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Price Sensitivity Without Income Elasticity: Evidence from a Progressive Block Tariff Economy

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Abstract

This study investigates household electricity price sensitivity and the contributory factors of residential electricity demand in Sri Lanka, a developing economy operating a seven-block progressive increasing block tariff with a 17-fold marginal rate differential. A nationally stratified survey of 435 households across all 25 administrative districts employs a 14-item Likert-scale instrument across four construct groups, economic variables, demographic and structural characteristics, climatic conditions, and technological dependence. Each respondent is classified into their actual CEB tariff block, enabling pricing response perceptions to be interpreted against the marginal rates each household faces, with implications for tariff design and utility revenue management.

1. INTRODUCTION

Understanding how households perceive and respond to electricity pricing signals is a critical but underexplored dimension of revenue and pricing management in regulated utilities. While the pricing management literature has advanced in dynamic pricing and consumer price sensitivity [30], empirical evidence from developing economies operating progressive block tariffs remains sparse — a significant gap given that progressive increasing block tariffs are the dominant residential pricing structure across South Asia, Sub-Saharan Africa, and Latin America, embedding fundamentally different consumer incentive structures than market-driven pricing environments [27, 31].

Sri Lanka presents a particularly instructive case. A regulated progressive block tariff spanning seven blocks with a 17-fold marginal rate differential (LKR 5.00 to LKR 85.00 per kWh) creates sharply differentiated consumer incentives across the consumption distribution. Supply-side dynamics compound the revenue management challenge: regulated tariffs diverge from the social marginal cost of supply under renewable surplus conditions [3], and interactions between solar generation, battery storage, and demand-side behaviour critically determine cost recovery outcomes [9, 10, 11, 12, 13]. The 2022–2023 economic crisis — during which a 66% tariff increase triggered mass consumption reduction and over one million household disconnections [21, 24] provided a natural experiment in price response that billing data has only partially explained [23]. Household-level perceptual and behavioural parameters remain unmeasured at national scale.

This study addresses that gap through a 14-item Likert-scale instrument administered to n = 435 households across all 25 districts of Sri Lanka, stratified proportionally to the 2024 national census [14, 15], with each respondent embedded within their actual CEB tariff block [2, 5]. It makes three contributions to the revenue and pricing management literature: first, the first nationally representative perceptual evidence on household electricity price sensitivity in Sri Lanka; second, a suite of composite pricing indices PPSI, WTR, Consumption Lock-in Score, Tariff Burden Ratio, and SCI distinguishing price awareness from behavioural response capacity; and third, empirical demonstration of a tariff-induced income elasticity ceiling effect with direct implications for utility revenue modelling under progressive tariff designs [28, 30].

2. LITERATURE REVIEW

2.1 Household Electricity Demand and Price Response in Sri Lanka

Sri Lanka's electricity demand literature is grounded in econometric time-series analysis, establishing that aggregate demand is income-driven but price inelastic, with long-run income elasticities of 1.0 to 2.0 and near-zero price elasticities [16, 17]. Household size, income level, and appliance access have been consistently identified as the primary structural determinants of consumption [18, 19], while temperature, GDP, and demographic change are the dominant forecasting inputs [20]. The 2022 to 2023 economic crisis provided a rare natural experiment in household price response: following a 66% tariff increase in February 2023, approximately 600,000 consumers actively shifted to lower consumption bands and disconnections increased fourfold [21]. Subsequent tariff reductions in 2024 produced a measurable rebound [22], confirming a strong bidirectional price-consumption relationship that aggregate billing data captures but perceptual evidence has not yet explained at national scale.

2.2 Price Sensitivity, Block Tariffs, and Consumer Behaviour

A critical distinction in the pricing literature concerns whether consumers respond to marginal or average prices. Ito [4] demonstrates that most residential consumers respond to average rather than marginal rates, which fundamentally shapes how progressive block tariff signals are perceived and acted upon. Meta-analyses confirm short-run price elasticities ranging from negative 0.1 to negative 0.4 and long-run elasticities from negative 0.3 to negative 0.9 [1], with Sri Lanka-specific estimates placing price elasticity at negative 0.015 and income elasticity at 0.046 [25]. Survey-based evidence confirms that time preferences, risk preferences, and social desirability bias further moderate price sensitivity perceptions beyond what econometric estimates capture [26]. Progressive increasing block tariffs are widely adopted across developing economies as social pricing instruments but frequently fail to reach the poorest households because consumption level is a weak proxy for income [27]. Behavioural economics further demonstrates that consumer electricity decisions are shaped by cognitive biases, reference points, and bill salience rather than rational marginal cost calculations [8]. Yeoman [30] identifies price sensitivity as a critical research frontier in pricing management, noting that economic conditions, consumer demographics, and psychological influences jointly shape consumer pricing response, precisely the framework this study operationalises in a regulated electricity context.

2.3 Demographic, Climatic, and Technological Moderators

Household size, dwelling size, appliance stock, and income are consistently identified as the dominant structural determinants of electricity consumption [7, 32]. Lifestyle factors including time spent at home, entertainment habits, and appliance usage patterns independently explain a significant portion of residential consumption variance beyond income and dwelling size alone [6]. Structurally locked-in households exhibit lower behavioural elasticity even when price sensitivity perceptions are high [29], a finding directly relevant to the constraint paradox developed in this study. Urban-rural differentials in both consumption levels and price responsiveness are well documented across developing economy contexts [33]. Temperature is the most important seasonal driver of consumption in tropical contexts through cooling loads [32], and the progressive electrification of previously non-electric household activities is a documented long-run demand growth mechanism [34].

2.4 Identified Gaps and Study Rationale

Three clear gaps justify the present study. First, no study has measured household price sensitivity and demand driver perceptions using a perceptual survey instrument at national scale across all 25 districts of Sri Lanka, despite well-established econometric evidence [16, 17, 25]. Second, no existing study integrates respondent-level tariff block classification with pricing response perceptions to test whether perceived price sensitivity is structurally grounded in the actual tariff rates each household faces, an approach motivated by Ito's [4] finding

that block tariff response depends critically on which price signal consumers perceive. Third, the asymmetry between strong downward price sensitivity and neutral upward income elasticity has not been theorised as a tariff-induced ceiling effect in the Sri Lankan or broader developing economy pricing literature, representing the primary contribution of this study to the revenue and pricing management field.

3. METHODOLOGY

3.1 Research Design

This study adopts a quantitative cross-sectional survey design to examine household electricity price sensitivity as depicted in Fig. 1.

3.2 Instrument Design

A structured self-administered questionnaire was employed as the primary data collection instrument. Each item was rated on a five-point Likert scale from Strongly Disagree (1) to Strongly Agree (5), with 3 as the neutral mid-point [39]. The instrument was designed for broad accessibility, enabling participation without requiring technical or economic literacy. Items were grouped under four hypothesised constructs: H1: Economic variables (Q1–Q4) as the primary pricing response construct [16, 25]; H2: Demographic and structural characteristics (Q5–Q8) as structural moderators [32, 33]; H3: Climatic conditions (Q9–Q10) as climatic moderators [20, 34]; and H4: Technological dependence and appliance intensity (Q11–Q14) as technological moderators [35, 36]. Overall internal consistency was excellent (Cronbach's α = 0.911), confirming the instrument's reliability across all four construct groups.

3.3 Sample Size Determination

The minimum required sample size was determined using Cochran's (1977) [15] formula for proportions, appropriate for large populations where the population proportion is unknown:

$$n_0 = \frac{Z^2 \cdot p \cdot q}{e^2}$$

Where Z = 1.96 is the critical value at the 95% confidence, p = q = 0.5 represents maximum variability under unknown population proportion, and e = 0.05 is the margin of error at 5%. Substituting these values yields a minimum required sample of n = 385. To improve precision and account for potential non-response, the target sample was set at n = 400, providing a margin of error of ± 4.9% at the 95% confidence level.

3.4 Stratified Proportional Sampling

A proportional stratified random sampling design was adopted across Sri Lanka's 25 administrative districts as strata [36], with sample allocation following Bowley's [14] proportional formula as shown in Eq. 1 Where n_h is the number of respondents allocated to district h, N_h is the district population.

$$n_h = \frac{N_h}{N} \times n \qquad (1)$$

Thus, depicted in Fig. 2 are the district wise samples collected adapting the above method.

3.5 Data Collection

A hybrid data collection strategy was employed from October 2025 to June 2026, combining online questionnaires via Google Forms with in-person field surveys conducted by trained enumerators in rural, estate, and northern districts with lower online penetration. The questionnaire was available in both Sinhala and English, with all participation voluntary and responses anonymised. The final sample of 435 respondents comprised 54.0% rural, 44.1% urban, and 1.8% estate sector respondents, reflecting the full geographic and sectoral diversity of Sri Lanka's household population.

3.6 Tariff Context

The CEB domestic tariff schedule approved by the PUCSL, effective 1 April 2026, is incorporated to contextualise pricing response perceptions. The CEB operates a progressive increasing block tariff (IBT) [27, 31] detailed in Table 1.

Table 1
CEB Domestic Tariff Structure

Category	Block	Consumption Range	Energy Rate (LKR/kWh)	Fixed Charge (LKR/month)
A -Low consumption (≤ 60 kWh/month)	Block 1	0–30 kWh	5.00	80
	Block 2	31–60 kWh	9.00	210
B -Higher consumption (> 60 kWh/month)	Block 1	0–60 kWh	14.00	—
	Block 2	61–90 kWh	20.00	400
	Block 3	91–120 kWh	28.00	1,000
	Block 4	121–180 kWh	44.00	1,500
	Block 5	> 180 kWh	85.00	2,100

3.7 Linking Survey Data to the CEB Tariff Block Structure

Each respondent was classified into their corresponding CEB tariff block based on reported monthly bill, using total bill boundary thresholds inclusive of energy and fixed charges [25]. This embeds each respondent within their actual pricing structure, enabling Q2 to be mapped to marginal rate escalation, Q3 to bill shock at the 60–61 kWh boundary [21], Q4 to upper-block financial burden [22], and Q1 to the progressive ceiling effect [27], extending the price sensitivity research agenda identified by Yeoman [30] to a regulated utility context.

3.8 Analytical Framework

Data analysis proceeded in seven sequential stages as depicted in Table 2.

Table 2
Analytical Framework

Analysis	Method	Purpose
Descriptive statistics	Mean, SD, median, skewness, kurtosis [37]	Characterise response distributions
Normality testing	Shapiro–Wilk test [38]	Justify non-parametric inference
Hypothesis testing	One-sample t-test [39]; Cohen's d [40]; 95% CI	Test deviation from neutral mid-point ($\mu_0 = 3.0$)
Group comparisons	Mann–Whitney U [41]; Kruskal–Wallis H [42]	Compare across urban/rural, income, household size, tariff block
Correlation analysis	Spearman's rank-order correlation [43]	Assess inter-item relationships; confirm no multicollinearity
Constructed pricing measures	PPSI (Q2 + Q3+Q4); WTR (Q2 + Q4); Lock-in (Q11–Q13); Tariff Burden; SCI	Quantify price sensitivity, response capacity, structural constraint
Tariff block integration	All measures by block, income, sector, household size [21]	Link perceptions to actual marginal rates

4. RESULTS

4.1 Sample Profile and Tariff Block Distribution

The achieved sample of n = 435 across all 25 districts exceeded the Cochran [15] minimum of 385, yielding a margin of error of ± 4.7% at the 95% confidence level. The sample comprised 54.0% rural, 44.1% urban, and 1.8% estate sector respondents, with 71.8% reporting monthly household income above LKR 100,000 and 58.9% in 3–4 member households. The largest tariff block group was Category B Block 1 (32.4%, n = 141), with upper-block respondents in Category B Blocks 4 and 5 each comprising 4.8% (n = 21). Full tariff block distributions are presented in Tables 3.

Table 3
Respondent Distribution Across CEB Domestic Tariff Blocks

Tariff Block	n	%	Marginal Rate	Bill Range (LKR)
Cat A - Block 1	5	1.1%	LKR 5.00/kWh	≤ 230
Cat A - Block 2	110	25.3%	LKR 9.00/kWh	231–630
Cat B - Block 1	141	32.4%	LKR 14.00/kWh	631–1,259
Cat B - Block 2	46	10.6%	LKR 20.00/kWh	1,260–1,840
Cat B - Block 3	84	19.3%	LKR 28.00/kWh	1,841–3,280
Cat B - Block 4	21	4.8%	LKR 44.00/kWh	3,281–6,420
Cat B - Block 5	21	4.8%	LKR 85.00/kWh	> 6,420
Total	**435**	**100%**		

4.2 Internal Consistency

Internal consistency was assessed using Cronbach's alpha [40]. The overall 14-item instrument achieved excellent reliability (α = 0.911). At the construct level, Technological Dependence was good (α = 0.847), Demographic and Structural acceptable (α = 0.772), and Economic Variables and Climatic Conditions questionable (α = 0.661 and 0.632 respectively), reflecting small item counts rather than genuine inconsistency.

4.3 Normality Testing

Non-normality was confirmed for all 14 items via Shapiro-Wilk testing (W range: 0.553–0.851, all $p < .001$) [38], consistent with the response concentration patterns typical of household pricing perception instruments. Non-parametric inference was employed for all subsequent group comparisons.

4.4 Descriptive Statistics and One-Sample t-Tests

Thirteen of 14 items departed significantly from the neutral mid-point, confirming strong household responsiveness to the pricing signals embedded in Sri Lanka's progressive block tariff structure. Q2 (Price elasticity) and Q4 (Crisis elasticity) dominated the instrument with large effect sizes and 87.4% agreement each, confirming that downward price sensitivity is the primary behavioural lever available to utility revenue and demand managers in this market. Q1 (Income elasticity) was the sole exception and constitutes the study's central revenue management contribution, examined in Section 4.7.

Table 4
Descriptive Statistics and One-Sample t-Test Results

Q	Factor	Group	Mean	SD	t	p	d	Effect	SA + A%
Q1	Income elasticity	Economic	2.96	0.89	−0.976	.330	−0.047	Negligible	31.1%
Q2	Price elasticity	Economic	3.93	0.43	44.683	< .001***	2.160	Large	87.4%
Q3	Bill awareness	Economic	3.42	0.60	14.547	< .001***	0.703	Medium	39.7%
Q4	Crisis elasticity	Economic	3.91	0.40	46.625	< .001***	2.254	Large	87.4%
Q5	Household size	Demographic	3.81	0.50	33.402	< .001***	1.615	Large	78.5%
Q6	House size	Demographic	3.71	0.55	26.777	< .001***	1.294	Large	67.5%
Q7	Modern lifestyle	Demographic	3.64	0.63	21.109	< .001***	1.020	Large	62.4%
Q8	Demand growth trend	Demographic	3.63	0.59	21.943	< .001***	1.061	Large	59.8%
Q9	Temperature sensitivity	Climatic	3.56	0.66	17.542	< .001***	0.848	Large	50.7%
Q10	Seasonal lighting	Climatic	3.20	0.56	7.261	< .001***	0.351	Small	23.1%
Q11	Appliance dependence	Technological	3.17	0.73	4.904	< .001***	0.237	Small	29.7%
Q12	Energy transition	Technological	3.61	0.60	20.883	< .001***	1.009	Large	58.4%
Q13	Demand intensity	Technological	3.35	0.74	9.806	< .001***	0.474	Small	45.3%
Q14	Efficiency offset	Technological	3.60	0.57	22.059	< .001***	1.066	Large	57.7%

4.5 Urban–Rural Differences

Urban respondents scored significantly higher than rural respondents across 13 of 14 items, with the largest pricing response differentials observed for Q9 (Temperature sensitivity, r = -0.507) and Q1 (Income elasticity), confirming that income-consumption linkages and cooling-driven demand are concentrated in appliance-intensive urban households, a finding with direct implications for sector-differentiated tariff and demand management strategy. Q4 (Crisis elasticity) showed the smallest urban-rural gap, confirming that financial hardship-driven consumption reduction is a cross-sector behavioural response uniform across the tariff distribution.

4.6 Kruskal–Wallis Tests by Income Group, Household Size, and Tariff Block

Kruskal-Wallis tests returned significant results for all 14 items across income groups (all p < .001), with mean scores increasing monotonically with income across all items except Q1, where the Rs.50k-100k group returned the lowest observed mean in the study (M = 2.41) against M = 3.56 in the above Rs.200k group, a first signal of the tariff-induced ceiling effect with direct implications for block-differentiated revenue modelling. Across the seven CEB tariff blocks, all 14 items returned significant variation (all p < .001), with pricing response scores rising systematically from lower to upper blocks. Table 5 presents the economic construct items by tariff block, revealing the divergent trajectory between Q1 and Q2-Q4 that constitutes the study's core revenue management finding.

Table 5
Economic Construct Items (Q1–Q4) by CEB Tariff Block

Q	Factor	H	p	A-B1	A-B2	B-B1	B-B2	B-B3	B-B4	B-B5
Q1	Income elasticity	177.782	< .001***	2.40	2.32	2.68	3.20	3.74	3.81	3.81
Q2	Price elasticity	79.418	< .001***	3.40	3.69	3.92	4.00	4.06	4.29	4.29
Q3	Bill awareness	116.786	< .001***	3.00	3.08	3.30	3.48	3.80	3.95	3.95
Q4	Crisis elasticity	26.433	< .001***	3.60	3.77	3.92	3.93	3.98	4.10	4.10

Note. A-B1 to A-B2 = Category A Blocks 1–2; B-B1 to B-B5 = Category B Blocks 1–5. Marginal rates range from LKR 5/kWh (A-B1) to LKR 85/kWh (B-B5). All p < .001

As illustrated in Fig. 3, Q2, Q3, and Q4 remain consistently above the neutral mid-point across all blocks while Q1 begins well below neutral in Category A blocks (M = 2.32–2.40), crosses neutral between B-B1 and B-B2, and reaches agreement only in the upper blocks (M = 3.74–3.81) confirming that income elasticity is tariff-suppressed rather than genuinely absent, with the 100% bill shock at the 60–61 kWh boundary the primary structural mechanism.

4.7 The Q1 Income Elasticity Asymmetry and Tariff-Induced Ceiling Effect

The most significant revenue management finding is the asymmetry between income elasticity (Q1) and price elasticity (Q2). While Q2 achieved M = 3.93 (d = 2.160), Q1 was the sole non-significant item (M = 2.96, p = .330, d = -0.047), directly challenging the income-elastic demand growth assumptions that underpin conventional utility revenue forecasting.

Tariff block disaggregation reveals why. Q1 transitions from strong disagreement in lower Category A blocks (M = 2.32–2.40) to agreement in upper Category B blocks (M = 3.74–3.81), as shown in Table 6. For the 68% of households below the LKR 20/kWh boundary, the 100% bill shock at the 60–61 kWh threshold structurally suppresses income-driven demand growth irrespective of income level — making tariff structure rather than household preference the binding constraint on revenue growth in the lower and middle blocks.

Table 6
Q1 Income Elasticity Mean Score by Tariff Block

Tariff Block	Marginal Rate	Q1 Mean	Direction
Cat A - Block 1	LKR 5/kWh	2.40	DISAGREE
Cat A - Block 2	LKR 9/kWh	2.32	DISAGREE
Cat B - Block 1	LKR 14/kWh	2.68	DISAGREE
Cat B - Block 2	LKR 20/kWh	3.20	NEUTRAL
Cat B - Block 3	LKR 28/kWh	3.74	AGREE
Cat B - Block 4	LKR 44/kWh	3.81	AGREE
Cat B - Block 5	LKR 85/kWh	3.81	AGREE

4.8 Spearman Inter-Item Correlation Matrix

All inter-item Spearman correlations were positive (ρ = 0.143–0.665), confirming absence of multicollinearity as depicted inFigure 4. Q1 showed the highest cross-construct correlations with appliance dependence (Q11, ρ = 0.594), demand intensity (Q13, ρ = 0.586), and temperature sensitivity (Q9, ρ = 0.580), confirming it functions as a marker of high-consumption household profile rather than a pricing response indicator, with implications for income elasticity interpretation in utility demand segmentation. The strongest within-construct correlations were in the Technological group (Q13–Q14, ρ = 0.665), reflecting appliance intensity as a coherent structural consumption driver.

4.9 Construct Composite Scores and Inter-Construct Correlations

The Demographic and Structural construct returned the highest composite mean (M = 3.696), followed by Economic (M = 3.554), Technological (M = 3.434), and Climatic (M = 3.376), with an overall instrument composite of M = 3.535. Inter-construct correlations were all positive and significant (all ρ > 0.620, p < .001), with the Technological construct most strongly correlated with the overall scale score (ρ = 0.924), confirming that appliance dependence and energy transition are the most globally representative dimensions of household electricity demand perception in Sri Lanka.

4.10 Constructed Pricing Measures

Five composite pricing measures were constructed to support demand segmentation and revenue management analysis, summarised in Table 7. The Perceived Price Sensitivity Index (PPSI) achieved M = 3.753, confirming strong aggregate price sensitivity. The Willingness to Reduce Score (WTR) was marginally higher at M = 3.918. The Consumption Lock-in Score (M = 3.378) quantifies structural appliance constraint, and the Tariff Burden Ratio averaged 1.0% of income but ranged to 12.8%. The Structural Constraint Index (SCI) averaged 0.865 meaning structural lock-in absorbs 87% of behavioural willingness to reduce, quantifying the limit of price-only demand management strategies.

Table 7
Constructed Pricing Measures

Measure	Components	Mean	SD
PPSI	Q2 + Q3 + Q4 (÷ 3)	3.753	0.372
WTR	Q2 + Q4 (÷ 2)	3.918	0.364
Lock-in Score	Q11 + Q12 + Q13 (÷ 3)	3.378	0.593
Tariff Burden	Bill / Income midpoint	0.010	0.013
SCI	Lock-in ÷ WTR	0.865	0.145

4.11 Constructed Pricing Measures by Tariff Block

Table 8 presents PPSI, WTR, Lock-in, Tariff Burden, and SCI disaggregated by tariff block. PPSI rose monotonically from 3.333 in Category A Block 1 to 4.111 in Category B Blocks 4 and 5, while SCI escalated from 0.761 to 0.990, indicating that price sensitivity intensifies with tariff exposure while behavioural margin simultaneously narrows. At B-B5, households facing LKR 85/kWh carry a 5.3% tariff burden and an SCI of 0.990, meaning structural lock-in absorbs virtually all willingness to reduce. Urban respondents recorded higher PPSI (3.882 vs 3.652), lock-in (3.653 vs 3.156), and tariff burden (1.4% vs 0.8%) than rural respondents ($p < .001$), confirming the constraint paradox is most pronounced in urban upper-block households.

Table 8
Constructed Pricing Measures by CEB Tariff Block

Block	n	PPSI	WTR	Lock-in	Burden%	SCI
Cat A - Block 1 (LKR 5/kWh)	5	3.333	3.500	3.267	0.3%	0.938
Cat A - Block 2 (LKR 9/kWh)	110	3.515	3.732	2.800	0.5%	0.761
Cat B - Block 1 (LKR 14/kWh)	141	3.716	3.922	3.262	0.7%	0.835
Cat B - Block 2 (LKR 20/kWh)	46	3.804	3.967	3.609	0.8%	0.912
Cat B - Block 3 (LKR 28/kWh)	84	3.944	4.018	3.837	1.2%	0.960
Cat B - Block 4 (LKR 44/kWh)	21	4.111	4.190	4.111	2.1%	0.981
Cat B - Block 5 (LKR 85/kWh)	21	4.111	4.190	4.127	5.3%	0.990

Figure 5. Left: Perceived Price Sensitivity Index (PPSI) by CEB tariff block. Right: Tariff Burden Ratio by income group U-shaped pattern with highest burden at the lowest (1.7%) and highest (1.5%) income extremes. Dashed line = neutral mid-point (3.0).

4.12 Spearman Correlations Among Constructed Measures

Two relationships are of particular theoretical importance. Tariff Burden was positively correlated with PPSI ($\rho = 0.434$, $p < .001$), confirming that households with greater financial exposure to the tariff report stronger perceived price sensitivity — consistent with billing-data evidence from PUCSL (2025) and CEPA (2025). The Lock-in Score was positively correlated with WTR ($\rho = 0.345$, $p < .001$), formalising the constraint paradox: households most dependent on appliances are simultaneously most motivated to reduce consumption yet structurally least able to do so, as evidenced by the negative SCI–WTR correlation ($\rho = -0.178$).

4.13 Hypothesis Testing Summary

Table 11 summarises the four hypothesis outcomes. H1 was partially supported, Q1 non-significance is interpreted as a tariff-induced ceiling effect rather than an absence of income elasticity. H2, H3, and H4 were fully supported.

Table 11
Hypothesis Testing Summary

Hypothesis	Construct	Composite Mean	α	Outcome
H1	Economic Variables	3.554	0.661	Partially Supported Q1 ns; Q2, Q3, Q4 p < .001
H2	Demographic & Structural	3.696	0.772	Fully Supported, all four items p < .001
H3	Climatic Conditions	3.376	0.632	Fully Supported, both items p < .001
H4	Technological Dependence	3.434	0.847	Fully Supported, all four items p < .001

5. DISCUSSION

5.1 Price Sensitivity Without Income Elasticity

The central finding is the structural asymmetry between price sensitivity and income elasticity. Q2 (Price elasticity) and Q4 (Crisis elasticity) produced the two strongest results in the instrument (d > 2.0, 87.4% agreement each), while Q1 (Income elasticity) was the sole non-significant item (M = 2.96, p = .330). This asymmetry does not indicate that income is irrelevant to consumption tariff block disaggregation reveals that Q1 transitions from strongly negative in lower blocks (M = 2.32–2.40) to positive in upper blocks (M = 3.74–3.81), crossing neutral only at the LKR 20/kWh boundary. Income elasticity is therefore tariff-mediated and block-differentiated, not absent.

The practical implication for revenue management is direct. Forecasting models that assume uniform income-elastic demand growth will systematically overestimate consumption in the lower and middle blocks, where 68% of this sample resides. For tariff designers, raising block consumption thresholds rather than rates is more likely to generate revenue growth, as it releases demand suppressed by the tariff ceiling rather than by household preferences. The PUCSL's [21] evidence that 600,000 households shifted consumption bands following the 2023 tariff increase corroborates this mechanism in billing data.

5.2 The Constraint Paradox and Demand-Side Management

The Structural Constraint Index reveals a critical tension for utility pricing managers. Upper-block households (B-B4 and B-B5) report the highest price sensitivity (PPSI = 4.111) and the highest tariff burden (5.3% of income), yet their Lock-in Score (4.127) nearly equals their Willingness to Reduce (4.190), producing an SCI of 0.990, meaning structural appliance dependence consumes virtually all available behavioural margin. Price signals have reached saturation in this segment. Additional rate increases will generate frustration but not consumption reduction.

For demand-side management practitioners, this finding reframes the intervention strategy for upper-block households entirely. Rather than price signalling, effective interventions should target the structural constraint directly appliance replacement incentive schemes, subsidised rooftop solar net metering, and time-of-use tariff adoption, where the 3.21:1 peak-to-off-peak ratio (LKR 90/kWh vs LKR 28/kWh) provides a meaningful incentive for load shifting that rate increases alone cannot achieve. The constraint paradox is most pronounced in urban areas (SCI urban = higher than rural across all blocks), confirming that city-specific demand management programmes are warranted.

5.3 Tariff Progressivity, Affordability, and Revenue Strategy

The U-shaped Tariff Burden Ratio, highest in both the lowest (1.7%) and highest (1.5%) income groups, lowest in the middle (0.8%) reveals that affordability and progressivity operate on different dimensions of the tariff's distributional impact. The IBT structure successfully directs the highest marginal rates at higher-income households, but the fixed charge escalation from LKR 80 to LKR 2,100 imposes a disproportionate burden on the very lowest-income consumers who cannot manage below the Category A threshold.

For revenue and pricing managers in regulated utilities, this U-shaped burden pattern is a design signal: fixed charge restructuring in the lower blocks would simultaneously improve affordability for the most vulnerable consumers and reduce the bill-shock discontinuity at the 60–61 kWh boundary that currently acts as a structural barrier to consumption growth and revenue expansion. Demographic and structural factors, household size, dwelling size, and lifestyle modernisation consistently outscored economic constructs as perceived demand drivers (Demographic composite M = 3.696 vs Economic M = 3.554), confirming that structural demand management through appliance standards and building efficiency requirements operates on a stronger lever than price signals alone for the majority of the population.

Declarations

Funding Declaration

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Author Contribution

W.D.G. conceptualised the study, designed the survey instrument, conducted the data collection, performed the statistical analysis, and wrote the main manuscript text. A.C.G. developed the data processing pipeline and contributed to the analytical framework and computational methods. A.H.T.S.K. and N.K.J. supervised the research design and methodology and contributed to the interpretation of findings and policy implications. N.K.J. also contributed to the theoretical framing and literature review. All authors reviewed and approved the final manuscript.

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Data Availability

All data will be granted upon request.

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Figures

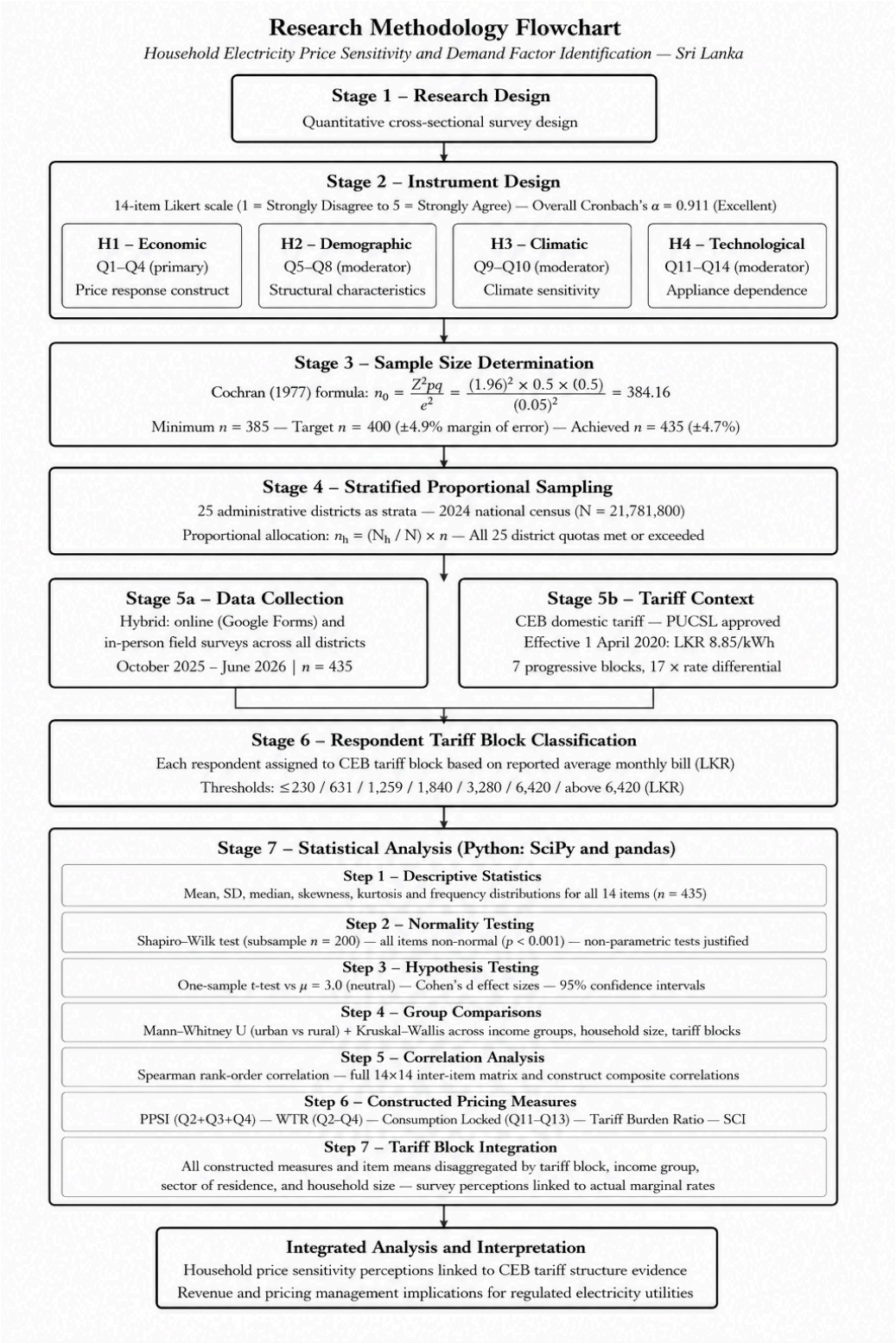


Figure 1

Methodological flowchart

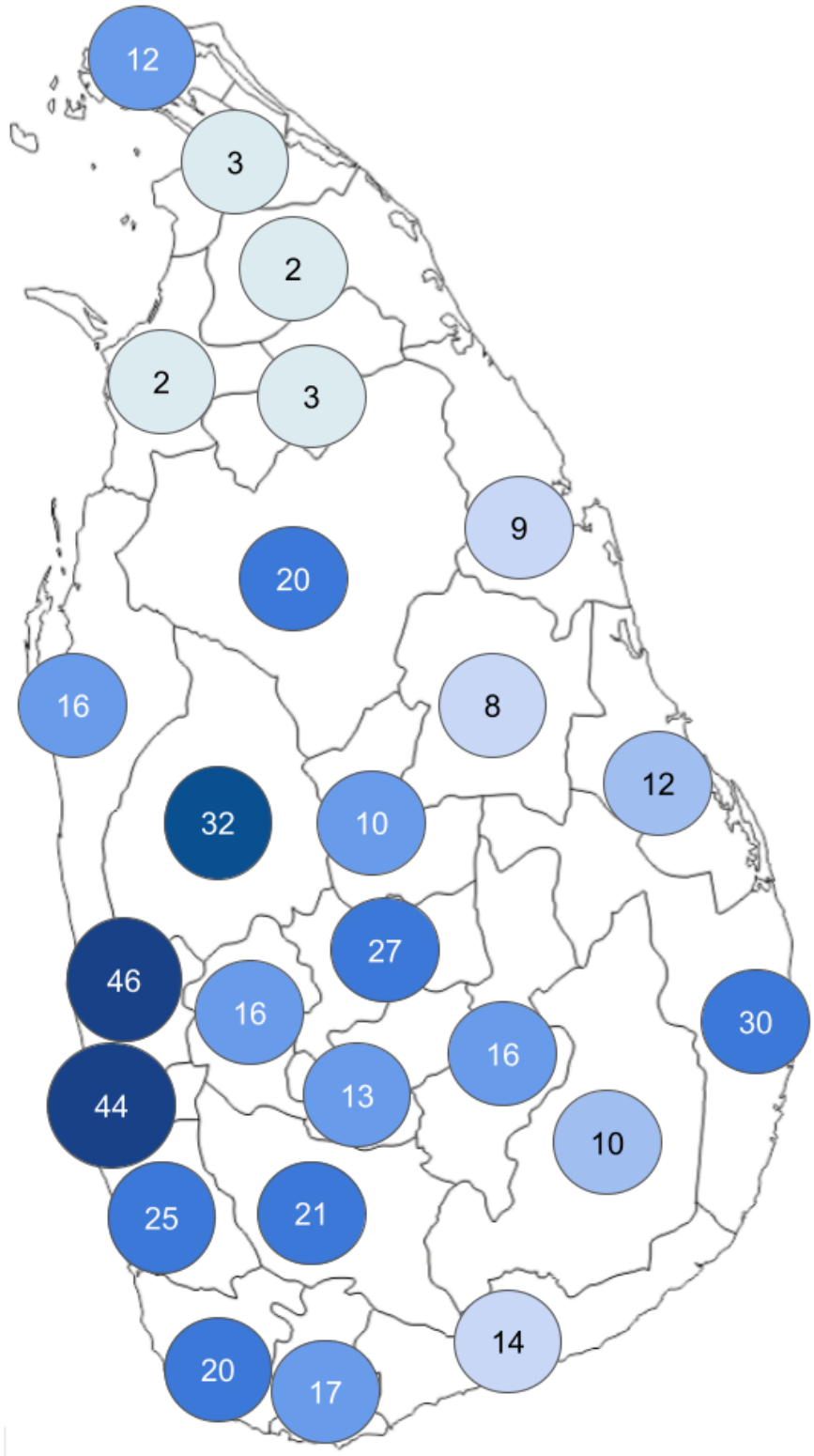


Figure 2

Spatial Distribution of the Study Sample Across the 25 Districts of Sri Lanka

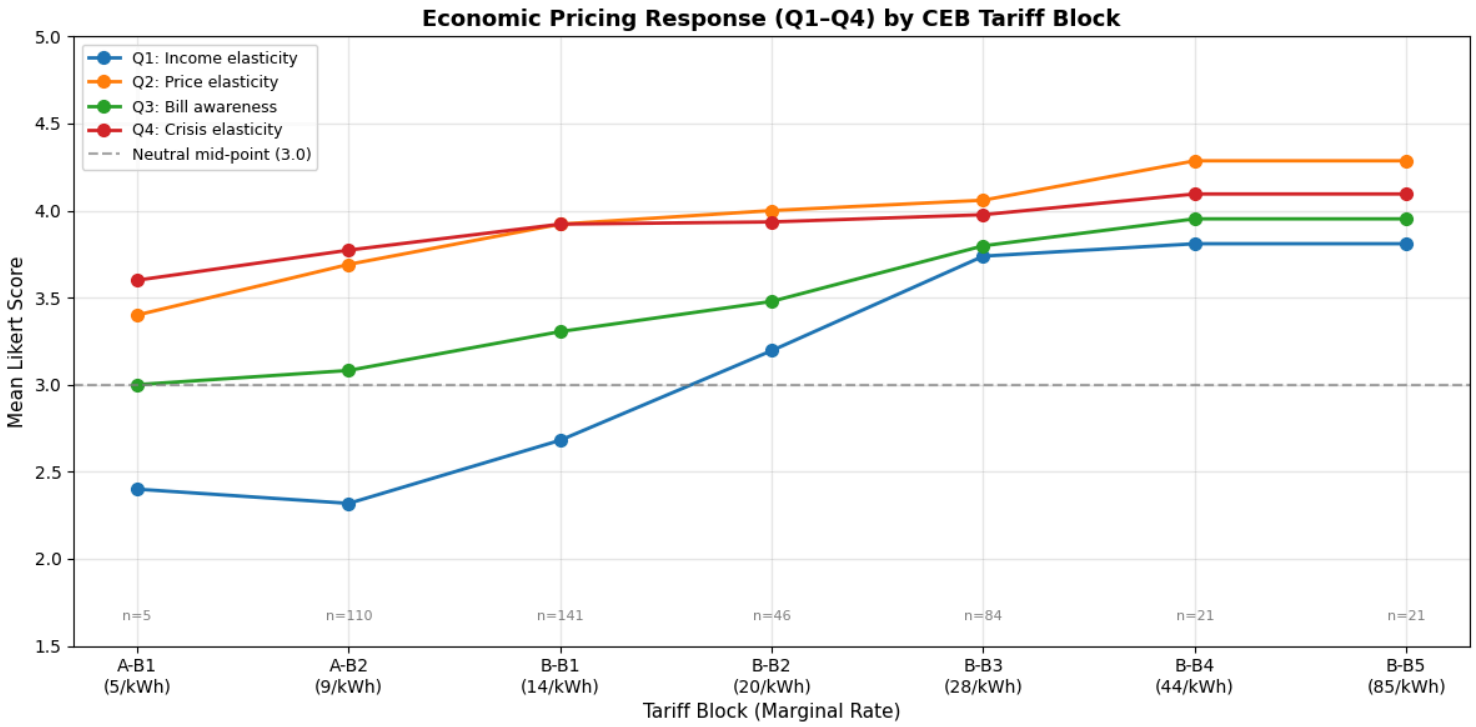


Figure 3

Economic Pricing Response by CEB Tariff Block

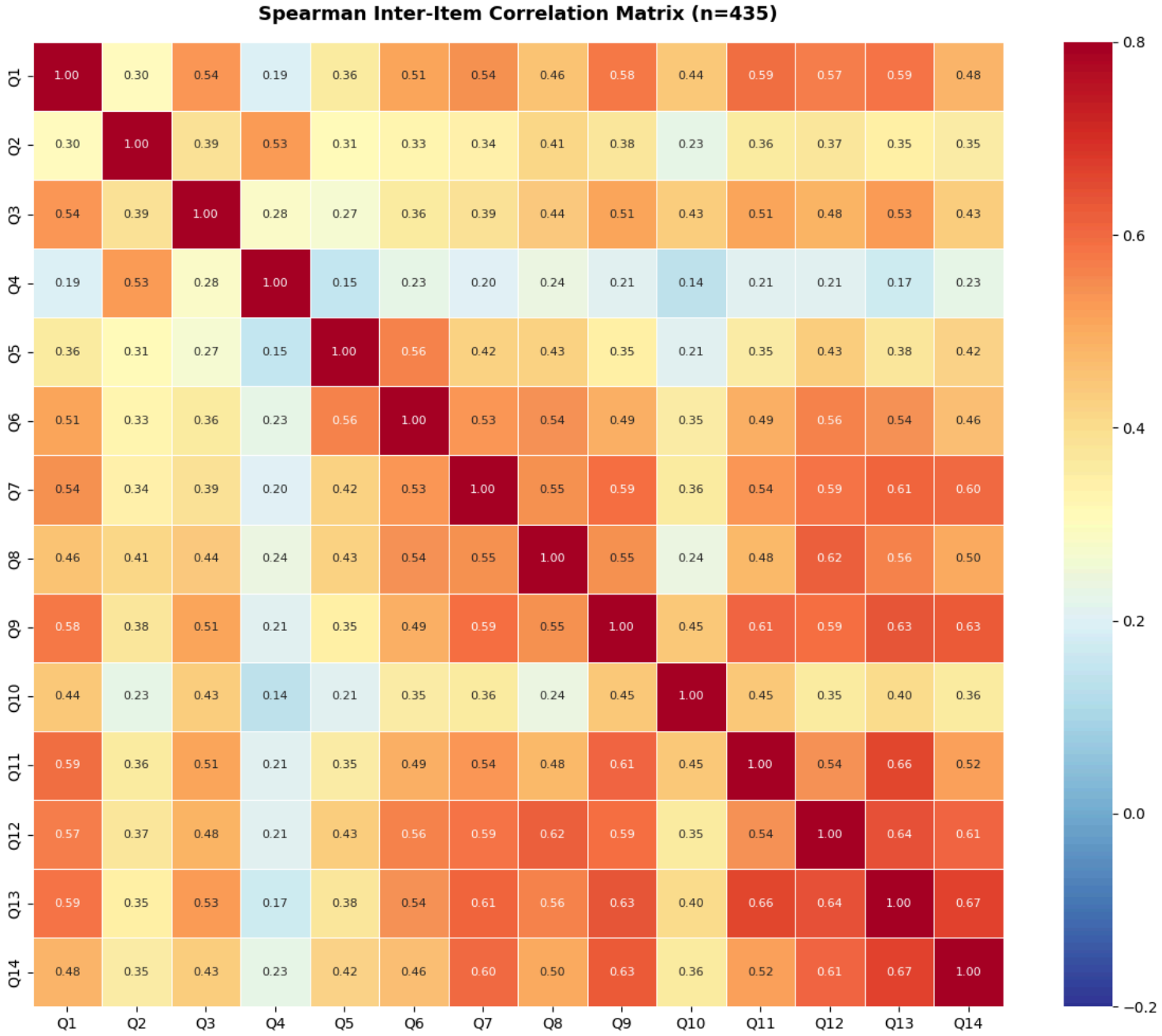


Figure 4

Spearman Inter-Item Correlation Matrix

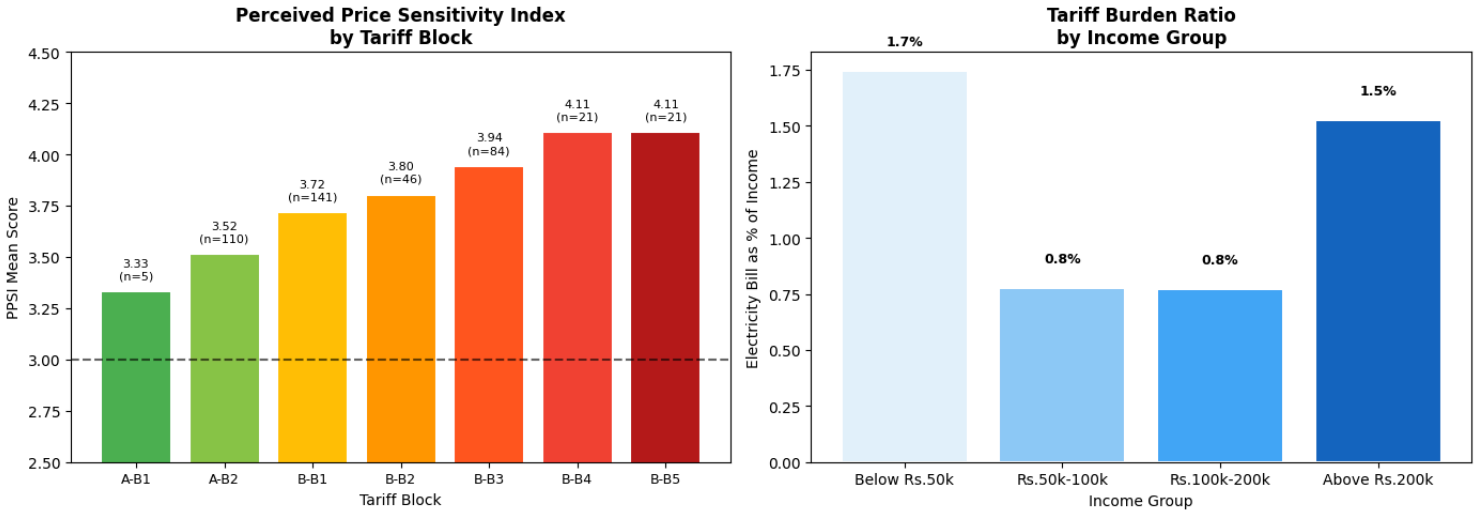


Figure 5

Left: Perceived Price Sensitivity Index (PPSI) by CEB tariff block. Right: Tariff Burden Ratio by income group U-shaped pattern with highest burden at the lowest (1.7%) and highest (1.5%) income extremes. Dashed line = neutral mid-point (3.0).