Modeling District Revenue to Certify Debt Service Obligations

February 29, 2024 A methodology report by EY/Quantitative Economics and Statistics

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Office of the District of Columbia Auditor

Modeling District Revenue to Certify Debt Service Obligations – Methodology 2024

Prepared for the Office of the District of Columbia

Auditor February 27, 2024

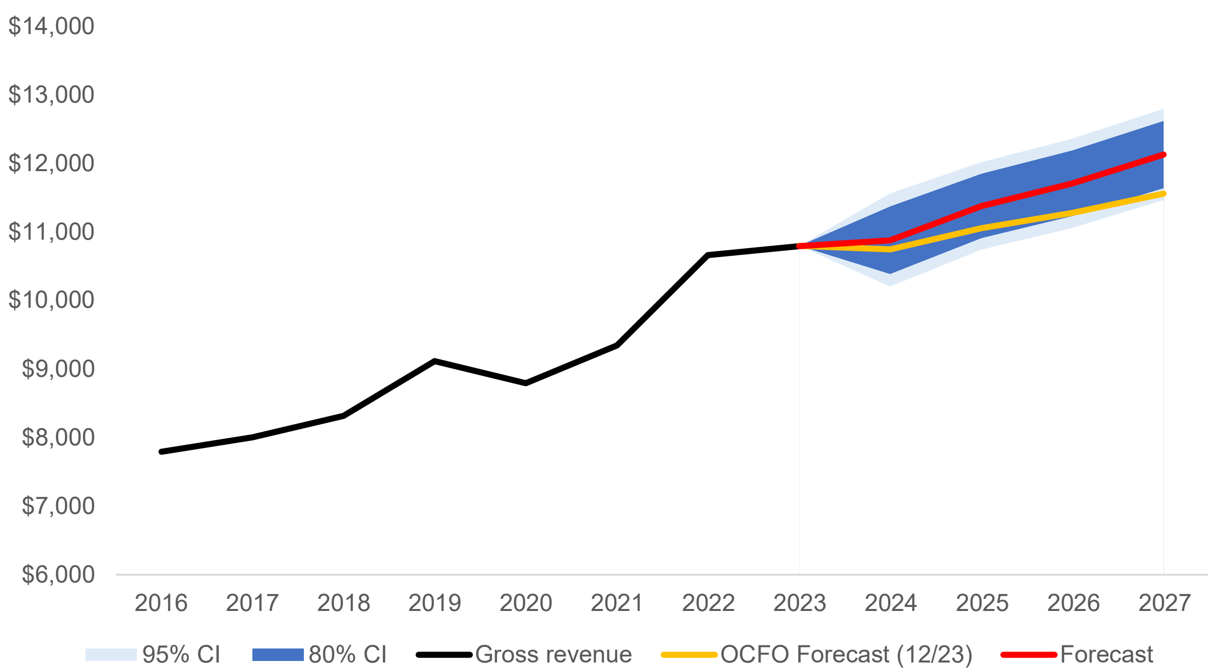
Contents

Executive Summary

The District of Columbia Home Rule Act states that the Office of the District of Columbia Auditor (ODCA) is required to certify compliance with the 17% test before new general obligation bonds can be issued. To support this certification, ODCA engaged EY/Quantitative Economics and Statistics (EY/QUEST) to create and update a model for forecasting District revenues (the "Certification Forecast") in 2023 to certify that the official projections of revenue prepared by the Office of the Chief Financial Officer of the District of Columbia (OCFO) are adequate for proposed debt issuance.

The Certification Forecast estimates $10.9 billion in gross revenue (revenue prior to dedicated revenues being netted out) in FY 2024. Figure 1 below shows the forecast for gross revenue increase to $12.1 billion in FY 2027. Much of this growth is due to growth in income, property, and sales taxes. The results of the analysis suggest that OCFO's December 2023 estimate of $9.9 billion in FY 2024 local fund revenue is within the confidence interval of the Certification Forecast, adjusting for revenues dedicated to other funds.

Figure 1. Total gross revenue forecast ($ in millions)



Sources: OCFO December 2023 Revenue Estimate; ODCA (see Table A1 for inputs).

I. Introduction

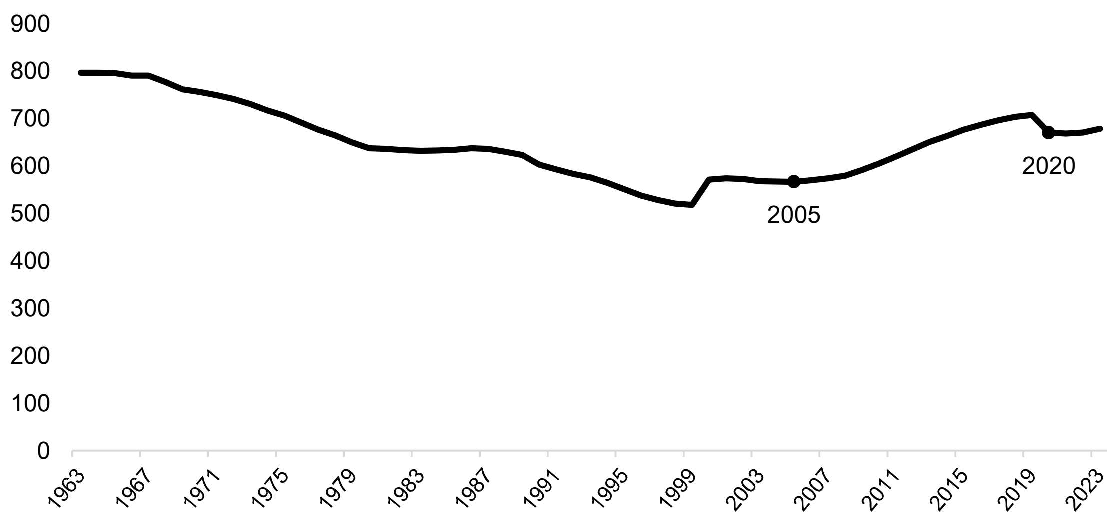
The Office of the District of Columbia Auditor (ODCA) is required to certify, before the issuance of new general obligation bonds, that aggregate annual debt service on all bonds will not exceed 17% of the District's revenue (the "17% test"). To support this certification, ODCA engaged EY/Quantitative Economics and Statistics (EY/QUEST) to create and update a model for forecasting District revenues (the "Certification Forecast") in 2023 to certify that the official projections of revenue prepared by the OCFO are adequate for proposed debt issuance.

The forecast presented here is data-driven using econometric models. A complete list of inputs and sources to the models is included the appendix (Table A1). In cases where there is information about future tax changes (e.g., the increase in the top income tax rate and the sunset of top deed tax rate), that information is incorporated. The forecast is meant to validate the official forecast prepared by the OCFO Office of Revenue Analysis (ORA) economists and not to replace it and should not be used as an official projection of District revenues.

Trends in the District economy

Over the last two decades, there have been several major developments in the District economy that will impact the revenues and the modeling choices for those revenues. There are two trends that create a much more volatile fiscal environment. First, the District's population declined from 1964 to 2000. Beginning in 2005, that decline reversed as the District became a much more attractive place to live and work. That change in population created pressure on housing markets. It overheated traditionally strong neighborhoods and created newly competitive neighborhoods. Figure 2 summarizes the District's population trend.

Figure 2. DC population from 1963-2023, in thousands



Source: U.S. Census Bureau; District resident population (via FRED at Federal Reserve Bank of St Louis)

The second major development was the COVID pandemic, which shuttered most of the District for several months and severely limited economic activity for over a year. While the District has mostly rebounded from the pandemic economically, the population loss during the period has not recovered to its pre-pandemic levels and the surge in technologically enabled remote work has created an enormous problem for the District, as it has for many large cities. The District, as a result, may be going through a significant shift in its basic long term economic structure from a concentration in the federal and professional sectors to a concentration in the residential and tourism sectors. In the short term, the latter appears to be largely offsetting the former but over time it is not clear how damaging the loss of about half of the daytime population on any given day will be for the District. For example, the strength in recent years of sales tax has been more of a story of recovery than underlying strength in the tax base. And, while corporate and individual income tax revenue remains strong and resilient, office buildings have been decimated, putting both deed and real property taxes in jeopardy.

For these reasons, the models used in the Certification Forecast allow for different trajectories of variables specific to these trends. This will provide additional "what-if" revenue forecast analyses under different scenarios. The models are also tailored to the affected major revenue sources: real property, sales and use, individual and business income, and deed taxes.

Outlook

The outlook for the District economy is for slowing growth in the short term but does not include a recession. The most recent OCFO forecast issued on December 29, 2023, is similar.[1] The risks noted above are related to the role of commuters and population declines. The Certification Forecast incorporates data from Oxford Economics, CoStar and the Congressional Budget Office for forecasts of the economic and demographic variables that drive the revenue projections. Table 1 summarizes the primary economic variables that are used in the analysis. Further details about sources are included in the Appendix.

Table 1. Summary of economic variables that can impact the revenue outlook

Indicator	FY 2023 value	FY 2023-2027 average annual growth forecast	Use in models
DC GDP ($M)	167,082	4.3%	Business income
DC food and accommodation GDP ($M)	3,516	3.0%	General sales
DC wage and salary income ($M)	91,050	4.2%	Indiv. income, General sales, Deed tax, Lottery
DC office vacancy (rate)	20.6%	8.6%	Real property (commercial assessed value)
DC office net deliveries (level)	61,918	N/A*	Real property (commercial assessed value)
US Capital gains ($M)	1,533,718	-4.5%	Indiv. Income
S&P 500 (index)	4,129	3.2%	Business income
US Case Shiller housing price (index)	300	2.1%	Real property (residential assessed value)
US Single family home sales ($M)	3,765,950	4.0%	Deed tax
US Gross private domestic investment ($M)	4,642,317	5.6%	Licenses/fees
US nonresidential fixed investment ($M)	3,549,774	4.6%	Real property (commercial assessed value)
DC resident population (level)	678,945	1.2%	Licenses/fees, Charges
DC employment (level)	773,733	0.7%	Fines

Sources: US Congressional Budget Office; US Bureau of Economic Analysis; US Bureau of Labor Statistics; US Census Bureau, CoStar; Oxford Economics (US BEA; S&P; Fiserv; Macro Markets LLC; National Association of Realtors; Haver Analytics). The average annual growth forecast is calculated as the compound annual growth rate (CAGR) from FY 2023-2027. DC employment includes in-commuters, causing total employment in the District to exceed the resident population.
*Office net deliveries reflect the difference between construction completed and demolition, changing from 61,918 in FY 2023 to -26,106 in FY 2027.

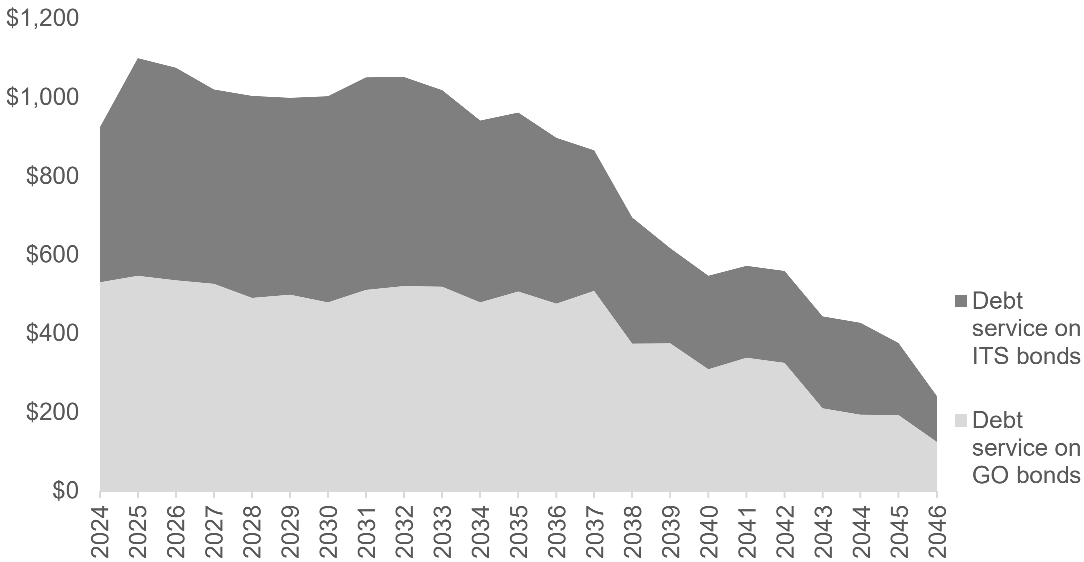
Debt issuance and ratings

Pursuant to the District of Columbia Home Rule Act, no new long-term general obligation debt can be issued that causes the principal and interest payments under all long-term debt to exceed

[1] Government of the District of Columbia, Office of the Chief Financial Officer. (December 29, 2023). Quarterly Revenue Estimates: December 2023 Revenue Estimates for FY 2024 – 2027. Retrieved from: https://ora-cfo.dc.gov/node/305482

17% of revenues in the fiscal year the debt is issued.[2] This condition relates to principal and interest payments on general obligation (GO) bonds and income tax secured (ITS) bonds. ODCA is required to certify compliance with the 17% test before new general obligation bonds can be issued; however, the condition is deemed not to apply to ITS bonds. Figure 3 shows the combined projected debt service for GO bonds and ITS bonds.

Figure 3. Debt service on GO debt and ITBs debt, FY 2024-2046 ($ in millions)



Source: DC ODCA; December 2023 [Income Tax Secured Revenue Bonds Official Statements]

At the current level of debt service, the ratio of debt service to revenue, according to the last certification issued by ODCA in April 2023, is 9.72%, well below the 17% threshold.[3] The District also has a local law capping the debt ratio to 12%, defined as the debt service to general fund expenditures, an alternative way to calculate the debt ratio. Because of these safeguards and the ODCA certification, the District enjoys good bond ratings from Standard and Poor's (AA+), Moody's (Aaa) and Fitch (AA+).[4] In November 2023 Moody's affirmed the bond rating but revised the District's outlook to negative due to the close linkage with the federal government.[5]

Overview of District revenue sources

As Table 2 shows, the District has three major revenue sources: taxes on individual income, general sales, and real property. These three sources account for 85% of District revenue. However, taxes like business franchise and deed taxes, which represent smaller shares of District revenue, account for an outsized share of the variability in District revenue. Most of the other revenues estimated by the OCFO are relatively small and relatively stable. From 2013 to 2022,

[2] D.C. Home Rule Act, Section 603(b)(1).
[3] Office of the District of Columbia Auditor (2023, April 5). Auditor Certifies Revenue In Support of General Obligation Bonds and Obligation Refunding Bonds. Retrieved from: https://dcauditor.org/report/auditor-certifies-revenue-in-support-of-general-obligation-bonds-and-obligation-refunding-bonds/
[4] District of Columbia. Bonds. Retrieved from: https://www.dcbonds.com/the-district-of-columbia-dc/bonds/i192
[5] District of Columbia. (2023, November 13). CFO's Statement on Moody's Ratings Outlook Change. Retrieved from: https://www.dcbonds.com/the-district-of-columbia-dc/about/news/i192?newsId=38011

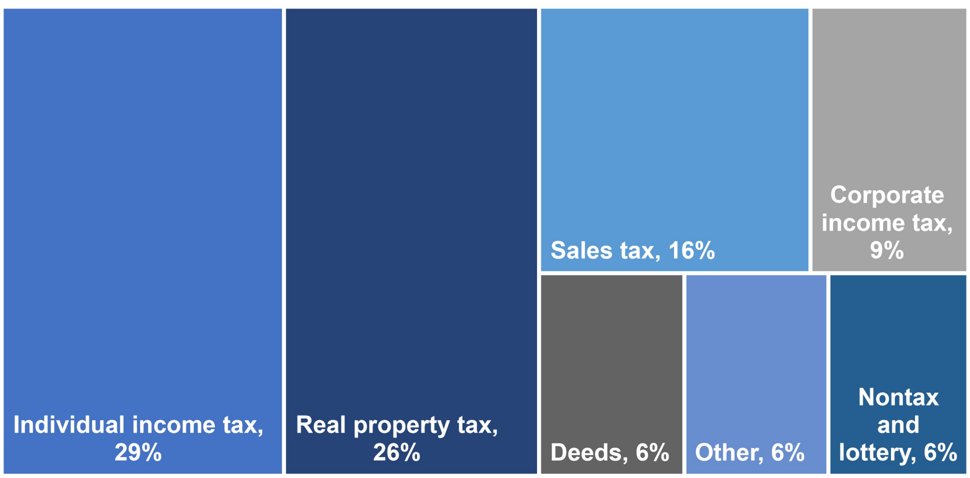
50% of the growth in revenue came from individual and business income taxes even though they represent only 39% of total revenue.

Table 2. District Gross Revenue Sources over time in order of average annual growth, FY 2019-2022 in nominal terms ($ in millions)

	2019	2020	2021	2022	% of pre pandemic	Avg. Annual Growth
Corporate income tax	643	728	863	991	154%	16%
Individual income tax	2,299	2,377	2,643	3,117	136%	11%
Deeds	561	453	554	690	123%	7%
Sales tax	1,598	1,222	1,203	1,702	107%	2%
Other	645	620	633	686	106%	2%
Real property tax	2,710	2,837	2,914	2,815	104%	1%
Nontax and lottery	664	561	537	665	100%	0%
Total	**9,120**	**8,798**	**9,346**	**10,666**	**117%**	**5%**

Source: DC Office of the Chief Financial Officer (OCFO) Quarterly Revenue Estimates; gross revenue before distributions to other funds.

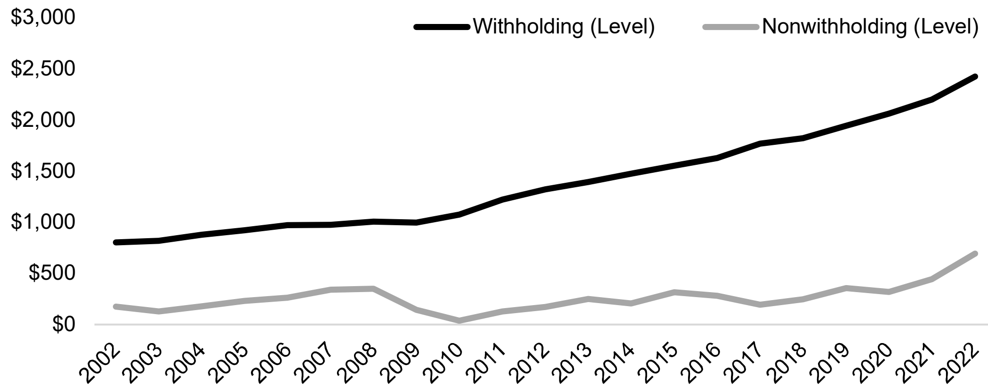
Figure 4. Composition of gross revenue in the District, FY 2022



Note: Totals do not sum due to rounding.
Source: DC OCFO FY 2024 Budget Executive Summary, Table 3-3; gross revenue before distributions to other funds.

Individual income tax. The individual income tax makes up the largest share of District revenue at 29%. Revenue is collected mostly from monthly withholding of income taxes on employee payrolls. From 2002 to 2022, 74% to 90% of fiscal year collections for the individual income tax were from withholding, as shown in Figure 5. The other components are quarterly estimated payments and final payments with returns offset by refunds. While the non-withheld payments typically make up less than 20% of individual income tax collections, these payments can exhibit annual growth rates up or down in the double digits. Much of the volatility comes from realized capital gains on asset sales including stocks and property.

Figure 5. Components of individual income tax, FY 2002-2022 ($ in millions)

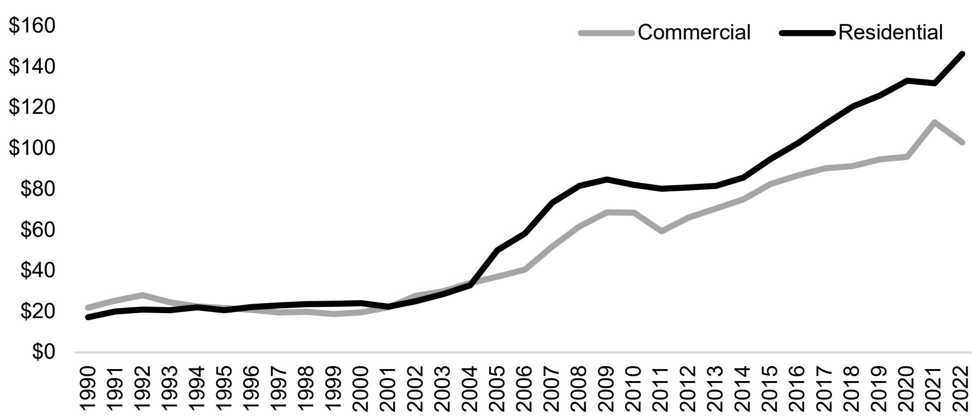


Source: Official statements for D.C. Income tax secured bond issues (Table 5 Collection of Pledged taxes). Available at D.C. Investor Relations - Documents.

Rates for the individual income tax are progressive, starting at 4% for the first $10,000 of taxable income and increasing to 10.75% (up from 8.95% in FY 2021) on taxable income over $1 million. Brackets are the same for all filing statuses.

Real property. Real property taxes, which account for 26% of revenue, are levied on the assessed value of real residential and commercial property in the District. Approximately 33% of real property is exempt from taxation because it is owned by the federal government, foreign government (embassies), District government, or nonprofits and religious entities. Of the taxable property, about 55% of the assessed value is residential (Class 1) and 45% is commercial (Class 2). The share of residential property tax revenue has increased over the last twenty years as population has increased, as shown in Figure 6. In FY 2022, commercial property value declined for the first time since the Great Recession and is not expected to recover in the financial plan forecast period due to the high vacancy rates of large office buildings that make up a significant share of real property valuation.[6]

Figure 6. Assessed value of real property in the District, FY 1990-2022 ($ in billions)



Source: DC OCFO Annual Comprehensive Financial Reports; estimated assessed value of taxable property.

[6] The Great Recession, occurring from late 2007 to mid-2009 corresponded with a negative impact on commercial assessed values from fiscal years 2010 through 2012, after which values increased through fiscal year 2021.

The tax rate for Class 1 property is $0.85 per $100 of assessed value and there is a homestead exemption for owner occupied exempting the first $84,000 (in 2023). There is a tiered rate structure for Class 2 properties: properties valued less than $5 million are taxed at $1.65 per $100 of assessed value; properties valued between $5 million and $10 million are taxed at $1.77 per $100; and properties valued above $10 million are taxed at $1.89 per $100.[7]

General sales and use tax. The general sales tax in the District, which comprises 16% of revenue, is comprised of four major components: off-street parking charges are taxed at 18%, hotel and short term rental receipts are taxed at 15.95%, restaurant and bar sales are taxed at 10% of receipts, and most retail sales are taxed at 6% of receipts.[8] Trends in sales tax revenue by type are summarized in Table 3. More than one-fourth of the sales tax is dedicated for other funds and agency purposes, including a transfer for the Washington Metropolitan Area Transit Authority (WMATA) capital investment of $178.5 million annually.

Table 3. Sales tax by type, FY 2019-2022 ($ in millions)

	2019	2020	2021	2022
Retail (6%)	692.3	685.8	743.8	894.9
Restaurants (10%)	446.8	271.7	255.5	420.6
Hotel (14.95%)	319.2	142.5	87.4	247.4
Parking (18%)	79.8	52.3	40.3	64.2
All Other	59.7	70.2	75.7	75.3
Gross Sales tax	**$1,597.8**	**$1,222.5**	**$1,202.7**	**$1,702.4**
Addendum:				
Dedicated revenue	-505.8	-380.9	-335.2	-460.8
Local fund sales tax	$1,092.0	$841.6	$867.5	$1,241.6

Source: DC OCFO District of Columbia Databook 2022; FY 2024 Budget Executive Summary, Table 3-6; estimated sales tax base, collections and transfers by sales tax type.

Parking tax revenue before FY 2020 exhibited low volatility as most of the revenue is from dedicated parking garages, often serving regular monthly office clients. Parking revenue is dedicated completely to the annual District contribution to support WMATA operations (separate from the capital transfer noted above). Revenue from parking was cut in half due to the pandemic and the subsequent office vacancy and is still 20% below FY 2019 levels.

Hotel tax revenue is directly tied to business and leisure travel. Of the 15.95% rate, 10.2pp goes to the local fund, 4.45pp goes to debt service for the convention center, and 1.3pp goes to Destination DC, which markets the District to visitors.[9] Like parking, the pandemic shutdown reduced hotel revenue significantly, declining 50% in FY 2020 and is still about 22% below FY 2019 levels.

[7] There are two additional tiers for vacant and blighted property at $5 and $10 per $100 assessed value respectively. Together, these tier accounted for only 2.1% of tax liability in 2022.
Government of the District of Columbia. (2022, August). District of Columbia Data Book: Revenue and Economy. Retrieved from: https://ora-cfo.dc.gov/sites/default/files/dc/sites/ora-cfo/publication/attachments/FY%202021%20Economic%20Report%20of%20the%20District%20of%20Columbia.pdf

[8] Other special rates are for alcohol sold for off-premise consumption and rental cars (10.25%), medical marijuana (6%) and sugar-sweetened beverages (8%).

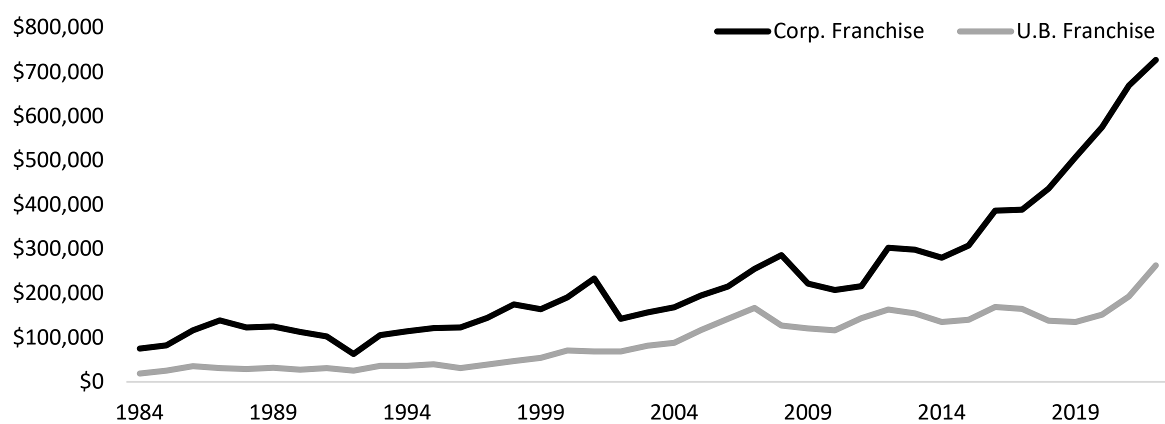
[9] PP reflects percentage points. For the period of time beginning on April 1, 2023 through March 31, 2027, the rate allocated to Destination DC is increased from 0.3% to 1.3%, raising the total rate from 14.95% to 15.95%. See D.C. Law 47; D.C. Official Code § 47–2002., § 47–2002.02., and § 47–2002.03a.

Bar and restaurant tax revenue is driven by tourism as well as local residents' ability to eat out or seek entertainment. One percentage point of the 10% rate goes to the convention center to support debt service and the remaining nine percentage points go to the local fund. These sales declined 39% in the pandemic and still trail FY 2019 levels by 6% in FY 2022.

Retail sales, including online purchases, historically have been correlated with District wages, including those of commuters who shop around offices. Since the pandemic and the widespread adoption of remote working, District resident wages are now a more reliable indicator of retail sales and tax revenue. Beginning in FY 2019, online remote retail sales were added to the sales tax base, significantly increasing revenue and protecting the retail sales tax base during the pandemic. A share of the tax collections attributable to retail sales goes to support the DC Commission on Arts and Humanities.

Business franchise (income) taxes. There are two types of business franchise taxes in the District. The first, the corporate franchise tax (CF) levies an 8.25% tax on net income and operates like the federal corporate income and other states' corporate income taxes. The rate was reduced from 9.975% in 2014 over 4 years. The second type of business franchise tax is the unincorporated business franchise tax (UB) which is structured very much like the CF but is for unincorporated businesses (partnerships and sole proprietorships) doing business in the District. The UB tax rate is equal to the CF tax rate. Figure 7 summarizes trends in business franchise taxes.

Figure 7. Business franchise taxes, FY 1984-2022 ($ in thousands)



Source: DC OCFO [Quarterly Revenue Estimates]; gross revenue before distributions to other funds.

Deed taxes. There are three types of deed taxes in the District. The deed transfer tax is a tax on sellers of property, payable when a property is sold. The deed recordation tax is a tax on buyers of commercial or residential property or on the refinancing of commercial property and is payable when the deed is recorded with the Recorder of Deeds, usually at the same time as the transfer tax.[10] There is also a tax on the transfer of economic interest which reflects the sale of shares in a property such as when a cooperative housing unit is sold – the unit is not sold but the equivalent share in the property representing a unit is sold. Another example is when an investor buys the shares of an LLC that owns a building rather than the building itself.

[10] Residential refinancing is not subject to the deed recordation tax.

Table 4. Deed tax rates (as of 10/1/2023)

Deed tax type	Residential rate	Commercial rate
Recordation	1.1% for residential less than $400,000 1.45% for residential greater than $400,000	1.45% for transactions and refinancing
Transfer	1.1% for residential less than $400,000 1.45% for residential greater than $400,000	1.45% for commercial transactions
Economic interest transfer	2.2% for properties valued less than $400,000 2.9% for properties valued more than $400,000	2.9% for properties

Source: DC OCFO DC Tax Facts 2023; major taxes and rates.

The distress in commercial office building occupancy has slowed sales significantly and greatly reduced the price on those buildings that do sell. This is particularly acute for older, less improved buildings (Class B and C) than for trophy and improved buildings (Class A). From October 1, 2020, to September 30, 2023, the rate on commercial properties with market values greater than $2 million were taxed at 2.5% for recordation and 2.5% for transfer for a total tax rate of 5%.

Nontax and lottery. There are four main categories of nontax revenue in addition to lottery proceeds: licenses and permits, fines and forfeitures, charges for services, and miscellaneous. In FY 2022, the largest category was “miscellaneous”, which includes interest income earned on fund balances and has benefited from higher interest rates over the last two years. The next largest category is fines which includes automated enforcement fines from traffic cameras. The pandemic reduced the number of commuters which impacted this revenue.

Table 5. Nontax revenue and lottery, FY 2019-2022 ($ in thousands)

	2019	2020	2021	2022	*2022 share*
Licenses	146,956	125,584	126,367	135,008	*20%*
Fines	195,392	147,943	137,544	161,321	*24%*
Charges	77,487	68,723	80,588	78,407	*12%*
Miscellaneous	199,407	180,645	143,999	249,429	*38%*
Lottery	45,050	38,060	48,150	40,670	*6%*
Total	**664,292**	**560,955**	**536,648**	**664,835**	**100%**

Source: DC OCFO. Quarterly Revenue Estimates; gross revenue before distributions to other funds.

II. Revenue Forecast Methodology

The methodological approach is to construct detailed models that reflect unique aspects of each major revenue stream. Revenue forecasts run from FY 2023 through FY 2027. Additional attention is paid to the major revenues with the greatest volatility.

Data required for the analysis – economic and demographic variables

To forecast revenues, District-specific economic and demographic variables were used where available and appropriate from a variety of public data sources. Principal data sources include the U.S. Bureau of Economic Analysis (BEA) which publishes detailed data by state and for the District for gross domestic product, investment, and income and wages; CoStar, which publishes detailed data on office vacancy rates and net deliveries; and Oxford Economics which incorporates a mix of public and private sources within its historical and forecast data. Other sources include the U.S. Bureau of Labor Statistics (BLS), which publishes data on employment, consumer prices, consumer expenditures, and business dynamics and the U.S. Census Bureau publishes population, construction, and retail sales indicators and the Congressional Budget Office (CBO) has historic data and forecasts for U.S. capital gains realizations.

Many of the economic and demographic indicators are forecast in logarithmic terms, a commonly used metric to normalize data that has grown exponentially over time as a means to make highly skewed indicators linear for use in ordinary least squares (OLS) and ARIMA regressions.

Data required for the analysis – revenue variables

Data on District revenues is sourced from a combination of publicly available sources on the ORA website as well as historical detail from ORA staff.[11] Key data aggregations are gross revenue, local revenue, and dedicated revenue. Gross revenue is the sum of local and dedicated revenue. Local revenue is what is available for annual general appropriations. Dedicated revenue is earmarked for specific purposes and can be divided into Agency dedications (part of the District General Fund) and Enterprise dedications (outside of the District General Fund).

Local fund revenue is used to determine the debt ratio. The models here focus on gross revenue to align with the economic variables. To derive local fund revenue, the OCFO estimates of dedicated revenue, many of which are specific formulas and not driven by economic behavior, are subtracted from gross revenue.[12]

Models and analysis

Real property tax

The real property tax forecast is comprised of forecasts for residential real property tax and commercial real property tax, both of which are derived from models for residential assessed value and commercial assessed value. The effective tax rates for residential and commercial properties are applied to predicted assessed value to obtain the final total real property forecast.

Real property is assessed as of January 1 of each year and mailed to owners in February. Following the assessment, property owners have until April 1 to appeal their assessments. In February of the following year, bills based on the final assessments (after appeals) are mailed to taxpayers and payments are due on March 30th and September 15th. Because of this schedule, the OCFO has reliable data on real property for the one year out estimate. In other words, in the February 2023 revenue estimate, the OCFO knows how much was billed to owners and payable in FY 2023 and the preliminary assessment, before appeals and improvements, of the bills that will be payable in FY 2024. As a result, the model for real property uses the OCFO forecast for the current and subsequent fiscal years and projects the next three years. For the years after the first two, separate models are used to forecast residential assessed value and commercial assessed value, after which effective tax rates are applied to obtain the property tax forecast.[13]

[11] The contribution from ORA staff is greatly appreciated.
[12] Table 2 of December 2023 OCFO Revenue Estimate enumerates dedicated revenue. Government of the District of Columbia, Office of the Chief Financial Officer. (2023, December 29). December 2023 Revenue Estimates. Retrieved from: https://ora-cfo.dc.gov/node/305482
[13] The Office of Revenue Analysis for the Office of the Chief Financial Officer of the District of Columbia publishes effective tax rates in their DC Data Book. Table 4-4 of the DC Data Book: Revenue and Economy (August 2022) lists an effective tax rate of 0.74% for Class 1 residential property and 1.72% for class 2 commercial property. Retrieved from: https://ora-cfo.dc.gov/node/215922

Residential real property

The residential real property model forecasts residential assessed value, and subsequently applies an effective tax rate of 0.74% to translate this value into a residential real property tax forecast, taking into account the homestead exemption on owner-occupied properties. The residential assessed value dependent variable is estimated in logs given the exponential growth of real property values over time. After running tests for stationarity and serial correlation, the forecast ultimately uses an ARIMA model specification of (1,1,2). For the three operators in parentheses: the first represents an auto-regressive parameter which identifies the number of time lags of the variable, the second represents the degree of difference between the current period and prior period values; and the third represents a moving average component indicating whether the error term from the prior time period should be included.

The model shown in Table 6 includes the US Case Shiller Housing Price Index as an independent variable, which comes from Oxford Economics forecasts incorporating information from S&P Fiserv, MacroMarkets LLC and Haver Analytics. Similar to residential assessed value, the independent variable is modeled as a log transformation due to continuous growth of the index over time and a first difference because the data is nonstationary. The model also includes a two-year lag due to the timing of when assessments occur and when property tax bills are distributed.

Table 6. Model specification for residential assessed value

	First differenced log of residential assessed value
Differenced (1) 2-yr lag for log of US Case Shiller Housing Price Index	0.996*** (0.260)
Auto Regressive term (L1)	-0.554** (0.240)
Moving Average term (L1)	3.256*** (0.827)
Moving Average term (L2)	1.000*** (0.002)
Constant	0.038*** (0.014)
N	23
Wald chi2(4)	2.26×10^{7}***

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Sources: OCFO (revenue history), Oxford Economics (S&P, Fiserv, MacroMarksLLC, Haver Analytics)

Commercial real property

The commercial real property model shown in Table 7 forecasts commercial assessed value and subsequently applies an effective tax rate of 1.72% to translate this value into a commercial real property tax forecast, taking into account the tiered rate structure. Similar to residential assessed value, a log transformation is applied to the dependent variable. An ARIMA model specification with a first difference (0,1,0) is used to make the dependent variable stationary. The two-year lags of District office vacancy rates, District office net deliveries, and US nonresidential fixed investments are also included in the estimation. These lags are again applied due to the timing of property tax valuations. A log transformation is also applied to the US nonresidential fixed investments variable given its growth over time. Office vacancy rates and net deliveries are sourced from CoStar, while US nonresidential fixed investments are available through the CBO.

Table 7. Model specification for commercial assessed value

	First differenced log of commercial assessed value
Differenced (3) of 2-yr lag of the DC office vacancy rate	-1.702*** (0.468)
Differenced (2) of 2-yr lag of DC office net deliveries	1.80×10^{-7}*** 4.25×10^{-8}
Differenced (2) of 2-yr lag for the log of US nonresidential fixed investments	0.956** (0.301)
Constant	-0.030 (0.023)
N	23
Wald chi2(3)	47.57***

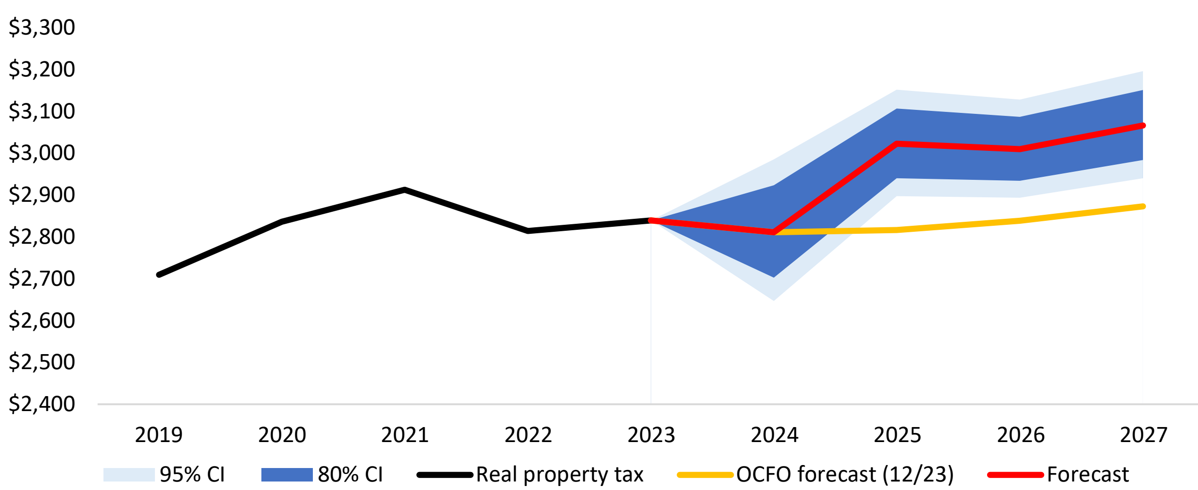
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Sources: OCFO (revenue history), US CBO, CoStar

Total real property

After estimating the regressions, the results are translated into real residential property tax revenue using the 0.74% effective tax rate and real commercial property using the 1.72% effective tax rate. The growth in forecasted total property tax revenue (residential plus commercial) is applied to the OCFO FY 2024 property tax revenue to project revenues as shown in Figure 8. Overall, the results suggest that forecasted real property tax revenues will grow from $2.8 billion in FY 2024 to $3.1 billion in FY 2027.

Figure 8. Real property tax forecast, FY 2019-2027 ($ in millions)



Sources: OCFO December 2023 Revenue Estimate, ODCA

Individual income tax

The individual income tax is forecast as a function of the logs of US capital gains and District wage and salary income over the period from FY 1990 to FY 2023. Data for US capital gains is sourced from the Congressional Budget Office. The series for District wage and salary income is constructed from a combination of BEA historic District wage and salary income through 2023, OCFO's wage and salary forecast from FY 2023-2027 and US long-term wage growth from CBO thereafter. Both capital gains and wages and salaries are positively correlated with income taxes and fluctuations in both generate changes in income tax collections. Table 8 presents the model specifications for the income tax calculation.

Table 8. Model specification for individual income tax

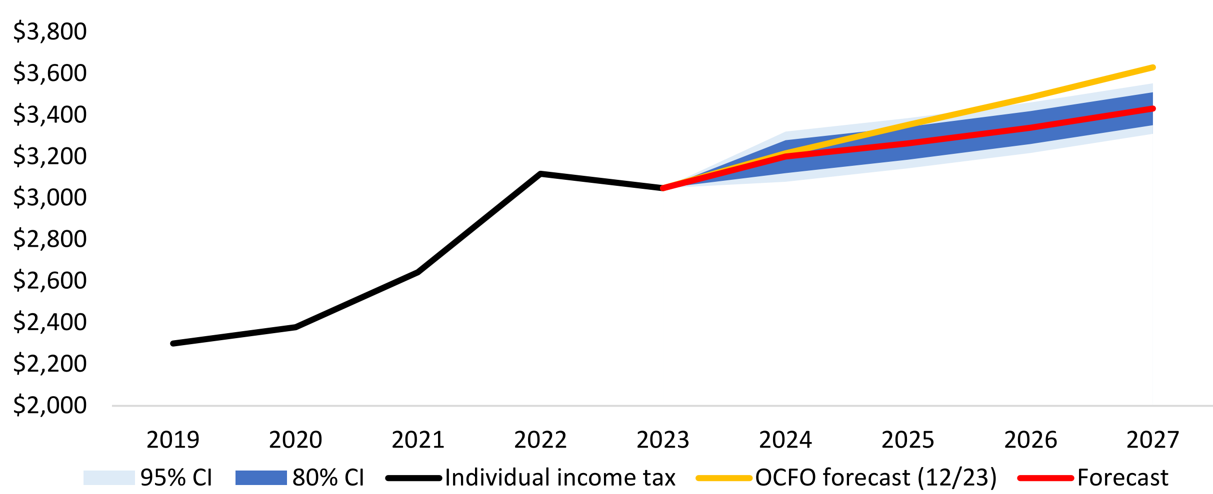
	Log individual income tax
Log US capital gains	0.296***
	(0.042)
Log DC wages and salaries	0.751***
	(0.065)
Constant	-4.867***
	(0.452)
N	28
R^2	0.968

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Sources: OCFO (revenue history), US CBO, US BEA

After estimating the regression, the model's growth rates are applied to the FY 2023 preliminary level to project revenues, as shown in Figure 9.[14] In addition, an off-model adjustment was implemented to account for additional revenue collections in the out-years due to the implementation of the Income Tax Fairness Act.[15] Overall, the results suggest that individual income tax revenue will grow from $3.0 billion in FY 2023 to $3.4 billion in FY 2027.

Figure 9. Individual income tax forecast, FY 2019-2027 ($ in millions)



Sources: OCFO December 2023 Revenue Estimate, ODCA

[14] The OCFO December 2023 forecast included preliminary FY 2023 values but actual will not be known until the February 28, 2024 forecast.

[15] Section 7222 of the Fiscal Year 2022 Budget Support Act of 2021, effective Nov. 13, 2021 (D.C. Law 24-45; D.C. Official Code § 47-1806.03(a)(11))

Business income tax (corporate and unincorporated franchise taxes)

The corporate and non-corporate franchise taxes are estimated together. The model is estimated as a function of the logs of District GDP growth and S&P 500 growth, each lagged by one year. A lag is used because it is assumed that general macroeconomic trends take time to be reflected in business income tax payments. The District's nominal GDP is forecasted using an ARIMA(0,0,3) model. The log of the forecast is then used as an additional exogenous variable. Forecast data on the S&P500 is sourced from Oxford Economics. Table 9 below presents the specifications for the business tax model.

Table 9. Model specification for business income tax

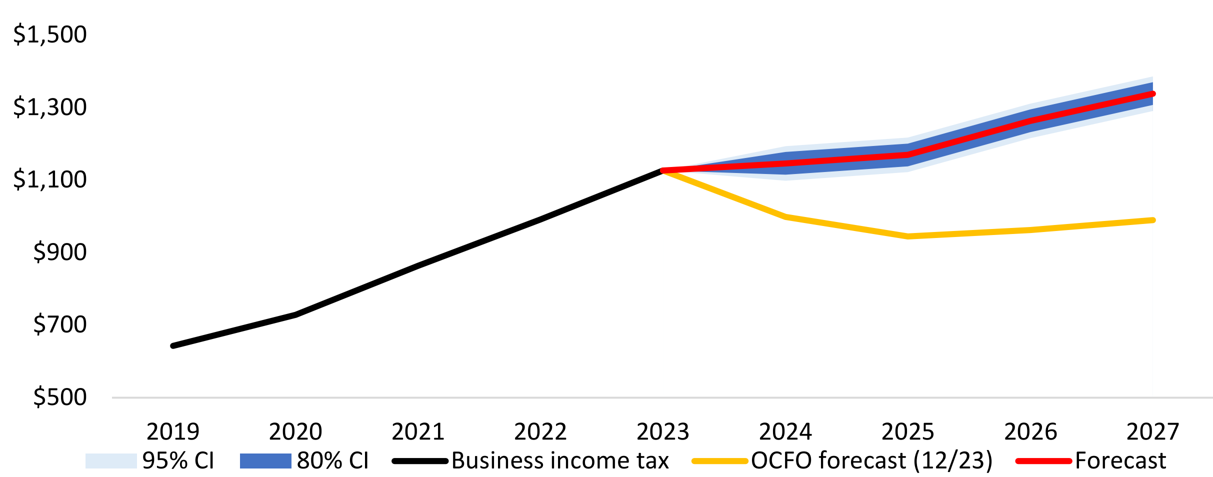
	Log business income tax
Log DC nominal GDP, 1 year lag	0.988*** (0.174)
Log S&P 500 index, 1 year lag	0.337*** (0.100)
Constant	-7.833*** (1.332)
N	32
R^2	0.958

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Sources: OCFO (revenue history), US CBO, Oxford Economics

After estimating the regression, the growth rates calculated from the forecasted business income tax revenues are applied to the FY 2023 preliminary level to project revenues, as shown in Figure 10. Overall, the results suggest that forecasted business income tax revenues will grow from $1.1 billion in FY 2023 to $1.3 billion in FY 2027. Based on the model output, business tax growth is expected to slow in FY 2024 and FY 2025 and then rebound in FY 2026. Given the volatility of business tax revenue and the changes in the District economy, this optimism should be viewed with caution.

Figure 10. Business income tax forecast, FY 2019-2027 ($ in millions)



Sources: OCFO December 2023 Revenue Estimate, ODCA

General sales tax

The general sales tax is estimated as a function of the logs of the food and accommodation industry's contribution to GDP and District wage and salary income. Data on food and accommodation contribution to GDP is sourced from Oxford Economics. This indicator is used in order to pick up the effects on revenue from commuters and tourists whose contributions are separate from the wage and salary income of residents. Table 10 presents the model specifications from the general sales tax calculation.

Table 10. Model specification for the general sales tax

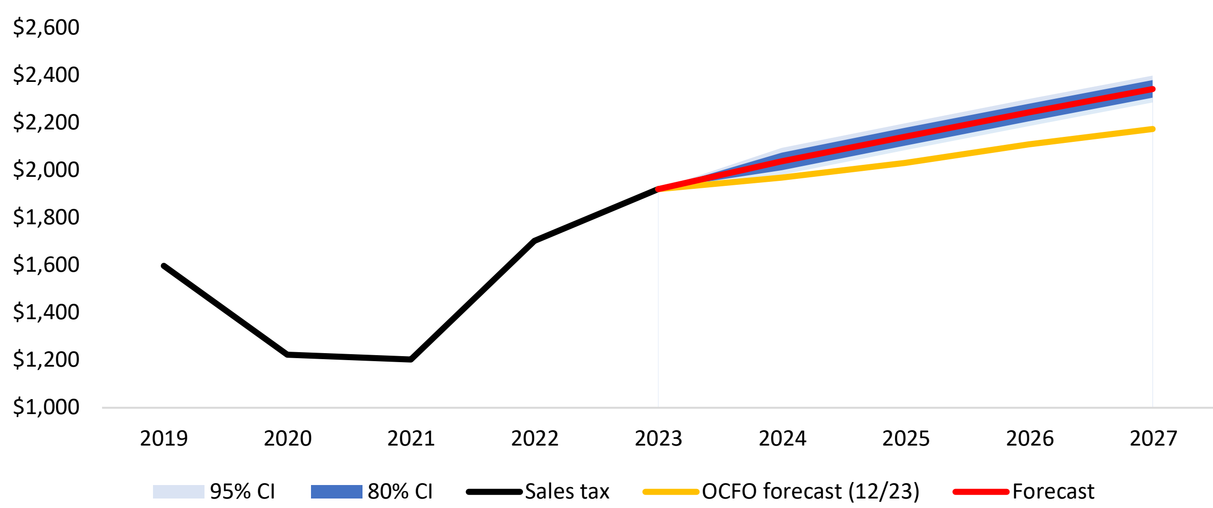
	Log general sales tax
Log DC food and accommodation GDP	0.450*** (0.075)
Log DC wages and salaries	0.874*** (0.041)
Constant	-9.39*** (0.906)
N	26
R^2	0.98

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Sources: OCFO (revenue history), Oxford Economics

After estimating the regression, growth rates calculated from the forecasted sales tax revenues are applied to the FY 2023 preliminary level to project revenues. The results shown in Figure 11 suggest that forecasted general sales tax revenues will grow from $1.9 billion in FY 2023 to $2.3 billion in FY 2027.

Figure 11. Sales tax forecast, FY 2019-2027 ($ in millions)



Sources: OCFO December 2023 Revenue Estimate, ODCA

Deed recordation and transfer (including economic interest)

Deed recordation and transfer taxes are forecast in aggregate and using the log-difference given their relatively consistent growth over time. An ARIMA model specification with a first difference (0,1,0) is used to make the dependent variable stationary. In addition, log transformations for US single family existing home sales and District wages and salaries were included as independent variables. The series for US single family home sales is sourced from Oxford Economics national forecasts including historical data from the National Association of Realtors and forecasts from Haver Analytics. Changes in US single family home sales as an indicator of overall market conditions are useful for forecasting residential deed taxes, while wages and salaries are a general economic condition indicator that drive both residential and commercial transactions. Changes in wages and salaries may reflect broader changes in the economy that imply larger purchasing power for potential residential and commercial owners. As mentioned, the series for District wage and salary income is constructed from a combination of BEA historic District wage and salary income through 2023, OCFO's wage and salary forecast from FY 2023-2027 and US long-term wage growth from CBO thereafter.

Both changes in US single family existing home sales and District wages and salaries are positively correlated with changes for deed and transfer tax collections. A binary variable or dummy was also included for FY 2022 due to a sharp increase caused by a few high-valued property transactions.[16] Table 11 presents the model specifications for the deed recordation and transfer tax calculations.

Table 11. Model specification for deed taxes

	First differenced log of deed taxes
Differenced (1) log of US single family existing home sales	0.862* (0.410)
Differenced (2) log DC wages and salaries	5.441* (2.477)
Binary dummy for commercial activity in 2022	0.141 (.076)
Constant	0.076 (0.036)
N	30
Wald chi2(3)	18.49***

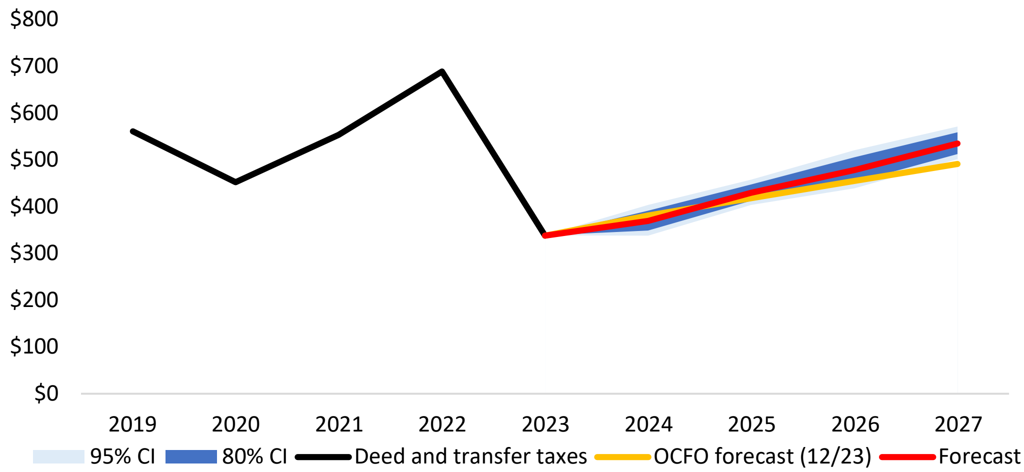
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Sources: OCFO (revenue history), Oxford Economics (National Association of Realtors, Haver Analytics)

After estimating the regression, the growth rates calculated from the forecasted deed recordation and transfer tax revenues are applied to the FY 2023 preliminary level to project revenues, as shown in Figure 12. Overall, the results suggest that deed and transfer taxes will grow from $339 million in FY 2023 to $536 million in FY 2027.

[16] According OCFO's September 2023 Revenue Estimates, FY 2022 revenue was driven by a sharp increase in high-valued property transactions, which have been largely absent in FY 2023. Retrieved from: https://cfo.dc.gov/sites/default/files/dc/sites/ocfo/release_content/attachments/Sep_2023_Estimate_letter_09292023_FINAL.pdf

Figure 12. Deed recordation and transfer tax forecast, FY 2019-2027 ($ in millions)



Sources: OCFO December 2023 Revenue Estimate, ODCA

Nontax and lottery proceeds

Nontax and lottery proceeds include forecasts for licenses and fees, fines, charges, and lottery revenue, as well as the prior five-year moving average for miscellaneous revenue. Several variables are used to forecast these revenue sources. District population and employment data are from Oxford Economics, which uses data from the Census Bureau and the US Bureau of Labor Statistics, respectively. The US gross domestic price index comes from July 2023 CBO estimates through FY 2025, and February 2023 CBO estimates for fiscal years 2026 and onwards (adjusted for the ratio of July to February values). The District wages and salaries variable include the same data used for regressions in income and deed taxes and represents a mixture of historical BEA data and OCFO forecasts as shown in Table 12.

Table 12. Model specifications for Nontax and lottery proceeds

	Licenses and fees
DC population	0.0002** (0.0001)
US gross domestic price index	0.0002*** (0.0000)
Constant	-98.625* (38.667)
N	32
R^2	0.90

	Fines
DC employment	0.0008*** (0.0001)
Constant	-488.195*** (42.490)
N	32
R^2	0.84

	Charges
DC population	0.0004*** (0.0001)
Constant	-149.333*** (27.854)
N	32
R^2	0.68

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

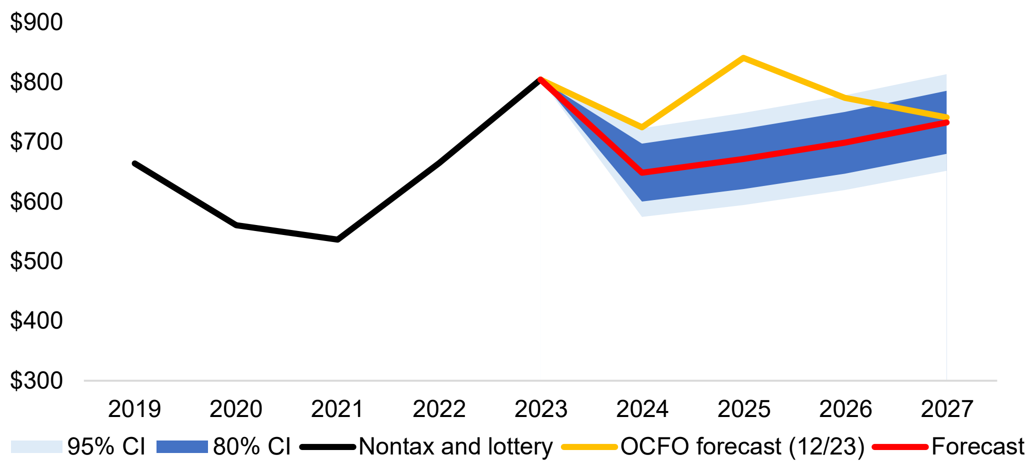
	Lottery
Log DC wages and salaries	-41.960*** (7.042)
Constant	521.332*** (77.937)
N	21
R^2	0.75

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Sources: OCFO (revenue history), US CBO, US BEA, US Census Bureau, Oxford Economics

After estimating the regressions, the growth rates calculated from the nontax and lottery forecasts are applied to the FY 2023 preliminary level to project revenues, as shown in Figure 13. Overall, the results suggest that nontax and lottery proceeds will decrease from $805 million in FY 2023 to $733 million in FY 2027.

Figure 13. Nontax and lottery proceeds forecast, FY 2019-2027 ($ in millions)



Sources: OCFO December 2023 Revenue Estimate, ODCA

All other taxes

As noted, the Certification Forecast focuses on major revenue sources and uses specific modeling based on directly related variables. All of the other tax revenue, consisting of 6.4% of gross tax revenue in FY 2022, include the following: personal property, public space rental, excise taxes, insurance premium tax, toll telecommunications, public utility, baseball fee, health related taxes, private sports gaming, games of skill, and estate taxes. Most of these smaller revenue streams were modeled using the 3- or 5-year average, as shown in Table 13. For many, this is due to the relatively low volatility and for others like the estate tax, the unpredictability unrelated to economic conditions.

Table 13. Summary of other tax forecasts

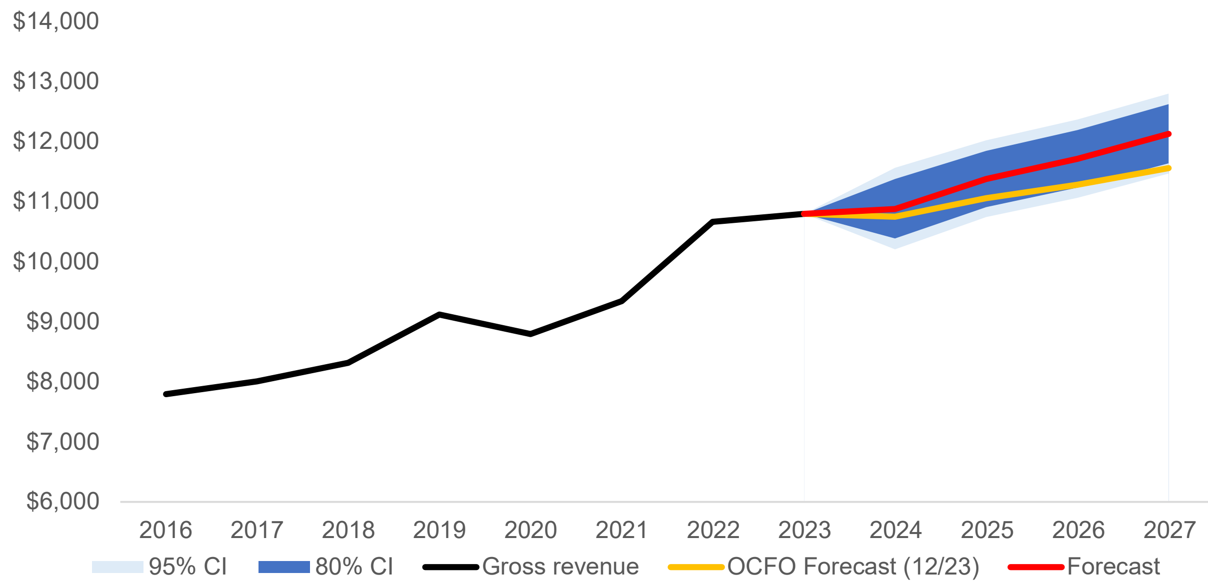
Aggregate	Components	Method
Other property	Public space rental, personal property	3-year moving average
Excise	Alcohol, cigarette, motor vehicle, motor fuel	3-year moving average
Gross receipts	Public utilities, toll telecommunication, insurance premium, ballpark fee, private sports wagering, games of skill, health related	3-year moving average
Estate tax	Estate tax	5-year moving average

Sources: OCFO (revenue history)

III. Revenues

Gross revenue. For FY 2024, the Certification Forecast estimates $10.9 billion in gross revenue (revenue prior to netting out dedicated revenues). Much of this growth is due to growth in individual income and corporate income taxes, property taxes, and sales taxes. Figure 14 below depicts the total gross revenue forecast, which estimates a decline in FY 2024 but higher revenue growth in the out-years relative to OCFO.

Figure 14. Gross revenue forecast, FY 2016-2027 ($ millions)



Sources: OCFO December 2023 Revenue Estimate, ODCA

By FY 2027, the Certification Forecast projects over $500 million more revenue than OCFO. Table 14 provides additional detail on the composition of gross revenue.

Table 14. Revenue forecast comparison, FY 2022-2027, ($ in millions)

Certification Forecast - February 2024									
	Real Property	General Sales	Individual Income	Business Income	Deeds	Nontax	All Other	Gross	Annual change
2022	2,815	1,702	3,117	991	690	665	686	10,666	
2023	2,840	1,922	3,048	1,126	339	805	720	10,800	1.3%
2024	2,812	2,038	3,200	1,146	370	649	668	10,882	0.8%
2025	3,024	2,142	3,264	1,169	430	672	681	11,382	4.6%
2026	3,011	2,244	3,339	1,263	478	699	680	11,715	2.9%
2027	3,068	2,344	3,432	1,339	536	733	684	12,136	3.6%
OCFO - December 2023									
	Real Property	General Sales	Individual Income	Business Income	Deeds	Nontax	All Other	Gross	Annual change
2022	2,815	1,702	3,117	991	690	665	686	10,666	
2023	2,840	1,922	3,048	1,126	339	805	720	10,800	1.3%
2024	2,812	1,969	3,215	998	381	725	654	10,754	-0.4%
2025	2,817	2,031	3,352	944	418	842	656	11,061	2.9%
2026	2,840	2,109	3,485	962	455	774	659	11,285	2.0%
2027	2,874	2,175	3,631	990	492	742	662	11,566	2.5%

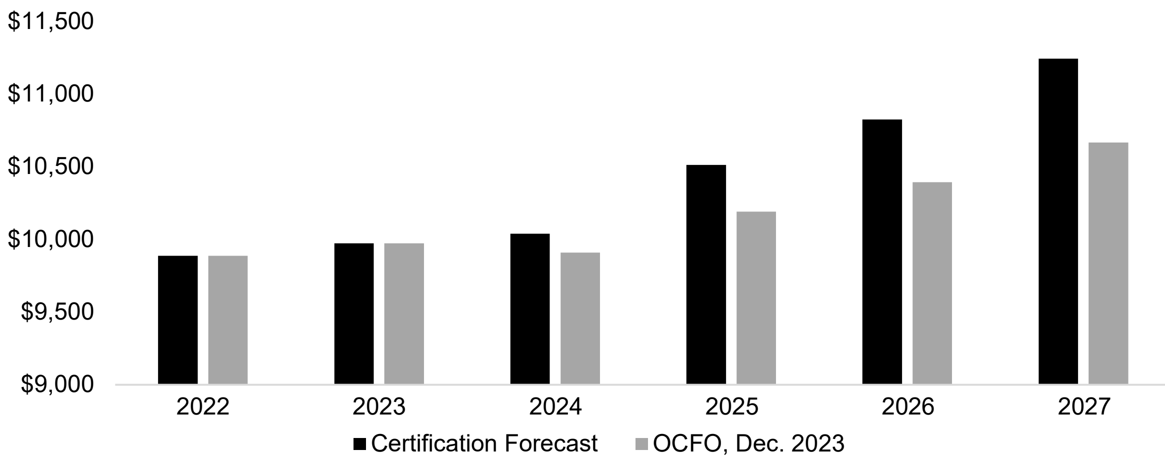
Source: OCFO December 2023 Revenue Estimate; Gross totals from sum of columns – ORA December Estimate gross totals include FY 2024 Budget Support Act provisions which increased the totals reported in Table 1.

Dedicated revenue. For the dedicated revenue to other agencies or funds, the Certification Forecast uses the most recent OCFO forecast of dedicated revenues. The bulk of the dedicated revenue is sales tax, where over $500 million, or about one-fourth, is dedicated, including $100 million (in FY 2022) of hotel and restaurant tax revenue was dedicated to the convention center and $178.5 million annually is dedicated to support WMATA capital investments.

Local revenue. Local revenue is calculated as gross revenue less dedicated revenue and is used for the 17% test.

Figure 15 shows that the Certification Forecast estimates that local revenue will grow from $10.0 billion in FY 2022 to $11.2 billion in FY 2027. Local revenues are consistent between the Certification Forecast and OCFO for the first several years of the forecast window but begin to diverge in FY 2025.

Figure 15. Local fund revenue, FY 2022-2027 ($ in millions)



Sources: OCFO December 2023 Revenue Estimate, ODCA

V. Certification

District law states that ODCA is required to certify compliance with the 17% test before new general obligation bonds can be issued. OCFO's December 2023 estimate of $9.91 billion in FY 2024 local fund revenue is within the confidence interval of the Certification Forecast, adjusting for revenues dedicated to other funds.

In addition, the proposed GO debt service of $530.48 million would be 5.3% of the forecasted FY 2024 general fund revenue. Including ITS debt as well, the proposed debt service of $924.9 million would be 9.2% of the forecasted FY 2024 general fund revenue, meeting the 17% requirement test.[17] For comparison, debt service would be 9.3% of OCFO's forecasted revenue. Table 15 details the calculation for the 17% requirement test.

[17] Office of the District of Columbia Auditor (2023, April 5). Auditor Certifies Revenue In Support of General Obligation Bonds and Obligation Refunding Bonds. Retrieved from: https://dcauditor.org/report/auditor-certifies-revenue-in-support-of-general-obligation-bonds-and-obligation-refunding-bonds/

Table 15. Calculation of debt certification, FY 2024 ($ in millions)

	Debt service on GO indebtedness only	Debt service on GO and ITS indebtedness combined
Debt service	$530	$925
Local revenue	$10,039	$10,039
Share of local revenue	**5.3%**	**9.2%**

Source: Certification Forecast revenue analysis. Debt service obligation data provided by ODCA in December 2023.

Another test is to estimate the maximum annual debt service (MADS) as a share of revenue. MADS occurs in FY 2025 when debt service is $546.6 million for GO bonds and $553.7 for ITS bonds, a total of $1.1 billion. This represents 11.0% of forecasted FY 2024 revenue and 10.5% of forecasted FY 2025 revenue. To reach 17% of local revenue, annual debt service would need to exceed $1.71 billion.

IV. Conclusions

The Certification Forecast estimates $10.9 billion in gross revenue (revenue prior to dedicated revenues being netted out) in FY 2024 and $10.0 billion in local revenue. The results of the analysis suggest that OCFO's December 2023 estimate of $9.9 billion in FY 2024 local fund revenue is within the confidence interval of the Certification Forecast. The proposed debt service of $924.9 million, composed of $530.5 million of GO debt service and $394.4 million of ITS debt service, would be 9.2% of the forecasted FY 2024 local fund revenue, meeting the 17% requirement test. The Maximum Annual Debt service (MADS) is in FY 2025 when debt service is $1.1 billion, or 10.5% of FY 2025 revenue.

In future certification cycles, it will be possible to develop revenue scenarios that reflect differing assumptions about the economy. For example, a recession scenario could be estimated where incomes and business profits decline. The ways in which risks associated with increases in commercial property vacancies impact property tax revenues could also be estimated. As noted above, the Certification Forecast uses models for the major revenues with economic variables specific to the revenue. As a result, impacts in specific variables like wages or types of assessed value can be isolated and explored for risk analysis. For example, if assuming commercial assessed value growth will be 0%, the property tax forecast for FY 2027 would decline from $3.07 billion to $3.01 billion, resulting in a total local forecast decline from $11.24 to $11.18 billion.

Appendix

Table A1. Certification Forecast sources for explanatory variables

Explanatory variable	Source	Last update
DC GDP ($M)	US CBO	July 2023
DC food and accommodation GDP ($M)	Oxford Economics (US BEA)	September 2023
DC wage and salary income ($M)	US BEA, DC OCFO, US CBO	September 2023
DC office vacancy (rate)	CoStar	October 2023
DC office net deliveries (level)	CoStar	October 2023
Capital gains ($M)	US CBO	July 2023
S&P 500 (index)	Oxford Economics (S&P), S&P Dow Jones Indices LLC	September 2023
US Case Shiller housing price (index)	Oxford Economics (S&P, Fiserv, MacroMarks LLC, Haver Analytics)	September 2023
US single family home sales ($M)	Oxford Economics (National Association of Realtors, Haver Analytics)	September 2023
US gross private domestic investment ($M)	US CBO	July 2023
US nonresidential fixed investment ($M)	US CBO	July 2023
DC population (level)	Oxford Economics (US Census Bureau)	September 2023
DC employment (level)	Oxford Economics (BLS)	September 2023

Note: Acronyms are as follows: Office of the Chief Financial Officer (OCFO) US Bureau of Economic Analysis (BEA), US Congressional Budget Office (CBO), US Bureau of Labor Statistics (BLS).

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