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

SCHAR School of Policy and Government
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The Impact of Changing Federal Procurement Outlays on Selected Sub-Sectors in the Washington Region's Economy

Research Paper 3

Custom Computer Programming Services

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Federal procurement spending has been the largest source of federal dollars in Washington region since 1996 when it surpassed payroll.[1] While a recent decline in federal procurement spending brought total regional economic growth to a standstill, not all sub-sectors of the economy are equally reliant on federal procurement spending.[2] This paper, the third in a series, examines the dependence of the "custom computer programming services" sub-sector on federal procurement spending.

As with the first two papers in this series, dependence on federal procurement spending will be analyzed two ways. First, direct employment impacts of federal procurement spending will be estimated using regression analysis. Employment supported by federal procurement spending will be estimated for comparison with the first two sub-sectors analyzed. Second, federal procurement spending will be examined directly as a share of total wages in the sub-sector.

Federal Dependence of the Custom Computer Programming Services Sector

The "custom computer programming services" sector was selected for analysis primarily due to the magnitude of employment and federal spending in the Washington region.[3] Annual average employment in the "Custom computer programming services" sub-sector was 46,022 in the Washington region in 2016. The average annual wage in 2016 was $124,439, resulting in $5.7 billion of total wages paid. Federal procurement from contractors in the region is also substantial, annual procurement spending in the Washington region averaged $3.1 billion from 2008 through 2015.[4] Firms awarded large contracts in 2016 include: Hewlett-Packard, Systems Research and Applications Corporation, Medical Science & Computing, and Excellus Solutions.

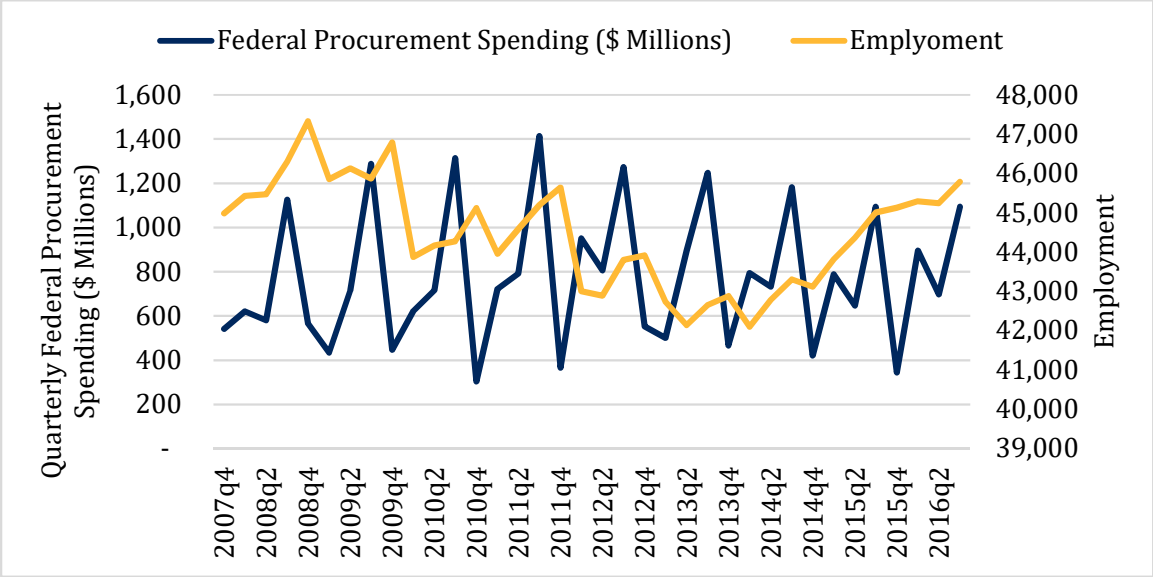
Employment and Federal Procurement

Employment in the "custom computer programming services" sub-sector peaked at 47,330 in the fourth quarter of 2008 and slowly declined 11.1 percent to 42,100 in the first quarter of 2014 (Figure 1). The decline over the roughly five-year period was followed by rapid employment growth in the sector. From the first quarter of

[1] Waters, K. (2017). Federal Procurement Spending in the Washington Region: 2008 - 2016. *The Stephen S. Fuller Institute*. Arlington, VA.
[2] Fuller, S., Chapman, J. (2015). What Are the Economic Consequences of a Reduction in Federal Spending? *The Stephen S. Fuller Institute*. Arlington, VA.
[3] NAICS Sector Classification 541511
[4] Data are aggregated by the date the federal contract was signed.

2014, employment increased 8.8 percent to 45,790 in the third quarter of 2016. In contrast, federal procurement from contractors in the "custom computer programming services" sub-sector remained relatively flat throughout the period, despite quarterly variation. Quarterly federal procurement spending throughout the study period averaged $776.2 million.

Figure 1. Custom Computer Programming Services



Sources: usaspending.gov; Bureau of Labor Statistics, Quarterly Census of Earning and Wages; The Stephen S. Fuller Institute at the Schar School, GMU

A first-difference regression model was used to analyze correlation between changes in federal procurement spending and changes in employment in the "custom computer programming services" sub-sector in the Washington region. Specifically, changes in employment is examined as function of changes in federal procurement spending. Despite the cyclical appearance of federal procurement spending, a quarterly dummy variable was insignificant when included in the model and was excluded in the final model. The quarterly dummy variable was also found to be statistically insignificant in analysis of the "research and development in the social sciences and humanities" sub-sector.

Regression results indicate that a $1 million increase in federal procurement spending in the "custom computer programming services" sub-sector is associated with an increase of 1.2 direct jobs the following quarter (Table1).[5,6] This does not include indirect or induced employment effects. Of the three sub-sectors examined in this series, this coefficient has the highest level of statistical significance.

[5] Durbin-Watson, Alternative Durban, Breusch-Pagan and lagged errors all indicate no serial correlation.
[6] Limitations include the small sample size and omitted variables

Table 1. First-Difference Regression of Employment on Federal Procurement Spending – Custom Computer Programming Services

	Coefficient	Robust Std. Error	P- Value
First-Difference Federal Procurement Spending (1-Quarter Lag)	1.159	0.326	0.001
Constant	5.308	126.9	0.967
$R^2 = 0.41$, F = 12.66, n = 34			

Sources: The Stephen S. Fuller Institute at the Schar School, GMU

Employment supported by federal procurement spending is estimated by applying the coefficient from the regression to annual federal procurement spending. Estimated employment supported by federal procurement spending and total employment in the "custom computer programming services" sub-sector followed opposite trends. Estimated employment supported by federal procurement spending in the sub-sector increased from 3,356 in 2008 to 4,155 in 2012 before decreasing to 3,334 in 2015. In contrast, employment decreased from 46,132 in 2008 to 42,602 in 2012 before increasing to 44,580 in 2015.

Opposite trends at the beginning of the study period resulted in the share of regional employment in the sub-sector supported by federal procurement spending to increase from 7.3 percent in 2008 to 9.6 percent in 2012. As both trends reversed, the share of total employment in the sub-sector supported by federal procurement spending declined from 9.6 in 2012 to 7.5 percent in 2015.

Table 2. Employment Impacts of Federal Procurement Spending - Custom Computer Programming Services

Year	Annual Federal Procurement Spending ($ Millions)	Annual Average Total Employment	Estimated Jobs Supported by Federal Procurement Spending	Estimated Share of Jobs Supported by Federal Procurement Spending
2008	2,892.9	46,132	3,356	7.3%
2009	2,883.4	46,160	3,345	7.2%
2010	2,955.7	44,358	3,429	7.7%
2011	3,292.8	44,841	3,820	8.5%
2012	3,582.1	43,403	4,155	9.6%
2013	3,108.6	42,602	3,606	8.5%
2014	3,129.1	42,828	3,630	8.5%
2015	2,874.1	44,580	3,334	7.5%

Sources: usaspending.gov; Bureau of Labor Statistics, Quarterly Census of Earning and Wages; The Stephen S. Fuller Institute at the Schar School, GMU

Wages and Federal Procurement

The second method used to analyze federal dependence by sub-sector is to compare federal procurement spending directly as a share of total wages paid. Total regional wages paid in the sub-sector increased from $4.8 billion in 2008 to $5.0 billion in 2011. Total wages declined slightly from 2011 to $4.8 billion in 2013 before increasing 9.8 percent to $5.3 billion in 2015. As discussed, federal procurement spending in the sub-sector increased from $2.8 billion in 2008 to $3.5 billion in 2012 before declining back to $2.8 billion in 2015.

Federal procurement spending and total wages paid in the "custom computer programming services" sub-sector both increased from 2008 through 2011. This resulted in federal procurement spending as a share of wages to remain at approximately 60 percent. As a result of federal procurement spending increasing through 2012 and a slight decline in total wages paid, federal procurement as a share of total wages increased to 72.4 percent in 2012. Following the 2012 peak, federal procurement spending declined through 2015 as total annual wages increased. The divergence of these two trends caused federal procurement spending as a share of total wages paid in the sector to decline to 53.8 percent in 2015.

As with the other two sub-sectors examined in this series, the share of wages estimated to be supported by federal procurement dollars is greater than the estimated share of employment supported by federal procurement dollars. This is likely due to the assumption regarding the share of wages supported by federal procurement dollars. The estimated share of wages supported by federal procurement spending would be less than assumed here because revenue also supports employee benefits, rent, and utilities.

Table 3. Federal Procurement Spending as a Share of Wages Paid - Custom Computer Programming Services

Year	Federal Procurement Spending ($ Millions)	Total Annual Wages ($ Millions)	Federal Procurement Spending as a Share of Total Wages
2008	2,892.9	4,813.1	60.1%
2009	2,883.4	4,876.5	59.1%
2010	2,955.7	4,782.1	61.8%
2011	3,292.8	5,000.9	65.8%
2012	3,582.1	4,948.8	72.4%
2013	3,108.6	4,863.3	63.9%
2014	3,129.1	5,029.1	62.2%
2015	2,874.1	5,339.7	53.8%

Sources: usaspending.gov; Bureau of Labor Statistics, Quarterly Census of Earning and Wages; The Stephen S. Fuller Institute at the Schar School, GMU

Conclusion

Since 1996, federal procurement from private sector contractors has been the primary source of economic growth in the Washington region. However, sub-sectors of the region's economy are not equally dependent on federal procurement dollars. This paper analyzed the dependence of the "custom computer programming services" sub-sector on federal procurement spending by examining employment and total wages during the FY 2008 – FY 2016 period.

Analysis using a first-difference regression model indicates that an increase in federal procurement spending of $1 million in the Washington region is associated with an increase of 1.2 direct jobs in the "custom computer programming services" sub-sector the following quarter. Analyzing annual data suggests that the share of jobs supported by federal procurement spending in the Washington region increased from 2008 to 2012 before declining through 2015. This estimate does not include indirect or induced employment effects.

Wages were then compared directly to federal procurement spending. Assuming that federal procurement dollars were allocated entirely towards wages reveals the same pattern found by examining employment; wages supported by federal procurement spending increased from 2008 through 2012 before declining through 2015.

Despite different estimates provided by the two methods, the analysis confirms a similar result: dependence of the "custom computer programming services" sub-sector in the Washington region on federal procurement spending increased from 2008 to 2012 and decreased from 2012 through 2015. The recent success of the sub-sector in diversifying revenues away from federal markets contributes to the goal of diversifying the regional economy.

About These Data

Employment and Wage Data from Quarterly Census of Earnings and Wages provided by the Bureau of Labor Statistics and retrieved on 9/21/2017. Federal procurement data are from usaspending.gov and were retrieved on 05/25/2017. Procurement spending was aggregated by place of performance by the date the contract was signed.