washington has been among the states fleeing Californians have turned to for expanded opportunity. But the competition for Golden State emigrants is great. Once a firm decides to expand or relocate to another region, all the usual business climate considerations come into play: incentives, the quality of the education system, the existing and potential talent pool, business costs, regulation and quality of life. California firms have migrated business activity across the country, including Texas, Nevada, Utah, and New York.

Massachusetts

Milken's *State Technology and Science Index 2010* ranks Massachusetts No. 1, and the state "topped the charts in three components: R&D inputs, risk capital and entrepreneurial infrastructure, and technology and science workforce."

According to a 2012 paper, "Workforce Skills and the Knowledge Economy in Massachusetts," Massachusetts is "outpacing the rest of the nation in [the] transition" to a knowledge-based economy (Renski and Wallace 22).

This success is helped by availability of capital and proximity to researchers, according to a 2009 University of Massachusetts study:

> The state's ability to garner large sums of investment capital—both from private venture capitalists and from federally funded research and development programs—is an indicator of a healthy 'entrepreneurial climate.' Research funding invested into educational institutions and private laboratories creates a critical mass of world-class research partners throughout the state (Goodman et al 38).

Focus groups said that the higher education institutions in Massachusetts are its "leading strength" and "natural advantage."

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Indeed, the *2010 Index of the Massachusetts Innovation Economy* report from the Massachusetts Technology Collaborative maintains that Massachusetts' innovation "ecosystem's anchor is the massive concentration of research and development activity in universities, hospitals and businesses, sustained by private and public investment in R&D" (MTC 8-9).

Massachusetts has a number of programs that would help its "natural advantage" along. In 2007, Governor Patrick announced the Massachusetts Life Sciences Initiative, a $1 billion investment over 10 years to "enhance and strengthen the state's internationally recognized leadership in the life sciences." The plan is to provide $500 million in capital funds for public higher education and "other facilities and equipment to be used in collaboration with the life sciences industry," $250 million for research grants and workforce training, and $250 million in tax benefits. *The Boston Globe* reports the initiative has "helped draw more than two dozen new company sites" to the state (Weisman).

The Massachusetts Life Sciences Center is a quasi-public agency formed in 2006 to promote the life sciences by investing in research and economic development. The Center has a number of funding programs, including an accelerator loan program (unsecured debt financing to early-stage life science companies) and a cooperative research matching grant program (grants for non-profit research institutions who have an industry sponsor for the research). Additionally, under the Life Sciences Initiative, the Center may award $25 million in tax incentives annually (including the life sciences investment tax credit, designation as an R&D company for sales tax purposes, sales tax exemption on certain property, and a life sciences jobs incentive refundable credit).

The Massachusetts Emerging Technology Fund offers loans of up to $2.5 mil-

Tax Incentives:

Massachusetts' Economic Development Incentive Program offers tax credits for expansion projects in certain areas and for retaining manufacturing jobs in the state.

lion to technology companies that begin or expand manufacturing in Massachusetts. The state's Economic Development Incentive Program provides companies that have an expansion project (must be in an economic opportunity area), have an enhanced expansion project (anywhere in Massachusetts), or retain manufacturing jobs in the state with tax credits (up to 10 percent, 10 percent, and 40 percent of qualifying property, respectively). Massachusetts also has an investment tax credit for manufacturers and R&D companies (3 percent of the cost of qualifying property) and a R&D tax credit of 10 percent of qualified research expenses. Additionally, the state has a sales and use tax exemption for R&D.

New York

According to *Cyberstates 2011*, New York had the third highest tech employment in 2010 (294,700) and the third highest tech payroll ($26.8 billion). It ranked fourth in tech establishments (20,700). New York City has a burgeoning tech sector in "Silicon Alley" and upstate New York is a draw as well.

As a 2012 report, *New Tech City*, notes, "As recently as five or six years ago, New York was very much considered an also-ran in the pantheon of tech hubs" (Bowles and Giles 4), but the city "has launched an array of ambitious programs and policies to support [the tech sector's] growth" (Bowles and Giles 10). The report estimates that "well over 1,000 tech start-ups have been created in the past five years" (Bowles and Giles 5). The New York City Economic Development Corporation (EDC) estimates that there was a 30 percent increase in tech jobs from 2005 to 2010 (Bowles and Giles 6).

Investment in Education:

Applied Sciences NYC brings applied science and engineering campuses to New York City.

Many of the city's initiatives have focused on fostering a tech community and increasing engineering capacity. The EDC has supported incubators and shared work spaces financially to help launch start-ups.

Additionally, in 2008, several New York groups founded NYCSeed to provide seed funding (up to $200,000) to technology entrepreneurs. In 2010, New York City established the $22 million NYC Entrepreneurial Fund to provide early stage funding for technology start-ups.

Possibly the biggest boost the city offers its tech sector comes through a higher education initiative. In 2010, the city established Applied Sciences NYC, an effort to bring more applied science and engineering campuses to New York City. As part of that, the city staged a contest for the right to build an applied science campus on Roosevelt Island. The city offered the land and $100 million for infrastructure and construction costs. Cornell University and the Technion-Israel Institute of Technology will build the campus. According to *New Tech City*, the competition to win the deal "sent a clear message . . . that the Big Apple is firmly committed to building a sustainable tech cluster and addressing long term challenges, namely the shortage of engineering talent" (Bowles and Giles 24).

The city has partnerships with other research institutions as well, including the New York University Center for Urban Science and Progress and the NYC Media Lab. Additionally, in 2012, the city announced that Columbia University will build a new center for data sciences and engineering, to be funded in part with $15 million from the Applied Sciences NYC initiative. IBM and New York City opened a six-year high school in 2011 whose students earn their high school diplomas and an associate's degree in a computer science field. This fall, New York City will open the Academy for Software Engineering, a high school that will focus on software engineering, design, and development.

Several tech companies have recently moved to New York City or opened major offices there. In October 2011, Twitter made New York City its east coast headquarters, as did Yelp. In December 2011, Facebook announced that it would open an engineering office in New York City—its first not on the west coast. Also in 2011, Infor (a software company then based in Georgia) announced plans

Seed Funding:

NYCSeed funds technology entrepreneurs.

to move its corporate headquarters (and 75 jobs) to New York City.

An Infor press release said that, in addition to access to New York's technical talent, "The planned technology campus the City of New York is building in conjunction with major universities was also an attraction for the company" (Infor).

In addition to the support offered by New York City, the state of New York offers a number of general business and tech-specific incentives, including sales tax exemptions for production machinery and equipment, R&D property, and fuels utilities used in manufacturing and R&D; a 9 percent corporate tax credit for R&D; and a general investment tax credit.

The state also provides credits for Qualified Emerging Technology Companies. A company must either have qualifying R&D in New York or provide products or services like biotechnologies or information technology. Options include a refundable tax credit of $1,000 per employee and a capital tax credit for 10 or 20 percent of qualified investments.

The state's Excelsior Jobs Program provides a jobs tax credit, an investment tax credit, an R&D tax credit and a real property tax credit. Empire State Development (ESD) may provide up to $50 million of these credits per year.

Upstate New York houses a lively nanotech sector. In 2004, the University of Albany created the College of Nanoscale Science and Engineering, a public-private facility.

GlobalFoundries began construction on a $4.2 billion semiconductor manufacturing facility in Malta (north of Albany) in 2009. The site was chosen over competitors in Germany, Israel, and Singapore. New York state offered $1.2 billion in incentives, including property tax abatement, reimbursable cash for construction, and funds for R&D.

In 2010 Sematech, the consortium of semiconductor manufacturers, announced plans to move most of its operations from Austin, Texas to Albany. ESD provided $20 million for Sematech to invest in its Albany operations.

Texas

According to the Federal Reserve Bank of Dallas, "Since the U.S. recession concluded in 2009, Texas employment has grown 3.3 percent, compared with 0.6 percent for the rest of the states" (FRBD). The Texas story has often been cast as a low-wage tale, but the analysts also report, "While more lower-wage jobs were created, higher-paying positions grew at a faster rate . . . making up an increasing proportion of total jobs."

Texas has intentionally sought growth in the innovation economy. In 2004, Governor Perry announced a new focus for the state on six target industry clusters, with a goal of building a competitive advantage in each. Among them are advanced technologies and manufacturing, biotechnology and life sciences, and information and computer technology.

A 2012 report from the Office of the Governor on the information technology services industry notes that it "is significantly specialized in the computer systems design and in the data processing and hosting areas, more than any other state except California" (Office 1). According to the report, "IT and software was the number one sector for foreign direct investment in Texas between 2007–2011. More than 60 IT companies from 20 countries established or expanded operations in Texas during that period" (Office 2). Accordingly, "employment in the major IT services sectors in Texas increased by 11%" (Office 6).

The report also references 2011 rankings from the National Science Foundation, which showed that Texas awarded the third most doctorates for science and engineering, the third most for mathematics, and the fourth most for computer and information science in the nation.

Since 2003 Texas has had the Texas Enterprise Fund (TEF), which may only be used when a site in Texas is in competition with another site out of state. Governor Perry's office says that "The TEF

Direct Funding:

The Texas Enterprise Fund awards grants to companies when a Texas site is in competition with another out of state.

gives Texas the competitive edge in attracting new businesses to the state and assisting with the expansion of existing businesses that might otherwise opt to expand in another state." As of June 30, 2012, 98 TEF awards had been granted since inception of the fund, for a total amount of $467.8 million.

- In 2010, Facebook received a $1.4 million TEF award, along with $200,000 in local incentives, to open a sales and operations office in Austin.
- In 2011, CGI Technologies received a $1.8 million TEF award to build an onshore IT services delivery center in Belton, Texas.
- In 2012, Apple received a $21.0 million TEF award, along with $8.6 million in tax abatements from Austin and about $6 million in real estate abatements from Travis County, to build a new campus in Austin.

In 2005, Texas created the Emerging Technology Fund (TETF). Its purpose is to fund innovation and research. For fiscal years 2008–2011, it made 167 awards totaling $370.0 million.

The Fund includes:

- Commercialization Awards, whose purpose is to expand small businesses to "accelerate new products and services to the marketplace." Of 133 commercialization awards, 27 were in the computer and information technology cluster, and 65 were in the biotechnology and life sciences cluster.
- Research Award Matching Program, with a goal of creating "public-private partnerships to leverage the unique strength of universities, federal government grant programs and industry." The preference is to award emerging technology R&D "that will have a significant impact on Texas' future economy or may result in a major medical or scientific breakthrough." As of August 31, 2011, 13 awards have been made, totaling $84.7 million. Aggregate total private sector investment, federal funding, and other contributions to these projects totaled $122.9 million.
- Acquisition of Research Superiority Awards are meant to bring researchers to Texas, and are only granted to public higher education institutions that want to bring in out-of-state researchers. As of August 31, 2011, 21 projects have been funded, totaling $92.7 million, with funds from other sources totaling $639.2 million.

R&D Support:

The Emerging Technology Fund offers awards for emerging technology R&D in Texas.

The legislature established the Texas Science, Technology, Engineering and Mathematics (T-STEM) Initiative in 2005 as a way to graduate more students in STEM fields. Fifty-one T-STEM academies have been created.

Tech sector growth in Texas, like employment growth in the state generally, can be attributed to policy certainty, extensive use of incentives, improvements in K-12 and higher education, and sharp focus on economic growth and development.

North Carolina

A 2008 North Carolina Department of Commerce paper looked at 29 industry clusters and identified computer programming, systems design, and related services as a growing industry. Data processing, internet hosting and related services; scientific R&D services; software publishing; and internet publishing and broadcasting, ISPs and search portals, and other information services were identified as emerging industries. (Haley et al.)

The 2011 *State of the N.C. Workforce Report* notes "the recession accelerated the state's shift to [a] knowledge-based economy because firms had to adjust to this new reality in a much shorter timeframe" (NCCWD iii). The report estimates that the North Carolina economy as a whole will grow 1.3 percent annually from 2010–2020, but the professional, scientific and technical services sector employment will grow by 3.3 percent. According to the report, computer systems design and related services and R&D in the physical, engineering and life sciences were among the top 20 fastest growing industries in the state from 2005–10. Not surprising-

ly, "At least 42 percent, perhaps many more, of the new jobs being created in North Carolina will require at minimum some post-secondary education, many in Science, Technology, Engineering and Math—STEM—disciplines" (NCCWD v).

North Carolina's Research Triangle Park (RTP), created in 1959, hosts more than 170 companies and 39,000 high-tech workers. Established industry clusters at RTP include biotechnology and information technology, with 45 percent of the companies at RTP in the life sciences and 18 percent in information technology. Companies include IBM, Cisco, and NetApp. RTP is also home to many small companies—43 percent of its companies have 1–9 employees, and 19 percent have 10–24. To help meet the needs of the start-ups (34 percent of the companies), RTP has five incubators and business accelerators.

Direct Funding:

North Carolina offers Job Development Investment Grants and the One North Carolina Fund.

North Carolina offers tax credits for creating jobs, investing in business property, and investing in real property (30 percent of the amount) that offer amounts that depend on how developed is the county in which the investment occurs. The state also offers a sales and use tax exemption for custom computer software, as well as for sales of electricity and business property to internet data centers. An interactive digital media tax credit is available, as are technology development tax credits for certain research expenses.

In addition to tax credits, North Carolina's discretionary incentive programs include Job Development Investment Grants (JDIG) and the One North Carolina Fund.

- JDIG are annual grants in amounts dependent on a percentage of withholding taxes paid by new employees. Among other criteria, the project must result in an increase in employment and the project must be competitive with other states or countries. A 2010 economic development report indicates that 14 were awarded in 2008–09 and 18 in 2007–08 (FRD 29). When a JDIG is awarded in a prosperous county, 25 percent of the grant is put in the Utility Fund to encourage development elsewhere.
- The One North Carolina Fund was established in 1993. According to the North Carolina Department of Commerce, it "helps recruit and expand quality jobs in high value-added, knowledge-driven industries." It is meant to "increase the state's competitiveness so the project location or expansion must be in competition with another location outside the state." Funds are available for equipment purchases, structural repairs or renovations, and construction, for example. To qualify, a company must "meet an average wage test" and local governments must agree to match the funding. Thirty-two were awarded in 2008–09 and 37 in 2007–08 (FRD 35).

In July 2012, NetApp announced plans to hire an additional 460 workers and build a new research facility at RTP. North Carolina offered the company a JDIG. It could receive 65 percent of the state personal income withholding taxes from the new jobs, if it meets targets over the next 10 years. The grant could total $11.78 million.

In June 2012, Citrix announced plans to add 337 new jobs in Raleigh. The company was awarded a JDIG that could total $8.65 million.

Emerging Competition

Georgia. In 2010, the state began offering an Angel Investor Tax Credit. Investors in early stage start-ups in Georgia may receive a tax credit of 35 percent of the investment (up to $50,000 a year). The state also offers a Quality Jobs Tax Credit (up to $5,000 per job) for companies that create jobs with wages that are 110 percent of the county average.

Georgia Tech offers a number of technology assistance programs. The Advanced Technology Development Center (ATDC), a technology start-up accelerator, provides companies (from early stage to revenue generating) with access to mentors, partnering events, and subsidized office space in Atlanta. It has a

Seed Capital Fund, through which it can invest up to $1 million per company. Since its founding in 1980, the ATDC has graduated more than 130 companies. The Enterprise Innovation Institute's goal is to improve business competitiveness. An additional accelerator, Flashpoint, began in 2011.

Venture Capital:

Georgia's VentureLab helps start-ups commercialize their technology innovations.

VentureLab, a project of Georgia Tech and the Georgia Research Alliance, launched in 2002 to help faculty and graduate students commercialize their technology innovations by providing expertise and funding. Upon a merger with ATDC in 2009, VentureLab opened its services to all Georgia start-ups at the earliest stages, whether affiliated with the university or not.

Utah. In 2006, Utah created USTAR, the Utah Science Technology and Research initiative, to provide funding to recruit research teams, build research facilities, and help with commercialization. "The objective of USTAR is to stimulate additional technology-based start-up firms, and significantly increase technology commercialization, high-paying job opportunities, and business activity in Utah which will produce an associated expansion of the tax base" (Innovation).

USTAR programs include BioInnovations Gateway (an incubator for life sciences start-ups) and Technology Commercialization Grants (helping faculty at regional institutions commercialize new products). Eighty-seven such grants have been awarded since 2009 totaling $3 million. According to the 2011 annual report, USTAR recruited more than 40 researchers to state universities in 2011. Additionally, the report estimates that the state investment of $73.5 million has yielded a $137.4 million impact since the beginning of the program (USTAR 2).

Investment in Education:

USTAR recruited more than 40 researchers to state universities in Utah in 2011.

Michigan. Automation Alley, a technology business association in Southeast Michigan, offers a technology business accelerator program called the Pre-Seed Fund. Companies receive up to $250,000, along with business plan and technology development support. Through 2011, $6.35 million has been invested in 32 companies. Automation Alley also provides IT training through which youth and dislocated workers can receive an array of IT certification.

The annual Accelerate Michigan Innovation Competition (AMIC) promotes the development of early stage companies, with no requirement that they originate in Michigan. They must, however, commit to operate in Michigan should they be a finalist or winner. It offers a grand prize of $500,000, and companies compete in one of eight sectors, including Life Science and Information Technology.

Washington Incentives

Some of these tools are also employed by Washington. For example, the state offers B&O tax credits for high technology R&D spending and for new employees in manufacturing and R&D; sales and use tax deferrals for high technology and biotechnology and medical device manufacturing; and a sales tax exemption for data centers.

In September 2011, the Office of Superintendent of Public Instruction and Microsoft partnered to make the Microsoft IT Academy available in public schools. Through the program, students can earn certification in Microsoft products and various IT topics. For the 2011–13 biennium, the state is providing $4 million for the program. As of April 2012, 1,391 certifications had been awarded. (OSPI)

Additionally, in May 2011, the Washington STEM Initiative was founded. Its purpose is "to discover and scale innovative approaches for improving STEM education as a means for creating better opportunities for students" (STEM). Its first investment was $2.4 million to 15 educators, schools and education nonprofits in Washington.

Also in 2011, the state legislature created the Washington State Opportunity Scholarship (RCW 28B.145). Its purpose is "to provide scholarships that will help low and middle-income Washington residents earn baccalaureate degrees in high employer demand and other pro-

Table 2: Washington Technology Incentives

Incentive	Date Implemented	Eligibility
High Technology B&O Tax Credit (of up to $2 million annually)	1/1/1995; expires 1/1/2015	Businesses conducting R&D in advanced computing, advanced materials, biotechnology, electronic device technology, or environmental technology
High Technology Sales & Use Tax Deferral/Waiver	1/1/1995; expires 1/1/2015	Businesses conducting R&D and pilot scale manufacturing in advanced computing, advanced materials, biotechnology, electronic device technology, or environmental technology
Biotechnology & Medical Device Manufacturing Sales & Use Tax Deferral/Waiver	7/1/2006; expires 1/1/2017	Biotechnology and medical device manufacturers, with certain construction and equipment purchases
B&O Credit for New Employees in Manufacturing and R&D in Rural Counties ($2,000 or $4,000 per job)	4/1/1986	Manufacturers, R&D labs, and commercial testing facilities located in rural counties or a community empowerment zone
Purchases of Server Equipment and Power Infrastructure for use in Eligible Data Centers -- Sales/ Use Tax Exemption	For data centers constructed between 4/1/2010 and July 1, 2011, the exemption expires 4/1/2018. For those constructed between 4/1/2012 and 7/1/2015, the exemption expires 4/1/2020.	Data centers with at least 100,000 square feet in a rural county

grams of study and encourage them to remain in the state to work." It is a public-private partnership; the first state match is $5 million. Two major corporations in the state have pledged $50 million. Beginning January 1, 2014 (or later, if state tax revenues have not yet exceeded 10 percent of amounts collected in fiscal year 2008), the state will match up to $50 million a year. In May 2012, about 3,000 students received $1,000 scholarships.

Keys to Development

This review of national studies and the cluster-development strategies pursued by the states clarifies the keys to success. A thriving tech cluster depends on superior education systems (at all levels), access to capital, and a vibrant entrepreneurial culture. States attempting to develop such clusters pursue policies that include seed funding, venture capital, tax incentives, R&D support, infrastructure development, and education investment, particularly centered on research institutions.

Enterprising States, a 2012 report from the U.S. Chamber of Commerce and the National Chamber Foundation, concludes:

> Innovation and market cycle times are much shorter and continue to accelerate. This makes it more important than ever that states provide the tools, support, and tax and regulatory environments for companies to continuously innovate without onerous delays and burdensome costs that put their entrepreneurs and businesses at a competitive disadvantage (Praxis Strategy Group and Kotkin 3).

In its national scan, ITIF notes that "innovative capacity (derived through universities, R&D investments, scientists and engineers, and entrepreneurial drive) is increasingly what drives competitive success" (Atkinson and Andes 13).

And in a warning against complacency, ITIF writes, "The IT revolution gives companies and individuals more geo-

graphical freedom, making it easier for businesses to relocate, or start up and grow in less densely populated states farther away from existing agglomerations of industry and commerce" (Atkinson and Andes 13). The group recommends state governments nurture growth by "boosting their infrastructure, education levels, business support systems, and technology development and transfer systems . . ." (Atkinson and Andes 45).

The Milken Institute's *State Technology and Science Index 2010* recognizes Washington's relative strength, while also identifying key vulnerabilities: "The state recorded an impressive third place in technology concentration and dynamism, fourth in technology science workforce and sixth in R&D inputs" (DeVol et al 6). But the report identifies problems in human capital: "Washington was at its weakest in various measures of state appropriations for higher education, and in graduate students in science, engineering, and health sciences" (DeVol et al 6).

Two new reports by the National Governors Association (NGA) highlight steps states are taking to spur economic growth. Predictably and appropriately, they make nurturing innovation a top priority. Human capital development—higher education—plays a pivotal role in their planning.

"Research at institutions of higher education is one of the most obvious ways that public policies influence innovation," NGA writes. While citing the dominance of federally-funded R&D, one of the reports notes that "states are increasingly creating their own R&D funds" (Cortright and Waits 19). The money is used to recruit faculty, encourage collaboration among research institutions and the private sector, and promote commercialization.

Discussion

Washington's vibrant tech cluster has had a strong, positive effect on the state economy. It accounts for nearly two-thirds of Washington's job growth since 1990 and almost half of the growth in employee compensation. Moreover, the sector mitigated the effects of the national recession here, showing relatively stable income and employment patterns, even during the sharpest economic downturn in more than half a century.

Other states and regions witness the success of states with strong innovation clusters and strive to replicate it. They offer incentives, make education and infrastructure investments that the sector finds essential, and provide start-up assistance in the form of incubators and accelerators. In addition to nurturing new firms, they recruit aggressively, seeking to gain from the relocation and expansion decisions made by thriving firms.

While Washington's cluster may appear secure, policymakers should not be complacent. The state has advanced several important initiatives, including tax incentives, STEM investment, and the Washington Opportunity Scholarship. These strategies, however, do not differentiate Washington from other states seeking to grow their own technology industries—or recruit them from elsewhere. While Washington's incentive programs are generally consistent with good tax policy, it should be acknowledged that "good tax policy" does not always guide the actions of our competition. To win business investment, states are often willing to forego tax revenues far in excess of expected short-term returns. (That kind of thinking led to the development of the car manufacturing cluster in the Southeast.) Location decisions are driven by many factors, but profit-and-loss calculations are always important.

Washington has been fortunate. The state's tech cluster has generated significant economic growth, created thousands of jobs, cushioned the recession, and spurred investment in critical infrastructure and higher education. The growth here not only has been consistent with good public policy, including tax policy, but it has also provided the intellectual and economic foundation to support an enhanced quality of life.

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