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Tax Expenditures by Race and Hispanic Ethnicity: An Application of the U.S. Treasury Department's Race and Hispanic Ethnicity Imputation

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This paper is part of an ongoing research project by the U.S. Department of the Treasury's Office of Tax Analysis (OTA) to investigate questions of racial equity in the U.S. individual income tax system. In this paper, we use OTA's new race and Hispanic ethnicity (RH) imputation (Fisher 2023) to analyze how the benefits of eight of the largest individual income tax expenditures vary by RH. Income tax expenditures (TEs) are exceptions to the tax code which would normally be based on a comprehensive income tax concept. Earlier studies of TEs by RH (Moran and Whitford (1996), Brown (2021)) had to rely on non-tax data to infer disparate tax treatment by RH. In this study, we use tax data to answer some of the same questions. Our findings using tax data and imputed RH data are consistent with some but not all of the earlier findings using non-tax data. We consider two measures of RH equity. First, we consider the share of tax expenditures received by families in each RH category. The general result from the first measure is that overall, the benefits of the eight tax expenditures we examine accrue disproportionately to White families. However, three of these eight tax expenditures are refundable credits, and the benefits of these tax expenditures accrue disproportionately to Hispanic families (and Black families in the case of the Earned Income Tax Credit (EITC)). Second, we consider a horizontal equity approach; we estimate tax expenditures by income and RH. The general results from the horizontal equity approach is that 1) with regard to the TE for preferential rates for certain capital gain and qualified dividends, White families have higher benefit rates across a range of income levels and, among the highest income families, White families have higher average benefits compared to Hispanic and Black families; 2) with regard to TEs for refundable credits, in general lower-and middle-income Hispanic families (and Black families in the case of the EITC) have higher benefit rates and higher average benefits than White families; and 3) with regard to the TE for the mortgage interest deduction, the average benefit is the same or higher for high-income Black and Hispanic families than for high-income White families.

All taxpayer data used in the research described in this paper was kept in a secured Treasury or IRS repository, and all results have been reviewed to ensure that no confidential information is disclosed.
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INTRODUCTION

This paper is part of an ongoing research project by the U.S. Department of the Treasury's Office of Tax Analysis (OTA) to impute race and Hispanic ethnicity (RH) to tax data and to use the imputation to investigate questions of racial equity in the U.S. individual income tax system. The first application of Treasury's RH imputation (Costello et al. (2022)) imputed RH weights to tax data to analyze marriage penalties and bonuses by RH. In this paper, we use the race and ethnicity imputation to analyze how the benefits of eight of the largest individual income tax expenditures vary by RH. Income tax expenditures (TEs) are exceptions to the tax code which would normally be based on a comprehensive income tax concept. Earlier studies of TEs by RH (Moran and Whitford (1996), Brown (2021)) had to rely on non-tax data to infer disparate tax treatment by RH. In this study, we use tax data to answer some of the same questions. However, because the tax data does not include information on RH, we must rely on an imputation of RH. Our findings using tax data and imputed RH data are consistent with some but not all of the earlier findings using non-tax data.

We consider two measures of RH equity. First, we consider the share of tax expenditures received by families in each RH category. This simple measure gives a broad sense of the total dollars being spent on a given tax expenditure by RH. The general result from the first measure is that overall, the benefits of the eight tax expenditures we examine accrue disproportionately to White families. However, three of these eight tax expenditures are refundable credits, and the benefits of these tax expenditures accrue disproportionately to Hispanic families (and Black families in the case of the Earned Income Tax Credit (EITC)). Second, we consider a horizontal equity approach; we estimate tax expenditures by income and RH. We answer the question "Do families with the same income, but different RH, receive the same level of tax expenditures?" With the horizontal equity approach, we consider both the share of families within an income decile that receive a given tax expenditure (benefit rates) and also whether families of different RH within an income decile receive the same amount on average (average benefit).

The horizontal equity analysis produced several interesting results. First, with regard to preferential rates for certain capital gain and qualified dividends, White families have higher benefit rates across a range of income levels, and, among the highest income families, White families have higher average benefits compared to Hispanic and Black families. Though the differences are not statistically significant, there is suggestive evidence of a similar pattern for the 20 percent deduction allowed to certain pass-through income. Second, with regard to the refundable credits, in general lower-and middle-income Hispanic families (and Black families in the case of the EITC) have higher benefit rates and higher average benefits than White families. However, among the lowest-income families, White families have higher benefit rates for the Earned Income Tax Credit than Black and Hispanic families, and, among higher-income families, Black families have lower average benefits for the child tax credits than White and Hispanic families. Third, with regard to the mortgage interest deduction, while favoring higher income families in general (of which White families are a disproportionate share), the average benefit is the same or higher for high-income Black families than for high-income White families. This does not necessarily imply that high-income Black families benefit from higher home values, only that the value of the mortgage interest deduction is relatively high for them. This might be due to relatively higher interest rates or higher mortgage debt for the same or lower home value.

This paper only attempts to measure whether or not there are disparate benefits by RH arising from certain TEs. It does not have an in-depth discussion of the source of variation by RH regarding the tax expenditures. It also does not argue for or against particular tax expenditures. A complete analysis of the value of a particular tax expenditure would include not only concerns over RH equity but also other forms of equity as well as efficiency and simplicity.

Further this paper is only an initial attempt at measuring TEs by RH. It uses a naïve approach to ranking families by their ability-to-pay. It does not control for family size when ranking families by their ability-

to-pay; thus, a single person with $20,000 of income is ranked the same as a four-person family with $20,000 of income. In Treasury's standard distributional methodology (Cronin (2022) and Cronin et. al. (2012)), Treasury adjusts for family size when ranking families. Future research will compare the current results to results where family size adjustments are used.

1. MOTIVATION

Moran and Whitford (1996) were among the first to consider tax expenditures by race, to hypothesize that "deviations from the ideal of a comprehensive income tax systematically favor whites over blacks" (p. 753). Without access to tax data by race, the authors used other available data by RH as well as studies on lifestyle differences to infer differences in tax treatment between Black and White families. The authors expected to find that most Black families had low income and wealth and that deviations from a comprehensive income tax would favor those with high income and wealth. Further, the authors expected to find that even holding income constant the Internal Revenue Code systematically favored White families. The authors suggested that the favoritism was not necessarily intentional racism but because "Black life remains largely unknown to most of the white world, and to most white legislators. Hence, legislators are largely unaware of the Internal Revenue Code's impact on blacks" (p. 758).

One of the findings of Moran and Whitford (1996), which will be most relevant to the current study, is that the Black/White wealth gap is large and that Black families tend to hold assets that are not tax-favored.

Brown (2021) inspired by Culp (1991) as well as the experience of her parents' tax filing as two married people subject to marriage penalties in the tax code, vowed to find the answer to the question "do our tax laws have a disparate impact by race" (p. 9). Brown, like Moran and Whitford (1996), did not have access to tax data and used data from other sources. Brown found that home ownership by White families was much higher than for Black families and home values for those who do own homes were

much higher for White homeowners than Black homeowners. Brown refers to tax subsidies for home ownership as "little more than twenty-first century version of redlining, and they must be repealed" (p. 94).[2] Similarly, Brown finds that the preferential tax treatment that comes with asset ownership favors White families. White families generally have much higher average wealth than Black families even at the same income levels. Further Brown argues tax-free transfers to family members do not work the same way for Black families as White families. Brown cites research by Meschede et. al. (2017) who found that White families with assets use tax-free transfers to increase the savings and investment opportunities for younger generations; whereas Black families with assets are more likely to use them to support older relatives. Brown (2021), among other proposals, advocates for a tax system based on individual filing instead of joint filing, repealing the mortgage interest deduction, and repealing the preferential rate on capital gains and dividends.

Of particular note, Brown (2021) calls for research using the tax data with imputed race if necessary to answer the question: Does the tax code have disparate impacts by race? This paper, along with other recent research from the Office of Tax Analysis (Costello et. al. (2022)) and others (see, for example, Gale (2021), Slemrod (2022), and GAO (2022)) is an attempt to develop the tools necessary to begin to investigate this question using tax data.

2. THE INDIVIDUAL TAX MODEL AND THE IMPUTATION OF RACE AND HISPANIC ETHNICITY

[2] The term redlining refers to policies developed by the Homeowners' Loan Corporation, a government agency. In 1936, the agency developed Residential Security Maps which highlighted safe locations for home mortgages. Neighborhoods where all residents were Black were given a D rating and outlined in red.

Treasury's method for imputing race to the Individual Tax Model (ITM) was first discussed in Costello et. al. (2022) and is more formally discussed in Fisher (2023). A brief outline is provided here. Importantly, Treasury's methodology builds on earlier methodologies and is the subject of ongoing research and refinement. As Brown (2021) aptly stated, "Each of these methods, of course, has advantages and disadvantages… But they are a thousand times better than nothing, which is what we have now." (p. 205). With this in mind, the application of Treasury's RH imputation method to tax expenditure estimates (in this paper) is part of the broader research project aimed at testing and further improving the imputation method and the ITM.

2.1 The Individual Tax Model (ITM)

Treasury's ITM is the primary model used by OTA to estimate current law liabilities and changes in those liabilities arising from proposed and enacted individual tax law changes. It is also used to estimate tax expenditures and is the model to which we have imputed RH. The ITM is based on the union of two samples, a filer sample and a nonfiler sample. The filer sample has two components, a random sample of tax returns (including all accompanying information returns) and an oversample of high-income returns and unusual returns, such as returns with negative income or a high number of capital gains transactions.

Treasury uses the random component of the filer sample design to create the nonfiler sample. If an individual does not file but would have been selected for the random filer sample if they did file, then they are included in the nonfiler sample if they received an information return (such as a Form 1095, Form W2 or Form 1099). Sampling weights on the ITM generally range from 1 to 3,000. Oversampled strata receive lower weights. The highest income returns have a weight of one, indicating that all are included in the sample.

The ITM sample (filers and nonfilers) is drawn from a recent filing year and updated every few years to keep the sample representative of current law filings (new forms, for example) and representative of new population and income trends. The current sample is drawn from 2016 filings and will soon be updated to 2019. Weights for both filers and nonfilers are updated to hit forecasted population targets, as well as forecasted distributions of income and other socio-economic characteristics over the Budget period, currently 2023 to 2034.

2.2 The Evolution of Imputing Race and Hispanic Ethnicity (RH)

As discussed in Elliott et al. (2008), the first imputations of race and Hispanic ethnicity (RH) used an address-only method. Addresses in the data were matched to Census information on RH for a given Census tract (hereafter referred to as geocoding). This method worked well for distinguishing between Black and non-Hispanic White people but did not do well identifying Asian or Hispanic people. Another methodology was to use surname lists to identify Asian and Hispanic people although this method did not do well distinguishing between Black and non-Hispanic White people. Hybrid models, such as the Categorical Surname and Geocoding (CSG) model, were then developed to use information on both surnames and geography. These models were then improved (Elliott 2008) by using a Bayesian Surname and Geocoding (BSG) approach but still used the standard geocoding and surname information. Finally, Elliott (2009) improved the BSG model by incorporating more comprehensive lists of surname matches to RH as released by the Census in 2007.[3]

The improved BSG model (BISG) treats the geocoding of an individual's address as a prior distribution of the probability of the individual's being categorized in different RH groups and then uses the comprehensive Census surnames lists to update the probabilities to reflect the additional information

[3] As described in Elliot (2009), of the six million unique surnames in the 2000 census, 151,671 surnames (listed by 100 or more individuals) represent almost 90 percent of all individuals listed on the 2000 census.

contained in these lists to arrive at an improved posterior distribution of probabilities of the individual's being categorized in different RH groups. This method was further improved by adding first name lists (Voicu (2018)) as a source for additional information where the BISG was the prior distribution and the first name list served to further refine the posterior probabilities of RH. The new modeling approach has been widely used and is known as Bayesian Improved Firstname Surname Geocoding (BIFSG) (Adjaye-Gbewonyo et al. (2014), Haas et al. (2019), and Voicu (2018)).

2.3 Treasury's Imputation Methodology

Information on RH is not collected on an individual's tax return. Therefore, to learn how elements or outcomes of the tax system vary based on RH, information on an individual's RH must either be matched or imputed using auxiliary data sources.

Fortunately, while the tax data does not include information on RH, it does include the information used in the BIFSG model to impute RH: first name, surname, and address (for geocoding). The Office of Tax Analysis (Fisher 2023) has sought to further improve the identification of RH by bringing the trove of information contained within the tax data, much of it obtained with 3rd party verification, to this missing data problem.

Thus, in short, the OTA imputation proceeds in two steps. First, we use the tax data and the BIFSG method to impute a prior distribution of RH probabilities and to estimate the joint distributions of RH and certain tax variables. Our extended model takes as given, the results of this first step. Second, we extend the BIFSG model to include the joint distributions of RH and the chosen tax variables. We apply the Bayesian method (and Markov-chain modeling techniques) to refine the prior probabilities given by the BIFSG model to obtain an improved model of the probability of being categorized in different RH groups.

In the Treasury model, we are predicting RH for the primary filer only. The primary filer is the filer listed first on the return. The imputation does not try to predict the combined RH of the primary and secondary filer or any dependents. In practice, the imputation is based on the address of the return, which is shared across all individuals on the return; the tax variables on the return which are also shared; and the last name on the return which is often shared. The first name and, in some cases, the last name will differ between the primary and other individuals listed on the return.

Each unweighted return in the ITM is assigned a non-zero probability of being each of the 6 RH designations. Weights in the ITM range from 1 to 3,000. Therefore a return with an ITM weight of 1,000 and a 70 percent probability of having a White Primary, a 15 percent probability of having a Hispanic primary, a 10 percent probability of having an Asian primary, a 4 percent probability of having a multiple race primary, and a 1 percent probability of having a Native American primary will represent: 700 returns with a White primary, 150 returns with a Hispanic primary, 100 returns with an Asian primary, 40 returns with an primary of multiple RH and 10 returns with a Native American primary. All tax fields except the race designation will be the same for this ITM return with weight 1,000 that has effectively been split to represent all 6 possible race designations.

To develop the imputation method more formally, consider the graphs in Figures 1 through 4. In Figure 1, the undirected graph (UG) represents the general model for BIFSG as well as the extended estimation method. In Figure 1, FSG represents the variables first name, surname and geocode; X represents the chosen tax variables; and Y represents other variables that might affect RH but in BIFSG and our extended model will only be modeled to affect RH through either X or FSG. Figure 2 represents a subgraph of Figure 1. The difference between the BIFSG estimator and the extended model lies in the way the subgraph shown in Figure 2 is modeled. Under BIFSG, it is modeled as in Figure 3. The tax

variables only affect RH through FSG. Under the extension, it is modeled as in Figure 4. The tax variables have a direct effect on RH.

FIGURE 1: UG FOR THE GENERAL MODEL AND FOR ESTIMATING RH

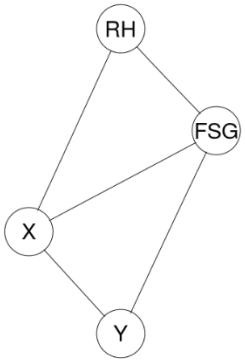


FIGURE 2: UG FOR THE GENERAL (RH, X, FSG) SUBGRAPH

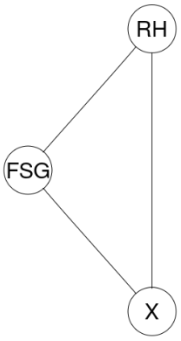
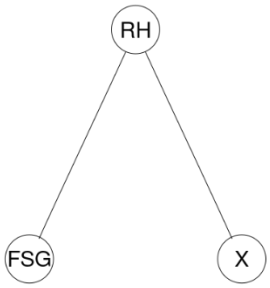


FIGURE 3: UG FOR THE BIFSG MODEL (RH, X, FSG) SUBGRAPH

FIGURE 4: UG FOR THE EXTENDED MODEL (RH,X,FSG) SUBGRAPH



With equations, the general model (Figure 2) is represented as

GENERAL MODEL: $P(X, RH, FSG) = P(RH = rh \mid X, FSG)\, P(X \mid FSG)\, P(FSG)$.

The joint probability that X, RH, and FSG take on a particular value is equal to the probability that RH takes on a particular value rh, conditional on values of FSG and the tax variables, multiplied by the probability that the tax variables take on particular values, conditional on FSG, multiplied by the

probability that FSG takes on a particular value. The assumptions of the BIFSG simplify some of the conditional probabilities on the righthand side of the general model. In the BIFSG model, the conditional probability of RH given the tax variables and FSG is assumed to be independent of the tax variables.

In the BIFSG model (Figure 3), X only affects RH through FSG

$P\,(RH = rh \mid X, FSG) = P\,(RH = rh \mid FSG)$.

Therefore, the joint probability for the BIFSG model is

BIFSG MODEL: $\boldsymbol{P\,(X, RH, FSG) = P\,(RH = rh \mid FSG)\, P(X \mid FSG)\, P(FSG)}$**.**

In the extended model (Figure 4), we estimate the effect of X directly on RH. Thus, the extended model updates the BIFSG model with a factor, ϑ, representing the different information about RH in the X variables. If the X variables are independent of RH, then $P\,(RH = rh, \mid X = x)\,] \,/\, P(RH) = 1$ and the estimator is just the BIFSG estimator.

$P\,(RH = rh, X = x, FSG = fsg) = [P\,(RH = rh, FSG = fsg)\, P\,(RH = rh, X = x)\,] \,/\, P(RH)$

and

$P\,(RH = rh, X = x) = P\,(RH \mid X, \vartheta)\, P(X)$

where the parameters ϑ *are* estimated.

Thus,

EXTENDED MODEL: $\boldsymbol{P\,(RH = rh \mid X = x, FSG = fsg, \vartheta) = [P\,(RH \mid X, \vartheta)\, P(RH \mid FSG)]/\, P(RH)}$**.**

The Treasury extended BIFSG model incorporates the joint distributions of RH and the following tax variables (Xs): total income, filing status, age, number of dependents, taxable interest, and presence of farm income. As explained in Fisher (2023), the tax variables chosen were judged likely to be predictive of RH and mediating variables between RH and other tax variables. The number of variables needs to be

limited to reduce computational difficulty and prevent issues related to overfitting. Choosing the appropriate variables, those with the most value added, is the subject of ongoing research.

Importantly, Treasury's extended model preserves the joint distributions of each of the chosen variables with RH as found in the first step of the modeling procedure. That is, if we sum over the tax variables used in the model, the result will be the BIFSG model probabilities. The final step of the extended modeling procedure (an iterative process) looks for the best solution to estimating RH given first name, last name, address, and the tax variables. Including the tax variables is important to refining the RH probabilities. For example, without including the joint probability of income given RH in the estimation procedure, income would only be associated with RH through the address, first name or last name of the individual. With its inclusion, income can have a direct effect on being a particular RH group.

The classifications of RH that we are using are Hispanic, White, Black, Asian (including Hawaiian Native and other Pacific Islander), Native American (including Alaskan Native), and Multiple Race. This is the classification taxonomy used in the BIFSG literature and is also one of the official Census classifications. The categories are mutually exclusive. Individuals who identify as Hispanic and another category are categorized as Hispanic (not multiple race). Individuals who identify as Mid-Eastern are categorized as White. There are other more refined classifications that we could use but, as will be discussed, we run into problems with the current classification with certain categories having a small number of families in them, especially with multiple race and Native American.

2.4 Comparison to Census

Table 1 compares the distribution of RH as measured by the U.S. Census Bureau's 2020 Decennial census for the U.S. residential adult population and the distribution of RH in Treasury's model for the primary

filer on a return (what is referred in this paper as the family's RH) for 2023, the first year of the Budget period.

There are conceptual differences between the two distributions. Census' adult population includes dependents over 18 and secondaries on a joint return; neither of these categories show up in the Treasury counts of primaries. To the extent that RH of adult dependents and secondaries is not distributed the same as other adults, the comparison will be imperfect. With these limitations in mind, Table 1 shows that the Treasury's model is more likely to sort multiple race primaries into a single RH designation and White primaries may be somewhat overrepresented.

TABLE 1: COMPARING U.S. POPULATION BY RACE AND ETHNICITY

Race/Ethnicity	Census 2020 Adults		Treasury 2023 Families/Primaries	
	Millions	%	Millions	%
Total	259.5	100	186.5	100
White	157.4	61	124.1	67
Hispanic	43.4	17	28.2	15
Black	30.3	12	19.7	11
Asian	16.2	6	11.0	6
Native American	2.2	1	1.3	1
Some other race alone	1.2	0.5	-	-
Multiple race	8.8	3	2.2	1

Source: U.S. Census Bureau, Decennial Census Table P4, "Hispanic or Latino, and Not Hispanic or Latino by Race for the Population 18 years and over."

2.5 Testing the methodology on U.S. Army applicant data

The BIFSG model is the most widely used model to impute RH. Our imputation takes the BIFSG model as a starting point and improves it with the tax data. We have tested our extension of the BIFSG model to the original BIFSG model, with promising results, especially with regard to imputing the probabilities of being Black or Hispanic. With permission of the U.S. Army, we tested our model by bringing the estimation procedure to the universe of U.S. army applicants. These data include the applicant's first name, surname, address, marital status, and income as well as self -reported race. Thus, we were able to test the BIFSG model against the extended model using marital status and income as the Xs in the extended version. In short, the Treasury's extended model results were very similar in predicting the joint distribution of marital status and income by race for White applicants, slightly improved for Hispanic applicants, much improved for Black applicants, but not improved for Asian applicants. This testing is encouraging but not definitive. Relative to the general population as represented in the tax data, Army applicants are much less likely to be Asian and are more likely to be low income and single. Treasury expects to further test the imputation with Census data.

In detail, our testing involved estimating the Kullback-Liebler (KL) distance between the estimated joint distributions ($\hat{P}$) of income and marital status (Xs) under the BIFSG model and the extended model as compared to the distributions as tabulated using the actual RH values in the military applicant data.

The KL distances for the BIFSG model and extended model are as follows (where ξ represents parameters from the look-up tables for first name and last name).

$$KL\left(\hat{P} \parallel P\right)_{BIFSG} = \sum_{x} P\,(X|RH = rh)\log\left(\frac{P(X|RH = rh)}{\tilde{P}(X|RH = rh, \xi)}\right)$$

$$KL\left(\hat{P} \parallel P\right)_{extended} = \sum_{x} P\left(X|RH = rh\right)\log\left(\frac{P(X|RH = rh)}{\frac{\hat{P}(RH = rh|X,\theta)}{P(RH = rh)}\tilde{P}(X|RH = rh,\xi)}\right)$$

The only difference is the extra term in the extended model: $\frac{\hat{P}(RH=rh|X,\theta)}{P(RH=rh)}$.

Thus, the difference between the KL measures for the extended model and the BIFSG measure can be estimated as follows:

$$KL\left(\hat{P} \parallel P\right)_{ext} - KL\left(\hat{P} \parallel P\right)_{BIFSG} = -\sum_{x} P\left(X|RH = rh\right)\log\left(\frac{\hat{P}(RH = rh|X,\theta)}{P(RH = rh)}\right)$$

$$= -\sum_{x} P\left(X|RH = rh\right)\log\left(\frac{\hat{P}(X|RH = rh,\theta)}{P(X)}\right)$$

$$= -\sum_{x} P\left(X|RH = rh\right)\log\left(\frac{\hat{P}(X|RH = rh,\theta)}{P(X|RH = rh)}\frac{P(X|RH = rh)}{P(X)}\right)$$

$$= \sum_{x} P\left(X|RH = rh\right)[\log\left(\frac{P(X|RH = rh)}{\hat{P}(X|RH = rh,\theta)}\right) - \log\left(\frac{P(X|RH = rh)}{P(X)}\right)$$

$$= \sum_{x} P\left(X|RH = rh\right)[\log\left(\frac{P(X|RH = rh)}{\hat{P}(X|RH = rh,\theta)}\right] - \sum_{x} P\left(X|RH = rh\right)\log\left(\frac{P(X|RH = rh)}{P(X)}\right)$$

Let

$$D_{X|RH,rh} = \sum_{x} P\left(X|RH = rh\right)[\log\left(\frac{P(X|RH = rh)}{\hat{P}(X|RH = rh,\theta)}\right)$$

And

$$D_{X} = \sum_{x} P\left(X|RH = rh\right)\log\left(\frac{P(X|RH = rh)}{P(X)}\right)$$

When the extended model performs better in terms of the KL measure, the difference between the KL distances should be negative, that is, $D_X > D_{X|RH,rh}$. For the military applicant data, these measurements are as given in Table 2. From the table we can see that relative to the BIFSG model, the KL distance under Treasury's extended model is virtually the same for White applicants, lower for Hispanic and Black applicants and higher for Asian applicants. Given that Asian applicants are only 1 percent of all military applicants but 6 percent of the U.S. resident population, we do not consider the results for Asian applicant RH from the military data to be definitive. It is also true that, since the sample has conditioned on being an Army applicant, the joint distribution of income, marital status, race, and geography are not the same as the ITM population. Therefore, although we are less confident in the Asian probabilities for the general model, this does not give us evidence to contradict the model or method in the ITM. We will only be using the largest three categories in our RH analysis of tax expenditure: White, Hispanic, and Black.

TABLE 2: COMPARING KL DISTANCES

Race or Ethnicity	D_X	$D_{X\|RH,rh}$
White	0.0080	0.0079
Hispanic	0.0056	0.0024
Black	0.1190	0.0072
Asian	0.0610	0.0936
Native	0.0500	0.0840
Mulitple	0.0200	0.0130

2.6 Clarifications and Limitations

Treasury's research on imputing RH is ongoing. We expect to further improve the imputation over time. This section clarifies some characteristics of our imputation and current limitations of our method.

RH is not considered in the ITM extrapolation. Race is imputed to the base year of the ITM model, currently 2016 and soon to be 2019. The baseline data is extrapolated from the base year to cover the ten-year Budget period (currently 2023 to 2034). Each year of the Budget period, the ITM reweights the

2016 data to reflect the expected growth in income and population and many other variables. RH is not part of this reweighting process. The RH weights are attached to the base year and carried forward. An unweighted return with a 90 percent probability of being White in 2016 and a weight of 1,000 in 2016 but a weight of 1,100 in 2034 will represent 900 White families in 2016 and 990 White families in 2034. This is the current state of the model. Treasury's RH analyses so far (this paper and Costello et. al (2022)) have only considered early years in the Budget period so it is unlikely that changes in RH probabilities over longer periods of time will affect the current study.

Geocoding based on 2010 Census. Treasury is using 2010 Census ZIP Code Tabulation Areas (ZCTAs) for geocoding by RH. We have not updated to the 2020 geocodes by RH but will do so when they become available to us. The older RH distributions within a ZCTA may differ from the 2020 RH distributions within a ZCTA, and the latter will not be reflected in our imputation.

Limited tax applications because of Non-RH Imputations on Treasury's ITM. Treasury's methodology for imputing race to tax data is a function of certain relationships in the tax data, namely the address on the tax forms, the first name and last name of the primary filer (the first person listed on the return) and certain tax variables. Of consequence, RH is not the only imputation that Treasury has on its model. When applying our imputations of RH to tax outcomes, we must be careful not to consider tax estimates that are based on imputations that did not consider race and Hispanic origin when imputed. Some of the imputations to the ITM will be robust to the RH imputation methodology. Exact matches using social security numbers (SSN) preserve the relationship between first name, last name, address, and other tax variables. Exact matches include matches to social security records on age and nontaxable social security income. Likewise, the nonfiler imputation is based on the same random sampling technique as the base

file and is therefore arguably usable with the RH imputation.[4] In contrast, the current versions of the ITM and Treasury's distribution model (DM) include imputations for wealth, pension participation, the value of employer-provided fringe benefits, the insurance value of Medicare and Medicaid, and public assistance, among others. These imputations do not incorporate direct differences by RH, though indirect effects operating through income and other variables that may be related to RH are possible. As a result, we will be limited in the number of tax expenditures that we will look at by RH. We will not consider tax expenditures related to pensions for example. We will also not be able to use the standard Treasury distributional methodology (Cronin (2022)) which relies on many imputations to achieve a better measure of well-being. Instead, we will use adjusted gross income (AGI) plus non-taxable Social Security Benefits to rank families by ability-to-pay.

High Variance for Native American and Multiple-Race Designations. The imputation model (as with the standard BIFSG model) does a poor job of identifying Native American and multiple race filers. The total counts are too small to result in reliable estimates. Table 3 illustrates the problem. It shows the coefficients of variation (CVs) for the percent of families by RH within each AGI class. These are the AGI classes used in the imputation. The CVs for most of the income distribution for White, Black, Hispanic and Asian are reasonably low but the CVs for Multiple Race and Native American are large. The high uncertainty for these RH/AGI combinations comes from a combination of sampling error and variance from the parameter estimates. Also of note, the CVs for certain very high-income Black families are also large. This uncertainty, along with the results from the Army applicant data, has led us to reserve any conclusions about Asian, Native American or mixed-race tax units pending further research, and to combine incomes over $250,000 into one category. We will also be using confidence intervals in the

[4] Even this is possibly problematic since all nonfilers in Treasury's model are represented by persons who have some information return on file (such as a 1095, W-2 or 1099). To the extent that nonfilers with some interaction with the tax system have a different distribution of RH than nonfilers without any interaction with the tax system, the imputed RH for nonfilers may be skewed.

horizontal equity analysis, partly because the size of the CVs vary by RH. The current analysis only uses the White, Black and Hispanic RH designations. We expect to be able to expand to other RH designations in future research.

Table 3: Coefficients of Variation for the Percent of Families in Each AGI class

AGI Class	White	Hispanic	Black	Asian	Native	Multiple
$0 to $9,999	0.69	1.45	1.34	1.75	7.58	5.39
$10,000 to $19,999	0.76	1.41	1.71	2.94	14.52	9.77
$20,000 to $29,999	0.81	1.46	2.26	3.82	16.54	12.99
$30,000 to $49,999	0.64	1.41	2.47	3.44	13.30	11.20
$50,000 to $74,999	0.65	1.71	2.96	4.01	21.79	12.43
$75,000 to $99,999	0.80	3.04	4.17	4.15	24.48	35.77
$100,000 to $149,999	0.66	3.32	5.27	4.89	32.03	34.60
$150,000 to $199,999	1.20	5.08	9.71	7.50	46.94	38.33
$200,000 to $499,999	0.62	3.71	8.20	3.97	38.67	34.74
$500,000 to $999,999	0.92	4.86	10.99	5.11	32.20	44.06
$1,000,000 to $1,999,999	0.90	4.99	19.40	6.91	39.48	56.60
$2,000,000 to $4,999,999	0.55	3.06	6.31	4.00	44.82	20.35
over $4,999,999	0.46	4.24	5.59	4.19	22.36	24.24

3. INDIVIDUAL INCOME TAX EXPENDITURES

The Congressional Budget Act of 1974 defines tax expenditures as “revenue losses attributable to provisions of the Federal tax laws which allow a special exclusion, exemption, or deduction from gross income or which provide a special credit, a preferential rate of tax, or a deferral of tax liability.’’ These exceptions may be viewed as alternatives to other policy instruments, such as spending or regulatory programs. The law did not specify the baseline, against which to identify and estimate tax expenditures.

For purposes of this analysis, tax expenditures are measured against a reference tax law that is based upon the tax law enacted as of July 31, 2021 and reflects the economic assumptions from the Midsession Review of the Fiscal Year 2022 Budget. The reference tax law baseline allows several major departures from a pure comprehensive income tax baseline, the latter of which defines income as the sum of consumption and the change in net wealth in a given period of time. For example, under reference tax law, income is taxable only when it is realized in exchange. Thus, the deferral of tax on unrealized capital gains is not regarded as a tax expenditure under reference law. The benefit of being able to choose when to realize certain capital income will not be considered in this study. Further, individual tax rates, including the brackets start and end points, the standard deduction, and personal exemption, are allowed to vary with marital status under reference tax law. The benefit of filing jointly or as a head of household will not be considered in this study.

Each tax expenditure is estimated as if the tax law provision providing the tax expenditure were repealed assuming no other changes in the tax code and no changes to behavior other than optimizing entries on one's tax return in order to minimize tax liability. For example, repealing the home mortgage interest itemized deduction might cause more taxpayers to choose to take a standard deduction rather than itemizing. Changing this entry on one's return could minimize tax liability and would be reflected in the tax expenditure estimate. However, repealing the home mortgage interest itemized deduction might also cause taxpayers to buy less expensive homes, resulting in lower deductions for property taxes. This is an example of a behavioral response and is not included in the tax expenditure estimate.

Further, tax expenditures (generally) cannot be added together to estimate the change of repealing multiple tax expenditures. For example, the estimate of repealing multiple itemized deduction provisions simultaneously would not be the same as the sum of the estimates of repealing each one individually. A taxpayer who claims an itemized deduction for both charitable contributions and home

mortgage interest, may minimize their tax liability by switching to a standard deduction if either deduction is repealed. After either is repealed such a taxpayer would not have any subsequent tax change from repealing a second itemized deduction. In this case, summing the tax expenditure estimates for the separate repeals of the mortgage interest deduction and the charitable contribution deduction would exceed the estimate of the simultaneous repeal of the two deductions.

In this paper, where applicable, we have included the outlay portion of each tax expenditure in our benefit estimates. An outlay is an amount a taxpayer receives that is in excess of their individual income tax liability. Individual income tax credits may be refundable or nonrefundable. Nonrefundable tax credits only reduce income tax liability. Amounts in excess of tax liability are unused. Refundable credits reduce income tax liability and any amount in excess of tax liability is given to the taxpayer as a payment or outlay.

The Earned Income Tax Credit (EITC) is a refundable individual income tax credit. The FY2023 tax expenditure for the EITC is $2.8 billion. This is the change in government receipts for FY2023 arising from the EITC provision. The EITC is targeted toward low-income earners, many of whom do not have individual income tax liability. The outlay portion of the EITC in FY2023 was $64.4 billion. In this paper we consider the effects of both changes in tax receipts and changes in outlays. For FY2023, this would mean estimating average benefits by race for the entire $67.2 billion Budget expenditure for the EITC provision.

Finally, many tax expenditures are dependent on imputed data. For example, the third largest tax expenditure, the exclusion of net imputed rental income, requires imputations of housing rental values. These values may vary with RH but they were not imputed to OTA's individual tax model (ITM) using RH. As a result, we cannot, without further investigation, reasonably estimate the tax expenditure for net imputed rental values by RH using the methodology explained above. Our methodology relies on using

variables that are exactly matched to the address, first names, and surnames used in our RH imputation methodology. Improvements to existing imputations and corresponding extensions to cover more tax expenditures may be considered in future research.

A list of the largest individual income tax expenditures (including outlays) in terms of dollars of expenditures is given in Table 4. For the reasons discussed above, this paper will only consider those tax expenditures among the top 15 tax expenditures that do not rely on additional imputations for their estimation. These tax expenditures are indicated in bold.

TABLE 4: ESTIMATES OF THE 15 LARGEST INDIVIDUAL INCOME TAX EXPENDITURES PLUS OUTLAYS FISCAL YEAR 2023[1]

(in billions of dollars, fiscal year calculation)

1	**Exclusion of employer contributions for medical insurance premiums and medical care**	**225**
2	**Preferential rates for certain capital gains and qualified dividends**	**146**
3	Exclusion of net imputed rental income	135
4	**Child credit (including outlay)**	**113**
5	Defined contribution employer retirement plans	109
6	Defined benefit employer retirement plans	75
7	**Deductibility of charitable contributions**	**71**
8	**Earned income tax credit (including outlay)**	**67**
9	**Allow 20-percent deduction to certain pass-through income**	**57**
10	Step-up basis of capital gains at death	46
11	Capital gains exclusion on home sales	45
12	**Premium assistance tax credit (including outlays)**	**36**
13	Self-Employed plans	35
14	**Deductibility of mortgage interest on owner-occupied homes**	**31**
15	Social Security benefits for retired and disabled workers and spouses, dependents and survivors	28

[1] Source: https://home.treasury.gov/policy-issues/tax-policy/tax-expenditures. In this table FY2023 outlays for each provision have been combined with the published tax expenditures; deductions for all charitable contributions have been combined and the preferential rate for qualified dividends has been combined with the preferential rate for certain long term capital gains.

3.1 Summaries of each provision we analyze[5]

TE1. Exclusion of employer contributions for medical insurance premiums and medical care ($225 billion). Under the baseline tax system, all compensation, including dedicated payments and in-kind

[5] The descriptions here are taken from the Tax Expenditure (TE) document found on OTA's website (Tax-Expenditures-FY2023.pdf (treasury.gov)) The estimates in Table 4 use forecasted parameter values (available at the time of estimation, mid-year 2021). The descriptions in the text have been updated to the actual parameter values for 2023 which reflect updated inflation expectations. The estimates in Table 2 are the fiscal year 2023 estimates found in Table 2b of the same document. In Table 2b, the exclusion of employer contributions for medical insurance premiums and medical care is TE 122; The preferential rate for certain capital gains and qualified dividends are TEs 67 and 68; The child credit is TE 134 with outlays listed in footnote 13. The deductibility of charitable contributions is TEs 104, 117 and 129. The EITC is TE 153 with outlays listed in footnote 15. Allow 20-percent deduction to certain pass-through income is TE 79. Refundable Premium Assistance Tax Credit is TE 127 with outlays listed in footnote 11. Deductibility of mortgage interest on owner-occupied homes is TE 55.

benefits, should be included in taxable income. In contrast, under current law, employer-paid health insurance premiums and other medical expenses (including long-term care or Health Reimbursement Accounts) are not included in employee gross income even though they are deducted as a business expense by the employer.

TE2. Preferential rates for certain capital gains and qualified dividends ($146 billion). The baseline tax system generally would tax all income under the regular tax rate schedule. It would not allow preferentially low tax rates to apply to certain types or sources of income. For individuals, tax rates on regular income vary from 10 percent to 37 percent in 2023 (plus a 3.8 percent surtax on high income taxpayers), depending on the taxpayer's income. In contrast, under current law, certain capital gains on assets held for more than one year and qualified dividends are taxed at a preferentially low rate that is no higher than 20 percent (plus the 3.8 percent surtax).

TE4. Child credit ($113 billion). The baseline tax system would not allow credits for particular activities or targeted at specific groups. Under current law, however, taxpayers with children under age 17 can qualify for a child credit. In taxable years 2023, taxpayers may claim a $2,000 per child partially refundable child credit. Up to $1,600 per child of unclaimed credit due to insufficient tax liability may be refundable; taxpayers may claim a refund for 15 percent of earnings in excess of a $2,500 floor, up to the lesser of the amount of unused credit or $1,600 per child. To be eligible for the child credit, the child must have a Social Security Number (SSN). A taxpayer may also claim a nonrefundable credit of $500 for each qualifying child not eligible for the $2,000 credit (those without SSNs) and for each dependent relative. The total combined child and other dependent credit is phased out for taxpayers at the rate of $50 per $1,000 of modified AGI above $400,000 ($200,000 for single or head of household filers and $200,000 for married taxpayers filing separately).

TE7. Deductibility of charitable contributions ($71 billion). The baseline tax system would not allow a deduction for personal expenditures including charitable contributions. In contrast, the Tax Code provides taxpayers a deduction for contributions to charitable, religious, nonprofit educational, nonprofit health, and certain other nonprofit organizations. Taxpayers who donate capital assets to charitable organizations can deduct the assets' current value without being taxed on any appreciation in value. An individual's total charitable contribution generally may not exceed 60 percent of adjusted gross income in 2023.

TE8. Earned income tax credit (EITC) ($67 billion). The baseline tax system would not allow credits for particular activities or targeted at specific groups. In contrast, the Tax Code provides an EITC to low-income workers at a maximum rate of 45 percent of income. In 2023, for a family with one qualifying child, the credit is 34 percent of the first $11,750 of earned income. The credit is 40 percent of the first $16,510 of income for a family with two qualifying children, and it is 45 percent of the first $16,510 of income for a family with three or more qualifying children. Low-income workers with no qualifying children are eligible for a 7.65 percent credit on the first $7,840 of earned income. The credit plateaus and then phases out with the greater of AGI or earnings at income levels and rates which depend upon how many qualifying children are eligible and marital status.

TE9. Allow 20-percent deduction to certain pass-through income ($57 billion). The baseline tax system generally would tax all income under the regular tax rate schedule. It would not allow deductions and exemptions or preferentially low (or zero) tax rates to apply to certain types or sources of income. In contrast, for tax year 2023, the Tax Code allows for a deduction equal to up to 20 percent of income attributable to domestic pass-through businesses, subject to certain limitations.

TE12. Refundable Premium Assistance Tax Credit ($36 billion). The baseline tax system would not allow credits for particular activities or targeted at specific groups. In contrast, for taxable years ending after

2013, the Tax Code provides a premium assistance credit to any eligible taxpayer for any qualified health insurance purchased through a Health Insurance Exchange. In general, an eligible taxpayer is one who does not have access to affordable minimum essential health care coverage. The amount of the credit equals the lesser of (1) the actual premiums paid by the taxpayer for such coverage or (2) the difference between the cost of a statutorily identified benchmark plan offered on the exchange and a required payment by the taxpayer that increases with income.

TE14. Deductibility of mortgage interest on owner-occupied homes ($31 billion). Under the baseline tax system, expenses incurred in earning income would be deductible. However, such expenses would not be deductible when the income or the return on an investment is not taxed. In contrast, in 2023 the Tax Code allows the owner-occupant to deduct mortgage interest paid on his or her primary residence and one secondary residence as an itemized non-business deduction. In general, the mortgage interest deduction is limited to interest on debt no greater than the owner's basis in the residence and is also limited to interest on debt of no more than $1 million ($750,000 for indebtedness incurred after December 15, 2017).

4. RESULTS

As discussed in the Introduction, we consider two measures of RH equity. First, we consider the share of tax expenditures received by families in each RH category. We compare the tax expenditure shares to population shares by RH. This gives a sense of whether the total dollars being spent on exceptions to the general rules of the Tax Code are being distributed equitably by RH.

Second, we consider a horizontal equity approach; we estimate whether families with different RH who have the same income receive the same tax treatment. Horizontal equity could also be evaluated by

conditioning on marital status, presence of children, age, and a host of other characteristics to define what makes two families of differing RH otherwise similar. We expect to extend our analysis to include marital status and the presence of children in future research.

One concern with using any characteristic to define "similarly situated" is that there may be barriers to attaining certain characteristics, such as having a high income. Those barriers may vary by RH and may also be affected by the Tax Code. So, while horizontal equity defined by some set of characteristics may be a necessary condition for deciding if the Tax Code is RH neutral, it may not be sufficient. To place the horizontal equity results (Section 4.3) in context, Section 4.2 shows the distribution of RH by income decile. As will be shown in the that section, there are relatively few high-income Black or Hispanic families.

4.1 Distribution of Tax Expenditures by RH

Table 5 shows the distribution of TEs amounts by RH.[6] The distribution of families by RH is given as a reference in the first row. In the first bank estimates for eight TEs, measured in billions of dollars, are distributed across the RH groups. For example, the TE estimate for the exclusion of employer contributions for medical insurance is $225 billion, $186 billion of which accrues to White families. The second bank shows the share of the tax expenditure estimate that accrues to each RH group. For example, 67 percent of the tax expenditure for the exclusion of employer contributions for medical care accrues to White families ($186 billion of the $225 billion). The third bank shows the average TE amount for families in each RH group. To allow for wider data columns, the titles for the TEs have been shortened in some cases; the full titles were given in the descriptions above in Section 3.

[6] The ITM is a calendar year model. Table 5 was produced by prorating the calendar year model results to the FY2023 Budget estimates in Table 4.

As can be seen in Table 5, of the 8 TEs we examine, every TE that is not a refundable credit disproportionately benefits White families. White families are 67 percent of all families but receive 82 percent of the benefits of the exclusion for employer contributions for medical insurance and medical care (ESI), 92 percent of the benefits of preferential rates for certain capital gains and qualified dividends, 91 percent of the benefits of the deductibility of charitable contributions, 90 percent of the benefits of the 20 percent deduction for certain pass though income (qualified business income or QBI), and 84 percent of the benefits of the deductibility of mortgage interest on owner-occupied homes (HMID). In contrast, Hispanic families are 15 percent of all families but receive 22 percent of the benefits of the child tax credit (CTC) and 28 percent of the benefits of the Earned Income Tax Credit (EITC). Black families are 11 percent of all families but receive 19 percent of the benefits of the EITC.

TABLE 5: TAX EXPENDITURES BY RACE AND ETHNICITY FY 2023

	ALL	WHITE	HISPANIC	BLACK	OTHER
Total Number of Families (Millions)	186	124	28	20	14
			($Billions)		
Exclusion of employer cont. for medical insurance & care	225	186	21	11	8
Preferential rates capital gains and dividends	146	135	4	2	5
Child credit (including outlay)	113	75	24	10	4
Deductibility of charitable contributions	71	64	2	2	2
Earned income tax credit (including outlay)	67	33	19	13	3
Allow 20-percent deduction to QBI	57	51	3	1	2
Premium assistance tax credit (including outlays)	36	24	6	3	3
Deductibility of mortgage interest	31	26	2	1	1
			(Percent Distribution)		
Total Number of Families	100	67	15	11	8
Exclusion of employer cont. for medical insurance & care	100	82	9	5	3
Preferential rates capital gains and dividends	100	92	3	2	4
Child credit (including outlay)	100	66	22	9	3
Deductibility of charitable contributions	100	91	3	3	3
Earned income tax credit (including outlay)	100	49	28	19	4
Allow 20-percent deduction to QBI	100	90	5	2	4
Premium assistance tax credit (including outlays)	100	66	18	8	8
Deductibility of mortgage interest	100	84	7	4	5
			($Average per Family)		
Exclusion of employer cont. for medical insurance & care	1,207	1,495	739	558	533
Preferential rates capital gains and dividends	784	1,086	131	124	370
Child credit (including outlay)	606	605	867	491	256
Deductibility of charitable contributions	379	516	87	105	150
Earned income tax credit (including outlay)	360	264	662	661	188
Allow 20-percent deduction to QBI	304	410	91	49	155
Premium assistance tax credit (including outlays)	195	195	228	147	200
Deductibility of mortgage interest	168	213	77	63	103

In terms of relative average benefits, preferential rates for capital gains and dividends has the most disparate benefits by RH. The average family benefit from preferential rates is eight times higher for White families than Hispanic families and nine times higher for White families relative to Black families.[7] The tax expenditure for QBI is a close second in terms of disparity by RH; the average family benefit is five times higher for White families relative to Hispanic families and eight times higher for White families relative to Black families. The CTC and premium assistance tax credit (PTC) have the least disparate benefits by RH. Average family benefits from the CTC are about 40 percent higher for Hispanic families relative to White families and about 20 percent higher for White families relative to Black families. Average family benefits from the PTC are about 20 percent higher for Hispanic families relative to White families but about 30 percent higher for White families relative to Black families.

Some of the difference in the tax expenditures related to children (EITC and CTC) are due to differences in the number of children by RH. In general, Hispanic families have more dependent children (under age 19) than White or Black families throughout the income distribution.[8] Low- and middle-income Black families have more dependent children under age 19 than White families but high-income Black families in our model have fewer dependent children under age 19 than high-income White families.

4.2 Distribution of Income by RH

Treasury's standard distributional analysis methodology (Cronin (2022)) uses a broad measure of income to rank families by ability-to-pay. This income measure includes nontaxable fringe benefits, such as employer paid medical insurance, and it includes nontaxable transfers, such as social security benefits and welfare benefits. Most of these benefits require imputations to the tax data. These imputations do

[7] The averages in Table 5 include families with no benefit. In contrast, Figures 6-13 (discussed in Section 4.3) show average non-zero benefits.
[8] Children under 19 is just a benchmark for eligibility. The CTC and EITC have differing eligibility rules regarding a qualifying child's age.

not vary by RH and therefore cannot reliably be used in the current analysis without careful consideration.[9] Instead, we use adjusted gross income plus nontaxable social security benefits to rank families into income deciles. We can match the nontaxable social security benefits to the correct returns by the individual's SSN. Excluding nontaxable fringe benefits, such as employer sponsored insurance, and nontaxable transfers, such as the insurance value of Medicare and Medicaid, will affect our results to the extent that certain families will have the same income and will be ranked the same in our analysis even though one may have a nontaxed fringe benefit or transfer income, and another does not or has a lower total value of for these benefits. Our standard methodology also adjusts income by family size, and we have not used family-size adjustments in this paper. As a result, in general, the lower income deciles in this paper will have more single-person families than the higher-income deciles, and families with children may be ranked higher than in our standard distributional analyses. To the extent that family size and composition also vary by RH, this may affect our results. We expect to extend our analysis to look at results by income, filing status and number of children to address this concern.

Our standard methodology also breaks the top decile into the top 5, top 1 and top 0.1 percent. Our race imputation cannot show this level of detail, as the variances of the estimates become too large to measure benefit rates or average benefits with any precision. Instead, we split the top decile into the 90th to 95th percentiles and the top 5 percent. Deciles of family income are defined as follows: first decile ($0 to $8,106), second decile ($8,106 to $16, 696), third decile ($16,696 to $25,702), fourth decile ($25,702 to $35,530), fifth decile ($35,530 to $46,604), sixth decile ($46,604 to $62,547), seventh decile

[9] To the extent that the imputations to the ITM and DM are mediated by variables also used in the RH imputation, it may be possible to include the imputations in our analysis. This is a subject of ongoing research.

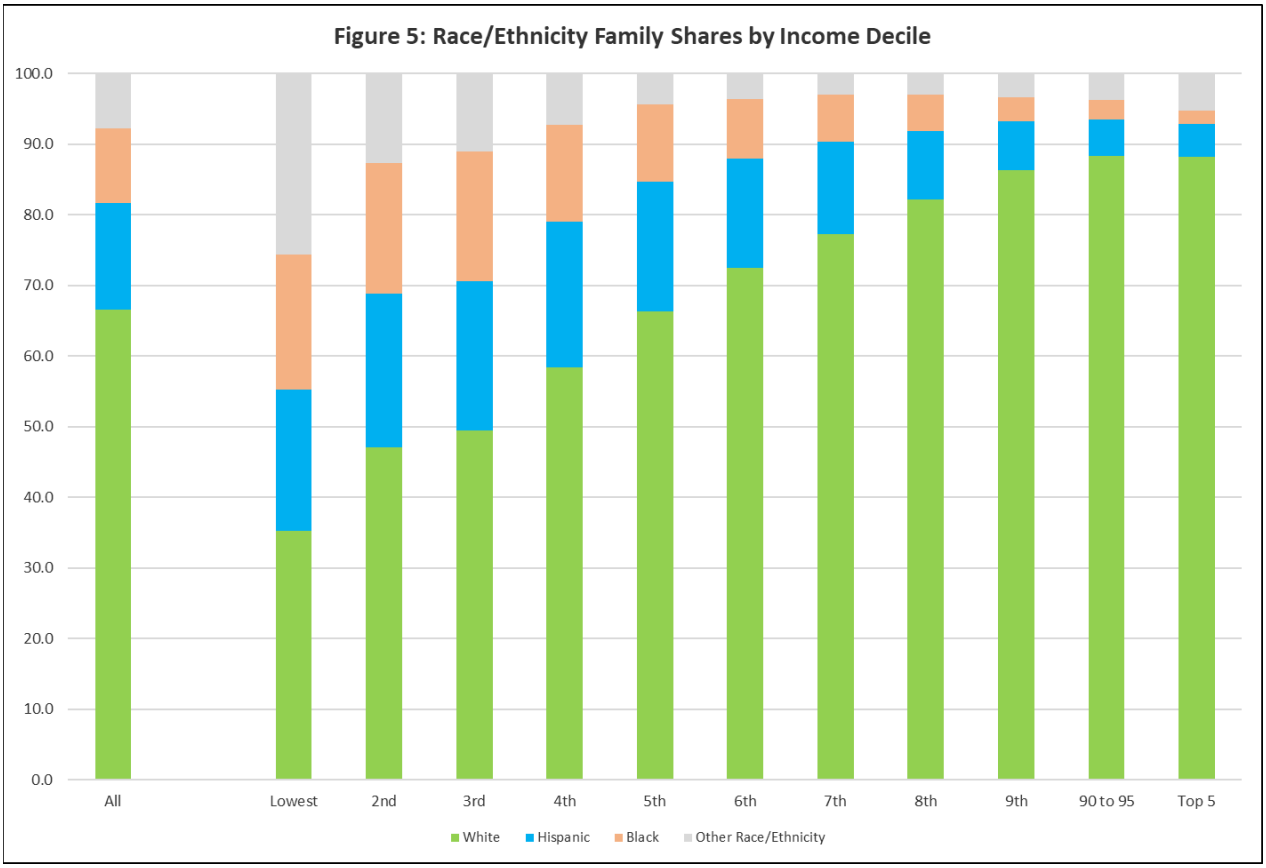
($62,547 to $82,185), eighth decile ($82,185 to $113,925), ninth decile ($113,925 to $171,247), 90th to 95th ($171,247 to $252,773) and top 5 (over $252,773).[10]

Figure 5 shows the share of families by RH for the total population and by income decile. White families account for about 67 percent of the total population (left most bar), Hispanic families account for about 15 percent of the total population, Black families about 11 percent, and other RH (Asian, Native American, and multiple race families) account for the remaining 8 percent. The share of White families in a decile grows with income. The lowest income decile is composed of 35 percent White families, 20 percent Hispanic families, 19 percent Black families, and 26 percent families of other RH.[11] In contrast, the top 5 percent of the income distribution is composed of 88 percent White families, 5 percent Hispanic families, 2 percent Black families, and 5 percent families of other RH.

As will be shown in the figures in section 4.3, for most TEs that we consider, benefit rates and average benefits rise with income. Since the share of White families also rises with income across deciles, it is not surprising that most TE dollars accrue disproportionately to White families.

[10] Following standard Treasury distributional analysis, we do not include families with negative income in the first decile, but they are included in the total and in defining the breaks for deciles. Families with negative income are not typical of low-income families. They have characteristics that are consistent with high-income families and including them in the lowest decile would muddle the analysis, making it more difficult to determine how tax policy affects typical low-income families.

[11] Native American families and multiple race families have particularly low income in our model.



4.3 Distribution of Tax Expenditures by RH and Income

Figures 6 – 13 show tax expenditure benefits by income deciles and by RH (figures are at the end of the paper). The order of figures is the same order as represented in Table 4, from the largest TE, the exclusion for employer contributions to medical insurance and medical care (estimated to be $225 billion for FY2023) in Figure 6 to the smallest considered here, the itemized deduction for mortgage interest on owner occupied homes (estimated to be $31 billion for FY2023) in Figure 13. Each figure includes two graphs, one showing the benefit rate and a second graph showing the average tax benefit of the TE for families that have a nonzero benefit. The benefit rates and average benefits are shown separately for White, Hispanic, and Black families and each is shown as the mean plus and minus 2 standard deviations.

As is apparent in Figures 6 -13, both the benefit rates and the average tax benefits for those who receive a benefit increase with income for most of the tax expenditures we analyze, with the exceptions of the Earned Income Tax Credit (EITC) and the premium assistance tax credit (PTC), both of which are targeted at lower-income households and phase-out as income increases. The distribution of RH across income deciles (Figure 5) compared to the distribution of tax expenditures across income deciles (Figures 6-13) suggests that in general the largest tax expenditures will favor high-income deciles; deciles that are disproportionately composed of White families.

There are many reasons why tax expenditure benefits vary from family to family. In distributional analysis, we measure both vertical equity and horizontal equity. Vertical equity requires that those with greater ability-to-pay taxes, pay more taxes. With regard to TEs, this paper provides evidence that certain tax expenditures violate this rule of vertical equity. This may be by design. TEs are often exceptions to the tax code designed to encourage certain behaviors, such as charitable giving, and those with a greater ability-to-pay will also have a greater ability to take advantage of the exceptions.

Horizontal equity requires that those with the same ability-to-pay are treated similarly and pay the same taxes. The difficulty in measuring horizontal equity is deciding what factors determine who has the same ability-to-pay. We might agree that, holding income constant, larger families, single parent families, and families with large expenses have a lower ability-to-pay but any one of these factors may be correlated with RH. Circumstances, opportunities, and behavior vary by RH and those factors can affect tax expenditure benefits. In this paper, we focus exclusively on income (AGI plus nontaxable social security benefits) when trying to put families on equal footing to measure horizontal equity. Further research will be needed to explain why differences in horizontal equity by RH occur.

4.3.1 Estimating Statistically Different Outcomes using Standard Deviations

The ITM produces *estimates* of tax expenditures. We use a sample of tax returns (both filers and nonfilers) to represent the entire population. The tax sample is large, and the sample design accounts for low occurrence returns (like very high income returns) to reduce the variance in our estimates but still the ITM only gives an estimate of the true expenditure. Likewise, the RH imputation results in estimated probabilities of being in a particular RH group. Both the sampling technique and the RH imputation will have standard errors or deviations.

In a normal distribution, 95 percent of the data values will fall within 2 standard deviations of the mean. Figures 6 to 13 show the mean benefit rates and mean average (nonzero) benefit plus or minus 2 standard deviations. If the ranges for the benefit rates or averages are overlapping, we will refer to them as not statistically different. It is possible that benefit rates or average benefits may be measured as not statistically different when, in truth, they are different (truth here is the result we would get if we had data for the entire population and knew RH with certainty). Unfortunately, in some cases, our estimates will have high variances because the estimates themselves are poor, usually because of a lack of data.

The variance measure shown in the figures accounts for both sampling variance and variance in the RH imputation. The sampling variance is calculated using 100 replicates of each sampling strata in the current sample of over 350,000 returns which represent both the filing and nonfiling populations. The replicates are subsamples of the entire sample. The entire sample is used to estimate the mean. The subsamples are drawn randomly, reweighted to hit the population targets, and then replaced before the next random sample is drawn. This allows us to replicate any estimate on the ITM using the 100 alternate samples (alternate weights). This is a standard technique for calculating sample variances. This

part of the variance can be applied to any estimate from the ITM and is independent of the race imputation.

The RH variance arising from the Treasury extension of the BIFSG model is calculated using 100 replicates around the convergence of the joint distribution of the BIFSG variables and tax variables in predicting RH. As detailed in the appendix of Fisher (2023), the Gibbs sampling algorithm used to estimate the ϑs (RH weights) in the extended model relies on 130 iterations to find the appropriate posterior distribution of ϑ. The last 100 iterations are assumed to be representative of the posterior distribution of ϑ and the average of these 100 is used in the model. We can also use the 100 estimates of ϑ to replicate any estimate on the ITM and thus estimate the variance for any estimate.

The combined sample and RH variances are estimated by combining the i^{th} (i=1 to 100) sample weight with the i^{th} RH weight. Thus, for any given estimate we have 100 sample and race replicates with which to estimate variance.

4.3.2 Vertical and Horizontal Equity Results for Each Tax Expenditure

The vertical and horizontal equity implications for each of the eight TEs we considered is discussed below.[12]

Figure 6: Exclusion of employer contributions for medical insurance premiums and medical care (ESI) ($225 billion). ESI benefit rates and average benefits increase with income. ESI is one of a number of federal subsidies for health care. Two other large programs (in terms of both coverage and expenditures) are targeted toward families with elderly members (Medicare) and low-income families

[12] Deciles of family income are defined as follows: first decile ($0 to $8,106), second decile ($8,106 to $16, 696), third decile ($16,696 to $25,702), fourth decile ($25,702 to $35,530), fifth decile ($35,530 to $46,604), sixth decile ($46,604 to $62,547), seventh decile ($62,547 to $82,185), eighth decile ($82,185 to $113,925), ninth decile ($113,925 to $171,247), 90^{th} to 95^{th} ($171,247 to $252,773) and top 5 (over $252,773).

(Medicaid). A complete analysis of federal subsidies for medical care would need to include these programs. Within income deciles, the horizontal equity results for ESI are mixed. The share of families with an ESI tax benefit in each decile is not statistically different by RH. However, among middle-income families, Hispanic and Black families have slightly higher average benefits than White families. Among high-income families, Black families have lower average benefits than White or Hispanic families. In the 9th decile, for example, we estimate that average ESI benefits for families with the benefit, range from $3,200 for Black families to $3,800 for White families and $4,000 for Hispanic families.[13]

Figure 7: Preferential rates for certain capital gains and qualified dividends ($146 billion). Benefits from preferential rates increase with income.[14] With regard to horizontal equity, within deciles and across most of the income distribution, the share of White families benefitting from preferential tax rates on capital gains and dividends is greater than the share of Hispanic or Black families receiving the benefit. In the 5th decile (middle of the income distribution), we estimate that 8 percent of White families benefit whereas less than 1 percent of Hispanic families and 3 percent of Black families benefit. For those with benefits, average benefits do not vary by RH and are relatively small until the top 5 percent. Average tax benefits for those with a benefit in the top 5 percent are higher for White families. Within the top 5 percent average benefits range from $16,900 for Hispanic families to $20,600 for Black families and $24,300 for White families.

Figure 8: Child credit ($113 billion). Benefits from the child credit increase with income, which is, in part, a mechanical result. The credit is only partially refundable, phases in at lower-income levels and phases out at high income levels (some top decile families are eligible for the credit). The horizontal

[13] Estimates in this section are point estimates; the confidence intervals are shown on the figures.
[14] The income measure is adjusted gross income plus nontaxable social security benefits. Adjusted gross income includes realized gains so it is not surprising that those with large amounts of realized gains are in the top of the income distribution.

equity results by RH are mixed. In general, middle- and upper-middle income Hispanic families are more likely to benefit than White families. The difference in benefit rates is most pronounced for the 8th decile where the likelihood of receiving a child tax credit ranges from 19 percent for Black families, to 22 percent for White families and 38 percent for Hispanic families. Average child credit benefits (for those who claim the credit) are higher for middle-income Hispanic families than White families (5th, 6th, and 7th deciles). Average child tax credit benefits for Black families are lower in the upper-middle income deciles (7th, 8th, and 9th deciles). In the 7th decile, the average child tax credit benefit ranges from $2,800 for Black families, to $3,300 for White families, and $3,500 for Hispanic families. These results are partly due to the distribution of children (individuals under age 19)[15] by income and RH. As estimated by our model, Hispanic families have more children on average than White or Black families. Black families that are lower and middle income also have more children on average than White families but Black families that have higher income have fewer children on average than White families.

Figure 9: Deductibility of charitable contributions ($71 billion). Benefit rates and average benefits from the deductibility of charitable contributions increase significantly with income. This is in part due to the fact that higher income households are more likely to itemize, and the value of itemized deductions increases with income because marginal tax rates increase with income. Within income deciles, the share of families benefitting from the deductibility of charitable contributions in a given income decile is not statistically different by RH (except in the 8th decile where Black families have slightly higher benefit rates). Average tax benefits for upper-middle income Black families are higher than for upper-middle income White or Hispanic families (7th, 8th, and 9th decile). In the 9th decile, average tax benefits from the

[15] Children eligible for the child credit must be under age 17 but the distribution of children under age 19 is not likely to differ from the distribution of children under age 17.

deduction for charitable contributions range from $800 for Hispanic families to $1,100 for White families and $1,800 for Black families.

Figure 10: Earned income tax credit (EITC) ($67 billion). Benefit rates and average benefits for the EITC rise and then fall with the income, mirroring the general structure of the credit, which first increases in value as earnings increase, then stays constant over a range of income, and then decreases as income increases further. There are no benefits for high income taxpayers. Within income deciles, the horizontal equity results by RH are mixed. In the lowest income decile, the share of White families that benefit is much higher than the share of Black or Hispanic families that benefit. The lowest income decile is disproportionately single and single individuals that are White are more likely to have earnings than single individuals that are either Black or Hispanic. Among middle-income families, the share of Hispanic and Black families that benefit is higher than the share of White families that benefit. Among lower income families, average EITC benefits are also higher for Hispanic and Black families.

Figure 11: Allow 20-percent deduction to certain pass-through income (QBI) ($57 billion). Benefit rates and the average benefit from the 20 percent deduction for QBI rise with income. This reflects the fact that higher income households are more likely to have qualified business income and the value of the QBI deduction increases with income since marginal tax rates rise with income. Within deciles, the share of families benefitting from the QBI deduction is not statistically different by RH in our measurements but there is suggestive evidence that White families are more likely to benefit across the income distribution. Average benefits for those families with QBI are relatively small until the highest decile. Within the top 5 percent, average benefits are higher for White families; average benefits range from $9,100 for Black families to $9,500 for Hispanic families and $11,100 for White families.

Figure 12: Refundable Premium Assistance Tax Credit (PTC) ($36 billion). Benefit rates and average benefits for the PTC are fairly flat, rising only slightly with income at low-income levels. By design, there

are no benefits for high income taxpayers. Within deciles, the share of families benefitting from the PTC does not vary by RH. Average benefits for those families with nonzero benefits are lower for middle-income Black families compared to White families (5^{th} and 6^{th} deciles).

Figure 13: Deductibility of mortgage interest on owner-occupied homes (HMID) ($31 billion). Benefit rates and average benefits from the HMID increase with income. This reflects the fact that higher income households are more likely to itemize, have greater amounts of mortgage interest expense, and the value of itemized deductions increase with income because marginal tax rates increase with income. Within deciles, the share of families benefitting from the HMID is not statistically different by RH. Average benefits for higher income Black and Hispanic families are slightly higher than for higher income White families (8^{th} and 9^{th} deciles).

4.3.3 Summary of Horizontal Equity Results

Table 6 summarizes the horizontal equity results found in Figures 6-13. In the table, all results are relative to White families. Blue shading and outlining is for Hispanic families and orange shading and outlining is for Black families. "Higher" indicates the benefit rate or average benefit is statistically higher for the identified group than for White families in the same decile; higher is shaded blue or orange. “Lower" indicates the benefit rate or average benefit for the identified group is statistically lower than for White families in the same decile; lower is outlined with blue or orange. Zeroes indicate that there no measured statistical difference among RH in the decile. Referencing back to the tax expenditure figures is necessary to see the magnitudes of “higher” and “lower.”

As seen in Table 6, in general, high-income Black families appear to have lower average benefits across a number of tax expenditures (ESI, preferential rates, child credit, and the QBI deduction). Lower and middle-income Hispanic families, and in some cases lower and middle-income Black families, have

higher benefit rates and higher average benefits than White families for a number of tax expenditures (ESI, child credit and EITC). The only tax expenditure that has a statistically significant negative tax treatment across the income distribution for both Black and Hispanic families relative to White families is the preferential rate for certain capital gains and qualified dividends. The same may be true for the 20 percent deduction to pass-through income, but this is not statistically significant. The disproportionate benefit of the preferential rates for capital gains and dividends accruing to White families is consistent with earlier findings (Moran and Whitford (1996) and Brown (2021)). In contrast the deduction for home mortgage interest, at least in this study, appears to have higher average nonzero benefits for upper-middle income Black and Hispanic families relative to White families. We have not explored why the HMID appears to favor these groups, but it's possible that upper-middle income Black and Hispanic homeowners face relatively higher interest rates or have relatively higher debt to value ratios than White families with similar incomes.

TABLE 6: SUMMARY OF HORIZONTAL EQUITY RESULTS[1]

Income Decile	RH	ESI		Pref Rates		Child Credit		Charity Ded		EITC		QBI Ded		PTC		HMID	
		Rate	Benefit	Rate	Benefit	Rate	Benefit	Rate	Benefit	Rate	Benefit	Rate	Benefit	Rate	Benefit	Rate	Benefit
Lowest Income	Hispanic	0	0	0	0	0	0	0	0	lower	0	0	0	0	0	0	0
	Black	0	0	0	0	0	0	0	0	lower	0	0	0	0	0	0	0
2nd	Hispanic	0	0	0	0	0	higher	0	0	0	higher	0	0	0	0	0	0
	Black	0	0	0	0	0	0	0	0	lower	higher	0	0	0	0	0	0
3rd	Hispanic	0	higher	0	0	higher	higher	0	0	higher	higher	0	0	0	0	0	0
	Black	lower	higher	0	0	0	0	0	0		higher	0	0	0	0	0	0
4th	Hispanic	0	0	lower	0	higher	0	0	0	higher	higher	0	0	0	0	0	0
	Black	0	higher	0	0	0	0	0	0	higher	0	0	0	0	0	0	0
5th	Hispanic	0	higher	lower	0	higher	higher	0	0	higher	higher	0	0	0	0	0	0
	Black	0	higher	lower	0	higher	0	0	0	higher	0	0	0	0	lower	0	0
6th	Hispanic	0	0	lower	0	higher	higher	0	0	higher	0	0	higher	0	0	0	0
	Black	0	0	lower	0	0	0	0	higher	0	lower	0	0	0	lower	0	0
7th	Hispanic	0	0	lower	0	higher	higher	0	0	0	0	0	0	0	0	0	higher
	Black	0	higher	lower	0	0	lower	0	higher	0	0	0	0	0	0	0	0
8th	Hispanic	0	0	lower	0	higher	0	0	lower	0	0	0	0	0	0	0	higher
	Black	0	0	lower	0	0	lower	higher	higher	0	0	0	0	0	0	0	higher
9th	Hispanic	0	0	lower	0	higher	0	0	lower	0	0	0	0	0	0	0	higher
	Black	0	lower	lower	0	0	lower	0	higher	0	0	0	0	0	0	0	higher
90 to 95	Hispanic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Black	0	lower	0	0	0	lower	0	0	0	0	0	0	0	0	0	higher
Top 5	Hispanic	0	0	0	lower	0	0	0	lower	0	0	0	lower	0	0	0	0
	Black	0	lower	0	lower	0	lower	0	0	0	0	0	lower	0	0	0	0

[1] In the table, blue shading is for Hispanic families and orange shading is for Black families. "Higher"indicates the benefit rate or average benefit is statistically higher than for White families in the same decile and "lower" indicates the benefit rate or average benefit is statistically lower than for White families in the same decile. Zeroes indicate that there no measured statistical difference among RH in the decile. The benefit rate (Rate in the table) is the percent of families within the race and decile group that benefit from the tax expenditure. The average benefit (Benefit in the table) is the average benefit for families within the race and decile group that receive a nonzero benefit.

5. Conclusion and Further Research

This paper has examined how benefits for eight of the largest tax expenditures vary by RH. We compared the distribution of tax expenditure dollars by RH to the distribution of families by RH. We also compared tax expenditure rates and average tax expenditure benefits within an income decile across RH (horizontal equity).

Comparing the share of dollars to population shares, we have found that the overall benefit of the eight tax expenditures we examine accrue disproportionately to White families. This disparity is driven by the preferential rates for capital gains, 92 percent of the benefits of which accrue to White families, the deductibility of charitable contributions, 91 percent of the benefits of which accrue to White families, and the deduction for pass-through income, 90 percent of the benefits of which accrue to White families. At the same time, the benefits of the three refundable credits we examined accrue disproportionately to Hispanic families and also, in the case of the EITC, to Black families.

We have also found that some tax expenditures are not equal for families with similar incomes. Generally speaking, lower- and middle-income Hispanic families have higher benefit rates and higher benefit shares for the child credit. In general, low- and middle income Hispanic and Black families have higher benefit rates and higher benefit shares for the EITC (with the exception of the lowest decile of the EITC where White families have higher average benefit rates). Higher-income Black families have lower average benefits for the child credit. The results with regard to the child credit and EITC may be because our analysis of horizontal equity did not include the presence or number of children in defining what it means to be similarly situated. This will be a subject of future research.

The benefit shares and average benefits associated with the tax expenditure for the preferential rates given to certain capital gains and qualified dividends are also starkly different by RH even within income

deciles. White families across much of the income distribution are more likely to benefit from preferential rates than Black or Hispanic families. High income families (of which White families are a disproportionate share) are also more likely to benefit from preferential rates than low-income families. And among the highest income families, White families have much larger average benefits (for those who receive benefits) than Black or Hispanic families. These findings are consistent with the earlier studies by Moran and Whitford (1996) and by Brown (2021).

The equity implications for the tax expenditure on the deductibility of home mortgage interest on owner occupied home is mixed. Dollars of expenditure disproportionately favor White families. The share of families benefitting, as well as average dollars of benefits, rise with income and White families are disproportionally high income. But among higher income families, average benefits are slightly higher for Black and Hispanic families relative to White families. This does not necessarily contradict the findings of Moran and Whitford (1996) or Brown (2021), both of whom found that housing values were higher for White families relative to Black families. It may be that Black families have higher mortgage debt or higher interest rates for the same or lower house value.

This paper has focused exclusively on equity in its examination of tax expenditures. However, tax expenditures can also be evaluated relative to other goals, such as simplicity, revenue, and efficiency, which this study does not address. An inequitable tax expenditure may be justified when a broader set of considerations, which includes but also extends beyond equity, are taken into account.

Finally, this study has examined tax expenditures taken as given income and other economic characteristics relevant for the determination of tax liability. It answers the question, given the current income distribution by RH, what are the vertical and horizontal equity implications by RH? Are there disparate tax consequences by RH? This study does not address the tax code's role in either promoting or reducing general income inequality by RH. We touch on this subject by suggesting that certain tax

expenditures might be favorable to Black and Hispanic families and those tax expenditures (like the EITC) might promote future income growth which might work towards reducing the income inequality by RH found in this paper. The tax expenditure for preferential rates may promote income growth for White families relative to Black families which would work towards increasing income inequality by RH. We leave a fuller examination of these issues to future research.

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FIGURE 6: EXCLUSION FOR EMPLOYER CONTRIBUTIONS TO MEDICAL INSURANCE AND MEDICAL CARE ($225B)

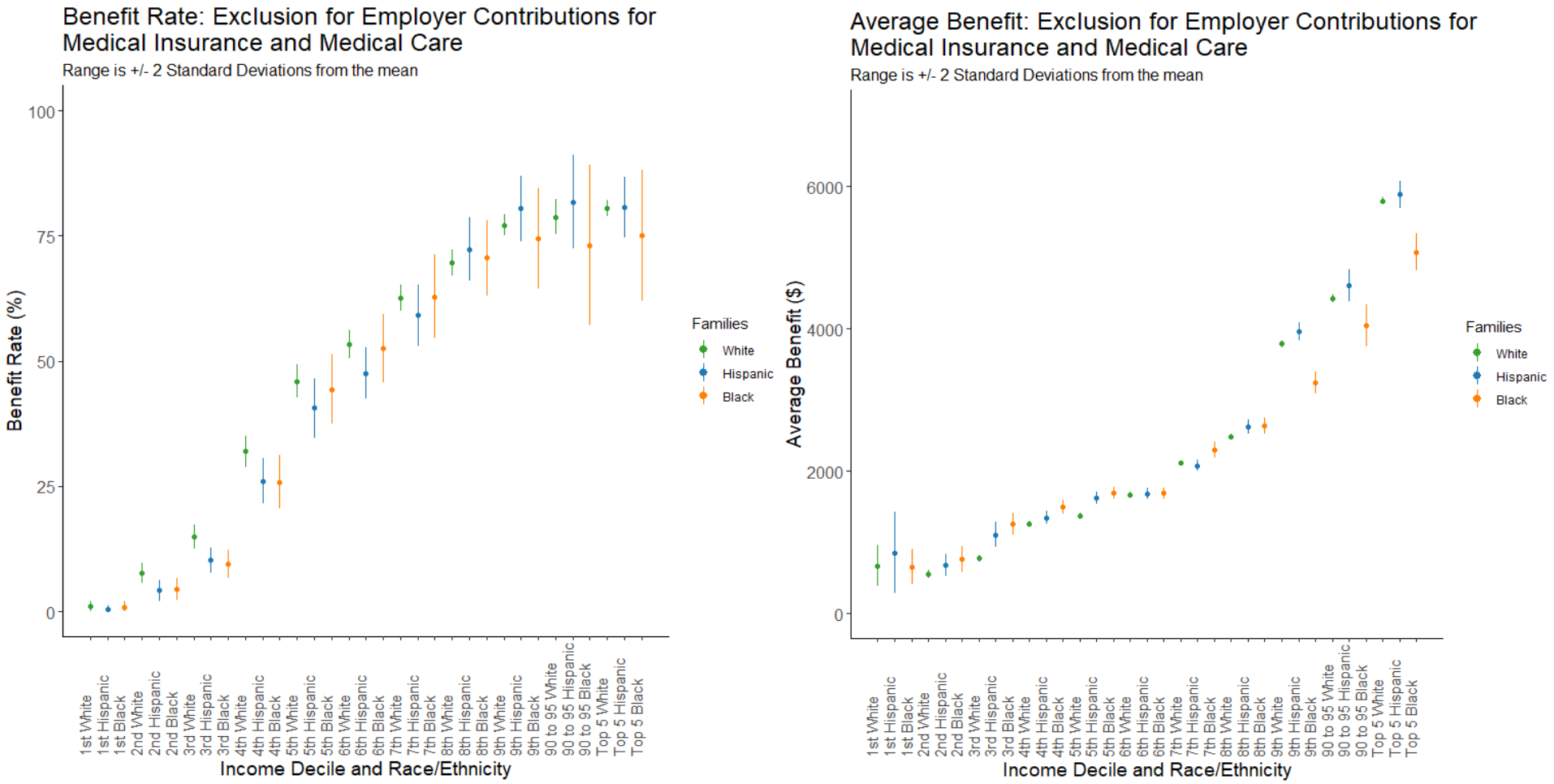

FIGURE 7: PREFERENTIAL RATES FOR CERTAIN CAPITAL GAINS AND QUALIFIED DIVIDENDS ($146B)

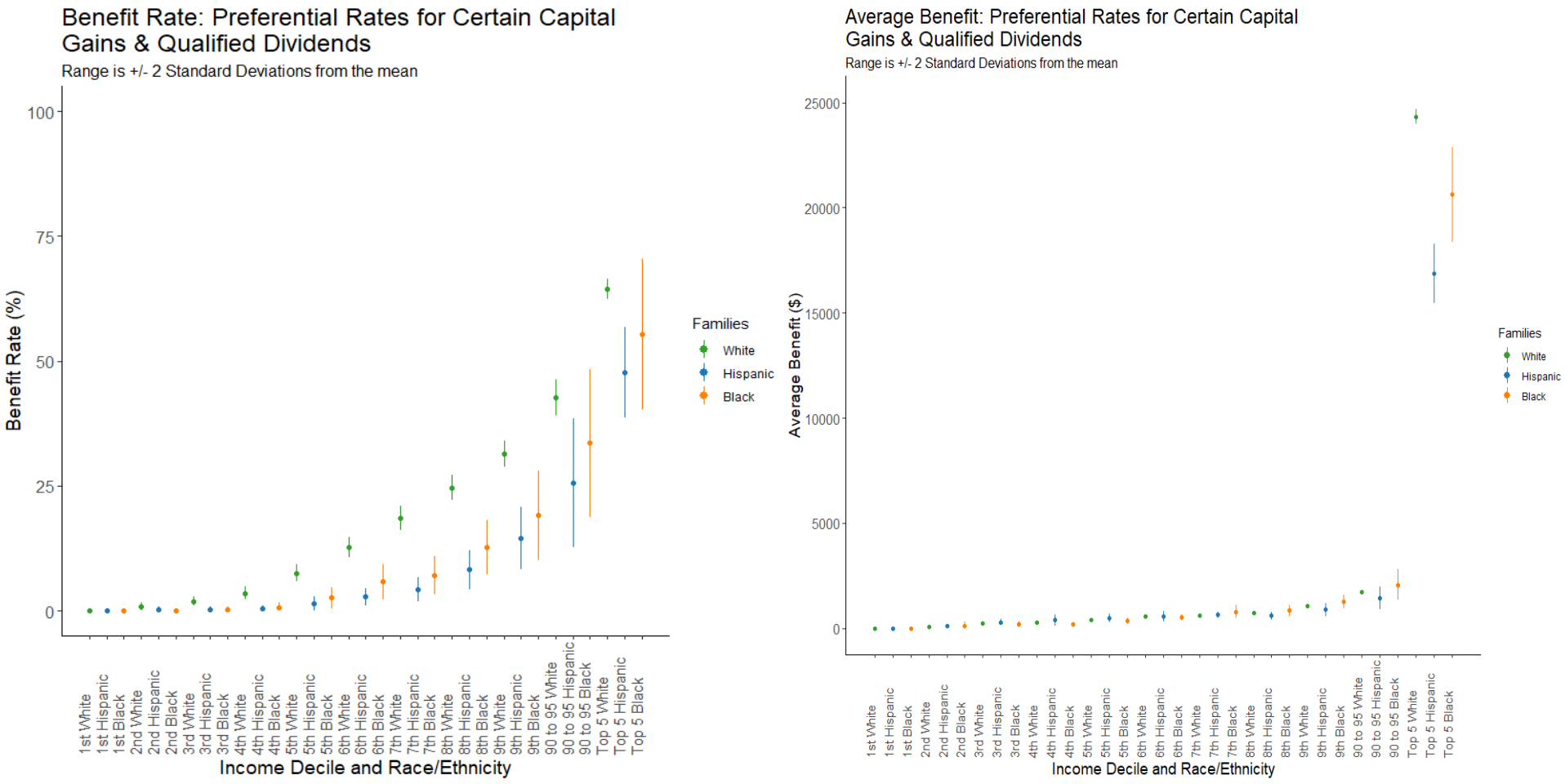

FIGURE 8: CHILD CREDIT (INCLUDING OUTLAYS, $113B)

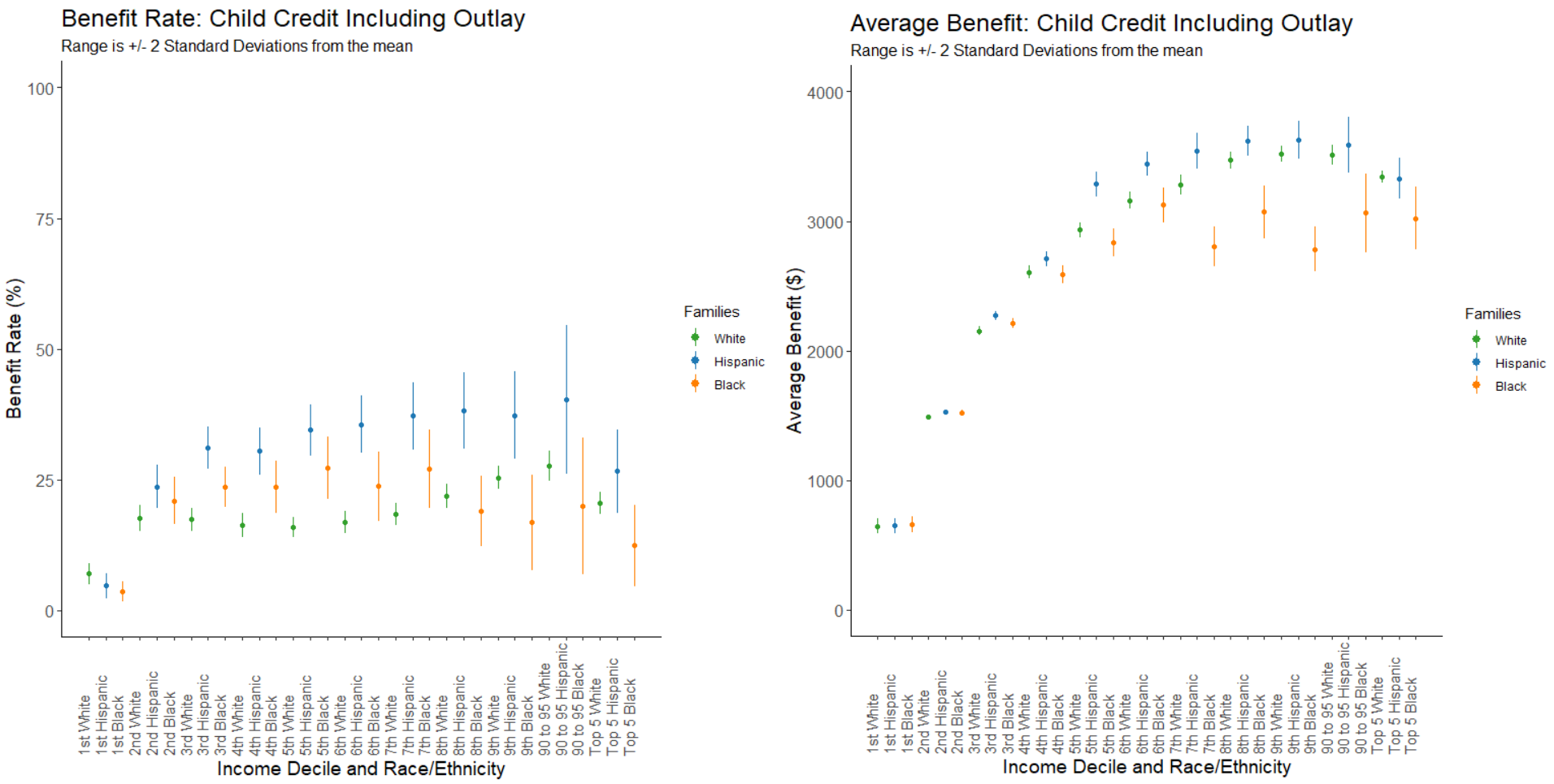

FIGURE 9: DEDUCTIBILITY OF CHARITABLE CONTRIBUTIONS ($71B)

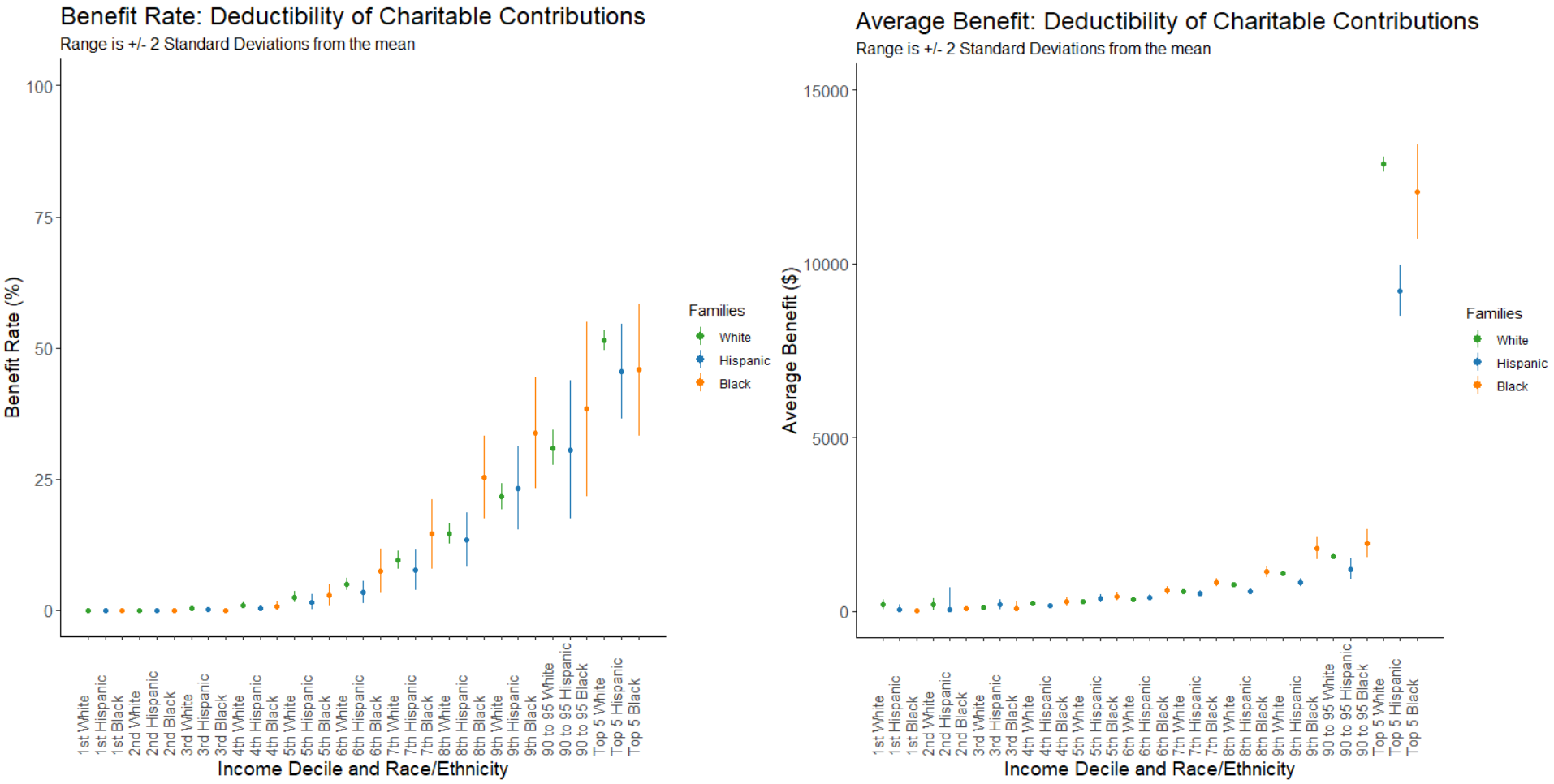

FIGURE 10: EARNED INCOME TAX CREDIT (INCLUDING OUTLAYS, $67B)

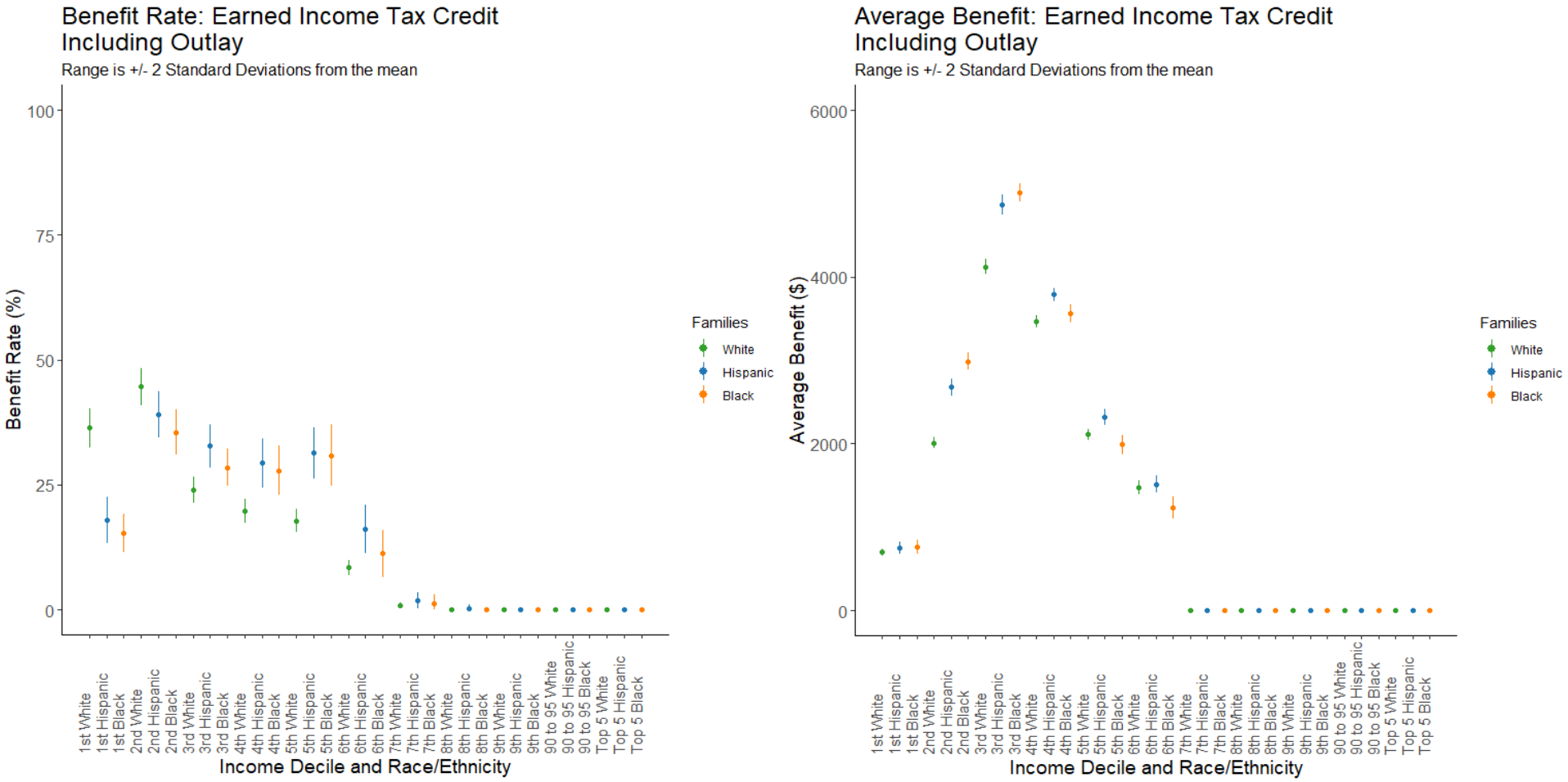

FIGURE 11: ALLOW 20-PERCENT DEDUCTION TO CERTAIN PASS-THROUGH INCOME (QBI) ($57 billion)

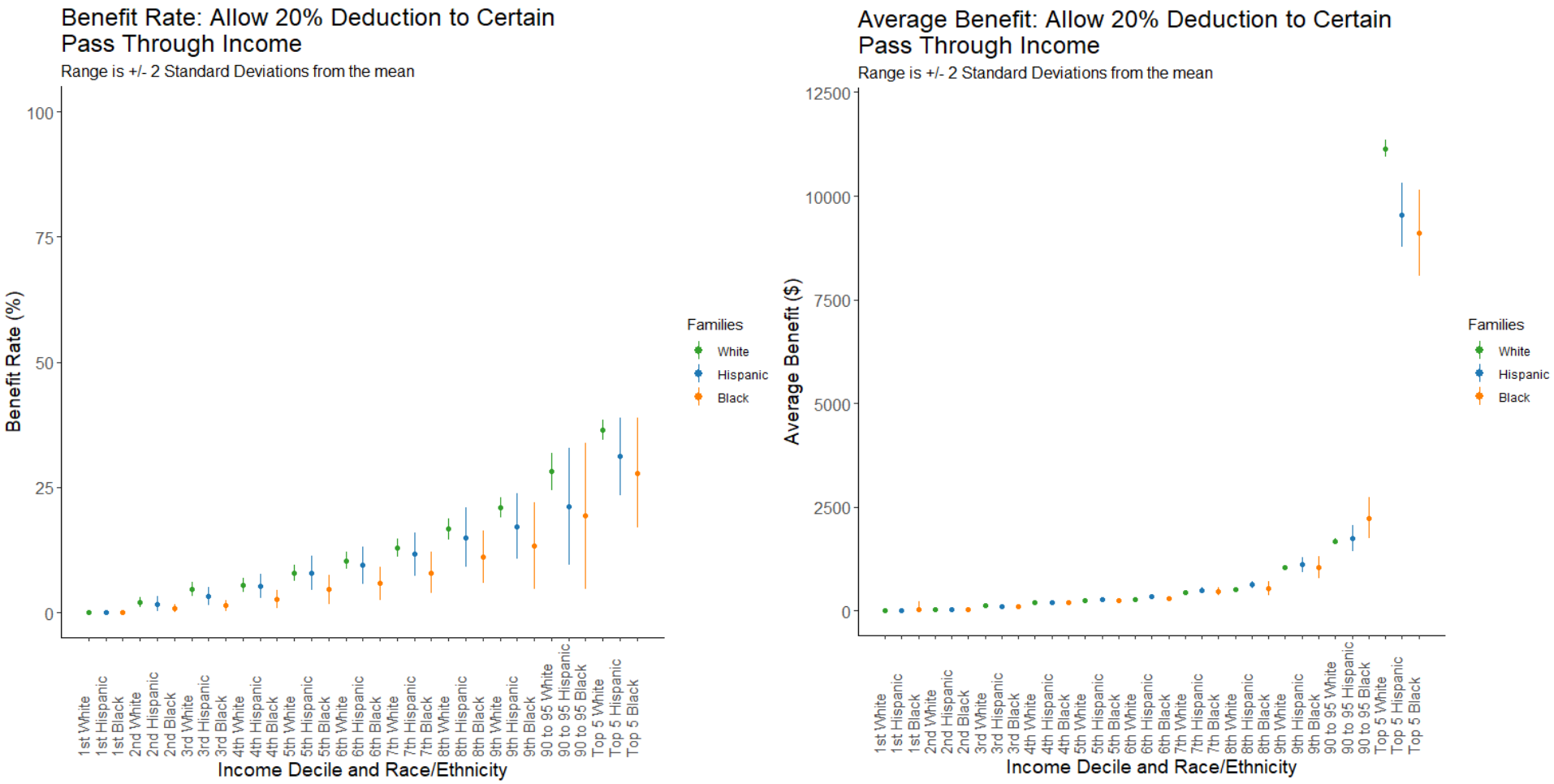

FIGURE 12: PERMIUM ASSISTANCE TAX CREDIT (INCLUDING OUTLAYS, $36B)

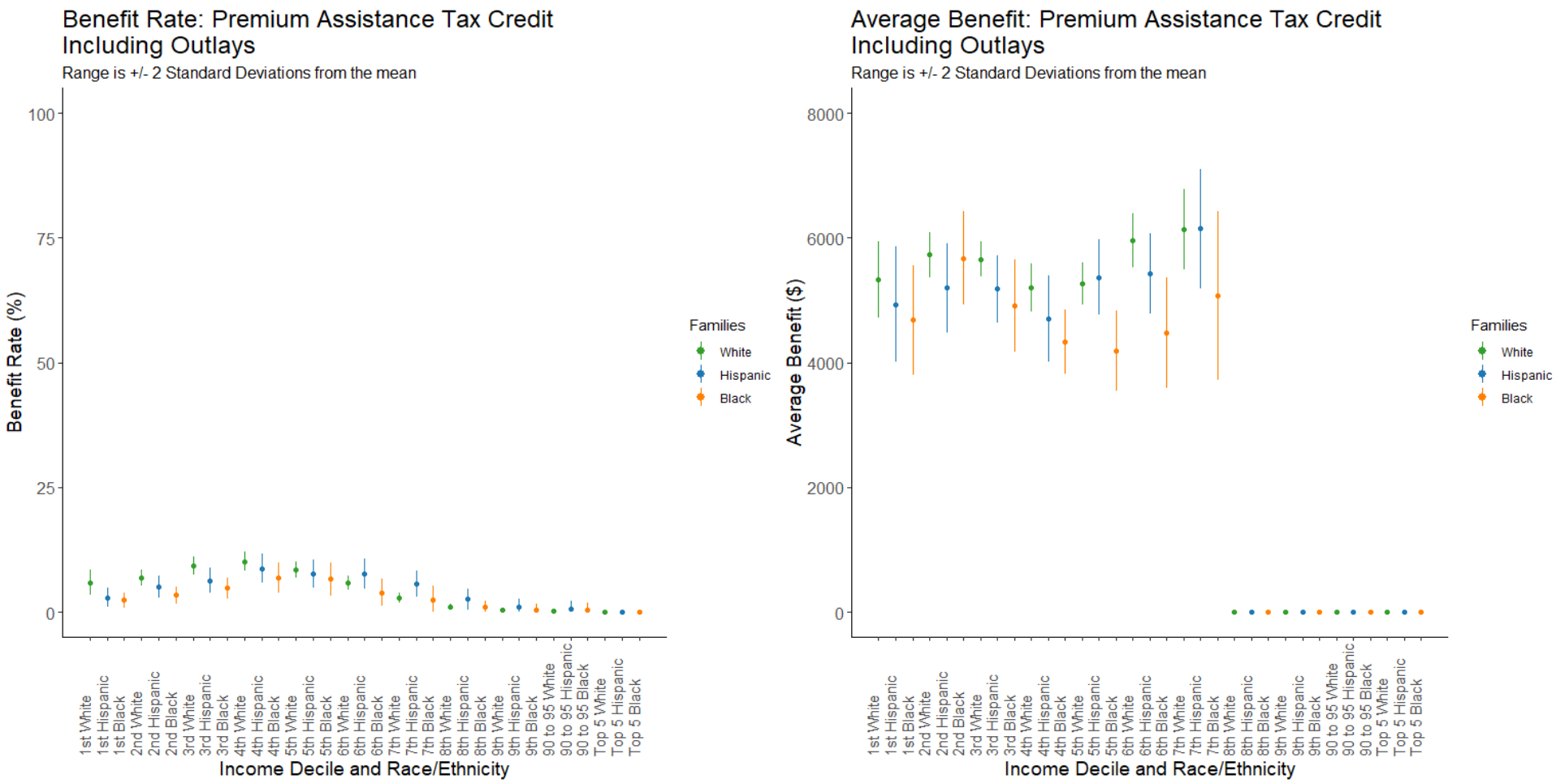

FIGURE 13: DEDUCTIBILITY OF MORTGAGE INTEREST ON OWNER-OCCUPIED HOMES (HMID) ($31B