Risk and Spending in Mexican Public Basic Education

Which community needs predict lower school outcomes, and does federal payroll spending follow them?

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Summary

This report applies the first step of the framework for evaluating and reforming education finance systems (Baker, Atchison & Levin, 2026), previously applied in Colorado (with the American Institutes for Research), Oregon and New Jersey, to Mexico's public basic education system. The framework holds that a school finance system should deliver the resources schools need to give every child an equal opportunity to achieve common outcome goals. **Risk modeling** asks which measurable student and community characteristics are most strongly associated with lower school outcomes. **Spending modeling** asks whether, and to what extent, current spending is targeted toward the schools where those risk factors are concentrated, after accounting for cost factors that are not about student need: school size, remoteness, labor costs and level of schooling. Cost modeling, the third step, is left for a subsequent report.

- **Locality-level indicators predict outcomes far better than municipal poverty rates.** Adult educational attainment, household crowding, the share of young children in the population, teen school attendance, household computer access and Indigenous-language prevalence in the school's own locality jointly explain roughly twice the outcome variance that municipal multidimensional or income poverty rates explain. A composite need index built from these measures separates schools by about one standard deviation in outcomes between the 10th and 90th percentiles of need (0.97 SD in primaria, 0.76 SD in secundaria).
- **Federal (FONE) payroll spending per pupil is regressive with respect to need.** Holding level and year constant, schools at the 90th percentile of need receive about 85% of the per-pupil payroll of schools at the 10th percentile. After also accounting for school size, remoteness and labor costs, the ratio falls to 0.75, and to 0.77 within states. High-need schools get some additional resources only because they are small and remote; beyond those structural cost factors they receive roughly a quarter less.
- **The gap is mainly a staffing gap.** High-need schools have fewer payroll staff per pupil (adjusted ratio 0.81) and modestly lower pay per staff member (0.95). Teaching payroll alone shows the same pattern (0.80).
- **No state is progressive once size and remoteness are accounted for,** and the pattern has been stable from 2019-20 through 2024-25. Adjusted ratios range from 0.44 (Baja California Sur) to 0.99 (Coahuila). Preschool is the most regressive level (0.73).

The spending measure covers federalized payroll paid through the Fondo de Aportaciones para la Nómina Educativa y Gasto Operativo (FONE), which is the dominant source of school-site resources in Mexico's federally transferred system. It excludes Mexico City (not paid through FONE), teachers paid directly by state-funded systems, CONAFE community schools, and non-payroll spending. The findings therefore describe how the largest single school-level resource stream is distributed, not total public spending.

1. Framing: Equal Opportunity, Risk and Spending

1.1 The purpose of a school finance system

This report starts from the purpose of school finance systems as Baker, Atchison and Levin (2026) define it: to deliver the resources schools need to give every child an equal opportunity to achieve common, adequate outcome goals. The definition contains two separable objectives. **Equal opportunity** holds when children's chances of reaching the common outcome goals do not depend on their backgrounds or on where they attend school. **Adequacy** holds when those common goals are high enough for children to become productive, self-determined and civically engaged adults. A system can deliver one without the other. Keeping the two distinct matters most where adequacy goals are loosely defined or unfunded, because equal opportunity can and should be pursued even then.

The framework rests on an empirical premise that has become much better established over the past two decades: money spent on schooling matters for children's achievement, attainment and later-life outcomes (Baker & Knight, 2025; Jackson & Mackevicius, 2024). The question is therefore not merely how dollars are distributed, but whether they are distributed in relation to what it takes for children in different circumstances to reach the same goals.

1.2 From spending parity to equal opportunity

Conceptions of school finance equity have evolved along with that evidence. The Coleman Report (Coleman et al., 1966) found that family background accounted for much of the variation in achievement. That finding supports two very different policy readings: that schools matter little, or that resources must be leveraged and targeted to offset differences in children's circumstances. Coons, Clune and Sugarman (1969) framed the first workable legal standard, fiscal neutrality: the quality of a child's education should not depend on local wealth. Garms and Smith (1970), anticipating the second reading of Coleman, argued that equal spending at equal tax effort would still fail to deliver equal opportunity, and defined equal opportunity in terms of outcomes across groups.

Berne and Stiefel (1984) organized the field around horizontal equity, the equal treatment of equals, and vertical equity, the unequal treatment of unequals. As state standards and accountability systems spread, Clune (1994) and Underwood (1994) shifted attention to outcomes, arguing that adequacy for children whose outcomes are depressed by poverty requires more resources. Later critiques identified the limits of those frames. Measured horizontal equity rewards uniformity and penalizes the differentiation that vertical equity demands. Vertical equity requires categorical judgments about who is "unequal" and by how much. And a guarantee of minimal adequacy leaves children who receive only the minimum at a positional disadvantage (Koski & Reich, 2006; Baker & Green, 2008, 2012).

The unified framework resolves these tensions by treating the common outcome goals, rather than the inputs, as the point of equal treatment. When all children are expected to meet the same standards, they are similarly situated with respect to those standards. Providing them equal opportunity to meet the standards requires differentiating programs, services and money according to the obstacles they face. Under this view, a group whose chances of meeting the common goals are systematically lower has a claim on additional resources whether or not it fits a statutory category. The evidence that establishes the claim is the relationship between the group's characteristics and its outcomes.

1.3 Mexico's commitments

The framework applies naturally to Mexico. Article 3 of the Constitution, as amended in 2019, establishes education as a right that is obligatory, universal, inclusive, public, free and secular. It directs the State to prioritize the best interest of children and youth in access to, continuation in, and participation in education. It requires that education be equitable, with measures to combat socioeconomic, regional and gender inequalities. And it calls for particular attention to basic education schools in areas of high marginalization. It also defines excellence as continuous, comprehensive improvement that promotes students' maximum learning achievement. Taken together, these provisions express common outcome aspirations for all children and an explicit obligation to offset the disadvantages that stand between some children and those outcomes.

Mexico differs from the U.S. state settings in which the framework was developed in one important respect. Most school staff in the federally transferred system are paid through a single federal fund, FONE, on nationally negotiated salary schedules, rather than through a state aid formula combined with local property taxes. Local wealth and local voter preferences therefore play little direct role in school-site resources. The fiscal-neutrality question that dominates U.S. school finance is largely displaced. What remains, and becomes central, is whether a centrally financed system allocates positions and pay in relation to the needs that most affect children's chances of success.

1.4 Risk and spending analysis

Baker, Atchison and Levin (2026) organize the empirical work in two steps. The first evaluates the existing system; the second estimates what funding should be and translates it into policy. This report carries out the first step.

- **Step 1a: risk (needs) analysis.** Borrowing from public health (Peterson et al., 2021), the framework identifies the "risk" factors that impede progress toward the common outcome goals, so that a finance system can mitigate their effects. The analysis begins by asking "at risk of what?": it constructs a comprehensive outcome measure and then tests which candidate measures of student and community need most strongly predict lower outcomes: Outcomes = f(Needs, Context). Measures must be consistently available across schools and years and usable in policy. Those with the strongest predictive validity carry forward to later steps.
- **Step 1b: spending analysis.** The second part asks whether current spending is distributed in relation to those risk factors: Spending = f(Needs, Context). Descriptive regressions relate per-pupil spending to need while accounting for contextual cost factors such as economies of scale, grade level, remoteness and labor costs. A system in which spending rises with need is progressive; one in which it falls is regressive. This step cannot say how progressive is progressive enough. That requires the cost modeling of Step 2.

Step 1b in the full framework also includes a fiscal-neutrality analysis relating district spending to local income, tax price and voter preferences. That analysis is not applicable to FONE payroll, which is not raised locally, and is omitted here. Step 2, cost modeling and the translation of costs into allocation weights, is left for subsequent work. The risk and spending analyses reported here identify the need factors such work should carry forward and the current implicit weights against which it can be compared.

1.5 Data

The school is the unit of analysis throughout. The work uses a school-by-year panel assembled from SEP's Formato 911 school census, FONE payroll reports by work center (Clave de Centro de

Trabajo, CCT), PLANEA assessment results, INEGI's 2020 Census at the locality level, CONEVAL and CONAPO indices, and IMSS formal employment records. Table 1 summarizes the sources.

Table 1. Data sources

Domain	Source	Level / years	Use
School characteristics	SEP Formato 911 (start-of-year census)	School; 2019-20 to 2024-25	Enrollment, level, service type, staff, repetition, attrition, completion
Payroll spending	FONE payroll by work center (LGCG Art. 73, Report 5)	School; calendar 2015–2026	Gross pay, staff counts by type, per-pupil payroll
Assessments	PLANEA school results (SEP/INEE)	School; 2015–2019	Achievement components of outcome index
Community need	INEGI Census 2020 (ITER); CONEVAL social lag; CONAPO marginalization	Locality & municipality; 2020	Candidate need measures
Poverty	CONEVAL municipal poverty	Municipality; 2020	Candidate need measures
Labor market	IMSS insured jobs and wages	Municipality; monthly	Labor-cost control; candidate need measure
Remoteness	INEGI locality coordinates & population	Locality; 2020	Distance to nearest city ≥ 50,000; rural locality

Note: All monetary values are nominal Mexican pesos. Payroll is linked to the calendar year in which each school year ends (e.g., 2023-24 school year with calendar 2024 payroll).

2. Risk Modeling

2.1 The outcome factor score

Following the Colorado and New Jersey studies, outcomes are summarized in a single school outcome factor score rather than a single test. Components, each standardized across schools, are: PLANEA achievement for every available test year (mean achievement level in language and mathematics; only results SEP flagged as representative, with no copying flag and at least five students tested), apparent attrition and repetition from the 911 census (reversed so higher is better), and, for secundaria, the completion rate. Weights are Thurstone factor-score weights from a one-factor model fit to the pairwise correlation matrix. The index is standardized to mean zero and standard deviation one within each level.

Table 2. Outcome factor score: components, loadings and weights

Component	Factor loading	Score weight	Schools with component
Primaria			
PLANEA 2015 achievement	0.68	39.7%	45,918
PLANEA 2016 achievement	0.52	21.9%	46,043
PLANEA 2018 achievement	0.66	35.6%	49,256
Apparent attrition (reversed)	-0.02	0.0%	88,581
Repetition (reversed)	0.09	2.8%	90,251
Secundaria			
PLANEA 2015 achievement	0.59	19.3%	18,241
PLANEA 2016 achievement	0.51	14.7%	17,958
PLANEA 2017 achievement	0.74	34.0%	21,626
PLANEA 2019 achievement	0.66	23.2%	22,445
Apparent attrition (reversed)	0.11	2.6%	34,950
Repetition (reversed)	0.11	2.6%	36,363

Secondary completion	0.16	3.6%	34,460

Note: Public schools. The index requires at least one PLANEA year. Coverage: 48,860 primarias and 21,828 secundarias (54% and 60% of public schools); very small and untested schools are excluded.

Achievement measures load strongly on the common factor (0.52–0.74), while the 911 flow measures barely correlate with achievement (0.00–0.15) and receive about 3% of the weight each. In practice the index is a multi-year achievement composite; an equal-weight version correlates 0.91 with it. Because a school's results correlate only about 0.4 from one test year to the next, there is substantial noise in any single-year measure. Combining years improves reliability but also limits how much variance any set of need measures can explain.

2.2 Candidate need measures

Mexico has no school-level counts of students in poverty comparable to free or reduced-price lunch eligibility in the United States. The candidate need measures are therefore characteristics of the community a school serves: 30 locality-level Census 2020 indicators covering language and ethnicity, disability, adult and child education, labor force status, housing deprivation, household assets and household structure. They also include the CONEVAL social lag index and CONAPO marginalization index at the locality and municipal levels, CONEVAL municipal poverty rates, IMSS formal-sector wages and employment, and two school-type indicators (Indigenous education service and multigrade organization). A student-reported family resources measure from the 2015 PLANEA context questionnaire is also tested but is available for only about a third of schools. All measures are oriented so that higher values mean more need.

Table 3. Predictive validity of selected need measures (univariate)

Need measure (higher = more need)	Prim. std. β	Prim. R^2	Prim. incr. R^2	Sec. std. β	Sec. R^2	Sec. incr. R^2
Avg years schooling 15+ (reversed)	-0.30	0.089	0.059	-0.22	0.048	0.017
% population 0-14	-0.29	0.086	0.068	-0.25	0.062	0.029
Occupants per room	-0.29	0.083	0.073	-0.25	0.063	0.036
% 15-17 in school (reversed)	-0.28	0.081	0.059	-0.20	0.041	0.025
% dwellings no computer	-0.28	0.081	0.056	-0.22	0.048	0.017
% 15+ without lower secondary	-0.26	0.068	0.046	-0.18	0.031	0.011
CONAPO marginalization index (locality, reversed)	-0.26	0.067	0.057	-0.21	0.043	0.029
CONEVAL social lag index (locality)	-0.25	0.061	0.050	-0.20	0.038	0.027
% 8-14 cannot read/write	-0.21	0.042	0.028	-0.19	0.038	0.016
% Indigenous-language speakers 3+	-0.15	0.023	0.017	-0.16	0.027	0.019
Indigenous education service	-0.14	0.019	0.012	—	—	—
Rural locality (<2,500)	-0.18	0.032	0.005	-0.11	0.011	0.001
CONAPO marginalization (municipality, reversed)	-0.16	0.027	0.013	-0.17	0.028	0.009
CONEVAL social lag index (municipality)	-0.16	0.025	0.014	-0.16	0.025	0.012
% multidimensional poverty	-0.12	0.014	0.025	-0.08	0.006	0.012
% income below poverty line	-0.11	0.013	0.033	-0.07	0.005	0.017
Formal avg daily wage (reversed)	-0.06	0.004	0.000	-0.05	0.002	0.000
Student-reported family resources, PLANEA 2015 (reversed)†	-0.44	0.197	0.190	-0.37	0.139	0.151

Note: Enrollment-weighted regressions of the outcome index on each measure, common sample (47,315 primarias; 21,550 secundarias). Std. β = standardized coefficient. Incr. R^2 = increase in R^2 when the measure is added to a base model with state fixed effects and log enrollment (and its square). † Available for a subset of schools (about 48,000 primarias) and drawn from the same 2015 test administration that contributes to the index. The full table of 47 measures is in the companion workbook.

Three patterns stand out. First, the strongest community predictors describe the immediate locality: adult schooling, crowding, the young-age share of the population, teen school attendance and computer access each explain 8–9% of the variance in primaria outcomes on their own. Second, the official composite indices (CONAPO marginalization and CONEVAL social lag) perform only somewhat below these single indicators, because they combine stronger and weaker components. Third, municipal poverty rates, whether multidimensional or income-based, explain only 1–1.5% of the variance. Municipalities in Mexico are large and internally diverse, so municipal averages misclassify many schools. Formal-sector wages carry essentially no signal about school outcomes.

Student-reported family resources from PLANEA 2015 is the single strongest predictor (R^2 of 0.20 in primaria). Part of that strength is mechanical, because it comes from the same test sitting that contributes to the outcome index. Against later-year achievement only, its correlation (0.29) is still somewhat higher than that of adult schooling (0.23). Expanding the collection of student-level socioeconomic information would substantially improve Mexico's ability to identify need.

2.3 Multivariate risk models

Table 4 follows the structure of the Colorado and New Jersey risk models. Each model regresses the outcome index on a set of need measures, with state fixed effects and a quadratic in log enrollment, weighting schools by enrollment and clustering standard errors by municipality. Model 1 uses the individual locality measures. Model 2 substitutes the CONEVAL locality social lag index. Model 3 substitutes municipal multidimensional poverty. Model 4 uses the composite need index (risk_need) constructed from the forward-selection exercise described below.

Table 4. Regression models of the school outcome index on need measures

Measure	P: M1	P: M2	P: M3	P: M4	S: M1	S: M2	S: M3	S: M4
Avg. years schooling, adults 15+	-0.019				-0.071***			
	(0.019)				(0.020)			
Occupants per room	-0.466***				-0.400***			
	(0.070)				(0.072)			
% population aged 0–14	-0.017***				-0.012**			
	(0.004)				(0.004)			
% aged 15–17 attending school	0.008***				0.008***			
	(0.001)				(0.001)			
% aged 8–14 unable to read/write	-0.021***				-0.023***			
	(0.004)				(0.004)			
% dwellings without computer	-0.006**				-0.005**			
	(0.002)				(0.002)			
% Indigenous-language speakers	-0.001	0.001	-0.004***		-0.006***	-0.005***	-0.008***	
	(0.001)	(0.001)	(0.001)		(0.001)	(0.001)	(0.001)	
Indigenous education service	-0.186***	-0.197***	-0.310***					
	(0.040)	(0.041)	(0.041)					
Rural locality (<2,500)	0.191***				0.266***			
	(0.025)				(0.027)			
CONEVAL social lag index (locality)		-0.607***				-0.370***		
		(0.035)				(0.033)		
% multidimensional poverty (municipality)			-0.010***				-0.005***	
			(0.001)				(0.001)	

Composite need index (risk_need)				-0.325***				-0.249***
				(0.010)				(0.011)
R^2	**0.176**	**0.135**	**0.118**	**0.179**	**0.225**	**0.199**	**0.194**	**0.220**
R^2, base (state FE + size)	0.083	0.083	0.083	0.083	0.167	0.167	0.167	0.167
Schools	48,104	48,104	48,104	48,104	21,550	21,550	21,550	21,550

*Note: P = primaria, S = secundaria. Dependent variable: outcome factor score (SD units). Coefficients per unit of each measure (percentages in percentage points); standard errors clustered by municipality in parentheses. All models include state fixed effects and log enrollment and its square, weighted by enrollment. Indigenous education service is a primaria and preschool program and is omitted for secundaria. *** p<.001, ** p<.01, * p<.05. Model 4 is in-sample by construction because risk_need was fit to these data; it is shown as a summary of the composite.*

The individual locality measures (Model 1) raise explained variance from 0.083 to 0.176 for primaria and from 0.167 to 0.225 for secundaria. The CONEVAL social lag index (Model 2) recovers a little over half of that gain, and municipal poverty (Model 3) recovers less than 40%. Conditional on the other measures, crowding, the young-age share, child illiteracy, computer access and teen school attendance remain strong independent predictors, and Indigenous-language prevalence and Indigenous education service add risk beyond community deprivation. The positive coefficient on rural locality is a conditional effect: once deprivation is held constant, schools in small localities that are tested score somewhat higher, which partly reflects which rural schools take PLANEA.

2.4 Predicted outcomes at low and high need

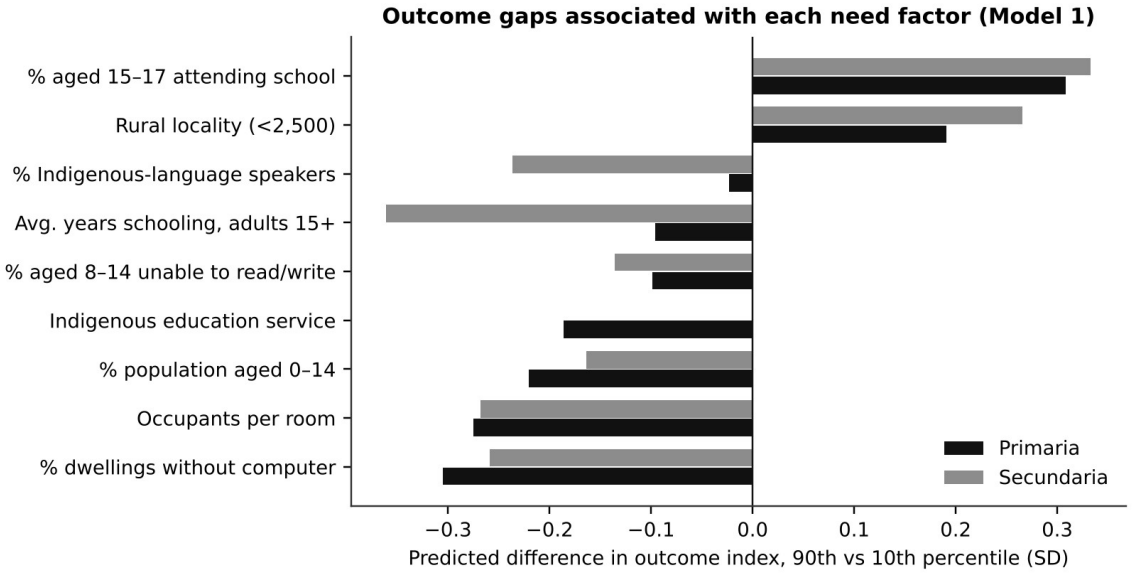
Table 5 and Figure 1 translate the models into the metric used in the Colorado study: the predicted difference in outcomes between schools at the 10th and 90th percentiles of each need measure, holding the other measures at their means.

Table 5. Predicted outcome differences between the 10th and 90th percentile of each need measure

Need measure	Primaria: p10 / p90 value	Primaria: outcome gap (SD)	Secundaria: p10 / p90 value	Secundaria: outcome gap (SD)
Avg. years schooling, adults 15+	6.2 / 11.4	-0.10	6.0 / 11.1	-0.36
Occupants per room	0.80 / 1.39	-0.28	0.81 / 1.48	-0.27
% population aged 0–14	20.0 / 33.3	-0.22	20.3 / 34.4	-0.16
% aged 15–17 attending school	48.1 / 85.7	+0.31	45.7 / 86.5	+0.33
% aged 8–14 unable to read/write	0.0 / 4.8	-0.10	0.0 / 5.9	-0.14
% dwellings without computer	44.8 / 97.4	-0.31	48.3 / 98.3	-0.26
% Indigenous-language speakers	0.0 / 22.6	-0.02	0.0 / 37.7	-0.24
Indigenous education service	0.00 / 1.00	-0.19	—	—
Rural locality (<2,500)	0.00 / 1.00	+0.19	0.00 / 1.00	+0.27
Composite need index (risk_need)	**-0.94 / 2.04**	**-0.97**	**-0.89 / 2.14**	**-0.75**

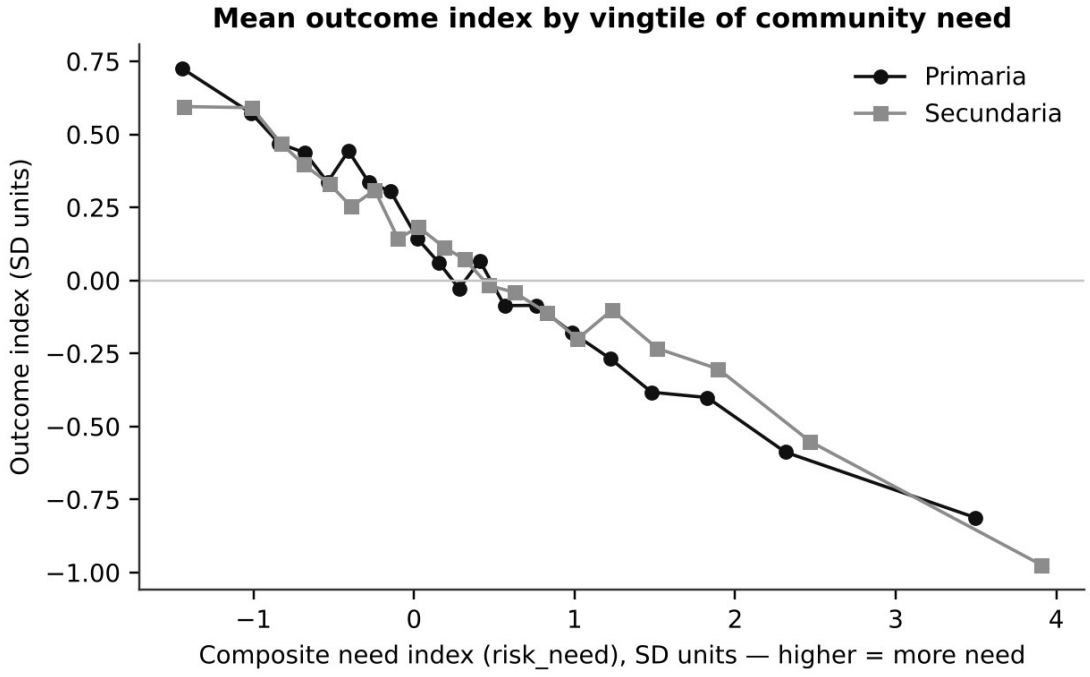
Note: From Model 1 (individual measures) and Model 4 (composite). For binary measures, values are 0 / 1. Outcome gaps are in standard deviations of the outcome index; negative values mean lower outcomes at higher need.

Figure 1. Outcome gaps associated with each need factor, 90th vs. 10th percentile (Model 1)



Taken one at a time and holding the others constant, the largest gaps are associated with computer access, crowding, teen school attendance and the young-age share, each about a quarter to a third of a standard deviation. Combined in the composite index, moving from the 10th to the 90th percentile of need is associated with outcomes 0.97 SD lower in primaria and 0.75 SD lower in secundaria. The relationship is close to linear across the full range of need (Figure 2).

Figure 2. Mean outcome index by vingtile of the composite need index



Note: Enrollment-weighted means within 20 equal-count bins of risk_need. Public schools with an outcome index.

2.5 The composite need index

To carry the risk results into the spending analysis, the candidate measures were combined into a single predicted need index, analogous to the Economic Disadvantage Index in the New Jersey study. Measures were added by forward selection, choosing at each step the measure that most improved 5-fold cross-validated R^2 (with folds defined by municipality, so that predictive performance is judged on communities not used in fitting). Selection stopped when the gain fell below 0.002. The primaria model retained nine measures (cross-validated R^2 0.137) and the secundaria model eight (0.108). The index is the negative of predicted outcomes, standardized so that higher values mean more need. The primaria model is applied to preschools as well as primarias. Before prediction, each input is bounded to the 0.5th–99.5th percentile of the estimation sample, so the index can be computed for virtually every public school, including those without test results.

The modest explained variance (about 14%) should be interpreted in context. School-level risk models in U.S. states, which use measured student poverty, typically explain considerably more. Here, need is measured only through community characteristics, outcomes are noisy, and the outcome sample omits many of the smallest and most remote schools. The index is therefore best understood as a conservative, community-based measure of need. Its use in the spending analysis is likely to understate rather than overstate differences in need between schools.

3. Spending Modeling

3.1 The spending measure

School-level spending is measured as FONE gross payroll at the school's work center during the calendar year in which the school year ends, divided by start-of-year enrollment. FONE pays the salaries of teachers, directors and support staff in Mexico's federally transferred ("federalizado") basic education system, so payroll at the school site is the most direct available measure of the resources each school receives. The analytic sample includes public preschools, primarias and secundarias with full-year FONE payroll in states whose payroll reports are complete for that year, and excludes school-years flagged as implausible (per-pupil payroll outliers or payroll staff counts inconsistent with the 911 census). The sample contains 627,124 school-years at 113,221 schools from 2019-20 through 2024-25. Pupil-weighted mean payroll per pupil is 19,867 pesos.

Three limitations shape interpretation. First, Mexico City is excluded because its schools are paid by the federal Autoridad Educativa Federal en la Ciudad de México rather than through FONE. Second, teachers in state-funded ("estatal") subsystems and CONAFE community instructors do not appear in FONE, so schools staffed largely by those systems are not represented. Third, the measure excludes non-payroll spending (materials, infrastructure, school-based programs such as La Escuela es Nuestra). Payroll accounts for the bulk of basic education spending in Mexico, but the results describe the distribution of FONE payroll specifically.

3.2 Descriptive patterns

Table 6. School characteristics by quintile of need, 2023-24 school year

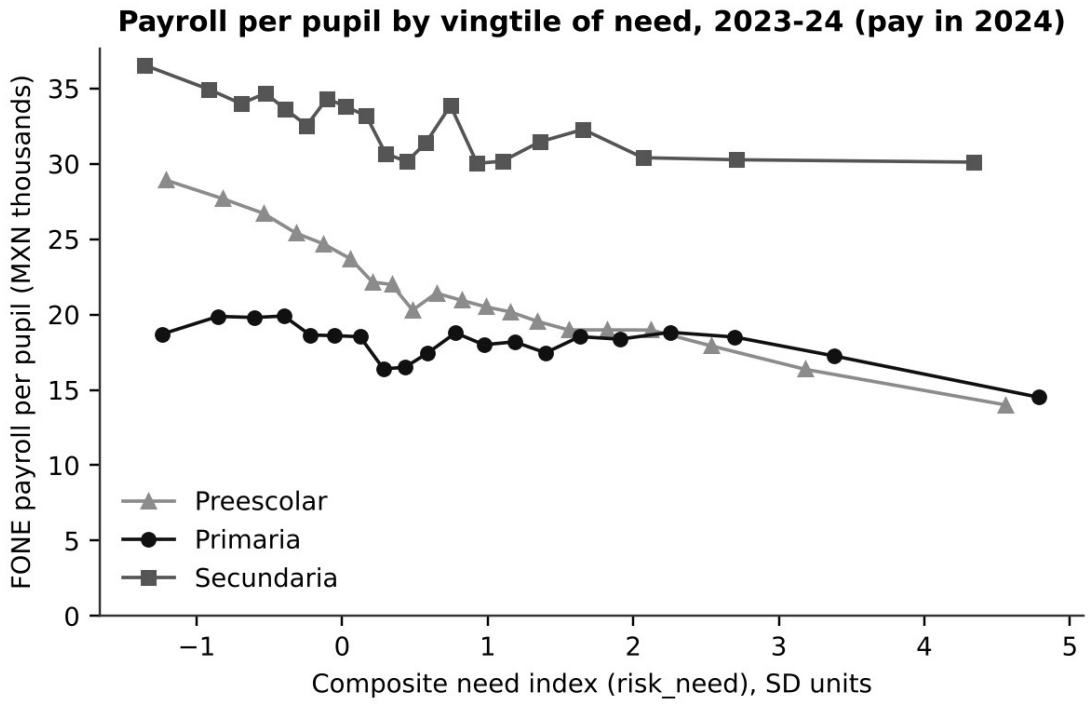
Need quintile	Mean need index	Payroll per pupil (MXN)	Payroll staff per 100 pupils	Pay per staff (MXN)	Mean enroll.	Pupils in schools <50	Pupils in rural localities	Km to city ≥50k	IMSS daily wage (MXN)
Q1 (lowest need)	-0.78	24,884	7.23	348,897	211	2%	8%	13	452
Q2	0.03	22,867	6.91	335,415	171	4%	16%	19	432

Q3	0.66	21,764	6.59	333,998	124	9%	31%	24	437
Q4	1.44	20,819	6.40	329,184	81	18%	56%	33	425
Q5 (highest need)	3.16	18,923	5.86	324,600	63	26%	80%	46	365

Note: Analytic sample, 2023-24 school year (calendar 2024 payroll). Quintiles contain equal numbers of schools; per-pupil and staffing figures are pupil-weighted.

Payroll per pupil falls steadily with need, from 24,884 pesos in the lowest-need quintile to 18,923 pesos in the highest, a difference of 24%. This happens even though higher-need schools are far smaller and more rural, conditions that would ordinarily raise per-pupil costs. The decline reflects both fewer payroll staff per pupil and lower average pay per staff member. Figure 3 shows the pattern by level. It is steepest in preschool, moderate in primaria and comparatively flat in secundaria.

Figure 3. FONE payroll per pupil by vingtile of need and level, 2023-24



Note: Pupil-weighted means within 20 equal-count bins of the composite need index.

3.3 Model specification

Following the framework's Step 1b specification, Spending = f(Needs, Context), as applied in the Colorado (AIR, 2024) and New Jersey (Baker, 2025) studies,, per-pupil payroll is regressed on the need index together with controls for cost factors that are not student need:

Spending per pupil(s,t) = f(Need(s), Level/Type(s), Size(s,t), Remoteness(s), Labor cost(m,t), Year(t), State(j))

- **Need:** the composite need index (risk_need). An alternative specification uses its component measures.
- **Level and type:** preschool, primaria and secundaria, with separate indicators for técnica secondaries and telesecundarias.
- **Size (economies of scale):** enrollment bands of under 20, 20–49, 50–99, 100–199, 200–399 and 400 or more pupils.

- **Remoteness:** great-circle distance from the school's locality to the nearest locality of 50,000 or more residents (bands under 10, 10–25, 25–50, 50–100 and 100 or more km), plus an indicator for rural localities (under 2,500 residents).
- **Labor cost:** the log of the average daily base wage of IMSS-insured jobs in the municipality. It serves as a comparable-wage proxy for the cost of hiring college-educated workers, in the spirit of the CWIFT used in U.S. studies.
- **Year and state fixed effects.** Year effects absorb nominal salary growth. State effects (Model 4) limit comparisons to schools within the same state, reflecting the fact that FONE positions and salary supplements are negotiated state by state.

Models are estimated by weighted least squares on the pooled school-year panel, weighting by enrollment so that results describe the resources available to the typical pupil. Standard errors are clustered by municipality. Each model is estimated in pesos (linear) and in logs. Progressiveness is summarized as the ratio of predicted payroll per pupil at the 90th percentile of the need index to that at the 10th percentile (pupil-weighted percentiles), with all other variables held at their means. A ratio above 1.0 indicates that higher-need schools receive more. Following the New Jersey study, the linear coefficient on need is also expressed as an implicit weight: the additional percentage of average per-pupil payroll associated with moving from low to high need.

3.4 Results

Table 7. Spending models: FONE payroll per pupil (MXN) on need and cost factors

	S1: Need, level, year	S2: + Size	S3: + Remoteness, labor cost	S4: + State FE
Composite need index (per SD)	-1,033***	-1,993***	-2,018***	-1,874***
Preschool (vs. primaria)	3,814***	-618***	-589***	-231
Secundaria (vs. primaria)	10,912***	15,255***	15,154***	14,760***
Técnica	2,400***	2,135***	2,155***	2,104***
Telesecundaria	5,570***	-2,194***	-2,099***	-2,664***
Enrollment < 20 (vs. 400+)		18,763***	18,493***	16,631***
Enrollment 20–49		12,372***	12,177***	10,879***
Enrollment 50–99		12,238***	12,079***	11,008***
Enrollment 100–199		9,254***	9,127***	8,425***
Enrollment 200–399		5,035***	4,907***	4,448***
Distance to city 10–25 km (vs. <10)			0	422*
Distance 25–50 km			288	641***
Distance 50–100 km			1,110***	889***
Distance 100+ km			2,401***	1,357**
Rural locality			-590***	-387**
Log IMSS municipal wage			-451	-420
Constant	12,813	7,373	9,909	11,183
Year fixed effects	Yes	Yes	Yes	Yes
State fixed effects	No	No	No	Yes
R^2	0.39	0.51	0.51	0.55
Predicted payroll per pupil, p10 need	21,186	22,413	22,445	22,261
Predicted payroll per pupil, p90 need	18,270	16,785	16,746	16,969
Ratio, p90 ÷ p10 (linear)	**0.86**	**0.75**	**0.75**	**0.76**
Ratio, p90 ÷ p10 (log model)	**0.85**	**0.76**	**0.75**	**0.77**
Implicit need weight, p10→p90	**-15%**	**-28%**	**-29%**	**-27%**

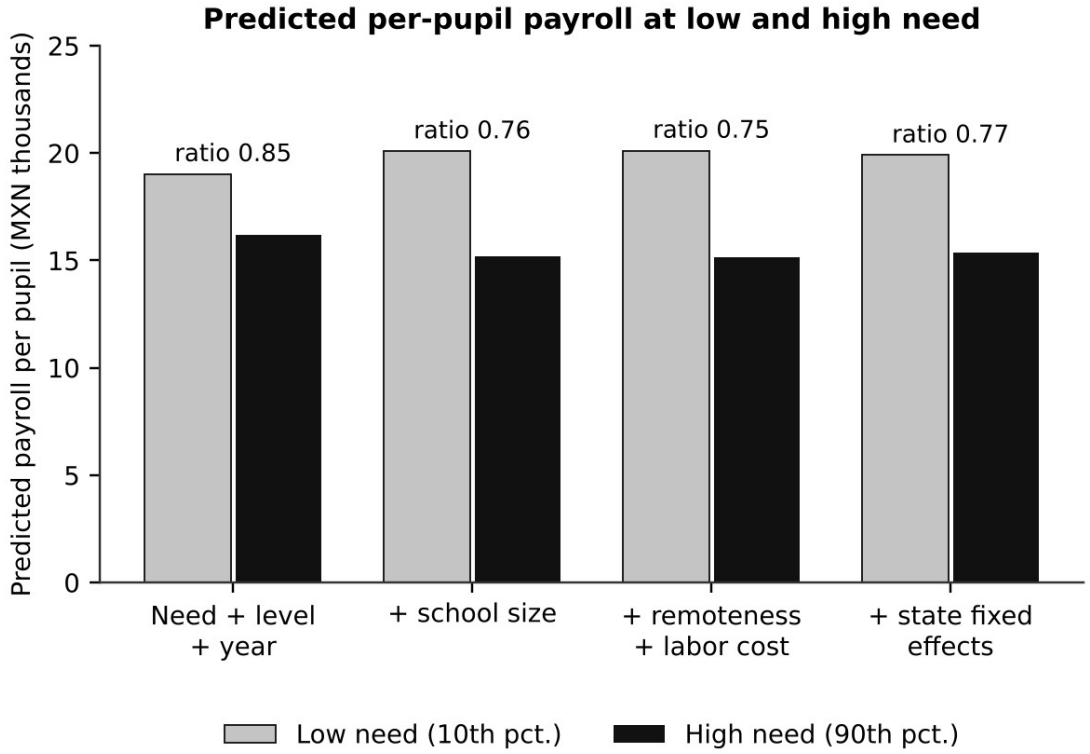
*Note: 627,124 school-years, 113,221 schools, 2019-20 to 2024-25; Mexico City not included (not paid through FONE). Enrollment-weighted least squares; standard errors clustered by municipality (*** p<.001, ** p<.01, * p<.05). Model S3 and S4 also include an indicator for municipalities with imputed wage. Predicted values hold other covariates at pupil-weighted means. Need percentiles are pupil-weighted (p10 = -0.93, p90 = 1.89). Implicit weight = coefficient × (p90 − p10) ÷ mean payroll per pupil (19,867 MXN).*

In Model S1, which accounts only for level and year, each standard deviation of need is associated with 1,033 fewer pesos per pupil. Schools at the 90th percentile of need receive 0.85 times the payroll per pupil of schools at the 10th percentile, an implicit need weight of -15%. This is the gross pattern a family or a policymaker would observe.

Adding school size (Model S2) roughly doubles the need coefficient. Small schools have much higher per-pupil payroll: about 16,600–18,800 pesos more per pupil for schools under 20 pupils than for schools of 400 or more, and about 11,000–12,000 pesos more for schools of 20–99 pupils. High-need schools are disproportionately small. The modest per-pupil advantage they would be expected to receive from their size alone is therefore largely what keeps the gross ratio as high as 0.85. Net of size, high-need schools receive about a quarter less (ratio 0.76; implicit weight -28%).

Remoteness and labor costs (Model S3) change the picture little. Schools 100 km or more from a city of 50,000 receive about 1,400–2,400 pesos more per pupil than schools near cities, a modest remoteness premium. The municipal wage level is negatively, not positively, associated with payroll per pupil. This suggests that FONE salaries, set on nationally negotiated schedules with limited geographic differentiation, do not compensate for local labor-market costs, and that higher-wage urban municipalities have larger schools and classes. Restricting comparisons to schools within the same state (Model S4) leaves the conclusion intact: the adjusted ratio is 0.77 and the implicit weight -27%.

Figure 4. Predicted payroll per pupil at the 10th and 90th percentiles of need, by model



Note: Log models; predicted values at pupil-weighted means of other covariates.

3.5 Need components and implicit weights

Table 8. Spending model with individual need measures (Model S4 controls)

Need measure	Coefficient (MXN)	SE	p10 / p90 value	MXN, p10→p90	Implicit weight
Avg. years schooling, adults 15+	244***	(70)	6.5 / 11.4	+1,203	+6%
Occupants per room	-1,229***	(346)	0.81 / 1.41	-737	-4%
% population aged 0–14	-283***	(23)	21.0 / 33.1	-3,418	-17%
% aged 15–17 attending school	29***	(4)	52.5 / 85.4	+940	+5%
% Indigenous-language speakers	7*	(3)	0.1 / 32.2	+224	+1%
Indigenous education service	-952***	(221)	0.00 / 1.00	-952	-5%

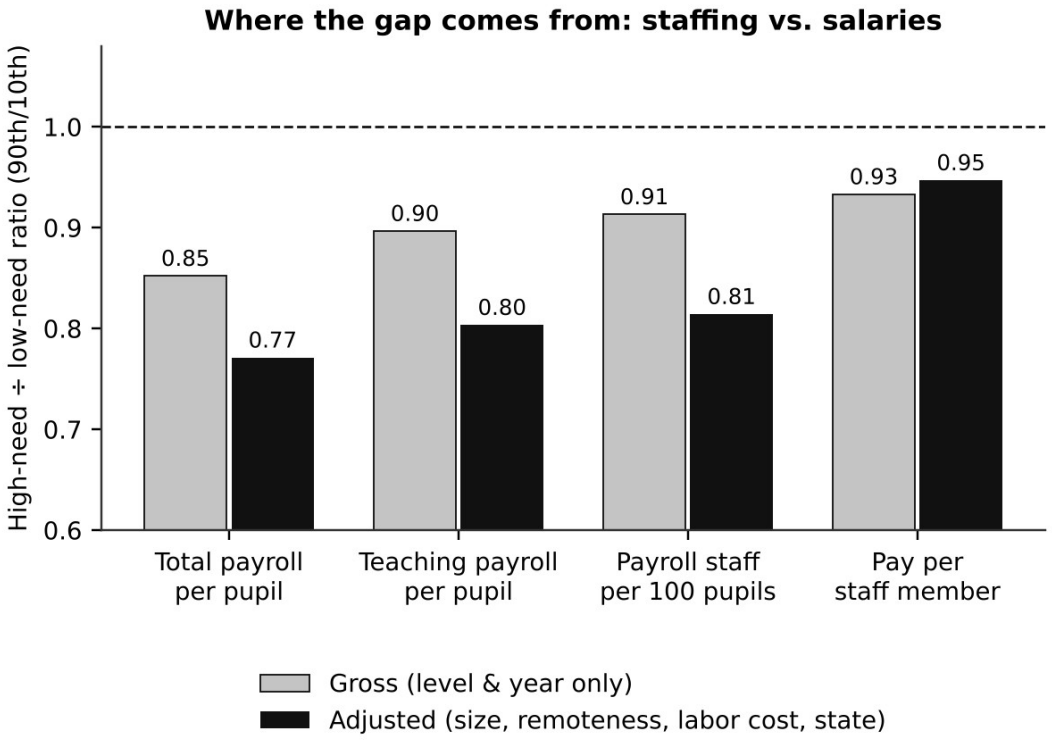
Note: Single model including all six measures plus the Model S4 controls (level/type, size, remoteness, labor cost, year and state fixed effects). For average schooling and teen attendance, the p90 value is lower need; a positive difference means more payroll in less-needy communities.

Breaking the composite into its components shows where targeting fails. Communities with more adult schooling and higher teen attendance (lower need) receive more payroll per pupil. Communities with more young children and more crowding (higher need) receive less, and Indigenous education service schools receive about 950 pesos per pupil less than otherwise similar schools. None of the components carries a positive implicit weight of more than about 1%, which is the case for the share of Indigenous-language speakers.

3.6 Staffing versus salaries

Because payroll per pupil is the product of payroll staff per pupil and average pay per staff member, the log models can be decomposed exactly. Figure 5 shows the ratio for each component. After adjustment, high-need schools have about 19% fewer payroll staff per pupil and about 5% lower pay per staff member. Teaching payroll alone shows a similar gap (0.80) to total payroll, so the pattern is not driven by administrative or support staff. Lower pay per staff member in high-need schools is consistent with less experienced teachers and teachers lower on the Carrera Magisterial / USICAMM salary progression. The larger part of the gap, however, is in the number of positions assigned per pupil.

Figure 5. Decomposition of the high-need/low-need payroll ratio



3.7 Variation by level, over time and across states

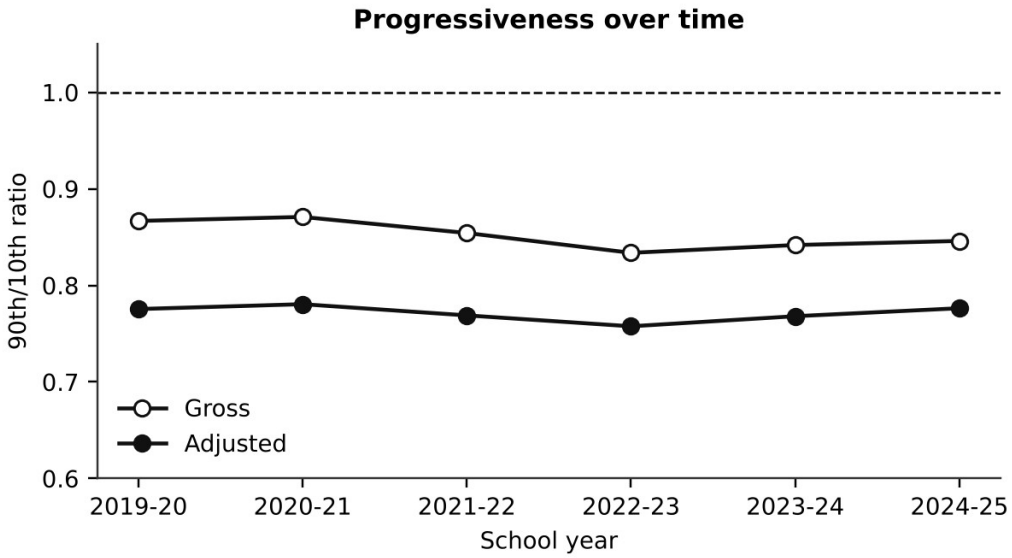
Table 9. Progressiveness ratios by level (90th ÷ 10th percentile of need)

Level	School-years	Gross (S1)	Adjusted (S4)
Preescolar	214,041	0.71	0.73
Primaria	325,725	0.91	0.79
Secundaria	87,358	0.83	0.76
All levels	**627,124**	**0.85**	**0.77**

Note: Log models estimated separately by level; national need percentiles. Gross = need, year (and secondary type) only; Adjusted = full Model S4 controls.

Preschool is the most regressive level, both gross and adjusted (0.71 and 0.73). Primaria looks nearly flat in gross terms (0.91), but only because high-need primarias are much smaller; adjusted for size and remoteness, its ratio is 0.79. Secundaria falls in between. Over time, the pattern is essentially unchanged from 2019-20 through 2024-25. The adjusted ratio ranges between 0.76 and 0.78 (Figure 6), with no sign that the post-2019 education reforms (the creation of USICAMM and the replacement of the Servicio Profesional Docente) have changed how payroll resources are distributed relative to need.

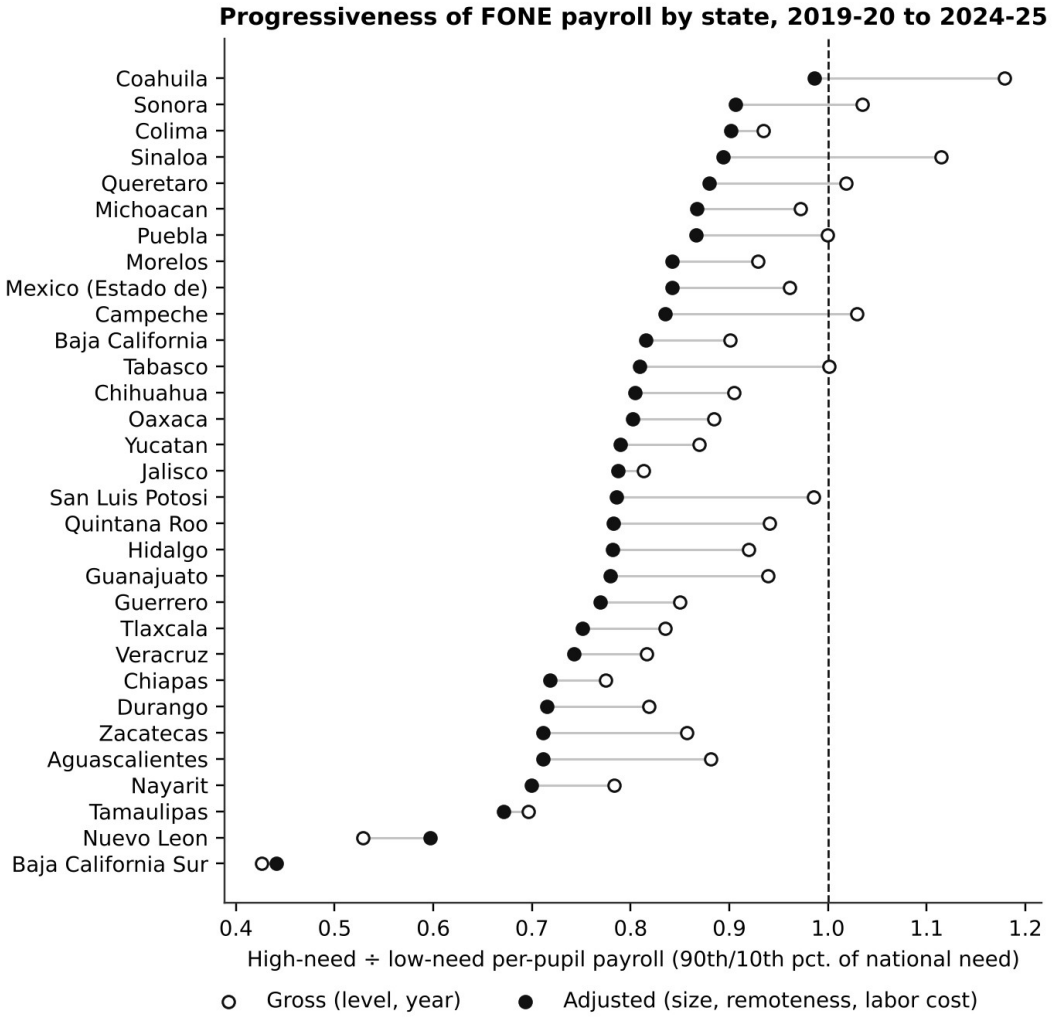
Figure 6. Progressiveness of FONE payroll over time



Note: Ratio of predicted payroll per pupil at the 90th vs. 10th percentile of need, from Model S1 (gross) and S4 (adjusted) with need-by-year interactions.

Figure 7 estimates a separate need slope for each state, measured against the same national 10th and 90th percentiles of need. In gross terms, 6 states show ratios at or above 1.0 (Coahuila, Sinaloa, Sonora, Campeche, Queretaro, Tabasco). In each case the apparent progressiveness disappears once size and remoteness are accounted for. Adjusted ratios range from 0.44 in Baja California Sur and 0.60 in Nuevo Leon to 0.99 in Coahuila. Among the states with the highest concentrations of need, Chiapas (0.72), Veracruz (0.74) and Guerrero (0.77) fall below the national adjusted ratio of 0.77, and Oaxaca (0.80) is close to it.

Figure 7. Progressiveness of FONE payroll by state, 2019-20 to 2024-25



Note: Model S4 (adjusted) and a state-FE model with level and year only (gross), each with need-by-state interactions; national need percentiles. Mexico City is not paid through FONE.

3.8 Robustness

- **Pupil weighting.** Weighting schools equally rather than by enrollment yields an adjusted ratio of 0.80, compared with 0.77 pupil-weighted.
- **Functional form.** Linear and log specifications give nearly identical ratios (Table 7).
- **Need measure.** Using individual community measures instead of the composite leads to the same conclusion (Table 8). So does substituting the CONEVAL locality social lag index, which is the strongest of the official composites.
- **Sample.** The spending sample is restricted to schools with complete FONE payroll. Coverage gaps (state-system teachers, CONAFE, and Mexico City) fall disproportionately on the very smallest rural schools and on urban schools in states with large estatal systems. The direction of any resulting bias is not obvious, but within the federally transferred system the result is consistent across levels, years, specifications and states.

4. Conclusions and Implications

The risk analysis identifies a coherent set of community characteristics that predict lower school outcomes in Mexico: low adult education, household crowding, a young population, low teen school attendance, lack of household technology, and Indigenous-language communities. These are measured best at the level of the locality, not the municipality. Municipal poverty rates, which are the measures most readily available for policy, are weak proxies for school-level need. A composite of locality measures provides a defensible, replicable basis for identifying need for every public school in the country.

The spending analysis shows that the largest stream of school-level resources, federal payroll through FONE, is not targeted to that need. It is modestly regressive in gross terms and clearly regressive once scale and remoteness are taken into account. Schools serving the highest-need communities receive about three-quarters of the payroll per pupil of otherwise similar low-need schools. The shortfall arises mainly because they have fewer positions per pupil, and secondarily because their staff are paid less. The pattern holds at every level, in every state and in every year from 2019-20 to 2024-25. The small-school and remoteness premiums in the system are real but are cost adjustments, not need adjustments. In the language of the framework, the system currently carries a negative implicit weight for student need.

For the next step, cost modeling, these results define the need factors to carry forward (the composite index or its components, along with Indigenous service), the structural cost factors to include (school size and remoteness), and a benchmark of current implicit weights against which estimated cost-based weights can be compared. Two data improvements would strengthen all three steps: school-level counts of students from low-income families (or regular collection of the PLANEA/SisAT family resources questionnaire), and integration of state-system and non-payroll spending so that total school resources can be observed.

Technical Notes

- Outcome index: one-factor model on the pairwise correlation matrix of standardized components (iterated principal-axis communalities). Score weights are Thurstone regression weights, with negative weights set to zero and normalized to sum to one. Schools must have at least one valid PLANEA year and at least half the total weight available.
- Risk models: enrollment-weighted least squares on the cross-section of public primarias and secundarias with an outcome index. Need measures are mostly 2020; outcomes span 2015–2023. Standard errors clustered by municipality.
- Composite need index: forward selection on 5-fold cross-validated R^2 (folds by municipality), stopping when the gain falls below 0.002. The index equals minus the predicted outcome, standardized to an enrollment-weighted mean of 0 and SD of 1 in the estimation sample. Inputs are bounded to the 0.5th–99.5th percentile of the estimation sample when the index is applied to all schools.
- Spending sample: public schools, levels preescolar/primaria/secundaria, full-year FONE payroll in calendar year sy_start+1, state payroll reports complete for all four quarters, enrollment > 0, and per-pupil payroll not flagged as an outlier or as inconsistent with 911 staffing. Missing municipal IMSS wages (municipalities with no registered employer) are imputed with the state-year median and flagged.
- Remoteness: great-circle distance from the INEGI coordinates of the school's locality to the nearest locality with 50,000 or more residents in the 2020 Census (232 localities).

- All variables, including oi_index and risk_need, are in the accompanying Stata panels (mx_school_panel.dta, mx_fone_panel.dta) with full definitions stored as variable notes.

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