

CONCENTRATION IN LOCAL TAX PORTFOLIOS: A SIGN REVERSAL AND WHAT IT REVEALS ABOUT UNIT SELECTION

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ABSTRACT

Whether larger governments hold more diversified revenue is an empirical question with an established expected answer. This article computes concentration for every Indonesian local government from the national tax realisation file for fiscal year 2024, and finds that the answer depends entirely on which units are included. Collapsing 97 reported tax objects into eight groups and computing a Herfindahl-Hirschman index across them, the correlation between concentration and the logarithm of realised tax revenue is positive at 0.244 across all 536 reporting governments and negative at minus 0.326 across the 498 districts alone. The reversal is not a statistical curiosity. Provincial governments hold a tax base consisting almost entirely of vehicle and fuel taxation, which falls into a single group, so 35 of 38 provinces record perfect concentration by construction while also recording the largest revenues in the file. Including them manufactures a positive slope that inverts the relationship holding among comparable units. The article reports the district distribution, in which mean concentration is 0.330 against a theoretical floor of 0.125 and no government approaches even eight-way balance, identifies five districts whose recorded concentration reflects reporting failure rather than revenue structure, and argues that concentration measures computed across constitutionally unlike tiers are uninterpretable.

1. INTRODUCTION

A government with one revenue source is exposed to whatever happens to it. A government with several is not, or is less so, and the proposition is intuitive enough that measures of revenue concentration are a standard diagnostic in subnational finance. What is less standard is care about which governments the measure is computed across.

This article computes concentration for Indonesian local governments and finds that the central empirical relationship reverses sign according to whether provincial governments are included alongside regencies and cities. Across all 536 governments reporting tax realisation in fiscal year 2024, concentration rises with revenue. Across the 498 regencies and cities alone, it falls. The two coefficients are 0.244 and minus 0.326.

The reversal has a clean explanation and an uncomfortable implication. Indonesian provinces levy vehicle tax, vehicle transfer duty, fuel tax and tobacco tax and almost nothing else, so any grouping of tax objects places nearly the whole of a province's revenue in one cell. Provinces are

therefore maximally concentrated by construction while also being the largest units in the file. Their presence generates a positive association that has no behavioural content.

The research gap is that concentration measures are reported for subnational governments without stating whether the panel mixes tiers, and the mixing is easy because national fiscal files are published tier-inclusive. This article documents what the mixing does in one large case and reports the district distribution that survives it.

2. LITERATURE REVIEW

2.1 Concentration as a fiscal diagnostic

The case for measuring revenue concentration rests on the same reasoning as portfolio analysis in finance: exposure to a single source is exposure to whatever moves that source, and the relevant risk is not the variance of any one stream but the covariance structure of the whole.

Nakatani (2024) finds that revenue decentralisation relates to fiscal crisis probability non-monotonically, with a tipping point beyond which further decentralisation raises risk — a result that presupposes the composition of decentralised revenue matters and not merely its share. Siwinska-Gorzalak, Bukowska and Wojcik (2020) find for Polish municipalities that revenue autonomy alters the composition of spending, establishing that what a government holds shapes what it does. Harikrishnan and Hiremath (2026) find fiscal asymmetry between Indian states shaping social spending.

Kim (2023) finds vertical fiscal imbalance in the American states responding to executive budget power rather than to fiscal need, and Sethia (2021) separates the vertical question of how much a federation shares from the horizontal question of how it is distributed. Both indicate that structural features of a revenue system carry information that aggregate measures suppress.

2.2 Why local tax portfolios might be expected to diversify with size

The expected relationship between size and diversification has two independent grounds, and it is worth stating them because the article finds the expectation confirmed only in the correctly specified sample.

The first is compositional. A larger local economy supports more kinds of taxable activity: hotels, restaurants, entertainment, advertising, parking and groundwater extraction all require an urban economy of some scale, while a small rural district may have property tax, street lighting tax and little else. Rachevski and Shami (2024) find local revenue performance improving with the business environment, which is the same mechanism observed from the revenue side.

The second is administrative. Collecting a tax has a fixed cost, so a small government may rationally decline to administer minor instruments whose yield does not cover it, concentrating on the two or three that do. Sen and Wallace (2022) show that revenue productivity depends on collection effort, and Baskaran (2021) that instrument parameters move the base rather than merely

dividing it. Both imply that the observed portfolio reflects administrative choice as well as economic endowment.

Anton (2024) and Bonvecchi, Calvo and Stein (2020) add the design dimension: the set of instruments available to a tier is a legislative choice, so concentration is bounded above by what the statute permits a government to levy. This is the feature that produces the artefact examined here, because the Indonesian statute assigns provinces a narrow set and districts a wide one.

2.3 The unit-of-analysis problem

Combining units that differ in the constraints they face is a familiar hazard, and the fiscal federalism literature has encountered it before in a related form.

Ladner, Keuffer and Bastianen (2025), presenting the extended Local Autonomy Index, are explicit that autonomy is multidimensional and that units must be compared on dimensions that mean the same thing for each. Porto, Puig and Vidal (2026) find subnational budgets adjusting to transfer changes dynamically, and Saens, Cox and Villalobos (2026) find the flypaper effect conditioned by fiscal capacity — in both cases a relationship that holds within a class of units and would be obscured by pooling across classes.

The Indonesian case is unusually clean because the constraint is statutory rather than economic. A province is not concentrated because its economy is narrow but because Law No. 1 of 2022 assigns it four taxes. Any measure of concentration applied to a province is therefore measuring the statute, and pooling provinces with districts measures a mixture of statute and behaviour with no way to separate them.

2.4 Concentration, shocks and what the measure is for

A concentration index earns its place only if it predicts something. The literature on how subnational governments absorb fiscal shocks supplies the outcome the measure is meant to anticipate, and is worth stating because it bounds what the index can be asked to do.

Singh and Dubey (2026) find for Indian states that the transmission of a fiscal shock depends on the composition of the affected revenue rather than on its magnitude, which is the clearest statement of why composition should be measured at all. Aikins (2023) shows that governments under fiscal stress draw on reserves in ways conditioned by their intergovernmental position, so the response to a concentrated shock is itself conditioned by structure.

Two Brazilian studies qualify the expectation. Alves and Araujo (2024) and Bernardelli, Paschoalino, Russo and Kortt (2026) both find that transfers alter local fiscal incentives unintendedly, which means a government's observed portfolio partly reflects the incentives it faces rather than the economy it sits in. Agrawal and Shybalkina (2024) make the same point from the administrative side, showing that a crediting rule redistributes revenue independently of activity. A concentration index therefore measures the joint product of economy, statute and incentive, and attributing it to any one of the three requires holding the others constant — which is precisely what pooling tiers fails to do.

2.5 The research gap

The gap is narrow and practical. Concentration statistics for subnational governments are reported without stating the tier composition of the sample, and national fiscal files invite pooling because they publish tiers together in one table. This article establishes what pooling does in a case where the artefact is large enough to reverse the sign of the headline coefficient.

3. METHOD

The data are the national local tax realisation file for fiscal year 2024 published by the Directorate General of Fiscal Balance, which reports realised revenue by tax object for every reporting regional government. The file contains 536 government rows and 97 tax-object columns together with a total.

The 97 objects were collapsed into eight groups: rural and urban land and building tax; duty on acquisition of land and building rights; the set of hotel, restaurant, entertainment and parking taxes, which the 2022 reform later consolidated into a single certain goods and services tax; street lighting tax; advertisement tax; groundwater tax; non-metallic mineral and rock tax; and a residual holding the provincial instruments and minor objects. Group sums were reconciled against the file's own total for every row, and 536 of 536 agree.

Concentration is measured by the Herfindahl-Hirschman index, computed as the sum of squared group shares. With eight groups the index ranges from 0.125, indicating perfectly even distribution across all eight, to 1.000, indicating that a single group supplies all revenue. The correlation reported is the Pearson coefficient between the index and the natural logarithm of total realised tax revenue; logarithms are used because revenue is right-skewed across three orders of magnitude, and all totals are strictly positive so no observation is dropped.

Four limitations apply. Ten districts present in the corresponding budget file are absent from the realisation file, including Kabupaten Kudus, so the panel is unbalanced and the loss is concentrated in the Papua-region provinces. The file records a pre-reform object taxonomy, so the consolidated goods and services tax does not appear as a column and the group used here is a reconstruction. Eight groups is a choice; a finer partition would lower every index and a coarser one would raise it, so levels are comparable within this study and not across studies using different partitions. And the figures are unaudited self-reported realisation.

4. RESULTS AND DISCUSSION

4.1 The sign reversal

Table 1 states the central result. The same index, computed on the same file in the same year, relates to revenue in opposite directions according to which governments are counted.

Table 1. Correlation between concentration and log realised tax revenue

Sample	n	Pearson r	Interpretation
All reporting governments	536	+0.244	Larger governments more concentrated
Districts only	498	−0.326	Larger districts more diversified
Provinces only	38	not computed	35 of 38 fixed at 1.000

Computed by the authors from the Directorate General of Fiscal Balance national local tax realisation file for fiscal year 2024 (retrieved 2026). Concentration is the Herfindahl-Hirschman index across eight tax-object groups. Correlation uses the natural logarithm of realised total tax revenue.

The provincial row explains the other two. Thirty-five of 38 provinces record an index of exactly 1.000, because vehicle tax, vehicle transfer duty, fuel tax, surface water tax and tobacco tax all fall into the residual group and a province levies essentially nothing else. Those same 38 governments account for 66.1 per cent of all realised local tax revenue in the file. The pooled sample therefore contains a block of observations that are simultaneously the largest and the most concentrated, and their presence is sufficient to reverse the slope.

The district-only coefficient of minus 0.326 is the one with behavioural content, and it confirms the expectation set out in Section 2.2: within a class of governments facing the same statutory menu, larger tax bases are more diversified.

4.2 The district distribution

Table 2 reports concentration across the 498 districts, alongside the pooled figures for comparison.

Table 2. Distribution of the concentration index

Statistic	All 536	Districts (498)	Note
Mean	0.3760	0.3299	Floor is 0.125
Median	0.3013	0.2953	
Standard deviation	0.2070	0.1225	Pooled SD inflated by the provincial block
Coefficient of variation	0.551	0.371	
Minimum	0.1977	0.1977	Kab. Ketapang, Kalimantan Barat
25th percentile	0.2630	0.2607	
75th percentile	0.3769	0.3503	
Maximum	1.0000	1.0000	Five districts; see Section 4.4

Computed by the authors from the source in Table 1. Percentiles are linearly interpolated; the standard deviation is the sample statistic.

The most striking figure is the minimum. No Indonesian district achieves an index below 0.1977 against a theoretical floor of 0.125, and the district recording it, Kabupaten Ketapang in West

Kalimantan, has its largest group at 29.9 per cent of revenue. Even the most diversified local tax portfolio in the country is some way from balance.

The interquartile range is narrow, from 0.2607 to 0.3503, so three quarters of districts sit between moderate and fairly high concentration. The distribution is right-skewed: the median of 0.2953 sits below the mean of 0.3299, pulled up by a small number of highly concentrated cases examined in Section 4.4.

4.3 What districts actually levy

The composition figures explain why concentration is bounded away from balance. Table 3 reports the national share of district tax revenue contributed by each group.

Table 3. Composition of realised district local tax revenue, FY2024

Group	Realised (IDR bn)	Share of district total	Cumulative
Hotel, restaurant, entertainment, parking	32,855.21	27.59%	27.59%
Duty on land and building rights	29,437.50	25.19%	52.78%
Street lighting tax	20,917.11	21.61%	74.39%
Rural and urban land and building tax	28,279.80	19.83%	94.23%
Non-metallic mineral and rock tax	2,636.81	2.85%	97.08%
Advertisement tax	2,574.08	1.75%	98.82%
Groundwater tax	1,077.95	1.07%	99.90%
Residual	—	0.10%	100.00%

Computed by the authors from the source in Table 1. Rupiah figures are national totals across all reporting governments; shares are of the district-only total of IDR 92,396.30 billion. The residual holds provincial instruments and is negligible at district level.

Four groups supply 94.23 per cent of all district tax revenue. The remaining four supply less than six per cent between them, and two of those — advertisement tax and groundwater tax — supply under two per cent each. A district cannot diversify into instruments that are structurally minor, which is why the observed floor of 0.1977 sits well above the arithmetic floor of 0.125.

The distribution of instruments actually reported reinforces the point. Of the 498 districts, 192 report revenue in all eight groups and 171 in seven, but 112 report six, and 23 report five or fewer. Five report revenue in only one group. Concentration in Indonesian local finance is therefore driven partly by the narrowness of the productive instrument set and partly by how many instruments a district administers at all.

4.4 Five cases that are reporting failures

The maximum of 1.000 among districts requires separate treatment, because it does not mean what the index says it means.

Five districts record an index of exactly 1.000: Kabupaten Grobogan in Central Java, Kota Blitar in East Java, Kabupaten Buru Selatan in Maluku, Kabupaten Pegunungan Bintang and Kabupaten Mamberamo Tengah in Papua Pegunungan. Two of them are implausible on their face. Grobogan reports IDR 183.53 billion of tax revenue entirely within the hotel, restaurant, entertainment and parking group; Kota Blitar reports IDR 54.18 billion the same way. Both certainly levy land and building tax and duty on acquisition of land and building rights, which are mandatory district instruments.

These are reporting failures — a district that filed only part of its return, or a mapping error in the compilation — and they are identifiable precisely because the index makes them extreme. Retaining them raises the district mean by a small amount and the maximum by a large one; the article retains and flags them rather than dropping them, because silent exclusion of inconvenient observations is worse than a disclosed anomaly.

The remaining three, all very small jurisdictions with revenue under IDR 700 million, may be genuine. A district whose entire tax revenue is IDR 677 million from mineral extraction is not obviously misreporting; it is a district with almost no taxable economy. Distinguishing the two cases requires a plausibility threshold that the data do not supply, and the article draws the line at the two large cases where the implausibility is unambiguous.

4.5 The provincial pattern

Mean district concentration by province ranges from 0.7749 in Papua Pegunungan to 0.2609 in West Java, and the ordering is interpretable.

Table 4. Mean district concentration by province, selected

Rank	Province	Districts	Mean index	Character
1	Papua Pegunungan	6	0.7749	Minimal taxable economy
2	Papua Tengah	8	0.5131	Minimal taxable economy
3	Kepulauan Riau	7	0.4697	Few, large instruments
10	Aceh	23	0.3673	
25	Sumatera Utara	33	0.3050	
26	Jawa Timur	38	0.3034	
27	Jawa Tengah	34	0.2961	One district absent from the file
36	Banten	8	0.2613	Dense urban economies
37	Jawa Barat	27	0.2609	Dense urban economies

Computed by the authors from the source in Table 1, district rows only. Thirty-seven provinces have district rows; the Special Capital Region of Jakarta has none. Central Java shows 34 rather than 35 districts because Kabupaten Kudus is absent from the file.

The ordering tracks economic diversity closely. The Papua-region provinces, whose districts have small and narrow taxable economies, sit at the top; the dense urbanised provinces of Java sit at the bottom. Aceh at 0.3673 is above the district mean and North Sumatra at 0.3050 is slightly below it, both consistent with their economic profiles.

This is the same relationship the district-only correlation reports, observed at provincial aggregate rather than at unit level, and its consistency across the two computations is a check on the correlation. Table 5 answers it.

4.6 How many instruments a district actually operates

The composition figures in Table 3 describe the national aggregate. A separate question is how many of the eight groups an individual district reports at all, and the answer bears directly on whether concentration reflects economic structure or administrative reach.

Table 5. Number of tax groups in which districts report revenue, FY2024

Groups reported	Districts	Share of 498	Interpretation
8 of 8	192	38.6%	Full instrument set operated
7	171	34.3%	One group absent
6	112	22.5%	Two groups absent
5	8	1.6%	
4 or fewer	15	3.0%	Includes the five at index 1.000

Computed by the authors from the source in Table 1, district rows only. A group counts as reported where realised revenue in that group is strictly positive.

Slightly under two fifths of districts report revenue in all eight groups, and a further third in seven. That is a higher figure than the concentration statistics alone might suggest, and it matters for interpretation: most districts are operating most of the available instruments, so their concentration reflects the relative size of those instruments rather than a failure to administer them.

The tail is where administrative reach shows. Fifteen districts report four groups or fewer, and the five reporting a single group are the cases examined in Section 4.4. Between them, the 23 districts reporting five or fewer groups account for under one per cent of district tax revenue, so their effect on national aggregates is negligible while their effect on the distributional statistics in Table 2 is not.

The practical reading is that Indonesian district revenue concentration is predominantly a compositional phenomenon rather than an administrative one. Four instruments are large and four are small, and a district operating all eight will still record an index near 0.30 because the four small ones cannot move it. Recommending diversification to such a district is recommending that it collect more of something that is structurally minor.

4.7 Two objections

The first objection is that the sign reversal is a well-known consequence of pooling heterogeneous groups and that the article makes too much of it. The objection is right about the statistics and wrong about the practice. That pooling unlike units can reverse an association is elementary; that national fiscal files publish tiers in a single table with no flag, so that a default analysis pools them, is a practical hazard rather than a theoretical one. The contribution is the demonstration that in this case the artefact is large enough to invert the headline coefficient, not the observation that such artefacts are possible.

The second objection is that eight groups is arbitrary and that a different partition would give different numbers. This is correct and the article states it in Section 3. Two considerations limit the concession. The sign reversal is invariant to the partition, because it arises from provinces holding their entire base in whichever cell the provincial instruments fall into, and that is true of any partition that does not split them. And the relative ordering of districts is far more robust than the absolute levels, so the provincial ranking in Table 4 and the correlation in Table 1 would survive a reasonable change of grouping even though the means in Table 2 would not.

4.8 Limitations

Four limitations bound the analysis. Ten districts are absent from the realisation file, six of them in the Papua-region provinces, so the provinces with the most extreme concentration are also the ones most affected by missing data; the direction of the resulting bias is unknown. The file records a pre-reform taxonomy, so the group used as a proxy for the consolidated goods and services tax is a reconstruction and is not comparable with the post-reform column of the same name.

The index levels depend on the eight-group partition and are not comparable with concentration figures computed elsewhere on different partitions. And the figures are self-reported and unaudited, which Section 4.4 shows is not a formality: at least two large districts filed returns that cannot be correct.

4.9 Policy implications

Three implications follow, addressed to different users of the data.

For analysts, the implication is a reporting convention: any concentration or diversification statistic computed on Indonesian regional finance should state its tier composition, and should default to district-only unless there is a specific reason to pool. The published files do not flag the tier, so the burden falls on the analyst, and the cost of getting it wrong is a reversed sign on the central coefficient.

For the ministry that compiles the file, the implication concerns data quality assurance. Two districts reporting large revenue in a single group are detectable by an arithmetic check that requires no judgement — a district reporting zero land and building tax has almost certainly not filed completely, since that instrument is mandatory. Flagging such rows at compilation would cost little and would prevent the error propagating into every downstream analysis.

For fiscal policy, the substantive finding is that four instruments supply 94.23 per cent of district tax revenue and that the four remaining ones are too small to diversify into. Advice to local governments to broaden their revenue base runs into that arithmetic: the breadth is not available within the current statutory menu. Whether the menu should be widened is a question for the legislature, but the diversification recommendation cannot be met by administrative effort alone.

One further consideration bears on how far the finding travels. The Indonesian tier structure is unusually favourable to the artefact because the statutory menus differ so sharply: four instruments for provinces against twelve for districts. In a system where both tiers levy overlapping sets, pooling would still mix units facing different constraints but the resulting distortion would be smaller and might not reverse a sign. The lesson is therefore conditional rather than universal. What generalises is the diagnostic question — does the statute assign different instrument sets to the tiers being pooled — and where the answer is yes, a pooled concentration measure should be treated as uninterpretable until the tiers are separated and shown to behave alike.

4.10 Summary of findings

The factual findings are five. The correlation between concentration and log realised tax revenue is positive at 0.244 across all 536 reporting governments and negative at minus 0.326 across the 498 districts. Thirty-five of 38 provinces record an index of exactly 1.000 by construction while accounting for 66.1 per cent of realised revenue. District concentration has a mean of 0.3299 and a minimum of 0.1977 against a theoretical floor of 0.125. Four groups supply 94.23 per cent of district tax revenue. And five districts record perfect concentration, of which at least two are reporting failures.

The interpretive claims are three. The sign reversal arises because provinces are simultaneously the largest units and maximally concentrated by statutory construction, so pooling measures the statute rather than behaviour. Within districts the expected relationship holds: larger tax bases are more diversified. And the distance between the observed minimum of 0.1977 and the arithmetic floor of 0.125 measures how far the statutory instrument menu is from permitting balance, which bounds what any diversification policy can achieve.

5. CONCLUSION

Concentration in Indonesian local tax portfolios rises with revenue if provinces are counted and falls with revenue if they are not. The second is the relationship with behavioural content; the first is an artefact of pooling governments that hold four taxes with governments that hold twelve.

The general claim is that a concentration measure computed across constitutionally unlike tiers is uninterpretable, because the measure is bounded above by the statutory instrument set and the statute assigns different sets to different tiers. Where a national file publishes tiers together, as Indonesia's does, the pooling is the default and the artefact is easy to reproduce.

Three extensions follow. Recomputing the index on the post-reform taxonomy, once realisation data on the consolidated goods and services tax is published, would test whether consolidation raised measured concentration mechanically. Relating district concentration to revenue volatility across years would test whether the measure predicts what it is used to predict. And examining the ten districts absent from the file would establish whether their omission is administrative or reflects something about the districts themselves.

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