Estimating Tax Gaps in Zambia based on Audits

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OUTLINE

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BACKGROUND

- Public revenue mobilisation through taxes is an important tool for developing economies. (Slemrod et al, 2011; Waseem, 2018).
- Developing countries require domestic revenue to also reduce their existing debt stocks.
- The challenges that revenue mobilisation faces include tax evasion and non-compliance.
- The challenges are more severe in economies with high informality.
- Lost revenue can be estimated based on the tax gap $\Rightarrow$ Potential revenue - actual revenue mobilised

BACKGROUND

- Using a population of taxpaying firms as guided by administrative tax data from the Zambia Revenue Authority, we seek to achieve the following:

- Employ different methods to estimate probabilities for selection into audits.

- Provide an estimate for evasion not limited to a sample of audited firms.

- Calculate the size of total tax gaps and its subsequent tax component drivers (VAT/CIT).

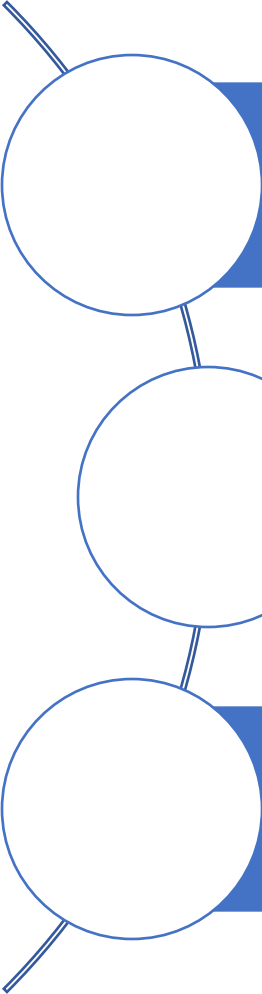- Extend gap analysis to investigate sector/industry drivers.

METHODS

Two approaches to tax gap estimations: Top-down and Bottom-up

Top-down uses macro data while Bottom-up uses micro data

The study uses Bottom-up approach to calculate a national estimate of potential revenue

METHODS

The study uses the information on audited firms as a base to predict audit outcomes of unaudited firms in the period 2014 to 2020.

We calculate the extent to which a firm can be audited

Based on these predictions from the audited firms, the study calculates the evasion of the non-audited firms.

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Why use audit information?

Audit outcomes are one of the few sources of information on tax evasion.

By relying on information on audit outcomes and information on various firm characteristics for the audited cohort, it is possible to estimate the evasion rates for non-audited firms.

This information exists usually only for a small sample of firms as audits are costly to implement.

These evasion estimates for all firms are then aggregated to calculate the tax gap.
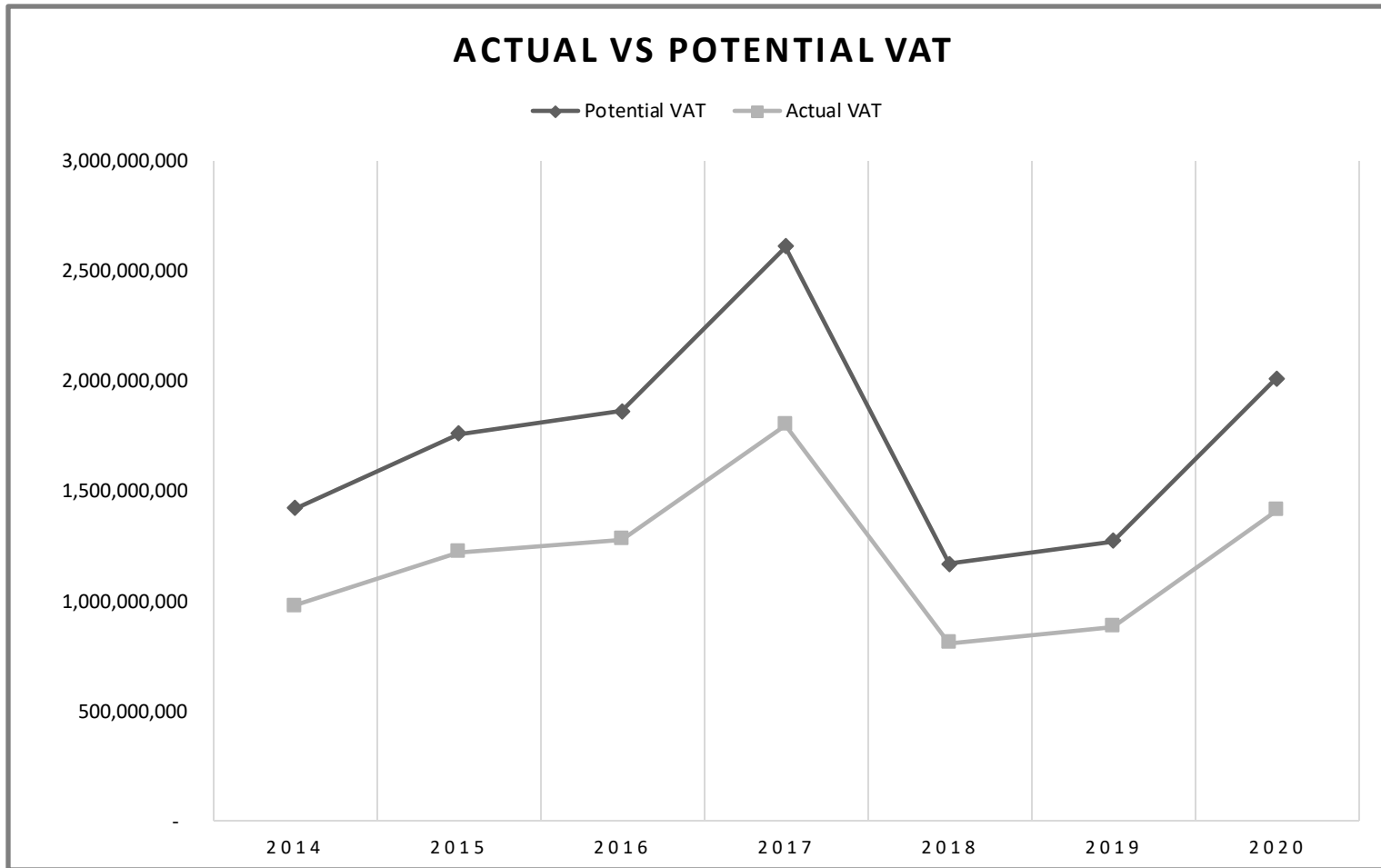
Results

The total tax gap estimate based on the panel regression shows the gap as 56% for the period 2014 to 2020.

The total tax gap estimate based on the Machine Learning approach shows the gap as 47%.

We use this estimate to calculate potential VAT and CIT returns for key sectors in Zambia.

Results – Regression Approach

**Figure 1: Total Actual vs. Potential VAT in ZMW**

ACTUAL VS POTENTIAL VAT

The highest potential VAT return of ZMW 2.6 billion in 2017 with the actual VAT of ZMW 1.8 billion resulting in a tax gap of ZMW 0.8billion.

The lowest VAT tax gap was record in 2018 amounting to ZMW 0.4 billion

In 2020 the VAT tax gap was found to be ZMW 0.6 billion

Results – Regression Approach

Figure 2: Total Actual vs. Potential CIT in ZMW
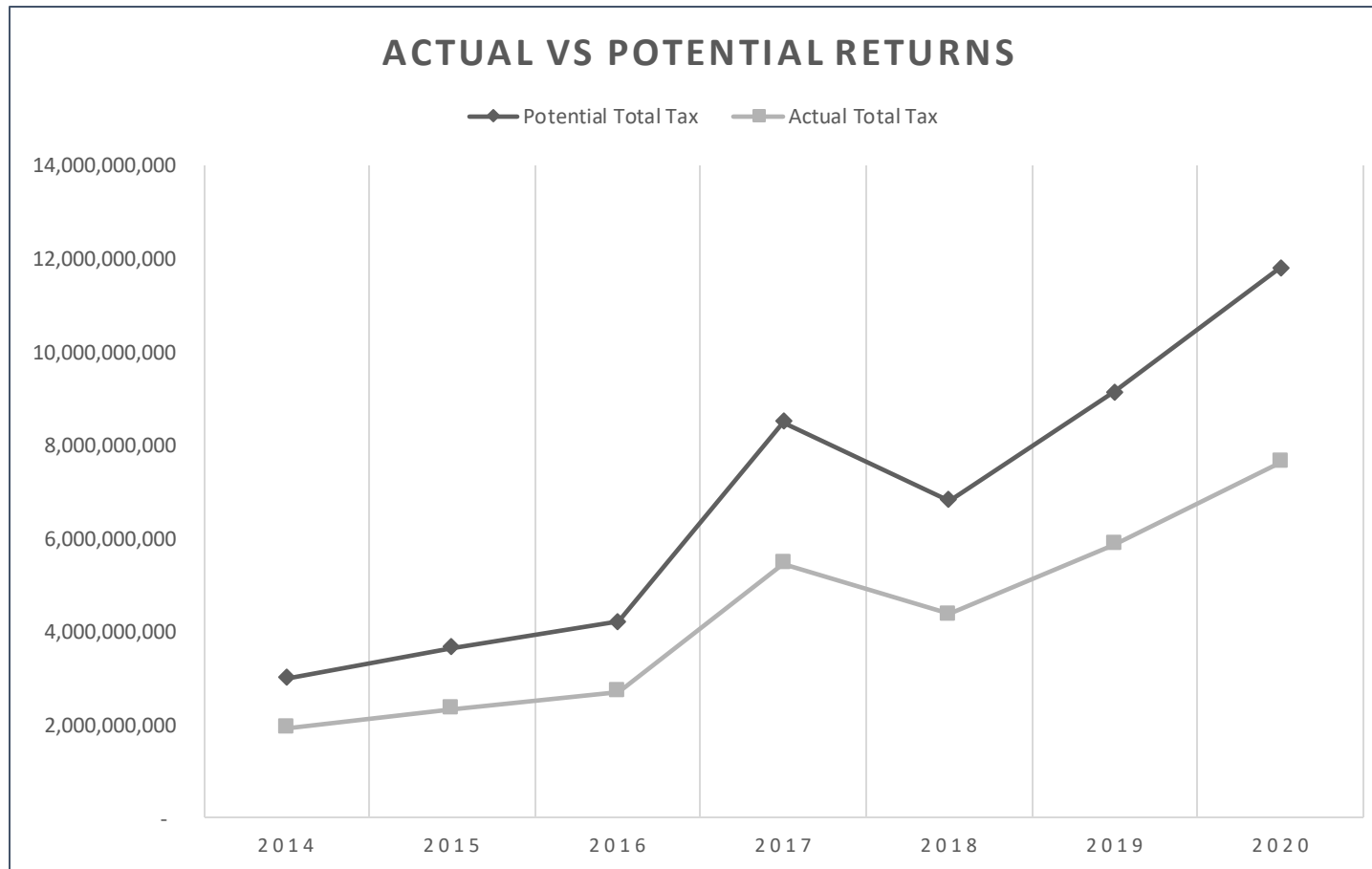

ACTUAL VS POTENTIAL CIT
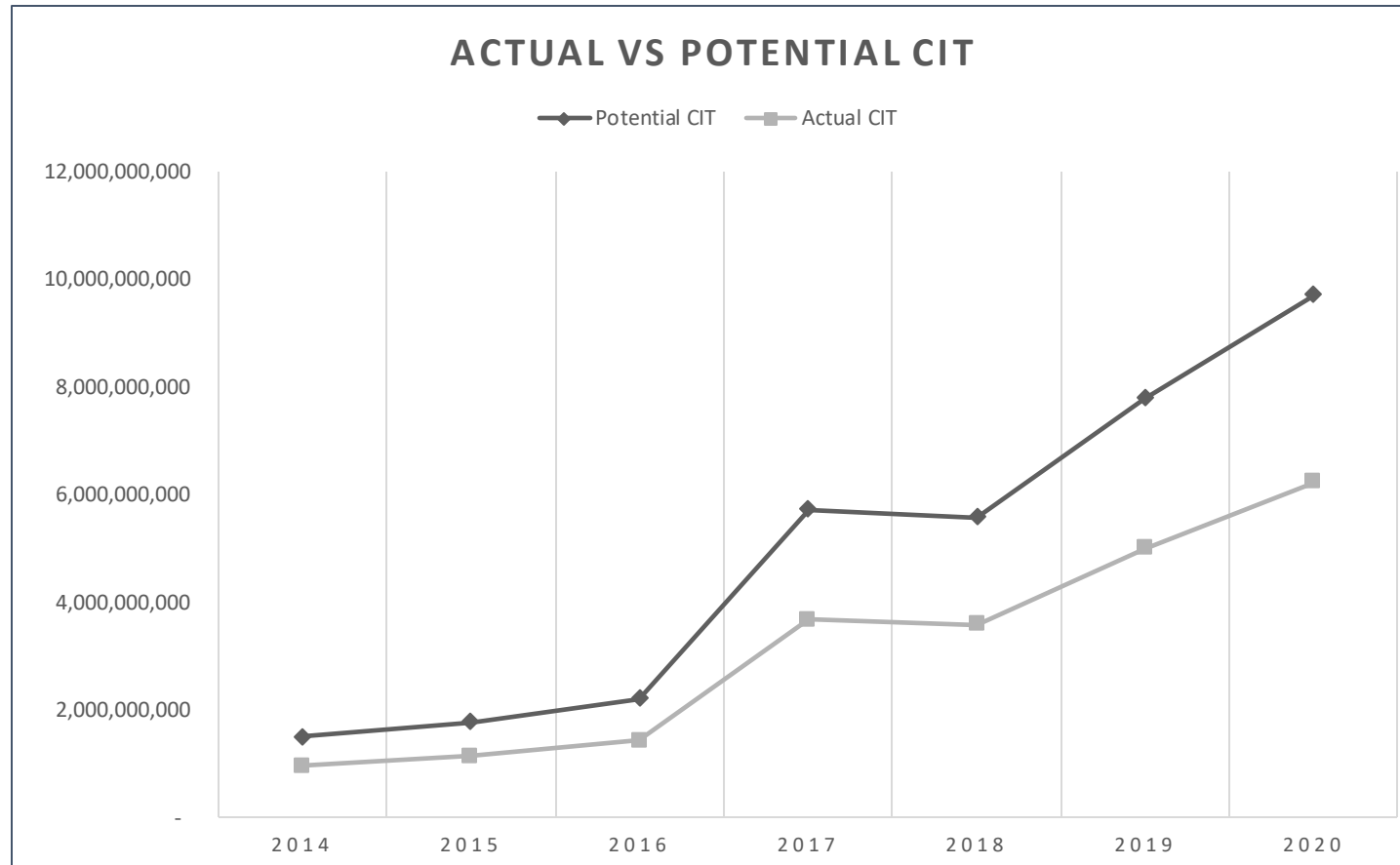
We observe the highest potential CIT return is ZMW 9.7 billion as compared to approximate returns of ZK6.2 billion resulting in a CIT gap of ZMW 3.5 billion in 2020

The lowest CIT gap was found in 2014

Results – Regression Approach

Figure 3: Total Actual vs. Potential CIT in ZMW

ACTUAL VS POTENTIAL RETURNS

Potential Total Tax ◆ Actual Total Tax ■

Comparing the two tax types, reflects CIT as the main driver of tax revenue as compared to VAT

Based on our gap estimate of 56 percent, the country could have potentially made ZMW 17 billion as additional domestic revenue from VAT and CIT returns

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Results – Machine Learning Approach

Figure 4: Total Actual vs. Potential VAT by key sector in ZMW

ACTUAL VS POTENTIAL SECTOR VAT

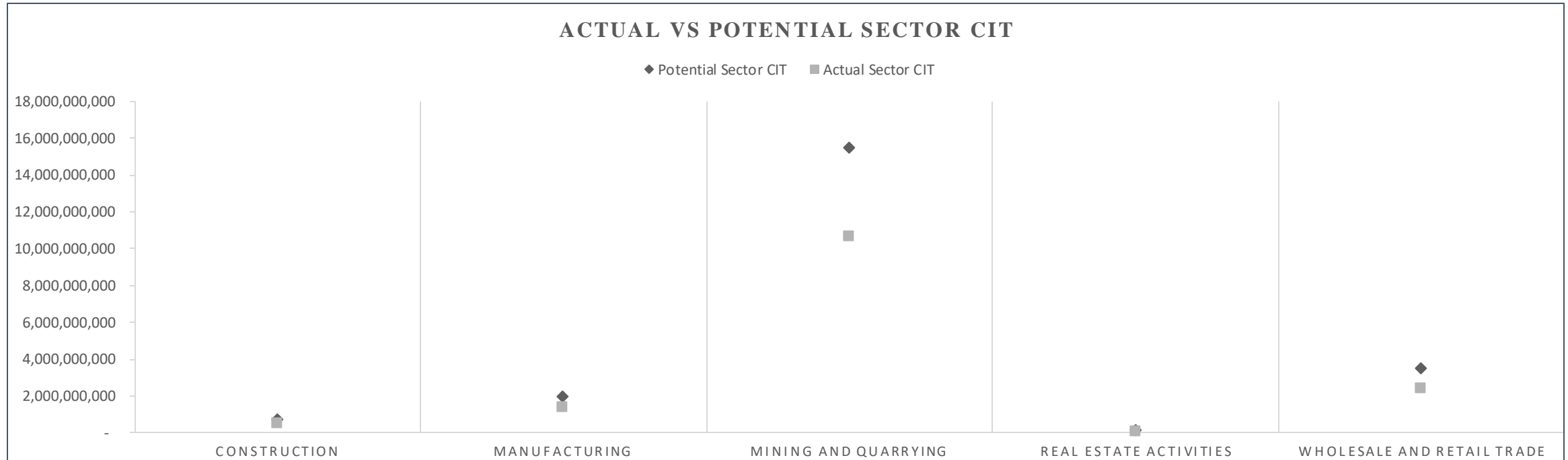◆ Potential Sector VAT   ■ Actual Sector VAT
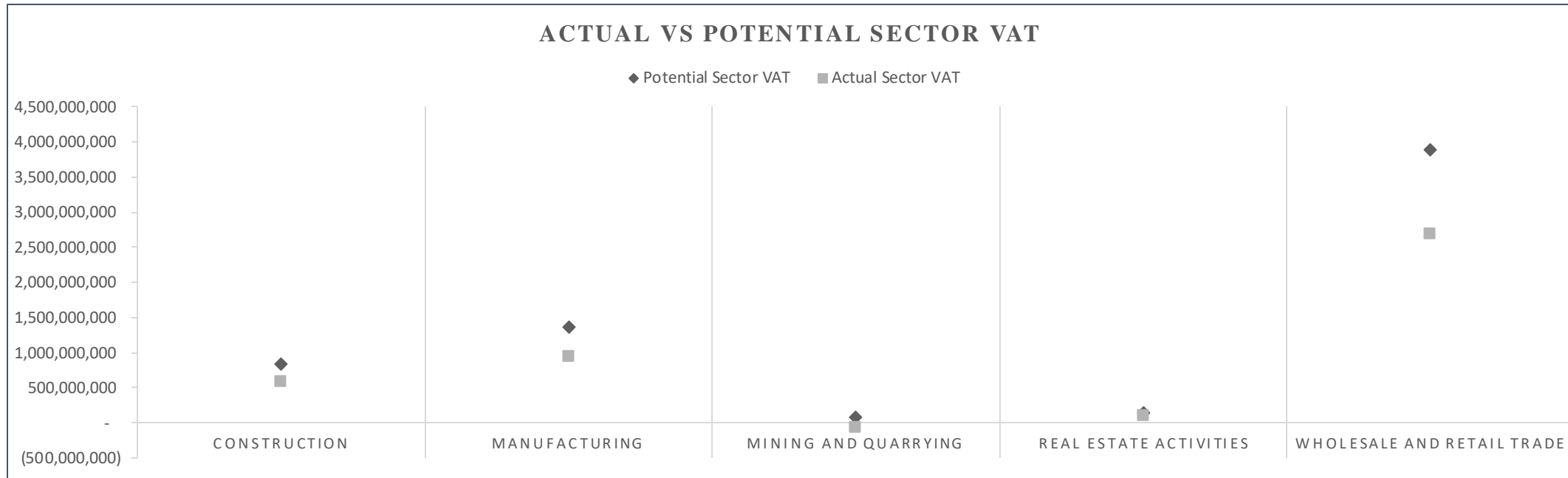
The wholesale and retail sector records large VAT gaps this is mainly due to high number of firms recorded in the data for that sector affecting the actual value of transactions.

VAT gaps for Mining and Quarrying sectors as well as the Real Estate sectors are minimal as compared to the other key sectors. Output from extractive sector is zero-rated (exports)

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Results – Machine Learning Approach

Figure 5: Total Actual vs. Potential CIT by key sector in ZMW

The extractives sector records a high CIT gaps as compared to the other key sectors followed by the financial and insurance sector.

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Results – Machine Learning Approach

Figure 6: Total Actual vs. Potential Sector Returns by key sector in ZMW

ACTUAL VS POTENTIAL SECTOR TOTAL TAX

◆ Potential Sector Total Tax   ■ Actual Sector Total Tax
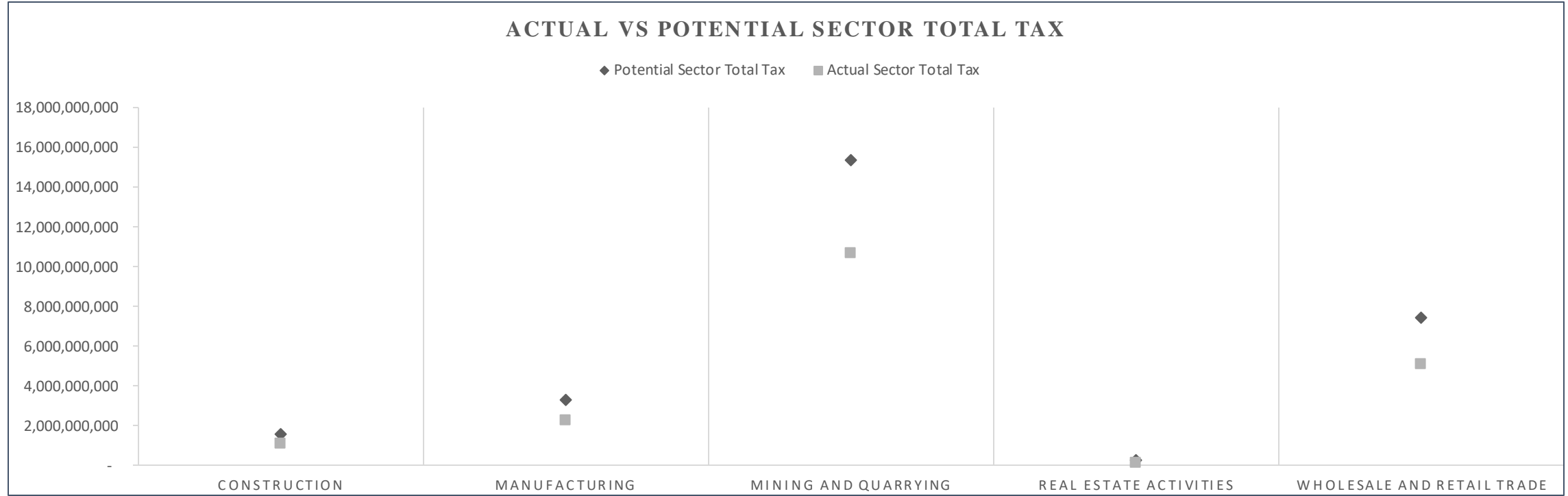
The extractives sector recorded the highest tax gap followed by the wholesale and retail trade sectors.

The real estate sector recorded the lowest tax gap among the six key sectors

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Challenges

- We combine three sets of data in our analysis:
  1 Annualised VAT returns on all Zambian firms for 2014 to 2020 (13,309 unique firms)
  2 Annualised CIT returns on all Zambian firms for 2014 to 2020 (34,668 unique firms)
  3 Audited firms (3,330 matched unique firms)

- The data contains 41,043 unique firms over the 7-year period. The risk parameters used in the analysis include gross profits, tax on taxable profit, cost of sales, and gross salaries. Used for risk score calculations
- ➢ Aside inability to use all possible parameters, audit data is silent on whether the audits were VAT or CIT triggered. Therefore Machine learning was incorporated in the analysis.
- Challenges of missing data due to incomplete reporting by firms.
- Remote/online working at times posed a challenge

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Interventions for tax evasion

- *The Investigations Unit* which investigates all allegations of tax evasion and other tax offenses have taken into account the study outcomes into their investigative plans

- *Tax Audit Units* which routinely conduct audits based on a risk-based approach have taken key interest in the study findings to inform their scope of work.

- *Data Analytics Units* which analyse internal and external data aimed at improving tax compliance.

- Creation of a unit to manage artisanal and small-scale miners.

- Creation of the mineral value chain data analysis unit

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Conclusion

- We validate results with a GDP comparison. Lower as compared to other authors. Endogeneity?

- The highest tax gap to GDP was observed at 1.02 percent in 2020 while the lowest was at 0.52 percent in 2014

- Results from other ML models (Random forest) similar. Given employed methods, comparability with other studies on tax gaps in Zambia/developing economies show accurate results.

Table 1: Tax Gap GDP nexus in millions of kwacha

Series Name	2014	2015	2016	2017	2018	2019	2020
GDP(ZMW)	167,053	183,381	216,098,	246,252	275,174	300,448	332,223
Total Tax Gap	864	1,050	1,210	2,440	1,960	2,630	3,400
Gap % of GDP	0.52	0.57	0.56	0.99	0.71	0.88	1.02

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