The STEPHEN S. FULLER INSTITUTE for Research on the Washington Region's Economic Future

SCHAR School of Policy and Government
GEORGE MASON UNIVERSITY

A Regional Science Center Will Make Northern Virginia and Loudoun County More Competitive For Economic Growth

The Stephen S. Fuller Institute
for Research on the Washington Region's Economic Future
Schar School of Policy and Government
George Mason University

Prepared for

Children's Science Center

January 2018

A Regional Science Center Will Make Northern Virginia and Loudoun County More Competitive for Economic Growth

A large-scale, interactive Regional Science Center is being proposed and planned by the Children's Science Center, a local non-profit that currently reaches 70,000 visitors annually at both the Lab, the region's first hands-on STEM museum facility located in Fairfax County, and through out-reach programs across the region. The Regional Science Center will be located on donated land at Kincora in Dulles, Virginia at the intersection of Routes 7 and 28.

The Regional Science Center is being designed to provide interactive, educational programs in science, technology, engineering and math targeting not only children but also citizens of all ages and backgrounds residing in Loudoun County and adjacent jurisdictions including Fairfax, Prince William, Arlington, Fauquier, and other nearby counties and cities. The Regional Science Center is envisioned as a multi-dimensional facility providing comprehensive experiences and programs to support and enhance STEM-education programs in the public schools and the community at large. The facility will serve as a destination for families, school groups, and learners of all ages with the mission to advance the interest in, understanding and study of the sciences broadly across all segments of the community as well as to showcase the region's larger role as a major national technology center.

By providing the region's children with exposure to the sciences in an informal and self-directed setting at this most critical, formative period in their intellectual development, the Regional Science Center will be a major building block in the educational ecosystem that complements the Loudoun County's elementary- and secondary-level STEM-education programs. Having this broad-based STEM-education ecosystem will further strengthen Loudoun County's competitiveness with is peers in attracting and retaining the resident workforce—the talent—required to support an advanced knowledge-base economy.

This has taken on even greater importance as the Washington Region's economy has experienced slower growth due to cutbacks in federal spending since 2010 and given local and state efforts to reduce the region's dependency on federal spending by diversifying the economy by building on its export-based, high-value added, non-federally dependent business clusters for which it has a competitive advantage in the global marketplace. Developing, attracting and retaining STEM-educated workers have been identified as being essential to successfully growing the Washington region's technology-intensive economy going forward.

The Regional Science Center as a Major Source of Economic Benefits

The proposed Regional Science Center has been shown to be a major source of economic impacts to the benefit of Loudoun County, Northern Virginia, and the

Commonwealth of Virginia.[1] These economic impacts will include both short-term and continuing benefits. Short-term benefits would include those that are generated during its construction phase—a total contribution to Loudoun County's economy of $83.8 million supporting 339.3 full-time, year-round equivalent jobs. Continuing benefits would accrue annually following the Center's completion from its operating outlays and spending in Loudoun County by non-county residents attracted to the county by the Regional Science Center—contributing $13.1 million annually to the County's economy and supporting 95.7 full-time, year-round equivalent jobs.

These construction-phase and post-construction annual impacts were shown to extend and multiply when measured at the Northern Virginia and state levels. With their larger and more complex economies, a greater share of the direct spending to build and operate the Regional Science Center, including the 64 full-time, part-time and seasonal jobs at the Center, and those jobs supported by the direct and indirect spending generated by the Center, would be retained within their economies.

There is an additional and important source of economic impact that will flow to the benefit of Loudoun County and adjacent jurisdictions from the development and operation of the proposed Regional Science Center that cannot be measured in dollars and cents but rather by measures of competitive advantage and qualities-of-life. These benefits comprise the contributions that the Regional Science Center would make to County's and region's competitive positions relative to peer jurisdictions in terms of the qualities-of-life offered to their local residents that will make them more attractive to and better able to retain the talent required to grow their high-value added, technology-intensive economies of the future.

The Region's Diminishing Competitiveness

The Washington region's economy is underperforming its peer metropolitan areas.[2] This is a new experience for the region. During the thirty years preceding 2010, the Washington region grew at an annual average rate (adjusted for inflation) of 3.25 percent inclusive of five recessions (1980, 1981-82, 1990-91, 2001, and 2007-2008). In the six years prior to the Great Recession, the Washington region's economy grew at a 3.8 percent average annual rate but has only grown 0.95 percent annually on average since 2010. With this slow growth rate, the Washington region ranked 15th out of the 15 largest metropolitan areas nationally in term of economic growth over the 2010-2016 period.

---

[1] The Economic Impact of the Proposed Regional Science Center on Loudoun County, Northern Virginia and the Commonwealth of Virginia, The Stephen S. Fuller Institute, January 2018(sfullerinsititute.gmu.edu).

[2] The Washington Region's Declining Economic Brand, The Stephen S. Fuller Institute, July 12, 2017 (sfullerinsititute.gmu.edu).

While Northern Virginia and Loudoun County have performed better than the region's average, they have shared the region's strengths and weaknesses during and after the Great Recession. The Northern Virginia economy slowed to a standstill registering no growth in 2013 as the region's economy contracted 0.5 percent as a consequence of the reductions in federal spending during the Sequester. In recent years, the Northern Virginia economy has not maintained its historic share of the region's job base; its annual growth rate has slipped compared to Suburban Maryland's in part due to the reductions in federal procurement spending that have impacted the Northern Virginia economy to a greater degree than the region's other two sub-state areas.

Requirements for Future Economic Growth

Research on the region's future economic prospects[3] has identified non-federally dependent clusters that offer it the greatest potentials for reducing its economic dependence on federal spending. The Washington region and Northern Virginia cannot succeed economically unless they successfully diversify their economies and become less dependent on federal spending to drive future economic growth. The region's future vitality requires that it build its emerging economy around high-value added, non-federally dependent businesses that compete effectively in national and global markets.

This research also reported results from interviews with CEOs of businesses in the region that reflect its future growth potentials regarding what local competitive conditions most concern these business leaders. While there was a range of responses, one condition was cited by all respondents: the ability of the region to attract and retain the talent required to support the region's future knowledge-based economy.

The second most often cited requirement for achieving the Washington region's growth potentials was having a competitive quality-of-life including an educational system capable of educating the workforce of the future. Interestingly, it was acknowledged that while having a world-class local educational system was viewed as being essential for educating the future workforce it was also cited as being critical to attracting and retaining the talent required to grow today's economy in the Washington region. Today's educated and high-skilled workers are mobile and have choices of where to move to achieve their economic and life-style goals and, to be considered, localities must have a competitive educational ecosystem that is attractive to these talented workers.

The Washington region and Northern Virginia, in particular, have long been receiving areas for talented workers relocating to the region after completing their college and post-college professional education. In recent years, however, the

[3]The Roadmap for the Washington Region's Future Economy, The Center for Regional Analysis, GMU, December 2015 (sfullerinsititute.gmu.edu).

Washington region has not been as competitive in attracting the talent it needs to support its economy. The region's population growth has slowed from 1.9 percent annually in 2010-2011 to 0.9 percent annual growth in 2015-2016 and for three years in a row (2013-2016), the Washington region has experience net domestic out-migration. Most worrisome is the larger number of millennial–age residents that moved out of the region in 2016 than moved in.[4]

Building on the identified clusters in which the region possesses competitive advantages will require the continuing inflow of new talent to complement the region's highly educated workforce. In order to be attractive to the net in-migration of the talent needed to support the region's future economic growth, local jurisdictions must have an advanced and broad-based educational ecosystem headlined by broad-based STEM-related learning opportunities. This requirement is central to being competitive in the global market place for talent.

STEM-Educated Talent Can Choose Where They Want to Live

There is almost universal agreement that the economy of the future will depend on an expanding supply of STEM-educated workers. In fact, there is an identified shortage of these workers today at the national level making their attraction to regions with advanced knowledge-based economies a key determinant of their being able to realize their full growth potential in the near term.

The Washington region, like all other regions with knowledge-based economies, cannot meet its demand for STEM-educated workers from local sources. Rather, it must compete in the global labor market for these workers with its peer metropolitan areas. As was noted earlier, the Washington region is not winning this competition, at least for domestic migration that has experienced three consecutive years of net outmigration including workers in the 25-34 year-old age cohort—this is the leading edge of the millennial generation—with more persons in this age group moving out of the Washington region than moving in in 2016.[5]

Being competitive in this important talent pool with the Washington region's peers is a continuing challenge. Among the essential values that educated workers consider—workers who have a wide choice of geographies from which to pursue their careers—are the relative qualities of life in the jurisdictions under consideration. As persons who value quality education themselves, these workers are attracted to jurisdictions that have the reputations for having high-quality educational and cultural resources, whose brands reflect these values as measured by the depth and quality of their institutions and programs. This is true of potential

[4]Demographic Change in the Washington Region: 1990-2015, March 2017
The Stephen S. Fuller Institute (sfullerinbstitute.gmu.edu).
[5]"Demographic Change in the Washington Region, 2015-2016," June 28, 2017,
The Stephen S. Fuller Institute (sfullerinbstitute.gmu.edu).

movers with or without children as these movers are seeking a broad-based educational ecosystem of which elementary and secondary education is only one component.

As a growing share of this essential (and mobile) talent pool needed to drive the knowledge-based economy is composed of millennial-age workers, consisting largely singles or households without children, the complementary sources of educational and cultural enrichment may be more important than the formal educational institutions. For these potential movers, a competitive educational ecosystem is defined by access to the resources found in local universities, cultural facilities, and other less-structured educational venues. For these potential movers—the talent essential to support future economic growth—these qualities of the educational ecosystem brand a jurisdiction as a good place in which to invest—buy a home and put down professional roots—as they evaluate potential locations in which to settle down.

Loudoun County and Northern Virginia Need To Become More Competitive Within The STEM-Based Talent Pool

In order for Loudoun County and Northern Virginia to achieve their full economic potential it is clear that their economies need to become less dependent on federal spending as their principal source of growth and build on the foundation of businesses and knowledge-based services that have been attracted to and have developed locally because of the area's federal functions. To accomplish this pivot to a nationally and globally competitive economy will require competing for the human resources—the essential talent—required to support the economy of the future. Being competitive within this essential talent pool with the region's peers will require local jurisdictions to provide a high quality educational ecosystem just to level the playing field.

The Washington region's educational ecosystem is not competitive with many of its peers. STEM education lags; no jurisdiction independently or as a sub-state region is recognized as a hot bed of STEM-educated graduates at the high school or post-high school levels. While there are selected magnet high schools that are nationally recognized and ranked, their enrollments are extremely limited and depend on students already having developed their STEM-related interests and abilities. These nationally recognized STEM-education centers accept a limited number of already talented students and push them further in the sciences than if they had pursued a more generalized approach offered in other high schools. However, these select STEM-based magnet high school programs do not discover and develop new STEM-inclined students.

So where are future scientists and mathematicians found? If there are presently an insufficient number of STEM-educated workers, why did the educational ecosystem fail to discover and promote students at an early age to prepare them for STEM-based careers? How are young people introduced to the opportunities of science

and math? By the time students reach high school, or even middle school, it is too late for almost all of them that are not already on the STEM track to get on board. They may have missed out on this possibility because they were not motivated at an earlier-enough age or the packaging of science and math as it has been taught in the lower grades, because of the structure and formality of teaching models common in elementary and secondary school systems, did not captivate these students. This is where alternative educational platforms have excelled; that is, in offering informal, flexible and self-directed STEM-based learning opportunities that enable the learning processes to better fit the needs of a broad base of local residents, especially young children.

The Role of the Proposed Regional Science Center in Expanding STEM Education and Broadening the Educational Ecosystem

One of these alternative-learning platforms that has emerged over the past thirty years—although many are much older—is the children's museum, science center or similarly focused organization. Planetariums, zoos and aquariums have been around for decades and were frequently the destinations for school class trips; natural history museums, too, have been a complementary part of the educational ecosystem. However, none of these institutions typically offer hands-on experiences for young people. This was not their initial design objective although most of these institutions now offer educational programming aimed at the school-age population.

Research has concluded that the majority of today's STEM workers discovered and developed their interests in science and math and related STEM fields informally in their home environment, experimenting in the garage or basement with a chemistry set, by tearing an old automobile engine apart, from participating in scouting programs, from their parents or a mentor, or by observing workers doing their jobs—arborists cutting down a tree and revealing its age by counting the growth rings, by watch an airplane show or auto race, or hiking in a meadow, along a river or exploring a swamp. This is where today's science centers have stepped in by bringing these types of STEM experiences to younger children (pre-school) and by providing informal and family-centered learning experiences to the broadest base of local residents.

These science centers are designed to appeal to and serve populations of all ages and intellectual development, whether they are in pre-school, public or private schools, or are home schooled and can offer STEM learning experiences to the adults accompanying their children. By design these science centers offer a wide range of topics enabling visitors to search out diverse interests with the intent of motivating and appealing to the curiosity of young people with the result that they subsequently pursue more focused STEM-based studies as they move into formal educational programming where curricula are more defined and driven by grading and test requirements. The science center model is intended to motivate and interest children, to appeal to their senses of curiosity and to help young people better appreciate the connections between science and everyday life.

There are 390 science museums and centers listed as members by the Association of Science-Technology Centers the U.S. Not all of these institutions look exactly like the Regional Science Center proposed for Loudoun County but have many features in common. Some are associated with higher educational institutions, some are locally or state operated, some even are connected to federal labs, and some operate adjoining schools and theaters. These institutions offer experiential, hand-on learning that explore the sciences in practical, everyday applications that are designed to open young minds to big questions that have captivated scientists for generations.

For the educational ecosystem to succeed in opening up the sciences to the broadest base of young people, the subject matter must be accessible. This exposure must make STEM-related topics relevant to the interests of young people starting at the earliest age when learning is the process of asking questions and finding answers. Why is the sky blue? This is not a question that should be deferred until it fits into a science class in grade school.

Children are exposed to science-based learning opportunities on a daily basis from the earliest age of cognition and they learn from this earliest age from experience and easily accessed information sources, usually from parents, and cause and effect results. The challenge with this process at its earliest stages is that it is uneven as it depends on the responsiveness of the resources available at the time and place, and increasingly adults, parents, are less able to respond to the science-based questions asked by their children due to their own gaps in STEM-related knowledge.

This is where science centers have excelled. Science centers are designed to expose children to science at the basic levels with programming to make science relevant, to challenge the inquisitive young minds, and to leverage play and interests to introduce STEM concepts. This can be targeted to an age group or to a range of ages including adults and families. Hands-on learning has the benefit of opening young people to new ideas and questions, making science a fun-filled exploration or adventure, a journey that introduces them to ideas and innovation, opening their minds at a pace that is self-determined and not directed by standardized requirements as becomes the norm once the educational process becomes institutionalized.

Beyond this early-stage exposure to science as an exploration in search of answers to everyday questions designed for pre-school age children, science centers can work in a complementary or supplementary role to elmentary and secondary schools to extend the STEM-related educational ecosystem from the classroom to the field. A science center can offer students the opportunity to apply their class-room learning to projects beyond the classroom with access to STEM-trained professionals and resources individually or in groups and further motivate and challenge young people freed up from the standards of assessment imposed by external state and national testing requirements.

All of the Washington region's peer metropolitan areas have at least one such large science center. However, there are only unconnected pieces of what might define an appropriately scaled interactive science center in Northern Virginia or more broadly throughout the Washington region that are designed to introduce young people to STEM-based education with an informal and self-directed design for learning, recreation, and self-fulfillment. While the Smithsonian Institution offers wonderful quality experiences that might captivate the minds of young people, there are few opportunities to actually touch anything and fewer opportunities to experiment in these managed learning environments. In addition, the travel times and distances to the nearest science centers in Richmond or Baltimore means Northern Virginia students and families are limited in accessing these experiences.

The absence of an intentionally designed, STEM-base, learning environment in the form of a science center in Northern Virginia puts it at a clear disadvantage when being considered as a place to which to relocate by workers who can also find equally rewarding job opportunities in Seattle, Boston, Atlanta, San Jose, Austin, all places with economies that have been growing at multiples of the Washington region's and Northern Virginia's growth rate since 2010.

Conclusions

The proposed Regional Science Center fills an important gap in Loudoun County's and Northern Virginia's STEM-educational ecosystems. For the region to better meet its talent requirements for STEM-educated workers to support its future economy, the region's educational systems must produce more STEM-literate workers. If it does not generate more of these workers it will fail to achieve the potential of its knowledge-based economy. Expanding STEM-based education to the broadest base of young people, to better prepare them for more-successful educational experiences during their more formal education, is essential to growing the local pool of future STEM-educated workers.

That the region is already lagging its competition because of its over-specialization in government-dependent services and needs to diversify away from this federal dependency underscores the importance of developing an economy based on advanced, non-federally dependent, high-value added, export-based business activities. However, to compete in these national and global economic spaces requires the Washington region and its jurisdictions to attract workers with advanced educational and professional skills in numbers well beyond what can be generated from local sources.

Being able to capture workers from the STEM-educated talent pool—workers who are innovative, independently driven, problem solvers—will demand a quality-of-life that is competitive with the nation's other knowledge-based economies. At present, the Washington region is not competitive in this talent pool and is experiencing net domestic outmigration across the 25-54 year old age groups, the core age cohorts comprising the region's future workforce.

Having a fully developed, cutting edge, STEM-based educational ecosystem is prerequisite to the region's achieving and maintaining a competitive quality-of-life that is attractive to the talent the region's economy requires for future growth. The evidence is in. The Washington region's peers are benefiting from offering broad-based STEM educational ecosystems that are exposing pre-school age and school-age children to the excitement of science in everyday life. At present, this opportunity does not exist in Northern Virginia or Loudoun County. The presence of the Regional Science Center, as proposed, would fill this gap and enable Loudoun County and Northern Virginia to better compete in the national and global labor markets for the essential talent required to drive their economies forward.