

VAT Introduction and Tax Mobilization in the Gulf: Synthetic Control and Event-Study Evidence

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Abstract

This study presents quasi-experimental estimates of the revenue effect of value-added tax (VAT) introduction in the Gulf Cooperation Council (GCC), where the tax was introduced from an almost zero base between 2018 and 2021, and examines whether subsequent rate increases in Saudi Arabia and Bahrain generated proportional revenue gains. Using IMF revenue data for 163 economies (2000–2024), I combine synthetic control estimation, two-way fixed effects, and cohort-based event studies against never-treated controls with permutation inference and a C-efficiency decomposition, and test the conditionality of the response with an extended sample of 29 VAT introductions (2005–2021). VAT increased taxes on goods and services by 1.1 percentage points of GDP in the first year and by about three points by the third year, with flat pre-trends and no offsetting decline in other taxes. At the initial 5 per cent rate, collection efficiency (0.64–0.74) exceeded the OECD average. Saudi Arabia's tripling of the rate raised revenue by only 91 per cent (elasticity 0.46) and reduced efficiency to about 0.42, while Bahrain's doubling preserved efficiency (elasticity 0.87). Higher governance quality is associated with larger revenue gains among adopters. The study moves beyond descriptive regional accounts by applying quasi-experimental identification, exploiting two consecutive policy changes within the same countries, and estimating the revenue–rate trade-off facing resource-dependent economies that seek fiscal diversification.

1. Introduction

Between January 2018 and April 2021, four Gulf Cooperation Council (GCC) members implemented a value-added tax (VAT) under a common framework agreement: Saudi Arabia and the United Arab Emirates (UAE) in 2018, Bahrain in 2019, and Oman in 2021. The reform is unusual in two ways. First, it was adopted by high-income resource-based economies, where governments depended heavily on hydrocarbon revenues and lacked a broad-based consumption tax. In Saudi Arabia, taxes on goods and services were 1.2 per cent of GDP in the three years before adoption, less than 0.5 per cent in the UAE, and zero in Bahrain. Second, two of the adopters changed the rate dramatically shortly afterward: Saudi Arabia tripled its rate from 5 to 15 per cent in July 2020, and Bahrain doubled its rate from 5 to 10 per cent in January 2022. The GCC is thus a distinctive setting in which to observe the revenue effects of a VAT introduced from an almost clean slate and, shortly afterward, substantial rate increases in some of the same countries.

The analysis is organized around four questions. How much of the increase in tax mobilization, measured as taxes on goods and services and total tax revenue as a share of GDP, can be attributed to the introduction of VAT in the GCC relative to a counterfactual path without the tax? Was the increase in net revenue mobilization offset by declines in other taxes? Did the rate increases produce corresponding revenue gains, or did collection efficiency suffer as rates rose? Finally, using an extended sample of all VAT introductions observed in the data between 2005 and 2021, does institutional quality affect the magnitude of the revenue response?

The empirical design takes advantage of the staggered timing of adoption and a large pool of economies that did not introduce VAT during the study window. I first estimate synthetic control counterfactuals for each adopter (Abadie et al., 2010; Abadie, 2021) with permutation inference from in-space placebos, then estimate two-way fixed-effects and cohort-based event studies against never-treated controls in the spirit of Callaway and Sant'Anna (2021), with permutation bands from randomly assigned placebo cohorts. Pre-adoption goods-tax revenue in the GCC is close to zero; the synthetic control approach is thus informative only for Saudi Arabia, and the main evidence for the group comes from event-study designs, which rely on within-country changes rather than level matching. I then decompose the revenue gain into a C-efficiency ratio (Ebrill et al., 2001; Keen, 2013) that relates incremental revenue to the

product of the statutory rate and final consumption, and use the Saudi and Bahraini rate changes to estimate the elasticity of revenue with respect to the rate.

The analysis yields four main findings. VAT introduction raised taxes on goods and services by about 1.1 percentage points of GDP in the year of adoption, rising to about three points by the third year. Pre-adoption event-time coefficients are small and statistically indistinguishable from zero, and post-adoption coefficients lie well outside permutation bands built from 2,000 placebo cohorts; the synthetic control estimate for Saudi Arabia is 3.1–3.2 points, with a good pre-period fit and a placebo p-value of 0.03. Second, no substitution effect is evident: customs revenue does not move, income tax revenue does not decline much, and total tax revenue grows by roughly as much as the goods-and-services tax. Third, at the 5 per cent rate, collection efficiency in the GCC ranges from 0.64 to 0.74, above the average OECD VAT revenue ratio of 0.58 (OECD, 2024); the two subsequent rate increases produced very different outcomes. Saudi Arabia's move to 15 per cent raised incremental revenue by 91 per cent, an elasticity of 0.46, and reduced efficiency to about 0.42, while Bahrain's move to 10 per cent raised revenue by 87 per cent, an elasticity of 0.87, with efficiency unchanged. Fourth, across the extended sample of 29 adopters, a one-unit improvement in a composite governance index is associated with a revenue gain of approximately 2.2 points of GDP; higher statutory rates are associated with lower efficiency; and GCC adopters rank among the most effective introductions in the sample.

The study contributes to the literature in three respects. It provides quasi-experimental evidence on the revenue effects of VAT adoption, which has previously relied mainly on cross-country panels with dummy variables for adoption (Keen and Lockwood, 2010; Ufier, 2014; Alavuotunki et al., 2019). It contributes to the literature on VAT design and C-efficiency (Ebrill et al., 2001; Aizenman and Jinjark, 2008; Keen, 2013) by documenting how efficiency responds to a large rate increase. It also speaks to the debate on fiscal diversification and sustainability in resource-rich countries (IMF, 2015, 2016; Besley and Persson, 2014; Magazzino, 2022), complementing regional literature that has examined revenue potential *ex ante* (Gurrib, 2017) and firm-level or market responses (Gopakumar et al., 2022; Mgammal et al., 2023; Al-Otaibi et al., 2024) without estimating the realized revenue effect against a credible counterfactual.

Section 2 sets out the institutional background. Section 3 reviews the relevant literature and develops the hypotheses. Section 4 describes the data, while Section 5 explains the empirical strategy. Section 6 presents the main results, Section 7 reports the robustness analyses, and Section 8 examines governance using the extended sample. Section 9 discusses the implications, and Section 10 concludes the paper.

2. Institutional setting: VAT in the GCC

The GCC Common VAT Agreement, signed in 2016, committed the six member states to a VAT at a standard rate of 5 per cent with common design features: a compulsory registration threshold, zero-rating of exports and certain essential goods and services, exemption of financial services and residential property, and destination-based treatment of intra-GCC trade. Implementation was left to national legislation and proceeded at different rates (Table 1). Following the oil price collapse of 2014–2016, the IMF recommended introducing a broad-based, low-rate VAT, together with selected excises, as a first step in diversifying the revenue base (IMF, 2015, 2016). Saudi authorities later reported that first-year collections exceeded expectations, with non-oil revenue rising from 7.2 per cent of GDP in 2017 to 10.1 per cent in 2018 (IMF, 2019).

Table 1
VAT introduction and rate changes in the GCC

Country	VAT effective	Initial rate	Rate change	Administering authority	Pre-VAT goods and services taxes (% GDP, mean t – 3..t – 1)
Saudi Arabia	1 January 2018	5%	15% from 1 July 2020	ZATCA (formerly GAZT)	1.18
United Arab Emirates	1 January 2018	5%	—	Federal Tax Authority	0.45
Bahrain	1 January 2019	5%	10% from 1 January 2022	National Bureau for Revenue	0.13
Oman	16 April 2021	5%	—	Oman Tax Authority	0.18
Qatar, Kuwait	Not yet implemented	—	—	—	n.a.
<i>Notes: Pre-VAT goods and services taxes are from IMF WoRLD (general government); the series for Oman starts in 2019, so the figure shown is the 2019–2020 average. WoRLD does not report a goods-and-services tax series for Qatar or Kuwait. Sources: PwC Worldwide Tax Summaries and national legislation.</i>					

Three features of this setting are particularly important for identification. First, adoption was driven by a supranational agreement and the oil price collapse, not by country-specific trends in consumption tax revenue, which were flat and close to zero. Second, the VAT was layered on a narrow excise regime introduced in 2017 and, in Saudi Arabia, on zakat and a corporate income tax applying only to foreign-owned firms; there was no general sales tax to replace. The recorded revenue response also reflects the exclusion of financial services — an important part of the region's non-oil capital markets, including Islamic finance products, which GCC authorities treat on par with their conventional counterparts. Third, the rate hikes in Saudi Arabia and Bahrain were fiscal responses to the 2020 oil-and-pandemic shock and to Bahrain's fiscal balance program, announced on short notice, which limits anticipatory behavior in the revenue series.

3. Literature review and hypothesis development

3.1 Adoption of VAT and revenue mobilization

The question of whether VAT acts as a 'money machine' has been examined mainly through cross-country panels in which an adoption indicator is interacted with country characteristics. Keen and Lockwood (2010) find that adoption is, on average, associated with higher revenue ratios, with effects that depend on openness and income. Ufier (2014) reports positive revenue effects using matching estimators. Alavuotunki et al. (2019) find that VAT adoption increases revenue mostly in higher-income countries. Bird and Gendron (2007) and Ebrill et al. (2001) document wide variation in VAT performance across developing countries and attribute much of it to base erosion through exemptions, thresholds, and weak enforcement. Although these studies estimate the average effect of adoption, they rarely observe adoption from a near-zero consumption-tax base and seldom distinguish de novo introductions from replacements of existing sales taxes.

3.2 C-efficiency and the rate–revenue relationship

The C-efficiency ratio — VAT revenue divided by the product of the standard rate and final consumption — is a standard summary measure of the extent to which a VAT captures its theoretical base (Ebrill et al., 2001; Keen, 2013). OECD (2024) member states had VAT revenue ratios averaging 0.58 in 2022, with New Zealand above 0.9 and

several European countries that use many reduced rates below 0.45. Aizenman and Jinjarak (2008) find that efficiency is positively associated with urbanization, trade openness, and political stability. A related issue is whether revenue rises proportionately with the statutory rate. Higher rates raise the return to evasion and informality, shift consumption toward exempt goods and cross-border purchases, and depress the consumption base, so less-than-proportionate responses are expected (Keen and Lockwood, 2010; Cnossen, 2019). Direct evidence from large rate changes remains limited because rate changes are usually small and occur alongside other reforms.

3.3 Institutions and fiscal capacity

As Besley and Persson (2013, 2014) argue, tax capacity is an investment in administrative and legal infrastructure whose returns depend on political institutions. Empirical evidence on the relationship between governance indicators and tax ratios remains mixed, and a recent global panel finds no strong within-country association between governance and direct tax mobilization once persistence and cross-sectional dependence are considered. The introduction of a VAT is a discrete event that immediately tests administrative capacity, so cross-sectional variation in the size of the revenue response provides a sharper test of the institutional hypothesis than slow-moving tax ratios.

3.4 Evidence from the Gulf Cooperation Council

The regional literature on GCC VAT can be grouped into three broad strands. Gurrib (2017) estimated through ex ante simulations that a 5 per cent VAT could raise between 1.8 and 7.8 per cent of GDP in the UAE, depending on collection efficiency. Firm-level and market studies find uneven movement of UAE sector returns around VAT announcements (Gopakumar et al., 2022), and reduced listed-firm profitability and higher distress risk in difference-in-differences and ARIMA designs around Saudi Arabia's increase to 15 per cent (Mgammal et al., 2023; Al-Otaibi et al., 2024), with compliance costs borne disproportionately by small firms. Macro-fiscal studies document weak sustainability of revenue and expenditure in parts of the region and identify VAT as the main non-oil revenue instrument (Magazzino, 2022; IMF, 2022). The present study addresses this gap: no prior study has estimated the realized revenue effect of the GCC VAT against a counterfactual or compared the two rate increases.

3.5 Hypotheses

H1. VAT introduction was associated with a large and persistent increase in taxes on goods and services relative to GDP, compared with the counterfactual path.

H2. The increase reflects net mobilization: total tax revenue increased by a similar amount, and other tax categories did not decline.

H3. Revenue responds less than proportionally to the statutory rate, so C-efficiency declines as the rate increases.

H4. The revenue effect of VAT introduction is larger where pre-adoption institutional quality is higher.

4. Data

The outcome variables come from the IMF World Revenue Longitudinal Data (WoRLD), which harmonizes general government revenue by category for 163 economies over 2000–2024 using the Government Finance Statistics classification. The main outcome is taxes on goods and services as a share of GDP; secondary outcomes are total tax revenue, taxes on income and profits, taxes on international trade, and total revenue including non-tax revenue. Country covariates are from the World Bank World Development Indicators (WDI): GDP per capita, GDP growth, inflation, trade openness, final consumption expenditure, and the GDP shares of natural resources and oil rents.

Governance measures are the Worldwide Governance Indicators (Kaufmann et al., 2011), comprising government effectiveness, regulatory quality, control of corruption, and a composite of the four core dimensions. Annual Brent spot prices are from the U.S. Energy Information Administration. The combined panel contains 6,227 country-year observations. Statutory VAT rates and effective dates were verified against national legislation, tax authority publications, and professional tax summaries (Appendix Table A2).

Three features of the data deserve particular attention. WoRLD's goods-and-services tax series for Oman begins only in 2019, so Oman is included in the descriptive and total-tax analyses but excluded from designs requiring goods-tax data before 2019. WoRLD does not report a usable goods-and-services tax series for Qatar or Kuwait. In the UAE, the income tax series is largely driven by taxes on foreign oil companies and co-moves with oil prices, so the narrower goods-and-services outcome is more informative than total tax revenue for that country. The WDI's own goods-and-services tax series covers only the budgetary central government and misses much GCC VAT revenue; it is used only as a directional check (Section 7). Descriptive statistics are reported in Table 2 and Appendix Table A1.

Table 2
Descriptive statistics, 2005–2023

Taxes on goods and services (% GDP)	GCC-4 mean	GCC-4 s.d.	Donor pool mean	Donor pool s.d.
	1.35	1.46	8.35	3.70
Total tax revenue (% GDP)	6.20	6.49	17.91	7.47
Total revenue (% GDP)	30.52	8.44	27.82	12.41
Oil rents (% GDP)	22.61	10.73	1.37	4.77
GDP per capita (US\$)	30,590	10,787	16,691	22,806
Trade openness (% GDP)	118.4	39.6	87.9	55.5
Government effectiveness (WGI)	0.52	0.46	0.20	0.97
<i>Notes: GCC-4 = Saudi Arabia, UAE, Bahrain, and Oman. Donor pool = 106 economies with complete goods-and-services tax data over 2005–23 that did not introduce a VAT or GST during the window and showed no single-year break larger than 2.5 percentage points (Section 5).</i>				

5. Empirical methods

5.1 Synthetic control

For an adopter j with adoption year T_0 , the synthetic control is constructed as a weighted average of donor economies, with non-negative weights summing to one, chosen to minimize the pre-adoption mean-squared gap in the outcome, augmented with a penalty on the standardized distance in pre-period covariate means (resource rents, log GDP per capita, trade openness, growth, and inflation). The donor pool consists of 106 economies with a full series that did not introduce a VAT or GST in 2005–2023 and had no single-year jump larger than 2.5 percentage points. Inference follows Abadie et al. (2010): the procedure is repeated for each donor as if it had been treated at T_0 , and the p-value is the rank of the treated unit's post/pre root-mean-squared-prediction-error (RMSPE) ratio among the placebo ratios. As a robustness check, I also use a restricted pool of 27 economies with average natural resource rents of at least 8 per cent of GDP.

5.2 Event study designs

I first estimate a two-way fixed-effects event study in which the outcome on country and year fixed effects, log GDP per capita, and indicators for event time $k = -5, \dots, +5$ relative to adoption ($k = -1$ omitted), with standard errors clustered by country. Because two-way fixed-effects estimators may be biased under staggered adoption with heterogeneous effects (Goodman-Bacon, 2021; Sun and Abraham, 2021), I thus also compute cohort-specific average treatment effects $ATT(g, t)$ as the difference between the change in the outcome from $g - 1$ to t for cohort g and the corresponding change for never-treated economies, aggregated across cohorts by cohort size (Callaway and Sant'Anna, 2021). Inference for the cohort estimator is by permutation: 2,000 placebo assignments of the donor economies to the actual cohort years generate a distribution of dynamic effects under the null hypothesis, and p -values are the proportion of placebo effects at least as large as the absolute value of the estimate. For revenue categories that co-move with oil prices, I add a country-specific oil-exposure control equal to the log Brent price times the country's mean oil rent share over 2005–2017.

5.3 Elasticity of C-efficiency and the rate

For year t , incremental revenue is defined as the difference between goods-and-services taxes in t and the average of these taxes over the three years before adoption. C-efficiency is incremental revenue divided by the statutory rate in force in t multiplied by final consumption expenditure as a share of GDP. In Saudi Arabia the rate is treated as 10 per cent for 2020, reflecting an average of 5 per cent in the first half of the year and 15 per cent in the second; in Oman the rate is treated as 3.75 per cent for 2021, reflecting nine months at 5 per cent. The elasticity of revenue with respect to the rate is the percentage change in incremental revenue between the last year at the old rate and the average of the first three years at the new rate, divided by the percentage change in the rate.

6. Main results

6.1 Descriptive evidence

Figure 1 displays taxes on goods and services for six GCC member states. All four adopters show a clear jump in the adoption year and a second jump in Saudi Arabia in 2020–2021 and in Bahrain in 2022, coinciding with the rate increases. Table 3 compares three-year averages before and after adoption: taxes on goods and services rose by 2.5 percentage points of GDP in Saudi Arabia, 1.5 in the UAE, 2.0 in Bahrain, and 1.3 in Oman, with total tax revenue rising by similar or larger amounts.

Table 3
Pre- and post-adoption means and synthetic control estimates

Country	Adopt.	Goods pre	Goods post	Δ	Tot. tax pre	Tot. tax post	Δ	SCM ATT	Pre-RMSPE	RMSPE ratio	Placebo p
Saudi Arabia	2018	1.18	3.72	+ 2.54	3.15	5.63	+ 2.48	3.17	0.17	19.2	0.028
UAE	2018	0.45	1.92	+ 1.47	10.04	13.01	+ 2.98	0.81	0.66	1.7	0.935
Bahrain	2019	0.13	2.10	+ 1.98	0.91	2.72	+ 1.82	1.41	1.08	1.4	0.869
Oman	2021	0.18	1.43	+ 1.25	3.22	4.06	+ 0.84	0.53	0.47	1.3	0.832
<i>Notes: Pre = average from $t - 3$ to $t - 1$; post = average from t to $t + 2$; percentage points of GDP. SCM ATT is the average post-adoption gap between the observed and synthetic outcomes through 2023 (goods-and-services taxes; total tax revenue for Oman). Placebo p is the rank-based p-value from 106 in-space placebos.</i>											

6.2 Synthetic control method

Figure 2 presents the synthetic control for Saudi Arabia. It tracks the observed series until 2018 (pre-period RMSPE 0.17) before diverging sharply. The resulting estimate is 3.17 percentage points of GDP; only two of the 106 placebos exceed the post/pre RMSPE ratio of 19.2 ($p = 0.028$). The weights concentrate heavily in Nigeria (0.96), the only donor with a level of goods-and-services taxes as low as Saudi Arabia's before 2018, with small weights on Gabon and Congo. Estimated effects are positive for the UAE, Bahrain, and Oman (0.8, 1.4, and 0.5, respectively), but the RMSPE ratios are unimpressive. The reason is that the convex-hull condition of the synthetic control method is barely satisfied when pre-adoption outcomes are at or near zero: the synthetic units collapse onto a single donor, and the placebo distribution has little power. For the group as a whole, the main evidence thus comes from event-study designs, which do not require level matching.

6.3 Estimates from the event study

Table 4 and Fig. 3 present event-study estimates for the four adopters relative to the 106-economy donor pool (110 economies, 1,530 observations). Pre-adoption coefficients range from -0.27 to $+0.01$ and are not statistically distinguishable from zero, supporting the parallel-trends assumption. The effect is 1.12 points in the adoption year, 1.91 in the first full year, 2.12 in the second, and 3.11 in the third, stabilizing thereafter at 2.8–3.0 points; all post-adoption coefficients are significant at the 1 or 5 per cent level. Cohort-based estimates are very similar (1.24, 2.17, 2.42, 3.24, 3.09, and 2.91 points for $k = 0$ to 5) and lie well outside the permutation band, whose 97.5th percentile does not exceed 1.5 points; pre-adoption cohort effects fall within this band. Taken together, these results support H1.

Table 4
Event-study coefficients (taxes on goods and services, pp of GDP)

Event time	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
TWFE coefficient	0.01	-0.26	-0.24	-0.27	0	1.12	1.91	2.12	3.11	2.98	2.78
(clustered s.e.)	(0.17)	(0.17)	(0.16)	(0.08)	—	(0.46)	(0.25)	(0.39)	(0.70)	(0.56)	(0.65)
Cohort ATT	—	-0.16	-0.12	-0.24	0	1.24	2.17	2.42	3.24	3.09	2.91
Permutation p	—	0.75	0.75	0.39	—	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001

Notes: TWFE: country and year fixed effects, log GDP per capita, 110 economies, 1,530 observations, standard errors clustered by country. Cohort ATT: Callaway–Sant’Anna aggregation with never-treated controls; Saudi Arabia, UAE, and Bahrain (Oman excluded for lack of pre-2019 data). Permutation p-values from 2,000 placebo cohorts.

6.4 Net mobilization or substitution?

Table 5 repeats the event-study analysis for other revenue categories, with and without the oil-exposure control. Customs revenue is insensitive, income and profit taxes do not decline much, and total tax revenue increases by about as much as the goods-and-services tax in both specifications (2.1–2.2 points). Without the oil control, total revenue including non-tax items increases by 2.2 points; including oil exposure, the estimate becomes imprecise and changes sign. This pattern reflects the dominance of hydrocarbon receipts in GCC total revenue and no offset within tax revenue. Overall, this evidence supports H2: VAT appears to have added to the tax base rather than displaced revenue from other tax categories.

Table 5
Substitution tests: average event-study effects by revenue category

Outcome (% GDP)	Mean pre-effect (k = -5..-2)	Mean post-effect (k = 0..+5)	Effect at k = +3 (s.e.)	Post-effect, oil control	Effect at k = +3, oil control (s.e.)	N
Taxes on goods and services	-0.18	+ 2.34	3.11 (0.69)	+ 2.57	3.38 (0.72)	2,070
Total tax revenue	+ 0.77	+ 2.14	2.11 (1.24)	+ 2.24	2.22 (1.41)	2,090
Taxes on international trade	+ 0.08	-0.07	-0.08 (0.05)	-0.08	-0.10 (0.07)	2,054
Taxes on income and profits	+ 0.77	-0.04	-1.11 (0.83)	-0.23	-1.28 (1.01)	2,065
Total revenue	+ 2.03	+ 2.20	2.24 (0.63)	-0.87	-1.09 (1.24)	2,090

Notes: Two-way fixed-effects event studies with log GDP per capita, GCC-4 adopters against the donor pool, standard errors clustered by country. Oil control = log Brent price × country mean oil rent (2005–2017).

6.5 Rate increases and C-efficiency

Country-year C-efficiency estimates are reported in Table 6 and Fig. 4. At a 5 per cent rate, GCC adopters collected between 64 and 74 per cent of the theoretical yield: 0.64–0.69 in Saudi Arabia, 0.63–0.98 in the UAE (mean 0.71 excluding the 2018 recording anomaly discussed in Section 7), 0.70–0.74 in Bahrain, and approximately 0.50 in Oman — high values for newly established administrations, and above the OECD average of 0.58. The two rate

increases, however, produced quite different outcomes. When Saudi Arabia moved to 15 per cent, efficiency fell to 0.39–0.47; incremental revenue rose from 2.13 to an average of 4.07 points, a 91 per cent increase for a 200 per cent rate increase, an elasticity of 0.46. When Bahrain moved to 10 per cent, efficiency held at 0.68–0.69; incremental revenue rose from 1.93 to 3.62 points, an 87 per cent increase for a 100 per cent rate increase, an elasticity of 0.87. H3 is supported for the larger rate change and only weakly for the smaller one, consistent with a convex relationship between the rate and base erosion.

Table 6
C-efficiency and rate elasticity

Country	Period	Rate	Incremental goods taxes (pp GDP)	Final consumption (% GDP)	C-efficiency	Rate elasticity
Saudi Arabia	2018–2019	5%	2.1–2.3	66–67	0.64–0.69	—
Saudi Arabia	2021–2024	15%	3.7–4.7	58–66	0.39–0.47	0.46
UAE	2019–2023	5%	1.7–2.5	50–60	0.63–0.98	—
Bahrain	2019–2021	5%	1.9–2.0	53–57	0.70–0.74	—
Bahrain	2022–2024	10%	3.4–3.7	51–54	0.68–0.69	0.87
Oman	2022–2024	5%	1.3–1.5	52–58	0.50–0.51	—
<i>Notes: Incremental revenue relative to the mean of the three pre-adoption years. Elasticity = percentage change in incremental revenue between the last year at the old rate and the mean of the first three years at the new rate, divided by the percentage change in the rate.</i>						

7. Robustness and sensitivity analyses

Restricted donor pool. Restricting the donor pool to 27 economies with average natural-resource rents of at least 8 per cent of GDP, the Saudi estimate is essentially unchanged (3.08 points, pre-RMSPE 0.14, RMSPE ratio 22.2, $p = 0.036$ among 27 placebos), and the other three estimates remain positive but imprecise, for the reasons given in Section 6.2.

Alternative data sources. WDI-based goods-and-services taxes (tax revenue multiplied by the goods-tax share, central government) show the same directional pattern as WoRLD in Saudi Arabia (0.16 to 1.52 points) and Bahrain (0.02 to 0.36) but at much lower levels. The federal budget series for the UAE shows almost no VAT (0.00 to 0.08), since VAT revenue is shared with the emirates. WoRLD's general government coverage is thus more appropriate for the main analysis, while WDI provides only a directional check.

Timing of revenue recording in the UAE. WoRLD records 0.46 per cent of GDP in goods-and-services taxes for the UAE in 2018 and 2.92 per cent in 2019, despite VAT being introduced in January 2018 — a pattern consistent with cash-based recording and federal–emirate settlement lags. Treating 2019 as the UAE's effective adoption year raises the adoption-year coefficient from 1.1 to 1.8 points, while later coefficients are practically unchanged (3.1 points at $k = +3$); the 2018 observation is excluded from the UAE's efficiency calculation.

Estimator selection. As expected, given that the controls are never treated and the cohorts are close in time – which limits the problematic comparisons that bias two-way fixed effects under staggered adoption (Goodman-Bacon, 2021) – the two-way fixed-effects and cohort-based estimates coincide within 0.15 points at every event time.

COVID-19. Excluding 2020 from the estimation sample changes the post-adoption coefficients by at most 0.35 points (1.25, 2.05, 1.78, 3.25, 3.11, and 2.95 for $k = 0$ to 5) and leaves pre-trends flat. The 2020 consumption surge in Saudi Arabia, where nominal GDP fell but final consumption rose to 77 per cent of GDP, mechanically reduced calculated C-efficiency for that year, which is why the elasticity calculation uses the 2021–2023 window after the increase.

8. Extended sample: institutions and the revenue reaction

To examine H4, I identify all VAT or GST introductions between 2005 and 2021 for which WoRLD has at least three pre-adoption and two post-adoption observations of goods-and-services taxes. Dates and rates of introduction were checked against national legislation and tax authority sources (Appendix Table A2). There are 29 adopters, including the four GCC economies, Egypt (September 2016), India (July 2017), Malaysia (April 2015, later repealed), the Bahamas (2015), Costa Rica (2019), Angola (2019), and a number of small island and low-income economies. The untreated control group consists of 120 economies with at least 15 observations. GCC-4, Kiribati, the Maldives, and Sierra Leone are among seven adopters that introduced the tax from a de novo base (pre-adoption goods-and-services taxes below 1.5 per cent of GDP); the rest replaced an existing sales or turnover tax.

Figure 5 presents the cohort-based event study for the full extended sample and for non-GCC adopters. The pooled effect is 0.74 points in the adoption year and 1.8–1.9 points in years 1–3, with permutation p-values below 0.001 and flat pre-trends; the non-GCC profile is almost identical (0.68 to 1.8 points). The GCC estimates of 2.4–3.2 points thus place the Gulf adopters in the upper part of the global distribution of VAT introductions.

Table 7 examines how each adopter's average revenue effect over the first three years, and its C-efficiency, to pre-adoption institutional quality (the composite of the four core WGI dimensions, averaged from $t - 3$ to $t - 1$), the statutory rate at introduction, a de novo indicator, and log GDP per capita. A one-unit higher composite governance score is associated with a revenue effect 2.2 percentage points of GDP larger ($p = 0.02$), and de novo introductions gain about 2.2 points more (marginally significant). The efficiency regressions show a negative coefficient on the statutory rate (-0.03 per percentage point, $p = 0.02$; -0.10 among de novo adopters, $p < 0.001$), higher efficiency among de novo adopters, and a positive, marginally significant effect of governance ($p = 0.08$). H4 is supported by the magnitude of the revenue response, and H3 is supported more generally than in the Gulf alone: higher statutory rates are associated with lower collection efficiency across adopters.

Table 7
Cross-section of VAT introductions, 2005–2021

Composite governance (WGI)	(1) Revenue effect, $k = 0..2$	(2) C-efficiency	(3) C-efficiency, de novo only
	2.207** (0.913)	0.126* (0.072)	–0.002 (0.099)
Statutory rate at introduction (%)	–0.109 (0.079)	–0.031** (0.013)	–0.101*** (0.022)
De novo introduction	2.188* (1.309)	0.161** (0.073)	–
Log GDP per capita	–1.145** (0.577)	–0.016 (0.049)	–0.126 (0.095)
Observations	28	18	6
R ²	0.36	0.80	0.96
<i>Notes: OLS with heteroscedasticity-robust standard errors in parentheses. The dependent variable in (1) is the mean cohort ATT over event times 0 to 2 in percentage points of GDP; in (2)–(3) it is the mean C-efficiency over the same window (available only where final consumption data exist). Andorra lacks WGI data. *, **, *** denote significance at 10, 5, and 1 per cent.</i>			

9. Discussion and implications

The findings have three main implications. First, the GCC VAT has been a fiscal success by the benchmark of comparable introductions: it raised non-oil tax revenue by about 2–3 per cent of GDP without crowding out other taxes, and its early collection efficiency compares well with mature European systems. The combination of a broad base with limited reduced rates, a registration threshold that focused administration on larger firms, mandatory electronic invoicing (introduced in Saudi Arabia in December 2021), and administrative build-up before go-live appears to have delivered a base that mature VATs, burdened by decades of reduced rates and exemptions, no longer reach. The estimates suggest that VAT alone closed about one quarter of the gap between GCC non-oil revenue and the emerging-market average, which is relevant to the fiscal-sustainability concerns raised by Magazzino (2022) and the IMF (2022).

Second, the two rate increases provide an unusual comparative setting. The increase to 10 per cent in Bahrain preserved efficiency almost completely, while the increase to 15 per cent in Saudi Arabia lost approximately a third of the theoretical base. This difference is consistent with a convex relationship between the rate and incentives toward informality, exemption-seeking, real estate and financial-sector leakage, and cross-border shopping, and suggests that the marginal revenue from the last five points of the Saudi rate was much lower than that from the first ten. The Saudi increase may also strain margins and raise distress risk, consistent with firm-level evidence (Mgammal et al., 2023). For policymakers contemplating further rate adjustments rather than base broadening, the implication is that the bottleneck is safeguarding the base at high rates, not the rate itself.

Third, evidence from the extended sample indicates that the revenue response to VAT introduction is conditional on institutional quality: better-governed adopters mobilize more, and de novo adopters mobilize more than those replacing an existing tax, presumably because the latter inherit exemptions and compliance habits. The estimates suggest that Qatar and Kuwait, which have yet to adopt the common framework, could plausibly generate around 1.5–2.5 per cent of GDP from a 5 per cent VAT within three years, subject to differences in tax base design, exemptions, implementation capacity, and compliance. The results also indicate that the fiscal case for VAT in the region does not rely on taxing financial intermediation by Islamic financial institutions, whose products are exempt under the common framework.

Several limitations should be kept in mind. The number of treated units in the core analysis is four, and for three of them the synthetic control method has low power because pre-adoption outcomes are near zero; event-study designs mitigate but do not eliminate this concern. Revenue data are annual and thus do not allow disentangling rate changes from contemporaneous administrative reforms such as e-invoicing. C-efficiency relies on total final consumption rather than the legally taxable base, so it understates efficiency where large shares of consumption are exempt or zero-rated. Statutory rates for the extended sample are taken at the time of introduction and do not track later changes, and the cross-section in Table 7 rests on 28 observations. Finally, the analysis addresses revenue effects, not welfare effects; the distributional and price consequences of GCC VAT remain an important complementary question.

10. Conclusion

This study presents quasi-experimental estimates of the revenue effect of introducing VAT in the GCC, using harmonized revenue data for 163 economies and a combination of synthetic control and cohort-based event-study designs. The tax raised goods-and-services revenue by about 3 per cent of GDP within three years, without crowding out other tax revenue and at collection efficiencies better than the OECD average. The Saudi and Bahraini rate hikes show that revenue does not increase in proportion to the rate, and that the shortfall grows with the size of the increase. Better governance predicts larger revenue gains across 29 global VAT introductions, higher rates predict lower efficiency, and Gulf adopters are among the most effective introductions in the sample. Taken together, the GCC experience suggests that, for resource-dependent economies pursuing revenue diversification, a simple and broadly based VAT administered by a well-resourced authority can deliver significant non-oil revenue within a short time frame, and that the payoff from further rate increases depends on protecting the base.

Declarations

Competing interests:

The author has no relevant financial or non-financial interests to disclose.

Ethics approval:

Not applicable. This study uses only publicly available, aggregated country-level and firm-level data (IMF, World Bank, and U.S. EIA sources) and involved no human participants, personal data, or animal subjects.

Consent to participate/ Consent to publish

Not applicable.

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Author Contribution

Mohammed Alomair is the sole author of this manuscript and confirms sole responsibility for the following: study conception and design, data collection, analysis and interpretation of results, and manuscript preparation. The author read and approved the final manuscript.

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Data Availability

The data that support the findings of this study are drawn from publicly available sources (IMF World Revenue Longitudinal Data, World Bank World Development Indicators and Worldwide Governance Indicators, and the U.S. Energy Information Administration). The merged dataset and replication code are available from the author upon reasonable request.

References

1. Abadie, A. (2021). Using synthetic controls: Feasibility, data requirements, and methodological aspects. *Journal of Economic Literature*, 59(2), 391–425. <https://doi.org/10.1257/jel.20191450>
2. Abadie, A., Diamond, A., & Hainmueller, J. (2010). Synthetic control methods for comparative case studies: Estimating the effect of California's tobacco control program. *Journal of the American Statistical Association*, 105(490), 493–505. <https://doi.org/10.1198/jasa.2009.ap08746>
3. Aizenman, J., & Jinjarak, Y. (2008). The collection efficiency of the value added tax: Theory and international evidence. *The Journal of International Trade & Economic Development*, 17(3), 391–410. <https://doi.org/10.1080/09638190802137059>
4. Alavuotunki, K., Haapanen, M., & Pirttilä, J. (2019). The effects of the value-added tax on revenue and inequality. *The Journal of Development Studies*, 55(4), 490–508. <https://doi.org/10.1080/00220388.2017.1400015>
5. Al-Otaibi, M. I., Nor, N. M., Yusri, Y., & Guzaiz, N. (2024). The impact of new VAT enforcement on financial performance: Evidence from Saudi Arabia non-financial listed companies using the event study and ARMA model. *Heliyon*, 10(20), e39137. <https://doi.org/10.1016/j.heliyon.2024.e39137>
6. Besley, T., & Persson, T. (2013). Taxation and development. In A. J. Auerbach, R. Chetty, M. Feldstein, & E. Saez (Eds.), *Handbook of Public Economics* (Vol. 5, pp. 51–110). Elsevier. <https://doi.org/10.1016/B978-0-444-53759-1.00002-9>
7. Besley, T., & Persson, T. (2014). Why do developing countries tax so little? *Journal of Economic Perspectives*, 28(4), 99–120. <https://doi.org/10.1257/jep.28.4.99>
8. Bird, R. M., & Gendron, P. P. (2007). *The VAT in developing and transitional countries*. Cambridge University Press.
9. Callaway, B., & Sant'Anna, P. H. C. (2021). Difference-in-differences with multiple time periods. *Journal of Econometrics*, 225(2), 200–230. <https://doi.org/10.1016/j.jeconom.2020.12.001>
10. Cnossen, S. (2019). *Modernizing VATs in Africa*. Oxford University Press.
11. Ebrill, L., Keen, M., Bodin, J. P., & Summers, V. (2001). *The modern VAT*. International Monetary Fund.

12. Goodman-Bacon, A. (2021). Difference-in-differences with variation in treatment timing. *Journal of Econometrics*, 225(2), 254–277. <https://doi.org/10.1016/j.jeconom.2021.03.014>
13. Gopakumar, A. A., Kaur, A., Ramiah, V., & Reddy, K. (2022). The sectoral effects of value-added tax: Evidence from UAE stock markets. *Journal of Risk and Financial Management*, 15(10), 429. <https://doi.org/10.3390/jrfm15100429>
14. Gurrib, I. (2017). An assessment of the potential VAT revenue collection for the United Arab Emirates. *Macroeconomics and Finance in Emerging Market Economies*, 10(3), 306–321. <https://doi.org/10.1080/17520843.2017.1321028>
15. International Monetary Fund. (2015). *Tax policy reforms in GCC countries: Now and how?* [IMF Policy Paper]. IMF.
16. International Monetary Fund (2016). *Diversifying government revenue in the GCC: Next steps*. [Paper prepared for the Annual Meeting of Ministers of Finance and Central Bank Governors of the GCC, Riyadh]. IMF.
17. International Monetary Fund (2019). *Saudi Arabia: 2019 Article IV consultation – Press release and staff report* (IMF Country Report No. 19/290). IMF.
18. International Monetary Fund (2022). *Saudi Arabia: Selected issues* (IMF Country Report No. 22/275). IMF.
19. Kaufmann, D., Kraay, A., & Mastruzzi, M. (2011). The Worldwide Governance Indicators: Methodology and analytical issues. *Hague Journal on the Rule of Law*, 3(2), 220–246. <https://doi.org/10.1017/S1876404511200046>
20. Keen, M. (2013). The anatomy of the VAT. *National Tax Journal*, 66(2), 423–446. <https://doi.org/10.17310/ntj.2013.2.06>
21. Keen, M., & Lockwood, B. (2010). The value added tax: Its causes and consequences. *Journal of Development Economics*, 92(2), 138–151. <https://doi.org/10.1016/j.jdeveco.2009.01.012>
22. Magazzino, C. (2022). Fiscal sustainability in the GCC countries. *International Journal of Economic Policy Studies*, 16(2), 389–408. <https://doi.org/10.1007/s42495-022-00082-9>
23. Mgamal, M. H., Al-Matari, E. M., & Alruwaili, T. F. (2023). Value-added-tax rate increases: A comparative study using difference-in-difference with an ARIMA modeling approach. *Humanities and Social Sciences Communications*, 10, 121. <https://doi.org/10.1057/s41599-023-01608-y>
24. OECD. (2024). *Consumption tax trends 2024: VAT/GST and excise, core design features and trends*. OECD Publishing.
25. Sun, L., & Abraham, S. (2021). Estimating dynamic treatment effects in event studies with heterogeneous treatment effects. *Journal of Econometrics*, 225(2), 175–199. <https://doi.org/10.1016/j.jeconom.2020.09.006>
26. Ufier, A. (2014). Quasi-experimental analysis on the effects of adoption of a value added tax. *Economic Inquiry*, 52(4), 1364–1379. <https://doi.org/10.1111/ecin.12099>

Figures

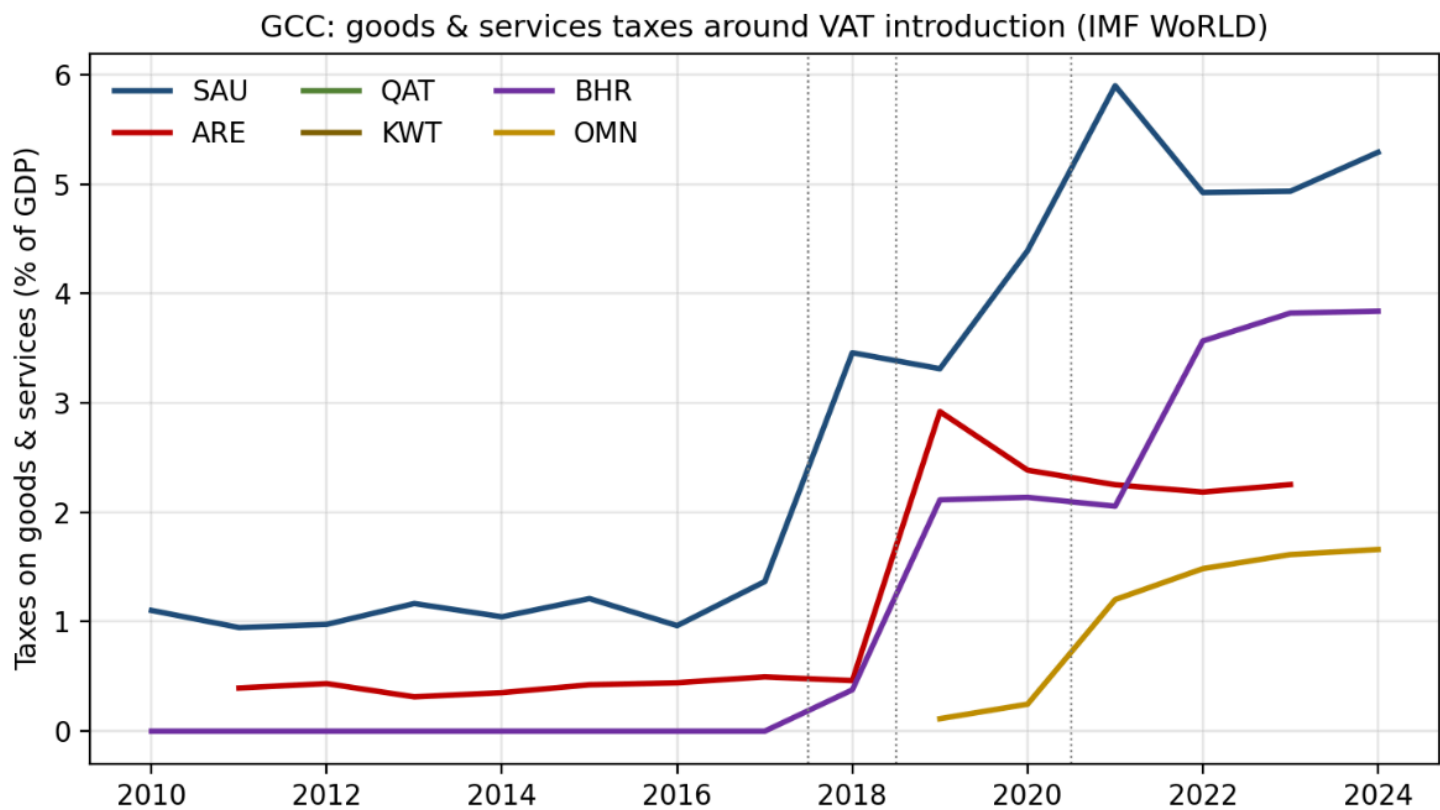


Figure 1

GCC economies: taxes on goods and services (% of GDP), 2010–2024. Vertical dotted lines indicate VAT implementation dates. Source: IMF WoRLD.

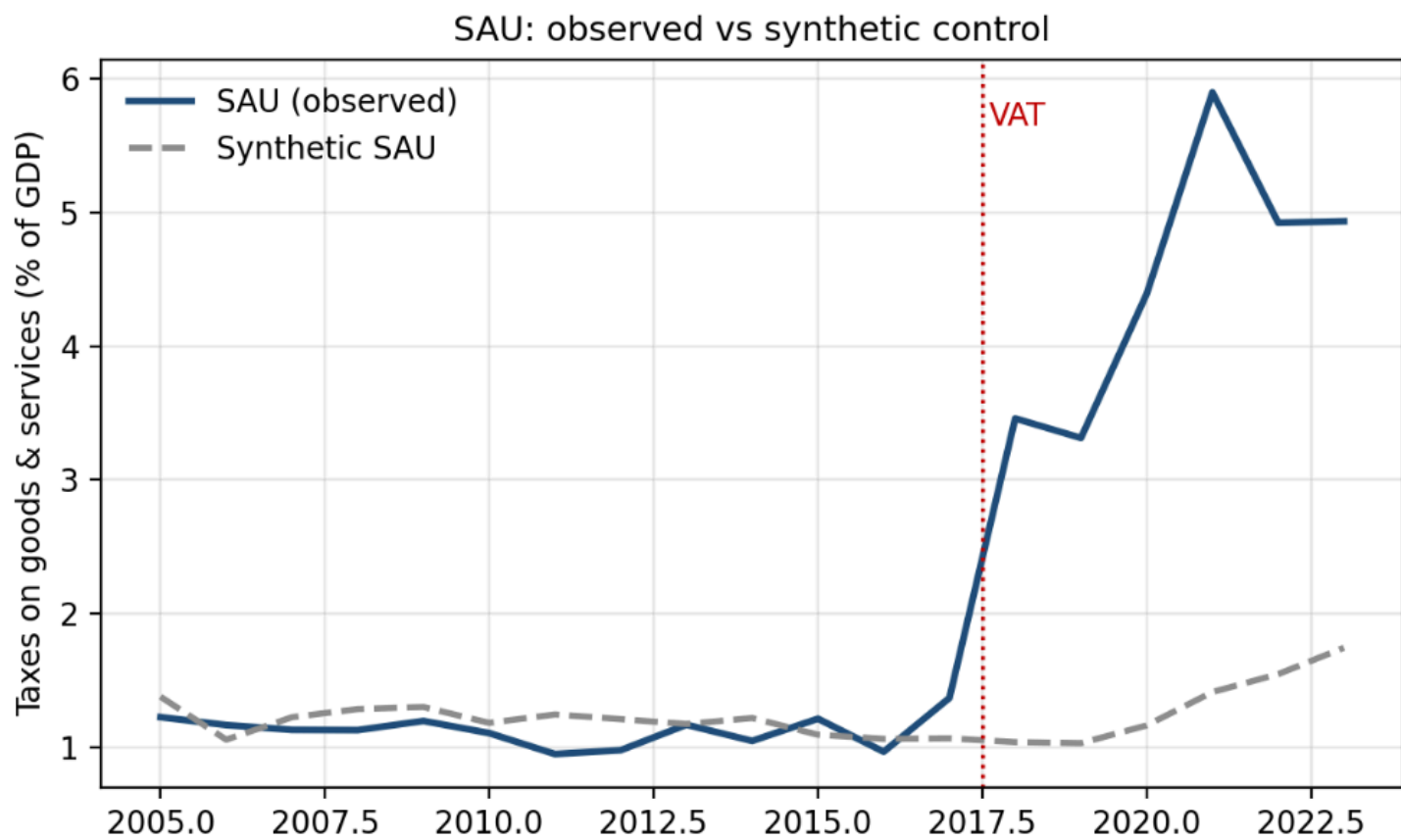


Figure 2

Saudi Arabia: observed taxes on goods and services versus synthetic control (weights: Nigeria 0.96, Gabon 0.03, Congo 0.02).

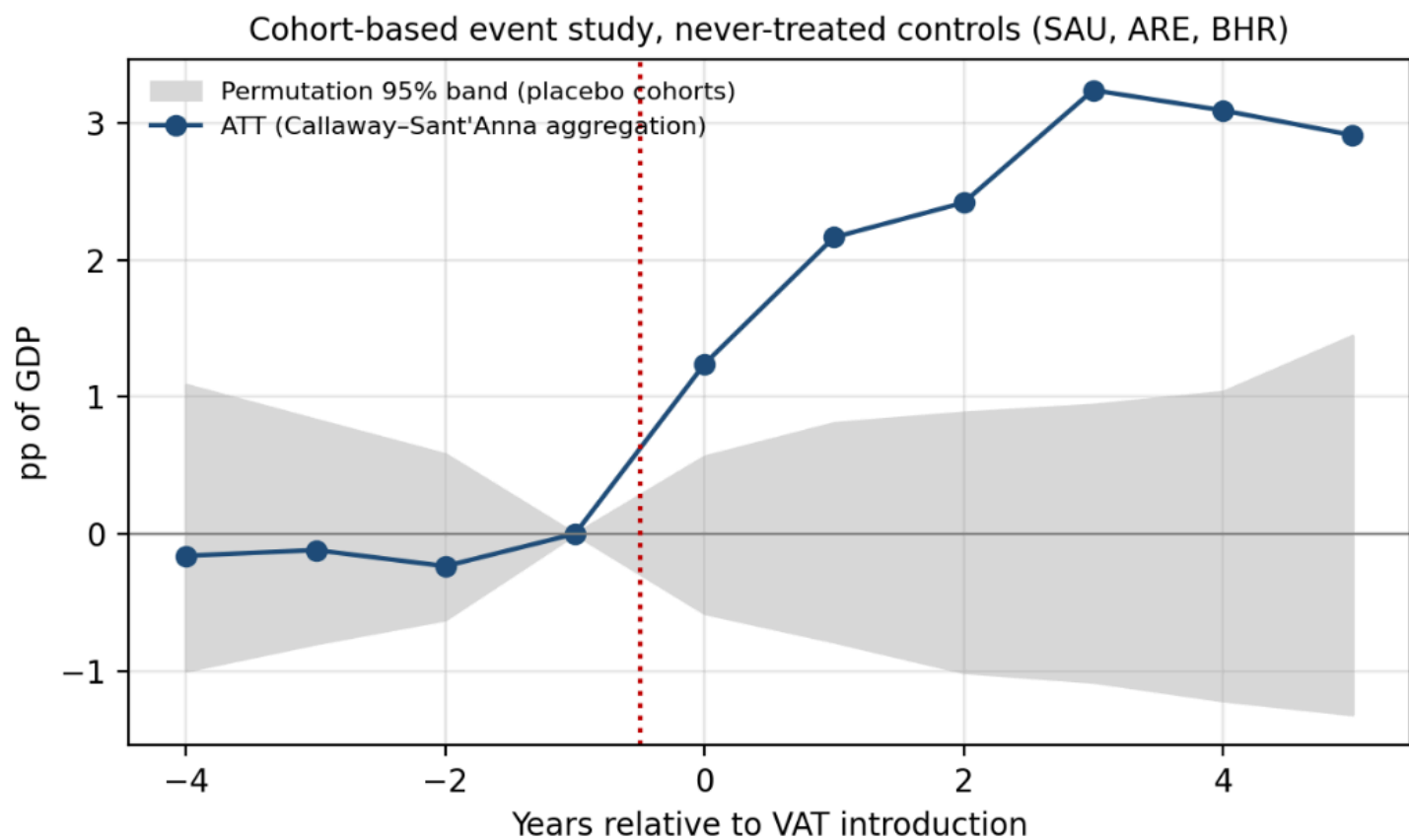


Figure 3

Cohort-based event study with never-treated controls; shaded area is the 95 per cent permutation band from 2,000 placebo cohorts.

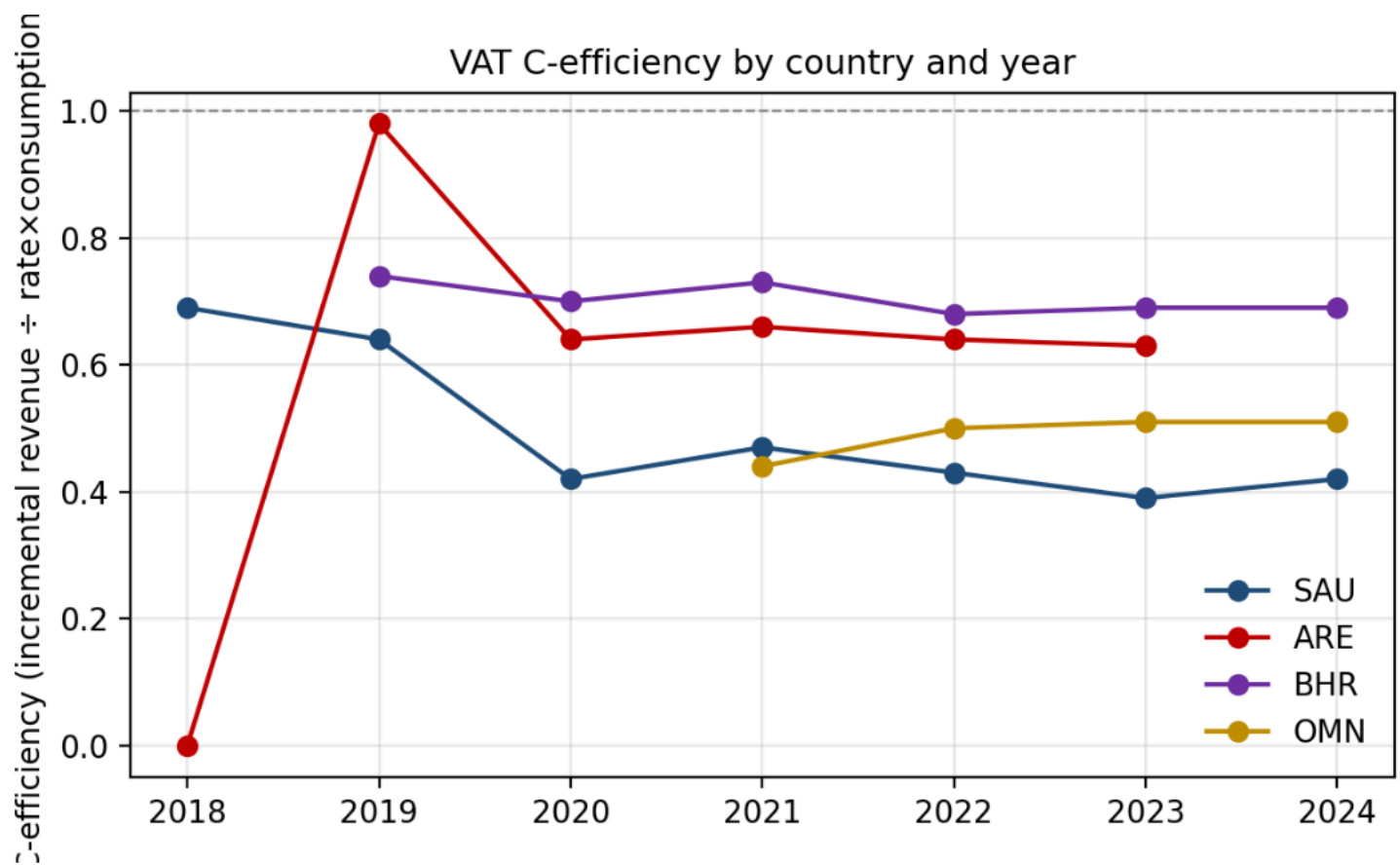


Figure 4

C-efficiency by country and year; dashed line marks full collection of the theoretical base.

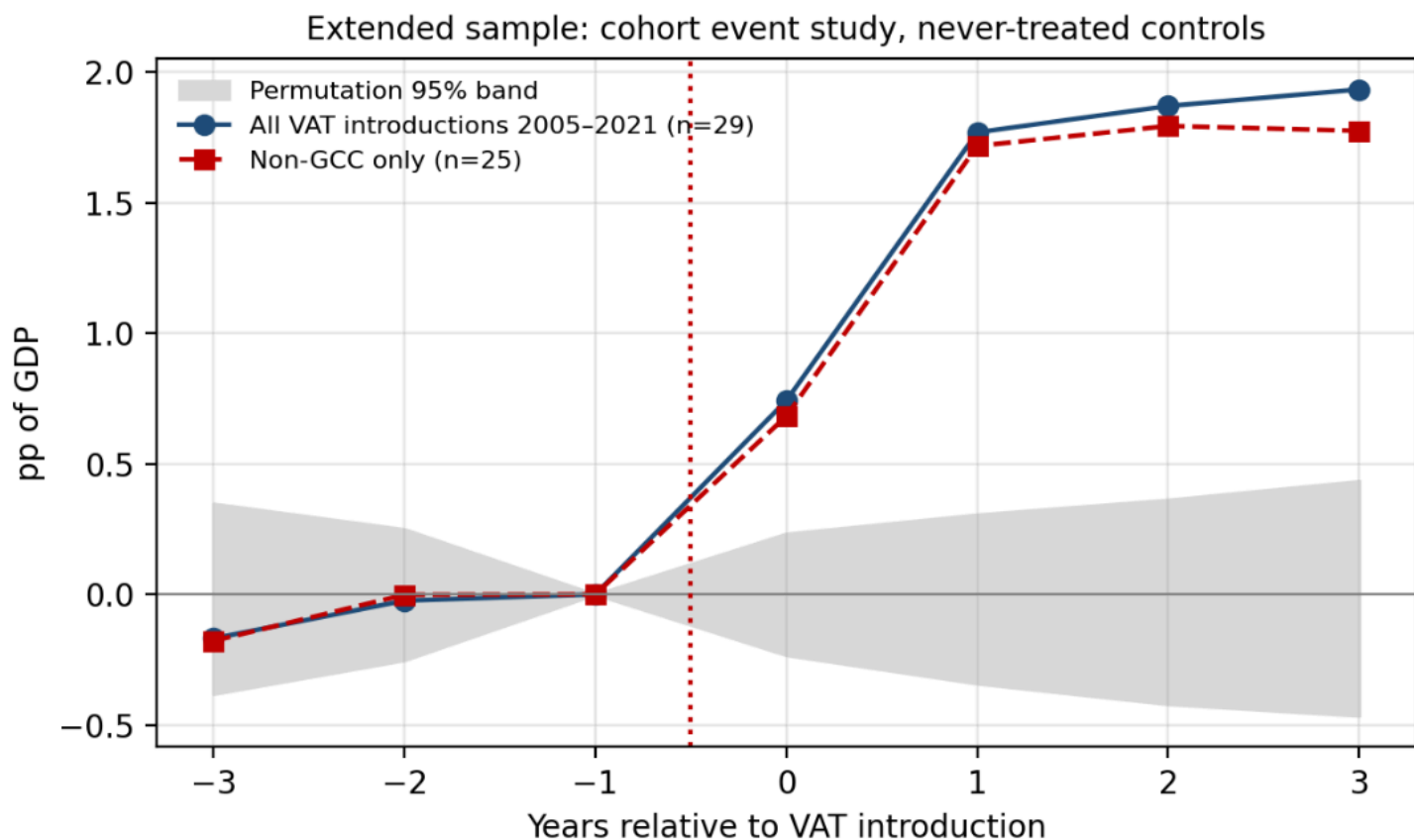


Figure 5

Extended sample of 29 VAT introductions (2005–2021): cohort-based event study with never-treated controls and a permutation band from 500 placebo assignments.

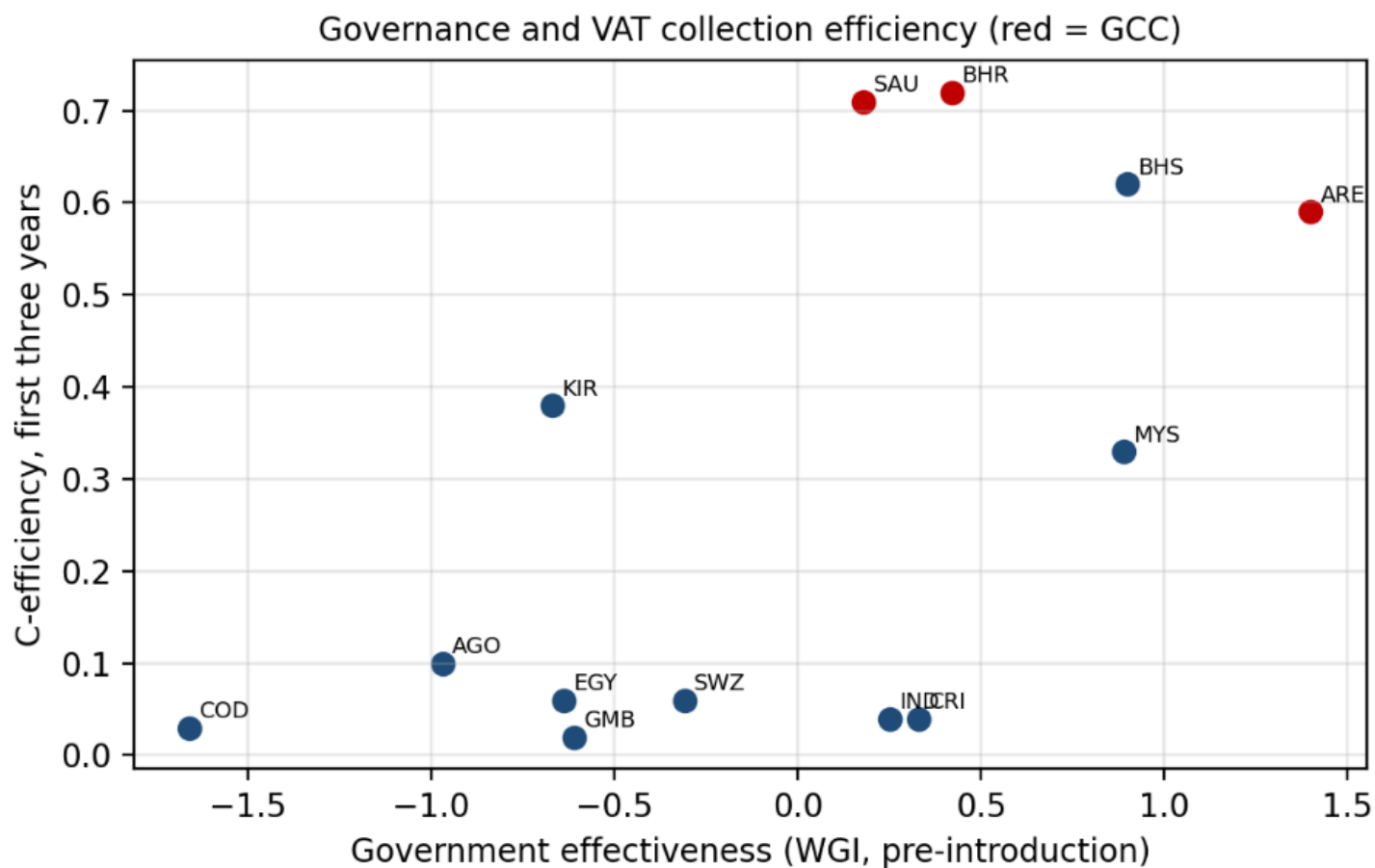


Figure 6

Pre-adoption government effectiveness and first-three-year C-efficiency across VAT introductions (red = GCC).

Supplementary Files

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- [Appendix.docx](#)