The Revenue Consequences of Introducing a Destination-based Cash Flow Tax in Uganda

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Abstract

We estimate the implications for aggregate tax revenues in Uganda of replacing the existing business income tax on profit (CIT) with a Destination-Based Cash Flow Tax (DBCFT). To do so, we use tax return data for both VAT and CIT for individual businesses over the period 2013 to 2017. We identify two approaches to estimating the DBCFT tax base: (a) adjusting the VAT base for labour costs; and (b) adjusting the CIT base for cash flow treatment of capital expenditure and other items, removing net interest costs, and introducing a border adjustment by taxing imports and zero-rating exports. We assume that firm behaviour would be unchanged, and apply the DBCFT tax base to the historic data. The results suggest that the DBCFT could raise substantially more revenue than the existing CIT. If the existing treatment of losses is preserved, we estimate that the tax base would be between seven and eight times higher. Even if symmetric treatment were given for losses under the DBCFT, we estimate that the tax base would rise substantially.

JEL codes: H25, H32.

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1 Introduction

This report analyses the size of the corporate profit tax base in Uganda, using administrative, company-level tax return data. The main aim of the report is to assess the likely impact on the aggregate tax base of one potential reform: a switch from the existing system to a destination-based cash flow tax (DBCFT).

The idea of a DBCFT was first proposed by Bond and Devereux (2002), and it was subsequently recommended by the President's Advisory Panel On Federal Tax Reform (2005) and also proposed by the Ways and Means Committee of the House of Representatives (2016).

The basic idea of the DBCFT is to make two changes to the tax base. The first is to shift to a cash flow tax: this would permit immediate expensing of all expenditure, including capital expenditure, but remove any relief for the costs of finance, such as the deduction for interest payments. This reform would result in an origin-based cash flow tax. The second element of the reform would be to change the location of taxing profit from – very broadly – where economic activity takes place (the "origin" country) to the market country where goods and services are sold (the "destination" country). To achieve this, the DBCFT would borrow the border adjustment mechanism used by destination-based VATs: exports would be zero-rated and imports would be taxed. For VAT, that has the consequence that all goods and services sold in a particular country are taxed at the same rate, irrespective of their origin. The equivalent would be true for the DBCFT: in this case, the profit earned on sales in a particular country would be taxed at the same rate, irrespective of the identity and location of business undertaking the sale. Tax relief for costs would be given in the country in which the expenses were incurred.

The properties of the DBCFT have been analysed by Bond and Devereux (2002), Weisbach (2003), Auerbach et al. (2017), Auerbach and Devereux (2018), and Devereux et al. (2021). In the policy debate around the DBCFT one important issue raised is the question of the impact on corporation tax revenues. In particular, it has been asserted that low income countries are likely to collect less revenue under a DBCFT because they tend to have small markets. However, while it may be true that smaller and lower income countries tend to have a relatively low share of all sales, they also have a small share of existing corporation tax bases. Moving to DBCFT could in principle therefore either raise or lower the tax base.

Three previous studies have examined the likely revenue consequences of a move to a DBCFT. At the time of the tax policy reform debate in the US in 2016, Patel and McClelland (2017) examined the revenue consequences of introducing a DBCFT in the

US, on the assumption of unchanged behaviour of businesses. They found that, over the period 2004-13, if the US had had an origin-based cash flow tax in place, the total tax base would have been almost the same as under the actual tax system in place at the time. Because the US had a trade deficit during this period, moving from this to a DBCFT would have significantly increased the aggregate US tax base. While this is a useful result in the context of a US reform, it does not give much guidance as to the impact of the reform in lower income countries, which may have very different characteristics.

Hebous et al. (2022) examined the same issue using national accounts data on 48 countries over the period 2002-11. They estimated the size of the DBCFT tax base as non-financial corporate gross operating surplus, less corporate investment, plus imports less exports. They applied the existing corporation tax rate to this tax base and compare the resulting revenue estimates with actual corporation tax collections in that period. They found that, on average across the sample, estimated revenues from the DBCFT would have been close to those obtained from current corporation taxes. However, this result hides considerable variation across countries: mostly as a result of whether the trade balance is significantly negative or positive. On average, they found that non-resource rich developing countries would be beneficiaries of a switch to the DBCFT. In a complementary study, Devereux et al. (2021) considered the impact of the introduction of a border adjustment on revenue, assuming that the border adjustment applied only to non-resources. They analysed 181 countries using data on balance of payments statistics over the period 1996-2014, from UNCTAD. They found that in only 17 out of the 181 countries did exports excluding natural resources exceed imports, and for which the border adjustment would therefore reduce the tax base. These included only one low income country (Nepal) and four lower middle income countries (East Timor, Uzbekistan, Bangladesh and Philippines).

Clearly, these macro approaches can only be a rough approximation of what would be the true DBCFT base in any country. There can be substantial variation across firms in the impact of such a tax reform. For example, the reform could affect whether firms move into a taxable loss position, which could have an impact on the aggregate revenue position.

This paper presents the results of an analysis of the hypothetical introduction of a DBCFT in place of the existing tax on business profit in a low income country, Uganda. It uses administrative data at the level of individual businesses, from two sets of tax returns: the business profit tax, and VAT, provided by the Ugandan Revenue Authority. It essentially follows the approach of Patel and McClelland (2017) of making adjustments to the tax base to model what the base would have been had the DBCFT been in

place, without any behavioural response on the part of the businesses. As we describe below, we undertake this analysis in two ways. First, we start from the VAT tax base, and adjust that base for the fact that VAT does not permit labour costs to be deductible. Second, we start from the business profit tax base, and make adjustments for both the cash flow treatment and the border adjustment.

Perhaps not surprisingly, these approaches do not yield precisely the same estimates of the hypothetical DBCFT tax base. This could be the result of two factors. First, there are technical differences in the computation of the VAT base and the business profit base, which we are not able to account for with the data we have available. Second, there could of course be measurement error in the data. However, while there is some variation in the estimates for individual businesses, in aggregate the two approaches give rather similar results.

Specifically, we find that if Uganda were to replace its current business profit tax (which we denote CIT) with a DBCFT, the tax base would increase by a factor of up to 9 (under benchmark assumptions) and by a factor of at least 3 (under conservative assumptions). These estimations are obtained with a subsample of firm-year observations for which we can match VAT and CIT returns and for which the total revenue from sales in each of the taxes also matches.

Two other papers investigate empirically the taxation of business profit in Uganda, both also using exploiting administrative tax return from the tax on business profit. Bachas et al. (2022) calculate firm-level effective tax rates (ETRs), defined as the ratio of CIT liability over economic profit. They show that the ETR increases with firm-size up to the 99th percentile of revenue collection, after which the average ETR decreases substantially. This suggests that firms at the right tail of the turnover distribution (i.e., the largest firms) face a lower tax burden. Koivisto et al. (2021) study differences in ETRs among large domestic firms and multinational corporations. They combine administrative data on CIT returns in Uganda with data on the activity of multinationals retrieved from the commercial Orbis database. They estimate the correlation between the ETR and multinational status controlling for year and industry fixed effects and find that the ETR for multinational corporations is approximately 20 percentage points lower relative to domestic firms' ETR.

Other studies have analysed the tax compliance behavior of Ugandan firms. Using transaction-level data from VAT returns, Almunia et al. (Forthcoming) document that sellers and buyers report different amounts 79% of the time. They estimate that, although a majority of firms manage to reduce their VAT payments thanks to these discrepancies, as many as 25% of firms end up pay more tax than they owe. On net, VAT misreporting cost the Ugandan government about US$384 million in foregone

2013-2016 tax revenue.

The remainder of the paper proceeds as follows. In Section 2 we describe the procedure used for moving from the tax bases of the VAT and CIT to that of the DBCFT. In Section 3 we describe the different sources of administrative data we use in the analysis. We analyze the within- and between-tax form consistency of the data and also compare the aggregate tax revenue estimates of the data with official figures published by the Uganda Revenue Authority (URA) and the OECD. In Section 4 we estimate the potential DBCFT tax base using the VAT and CIT definitions, under two different sets of assumptions. In Section 5 we provide some concluding remarks. Appendix A provides more analysis on the distributional effects of moving to a DBCFT. Appendix B provides a robustness analysis, which shows that the qualitative results are not changed by using a smaller sample of observations that meet more stringent tests of consistency.

2 Definition of Tax Bases

In this section, we set out the similarities and differences in the various tax bases. In particular, we identify the main changes that would need to be made to move from the VAT base and the business profit tax (CIT) base to a DBCFT. We set this out in broad terms. There are many details in the actual tax returns that we leave to one side.

In principle, the DBCFT base is closely related to both the VAT base and the CIT base. In a system in which all goods and services are subject to VAT at the same rate, then the VAT base for a single company is equal to its domestic sales less its costs of sales (that is all costs, including the purchase price of capital goods, but excluding labour costs) plus the value of its imports. This can be written as:

$$B_{VAT} = S - C - (X - M) \tag{1}$$

where S =total sales, X = exports, C =total non-labour input costs, M = imports.

Note that imports appear in this equation because they represent costs to the Ugandan business and they are taxed directly. The VAT return data we use includes a deduction for the cost of imports (as part of C) but does not include the specific tax on imports. Therefore, we add imports to our measure of the tax base in order to arrive at the full VAT tax base.

In broad terms, the DBCFT base is equal to the VAT base, but with a deduction for the costs of labour. Since value added is equal to the sum of economic rent and labour costs, deducting labour costs transforms the tax base into one on economic rent only. Hence the DBCFT tax base is:

$$B_{DBCFT(VAT)} = B_{VAT} - W \tag{2}$$

where W = gross wage costs. Note that we denote the estimate of the DBCFT tax base starting from the VAT base as $B_{DBCFT(VAT)}$.

The business profit tax (CIT) differs in a number of ways, since it starts with accounting profit, rather than cash flows. We can write the tax base of the CIT as follows:

$$B_{CIT} = SG - VC - W - DEP + PD + (FI - FC) + \Delta INV \tag{3}$$

where SG =value of sales of goods and services (excluding sales of capital assets), VC =variable costs (excluding costs associated with capital spending), DEP = depreciation charge, PD =net profit on any sale of assets, FI =financial income, FC =financial costs and $\Delta INV = INV - INV_{-1}$ = change in inventories, and where INV_{-1} is the beginning of period value of inventories, with all other variables being dated period t.

There are four main adjustments required to estimate the DBCFT tax base. The first reflects the different treatment of the purchase and sales of capital assets. With CIT, capital expenditure is not typically allowed as a deduction, but only a depreciation charge. In addition, the CIT base includes any gain on the sale of assets as profit. Hence the net CIT deduction associated with the purchase and sale of assets is

$$C1_{CIT} = DEP - PD \tag{4}$$

where $PD = SD - BD$, and where SD is the sale proceeds of any asset sales and BD is the corresponding book value.

By contrast, the DBCFT would give relief for the net cost of new investment, less the sales proceeds of any capital disposed of during period t. That is the deduction for DBCFT would be

$$C1_{DBCFT} = I - SD \tag{5}$$

where I is the value of new capital expenditure.

It follows that the adjustment required from the CIT base to move to the DBCFT base is to add back the depreciation charge and the book value of asset sales and deduct new investment. We denote this first adjustment as $A1$:

$$A1 = DEP + BD - I \tag{6}$$

To investigate this a little further, let K_{-1} be the book value of the capital stock at

the end of period $t-1$. The equation of motion of the book value of the capital stock is

$$K = K_{-1} + I - BD - DEP \tag{7}$$

It follows that the adjustment required to move to a DBCFT is also equal to the negative of the change in the book value:

$$A1 = K_{-1} - K \tag{8}$$

The second step is to remove the net costs of finance from the CIT base. This primarily concerns net interest payments, which are broadly deductible from the CIT base. Note that interest and other financial flows received by the firm are taxable under the CIT, but not under the DBCFT. The second adjustment required from the CIT base to move to the DBCFT base is

$$A2 = FC - FI. \tag{9}$$

A third adjustment from the CIT base is in principle to switch from accruals-based accounting to a cash flow approach. For example, suppose that at the end of the financial year, the firm has received various materials for production, but not yet paid for them. Accounting profit would normally deduct these costs if the materials had been received. Pure cash flow treatment would not recognise the cost until the payment had been made. It is difficult to identify accruals in the tax database. We do make one adjustment, based on inventories. That is, accounting profit - and hence the CIT base - typically includes the increase in the value of inventories during the period. For the DBCFT tax base we include this only when a sales has a been made.

The third adjustment required from the CIT base to move to the DBCFT base is

$$A3 = -\Delta INV = INV_{-1} - INV. \tag{10}$$

Making these three adjustments would generate an estimate of a cash flow tax levied on an origin basis. The final adjustment for the DBCFT is to include imports in the tax base, but deduct exports. That is,

$$A4 = M - X \tag{11}$$

Introducing all four adjustments, the DBCFT tax base is equal to

$$B_{DBCFT(CIT)} = B_{CIT} + A1 + A2 + A3 + A4 \tag{12}$$

where $B_{DBCFT(CIT)}$ is the estimate of the DBCFT tax base starting from B_{CIT}. Making these adjustments, then

$$B_{DBCFT(CIT)} = SG - VC - W - (I - SD) - (X - M) \tag{13}$$

In principle, this corresponds to the estimate based on VAT, where total sales are $S = SG + SD$ and total costs are $C = VC + I$. Hence:

$$B_{DBCFT(CIT)} = B_{DBCFT(VAT)} \tag{14}$$

It is worth noting that there are many detailed elements of the tax bases which mean that, in practice, these two estimates are unlikely to be precisely equal. In the remainder of the paper we seek to identify the values of each of these adjustments, and of the two DBCFT tax bases from administrative returns from VAT and CIT in Uganda.

3 Data

3.1 Scope of Available Data

The data used in this report comes from administrative tax returns from VAT- and CIT-registered firm's declarations between years 2013[1] and 2017 in Uganda. Both the monthly VAT data and the CIT annual data include a unique Tax Identification Number (TIN) for each taxpayer, which allow us to identify firms across tax forms and merge VAT and CIT declarations into one dataset.

In order to do so, we first derive the specific months covered by the CIT filing in a given fiscal year for each firm, and link them to their monthly VAT declarations. We then aggregate the VAT data over the fiscal year to have annual data comparable between the two sources. We therefore have an annual panel dataset with information on annual VAT and CIT returns over the period 2013-2017. Note that we have incomplete data for 2017, with a much smaller number of observations. In some of our analysis below, we therefore exclude 2017 data.

In Table 1, we show both the number of firms in each fiscal year by whether the firm's declarations are available in VAT, CIT, or can be matched in both datasets.

[1] We label fiscal year 2013/14 as 2013 for simplicity.

TABLE 1
NUMBER OF FIRMS FROM VAT AND CIT DATA, AND NUMBER MATCHED

	Only VAT (1)	Only CIT (2)	Matched (3)
No. of unique firms	20,665	33,362	15,551
2013	3,853	13,631	9,757
2014	3,672	16,371	10,237
2015	3,429	19,411	10,704
2016	4,538	19,665	11,071
2017	12,651	3,525	2,421

Notes: This table shows the number of firms available in both VAT and CIT datasets for each fiscal year, and the number matched across forms. *Source*: VAT and CIT returns data for fiscal years 2013-2017

Overall, we are able to match 27% of the total number of unique firms. However, excluding 2017, where because of the timing of submission of returns we have many unmatched VAT returns, just under 50% of all observations can be matched. It is of course possible for a business to meet the requirements to be registered for only one of the taxes,[2] which could at least partly explain the rather large proportion of the firms that cannot be matched. We restrict our further analysis to the matched panel, which contains 44,190 observations for 15,551 unique firms, over the five-year period.

3.2 Internal Consistency of Data

Each of the two datasets can be checked for internal consistency. Some entries in the dataset are completed by the firms; others are automatically derived within-form using the submitted data entries. We manually calculate the relevant tax variables using the formulas provided in the tax forms from the raw data entries and compare them against their pre-computed counterpart in the administrative data.

Table A.1 in the Appendix sets out a series of internal checks carried out on each of the datasets. The columns in Table A.1 refer to the section and line of each of the two forms. For example, the total output tax is shown in Section C of the VAT form, where lines 4, 5, 6 and 7 should add up to the total in line 8. The second panel refers to the CIT form. Table 2 presents the extent of internal consistency for the two databases. Column (3) shows the extent to which each of the 44,190 observations is internally consistent. For comparison, column (4) describes the internal consistency of the universe of VAT firms, using monthly data.

[2]For example, firms operating in Uganda are only required to register for the VAT if their turnover is above UGX 150 million ($45,450).

TABLE 2
INTERNAL CONSISTENCY RATES

	Section (1)	Form cell (2)	Yearly data (3)	Monthly data (4)
		Panel A: VAT		
Imported services	C, D	-	0.98	0.99
Total output tax	C	8	0.78	0.94
Total output tax	H	32	0.99	1.00
Total input tax	C	17	0.93	0.99
Total VAT Paid/Withheld	G	31	0.99	1.00
Total VAT payable	H	35	1.00	1.00
Total VAT paid	H	36	0.98	0.99
Net VAT Payable/Claimable	H	37	1.00	1.00
N			44,190	1,016,344
		Panel B: CIT		
Total sales	F	1c	1.00	-
Cost of sales	F	2f	1.00	-
Gross profit	F	3	1.00	-
Other income	F	4p	1.00	-
Income from short term insurance business	F	5e	1.00	-
Operating expenses	F	6bb	0.96	-
Total employment expenses	F	8e	1.00	-
Financial expenses	F	9g	1.00	-
Insurance business income	F	10f	1.00	-
N			44,190	

Notes: Columns (1) and (2) show the section and form cell corresponding to the variable in the tax form. Column (3) shows the rate of internal consistency within VAT (Panel A) and CIT (Panel B) forms in the merged dataset. This is computed as the share of firms for which there is a match between the pre-computed variable provided by the URA and the manually derived variable. Additionally, in Column (4) we show the internal consistency rate within VAT forms using the full monthly-level data. *Source*: Monthly VAT and yearly CIT returns data data for fiscal years 2013-2017.

Table 2 indicates that internal consistency is very high for the CIT data. There is only one test - for operating expenses - where there is any inconsistency, and then this applies to only 4% of observations. Internal consistency is slightly lower for some aspects of the VAT data.[3]

3.3 Consistency of Data between Datasets

We now turn to look at equivalencies between VAT and CIT filings in our merged sample. Specifically, we explore the extent to which firms are consistently reporting their returns across forms by focusing on variables that are likely to be equivalent in both VAT and CIT filings. This exercise is much less precise than the tests for internal consistency, since the data requirements for VAT and CIT differ from each other. In general, there are few, if any, directly comparable data points between the two sets of tax returns.

[3]We find the greatest rate of mismatches when calculating total output tax and comparing it against the pre-computed aggregate in VAT form Section C. Surprisingly, we do not find mismatches when we use total output tax from Section H, which is supposed to take the exact same value as in Section C within the form.

In Table 3, we show the cross-filing consistency rate for sales, purchases, and cost of inputs. These are based on our best estimates of comparable data between the two datasets; the variables being compared are set out in columns 1 and 2 for CIT and VAT data respectively. The final columns indicate the proportion of observations for which the data from the two sources match each other, allowing for a rounding error of up to 5%.

TABLE 3
EQUIVALENCE OF CIT AND VAT VARIABLES

	CIT form cell	VAT form cell	Eq. rate	Eq. rate (non-zero)
	(1)	(2)	(3)	(4)
Sales	1(c)	[4+5+6+7]	0.61	0.67
Import purchases	2b(i)	[10+12]	0.77	0.40
Local purchases	2b(ii)	[9+11]	0.43	0.41
Cost of inputs[a]	[2f - 2c(iii) - 2d(iv) - 2d(vi)]	17	0.24	0.20
Cost of inputs[b]	[2b(iii) + 2d(viii) - 2d(iv) - 2d(vi)]	17	0.33	0.35

Notes: [a] Including value of stock, [b] excluding value of stock. Column (3) shows the equivalency rate for all observations, whereas Column (4) shows the equivalency rate only among non-zero observations in both VAT and CIT. *Source*: Monthly VAT and CIT annual returns data for fiscal years 2013-2017.

Table 3 makes it clear that we cannot be sure that our data are generally consistent across VAT and CIT forms. For example, we are able to match data on sales for only 61% of the observations (slightly higher conditioning on positive observations in both datasets). However, to some extent that is to be expected, as the precise definitions of these variables are less clear, suggesting that at least part of the mismatch may be due to differences in definition.

We further look into these differences by looking at the relevant distributions in both VAT and CIT in Appendix Figures A.1 to A.3. In particular, we find that firms are more likely to report zero sales in CIT returns relative to VAT, whereas they are also more likely to report values concentrated at the right tail of the distribution in sales and local purchases. In imports, however, this pattern reverses.

In order to reduce potential error in our analysis below, we further restrict the sample to observations that are consistent across the two datasets with respect to sales (i.e., we keep 61% of the 44,190 observations as indicated in Table 3, leaving us with 26,766 remaining observations) and, among those, we keep only firm-year observations with positive sales (which implies dropping an additional 3,608 observations). This yields a dataset of 23,158 observations. Finally, the calculation of some of the DBCFT adjustments imply taking first differences of the capital stock and inventories, which requires having data from the previous fiscal year for a given firm. Due to this, we lose all the observations for the first fiscal year (2013) available in our dataset plus some other

observations for firms that did not file both taxes for consecutive years. This final adjustment further removes 7,380 observations from the sample, which leaves us with a final dataset of 15,778 observations.

3.4 Descriptive Statistics for Final Sample

Table 4 reports descriptive statistics for the main variables of interest, including sales, cost of inputs, labor costs, net fixed assets, interest payments, the share of firms with zero or negative profits, exports, imports and the tax base for the VAT and the CIT. The average firm in the sample has UGX 7.05 billion ($2.1 million) in sales, UGX 3.85 billion ($1.2 million) in input costs, UGX 0.35 billion in labor costs and fixed assets worth UGX 2.99 trillion. The medians of all variables are substantially smaller, indicating that the firm size distribution is significantly right skewed and a lot of the aggregate patterns are driven by a small subset of large firms.

TABLE 4
SUMMARY STATS - DBCFT SAMPLE

	(1) Mean	(2) Median	(3) Std. dev.
Sales	7,046.40	587.38	43,011.33
Cost of inputs	3,851.10	317.85	28,528.46
Labor costs	345.73	24.50	3,158.47
Net fixed assets	2,991.07	30.54	37,107.25
Interest	12.80	0.00	364.44
Share with profits $<= 0$	0.38	0.00	0.49
Exports	942.92	0.00	9,326.59
Imports	1,258.61	0.00	10,222.54
VAT tax base	1,942.25	62.41	16,077.82
CIT tax base	194.02	0.00	3,801.74
N	15,778		

Notes: Monetary amounts are in millions of Ugandan shillings. *Source*: Monthly VAT and CIT yearly returns data for fiscal years 2013-2017.

We show some of the heterogeneity across firms in Table 5, which explores the skewness in the distributions of the tax base for both VAT and CIT, in both our sample and the entire database. The table treats firms with tax losses as having no taxable profit, since they do not contribute any revenue. It is clear from the table that the vast majority of revenue is raised from the largest firms. In the full sample, 82% of both CIT and VAT come from the largest firms (measured by turnover). In the DBCFT sample, these percentages are 68% and 75% respectively, indicating rather less skewness in this

sample - although it is still considerable. At the extreme, in both samples just under one third of the entire CIT base is accounted for by one tenth of one percent of firms. It clearly follows that the impact of any reform on aggregate revenue will depend heavily on the impact of the largest firms.

TABLE 5
PROPORTION OF THE AGGREGATE TAX BASE ACCOUNTED FOR BY TURNOVER PERCENTILES

	DBCFT sample		Full sample	
	VAT	CIT	VAT	CIT
	(1)	(2)	(3)	(4)
Bottom 25%	0.00	0.00	0.00	0.00
Bottom 50%	0.02	0.01	0.01	0.10
Top 25%	0.92	0.94	0.97	0.89
Top 10%	0.79	0.84	0.89	0.87
Top 5%	0.68	0.75	0.82	0.82
Top 1%	0.40	0.54	0.58	0.67
Top 0.1%	0.14	0.31	0.25	0.31
N (firm-year)	15,778		97,929	119,636

Notes: This table shows the proportion of the aggregate tax base accounted for different percentiles of the turnover distribution. In Columns (1) and (2), turnover is defined identically as in the DBCFT sample total sales match across forms by construction. In Columns (3) and (4), Turnover is defined using total sales in VAT and in CIT, respectively. *Source*: Monthly VAT and CIT yearly returns data for fiscal years 2013-2017.

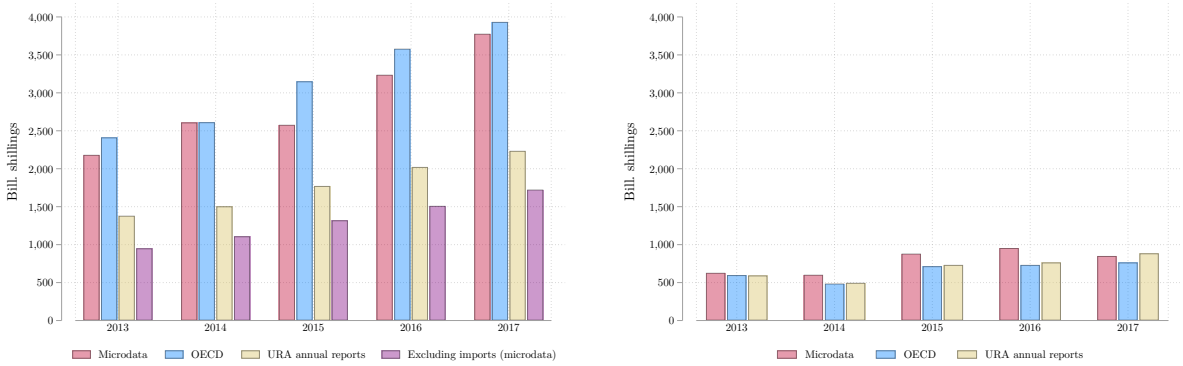
3.5 Comparability of tax return and aggregate data

We now provide a comparison of the tax return data with total revenues from VAT and CIT provided by other sources. Specifically, we consider data on total revenues from the OECD Global Revenue Statistics Database (OECD, 2022), and also from Uganda Revenue Authority Annual Reports (URA, n.d.). For this comparison we do not exclude any observations in the micro data as described in the previous subsection, but simply aggregate over all observations included in Table 1.

Figure 1 presents comparisons separately for VAT and CIT. The first column for each year is the sum of all revenues from the micro tax return dataset. The second column is from the OECD and the third is from the Uganda Revenue Authority.

FIGURE 1
REVENUE ESTIMATES COMPARISON

(A) VAT **(B) CIT**



Notes: In the microdata, firm-year observations with zero or negative value-added in VAT declarations and observations with zero or negative corporate income tax liability are treated as zeros in the aggregation. *Source*: Monthly VAT and CIT yearly returns data for fiscal years 2013-2017, OECD Global Revenue Statistics Database, and URA annual reports.

There appears to be a discrepancy between the aggregate VAT revenue statistics from the OECD and the URA, with the OECD giving consistently higher estimates of total VAT revenue. This seems to be because the URA data do not include tax on imports collected at the border. This sum is also not directly included as a charge in the VAT tax return form, but it is available in the form as an input deduction. Since we are interested in the total VAT (and potential DBCFT) collected, we add back this import VAT to the micro data. When we do so, the aggregate micro data is close to the OECD estimate of total VAT revenue. When we do not add this back, the aggregate micro estimates are close to the URA total as shown in the fourth (purple) bar of Figure 1a.

There is also a broad comparability of the three sources for CIT revenues, which are substantially lower than VAT revenues.

4 Estimating the DBCFT Tax Base

In order to estimate the tax base that a DBCFT would generate in Uganda, we apply the definitions of the tax base derived in Section 2 to our final dataset of 15,778 observations.

We take two separate empirical approaches with respect to the treatment of losses. First, we follow the existing approach of the CIT system, which is not to permit a rebate for losses. Instead losses can be carried forward to set against future profit. We identify cases of transition from profit and/or loss under the CIT system to profit and/or loss under the DBCFT. But we do not reduce the estimated revenue in respect of loss-making firms under either the CIT or the DBCFT. This is the most likely, and

practical, way of introducing a DBCFT. However, it does not accord with the "pure" form of the DBCFT according to theory (see Devereux et al., 2021, which would permit symmetric treatment - in effect, giving full relief for losses). Second, then, we consider the position under which full relief is given for losses under the DBCFT. To make this comparable with the existing system, however, we compare this outcome with the hypothetical case of the existing CIT system, but also with full relief for losses. In this case, we also assume that the VAT is fully symmetric.

4.1 No Relief for Losses

Figure 2 shows our main aggregate results for the first scenario, with no immediate relief for losses. This reports the current tax base of the CIT (light red bar) and VAT (light blue bar) compared to the potential tax base of the DBCFT estimated from the CIT data (dark red bar) and the VAT data (dark blue bar). The analysis is carried out for fiscal years 2014, 2015 and 2016.[4]

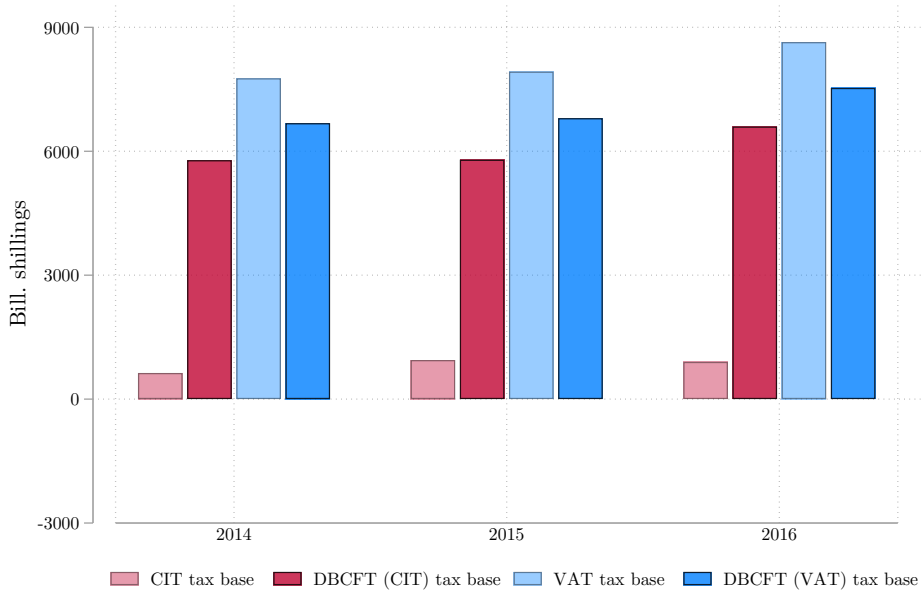
The main result is that the tax base of the DBCFT would be substantially higher than the current tax base of the CIT, and a little lower than the current tax base of the VAT. For the three fiscal years analyzed, and for our sample of firms and observations, the tax base of the CIT is between 630 and 900 billion Ugandan shillings (UGX, equivalent to $191-$272 million[5]), while the tax base of the VAT is in the range of UGX 6.7-8.6 trillion ($2.02-$2.61 billion). The DBCFT tax base estimated after applying all the adjustments to the CIT tax base is about UGX 6 trillion ($1.82 billion), which is in the same order of magnitude as the DBCFT tax base obtained after deducting labor costs from the VAT tax base. The difference between them is between 10% and 15% in all three fiscal years.[6]

[4]We do not include fiscal year 2013 because some of the adjustments made to go from the CIT tax base to the DBCFT tax base require calculating yearly changes in inventories and the capital stock, as explained in Section 2. We also do not include fiscal year 2017 due to reduced data availability as indicated in Table 1, which rules out 1,089 observations.

[5]The exchange rate between the Ugandan Shilling and the US Dollar in the period 2014-2017 was 3,300 UGX per dollar, on average.

[6]Specifically, the DBCFT tax base calculated using CIT data is 13.5%, 15%, and 12.5% smaller than the DBCFT tax base calculated with VAT data in fiscal years 2014, 2015 and 2016, respectively.

FIGURE 2
TOTAL VAT, CIT, AND DBCFT (ESTIMATED) TAX BASES

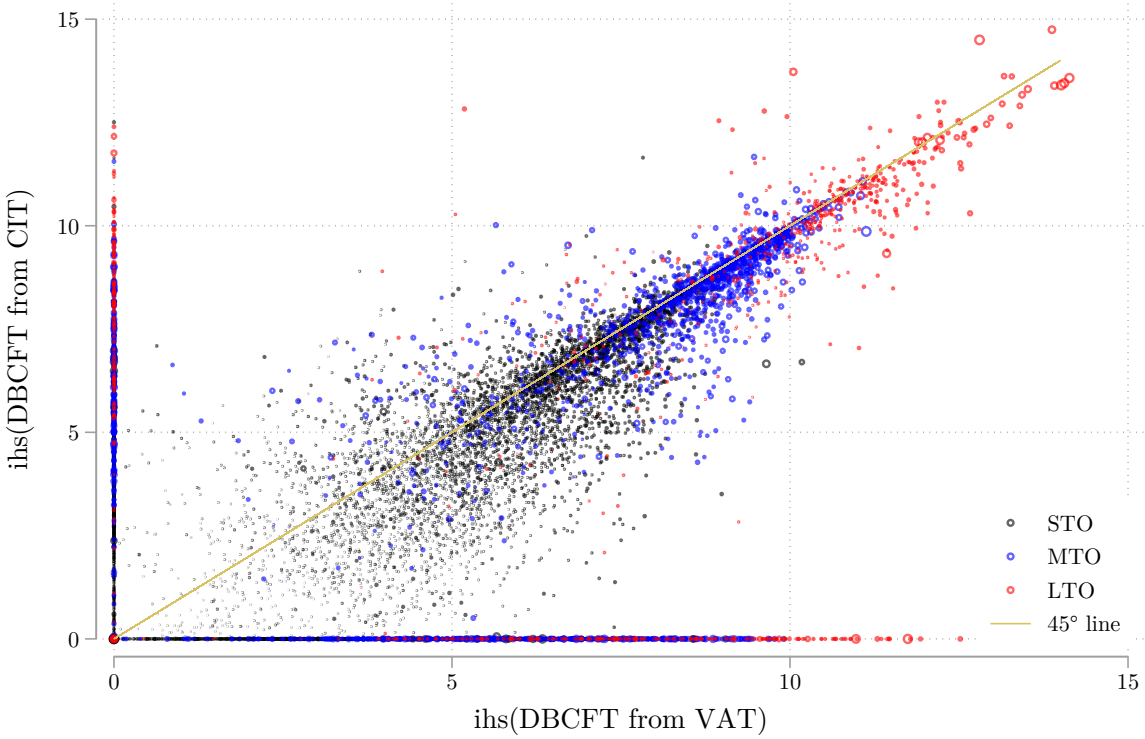


Notes: For each tax base, individual firm-year observations with a negative value are treated as zeros in the aggregation. Tax bases are estimated in a subsample of firms for which we have both monthly VAT and CIT returns available in a given fiscal year. *Source:* Monthly VAT and CIT yearly returns data for fiscal years 2014-2016.

Figure 3 shows graphically the correlation between the estimated DBCFT tax base, starting from either the CIT or the VAT tax base. Each dot in the figure represents a firm-year observation. We use the inverse hyperbolic sine (ihs) transformation, which is essentially a logarithmic scale but allows for zeros to be defined.[7] The figure shows that the estimated tax base is not only similar in the aggregate, but also highly correlated at the micro level. It is worth emphasizing that the correlation is especially tight for the largest firms (the red dots corresponds to firms in the Large Taxpayers Office, LTO, and the blue ones to those in the Medium Taxpayers Office, MTO). Since these firms account for a very large share of the tax revenue collected both in the VAT and the CIT, they would also have a disproportionate weight in the potential revenue from a DBCFT.

[7] Specifically, the inverse hyperbolic sine function is defined as follows: $arsinh(x) = \ln\left(x + \sqrt{1+x^2}\right)$.

FIGURE 3
DBCFT ESTIMATED TAX BASES: MICRO-LEVEL COMPARISON



Notes: This figure plots the inverse hyperbolic sine transformation of the DBCFT tax base from CIT against the inverse hyperbolic sine transformation of the DBCFT tax base from VAT, separately by firm-size and weighted by total sales. *Source*: Monthly VAT and CIT yearly returns data for fiscal years 2014-2017.

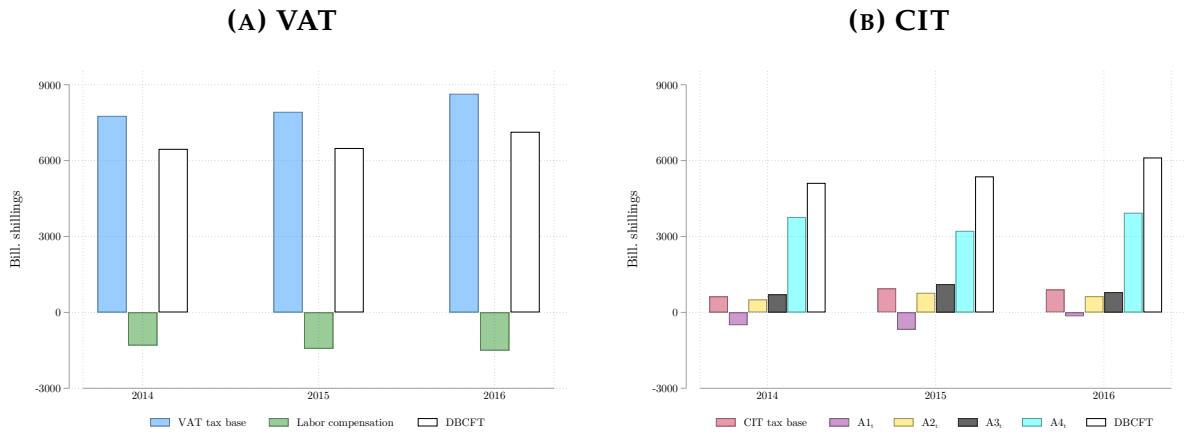
We now provide more details on the impact of each of the adjustments on the estimated tax bases. The left panel of Figure 4 shows how the deduction of wage costs from the VAT tax base yields a potential tax base for the DBCFT in our sample of around UGX 6.6 trillion ($2 billion). The right panel of Figure 4b shows the effect of the four adjustments to the CIT tax base. Allowing for full expensing of investment (A1) would reduce the tax base. In contrast, the adjustments subtracting net financial income (A2) and the change in inventories (A3) have a positive impact on the DBCFT tax base. Finally, the largest effect comes from the border adjustment, which deducts net exports (A4). This adjustment turns out positive because, in aggregate, Ugandan firms have a negative trade balance. The resulting DBCFT tax base in our sample (white bar), as already shown in Figure 1, is above UGX 6 trillion ($1.82 billion), approximately nine times larger than the current CIT tax base.

It is important to note that, as already set out, in all the calculations reported in Figure 4, we do not include any negative revenue arising from firms with a negative tax base, by setting the tax base for such firms to zero. In the case of the VAT, the deduction of wage costs can only make the DBCFT tax base smaller than the VAT tax

base, which increases the number of firms with taxable losses. However, in the case of the CIT the four adjustments could be either positive or negative, and the tax base estimated for the DBCFT could have a different sign than the original CIT tax base.

Consider a case in which the CIT tax base is positive, but the four adjustments yield a negative DBCFT tax base (this could happen to a firm with large investments or with a positive amount of revenue from net exports). In this exercise, we would set the resulting DBCFT tax base to zero because that would be the taxable amount for that fiscal year, and we would allocate the negative impact proportionally to the four adjustments.[8] However, it may also be the case that the CIT base is negative but the DBCFT base is positive. In this case, we again adjust the contribution of each of the four factors proportionally.

FIGURE 4
DBCFT ADJUSTMENTS BREAKDOWN: NONNEGATIVE TAX BASES



Notes: For VAT and CIT tax bases, firm-year observations with a negative value are treated as zeros in the aggregation. Revenues are estimated in a subsample of firms for which we have both monthly VAT and CIT returns available in a given fiscal year. For the VAT, the only adjustment is the subtraction of wage costs. For the CIT, we apply four adjustments as described in Section 2. If an adjustment pushes the tax liability below zero, we limit the impact of the adjustments to the amount in which the tax liability is reduced. *Source*: Monthly VAT and CIT yearly returns data for fiscal years 2014-2016.

The main limitation of this accounting exercise is that negative tax bases can be carried forward as tax credits to offset future tax liabilities.[9] Therefore, even if a negative tax base does not reduce tax revenue this year, it potentially reduces tax revenue in the future. Table 6 presents a transition matrix showing the frequency with which the tax

[8]For example, consider a firm that starts out with a positive CIT tax base of 100 and the four adjustments combined have an impact of -200. In the aggregate, the tax base is only reduced by -100 because we assume it cannot be negative. To allocate this change proportionally, we divide the total impact of each adjustment by a uniform factor (in this example, the factor is 2, i.e. $-200/-100$). Moreover, if the tax base was negative before the adjustments and remains negative after them, we replace all adjustments with zero, since the adjustments have no impact on that year's tax liability.

[9]In the case of the VAT, firms with a negative tax liability could actually apply for a refund in the same fiscal year, but in practice VAT refunds are severely restricted in Uganda as discussed in Almunia et al. (Forthcoming).

base switches sign when moving from a tax base definition to another. In the case of the CIT, the majority of firm-year observations that start from a positive CIT tax base also end up with a positive DBCFT tax base, although a non-negligible 31% (19% of the total) of these end up with a negative tax base. Conversely, 37% of firm-year observations with a negative CIT tax base end up with a positive DBCFT tax base. The case of the VAT is simpler, because all adjustments lead to a smaller DBCFT tax base than the VAT tax base. Thus, all firms starting with a negative VAT tax base end up with a negative DBCFT tax base. However, among those that start with a positive VAT tax base, 26% end up with a negative DBCFT tax base after deducting wage costs.

TABLE 6
DBCFT ADJUSTMENTS: TRANSITION MATRIX

	CIT tax base		VAT tax base	
	Negative	Positive	Negative	Positive
Negative DBCFT tax base	3,802	3,030	3,418	3,177
	(0.24)	(0.19)	(0.22)	(0.20)
Positive DBCFT tax base	2,236	6,710	0	9,183
	(0.14)	(0.43)	(0.00)	(0.58)

Notes: This table shows the transition matrix from CIT and VAT tax bases to the DBCFT tax bases after the adjustments. *Source*: Monthly VAT and CIT yearly returns data for fiscal years 2014-2017.

Finally, in this subsection, Table 7 shows the skewness in the estimated DBCFT tax bases across our sample. This is comparable with the second column in Table 5, which shows the skewness of the CIT tax base under the existing system. Both of the estimated DBCFT bases (starting from VAT and for CIT) are highly skewed. For example, both approaches show that 93% of the tax base is accounted for by the largest 25% of firms (measured by turnover) - compared to 94% under the existing CIT system for the same sample. However, beyond that, both of the estimated DBCFT bases are slightly less skewed than existing tax bases. For example, the top 1% of firms account for 40% or 45% of the estimated DBCFT tax bases, compared to 54% of existing tax bases.

TABLE 7
PROPORTION OF THE AGGREGATE DBCFT TAX BASE ACCOUNTED FOR BY TURNOVER PERCENTILES

	From VAT (1)	From CIT (2)
Bottom 25%	0.00	0.00
Bottom 50%	0.02	0.01
Top 25%	0.93	0.93
Top 10%	0.79	0.80
Top 5%	0.68	0.70
Top 1%	0.40	0.45
Top 0.1%	0.14	0.18
N (firm-year)	15,778	

Notes: This table shows the proportion of the aggregate tax base accounted for different percentiles of the turnover distribution. Turnover is defined using total sales in VAT and in CIT, respectively. *Source*: Monthly VAT and CIT yearly returns data for fiscal years 2014-2017.

4.2 Fully Symmetric Taxes

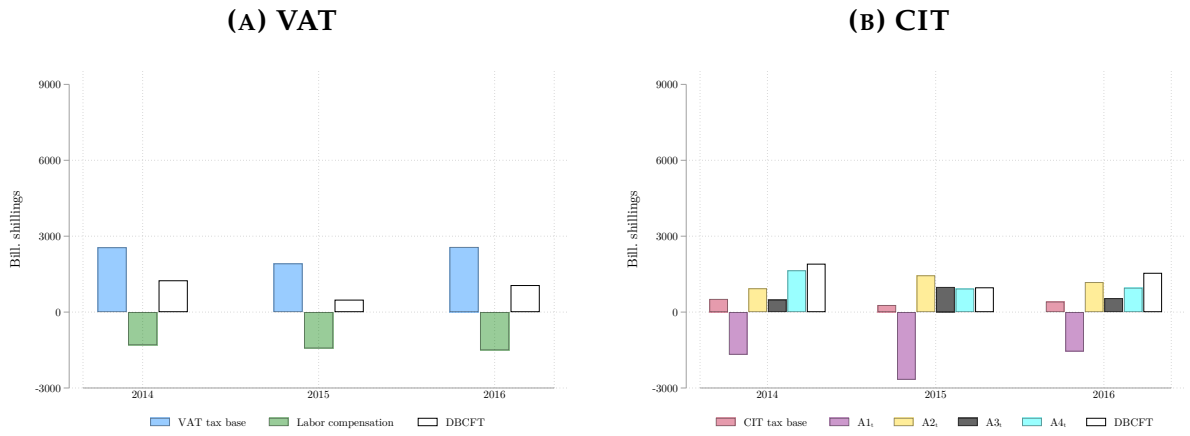
In order to estimate the potential DBCFT tax base under the most conservative assumptions, and in line with normative economic theory, we now present the results of an alternative exercise in which we assume that any negative tax bases receive an immediate rebate. That is, we include negative tax bases, both when calculating the tax base of the VAT and CIT, and when estimating the impact of the adjustments needed to arrive at the DBCFT tax base.

The results of this second exercise are reported in Figure 5. The left panel contains the results for the VAT. The tax base of the VAT is substantially lower than in the previous case due to the impact of negative tax bases. The deduction of wage costs is the same as in the previous exercise, so the resulting DBCFT tax base of our sample is substantially lower than in Figure 4, between UGX 0.5 and 1.3 trillion ($0.15-$0.39 billion) in all fiscal years analyzed.

The right panel of Figure 5 shows the calculations for the CIT. Taking into account the observations with a negative tax base make the overall CIT tax base lower than before, but still positive in all fiscal years. The impact of all four adjustments has the same sign as before, but the magnitudes are different: the deduction of investment

now leads to a large reduction in the tax base for the DBCFT. By contrast, the border adjustment has a more moderate positive impact on the overall DBCFT tax base, because we now account for the full impact of firms with a high share of exports (which are taxable under a CIT but not under a DBCFT). The resulting DBCFT tax base in our sample is between UGX 0.9 and 1.9 trillion ($0.27-$0.57 billion), which is significantly lower than in the previous exercise, but of the same order of magnitude as the DBCFT tax base estimated using the VAT definition. Overall, the DBCFT tax base is higher than the CIT tax base by a factor between 3 and 4.

FIGURE 5
DBCFT ADJUSTMENTS BREAKDOWN: INCLUDING NEGATIVE TAX BASES



Notes: For any given tax base, firm-year observations are allowed to take negative values. Revenues are estimated in a subsample of firms for which we have both monthly VAT and CIT returns available in a given fiscal year. *Source*: Monthly VAT and CIT yearly returns data for fiscal years 2014-2016.

5 Conclusions

We have analysed the revenue potential of a destination-based cash-flow tax (DBCFT) in Uganda. We have used tax return data for both VAT and CIT on individual businesses in Uganda. We constructed a matched sample that allowed us to estimate the tax base for a DBCFT starting from both the VAT tax base and from the existing CIT base. Table 8 summarises our results on the aggregate tax base, based on the sample of businesses used in our analysis.

The results are striking. For our sample, the annual tax base for CIT, averaged over the period 2014 to 2016, was 827 million shillings. This estimate treats firms with a taxable loss as having a zero tax base. On the same basis, our two estimates for the aggregate DBCFT tax base are 5,536 million shillings (based on adjusting the CIT base) and 6,700 million shillings (based on adjusting the VAT base). That represents an *increase* of 569% and 709%, respectively.

These estimates assume that Uganda does not offer any rebates to firms with taxable losses. However, even if Uganda moved to a completely symmetric DBCFT system, with a full and immediate rebate for taxable losses, the estimated revenues under the new system would still be higher than under the existing system with no rebates. In this case, we estimate that revenues would rise between 13% (based on adjusting the VAT base) and 79% (based on adjusting the CIT base).

TABLE 8
REVENUE CONSEQUENCES OF INTRODUCING A DBCFT: 2014-2016

	CIT		VAT	
	CIT	DBCFT	VAT	DBCFT
	(1)	(2)	(3)	(4)
Tax base without loss relief	827.32	5,536.89	8,113.68	6,697.59
Tax base with loss relief	403.97	1,479.24	2,352.64	936.55

Notes: This table shows the average annual tax base estimates with and without loss relief over the 2014-2016 period for the CIT, VAT, and DBCFT under the two different approaches. Subsample of firms for which we have both monthly VAT and CIT returns available in a given fiscal year, and for which total sales are consistent across forms. *Source*: Monthly VAT and CIT yearly returns data for fiscal years 2014-2016.

References

Almunia, Miguel, Jonas Hjort, Justine Knebelmann, and Lin Tian, "Strategic or confused firms? Evidence from "missing" transactions in Uganda," *Review of Economics and Statistics*, Forthcoming.

Auerbach, Alan J. and Michael P. Devereux, "Cash-flow taxes in an international setting," *American Economic Journal: Economic Policy*, 2018, *10* (3), 69–94.

_ , _ , Michael J. Keen, and John Vella, "Destination-based cash flow taxation," *Centre for Business Taxation Working Paper*, 2017, *17/01.*

Bachas, Pierre, Anne Brockmeyer, Roel Dorn, Kyle McNabb, and Camille Semelet, "Effective Tax Rates and Firm Size: The Case of Uganda," External publication, TaxDev Centre: Institute for Fiscal Studies and ODI 2022.

Bond, Stephen R. and Michael P. Devereux, "Cash flow taxes in an open economy," *Centre for Economic Policy Research Discussion Paper Series*, 2002, *Discussion Paper 3401.*

Devereux, Michael, Alan Auerbach, Michael Keen, Paul Oosterhuis, Wolfgang Schon, and John Vella, *Taxing Profit in a Global Economy*, Oxford: Oxford University Press, 2021.

Hebous, Shafik, Alexander D Klemm, and Saila Stausholm, "Revenue Implications of Destination-Based Cash-Flow Taxation," IMF Working Papers, International Monetary Fund 2022.

Koivisto, Aliisa, Nicholas Musoke, Dorothy Nakyambadde, and Caroline Schimanski, "The case of taxing multinational corporations in Uganda," March 2021.

OECD, "Global Revenue Statistics Database," 2022. Data retrieved from https://stats.oecd.org/Index.aspx?DataSetCode=RS_GBL.

Patel, Elena and J. McClelland, "What would a cash flow tax look like for US companies? Lessons from a historical panel," *Office of Tax Analysis Working Paper*, 2017, *116.*

President's Advisory Panel On Federal Tax Reform, "Simple, fair and pro-growth: Proposals to Fix America's Tax System," 2005.

URA, "Global Revenue Statistics Database." Data retrieved from https://www.ura.go.ug/#, available in the publications → revenue performance report tab.

Ways and Means Committee of the House of Representatives, *A Better Way Forward: Our Vision for a Confident America* 2016.

Weisbach, David, "Does the X-Tax mark the spot?," *SMU Law Review*, 2003, *56*, 201.

A Appendix

Table A.1 shows the formulas which have been used to compute the internal consistency rates shown in Table 2.

TABLE A.1
FORMULAS FOR INTERNAL CONSISTENCY

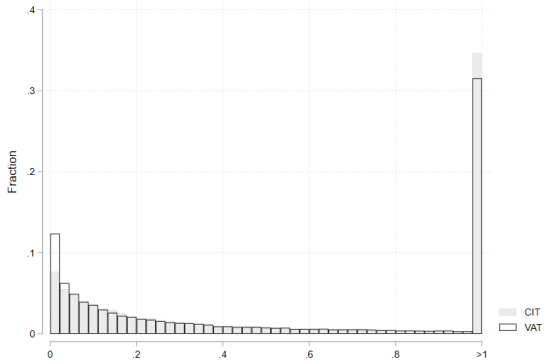
	Section	Form cell	Formula
	(1)	(2)	(3)
		Panel A: VAT	
Imported services	-	-	[6-15]
Total output tax	C	8	[4+5+6+7]
Total output tax	H	32	[4+5+6+7]
Total input tax	C	17	[11+12+13+14+15+16]
Total VAT paid/withheld	G	31	[29+30]
Total VAT payable	H	35	[32-33-34]
Total VAT paid	H	36	[31]
Net VAT payable/claimable	H	37	[35-36]
		Panel B: CIT	
Total sales	F	1c	[1a + 1b]
Cost of sales	F	2f	[2a(iv)+2b(iii)+2c(iii)+2d(vii)-2e(iv)]
Gross profit	F	3	[1c - 2f]
Other income	F	4p	[4a + 4b + 4c + ... + 4o]
Income from ST ins. business	F	5e	[5a + 5b + 5c + 5d]
Operating expenses	F	6bb	[6a + 6b + 6c + ... + 6z + 6aa]
Total employment expenses	F	8e(x)	[8e(i) + 8e(ii) + ... + 8e(ix)]
Financial expenses	F	9g	[9a + 9b + 9c + ... + 9f]
Insurance business income	F	10f	[10a + 10b + 10c + 10d + 10e]

Notes: This table shows the formulas for computing the internal consistency rates within VAT (*Panel A*) and CIT (*Panel B*) forms. *Source*: Uganda Revenue Authority's VAT and CIT tax forms.

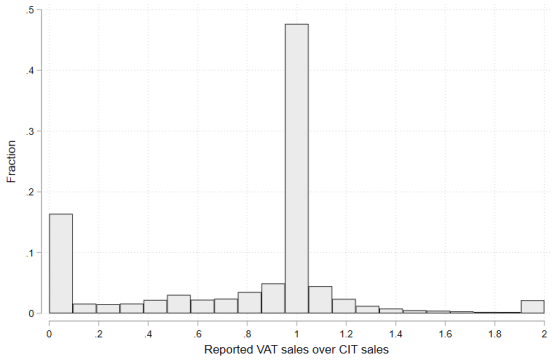
In Figures A.1-A.3, we show the individual distributions in CIT and VAT for some of the variables depicted in Table 3.

FIGURE A.1
DISTRIBUTION OF TOTAL SALES

(A) INDIVIDUAL DISTRIBUTIONS



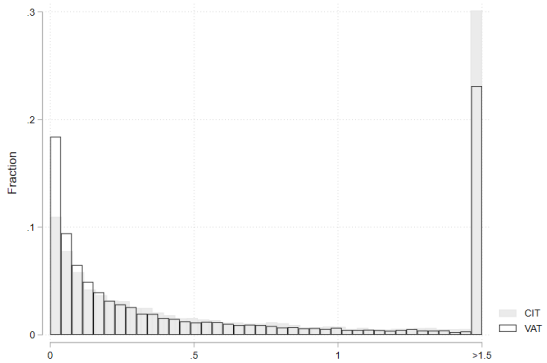
(B) VAT OVER CIT DISTRIBUTION



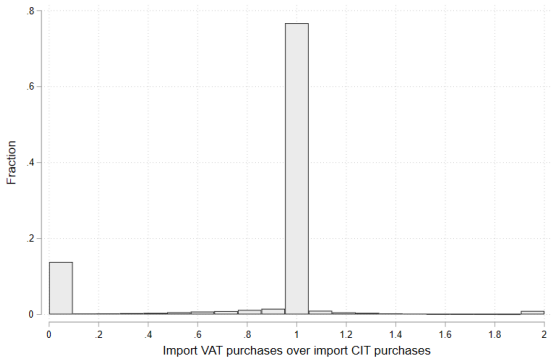
Notes: In *Panel A*, we show the distribution of total sales, separately by type of filing (VAT and CIT), winsorized at 5% and topcoded at 1 bill. shillings. In *Panel B*, we plot the distribution of VAT sales over CIT sales. *Source*: Monthly VAT and CIT Returns data for fiscal years 2013-2017.

FIGURE A.2
DISTRIBUTION OF IMPORT PURCHASES

(A) INDIVIDUAL DISTRIBUTIONS



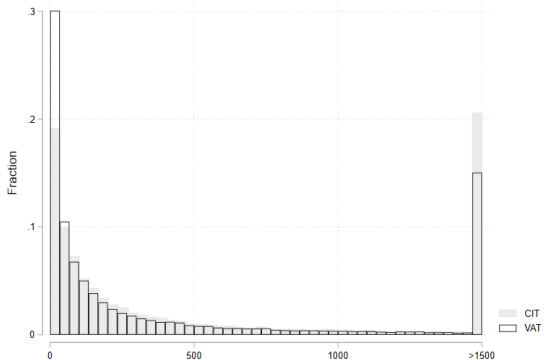
(B) VAT OVER CIT DISTRIBUTION



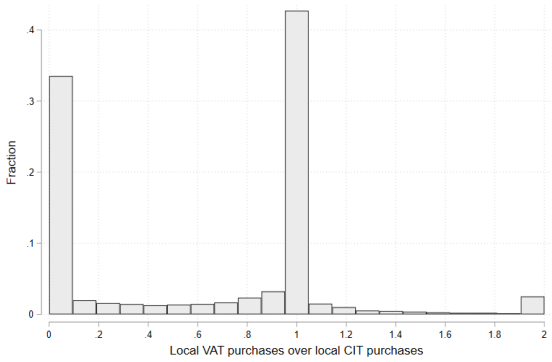
Notes: In *Panel A*, we show the distribution of import purchases, separately by type of filing (VAT and CIT), winsorized at 5% and topcoded at 1.5 bill. shillings. In *Panel B*, we plot the distribution of VAT import purchases over CIT import purchases. *Source*: VAT and CIT returns data for fiscal years 2013-2017.

FIGURE A.3
DISTRIBUTION OF LOCAL PURCHASES

(A) INDIVIDUAL DISTRIBUTIONS



(B) VAT OVER CIT DISTRIBUTION

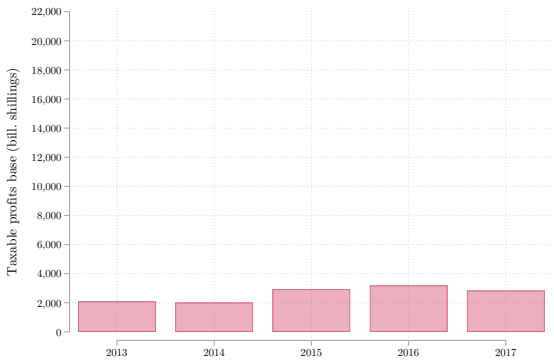


Notes: In *Panel A*, we show the distribution of local purchases, separately by type of filing (VAT and CIT), winsorized at 5% and topcoded at 1.5 bill. shillings. In *Panel B*, we plot the distribution of VAT local purchases over CIT local purchases. *Source*: Monthly VAT and CIT yearly returns data for fiscal years 2013-2017.

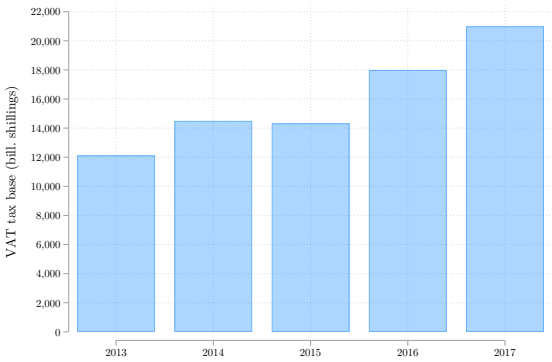
Figure A.4 shows the aggregated tax bases from which we derive the revenue estimates in Figure 1b.

FIGURE A.4
TAX BASES IN CIT AND VAT

(A) TAXABLE PROFITS IN CIT



(B) VAT TAX BASE

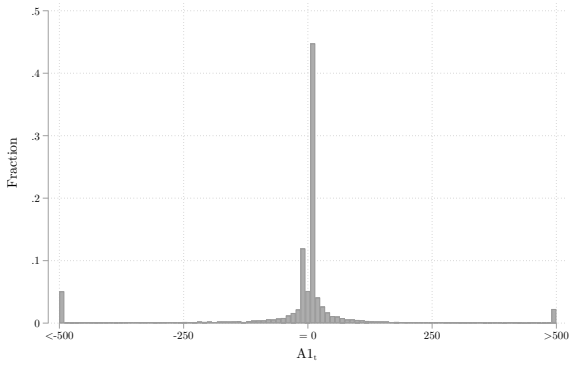


Notes: For each tax base, individual firm-year observations with a negative value are treated as zeros in the aggregation. *Source*: Monthly VAT and CIT yearly returns data for fiscal years 2013-2017.

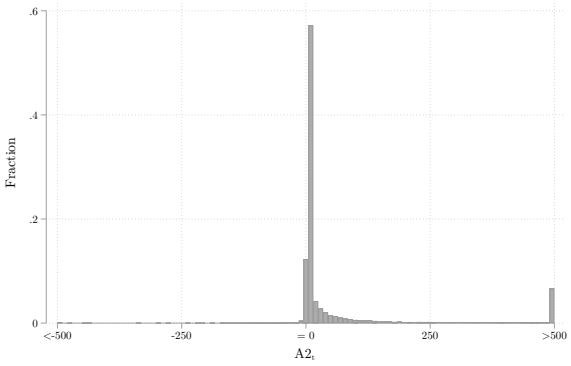
In Figure A.5, we show the individual distribution for each DBCFT adjustment under the CIT (investment, net financial income, inventories, and net exports) and VAT (labor costs) approaches.

FIGURE A.5
DISTRIBUTIONS OF DBCFT ADJUSTMENTS

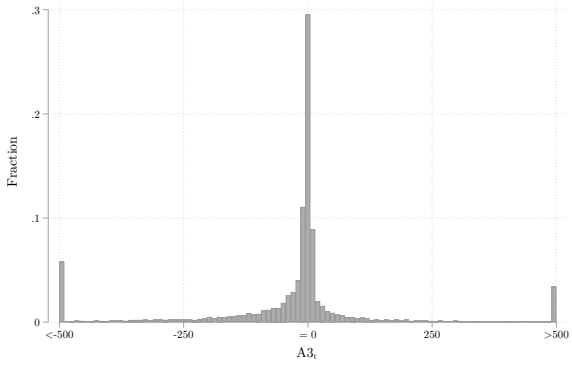
PANEL A: INVESTMENT ($A1$)



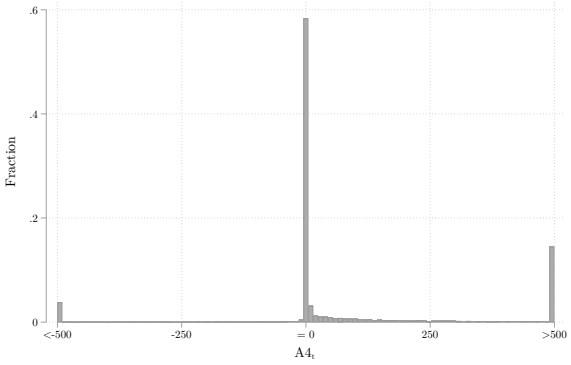
PANEL B: NET FINANCIAL INCOME ($A2$)



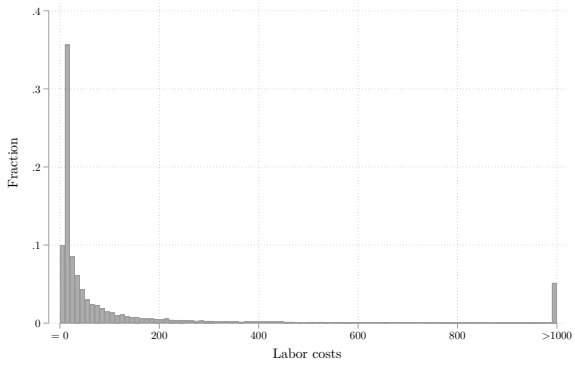
PANEL C: INVENTORIES ($A3$)



PANEL D: NET EXPORTS ($A4$)



PANEL E: LABOR COSTS (VAT)



Notes: This figure shows the individual distributions of all DBCFT adjustments. *Source*: Monthly VAT and CIT yearly returns data for fiscal years 2014-2017.

B Within-Tax Form Consistent Sample

In this Appendix we report the main results using a restricted dataset that only include the firm-year observations that are internally consistent within tax forms. As shown in Table 2, essentially all variables in CIT declarations are always internally consistent, but there is a small fraction of variables in VAT forms that are not internally consistent.

Table B.1 reports the descriptive statistics of the 11,450 firm-year observations that are internally consistent for all variables. In other words, the criterion of internal consistency eliminates 4,328 firm-year observations. The average firm size in this subsample is about half than in the main sample: average sales are UGX 3.63billion, while they are UGX 7.05 billion in the main sample (see Table 4 for details). The differences in the other variables are of the same order of magnitude, suggesting that the criterion of internal consistency appears to remove some of the largest firms in the sample.

TABLE B.1
SUMMARY STATS - INTERNALLY CONSISTENT SAMPLE

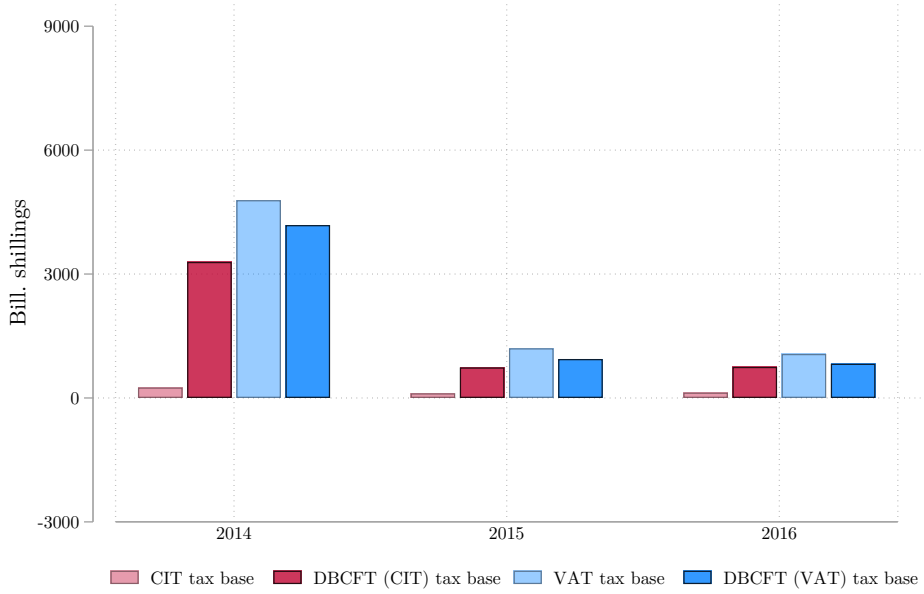
	(1) Mean	(2) Median	(3) Std. dev.
Sales	3,632.70	413.80	14,678.46
Cost of inputs	1,954.05	211.23	8,108.75
Labor costs	175.56	19.80	2,242.44
Net fixed assets	1,194.17	24.52	12,477.99
Interest	2.54	0.00	72.59
Share with profits $<= 0$	0.40	0.00	0.49
Exports	564.51	0.00	7,293.82
Imports	435.92	0.00	3,785.51
VAT tax base	701.65	36.39	4,308.47
CIT tax base	49.68	0.00	534.11
N	11,450		

Notes: Monetary amounts are in millions of Ugandan shillings. *Source*: Monthly VAT and CIT yearly returns data for fiscal years 2014-2017.

Figure B.1 shows the estimated tax bases of the CIT, VAT and DBCFT (using both the CIT and the VAT approximations), for the case of no relief for losses. The figure uses the same scale in the vertical axis as Figure 2, making it clear that this sample restriction removes observations of some large firms, especially in fiscal years 2015 and 2016, where the tax bases are an order of magnitude smaller than in the equivalent periods for the main sample. However, it is worth noting that the estimated DBCFT tax base remains very similar whether we use the CIT or the VAT definition, thereby

confirming that our method to arrive at the potential DBCFT tax base is robust despite the limited size of this subsample.

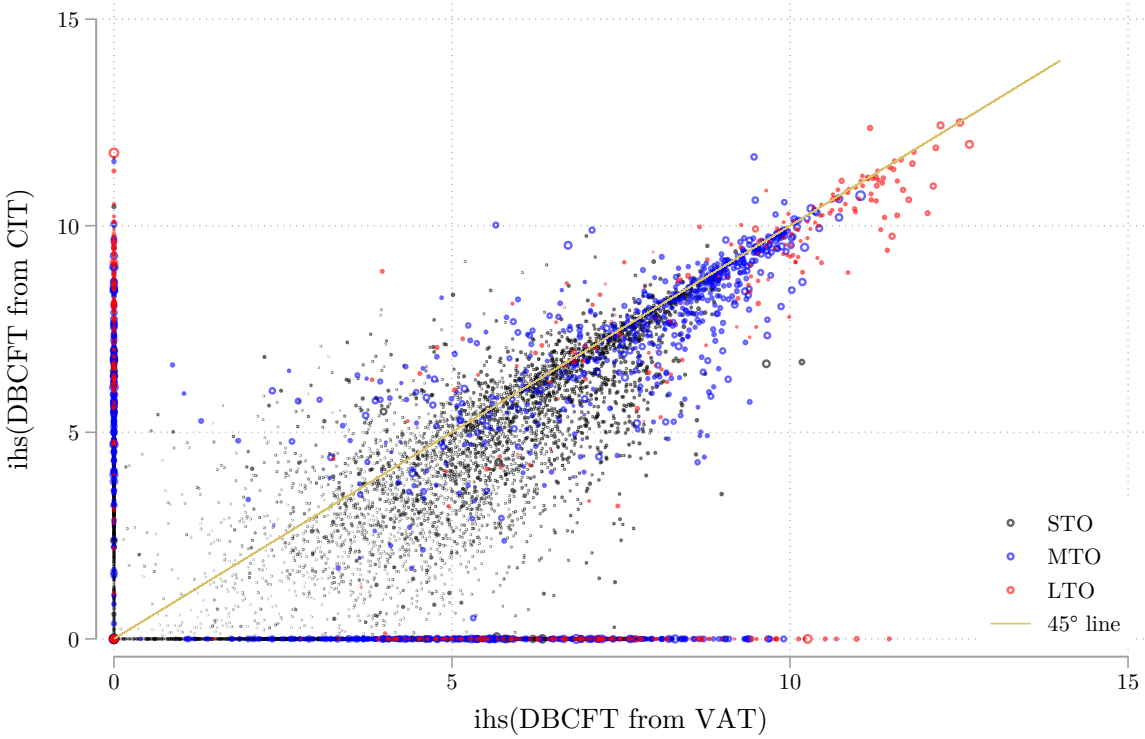
FIGURE B.1
TOTAL VAT, CIT, AND DBCFT (ESTIMATED) TAX BASES



Notes: For each tax base, individual firm-year observations with a negative value are treated as zeros in the aggregation. Tax bases are estimated in a subsample of firms for which we have both monthly VAT and CIT returns available in a given fiscal year, and for which this returns are internally consistent within each form. *Source:* Monthly VAT and CIT yearly returns data for fiscal years 2014-2016.

In Figure B.2, we replicate the analysis of the correlation of the estimated DBCFT tax base at the firm-year observation from Figure 3 for the subsample of internally consistent observations. Despite the reduced sample, we still observe a strong and positive correlation between the estimates obtained with the two different tax returns.

FIGURE B.2
DBCFT ESTIMATED TAX BASES: MICRO-LEVEL COMPARISON



Notes: This figure plots the inverse hyperbolic sine transformation of the DBCFT tax base from CIT against the inverse hyperbolic sine transformation of the DBCFT tax base from VAT, separately by firm-size and weighted by total sales. *Source*: Monthly VAT and CIT yearly returns data for fiscal years 2013-2017.

Table B.2 replicates the analysis done in Table 6, showing for what fraction of firm-year observations the tax base of the DBCFT has the same or opposite sign as the original tax (CIT or VAT). The proportions are very similar to those documented in Table 6 for the main analysis sample.

TABLE B.2
DBCFT ADJUSTMENTS: TRANSITION MATRIX

	CIT tax base		VAT tax base	
	Negative	Positive	Negative	Positive
Negative DBCFT tax base	2,733	2,545	2,733	2,545
	(0.27)	(0.21)	(0.27)	(0.21)
Positive DBCFT tax base	1,485	6,172	0	6,172
	(0.13)	(0.39)	(0.00)	(0.39)

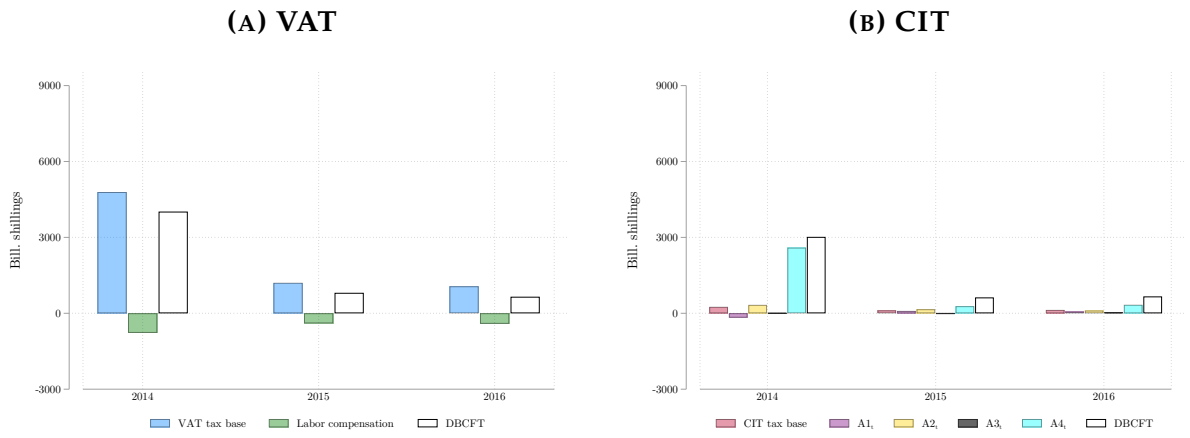
Notes: This table shows the transition matrix from CIT and VAT tax bases to the DBCFT tax bases after the adjustments. *Source*: Monthly VAT and CIT yearly returns data for fiscal years 2013-2017.

In Figures B.3 and B.4, we provide details on the impact of each of the tax base

adjustments needed to transition from the VAT and CIT tax bases to the DBCFT tax base. These are equivalent to Figures 4 and 5 in the main text. The results are again qualitatively similar, although the tax bases as much smaller than in the subsample used in the main text because by imposing the internal consistency requirement we lose some large firms.

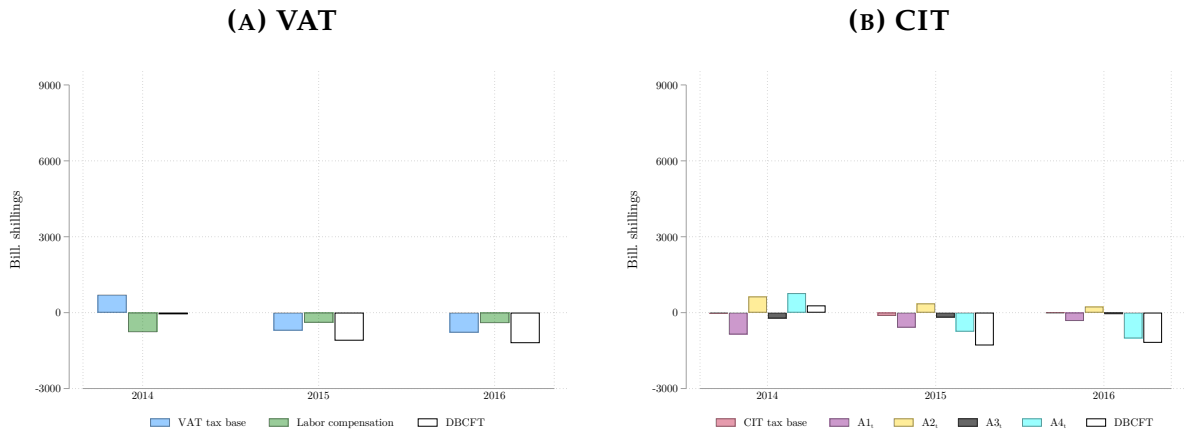
It is worth noting that in Figure B.4, where we allow for negative tax bases, the estimated aggregate tax base in 2015 and 2016 is negative, both for the current taxes and for the DBCFT. Again, this is due to not including some of the largest firms in 2015 and 2016, and it demonstrates the importance of these larger firms in the aggregate revenue potential of any tax on businesses.

FIGURE B.3
DBCFT ADJUSTMENTS BREAKDOWN - NONNEGATIVE TAX BASES



Notes: For VAT and CIT tax bases, firm-year observations with a negative value are treated as zeros in the aggregation. Revenues are estimated in a subsample of firms for which we have both monthly VAT and CIT returns available in a given fiscal year, and for which this returns are internally consistent within each form. For the VAT, the only adjustment is the subtraction of wage costs. For the CIT, we apply four adjustments as described in Section 2. If an adjustment pushes the tax liability below zero, we limit the impact of the adjustments to the amount in which the tax liability is reduced. *Source*: Monthly VAT and CIT yearly returns data for fiscal years 2014-2016.

FIGURE B.4
DBCFT ADJUSTMENTS BREAKDOWN - INCLUDING NEGATIVE TAX BASES

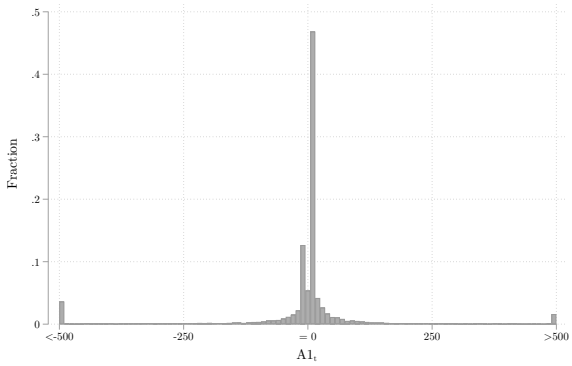


Notes: For any given tax base, firm-year observations are allowed to take negative values. Revenues are estimated in a subsample of firms for which we have both monthly VAT and CIT returns available in a given fiscal year, and for which this returns are internally consistent within each form. *Source*: Monthly VAT and CIT yearly returns data for fiscal years 2014-2016.

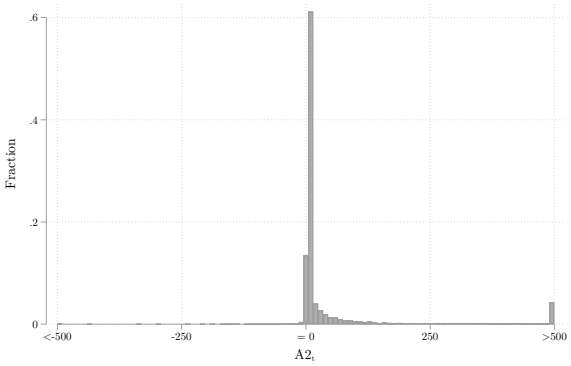
Finally, Figure B.5 shows the distribution of each of the adjustments made to the CIT and VAT tax bases to arrive at the DBCFT tax base. Again, the patterns are qualitatively very similar to those documented for the main sample in Figure A.5.

FIGURE B.5
DISTRIBUTIONS OF DBCFT ADJUSTMENTS - CONSISTENT OBSERVATIONS

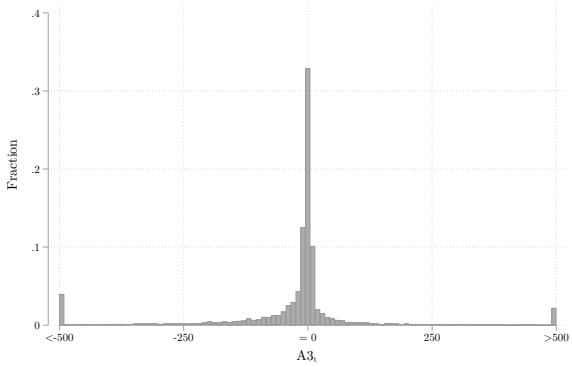
PANEL A: INVESTMENT ($A1$)



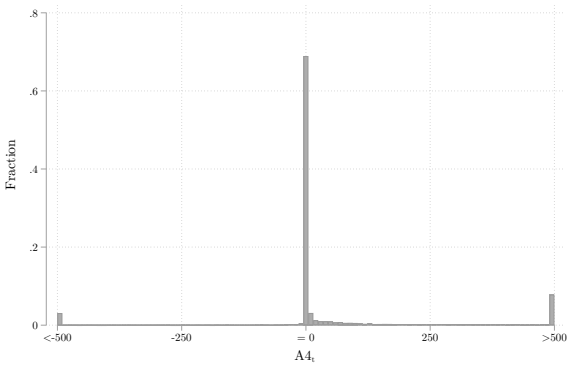
PANEL B: NET FINANCIAL INCOME ($A2$)



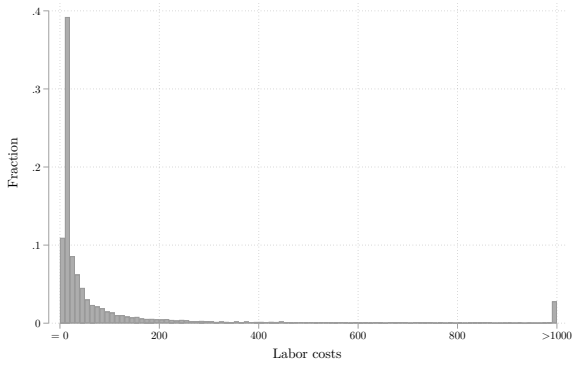
PANEL C: INVENTORIES ($A3$)



PANEL D: NET EXPORTS ($A4$)



PANEL E: LABOR COSTS (VAT)



Notes: This figure shows the individual distributions of all DBCFT adjustments. *Source*: Monthly VAT and CIT yearly returns data for fiscal years 2014-2017.