

POLICY ANALYSIS

Forecasting Through a Structural Break: Provincial Revenue Targets Under Fiscal Reform

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ABSTRACT

Revenue forecasting in subnational budgets is known to be optimistically biased, but the literature has concentrated on political and institutional drivers of that bias within a stable tax regime. This study examines a different and less studied case: forecasting across a legislated change in the tax base itself. Indonesia's Law 1 of 2022 introduced a district surcharge on provincial vehicle taxes effective January 2025, mechanically transferring a large share of provincial revenue to districts. Using published budget and accountability documents for Central Java province, the study compares monthly realised vehicle tax revenue for 2018 to 2022 with the targets set for 2024 and 2025. Two findings emerge. First, realised revenue in the pre-reform period was highly volatile, with vehicle transfer tax contracting 28.44 per cent in 2020 and recovering 24.57 per cent in 2021, while motor vehicle tax varied far less, indicating that the two bases carry different forecasting risk and should not be projected by a common method. Second, the 2025 targets embody a structural break of a magnitude that no time-series method could anticipate: the motor vehicle tax target falls 35.6 per cent and the transfer tax target 31.8 per cent against 2024, with total provincial revenue down 16.3 per cent. The study argues that budget credibility assessment must distinguish forecast error from legislated reallocation, since conventional accuracy measures would record the latter as a forecasting failure.

KEYWORDS: revenue forecasting; budget credibility; fiscal decentralisation; forecast error; local taxation

ABSTRAK

Peramalan pendapatan dalam anggaran daerah diketahui mengandung bias optimisme, namun literatur selama ini memusatkan perhatian pada pendorong politik dan kelembagaan bias tersebut dalam rezim pajak yang stabil. Penelitian ini menelaah kasus berbeda yang jarang dibahas: peramalan yang melintasi perubahan basis pajak yang ditetapkan undang-undang. Undang-Undang Nomor 1 Tahun 2022 memperkenalkan opsen kabupaten/kota atas pajak kendaraan provinsi yang berlaku Januari 2025, sehingga secara mekanis mengalihkan sebagian besar pendapatan provinsi kepada kabupaten/kota. Dengan menggunakan dokumen anggaran dan pertanggungjawaban yang telah dipublikasikan untuk Provinsi Jawa Tengah, penelitian ini membandingkan realisasi bulanan pajak kendaraan 2018 hingga 2022 dengan target 2024 dan 2025. Dua temuan diperoleh. Pertama, realisasi pada periode prareformasi sangat berfluktuasi, dengan bea balik nama kendaraan menyusut 28,44 persen pada 2020 dan pulih 24,57 persen pada 2021, sementara pajak kendaraan bermotor jauh lebih stabil — menunjukkan kedua basis memiliki risiko peramalan berbeda dan tidak layak diproyeksikan dengan metode yang sama. Kedua, target 2025 memuat patahan struktural yang tidak mungkin diantisipasi metode deret waktu mana pun: target pajak kendaraan bermotor turun 35,6 persen dan bea balik nama 31,8 persen terhadap 2024, dengan total pendapatan provinsi turun 16,3 persen. Penelitian ini berargumen bahwa penilaian kredibilitas anggaran harus membedakan kesalahan peramalan dari realokasi yang diperintahkan undang-undang.

KATA KUNCI: peramalan pendapatan; kredibilitas anggaran; desentralisasi fiskal; kesalahan peramalan; pajak daerah

INTRODUCTION

Budgets rest on forecasts. A government that overestimates revenue must later cut spending, borrow, or leave commitments unfunded, and the adjustment falls unevenly on programmes that are easiest to defer rather than those that matter least. Forecast accuracy is therefore not a technical property of a budget document but a determinant of what the budget actually delivers.

The comparative literature has established that government revenue forecasts are systematically optimistic, particularly in developing countries, and has traced the bias to political incentives and institutional weakness. What that literature has examined far less is forecasting across a discontinuity in the tax base itself. When legislation reassigns a revenue stream between levels of government, the historical series ceases to describe the quantity being forecast, and every method calibrated on that series becomes invalid at the moment the law takes effect.

Indonesia provides an unusually clean instance. Law 1 of 2022 on fiscal relations introduced *opsen*, a district surcharge on provincial motor vehicle and vehicle transfer taxes, effective from January 2025. The provincial revenue base was reduced accordingly. A province forecasting its 2025 revenue therefore faced a known, legislated, and large discontinuity — one that is not a forecast error in any meaningful sense, but that conventional accuracy measures would record as one.

This study uses published budget and accountability documents for Central Java to examine both sides of this problem. It asks three questions. First, how volatile was realised vehicle tax revenue in the pre-reform period, and did the two tax bases behave alike? Second, what is the magnitude of the structural break embodied in the 2025 targets? Third, what does the case imply for how budget credibility should be assessed where tax assignment changes?

LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

Optimism bias in government revenue forecasting

The finding that governments overestimate revenue is robust across settings. Cangiano and Pathak (2019), analysing public expenditure and financial accountability data for 26 countries over 2012 to 2017, find that most systematically overestimate revenue, with error magnitude correlated to income level and administrative capacity. Boukari and Veiga (2018), comparing French and Portuguese local governments, find budget forecasts both biased and inefficient, with opportunistic behaviour stronger where subnational fiscal discretion is greater.

Jochimsen and Lehmann (2017) identify political-economy determinants of national tax revenue forecasts across OECD countries, and Gilbert and de Jong (2017) ask whether European fiscal rules themselves induce forecast bias. Cronin and McQuinn (2023), examining 26 European Union member states over 2012 to 2019, find debt outturns consistently exceeding projections with errors widening over a four-year horizon and concentrated in high-debt countries.

Not all error is deliberate. Bachleitner and Prammer (2024) find that debt forecast errors grow with horizon but that the European Commission's now-casts are unbiased, and attribute a substantial share of error to stock-flow adjustments outside government control. This distinction between bias and unavoidable uncertainty is central to the present study, which identifies a third category — legislated discontinuity — that belongs to neither.

Transparency, institutions and budget credibility

A related literature examines what reduces forecast deviation. ElBerry and Goeminne (2021) find that among transparency dimensions, oversight of fiscal risk from public sector entities most significantly reduces budget deviation, and that audit institution independence matters more than publication of fiscal data as such. Ríos et al. (2018) find municipal budget transparency associated with smaller forecast deviations, and Spreen and Martinez Guzman (2022) show that information sharing between jurisdictions improved corporate income tax forecasting accuracy among United States states.

Mancini and Tommasino (2023) connect fiscal rules to the reliability of local public investment plans, linking forecast quality directly to execution quality. Nguyen (2024) finds local governance quality affecting the forecasting accuracy of economic actors within a jurisdiction.

Subnational forecast error as a research design

The closest methodological precedent is Chakraborty et al. (2020), who analyse fiscal forecasting errors across 28 Indian states for 2011 to 2016 using Theil decomposition. They find revenue forecast errors larger than expenditure errors, with grants the most error-prone revenue component, and conclude that errors are largely random rather than systematically biased. Their design — decomposing subnational forecast error by revenue component — is the template this study adapts.

Indonesian evidence

Herianti (2019), using district and municipal budget data for 2014 to 2017, finds budget turbulence significantly increasing budget deviation, with local government capacity moderating the effect. Musviyanti et al. (2022), using a panel of 34 provinces over 2013 to 2020, find own-source revenue and general allocation grants both positively associated with fiscal autonomy, with revenue sharing additionally significant outside Java and Bali.

Desdiani et al. (2022) find that transfer-dependent provinces struggled to run countercyclical policy during the pandemic while revenue-rich provinces were hit harder by the shock itself — a finding directly relevant to interpreting the 2020 contraction documented below. Wiguna and Khoirunurrofik (2021) establish political budget cycle patterns in Indonesian local government spending, and Lewis (2019) links legislature size to local taxation, together supplying the political-incentive mechanism the forecasting literature posits. Lewis (2023) provides a critical assessment of the fiscal decentralisation law whose effects this study observes.

Capacity, competition and what a forecast can be expected to do

A revenue forecast is produced by an administration, and the comparative evidence indicates that the administration's capacity constrains the forecast more than the technique does. Vidyattama et al. (2022), examining budget formation across Indonesian districts, find human capacity and administrative problems slowing both development and enactment of budgets, with bargaining over infrastructure commitments weakening participatory processes. Where the budget cycle is already under time pressure, a target is settled by negotiation before it can be refined by estimation.

Mahdavi and Westerlund (2018), testing convergence in subnational tax capacity and tax effort across more than three decades using sequential unit root methods, find no convergence in either, with only about half of revenue-effort gaps converging under a broader revenue definition. The finding matters for forecasting because it establishes that jurisdictions do not tend toward a common revenue-raising performance, so a forecast anchored on a peer benchmark is anchored on a quantity that is not converging.

Two further studies describe the environment in which targets are set. Chalil (2020) finds significant spatial spillovers among Indonesian municipalities in tax rates, spending and service provision, but no significant electoral response to neighbourhood performance, so the yardstick mechanism that would discipline optimistic targets is not operating. Van Rompuy (2021) finds autonomously raised subnational revenue contributing to regional convergence while the contribution of transfers diminishes and eventually reverses with dependence, and Siburian (2020) finds fiscal decentralisation reducing regional income inequality in Indonesia — both of which raise the stakes of getting own-source projections approximately right.

Research gap

No located study measures target-realisation divergence for Indonesian provincial revenue using formal forecast-error methods, and none examines forecasting across a legislated reassignment of the tax base. The first gap this study addresses descriptively; the second is its conceptual contribution.

METHOD

The study is quantitative descriptive, using published budget and accountability documents for one province. It makes no causal claims and estimates no model; the contribution is measurement and conceptual clarification.

Data

Monthly realised motor vehicle tax and vehicle transfer tax revenue for 2018 to 2022 were taken from revenue coordination materials of the provincial legislature secretariat. Revenue targets for 2024 and the 2025 planning year were taken from the provincial revenue recapitulation prepared for the same forum. Budget documents and accountability reports are public information under Law 14 of 2008. No confidential material was used.

Measures

Year-on-year growth was computed for each tax from annual totals of the monthly series. The structural break was measured as the percentage change between the 2024 target and the 2025 planning figure for each revenue category, from total revenue down to individual taxes, permitting the break to be located precisely within the revenue structure.

Limitations of the data

Three limitations bound the analysis. First, the realised series runs to 2022 while targets run to 2025, so target and realisation cannot be compared for the same year across the full period; the study therefore measures volatility and structural break separately rather than computing conventional forecast error. Second, the analysis covers one province, so the magnitudes are not generalisable although the mechanism is. Third, the 2025 figures are planning targets rather than enacted appropriations and may have been revised.

RESULTS AND DISCUSSION

Volatility in the pre-reform period

The two vehicle taxes behaved very differently over 2018 to 2022. Motor vehicle tax grew 8.72 per cent in 2019, contracted 0.84 per cent in 2020, grew 3.92 per cent in 2021 and 14.16 per cent in 2022. Vehicle transfer tax contracted 9.03 per cent in 2019, contracted a further 28.44 per cent in 2020, recovered 24.57 per cent in 2021, and grew 3.97 per cent in 2022.

Figure 1. Year-on-year growth in realised vehicle tax revenue, Central Java, 2019-2022 (source: computed from provincial revenue coordination materials)

The contrast is structural rather than incidental. Motor vehicle tax is levied annually on the existing vehicle stock, which changes slowly; the base is close to inelastic in the short run. Vehicle transfer tax is levied on transactions, so its base is the flow of vehicle sales, which collapses when households defer durable purchases. The 2020 divergence — a 0.84 per cent decline against a 28.44 per cent collapse — is the clearest possible demonstration that a stock-based and a flow-based tax carry entirely different forecasting risk.

Table 1. Realised vehicle tax revenue and growth, Central Java, 2018-2022

Source: computed by the authors from monthly realisation data in provincial revenue coordination materials.

The practical implication is immediate. Where a single growth assumption is applied across both taxes — as is common practice in target setting — it will be simultaneously too high for one and too low for the other in any year of macroeconomic disturbance. Desdiani et al. (2022) show that revenue-rich provinces absorbed the pandemic shock more severely, which is consistent with the transaction-based component of their revenue being the more exposed.

The 2025 structural break

The 2025 planning targets differ from 2024 by margins that no volatility in the historical series approaches. Total provincial revenue falls 16.3 per cent; own-source revenue falls 18.7 per cent; local taxes fall 21.2 per cent; motor vehicle tax falls 35.6 per cent; and vehicle transfer tax falls 31.8 per cent.

Figure 2. Change in provincial revenue targets between 2024 and 2025, by category (source: computed from provincial revenue recapitulation)

Table 2. Provincial revenue targets, 2024 and 2025

Source: provincial revenue recapitulation prepared for the annual revenue coordination forum. The 2025 column reports the planning figure; a subsequent desk review produced a higher total revenue figure of 23,660.40 billion.

The gradient across the table locates the break precisely. The reduction is largest at the level of the two vehicle taxes, smaller for local taxes as a whole, smaller again for own-source revenue, and smallest for total revenue. This is exactly the pattern a carve-out from two specific taxes would produce, diluted at each level of aggregation by categories the reform does not touch. The break is not a change in economic expectations; it is the arithmetic of a legislated transfer.

The magnitude also indicates something the open literature has not emphasised. A reduction of roughly a third in the two largest own-source taxes is not a marginal adjustment to provincial finance. Whatever the merits of the reallocation, the province must absorb a structural revenue reduction of this size in a single budget year, and the adjustment necessarily falls on expenditure.

Locating the break within the revenue structure

It is worth pressing on why the gradient in Table 2 matters analytically rather than merely descriptively. If the 2025 reduction reflected a deteriorating economic outlook, it would appear across revenue categories roughly in proportion to their sensitivity to activity — transfer tax falling most, motor vehicle tax somewhat less, transfers from the centre least. The observed pattern is different: the two vehicle taxes fall by similar large margins despite having demonstrably different cyclical sensitivity, and the aggregate categories fall by amounts that are close to what simple dilution of those two reductions would produce.

That signature is diagnostic. A common proportional reduction across two taxes with dissimilar elasticities is what a legislated rate carve-out produces and what an economic revision does not. The magnitudes themselves are consistent with the surcharge structure, under which the district entitlement is set as a fixed proportion of the provincial assessment.

This matters because the two explanations imply opposite policy responses. A revenue reduction driven by economic outlook is provisional and may reverse; one driven by statutory reassignment is permanent and requires structural expenditure adjustment. A province that misdiagnoses the second as the first will bridge the gap with one-off measures and face the same gap again the following year.

Why this matters for budget credibility assessment

Standard budget credibility measures compare outturn to original approved budget, and treat divergence as evidence of weak forecasting or weak execution. Applied mechanically to Indonesian provinces in 2025, such measures would record a large deterioration.

They would be wrong. The divergence arises from a statutory reassignment known in advance, and a province that projected 2025 vehicle tax revenue on the 2024 base would have been forecasting badly, not well. This is the study's central conceptual point: forecast error, unavoidable uncertainty, and legislated discontinuity are three different things, and credibility assessment that collapses them will misattribute the third to the first.

The distinction has practical consequences beyond measurement. If credibility indicators fall for reasons outside the forecaster's control, the incentive to invest in forecasting capacity weakens, and the indicator loses its diagnostic value precisely when fiscal reform makes good forecasting most necessary. ElBerry and Goeminne's (2021) finding that fiscal risk oversight is the transparency dimension that most reduces deviation suggests the remedy: treating legislated base changes as a disclosed fiscal risk, reported separately, rather than allowing them to surface as unexplained deviation.

Chakraborty et al. (2020) conclude that Indian state forecast errors are largely random rather than systematically biased. The Indonesian case suggests a caution for such conclusions generally. Where a tax regime changes within the observation window, decomposition methods will attribute the resulting break to the random component unless the break is modelled explicitly, and the inference of randomness may be an artefact of that omission.

Forecasting method under a known discontinuity

The case also raises a methodological question that the forecasting literature addresses only obliquely. Where a discontinuity is known in advance, the forecaster is not facing uncertainty about the future so much as a modelling choice about which series to project.

Two approaches are available and they differ in what they preserve. The first projects the historical provincial series and applies the statutory carve-out as an adjustment at the end. This preserves comparability of the underlying forecast across the break, so forecasting performance remains measurable, but the published target is a derived rather than a directly forecast quantity. The second projects the post-reform provincial share directly, which produces a target aligned with what will actually be collected but severs the series from its history and leaves no basis for evaluating the forecast.

The first approach is preferable on the evidence assembled here, and for a reason the transparency literature supports. Ríos et al. (2018) and ElBerry and Goeminne (2021) both find that visible fiscal information reduces deviation. Publishing the pre-carve-out projection alongside the post-carve-out target makes the reform's fiscal effect explicit rather than embedding it invisibly in a lower number, and it preserves the analytical basis on which forecasting capacity can be judged and improved.

There is a further consideration specific to the multi-level setting. The province's carve-out is the districts' gain, and district revenue projections for 2025 must embody the mirror image of the same statutory change. Where the two levels project independently without a shared assumption about the base, the aggregate of provincial and district targets need not reconcile to the total tax expected — a coordination problem that Spreen and Martinez Guzman (2022) show information sharing can address in a federal setting.

Implications

Three implications follow. First, revenue targets should be projected separately for stock-based and flow-based taxes, since the evidence here shows their volatility differs by an order of magnitude in a disturbance year. A single provincial growth assumption is indefensible on this evidence.

Second, budget credibility reporting should carry a reconciliation line separating legislated base changes from forecasting performance. The information required is already known at the time the budget is prepared, so the disclosure imposes no analytical burden — only a reporting convention.

Third, and specific to the reform, the province's absorption of a structural revenue reduction of this magnitude deserves monitoring in its own right. The literature on open has concentrated on the gain to districts; the corresponding provincial adjustment, and how it falls across expenditure categories, is the unexamined half of the reform.

The political-incentive question

The forecasting literature attributes optimism bias substantially to political incentives, and it is worth asking whether the Indonesian evidence speaks to that. Boukari and Veiga (2018) find opportunistic bias stronger where subnational fiscal discretion is greater, and Wiguna and Khoirunurrofik (2021) establish political budget cycles in Indonesian local spending. Lewis (2019) connects legislature characteristics to local taxation outcomes.

The data examined here cannot test the proposition, because target and realisation series do not overlap across the full period. What can be said is that the direction of the 2025 revision runs against what a naive political-incentive account would predict. Optimism bias implies targets set above realistic expectations; the province instead published a sharply reduced target, which is politically costly in that it announces smaller resources.

This is consistent with the interpretation advanced above — the reduction is statutory rather than discretionary — and it suggests a broader point for the bias literature. Where a legislated change compels a downward revision, the observed forecast will appear conservative regardless of the forecaster's incentives. Studies inferring bias from the sign of forecast errors across periods spanning tax reform may therefore understate bias in exactly the years when reform occurs, which is the mirror image of the measurement problem identified earlier.

Transferability of the finding

Although the analysis covers one province, the mechanism is general and its magnitude elsewhere is predictable in direction. Every Indonesian province faces the same statutory carve-out on the same two taxes from the same date. What differs is the weight of those taxes in each province's revenue structure, so the aggregate effect scales with vehicle tax dependence.

This yields a testable prediction. Provinces where vehicle taxes constitute a larger share of own-source revenue should show a proportionately larger fall in total revenue targets between 2024 and 2025, and the relationship should be close to linear given that the carve-out proportion is uniform. Musviyanti et al. (2022) document substantial variation in revenue structure between Java-Bali and other regions, so the predicted effect should differ systematically across that divide.

Confirming this would require assembling target data across provinces, which the budget documents make possible in principle since all are public. It would convert the single-province description offered here into a national measurement, and would establish whether the aggregate fiscal magnitude of the reform is larger or smaller than the district-side gains on which discussion has concentrated.

The prediction has a policy use as well as a research one. A province able to anticipate the magnitude of its own carve-out before the reform took effect could have phased its expenditure adjustment across two budget years rather than absorbing it in one. Because the carve-out proportion was set in statute in 2022 and took effect in 2025, three budget cycles were available in which to prepare. Whether provinces used that interval is an empirical question that expenditure data would answer.

Limitations

Four limitations qualify the findings. First, the study covers one province, and the magnitude of the break will differ elsewhere with vehicle tax dependence. Second, realised and target series do not overlap fully, so conventional forecast-error statistics could not be computed. Third, the 2025 figures are planning targets and may differ from enacted appropriations. Fourth, the study describes the break but does not observe its consequences, since outturn data for the reform period were not available.

A final observation concerns what the case adds to the credibility literature methodologically. Chakraborty et al. (2020) decompose Indian state forecast errors into bias, variance and covariance components, concluding the errors are largely random. That decomposition presumes a stable relationship between the forecast and the quantity forecast. Where a statutory break intervenes, the presumption fails, and the break loads onto whichever component absorbs unexplained variation. Applying such decompositions across periods containing tax reform therefore requires either excluding the break year or modelling the break explicitly — a caution that applies well beyond the Indonesian case as decentralisation reforms proliferate.

CONCLUSION

This study examined provincial revenue forecasting across a legislated change in the tax base. In the pre-reform period the two vehicle taxes displayed sharply different volatility, with the transaction-based transfer tax contracting 28.44 per cent in 2020 against a 0.84 per cent decline in the stock-based motor vehicle tax, establishing that they carry distinct forecasting risk and should not share a projection method.

The 2025 targets embody a structural break far larger than any historical variation: motor vehicle tax down 35.6 per cent, transfer tax down 31.8 per cent, total revenue down 16.3 per cent. The gradient across aggregation

levels confirms the break originates in the two taxes subject to the surcharge rather than in changed economic expectations.

The conceptual contribution is the distinction between forecast error, unavoidable uncertainty, and legislated discontinuity. Budget credibility frameworks currently recognise the first two and collapse the third into the first. Where fiscal reform reassigns revenue between levels of government — an increasingly common occurrence as decentralisation deepens — that conflation will misread reform implementation as forecasting failure. Adding a reconciliation line to credibility reporting would resolve it at negligible cost.

Two further caveats attach to interpretation. The 2025 planning figure was subsequently revised upward to 23,660.40 billion following desk review, so the 16.3 per cent reduction reported here is the initial planning position rather than the final one; the direction is unaffected but the magnitude at total-revenue level is sensitive to which figure is used. And because the study observes targets rather than outturns for the reform year, it establishes what the province expected rather than what it received.

DECLARATIONS

Author contributions (CRediT)

Conceptualisation: Author 1. Methodology: Author 1. Formal analysis and investigation: Author 1. Writing — original draft preparation: Author 1. Writing — review and editing: Author 1. Supervision: Author 1. All named authors have read and approved the final manuscript and accept responsibility for its content.

Conflict of interest

The authors declare that they have no financial or non-financial conflict of interest in relation to the subject matter of this article. No author holds a position in, or receives support from, any organisation examined or evaluated in this study.

Data availability

This study generated no primary data. It draws exclusively on published peer-reviewed literature, publicly available legal instruments and publicly available official statistics, all of which are identified in the text and listed in the references. No confidential administrative record, individual taxpayer record, permit file or personal datum was accessed, and no individual person or business is identified. Every quantity reported was traced to a single identified public source and can be verified by any reader from that source.

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Declaration on the use of artificial intelligence

In accordance with COPE, ICMJE and WAME positions, and with the RCP AI Use Declaration requirement, the authors disclose that generative artificial intelligence tools were used in preparing this manuscript, specifically to assist with literature identification, synthesis of the reviewed sources, and language editing of the draft. Artificial intelligence was not used to generate data, results or citations. Every reference in this article was verified by the authors against the publisher's own record, a digital object identifier record or an indexing database record before inclusion, and sources whose bibliographic details or indexing status could not be confirmed were excluded. No artificial intelligence tool is listed as an author. The authors take full responsibility for the accuracy, integrity and originality of the entire content of this article.

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