Modeling Spending

Using the Arlington Model, we can use information about the county to help us forecast different components of Arlington's spending, and how that spending is affected by property development as well as growth assumptions about Arlington's existing residences and businesses.

Although there are a huge number of different types of expenditures, we break down spending into a couple of major categories and model the impacts of development and growth on each of these categories.[1] In this paper, we cover how we forecast the following categories:

- General Government Administration
- Environmental Services
- Human Services
- Libraries
- Parks and Recreation
- Development and Planning
- Courts and Constitutionals
- Public Safety
- Non-departmental Expenses
- Contributions to Regional Initiatives and Programs
- Debt Service
- WMATA Contributions
- Capital Expenditures
- Arlington Public Schools

We describe how we use the model to forecast spending in each of these categories and how these categories respond to changes in development. Parts of the spending forecasts are still under construction, either awaiting better data or additional research to more accurately model spending projections. A summary of our current methodology is presented in Table 1. For the most important modeling assumptions, we offer the ability to make changes on the website so they can see how changes in these assumptions affect spending forecasts.

[1] Revenue data is generally sourced from the open data portal, however, more recent data is pulled directly from the budget documents themselves.

Table 1: Spending Projections by Category

Category	Baseline Change	Development Effects
Gen. Gov't Admin	2.5%	None
Environmental Services	2.5%	Commuter services grow with apartments (and condos); ART buses grow with businesses and apartments (and condo); water, sewer, transportation grow with business and population; other categories unaffected
Human Services	2.0%	Grows with population
Libraries	2.0%	Grows with population
Parks and Recreation	2.0%	Grows with population
Development and Planning	0.0%	80% of equal-weighted growth of apartments and business space
Courts and Constitutionals	2.0%	Grows with population
Public Safety	2.75%	Growth with population and business (75% weight on population)
Non-dept Expenses	3.0%	None
Regional Contributions	0.0%	Formula growth applied to separate categories; roughly half grows with population, other half has no growth
Debt Service	Based on CIP	Grows at 80 percent of population
WMATA	2.0%	Grows 62.5 percent faster than apartment and business growth
Capital Expenditures	5.0% to 8.0% to 0%	None
Schools	2.0%	Grows with school enrollment

General Government Administration

This category—which is about 3.5 percent of the general fund and school budgets—includes support for the county board, the county manager, human resources, management and finance, and technology. The largest categories in this group likely have large fixed costs which do not scale with population, students, development, or other county economic indicators. Nonetheless, we expect that this category will grow a little bit faster than inflation, mostly driven by increases in spending on technology. Therefore, the spending in this category will outpace inflation, but there is no additional response to growth or development in the county.

Environmental Services

Although this group covers a large number of departments, the six largest contributors are the ART buses, the solid waste bureau, facilities management services, transportation engineering, water and sewer, and commuter services. ART bus services are concentrated in higher density areas, and will probably need to respond positively toward. The county spends about $100 million on environmental services per year. Over the last eight years, spending on this has increased by four percent per year.

We predict that overall, the increase in the cost of these services will slightly exceed inflation and grow at a baseline of 2.5 percent. In addition, many of these categories will grow with county development. Water and sewer are aging and will likely require more resources. The transit program has expanded significantly but appears to have slowed down in the most recent budgets. We expect that commuter services will increase in proportion to apartment growth; ART bus to increase in proportion to a weighted average of apartment and business growth; water, sewer, solid waste, and transportation engineering to increase in proportion to a weighted average growth in population and business. We predict that the rest of the department expenditures will grow at 2.5 percent per year without regard to changes in county development or demographics.

Human Services

Human Services is a large component of the budget, about $140 million or about 10 percent. It covers a wide range of services including behavioral healthcare, public health, housing assistance, and many other programs aimed at assisting a wide variety of Arlington's residents. Growth of human services has increased by slightly under three percent from 2012 to 2018; recent adopted budgets have reduced that growth slightly to a little over two percent.

This department's services primarily go to county residents; businesses do not take advantage of most of these services. In line with historical growth, we set the baseline growth to be about two percent per year representing the increase in the cost of providing these services to the existing residents. New residents increase the growth of this category proportionally beyond that; an additional one percent population growth would result in roughly a three percent increase yearly.

Libraries

The Department of Libraries is responsible for the county's libraries, and has a budget of around $15 million per year, or approximately one percent of the general and school funds. From 2012 to 2018, actual spending on libraries increased about three percent per year, which is roughly in line with inflation plus population growth. We assume that the library budget grows at two percent per year plus the rate of population growth.

Parks and Recreation

The Department of Parks and Recreation constructs and maintains the county's parks, and the department provides programming. It's $40 million budget is about three percent of the budget. From 2012 to 2018, actual expenditures have increased by about four percent per year. Land acquisition is typically done through the capital budget: Most of this budget is for construction, maintenance, and programming. Since 2012, spending has increased by about four percent per year, although the path has retreated to a little below three percent

over the last four adopted budgets (2016 through 2020). Therefore, we use the typical assumption that this department budget grows at inflation plus the rate of population growth.

Development and Planning

Development and planning consists of two planning departments, Economic Development and Community Planning. These departments provide services related to real estate development, construction, code compliance, and more. Community Planning takes a slightly larger share of the combined $20 million budget. These services have decreased significantly in the last few years, but the decrease can be attributed to the closure of the Artisphere

Most of the budget seems skewed toward development in the urban corridors, although some is dedicated toward neighborhood preservation projects. We keep the budget flat in the absence of development, and increase the total budget of these two departments by 80 percent of equal-weighted growth of apartment units and business space, representing the increased burden on the planning units that those types of development demand.

Courts and Constitutionals

The Courts and Constitutionals category covers a numerous different department including elections, the treasurer, the sheriff, the commissioner of revenue, the courts, legal, and other similar offices. The total 2020 budget is a little under $80 million, which is a little under six percent of the entire budget. Of that, a little less than half of this funding goes toward corrections. Overall, from 2012 to 2018, the actual amount spent has grown about 3.5 percent per year, although recent adopted budgets from 2016 to 2020 have slowed this to closer to 3.0 percent. The biggest sources of growth have been in operations of the sheriff's office unrelated to corrections as well as juvenile and domestic relations programs. Funding for the jail has increased by about three percent per year since 2012.

We assume that most of these types of expenditures are related to the county population and unrelated to business operations. We use the typical assumption that this department budget grows at inflation plus the rate of population growth. Nonetheless, we look forward to working on new research on the relationship between legal services and different types of properties, businesses, and other indicators that may improve our accuracy at predicting the need for these types of services.

Public Safety

Public safety includes funding for communication and emergency management, police, and fire / EMS services. This group of expenditures totals about $150 million, or more than 11 percent of the county's budget. About half of this spending is on police, roughly 40 percent on the fire department, with the rest on communication and emergency management. Actual spending from 2012 through 2018 has grown less than 2.5 percent, or less than population growth plus inflation. More recently, expenses have increased in the budget by a little more than three percent, driven by larger increases in spending on the fire department.

Historically, the police department has not increased the number of officers. In fact, from 1999 to 2018, the number of sworn officers has declined by 15 in spite of growth in the county's population. Recent statements by the police command staff have indicated a significant shortage of police officers. A recent report shows that the fire department has been understaffed for some time as well.

We anticipate that the average growth rate in the budget for public safety services will be higher than in years past. Undoubtedly, the growth in this budget category will be somewhat lumpy—salary corrections tend to occur infrequently and in larger disbursements—however, we cannot predict the years in which these salary increases will be implemented, so we increase the average growth rate across the entire time frame. We expect that the average growth rate will be about 2.75 percent plus growth in business and residences, which results in a growth rate of slightly more than 3.5 percent per year going forward. We will average growth in population and business, applying a weight of about three-quarters to the population growth and one quarter to growth in business square footage. We anticipate conducting more research to understand what types of development lead to greater expenditures on public safety, and we plan to update our model as we learn more about this relationship.

Non-departmental Expenses

These expenses cover a bunch of unrelated categories including contingencies, health insurance, certain employee benefits, consultants, insurance, and other items. We do not see a relationship between these expenses and the features in our model, and therefore project expenses to increase at about three percent per year, in line with the average increases between the adopted budgets from 2016 and 2020.

Contributions to Regional Initiatives and Programs

Arlington contributes about $7.5 million toward regional groups and programs that provide services to the county. The funding is broken into four groups, defined by the method of determining Arlington's contributions. Groups I and II have seen large increases in their funding, based on population and service usage, whereas groups III and IV are flat at a nominal level. Overall, funding has declined slightly over the past eight years.

We set baseline funding to remain flat over the subsequent years. Groups I and II increase with population, but groups III and IV remain constant. The net result is a very small increase in a fairly small component of the overall budget.

Debt Service

In order to finance its larger infrastructure projects and land acquisition, the county issues debt. The county pays back this debt slowly over time, however, debt payments are substantial and are projected to reach $72 million in 2020. In order to sustain its debt rating, which allows the county to borrow at the most favorable rates, the county needs to keep its debt below prescribed shares of income, expenditures, and taxable base.

In the 2018 Capital Improvement Plan (CIP), the included analytics show that the county is mostly constrained by the debt payments as a share of total expenditures effectively starting in 2023. Using their projections, we compute that debt service is expected to increase by about 5.5, 4.3, 3.5, and 3.5 percent in 2021 through 2024 before stalling at about three percent, or roughly inflation plus population.[2]

We assume that the county will continue to push to this boundary on debt service, and that increases in expenditures—related to population growth and development—will result in commensurately higher levels of

[2] The county does not distinguish among debt in different funds, we assume that the increase in the general fund obligations modeled here are comparable to the total.

debt service. Therefore, we expect that the growth rate in debt service will increase at 80 percent the rate of population growth, which is the primary driver of increases in expenditures.

WMATA

Arlington contributes a significant amount of money to the maintenance and capital costs for the region's transportation authority for Metrorail and Metrobus. Although the total subsidy to WMATA is about $80 million, approximately $33 million is offset by state aid and a regional gas tax. Arlington's contribution has increased substantially to support efforts to improve Metro capital and operations, increasing at an annual rate of 15 percent since the 2016 adopted budget. We expect that WMATA will continue to need contributions significantly in excess of inflation, probably on the order of five percent increases per year.

Calibrating the effect of development offers challenges. We assume that business growth and apartment / condo growth will drive Metro funding. State aid, which currently accounts for about ⅜ of WMATA funding, does not appear to respond immediately to Metro needs.

Additional growth will be factored in periodically as the funding arrangement is updated and renegotiated. It is certainly possible to argue that development has almost no impact at the margin—an additional rider will not cause Arlington to need to adjust its contributions to WMATA operations and investment. Nonetheless, we might expect that the 10,000th additional rider would have a very high marginal cost. Therefore, when computing the fiscal costs of development, we assume that increases in the budget coming from development are spread out evenly over all of the new riders. The very high marginal cost of the hypothetical 10,000th additional rider is spread out evenly over the prior 9,999.

In addition, state aid seems fairly unresponsive, so we assume that Arlington will be paying greater than the average growth rate for additional development. We take an average growth for all apartments and business square footage, and then divide it by ⅝ (Arlington's share of the WMATA contribution) to approximate the expected increase in WMATA's budget that Arlington itself will be contributing toward WMATA's funding.

Capital Expenditures

Arlington pays for some small share of its capital investment through the pay-as-you-go (PAYG) fund. Each year, the county makes a small contribution to this fund. The PAYG contribution for the latest Capital Improvement Program (CIP) is smaller than the one from the previous two years. Moreover, changes to the PAYG contribution toward capital building responds slowly, the CIP is on a two-year schedule, so it would be several years before any changes to demographics or county indicators were reflected in changes to the county's contribution toward this fund. Moreover, the PAYG fund has a balance that can be used to smooth out funding over short periods of time.

Nonetheless, as the county reaches its self-imposed debt limits, PAYG will become the marginal vehicle for funding capital projects that are not being funded with external funding. The most recent CIP relies on historically high levels of debt and historically low levels of PAYG contributions; significant capital projects in the future will probably have to be funded by direct contributions to preserve the county's AAA debt rating. Therefore, we do not see the low levels of PAYG contribution levels requested in the 2018 CIP to be sustainable. Immediate increases in PAYG contributions start at 5.0 percent, peaking at about 8.0 percent and dropping to 0.0 percent in future years.

Future development may have a strong impact on future PAYG expenditures, however, capital projects are large and idiosyncratic, so it is difficult to predict PAYG expenditures far into the future. Therefore, we do not have PAYG respond to changes in development.

Arlington Public Schools

Arlington Public Schools (APS) has a budget of about $670 million in the adopted 2020 budget. The huge majority, about $550 million of this funding is for school operations. Overall, salaries and benefits are by far the largest expenses in the school budget. The school budget typically grows about five percent, reflecting an increase in costs plus a growing school population.

We break down the school budget into two components: debt service and the rest of the operating budget. We increase the school operating budget by a baseline two percent per year reflecting typical increases in salaries and materials costs. In addition, we increase the spending in the rest of the operating budget by the growth in the school population, reflecting historical trends.

We project debt service based on the 2018 Comprehensive Annual Financial Report. We have debt service beginning in 2021 at about $48 million, declining to $27 million in 2030. These numbers, however, are debt that has already been issued. New debt or capital expenditures will increase this substantially.[3] In general, the cost of a new student seat is very roughly $100,000.[4] At about 4% interest, this leads to a cost of about $140,000 over 20 years (the bonds in 2018 have a maturity of about 20 years). Splitting the $140,000 payment evenly for convenience, this leads to each student costing about $7,100 per year for the next 20 years in school construction costs.[5]

The school is funded by a revenue sharing agreement. Nonetheless, as school enrollment continues to grow, either that sharing agreement will eventually have to be revisited or the county will need to make larger and larger "one-time" transfers as were negotiated for the 2020 budget.

Growth in school enrollment likely has uneven effects on school growth. New teachers are hired at lower salaries than existing teachers, however, their salaries increase faster as they gain additional education and experience. School construction also tends to lag enrollment growth, so capital expenses lag student growth as well. We look forward to improving the model of APS spending with additional analysis. For the moment, however, the current "cost plus enrollment" growth approach to modeling school spending appears to capture the most important trends in APS spending.

Notes and Acknowledgments

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[3] School construction happens at discrete intervals: Each new student does not individually have a seat constructed for his or her. Therefore, we use a "marginal effective rate", which is the average cost for new students and apply that individually to each student. Actual school construction costs are going to be lumpier and harder to predict; we simply apply a fixed cost to every new student at the time the student is projected to enroll in APS schools.

[4] A list of recent schools is available from the 2018 APS Cost Comparison Study. The Wilson school is top on the list at about $130,000 per seat and the Wakefield comes in $60,500 per seat. As construction costs have been rising, we assume that $100,000 is a reasonable if possibly slightly high estimate for the cost of a new seat.

[5] Ideally, we would keep track of "vintages" of new students and ascribe a declining cost over time of interest and principal payments. Nonetheless, the bond payments could be back-loaded so that the out-of-pocket expense is roughly stable over time. As this is the easier option to model, that is what we apply. Bond payments---both principal and interest---are assumed to be constant over time.

For additional tools, data, and analysis, please visit our site at https://www.arlington-analytics.com/.

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