Elasticity of Taxable Income: New data and estimates

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Introduction

- The **behavioral response of taxpayers to changing tax rates** is central to the formulation of tax and transfer policies, and the study of the welfare implications of tax decisions.

- The **elasticity of taxable income (ETI)** captures all possible responses to changing tax rates in a single measure (Creedy, 2009; Thoresen and Vattø, 2013).

- A **large body of literature** has sought to estimate the ETI and elasticities for related income measures. Most of the literature has focused on the United States, Canada, and Western Europe, but a limited number of studies have focused on countries and regions outside these developed economies.

Introduction (ii)

- The goal of the ETI literature amounts to **estimating the elasticity of taxable (or reported) income with respect to the net-of-tax rate**, defined as:

$$e = \frac{(1-\tau)}{z}\frac{\partial z}{\partial(1-\tau)}$$

- The estimation of the ETI has taken on **two distinct forms**:
  - The first is based on the **standard labor supply model** and attempts to model behavioral responses in a structural way.
  - The second is based on the **analysis of observations before and after a realized policy reform**.
    - In this tradition, policy reforms are seen as *quasi-experiments*.

Introduction (iii)

- The second approach has been extended to incorporate identification strategies not necessarily focused on specific tax reforms
  - **'Bracket creep'** (Saez, 2003)
  - **Bunching analysis** (Saez (2010), Chetty et al. (2011), among others)

- In the South African context, the lack of the type of major tax reforms that are usually used to identify the ETI complicates identification (Kemp, 2019).

- To that end, Kemp (2019) used the phenomenon of 'bracket creep' to identify the ETI.

- This approach is extended in the current paper to include a **new sample period** and a **new expanded dataset**.

Identification strategy

- There was no large, policy-induced variation in marginal tax rates of the kind that is often used to identify and estimate the ETI introduced over the sample period in question.

- To that end, I use the phenomenon of **'bracket creep' to identify the ETI**:
  - National Treasury adjusts individual tax brackets in order to **compensate for the effects of inflation**.
  - Without these adjustments, taxpayer might graduate to higher tax bracket even though their **real taxable income did not change**.
  - Over the sample period in question (2010/11 to 2016/17), tax brackets were not adjusted in line with economy-wide nominal wage inflation.

Identification strategy (ii)

Table 1: Bracket adjustment and inflation

Tax year	Average bracket adjustment	CPI inflation	GDP deflator	Economy-wide wage rate
2011/12	6.1%	5.6%	6.1%	10.2%
2012/13	6.5%	5.5%	5.6%	8.7%
2013/14	3.5%	5.8%	5.9%	9.8%
2014/15	5.4%	5.6%	5.2%	8.6%
2015/16	4.2%	5.2%	6.3%	8.2%
2016/17	2.0%	6.3%	6.2%	8.0%

Source: National Treasury, Statistics South Africa, South African Reserve Bank. Inflation rates calculated as year-on-year % changes in CPI, the GDP deflator, and the total economy-wide wage rate.

Identification strategy (iii)

- This suggests that a significant proportion of taxpayers likely migrated to higher tax brackets and faced a **higher marginal tax rate** in the following tax year.

- As in Kemp (2019), in the absence of significant reforms, it is the **exogenous variation in marginal tax rates** generated by ’bracket creep’ that is used to identify the ETI.

- This identification strategy has **one major drawback**:
  - ’Bracket creep’ is not a publicized, legislated tax reform and affects taxpayers only on the margin.
  - Therefore, the average taxpayer might not be fully aware of the small change to the tax code and, as such, any estimated behavioral response could be muted.

Data and estimation

- The analysis presented here uses **confidential tax return data**, made available for research purposes by SARS and the National Treasury.
- The available sample runs from **2010 to 2016**.
- The full dataset is based on a panel constructed by Ebrahim and Axelson (2019) and contains most items found on individual Employee Tax Certificate (IRP5) and Income Tax Return (ITR12) forms.
- Whereas Kemp (2019) focused only on those taxpayers who submitted tax returns that were, in turn, assessed by SARS, the current study extends the analysis to include information from employee tax certificates, i.e. IRP5's.

Data and estimation (ii)

- Following Gruber and Saez (2002) and Kemp (2019), the empirical strategy is to **relate changes in income between pairs of years to the change in marginal tax rates between the same pairs of years**.

- The time length between year one (the base year) and year two is set at **three years**.
  - That is, year 2013 is related to year 2010, and year 2014 to year 2011, etc.
  - The identification strategy relies on essentially unobserved tax rate changes, and the three-year time lag allows for a more complete behavioral response as taxpayers become aware of the tax implications of ’bracket creep’ (Kemp, 2019).

Data and estimation (iii)

- Estimation boils down to estimating the following equation (difference-in-difference estimation):

$$\log(z_2/z_1) = e\log[(1-T_2')/(1-T_1')] + \eta\log[(z_2 - T_2(z_2))/(z_1 - T_1(z_1))] + \epsilon$$

- This framework highlights the main **identification problem** found in the literature:
  - The term in the change in marginal tax rates is **correlated with the error term:** a positive shock to income could generate an automatic increase in the marginal rate due to the progressive income tax system.
  - An **instrument** T_p' is constructed by computing the marginal tax rate that an individual would face in year two if their real income did not change from year one to year two.

Data and estimation (iv)

- Running an IV regression might still lead to a biased estimate of the elasticity if the error term is correlated to base year income.

- This might be due to:
  - **Mean reversion** in income
  - Secular **changes in the income distribution**.

- As such, I follow Auten and Carroll (1999), among others, in including several **controls in base year income**.

Data and estimation (v)

- The full regression framework is:

$$\log(z_2/z_1) = \alpha_0 + e^c \log[(1-T_2')/(1-T_1')] + \alpha_1 \log z_1 + \alpha_2 f(taxinc_1)$$
$$+ \sum_{i=1}^{10} \alpha_{3i} SPLINE_i(z_1) + \sum_j \alpha_{4j} YEAR_j + \alpha_5 AGE + \alpha_6 AGE^2 + \beta item + \epsilon$$

estimated via 2SLS, with the first step being:

$$\log[(1-T_2')/(1-T_1')] = \log[(1-T_p')/(1-T_1')] + \theta_1 \log z_1 + \theta_2 f(taxinc_1)$$
$$+ \sum_{i=1}^{10} \theta_{3i} SPLINE_i(z_1) + \sum_j \theta_{4j} YEAR_j + \theta_5 AGE + \theta_6 AGE^2 + \gamma item + \epsilon$$

Estimation results

	Taxable Income			
	(1)	(2)	(3)	(4)
e^c	-0.294***	0.177***	0.392***	0.405***
	[0.017]	[0.013]	[0.022]	[0.029]
$item$	0.029**	0.149***	0.135***	0.144***
	[0.001]	[0.002]	[0.001]	[0.001]
AGE	-0.016***	-0.002***	-0.004***	-0.003***
	[2.14e-04]	[2.48e-04]	[2.10e-04]	[2.15e-04]
AGE^2	5.92E-05***	-7.47E-05***	-6.13e-05***	-7.20e-05***
	[2.47e-06]	[2.76e-06]	[2.35e-06]	[2.51e-06]
$\log(z_1)$		-0.130***	-0.103***	
		[0.002]	[0.002]	
$taxinc_1$			-2.41e-08**	
			[2.76e-09]	
$taxinc_1^2$			1.83e-16**	
			[3.47e-17]	
Spline 1^{st} decile control				-0.460***
				[0.001]
Spline 2^{nd} decile control				-0.380***
				[0.002]
Spline 3^{rd} decile control				-0.059***
				[0.002]
...				

Estimation results (ii)

- When including controls for mean reversion and income distribution, **ETI estimates range of around 0.4.**
- Well within the range of the post-Feldstein literature, but somewhat larger than the ETI estimate in Kemp (2019) of around 0.3.
- The fact that bracket adjustments were **significantly below nominal income growth** in the latter half of the sample could have led to a greater understanding of the implications and might explain the higher elasticity estimates when compare to Kemp (2019).

Sensitivity analysis

- Allow for **year-specific changes in the income distribution** (interact base year income with full set of year dummies):
  - Estimated standard error increases, but ETI estimate in line with basis results
  - Robust to this additional control

- **Heterogeneity**:
  - ETI estimates larger for **itemizers** (confirmed in basic results)
  - ETI estimates larger for **high-income individuals**
    - Much higher ETI for top two income tax brackets (0.9) and top 10% of income distribution (0.5).

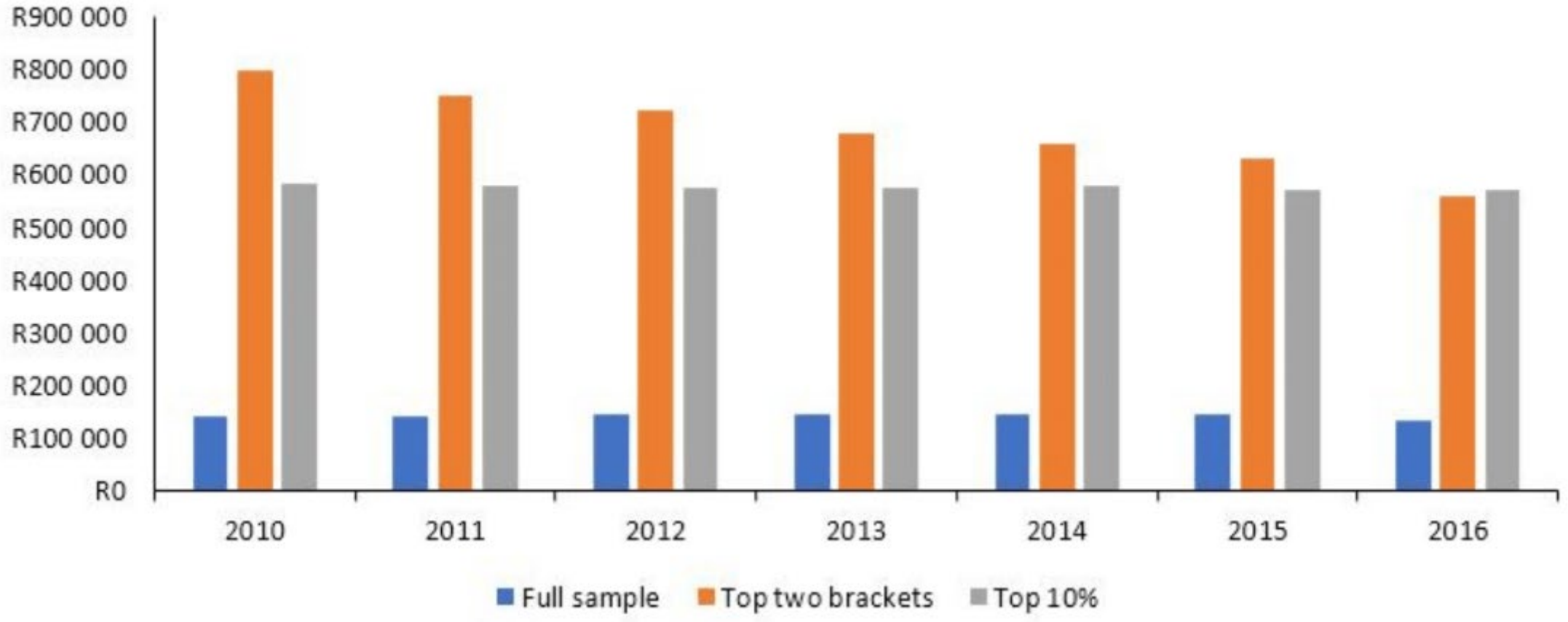
Comparison with earlier studies: High-income earners

- Estimates imply a much **larger behavioral response** of high-income earners relative to the earlier sample investigated in Kemp (2019).

- Much of the difference concentrated in the **latter part of the sample**.

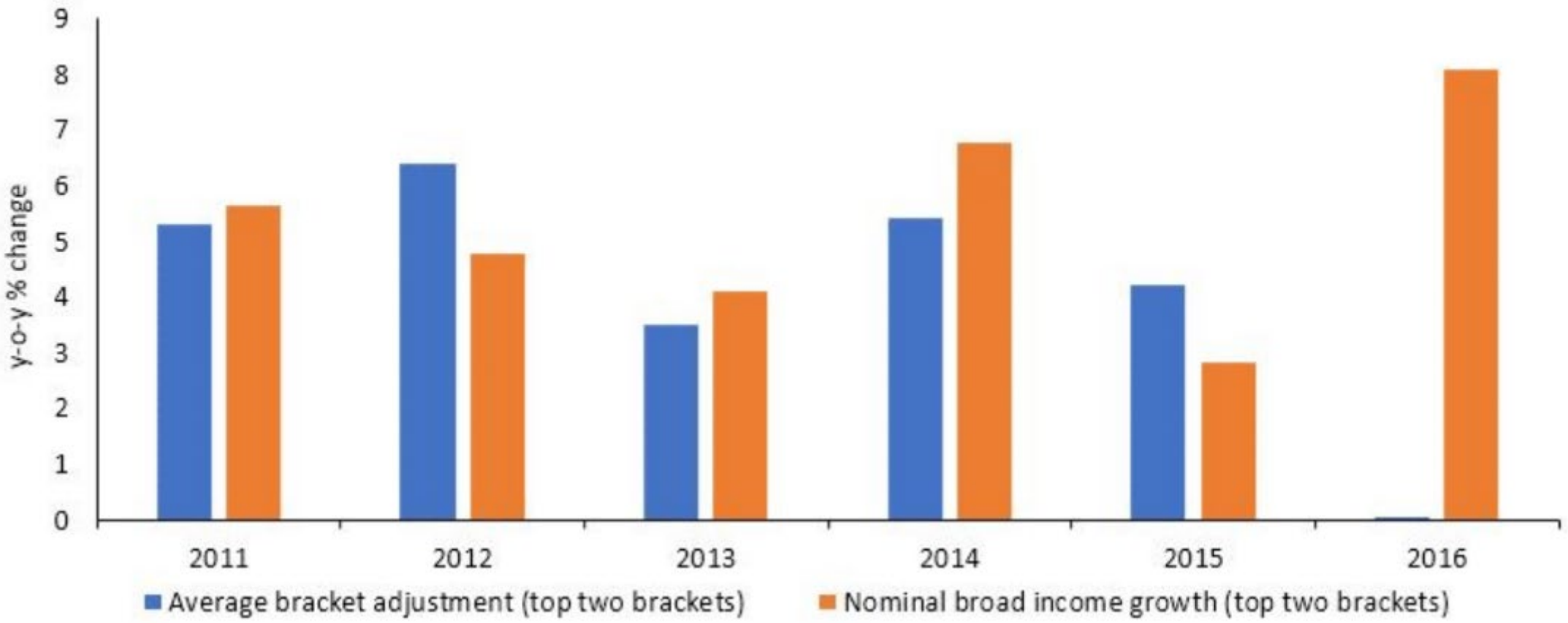
Comparison with earlier studies: High-income earners (ii)

Figure 1: Taxable income (constant 2010 prices)



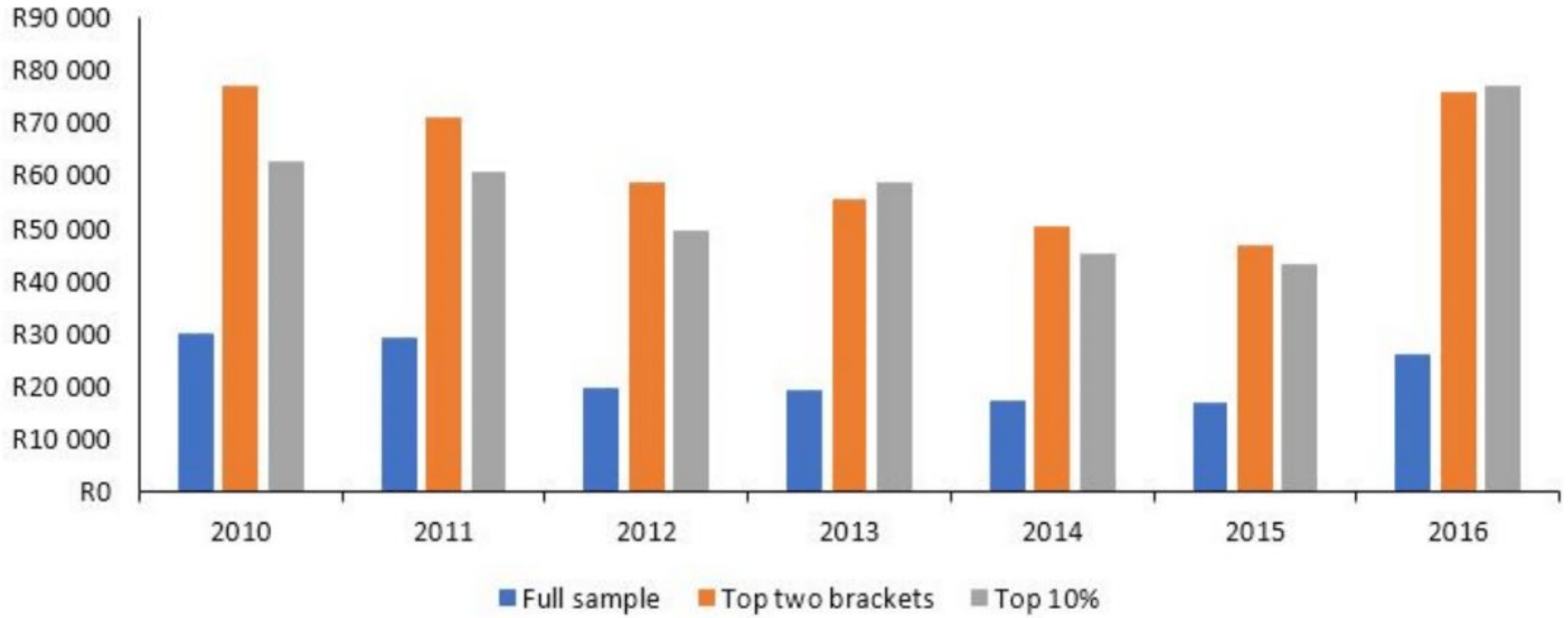
Comparison with earlier studies: High-income earners (iii)

Figure 2: Bracket adjustment versus nominal income growth



Comparison with earlier studies: High-income earners (iv)

Figure 3: Average level of deductions (constant 2010 prices)



Comparison with earlier studies: High-income earners (v)

Table 5: Elasticity estimates for various sub-samples

	Full sample	2010/2011	2012/2013
Top two tax brackets (using taxable income cuts)	0.937	0.238	1.379
Standard deviation	[0.009]	[0.204]	[0.260]
Top 10% of income earners	0.497	0.126	0.868
Standard deviation	[0.009]	[0.077]	[0.157]

Estimates of 2SLS regressions. Regressions weighted by income. All income ranges based on base year income. All regressions include log income, polynomials in base year income, and dummy variables for each base year.

- Implication for **optimal taxation**?

Conclusion

- ’Bracket creep’ is useful to identify the ETI in cases where large tax reforms are unavailable.

- Caveats:
  - ’Bracket creep’ is **not a well-publicized legislated tax change** and taxpayers may not be fully aware of the marginal tax increases and thus might not respond to the change.
  - The identification technique does not allow for the investigation of the **anatomy of the behavioral response**, i.e. how different income sources respond to tax rates.

- Recent **reforms to the tax structure** (increase in the marginal rates for the top two tax brackets; creation of a new top tax bracket with marginal rate of 45%), could conceivably be used to identify and estimate the ETI for high-income earners.