

Tax Burden Shifting: What Happened in Washington, D.C., During the 2007-2009 Recession?

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Abstract

This study examined the effects of the 2007-2009 recession on the distribution of tax burdens within the District of Columbia by constructing a novel dataset via a fuzzy match between two administrative datasets. The findings revealed that homeowners with federal income less than zero experienced a lower tax burden, suggesting that the recession and its negative impact on income from capital gains contributed to a change in the tax burden. The findings also showed that in some cases, filers who reside in properties with high assessed values and who earn high wages accompanied by high capital losses experienced a lower tax liability and tax burden than filers with low wage income and zero or little income from capital gains. Overall, the tax burden shifted from filers with high wages and income from multiple sources to filers with low wages and zero income from other sources. The shift in the burden was primarily driven by a change in the individual income tax share of the total tax burden faced by filers, primarily those with low wages who faced a bigger burden.

Keywords

tax burdens, tax shifting, tax burdens for homeowners, tax incidence

Introduction

Policy makers and researchers alike have long been interested in how changes in the tax system affect the overall economy and the distribution of tax burdens across income classes. Given that there is a theoretical presumption that tax changes should

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increase the size of an economy, tax changes are frequently explored as a fiscal measure to spur increased activity and stimulate growth. It is during the debates on tax changes that it is often brought to bear the issue of who will bear the burden of such proposed tax changes. At the state and local levels, there is a wide diversity in tax systems. While the 50 states and the District of Columbia employ a broad range of taxes, the combination of taxes in the various jurisdictions are dependent on many factors including, but not limited to, revenue needs and constitutional and legal limitations of taxation powers.

Starting in 2000, the District embarked on a comprehensive revitalization program for the city which, in part, was aimed at increasing homeownership (Conrad & Alleyne, 2011). Conrad and Alleyne (2011) found that median household income is a statistically significant determinant of the likelihood of homeownership. Consequently, changes in real household income through income tax changes and property tax changes would have an impact on homeownership in the District. Furthermore, any changes in income or property taxes in the District can have far reaching implications for various income groups if the burden of that tax is shifted, the ability to afford a home being one of them. This can exacerbate inequality depending on how the tax burden shifts. Therefore, it is important to understand how such changes can affect various income groups in the District which would provide some invaluable insight on tax changes and shifting burdens.

In this article, we focus on how tax changes affect various income classes in Washington, D.C. (the District). More specifically, our focus is on individual income tax and property tax for homeowners as these taxes are the largest sources of revenue in the District, accounting for approximately 58% of total tax revenue. Using 2007 as a baseline, this study examined the effect of the economic recession and resultant tax changes in the District of Columbia during the period 2007-2009 on the distribution of the tax burden of homeowners by creating a novel dataset that was constructed using a fuzzy match methodology. Unlike previous studies which used macro-level data to analyze tax burdens in the District, this research utilizes micro-level data to evaluate homeowners as a group. The fuzzy match data study approach has its advantages over other studies in the District such as the DC Tax Burden Study (2016) in that it utilizes micro-level data that is generally not available in other jurisdictions; this allows for a more thorough analysis of the income and property taxes paid by resident homeowners as a subset of all taxpayers (Bowser & DeWitt, 2016).

Literature Review

Tax burdens and their measures are used as indicators of how well tax policies meet the goals of equity in raising revenue to finance government expenditure (Atrostic & Nunns, 1990). Tax burdens also provide answers to broader economic and socioeconomic questions about the effect of tax policies on the distribution and potential redistribution of income and wealth in the United States. Over the years, a variety of tax burden measures have been proposed and used to capture the advances in economic and measurement theories, policy concerns, newly emerging data sources, and social

forces. The constantly evolving measurement theory continues to provide the impetus for advancing new tax burden measurements and is also fertile grounds for analytical research on the distributional effects of taxes.

The study of who bears the economic burden of taxes is the tax incidence (Fullerton & Metcalf, 2002). Broadly speaking, tax incidence is the positive analysis of the impact of taxes on the distribution of welfare within a society (Kotlikoff & Summers, 1987). This is based on the tenet that the person who has the legal obligation to make a tax payment may not be the person whose welfare is reduced by the very existence of a tax. Tax incidence is also divided into statutory incidence and economic incidence which means that the discussion must evolve into statutory burdens and economic burdens.

Bearing in mind that tax incidence and tax burdens are used rather loosely by economists, sometimes even used interchangeably, this study adopts the definitions advanced by Entin (2004). The initial incidence concerns how demand and supply conditions in the marketplace allocate a tax among suppliers and consumers, while the burden measures changes in after-tax incomes after all economic adjustments to the tax have occurred across all affected markets and consumers shift to new patterns.

Taxation or proposed tax changes often focus on the questions of who would gain and who would lose, albeit the negative liberties or the public costs. The effects of tax shifting and determining the ultimate bearer of the economic burden are longstanding topics for debate in the economic and public finance disciplines and are topics for theoretical discourse based on empirical evidence (Adams, 1898; Slemrod & Bakija, 1996; Steenekamp, 2012). Seligman (1927) stressed that the shifting of a tax is the process and tax incidence is the result, in which the changes in the distribution of wealth are the final effect (Nerudová & Dobranschi, 2016). In short, taxation occupies the important position of distribution and, by extension, distributive justice which is of equal and potentially greater importance. Consequently, any discussion on taxes must address the issue of the distribution of the burdens (Farrelly, 2004). According to the Institute for Research on the Economics of Taxation (IRET) Policy Bulletin Number 88, the true measure of the burden of any tax is the change in the economic situations of individuals as a result of the tax after all economic adjustments have been taken into account. While there is extensive literature on tax burdens and equity, very little research focuses on the redistribution effect of a recession and resultant state and local tax changes on tax burdens for subsets of all taxpayers which in this case are the homeowners.

According to a recent study by Julia-Wise, Cooke, and Holland (2002), the study of tax incidence attempts to determine who in the economy bears the burden of taxation by analyzing the processes by which it removes resources from the market or by comparing how the burden is borne using one tax as opposed to another. Because taxes affect relative prices in the economy—setting up forces that change other prices and resource allocation—the burden of a given tax may be shifted from the party that pays the tax to others, via these prices changes. The analysis of tax incidence that attempts to take into consideration the effects of a tax change on all prices in the economy has been called a general equilibrium analysis of tax incidence.

The measurement of tax burdens itself is largely an unsettled issue in academic literature. As a matter of fact, according to the Federation of Tax Administrators, no single measure tells the whole story because of various characteristics and limitations of the data used. Early studies generally expressed tax burdens in terms of tax liability and representative incomes of taxpayers which made broad generalizations of incomes and income groups. Consequently, comparisons of tax burdens are made based on statewide averages of tax revenue collected or the estimated tax burden on a family of a particular size and income in a particular jurisdiction in the county and state. While this approach is convenient and makes analysis easier, it fails to account for differences in types and levels of taxes used and do not address the issue of overlapping areas of local government and tax jurisdictions.

Method

The ability of the researchers to analyze data on the District's Individual Income Tax (IIT) and Real Property Tax (RPT) has been limited to date primarily because there was no uniquely identifiable relation between the two datasets. As a result, important tax administration issues like tax offsets, homestead compliance, and research questions related to the distribution of the District's total tax burden remained unanswered. To partially remedy this deficiency in the tax database, this study used fuzzy matching to create a comprehensive "Taxpayer Dimension" table that could be used by tax administrators and researchers to query real property and individual income tax data at the same time.

Data Integrity and Standardization

For the purpose of this project, only residential properties with active Square Suffix Lots (SSL's), which received the homestead deduction, were selected. The homestead deduction reduces the assessed value of the property by US\$67,500. A nonactive or dead lot is a property that existed in the previous year but does not currently exist because the property was merged or combined with an adjacent property. The selected subset contained 95,586 properties, out of 197,970 records or 48% of all the properties registered in the Real Property Tax (RPT) database in 2007. The 2007 D.C. individual income tax file contained 301,304 records. To eliminate as many errors as possible and maximize the best address data, we eliminate records where addresses contained P.O. Boxes or where D.C. was not listed as the state code. This resulted in 263,663 records or 88% of the original income tax file.

A quick profiling of the data revealed that taxpayer addresses had a number of integrity problems, such as missing or invalid data values, duplicate data, and dormant taxpayer data that have seldom, if ever, been updated. Consequently, a standardization scheme was used to parse the address field of each dataset into several tokens, including street number and name, street type, unit number, and post-direction or quadrant. Likewise, the software's standardization scheme was used to standardize the taxpayer names on the IIT file and homeowner names on the RPT file.

Constructing the Dataset

The standardized property and income files were merged based on the four distinct address match codes resulting in a master file containing 54,601 matched records for TY2007; 55,614 matched records for TY2008; and 53,772 matched records for TY2009. The data were divided into groups: Group A2 contained 12,743 records where the RPT name was not the same as the IIT name, but there was only one instance of an address. This could be the result of name differences or misspellings between the two files. Group B1 contained 7,892 records where the RPT name was the same as the IIT name but there were multiple instances of an address. In other words, someone else, possibly a renter or another family member, listed this address on their income tax file. Finally, Group B2 contained 25,183 records where the RPT name did not match the IIT name and there were multiple instances of an address.

We analyzed Group A2 further to account for some of the differences in the names using an 85% sensitivity level on just the last names. This was an attempt to capture records where the first name contained only initials or misspellings in either file and therefore would not match according to our initial criteria. This resulted in 6,261 records that matched by last name. The 6,482 records that did not match during this process were further analyzed, using a lower sensitivity of 50% on the full name. We used the full name because we realized there were some instances where the names were reversed on the files and we felt looking at the full name at a lower sensitivity would help match those records better. This resulted in 335 more matches. In the end, we were able to move 8,775 records from *Group A2* to *Group A1*. This resulted in 25,565 records where the name and address of the tax filer matched the name and address of the homeowner and this was the only time this record appeared in each file.

As previously stated, Group B1 contained 7,892 records. These homeowners have a corresponding record in the income tax record; however, multiple records were found in the IIT file. Group B2 (25,183 records) contained multiple instances of an address; however, the name on the RPT file did not match the name on the IIT file. We merged these two files based on address match codes to match property owners with the nonowners (adult family members, nonfamily cohabiters, and renters) who file income taxes from the same address. The resulting file contained 10,435 records (Group B nonowners). This means that for each of the 7,892 property owners found in Group B1, or Group B owners, there was at least one other person filing an income tax record from this address. In many cases, there were three to four persons to one property owner record.

For the 15,175 records that did not match, this group was further analyzed (using the same sensitivity analysis and methods described above) to see if any possible name matches were missed due to inconsistencies and errors in spelling of the name on either file. This resulted in 7,444 records. These records were not added to the original Group B1 as was done with the Group A1 and Group A2 data. We decided this file would be analyzed separately due to the complexity of the multiple addresses and the higher probability that some of the name matches were family members and

not the actual property owner. Unlike the “A” group where there is one IIT record for every RPT record, and thus a higher likelihood that the income tax filer’s name is indeed that of the property owner’s name, the “B” group has a one-to-many relationship where there are multiple income tax filers at a property address. Therefore, once the standards are lowered, that is, a lower sensitivity level, there is a higher probability that the name match is that of an adult family member and not the actual property owner. For example, D. Young is now matched to David Young. The addresses match; however, the names are not an exact match. Because we know multiple income tax filers use this address, D. Young could be David’s adult son, Dwayne. These additional 7,444 matched records using the looser criterion were labeled Group C owners. In the remaining records, 7,730 were labeled Group C nonowners.

Tax Policy and Economic Changes

The tax liability of households is impacted by changes in tax policies as well as changes in the economic environment. To understand the burden faced by the District’s taxpayers, it is important to highlight some of the policy and economic changes that influence the tax burden.

Real Property Tax Changes

1. In 2007, the residential tax rate was lowered by 4.3% from US\$0.92 to US\$0.88 per US\$100 of assessed value.
2. In 2008, the tax rate was reduced from US\$0.88 to US\$0.85 per US\$100 of assessed value, and the homestead deduction was increased from US\$60,000 to US\$64,000. Both of these had the potential to lower the assessed value and the resultant tax.
3. Between 2008 and 2009, the tax rate remained unchanged but the homestead deduction increased by 5.5% to US\$67,500.
4. By 2007, the average assessed value for the city grew 20% before declining to 7.2% and 1.1% in 2008 and 2009, respectively. In addition, the average sales price for homestead properties in the city increased by 6.3% in 2007 before declining in 2008 and 2009 by 2.1% and 2.7%, respectively. Even though the homestead tax base for the city grew between 2006 and 2009, the rate of growth declined each year. Likewise, the homestead tax revenue also demonstrated a similar pattern whereby there was growth but at a lower rate.

Individual Income Tax Changes

Between 2007 and 2009, there were a number of tax policy changes that impacted the amount of individual income that was taxable and the tax burden incurred by filers.

1. In 2007, the lowest, middle, and top individual income tax rates decreased from 4.5% to 4%, 7% to 6%, and 8.7% to 8.5%, respectively.
2. In 2008, the standard deduction and personal exemption increased from US\$2,500 to US\$4,000 (a 60% increase) and US\$1,500 to US\$1,675 (an 11.7% increase), respectively.
3. In 2008, the first-time homebuyer credit was expanded to all District Government employees.
4. In 2009, the Earned Income Tax Credit (EITC) was increased from 35% to 40% of the federal EITC credit.

The District experienced a decline in its taxable income in 2008 (−11%) and 2009 (−4.2%) after growth of 10.4% in 2007. Individual income tax revenue experienced a similar pattern with a decline in revenue of 9.1% in 2008 and 4% in 2009. This downward trend followed 3.9% growth that occurred in 2007.

Economic Variables

There are a number of economic variables that can impact the amount of individual income and real property taxes that the District collects.

1. The number of employed residents grew between 2007 and 2008 before declining in 2009 by 4.2%; however, the growth rate was lower in 2007 (2.3%) and 2008 (0.8%).
2. In 2007, the wages and salaries of the District's residents grew by 8% before slower growth in 2008 (6.1%) and in 2009 (1.4%).
3. The SP500 which plays a key role in the performance of the declarations component of individual income tax experienced 12.7% growth in 2007. This was followed by a 17.3% decline in 2008 and a further decline of 22.5% in 2009. The behavior of the stock market impacts the capital gains/losses earned by filers and the resultant level of taxes that are paid. Tables 1 and 2 below summarize the tax policy and economic changes for the period 2006-2009.

From Table 2, we see that the number of employed residents grew by 1.6% in 2008 after experiencing growth of 2.4% in 2007. In 2009, there was a decline of 3.6% in the number of employed residents. The performance of resident employment determines the total wages earned by the District's residents. In 2007 and 2008, respectively, there was a 7.8% and 6.7% growth in wages; this was followed by slower growth of 2.4% in 2009. A key economic factor that influences the tax burden faced by residents is the stock market. In 2007, the market grew by 14.1%; this was followed by negative growth in 2008 and double a digit decline in 2009. The taxable income as well as the individual income tax revenue experienced slower growth in 2008 and 2009 resulting in a negative growth of the average income tax paid by filers. On the real property side,

Table 1. Tax Policy Changes in Washington, D.C., 2006-2009.

Tax policy changes	2006	2007	2008	2009
Real property tax				
Residential tax rate	US\$0.92	US\$0.88	US\$0.85	US\$0.85
Percent change		-4.20%	-3.40%	0.00%
Homestead deduction amount	US\$60,000	US\$60,000	US\$64,000	US\$67,500
Percent change		0.00%	6.70%	5.50%
Individual income tax				
Tax rates	4.50%	4.00%	4.00%	4.00%
	7.00%	6.00%	6.00%	6.00%
	8.70%	8.50%	8.50%	8.50%
Standard deduction	US\$2,500	US\$2,500	US\$4,000	US\$4,000
Percent change		0.00%	60.00%	0.00%
Personal exemption	US\$1,500	US\$1,500	US\$1,675	US\$1,675
Percent change		0.00%	11.70%	0.00%
EITC (% of Federal EITC)	35.00%	35.00%	35.00%	40.00%
First time homebuyer credit (US\$2,000 credit)	Police officers only	Police officers only	All district government employees	All district government employees

Source. Office of Tax and Revenue, Washington, D.C.

Note. EITC = Earned Income Tax Credit.

the assessed values of homesteads as well as the property tax revenue had slower growth in 2008 and 2009 when compared with 2007.

Data Analysis

Tables 3 and 4 provide the distribution of filers by filer type, distribution, and income. A comparison of statistics for the city and the matched data in both these tables show that in 2007, 58.6% of all filers in the District were single, compared with 51.9% in the matched dataset. In addition, almost 30% of the matched data filers were married versus 15.6% of the District's filers. From Table 3, a look at the head of household filers in TY2007 showed that in the District, almost 20% of the filers were head of household filers but only 15% of filers who were homeowners were head of household filers. A comparison of head of household filers and married filers suggests that even though the proportion of married filers in the District is less than head of household filers, the proportion of married filers that are homeowners is larger than that of head of household filers. The statistics for TY2009 tell a similar story except that the proportion of married filers who are homeowners increased slightly while the share of head of household filers who were homeowners declined. The distribution of the matched data is somewhat reflective of the distribution of filers in the District as a whole where the majority of filers are single filers. A comparison between TY2007

Table 2. Economic and District Demographics 2006-2009.

Economic variables and city-wide demographics	2006	2007	2008	2009
Population ('000)	583.9	585.6	588.6	597.1
Percent change		0.3	0.5	1.4
Employed residents ('000)	302	309.2	314.1	302.7
Percent change		2.4	1.6	-3.6
Personal income (US\$ Billions)	34.1	36.8	40.4	40.3
Percent change		8.0	9.6	-0.1
Wages and salaries of D.C. residents (US\$ Billions)	17.9	19.3	20.6	21.1
Percent change		7.8	6.7	2.4
Gross State Product (US\$ Billions)	86.2	90.8	96.8	98
Percent change		5.3	6.6	1.3
SP500	1,270.9	1,450.5	1,367	902
Percent change		14.1	-5.8	-34.0
Average assessed value	US\$428,427.00	US\$513,903.00	US\$550,724.00	US\$556,834.00
Percent change		20.0	7.2	1.1
Average sale price	US\$572,200	US\$608,100	US\$595,600	US\$579,600
Percent change		6.3	-2.1	-2.7
Average real property tax	US\$2,131	US\$2,353	US\$2,492	US\$2,696
Percent change		10.4	5.9	8.2
Total residential tax base (US\$ Billions)	62.5	77.1	85.6	88.0
Percent change		23.4	11.0	2.8
Homestead tax base (US\$ Billions)	38.1	46.0	50.6	50.8
Percent change		20.7	10.0	0.4
Homestead tax revenue (US\$ Million)	189.5	210.6	229.0	246.5
Percent change		11.1	8.7	7.6
Average individual income tax	4,121.6	4,098.0	3,685.3	3,533.7
Percent change		-0.6	-10.1	-4.1
Individual tax revenue (US\$ Million)	1,233.6	1,314.0	1,343.0	1,136.0
Percent change		6.5	2.2	15.4
Taxable individual income (US\$ Million)	16,846.9	18,601.2	16,557.9	15,867.2
Percent change		10.4	-11.0	-4.2

Source. Bureau of Labor Statistics, Bureau of Economic Analysis and Washington, D.C., Office of Tax and Revenue.

and TY2009 found that there was growth in the proportion of single filers in the city and growth in the proportion of single filers who were homeowners (see Table 4).

In 2007, filers with income less than US\$50,000 accounted for the majority of filers in the matched data and had the highest tax burden (9.5%), compared with those

Table 3. Distribution of Filers for the District and Matched Data by Filer Type.

Filer type	CY2007		CY2008		CY2009	
	The District (%)	Matched data (%)	The District (%)	Matched data (%)	The District (%)	Matched data (%)
Single	58.6	51.9	61.1	53.1	61.9	52.7
Married	15.6	29.9	15.9	29.3	16.3	30.0
Head of household married filing	19.5	14.3	19.8	13.9	18.6	13.6
Separate	3.2	3.8	3.2	3.7	3.2	3.7

Table 4. Distribution of Matched Records and Tax Burden (US\$) by Income, TY2007-TY2009.

Income category	TY2007		TY2008		TY2009	
	Matched data (%)	Tax burden (US\$) ^a	Matched data (%)	Tax burden (US\$) ^a	Matched data (%)	Tax burden (US\$) ^a
Less than US\$50,000	31.4	2,215	33.4	2,492	27.6	2,403
US\$50,000-US\$75,000	14.9	3,682	14.2	3,845	14.8	3,926
US\$75,000-US\$100,000	11.8	5,748	11.6	5,842	12.0	6,036
US\$100,000-US\$200,000	22.2	10,440	22.5	10,563	25.4	10,860
US\$200,000-US\$500,000	14.2	23,359	13.7	23,425	15.8	23,496
Greater than US\$500,000	5.5	104,250	4.6	94,213	4.4	79,236
All		13,286		11,991		11,956
Total for city		6,594		6,310		6,362

Note. RPT = Real Property Tax; IIT = Individual Income Tax.

^aTax Burden is RPT + IIT.

Source. Office of Tax and Revenue, Washington, DC.

with income greater than US\$500,000 whose tax burden was 6.5% and who accounted for almost 6% of all filers (see Tables 4 and 5). The calculated Effective Tax Rates (ETR) suggest a progressive tax structure where the higher the income the higher the taxes paid; likewise, the higher the assessed value the higher the taxes levied on the property. Despite this, the data in Table 5 suggest that those taxpayers with lower incomes have a higher tax burden. A comparison of the matched data to the city found that the burden for those filers was 7% compared with almost 9% for the city as a whole. On the contrary, in 2009, the share of matched data filers with income less than US\$50,000 declined to 27.6% and their tax burden increased from 9.5% to 15%. For those filers with income greater than US\$500,000, their share fell from 5.5% to 4.4% and their tax burden declined from 6.5% to 6%, a burden lower than that of filers with 10 times less income.

Table 5. Distribution of Matched Records and Tax Burden (%) by Income, TY2007-TY2009.

Income category	TY2007		TY2008		TY2009	
	Matched data (%)	Tax burden (%) ^a	Matched Data (%)	Tax burden (%) ^a	Matched data (%)	Tax burden (%) ^a
Less than US\$50,000	31.4	9.5	33.4	15	27.6	15
US\$50,000-US\$75,000	14.9	5.9	14.2	6	14.8	6
US\$75,000-US\$100,000	11.8	6.6	11.6	7	12.0	7
US\$100,000-US\$200,000	22.2	7.4	22.5	8	25.4	8
US\$200,000-US\$500,000	14.2	7.8	13.7	8	15.8	8
Greater than US\$500,000	5.5	6.5	4.6	6	4.4	6
All		7.0		7		7
Total for city		8.6		9		9

Note. RPT = Real Property Tax; IIT = Individual Income Tax.

^aTax Burden is RPT + IIT.

Source. Office of Tax and Revenue, Washington, DC

Table 6. Aggregate Statistics for the Matched Dataset.

	Percent change TY2007-TY2008 (%)	Percent change TY2008-TY2009 (%)
Federal adjusted gross income	-9.2	-8.1
Individual income tax	-12.3	-11.6
Real property assessment	4.8	1.9
Real property tax	6.7	10.4
Total tax burden	-7.0	-6.7

	TY2007 (%)	TY2008 (%)	TY2009 (%)	Percentage point change TY2007 vs. TY2009
Individual income effective tax rate	5.5	5.3	5.1	-0.4
Real property effective tax rate	1.5	1.8	1.9	0.4
Tax burden	7.0	7.1	7.3	0.3

For the matched dataset in 2007 (compared with 2009), the tax burden increased from 7.0% to 7.3% (see Table 6). This can be explained by a 1.1% increase in federal adjusted gross income, a 0.7% increase in individual income tax, and a 3.71% increase in real property tax. Micro analysis allows for a glimpse of some of the underlying

Table 7. Decile Statistics.

Minimum and maximum Adjusted Gross Income by decile for the matched dataset

	2007		2009	
	Minimum	Maximum	Minimum	Maximum
1st Decile	US\$(7,712,962)	US\$12,614	US\$(7,736,409)	US\$10,890
2nd-9th Decile	US\$12,616	US\$266,651	US\$10,891	US\$257,613
10th Decile	US\$266,652	US\$387,344,936	US\$257,666	US\$326,957,114

Table 8. Effective Tax Rates of the Matched Dataset by Deciles, TY2007 Versus TY2009.

	1st decile (%)		2nd-9th decile (%)		10th decile (%)	
	2007	2009	2007	2009	2007	2009
Entire matched dataset						
iit_agi	3.3	3.3	4.6	4.6	6.0	4.5
rpt_agi	15.7	41.6	2.9	3.3	0.7	0.9
tb_agi	19.0	44.8	7.5	7.9	6.7	5.5
Capital gains						
iit_agi	4.5	12.1	5.6	5.3	5.8	5.4
rpt_agi	23.1	275.7	2.3	3.1	0.6	0.9
tb_agi	27.6	287.8	7.9	8.3	6.5	6.3
Business income						
iit_agi	8.2	1.0	3.9	4.3	5.9	6.0
rpt_agi	67.0	71.7	3.3	3.5	1.6	1.8
tb_agi	75.3	72.8	7.2	7.8	7.5	7.8

Note. RPT = Real Property Tax; IIT = Individual Income Tax.

changing dynamics that contributed to the change in tax burden. An analysis by deciles provides a look at how the tax burden performs for different income groups. Table 7 shows the minimum and maximum adjusted gross income for each decile.

A look at the real property tax found that the bottom decile experiences a decline in adjusted gross income and an increase in real property tax (see Table 6). More specifically, if we compare Tables 8 and 10, the lowest income group paid 7.2% of the total real property for the matched dataset in 2007 compared with a 10.3% contribution in 2009. In addition, in 2007, their total ETR (the tax burden relative to income) increased from 19% in 2007 to 44.8% in 2009. In terms of total individual income tax for the matched dataset, the top decile paid 63.4% in 2007, which decline to 54.3% in 2009. The middle deciles (or 80% of the taxpayers in the dataset) contributed 36% of the individual income taxes paid in 2007 and 46% in 2009.

Table 9. Shares of Study Variables for the Matched Dataset by Deciles, TY2007 Versus TY2009.

	1st decile (%)		2nd-9th decile (%)		10th decile (%)	
	2007	2009	2007	2009	2007	2009
Entire matched dataset						
iit	0.3	0.2	36.4	45.6	63.4	54.3
rpt	7.2	10.3	66.5	65.9	26.3	23.7
tb	2.0	3.6	44.0	52.4	54.0	44.0
Capital gains						
iit	0.5	0.2	46.7	52.0	52.8	47.7
rpt	8.9	12.3	70.0	69.1	21.1	18.6
tb	2.3	3.9	51.8	57.3	45.9	38.8
Business income						
iit	0.7	0.1	51.4	55.7	47.9	44.2
rpt	9.0	9.2	69.8	71.1	21.2	19.8
tb	3.9	-0.3	58.4	64.7	37.7	35.6

Note. RPT = Real Property Tax; IIT = Individual Income Tax.

The top decile had major capital losses, which through a decline in their income as well as a decline in individual income taxes helped to offset the rise in real property taxes. This group experienced a 21% decline in adjusted gross income and a 27% decline in individual income tax liability, so that the total ETR declined from 6.49% in 2007 to 6.30% in 2009. Among the matched data, the adjusted gross income for business filers increased by 38%, while their real property tax liability increased 51.2% and their total ETR increased from 7.7% to 8.2%. For these filers, 41% of the increase in the ETR could be contributed to higher individual income tax liability, while 59% of the increase in the ETR could be the result of higher real property taxes.

In Table 8, we note that the total ETR (total tax burden relative to income) increased by 25.8% for the lowest income filers, while those in the highest income group experienced a decline of 1.2% in their tax burden. Middle income filers had an increase of 0.4% in the tax burden incurred. For the high income filers, the share of individual income tax paid relative to income declined by 1.5% contributing to a lower overall burden despite the increase (0.2%) in the share of real property tax paid relative to income. For low income filers, the change in the tax burden can be explained by the growth in the share of real property taxes that these filers paid relative to their income. The implication here is that the decline in the share of income for the top income filers was driven by negative changes taking place in the economy.

A comparison of specific study variables for TY2007 and TY2009 for the matched dataset in Table 9 showed that in TY2007, the lowest income category paid 0.3% of the individual income tax and had a tax burden (total taxes relative to income) of 2%. Their share of individual income tax declined in TY2009 to 0.2%, but their share of

Table 10. Total % Age Point Change in Tax Burden by Income, TY2007-TY2009.

Income category	Change in tax burden (%)
Less than US\$50,000	5.5
US\$50,000-US\$75,000	0.4
US\$75,000-US\$100,000	0.3
US\$100,000-US\$200,000	0.3
US\$200,000-US\$500,000	0.2
Greater than US\$500,000	-0.4
All	20.0

the total tax burden increased to 3.6%. The performance of real property contributes to the total tax burden on residents, and for this group within the matched dataset, it was found that the real property tax share for the first decile increased from 7.2% to 10.3% (see Table 9). These findings imply that while taxable income declined over time, the assessed value of taxpayers' properties increased. For the 10th decile (or high income category), the share of individual income tax paid declined from 63.4% to 54.3%, while their share of real property taxes declined from 26.3% to 23.7%. The result was a decline in their share of the tax burden from 54% to 44%.

In examining those filers within the matched dataset that had capital gains, it was found that for the high income group, their share of income tax paid decreased from 52.8% to 47.7% and their share of the tax burden declined from 45.9% to 38.8% (see Table 9). These results implied that the slowing economy and the adverse effect on the stock market during the recession negatively impacted the capital gains reported and the resultant individual income tax liability and tax burden. In addition, the share of the total tax burden for all filers in the matched dataset that was paid by the high income filers declined by almost 10% between 2007 and 2009 compared with the 1.6% increase in the share of the total tax burden that was paid by low income filers.

Figures 1 through 3 illustrate how the share of the tax burden by decile changed for the matched dataset. By comparing TY2007 and TY2009, it was found that the first decile's share of the total tax burden increased by 1.6%. This was influenced by an increase of 3.1% in their share of the total real property paid and negligible growth in their share of the total individual income tax. On the contrary, the share of the total tax burden for the high income taxpayers declined by almost 10%; this was influenced by decreases in this group's shares of individual income and real property tax liabilities.

Along with examining changes to the total tax burden for the entire matched dataset, the study also looked at changes to the total tax burden of those filers from the matched data that had capital gains and business income (see Figures 2 and 3). Between TY2007 and TY2009, the low and middle income groups experienced increases in their share of total tax burden, while the high income group experienced a decrease in their total tax burden. For this group, their share of individual income and real property

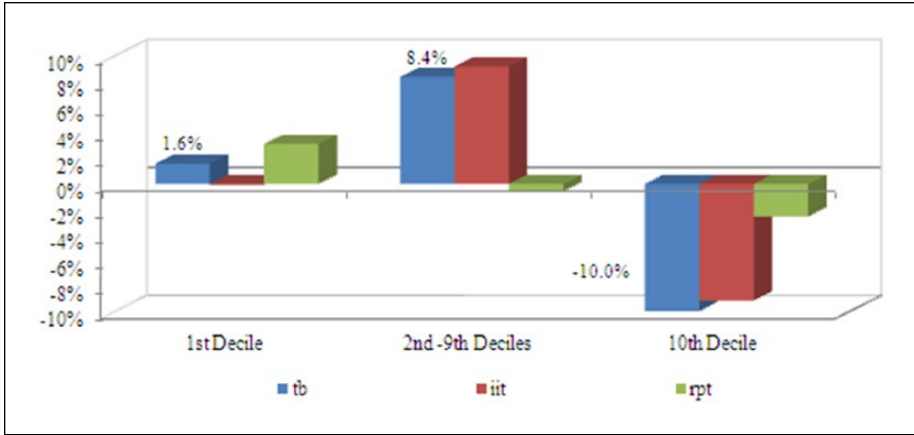


Figure 1. Percentage point change in tax burden shares for matched dataset by decile, TY2007 versus TY2009.

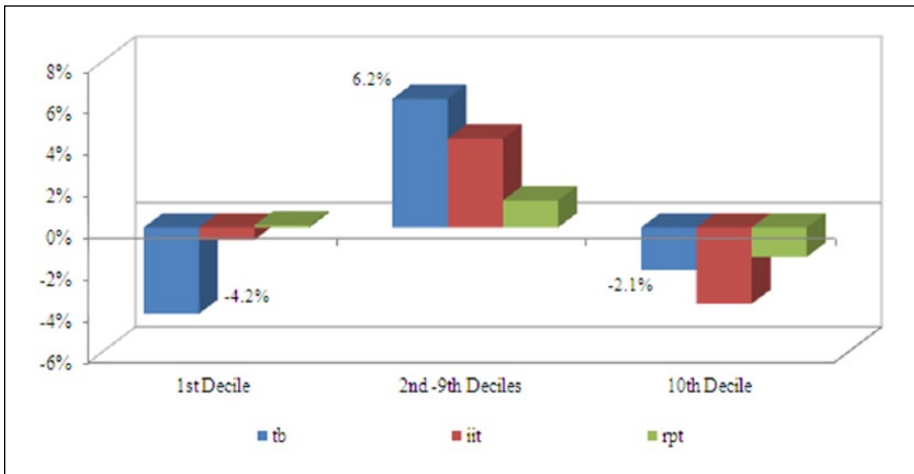


Figure 2. Percentage point change in tax burden shares for business income filers by decile, TY2007 versus TY2009.

tax liabilities declined implying that their income performance was influenced by the behavior of the stock market. For the other deciles, their share of individual income tax liability relative to income increased.

Table 10 shows the change in the total tax burden by income category. Those filers in the matched dataset with income greater than US\$500,000 experienced a decline of 0.4% age points in their tax burden; coupled with this was a double digit decline of 27.5% in their income tax liability and an increase of 13.1% in their real

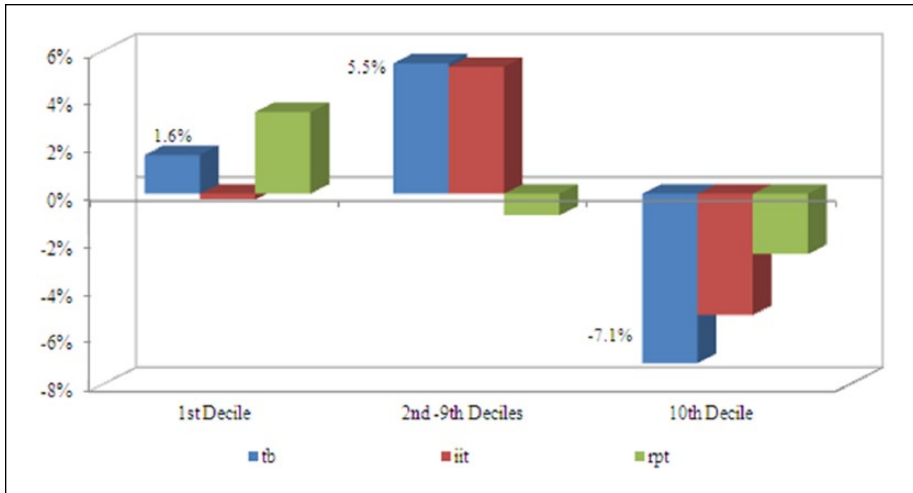


Figure 3. Percentage point change in tax burden shares for capital gain filers by decile, TY2007 versus TY2009.

property tax liability. At the other end of the spectrum, those filers with income of less than US\$50,000 experienced an increase of 5.5% age points in their total tax burden. This group experienced a smaller decline in its income tax liability (17.8%) and a larger increase in its real property tax liability (22.2%) than the top income category. There tends to be more capital gain filers in the high income category who as a result of a declining economy have lower taxable income and lower income tax liability such that the change in their income tax liability is larger than for the lowest income group.

Our study presented an alternative way to examine the tax burden of District residents by matching two different datasets. Alternatively, the District publishes a nationally recognized study that uses an alternative methodology to calculate the tax burden of residents. The study is based on a number of assumptions about the household size and income whereas this study uses actual taxpayer micro-level data. The table below provides a comparative view of the District tax burden calculation with that of this study.

A comparison of 2007 and 2009 shows that in 2007 at the US\$25,000 income level were filers are assumed to be renters, the tax burden from the OCFO alternative study was higher than the burden calculated in the matched data study (see Table 11). On the contrary, in 2009, the tax burden using the matched data was higher than in the other study. At the high income level of US\$150,000, the tax burden under both studies increased; however, the burden was higher for the matched data. In addition, the analysis showed that the tax burden was lower for filers with incomes above US\$25,000 suggesting that filers at the higher income levels pay a lower share of their income in taxes than filers in the low income bracket.

Table II. Comparison With the District Tax Burden Study.

Income level	TY2007		TY2008		TY2009	
	OCFO/ ORA study tax burden (%)	IIT/RPT matched data tax burden (%)	OCFO/ ORA study tax burden (%)	IIT/RPT matched data tax burden (%)	OCFO/ ORA study tax burden (%)	IIT/RPT matched data tax burden (%)
US\$25000 ^a	7.9	7.0	7.2	7.5	7.2	7.8
US\$50,000	5.0	5.8	4.4	6.0	5.6	6.1
US\$75,000	5.5	6.4	5.4	6.4	6.2	6.6
US\$100,000	6.1	6.8	5.8	6.9	6.6	7.2
US\$150,000	7.1	7.6	6.7	7.6	7.3	7.8

Note. IIT = Individual Income Tax; RPT = Real Property Tax; OCFO= Office of the Chief Financial Officer; ORA= Office of Revenue Analysis.

^aAssume that filer with income of US\$25,000 are renters and that about 20% of rent is applied toward property taxes.

A look at the data for the matched records found that those records were representative of the city. For individual income tax, the matched records accounted for 18% of all filers, 80% of all federal adjusted gross income, and 70% of all the individual income taxes paid. On the real property side, the matched records represented 42% of all registered homesteads and 70% of all the homestead values and property taxes paid. In total, the records accounted for US\$1.6 billion in tax revenue or about 30% of all taxes paid to the District. To further explain the tax burden of the matched data, it was found that for those matched records that claimed business income, there was an 11.3% increase in AGI in 2009 compared with 2007 and a 14.6% increase in individual income tax liability in 2009 compared with 2007.

Conclusion

The purpose of this analysis was to examine changes in the tax burden using the novel dataset created using a fuzzy matching method of the micro-level data. This study uses actual IIT and RPT payments by a statistically significant number of households and is not premised on an inordinate number of methodological assumptions. The analysis of the data suggested that due to economic changes, high income filers were better able to lower their individual income tax liability, and consequently the income tax incidence shifted away from high income filers toward lower income filers. The real property tax grew almost twice as fast as home values because of the District's tax cap policy. Even though income and individual income tax liability declined, the tax cap policy caused the total taxes for all to increase, especially for those filers in the lower income brackets.

While this study's tax burden results are similar to the DC Tax Burden Study, it allows for robust microanalysis of actual taxpaying/economic behaviors across households and over time. The comparison of 2007 and 2009 indicated a growth in the tax

burden, such that after the recession, the burden became greater for all filers but was most noticeable for low income filers. The analysis suggests that the District was affected more so by Wall Street than Main Street as it was the financial side of the recession that impacted the District. The recession caused a redistribution of some of the tax burden from the wealthiest to the not-so-wealthy. In addition, a combination of falling adjusted gross income and rising real property taxes caused the total ETR for the bottom deciles to more than double. It appears that the unintended consequence of tax cap policy caused property taxes to grow faster than home values for most of the matched dataset, which likely exacerbated the financial stress of these households during recession.

Declaration of Conflicting Interests

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