

Washington, D.C. Metropolitan Statistical Area

Entrepreneurial Ecosystem Metrics: Summary

We applied metrics from publicly available data sources to the entrepreneurial ecosystems indicators suggested by Stangler & Bell-Masterson (2015) for the Washington, D.C. metropolitan statistical area (MSA). We assessed the metro's entrepreneurial vibrancy based on its Density, Fluidity, Connectivity, and Diversity of entrepreneurship.

Density: The Washington, D.C. MSA's (WMA's) density of entrepreneurial activity measures slightly below the national average and has also been declining since 2009. Yet, the WMA outpaces the nation in the concentration and growth of its high-tech sector.

Fluidity: The WMA's entrepreneurial ecosystem is very fluid. The metro has the largest migration flows of the metros in this study and also boasts gross job reallocation rates and churn of workers well above the national average.

Connectivity: The WMA's entrepreneurial ecosystem is under-networked. The metro has a low representation of investors and universities on the CrunchBase network, while regional companies are well-represented. The metro has a high concentration of business and professional associations; however, most of them operate nationally rather than regionally.

Diversity: Entrepreneurial opportunity in the WMA is diverse. The metro's economy is moderately diversified with specializations across 12 4-digit NAICS sectors. It has high shares of foreign-born workers and business owners and also performs strongly in socio-economic opportunity for its residents, ranking of 8th in the nation.

Introduction

We are interested in seeing how well a metropolitan's entrepreneurial ecosystem sustains opportunity for individuals as well as firms. Entrepreneurship occurs across all sectors of the economy and the four indicators discussed in this report capture various dimensions of entrepreneurial activity. We consider regional industrial and occupational compositions, population and labor flows, and regional networks to assess entrepreneurial opportunity. We also consider entrepreneurial outcome-based measures of self-employment rates, firm entry and exit dynamics, and socio-economic opportunity to assess metropolitan entrepreneurial vibrancy.

We evaluated Washington, D.C. MSA's entrepreneurial vibrancy using both metropolitan self-employment rates¹ as well as the share of new and young firms² normalized by the resident population. These measures, discussed in detail below, suggest that the WMA's entrepreneurial ecosystem lags in

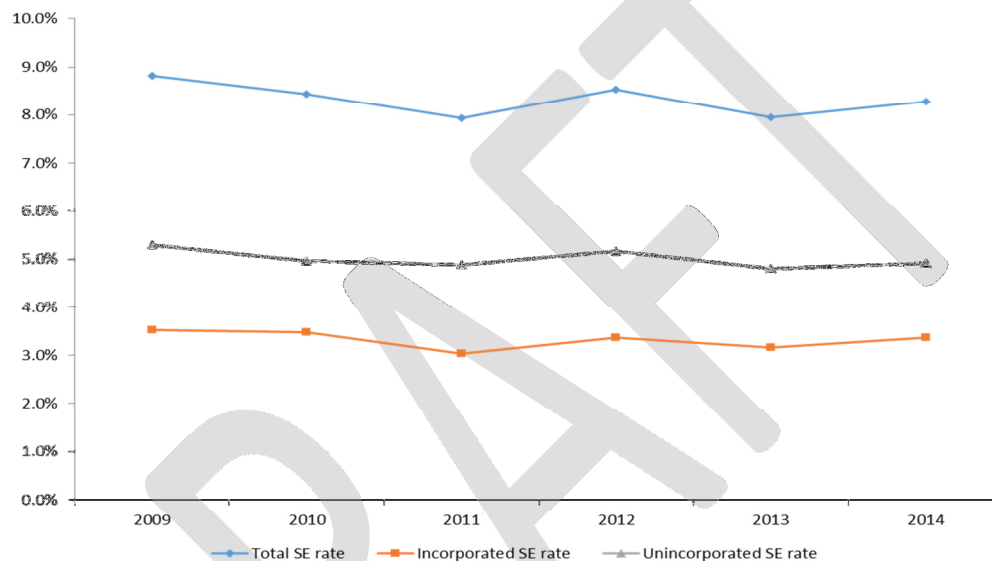
¹ The self-employment rate provides a broader measure of entrepreneurial activity as it is estimated by surveying individuals. It includes both incorporated as well as unincorporated self-employment.

² A region's share of new and young firms per 1,000 residents is more adequate for assessing entrepreneurial activity at the firm-level and is representative of employer-type entrepreneurship.

terms of individual self-employment rates, but the metro outpaces the nation in terms of firm-level entrepreneurial outcomes.

For instance, the WMA's total self-employment rate in 2014 was 8.3 percent, about 1.3 percentage points below the national average. This underperformance has been persistent with the metro averaging about 1.4 percentage points below the nation since 2009. This differential between the regional and national self-employment rates, however, is a result of low unincorporated self-employment rates in the metro whereas the WMA's incorporated self-employment rate about paralleled that of the nation at 3.4 percent in 2014 (figure 1).³

Figure 1: Washington, D.C. MSA Self-employment rate 2009 -2014 by type



Source: Author's estimates of American Community Survey 1-year estimates from 2009 to 2014.

In contrast, at the firm level the WMA's proportion of new and young firms per 1,000 people has slightly outpaced the nation. Still, from 2009 to 2013 the metro's share of new and young firms declined from 6.5 firms per 1,000 residents to 5.5 firms per 1,000 residents. In comparison, the national share of new and young firms declined from 7.2 firms per 1,000 residents in 2009 to 6.1 in 2013.

These higher proportions of incorporated self-employment and new and young firms indicate that the metro performs above average in terms of creating and sustaining the types of businesses that typically employ workers⁴. However, the declining trend suggests that regional opportunities for entrepreneurship are on the decline. To investigate these claims further the following sections discuss the metro's knowledge capabilities embedded in its industrial and occupational structure as well as the four ecosystem indicators.

³ The national self-employment rates include self-employment activity in agriculture and natural resource mining, both of which are under-represented in metropolitan areas.

⁴ Unincorporated self-employment is associated with non-employer types of businesses and proprietorships that often provide secondary incomes to households.

Metropolitan Comparative Advantages

Entrepreneurship relies on the recombinant nature of innovation and successful entrepreneurs engage actively in “bricolage”⁵. Regional physical, knowledge, and organization capital thus play an important role in the development of entrepreneurial opportunity and are best expressed in the region’s industrial and occupational structure. In this section we assess the WMA’s comparative advantages to identify regional assets that enable the entrepreneurial ecosystem. Specifically, we find that the metro has a strong knowledge-based economy centered on a STEM and STEM-related workforce.

The WMA is home to the federal government and consequently the region’s economy has emerged around the needs of the government. The largest employing broad sector in the Washington metro area is the Professional and technical services sector, employing a fifth of the metro’s private sector workforce. The other broad NAICS sectors with significant employment are Health care and social assistance (12.5%); Retail trade (11.7%); Accommodation and food services (11.2%); and Administrative and waste services (7.8%).

Exploring the detail of establishment clusters in the WMA reveals a nuanced picture where support services of the federal government and its workers dominates the economy.^{6,7} For instance, establishment clusters with large LQs for detailed NAICS categories include: Public relations agencies (LQ=6.1); Other social advocacy organizations (LQ=4.1); Private household (LQ=3.9); Computer systems design services (LQ=3.6); and, Other management consulting services (LQ=3.0).

Similarly, the occupational composition of the metro’s private sector workforce also parallels the expectation that the region’s economy has developed around the needs of the federal government. Prominent detailed occupational concentrations relating directly to the presence of government include Political scientists (LQ=33.3); Economists (LQ=18.3); Legal support workers (LQ=10.3); and Social scientists and related workers (LQ=9.0). In addition, other occupational concentrations that have developed incidental of government presence include: Mathematical and science occupations (LQ=11.1); Astronomers (LQ=10.3); and, Artists and related workers (LQ=9.6).⁸ Most of these occupations require advanced degrees in STEM or STEM-related fields.

The WMA has a high concentration of high-technology workers, comprising 11.5 percent of the workforce, higher than any of the other metros in this study.⁹ This comparative advantage in high-tech workers has resulted in an active patenting base for the region concentrating patenting activity since

⁵ “Bricolage” here refers to the entrepreneurial recombining and repurposing of knowledge and resources towards economics gains.

⁶ We defined comparative advantage as having an establishment location quotient over 2.5.

⁷ A list of the top 10 occupations by location quotient and employment at the detailed SOC level is provided in the appendix.

⁸ A list of the top 10 detailed occupations by LQ for the Washington, D.C. metropolitan statistical area is provided in the appendix.

⁹ We assessed the number of high-growth firms based on the Inc. 5000 annual lists of high-growth firms. Admittedly, businesses self-report to Inc. 5000 and our estimates may not capture all of the high-growth activity in the metros.

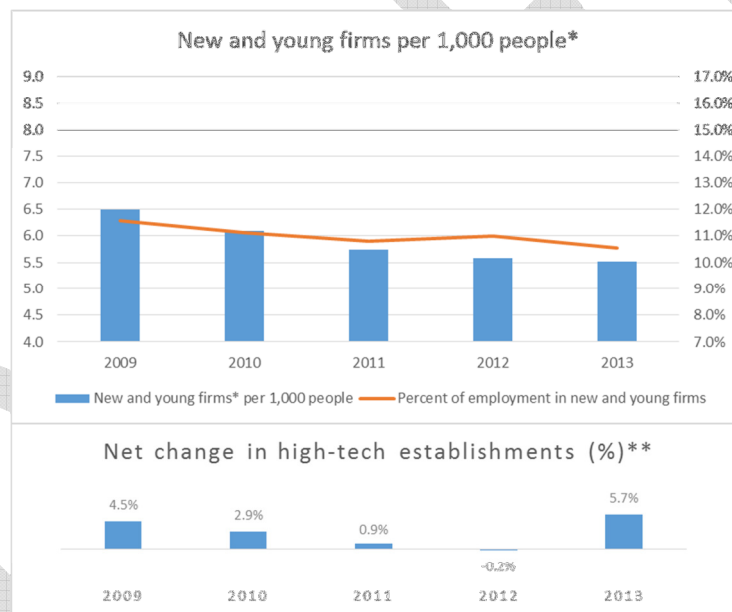
2000 in the technology classes of Drug, bio-affecting and body treating compositions; Chemistry: molecular biology and microbiology; Multiplex communications; Financial, business practice, management or cost/price determination; and Telecommunications. Additionally, the WMA has the second-highest proportion, next to Santa Fe, NM metro, of individually filed patents of any of the other metropolitan in this study at 21 percent of all patents filed.

How well are the WMA’s entrepreneurs able to avail themselves of the metropolitan’s comparative advantages? To answer this question, we assess the four indicators of the WMA’s entrepreneurial ecosystem based on entrepreneurial opportunity and vibrancy.

Ecosystem Density:

The Washington, D.C. MSA’s (WMA’s) density of entrepreneurial activity measures slightly below the national average and has also been declining since 2009. Yet, the WMA outpaces the nation in the concentration and growth of its high-tech sector.

Figure 2: Washington, D.C. MSA Entrepreneurial Ecosystem Density



*Firms 5 years of age or less.
 ** High-technology NAICS sector definition follows Hecker (2005) with updated definitions.
 Source: Author’s estimates based on the BDS and QCEW 2009 – 2013.

The WMA’s proportion of new and young firms per 1,000 people has lagged behind the national average between 2009 and 2013. The metro’s share of new and young firms declined from 6.5 firms per 1,000 residents in 2009 to 5.5 firms per 1,000 residents 2013 (figure 2). In comparison, the national share of new and young firms declined from 7.2 firms in 2009 to 6.1 firms per 1,000 residents in 2013. Over this same period, the employment share of new and young firms in the WMA also fell from 11.6 percent in 2009 to 10.6 percent in 2013. This is indicative of a slowdown in overall entrepreneurial activity in the metro.

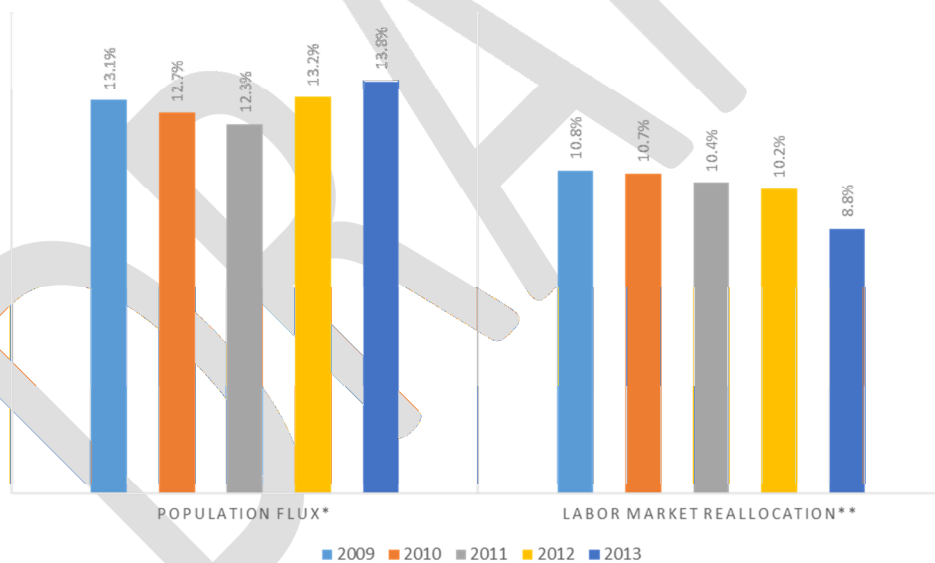
In terms of the level of entrepreneurship, new and young firms declined 9 percent from 36,067 firms in 2009 to 32,914 firms in 2013. Over the same period, employment in new and young firms fell by 4 percent from 278,037 to 267,665 employees. The differential between the percent change in employment and percent change in firms resulted in the average size of new and young firms increasing from 7.7 employees per new and young firm in 2009 to 8.1 employees in 2013.

Despite the declining entrepreneurial density, the high-tech sector¹⁰ has grown over the period. From 2009 to 2013, regional net change in the number of high-tech establishments was only negative for one year, and the decline was small at 0.2%. The WMA saw an annual average net change of 2.8% from 2009 to 2013, the largest average net change of high-tech establishments of cities examined in this study. This growth in the high-tech sector indicates that entrepreneurs in the metro are availing of regional capabilities embedded in the metro’s STEM and STEM-related workforce and industries.

Ecosystem Fluidity:

The WMA’s entrepreneurial ecosystem is very fluid. The metro has the largest migration flows of the metros in this study and also boasts gross job reallocation rates and churn of workers well above the national average.

Figure 3: Washington, D.C. MSA Entrepreneurial Ecosystem Fluidity



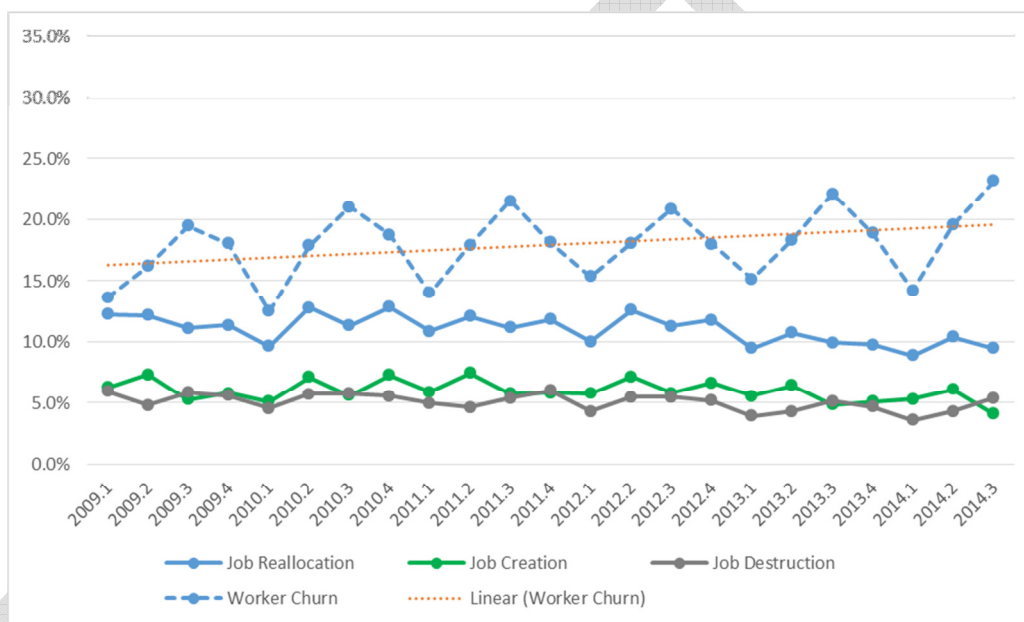
* Gross Migration as percent of population.
 ** Annual averages of excess job reallocation.
 Source: Author’s estimates from IRS SOT data and Quarterly Workforce Indicators.

We estimate regional entrepreneurial fluidity based on the three ecosystem features: Population flux; Labor market reallocation; and, the proportion of high-growth firms. The WMA boasts high levels and proportions for all three features.

¹⁰ High-technology NAICS sector definition follows Hecker (2005) and were updated for most recent NAICS codes.

For instance, the WMA’s gross migration rate¹¹ in 2013 was 13.8 percent, the highest among the metros studied. The rate declined slightly in 2010 and 2011 but has since recovered (figure 3). The largest component of all migration was comprised of international flows from Asia reinforcing the ‘new immigrant gateway’ status of the WMA. Other high international migrant flows connect the WMA with Europe and Africa. Domestically the WMA shared strong migration flows with the metros of Baltimore-Columbia-Towson, MD; New York-Newark-Jersey City, NY-NJ-PA; and Virginia Beach-Norfolk-Newport News, VA-NC. In this regard, the WMA stands apart from the other metros in this study because it shares strong international connections through migration as well as with the large metros such as New York City, NY.

Figure 4: Washington, D.C. MSA Labor Market Reallocation



Source: Author’s estimates from Quarterly Workforce Indicators.

Like the other metros in this study, gross job reallocation in the WMA declined between 2009 and 2013 (figure 4). In the WMA, the gross job reallocation rate fell from 12.2 percent in the first quarter of 2009 to 8.9 percent in the first quarter of 2014. The decline in gross job reallocation was the result of decreases in both the job creation and job destruction. Examining the unadjusted quarterly estimates, gross job reallocation in the Washington D.C. metro was relatively stable with higher levels of job creation than destruction for the majority of the period.

Counter to the job reallocation trend, worker churn¹² in the WMA increased between 2009 and 2014 from an annual high of 19.5 percent in the third quarter of 2009 to 23.2 percent in the third

¹¹ Gross migration rate was calculated as the sum of inflows and outflows of migrants in the metro divided by metro population.

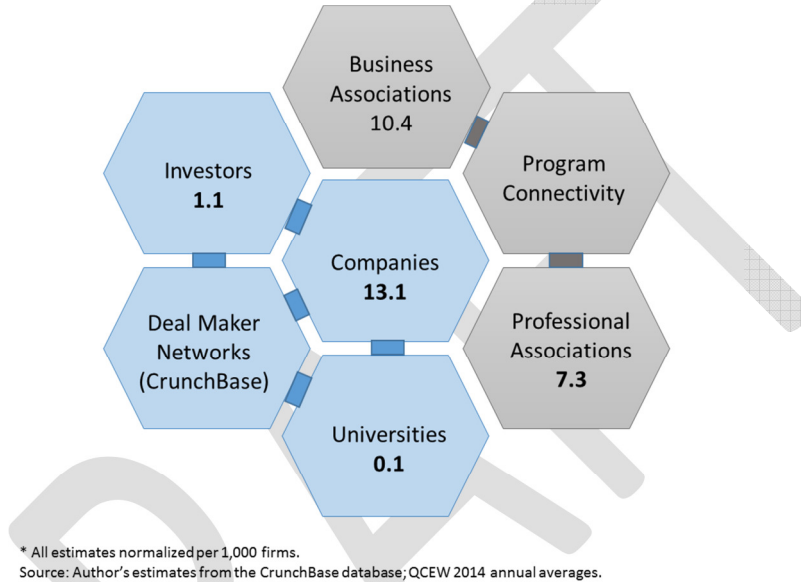
¹² Worker churn is the dynamic movement of workers across jobs not accounted for by new job creation or job destruction by establishments and is interpreted here as a proxy for information spillovers within the metro area.

quarter of 2014. However, over this period the average churn of workers was 17.8 percent, lowest of the six metros studied here.

Ecosystem Connectivity:

The WMA’s entrepreneurial ecosystem is under-networked. The metro has a low representation of investors and universities on the CrunchBase network, while regional companies are well-represented. The metro has a high concentration of business and professional associations; however, most of them operate nationally rather than regionally.

Figure 5: Washington, D.C. MSA Entrepreneurial Ecosystem Connectivity



In 2013, the Washington, D.C. metropolitan area economy comprised of 100,545 firms employing 2,533,676 employees. Correspondingly, there were 1,048 business associations and 731 professional associations operational in the metro. This concentration of associations represented 10.4 business associations per 1,000 firms and 7.3 professional associations per 1,000 firms (figure 5). Both these proportions are substantially above the concentrations of business and professional associations of the six metros examined in this study. However, these high concentrations in the WMA can be attributed to the regional presence of the federal government. Most of this local presence is comprised of national headquarters of the associations and not necessarily aimed at supporting the regional interests of firms and workers.

We also assessed ecosystem Connectivity using the CrunchBase network which provides a list of major companies, startups, and investors active in the technology sectors. By estimating regional participation of investors, companies, and universities on this network we draw conclusions on the connectedness of regional entrepreneurial activity.¹³

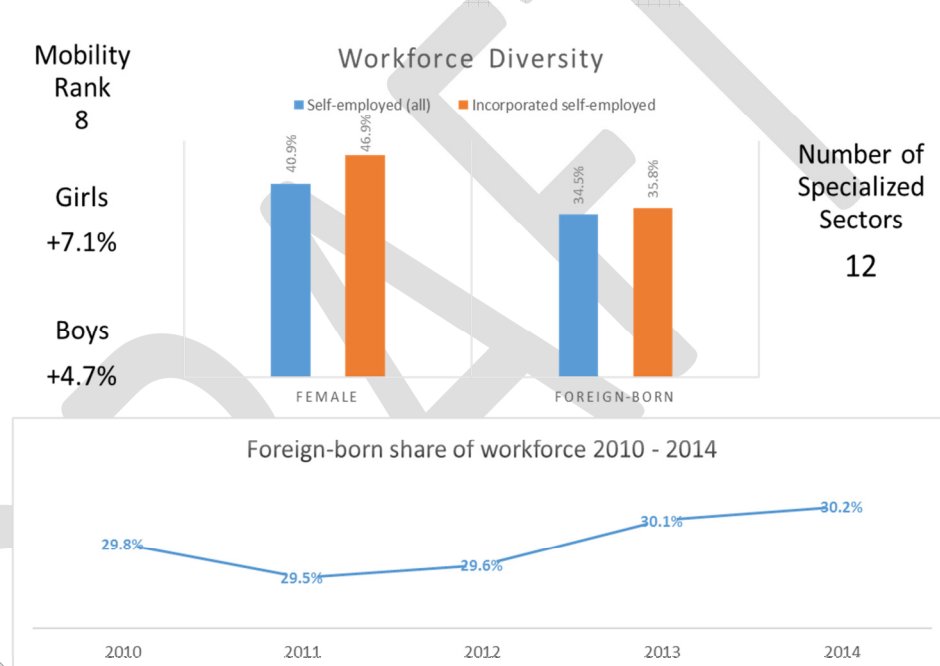
¹³ The CrunchBase database is biased in favor of the technology sector. Yet, it does provide some indication of an ecosystem’s connectedness in the absence of better publicly available regional metrics.

For the WMA, as of 2015, there were 1,322 companies, 115 investors and 4 universities listed on the CrunchBase network. Normalized by 1,000 firms, the WMA has 13.1 companies per 1,000 firms listed on Crunchbase, a high concentration relative to the other metros in this study. However, the WMA has low concentration of investors and universities active on the CrunchBase network, especially relative to the other metros in this study.

Ecosystem Diversity:

Entrepreneurial opportunity in the WMA is diverse. The metro’s economy is moderately diversified with specializations across 12 4-digit NAICS sectors. It also has high shares of foreign-born workers and business owners and also performs strongly in socio-economic opportunity for its residents, ranking of 8th in the nation.

Figure 6: Washington, D.C. MSA Entrepreneurial Ecosystem Diversity



*Specialized sectors have employment location quotients >= 2.0 at the 4-Digit NAICS level.
 **Mobility shows the percent change in income for a child from low-income family growing up to age 26.
 Source: Author's estimates from ACS 2009 – 2014; QCEW 2012 – 2014; and Equality of Opportunity Project.

The Washington, D.C. metro area ranks a high 8th in economic mobility according to the Equality of Opportunity Project, the highest rank of the six cities examined here. The ranking studies intergenerational mobility for the metro’s residents and reported positive opportunities for upward mobility for both boys and girls born in the WMA.

Workers in the WMA also earn relatively higher wages compared to most other metros. In 2014 the median earnings for employees 16 years of age and above was \$50,096, roughly \$14,000 higher than the second highest income in this study, the Kansas City metro area. The WMA also boasts high annual median incomes from entrepreneurship, both for the incorporated (\$60,595) and unincorporated (\$30,239) types of self-employment.

The WMA also contains significant diversity in its self-employment activity as well as its workforce, in addition to the high self-employment incomes and the opportunity for economic mobility. Women comprised 40.9 percent of all self-employment in the metro, and 46.9 percent of incorporated self-employment (figure 6). The share of foreign born self-employment was the highest in the sample of cities for both total and incorporated self-employed at 34.5 percent and 35.8 percent respectively.

Conclusion

The entrepreneurial ecosystem of the Washington, D.C. metropolitan area is vibrant and dynamic. It leverages regional capabilities in the high-tech sector supported by high concentrations of STEM and STEM-related workers. The metro fares below the national average in terms of its ecosystem Density yet excels in terms of ecosystem Fluidity and Diversity. The metro has room for improvement of its ecosystem Connectivity, possibly by engaging more investors and universities in facilitating regional entrepreneurial activity.

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APPENDIX: Washington, D.C. Metropolitan Statistical Area

Table 1A. Washington, D.C MSA Top Five Major Industry Sectors by Employment 2014

| Washington, DC MSA | Employment | % of Total | Avg. Wage (\$s) |
|--------------------------------------|------------------|---------------|-----------------|
| Professional and technical services* | 460,944 | 20.0% | \$111,326 |
| Health care and social assistance | 287,328 | 12.5% | \$52,754 |
| Retail trade | 269,449 | 11.7% | \$31,234 |
| Accommodation and food services* | 258,297 | 11.2% | \$23,057 |
| Administrative and waste services | 179,879 | 7.8% | \$45,658 |
| Total Private Employment | 2,302,249 | 100.0% | \$66,291 |

*estimate based on most recent available quarters

Source: Quarterly Census of Employment and Wages 2014

Table 1B. Washington, D.C. MSA Top 10 Detailed Industries by Establishment LQs 2014

| Washington, DC MSA | Establishments | LQ |
|---|----------------|------------|
| Private households | 17,858 | 3.9 |
| Computer systems design services | 7,634 | 3.6 |
| Administrative management consulting services | 4,697 | 2.6 |
| Custom computer programming services | 4,346 | 2.2 |
| Other management consulting services | 1,248 | 3.0 |
| Public relations agencies | 1,162 | 6.1 |
| All other professional and technical services | 1,059 | 2.1 |
| Business associations | 1,037 | 2.7 |
| Other computer related services | 971 | 3.3 |
| Other social advocacy organizations | 843 | 4.1 |
| Total Private Establishments | 178,420 | 1.0 |

*Only establishments with LQ>2.0 included

Source: Quarterly Census of Employment and Wages 2014

Table 1C. Washington, D.C. MSA Top 5 Major Occupations by Employment 2014

| Washington, DC MSA | Employment | % of Total | Median Wage |
|--|------------------|---------------|-----------------|
| Office and Administrative Support Occupations | 403,560 | 13.7% | \$38,980 |
| Business and Financial Operations Occupations | 293,920 | 10.0% | \$83,260 |
| Sales and Related Occupations | 255,730 | 8.7% | \$27,590 |
| Food Preparation and Serving Related Occupations | 237,120 | 8.1% | \$20,310 |
| Management Occupations | 222,140 | 7.5% | \$127,510 |
| Total Occupations | 2,944,560 | 100.0% | \$50,070 |

Source: Occupational Employment Statistics 2014 Annual Estimates.

Table 1D. Washington, D.C. MSA Top 10 Detailed Occupations by Location Quotients 2014

| Washington, DC MSA | LQ | Employment | Median Wage |
|--|------------|-------------------|--------------------|
| Political Scientists | 33.3 | 4,090 | \$116,900 |
| Economists | 18.3 | 7,460 | \$113,350 |
| Mathematical Science Occupations, All Other | 11.1 | 390 | \$64,630 |
| Legal Support Workers, All Other | 10.3 | 10,100 | \$96,260 |
| Astronomers | 10.3 | 370 | \$127,510 |
| Artists and Related Workers, All Other | 9.6 | 1,610 | \$85,710 |
| Social Scientists and Related Workers, All Other | 9.0 | 6,280 | \$98,920 |
| Geographers | 7.6 | 210 | \$88,220 |
| Statisticians | 7.1 | 4,170 | \$98,910 |
| Historians | 6.3 | 440 | \$92,920 |
| Total Occupations (All) | 1.0 | 2,944,560 | \$50,070 |

Source: Occupational Employment Statistics 2014 Annual Estimates.

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