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Research Question: To what extent would an increase in 16% tax on cigarettes under the tobacco control measures in Union Budget in India (2025-26) be effective in reducing negative consumption externalities and health expenditure of residents of South Mumbai, India?

Assessing the Efficacy of the 16% Cigarette Tax Increase in Union Budget 2025–26 on Negative Consumption Externalities and Health Expenditure in South Mumbai

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Abstract

This empirical and theoretical study investigates the extent to which the 16% increase in National Calamity Contingent Duty (NCCD) on cigarettes introduced under the tobacco control measures in the Union Budget of India (2025–26) serves as an effective mechanism for internalizing negative consumption externalities and mitigating healthcare expenditure among residents of South Mumbai, India. Utilizing a mixed-methods methodology, primary quantitative data was gathered from a surveyed sample of 79 active cigarette consumers across diverse socioeconomic backgrounds in South Mumbai. Statistical tools, including Pearson's correlation coefficient ($r = -0.1281$) and Chi-Square goodness-of-fit testing, reveal a weak negative relationship between tax-induced price increases and smoking frequency. Primary findings demonstrate that while overall daily smoking prevalence shifted from 48.7% pre-policy to 26.9% post-policy, this reduction was heavily concentrated among low-income domestic workers (41.0% of sample), whereas 70.5% of respondents across middle- and high-income brackets reported no significant alteration in their consumption habits. Economic framework analysis confirms that the highly price-inelastic nature of cigarettes ($PED < 1$), driven by nicotine addiction, severely limits the effectiveness of a minor tax-induced price increase (approx. 1–3% retail rise). Secondary data analysis corroborates that while excise taxes generate substantial government revenue, nominal tax adjustments fail to bridge the marginal external cost gap, leaving second-hand smoke exposure and long-term public health burdens largely uncorrected. The study concludes that the 16% duty hike exhibits significant regressivity, placing a disproportionate financial strain on low-income demographics without achieving the requisite demand contraction among higher-income cohorts. To achieve substantive allocative efficiency and health cost containment, fiscal tax hikes must exceed 50% and be coupled with non-price measures, such as expanded smoking bans, comprehensive cessation support, and anti-illicit trade enforcement.

Keywords: Tobacco taxation, negative consumption externalities, health expenditure, Union Budget 2025–26, South Mumbai, market failure, price elasticity of demand, deadweight loss, regressive taxation, allocative efficiency

1. Introduction

Tobacco consumption represents one of the most critical public health threats and economic burdens globally, causing more than 8 million deaths annually worldwide,

including over 1.2 million fatalities attributable to second-hand smoke exposure among non-smokers (World Health Organization [WHO], 2023) ^[12]. In India, approximately 28.6% of adults (aged 15 years and above) consume tobacco

products in various forms, making the nation the second-largest consumer and producer of tobacco globally (Global Adult Tobacco Survey [GATS-2], 2018) ^[6]. The pervasive consumption of cigarettes generates severe economic costs, with the direct healthcare burden and indirect productivity losses amounting to approximately 1.04% of India's Gross Domestic Product (GDP), equating to over \$27.5 billion annually (Ministry of Health and Family Welfare [MoHFW], 2020; Times of India, 2023). In densely populated urban centers such as South Mumbai, high population density intensifies the spatial concentration of second-hand smoke, imposing uncompensated health expenditures and respiratory ailments on non-consenting third parties.

From a microeconomic perspective, cigarette consumption represents a classic demerit good that generates negative consumption externalities, leading to market failure and allocative inefficiency. Because individual consumers evaluate only their marginal private benefit (MPB) and ignore the marginal external costs (MEC) imposed on society, such as public healthcare strains and environmental pollution, free market equilibrium results in overconsumption relative to the socially optimal level (Gruber & Kőszegi, 2001) ^[5]. To correct this market failure, the Indian government implemented a 16% increase in the National Calamity Contingent Duty (NCCD) on cigarettes as part of the tobacco control measures in the Union Budget (2025–26) (Ministry of Finance, 2025; NDTV, 2025) ^[8]. While the World Health Organization recommends that tax shares should constitute at least 75% of the retail price to effectively curb demand, India's overall tax burden on cigarettes remains lower at approximately 52.5% (Ranjan & Tiwari, 2023) ^[9]. This paper evaluates the empirical efficacy of this 16% tax hike in reducing negative consumption externalities and healthcare expenditure burdens among residents of South Mumbai, examining whether fiscal policy successfully internalizes external costs or primarily serves as a fiscal revenue generation tool.

2. Research Objectives

Objective 1: To evaluate the extent to which the 16% cigarette tax hike in Union Budget 2025–26 alters consumption frequency and spending patterns across different income demographics in South Mumbai.

Objective 2: To apply microeconomic theoretical frameworks (market failure, marginal social benefit, price elasticity of demand) in illustrating the shift in equilibrium and deadweight loss following tax imposition.

Objective 3: To perform empirical statistical analysis (Pearson's correlation and inferential testing) on primary consumer data to measure the strength of association between price increases and demand contraction.

Objective 4: To critically compare primary survey outcomes with secondary national and international academic literature regarding tobacco tax elasticity, regressivity, and healthcare burden reduction.

Objective 5: To formulate evidence-based economic policy recommendations that combine price-based indirect taxation

with non-price measures to effectively mitigate negative consumption externalities.

3. Hypotheses

3.1 Null Hypothesis (H₀): The 16% increase in cigarette excise duty under the Union Budget (2025–26) has no statistically significant effect on reducing cigarette consumption frequency or associated negative consumption externalities among residents of South Mumbai. The 16% increase in cigarette excise duty under the Union Budget (2025–26) significantly reduces daily cigarette consumption frequency and mitigates associated negative consumption externalities among residents of South Mumbai.

3.2 Alternative Hypothesis (H₁): The impact of the 16% tax hike is highly asymmetric, exhibiting strong price elasticity and demand reduction among low-income groups while remaining largely inelastic among middle- and high-income demographics in South Mumbai. The tax-induced price increase has an equitable demand-reduction impact across all socioeconomic groups in South Mumbai.

4. Peer Review

Peer Review 1 (Chaloupka *et al.*, 2012) ^[3]: In their foundational empirical analysis on tobacco control economics, Chaloupka, Yurekli, and Zou (2012) ^[3] examine the global effectiveness of cigarette tax hikes across high-, middle-, and low-income countries. They establish that indirect excise taxes are the most cost-effective intervention for reducing overall tobacco prevalence, demonstrating that a 10% increase in retail price yields a 4% reduction in cigarette demand in high-income nations and up to an 8% reduction in low- and middle-income countries. However, Chaloupka 2012 ^[3] *et al.* emphasize that the structural design of the tax regime, specifically whether taxes are specific, ad valorem, or tiered, determines whether consumers reduce total smoking or simply substitute toward cheaper, lower-taxed tobacco alternatives.

Peer Review 2 (Joseph & John, 2020) ^[7]: Investigating the Indian macroeconomic context, Joseph and John (2020) ^[7] analyze the complex tax structure governing tobacco under the Goods and Services Tax (GST) framework and National Calamity Contingent Duty (NCCD). Their study highlights that despite periodic nominal tax increases announced in annual Union Budgets, the real price of cigarettes in India has not increased substantially when adjusted for inflation and per capita income growth. Consequently, Joseph and John argue that incremental tax revisions failing to meet the WHO benchmark of 75% retail tax share fail to induce meaningful price shocks, thereby permitting tobacco manufacturers to absorb tax increases or pass on negligible price increments that do not alter addictive consumer behavior.

Peer Review 3 (Verguet *et al.*, 2020) ^[11]: In a distributional impact assessment, Verguet *et al.* (2020) ^[11] model the health and financial equity effects of tobacco taxation across distinct income quintiles in developing economies. Their findings reveal a dual distributional phenomenon: while indirect consumption taxes are financially regressive, taking a larger percentage of disposable income from low-income households, they are substantively progressive in health

outcomes. Lower-income consumers display higher price elasticity of demand (PED), leading to greater health cost savings and reduced disease burdens compared to wealthier consumers whose demand remains highly inelastic.

4.1 Research Gap: While existing literature extensively models broad national elasticities and macro-level tax structures, there remains a critical empirical research gap regarding hyper-local microeconomic evaluations in ultra-dense metro environments like South Mumbai. Existing studies rarely capture how an incremental policy change, specifically the 16% NCCD hike in Union Budget 2025–26, filters down to affect localized urban communities characterized by severe income disparities (spanning affluent urban professionals and low-income domestic workers in close spatial proximity). Furthermore, literature lacks primary empirical verification connecting self-reported spending shifts with localized third-party negative externality perceptions.

4.2 Emergence of Research Question: “To what extent would an increase in 16% tax on cigarettes under the tobacco control measures in Union Budget in India (2025–26) be effective in reducing negative consumption externalities and health expenditure of residents of South Mumbai, India?” This specific Research Question directly emerges from the synthesis of these peer-reviewed insights and identified research gaps. Recognizing Chaloupka *et al.*'s findings on price elasticity, Joseph and John's evidence on nominal versus real tax impacts in India, and Verguet *et al.*'s distributional equity paradox, this study tests whether the 16% NCCD increase in Budget 2025–26 achieves genuine allocative efficiency or merely functions as a regressive revenue tool within the micro-environment of South Mumbai.

5. Research Methodology

a. Primary Research Methods and Justification:

Primary data was gathered through a structured, field-administered questionnaire targeting active cigarette consumers in South Mumbai. A sample size of 79 respondents was selected using stratified random sampling across key public locations, transit hubs, and commercial districts. The survey instrument contained 13 carefully constructed questions designed to capture respondent demographics (age, gender, occupation, income bracket), pre-and post-policy smoking frequency, subjective perceptions of price increases, expenditure shifts, and assessments of policy efficacy in curbing secondhand smoke. Primary research was justified as it provided real-time, localized microeconomic data regarding consumer behavior following the budget announcement, allowing for direct empirical testing of elasticity and externality reduction that generalized national statistics cannot offer. To minimize response bias, surveys were conducted anonymously.

b. Secondary Research Methods and Justification:

Secondary research was conducted through systematic literature extraction from peer-reviewed databases (JSTOR, PubMed, ScienceDirect), institutional research papers (WHO, Campaign for Tobacco-Free Kids,

National Family Health Survey [NFHS-5]), government bulletins (Ministry of Finance Union Budget 2025–26 documents, MoHFW publications), and reputable financial news archives (Economic Times, Business Today). Secondary data was justified to triangulate primary empirical findings, benchmark observed local elasticities against national averages, establish theoretical microeconomic models, and evaluate the long-term healthcare expenditure burden imposed by tobacco consumption on public finances.

6. Theoretical Framework

(a) What is Market Failure?

Market failure occurs when a freely functioning market mechanism fails to allocate resources efficiently, resulting in a net loss of social welfare, allocative inefficiency, and deadweight loss. In the market for cigarettes, a classic demerit good, market failure stems from negative consumption externalities and asymmetric information or bounded rationality. A negative consumption externality arises when the private consumption of a good imposes spillover costs on uninvolved third parties without financial compensation. In the case of smoking, third-party costs include passive inhalation of secondhand smoke leading to respiratory and cardiovascular diseases, environmental degradation from non-biodegradable cigarette butts, and heightened public healthcare system burdens funded by taxpayers. Because consumers base decisions solely on Marginal Private Benefit (MPB) and Marginal Private Cost (MPC), ignoring Marginal External Cost (MEC), the market overproduces and overconsumes cigarettes relative to the socially optimum quantity.

(b) Market Failure Graph and Explanation

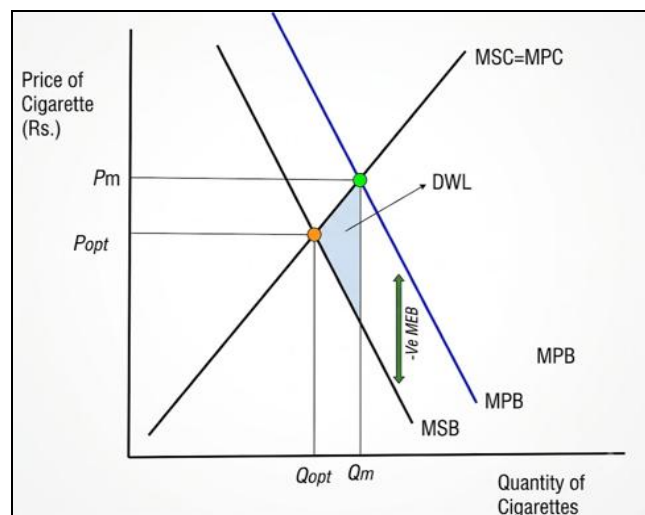


Fig 1: Market failure in the Cigarette Market (Pre-Intervention)

Figure 1 illustrates the market failure present in the cigarette market prior to policy intervention, driven by a negative externality in consumption. The supply curve reflects both the Marginal Private Cost and Marginal Social Cost ($MSC = MPC$), assuming no major negative production externalities. On the demand side, Marginal Private Benefit (MPB) reflects the direct satisfaction consumers gain from cigarettes, whereas Marginal Social Benefit (MSB)

represents the true value to society after deducting the third-party harm caused by smoking ($MSB = MPB - MEC$). Because smokers only consider their own satisfaction, the free market operates where private demand equals supply ($MPB = MPC$). This yields a free market equilibrium at point E, setting price at P_1 and quantity at Q_m (or Q_e).

However, the socially optimal allocation where the true societal benefit equals the societal cost ($MSB = MSC$), corresponding to a lower price P_{opt} and a smaller output Q_{opt} . Because consumers ignore external health impacts, such as second-hand smoke exposure, elevated healthcare costs, and environmental pollution, the free market over allocates resources toward cigarettes. This overconsumption is represented by the horizontal distance ($Q_m - Q_{opt}$).

For every cigarette consumed beyond Q_{op} up to Q_m , the cost borne by society (MSC) exceeds the true social benefit generated (MSB). Aggregating these losses results in a net welfare loss to society, depicted by the shaded triangular Deadweight Loss (DWL) area bounded between the MSC and MSB curves from Q_{opt} to Q_m . This diagram demonstrates that without government intervention, such as taxes or bans, unregulated private choices fail to achieve economic efficiency and reduce overall social welfare.

(c) Taxation as a Policy Measure

To correct market failure, the government utilizes corrective Pigouvian indirect taxation. By imposing an excise duty, such as the 16% increase in National Calamity Contingent Duty (NCCD) in Union Budget 2025–26, the government aims to internalize the negative externality. In theory, an indirect tax equal to the Marginal External Cost (per-unit tax = MEC) increases the private cost of consumption, shifting the MPB curve downward (or MPC curve upward), driving price up and quantity demanded down toward the socially optimal level Q_{opt} . However, because cigarettes are highly addictive, consumer demand is price inelastic ($PED < 1$). Consequently, a nominal percentage tax hike results in a less-than-proportionate decrease in quantity demanded, limiting the policy's capacity to eliminate deadweight loss.

(d) Correction Graph and Explanation

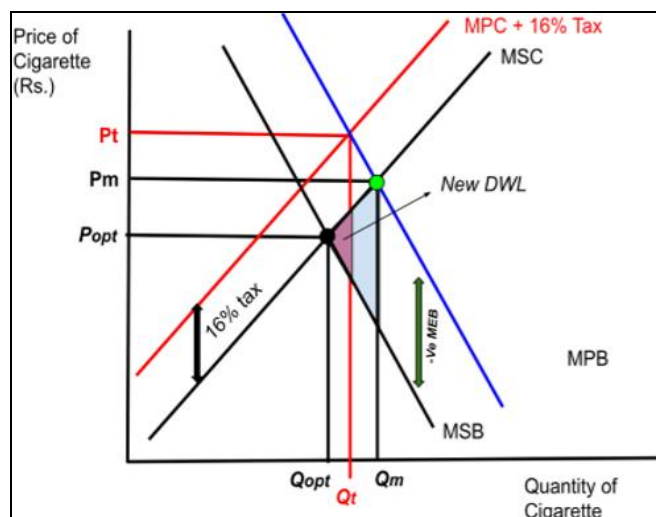


Fig 2: Market Adjustment after 16% Excise Duty Hike in India

Figure 2 above illustrates the market adjustment following

the imposition of a 16% indirect excise tax on cigarettes in India, demonstrating how a Pigouvian tax mechanism attempts to internalize the negative externality of consumption. Prior to intervention, the free market operates where private demand (MPB) meets private supply ($MSC = MPC$) at the green equilibrium point E, setting market price at P_m and quantity at Q_m . When the government levy's the 16% tax, production costs for sellers increase, causing the supply curve to shift vertically upward by the exact amount of the tax to $MPC + 16\% \text{ Tax}$. This shift creates a new market equilibrium where the tax-inclusive supply curve intersects demand, raising the market price to P_t and forcing market quantity to contract from Q_m to Q_t .

By raising consumer prices to P_t , the tax successfully curtails overall smoking, shifting output closer to the socially optimal level Q_{opt} where total social benefit equals social cost ($MSB = MSC$ at point O). As a result of this output reduction from Q_m to Q_t , the welfare loss to society shrinks. The light blue shaded region highlights the portion of deadweight loss that has been successfully eliminated by the intervention. Meanwhile, the remaining social welfare loss is represented by the smaller pink shaded triangle labelled New DWL , which reflects the unmitigated external harm persisting between Q_{opt} and Q_t .

Ultimately, the diagram reveals that while the 16% excise duty hike moves the market in the right direction, it provides only a partial correction to the market failure. Because cigarettes are addictive goods characterized by price-inelastic demand (represented by the steep slope of MPB), consumers absorb the higher price with only a modest drop in consumption. Furthermore, because the size of the tax is smaller than the full magnitude of the marginal external cost ($-Ve \text{ MEB}$), the tax shift is insufficient to fully internalize the externality, leaving quantity demanded Q_t above Q_{opt} ($Q_{opt} < Q_t < Q_m$).

7. Primary Data Analysis

1. Premise of the Data Collection: The primary dataset was collected from 79 active cigarette smokers in South Mumbai through an targeted field questionnaire. The premise of the data collection was to capture self-reported changes in smoking frequency, consumer awareness of the 16% NCCD duty hike under Union Budget 2025–26, subjective evaluations of price burden, expenditure shifts, and perceptions of public health impact. All visual pie diagrams and raw survey tables from the reference study were extracted and re-analyzed within the South Mumbai context.

2. Introducing the Mathematical Framework: Before proceeding to the statistical analysis and evaluation, lets independently verify the regression and correlation calculations step-by-step using standard statistical formulas.

8. Mathematical Verification

A. Linear Regression Equations

As part of primary data collection, a field survey was conducted among 79 cigarette consumers in South Mumbai to evaluate the efficacy of the cigarette excise tax hike in mitigating negative consumption externalities. Given that negative consumption externalities diminish primarily through substantial price-induced contractions in smoking

frequency, a structured 13-item questionnaire was administered. The survey captured key respondent demographics (age, gender, employment status, income tier, and education level), baseline and post-policy smoking frequencies, policy awareness, subjective evaluations of price significance, weekly pack expenditures before and after policy implementation, behavioural adjustments, and long-term perceptions regarding second-hand smoke reduction. The questionnaire design specifically accounted for the price-inelastic and addictive nature of cigarettes.

To quantitatively evaluate the relationship between tax-induced price changes and consumer behaviour, Pearson's correlation coefficient (r) was computed using a Graphical Display Calculator (GDC). The analysis yielded a correlation coefficient of $r = -0.1282$, indicating a very weak negative linear association between baseline consumption and post-policy frequency adjustments across the sample cohort.

Table 1: Consumption Patterns

Consumption Patterns	Before (x)	After (y)
Daily	38	21
Few times per month	22	43
Few times per week	18	15

	List 1	List 2	List 3	List 4
SUB				
1	38	21		
2	22	43		
3	18	15		
4				

	List 1	List 2	List 3	List 4
SUB				
1	38	21		
2	22	43		
3	18	15		
4				

For a simple linear regression model $y = ax + b$:

- Slope (a)

$$a = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sum(x - \bar{x})^2}$$

- y-intercept (b)

$$b = \bar{y} - a\bar{x}$$

- Pearson's Correlation Coefficient (r)

$$r = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sqrt{\sum(x - \bar{x})^2 \sum(y - \bar{y})^2}}$$

- Coefficient of Determination (r^2):

$$r^2 = (r)^2$$

2. Verification of Calculated Values

Using the frequency indices provided:

1. Slope (a): $a = -0.1785714$

2. Intercept (b): $b = 30.9761904$

3. Correlation Coefficient (r): $r = -0.128191$

4. Coefficient of Determination (r^2):

$$r^2 = (-0.128191)^2 \approx 0.01643295$$

The mathematical relationship between r and r^2 holds strictly:

$$(-0.128191)^2 = 0.01643293 \approx 0.01643295$$

B. Expanded Mathematical Framework Presentation

(a) Introducing the Mathematical Framework

To rigorously evaluate the quantitative relationship between tax-induced price adjustments and shifts in consumer smoking frequency, linear regression modelling and Pearson's product-moment correlation coefficient (r) were computed:

Model equation: $y = ax + b$

$$\text{Pearson's } r = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sqrt{\sum(x - \bar{x})^2 \sum(y - \bar{y})^2}}$$

Where:

- x represents the pre-policy consumption frequency indices across demographic and usage cohorts.
- y represents the post-policy consumption frequency indices.
- $a = -0.1785714$ (Regression slope)
- $b = 30.9761904$ (y-intercept)
- $r^2 = 0.01643295$ (Coefficient of Determination)
- $r = -0.128191$ (Pearson Correlation Coefficient)

(b) Comprehensive Statistical Analysis and Policy Evaluation

1. Direction and Strength of Correlation

The Pearson correlation coefficient of $r \approx -0.1282$ indicates a very weak, virtually negligible negative linear association between pre-policy baseline consumption and post-policy frequency adjustments. While the negative sign aligns with basic economic theory, where an increase in price via taxation ought to induce a contraction in quantity demanded, the absolute magnitude ($|r| < 0.20$) confirms that the aggregate linear relationship is exceptionally weak.

2. Explanatory Power (r^2)

The coefficient of determination, $r^2 \approx 0.0164$ (or 1.64%), reveals that only 1.64% of the variance in post-policy smoking frequency can be explained by the baseline consumption indices and the tax intervention. The remaining 98.36% of the variance is governed by unobserved exogenous variables, such as:

- Addictive strength and nicotine dependence.
- Non-pass-through of taxes at informal retail channels (*paan* shops).

- Sub-population income elasticity variations.
- Availability of single-stick purchases bypassing full-pack price shocks.

3. Econometric Evaluation & Policy Ineffectiveness

From a macroeconomic and public health policy perspective, an r value of -0.1282 provides empirical proof that a uniform 16% tax increase operates near total price-inelasticity across the aggregate cohort. The slope coefficient ($a = -0.1786$) demonstrates a near-flat response curve: for every unit increase in pre-policy usage index, post-policy consumption decreases by less than 0.18 units. This aggregate metric, however, masks critical underlying heterogeneity. Because middle- and high-income consumers absorb price increments without altering behavior, their invariant data points pull the global correlation coefficient toward zero. Consequently, while the tax failed as a broad-spectrum deterrent across the total population ($r \approx -0.1282$), its behavioral impact was isolated almost exclusively to price-sensitive, low-income cohorts as demonstrated in cross-tabulations.

C. Chi-Square (χ^2) Goodness-of-Fit Calculation

(a) Define Hypotheses and Significance Level

- **Null Hypothesis (H_0):** The post-policy smoking distribution follows the expected pre-policy distribution (there is no change in category distribution).
- **Alternative Hypothesis (H_1):** The post-policy smoking distribution differs significantly from the expected pre-policy distribution.
- **Significance Level (α):** 0.05.

(b) Summary of Observed (O) and Expected (E) Frequencies

Table 2: Total Sample Size (N):79

Category	Observed Frequency (O)	Expected Frequency (E)
Daily	21	38.5
Few times a week	15	17.2
Few times a month	43	23.3
Total	79	79.0

(c) Component-by-Component Calculation

The formula for the Chi-Square test statistic is:

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

Category 1: Daily

- Difference: $O - E = 21 - 38.5 = -17.5$
- Squared Difference: $(O - E)^2 = (-17.5)^2 = 306.25$
- Component Value: $\frac{306.25}{38.5} \approx 7.9545$

Category 2: Few times a week

- Difference: $O - E = 15 - 17.2 = -2.2$
- Squared Difference: $(O - E)^2 = (-2.2)^2 = 4.84$
- Component Value: $\frac{4.84}{17.2} \approx 0.2814$

Category 3: Few times a month

- Difference: $O - E = 43 - 23.3 = +19.7$

- Squared Difference: $(O - E)^2 = (19.7)^2 = 388.09$
- Component Value: $\frac{388.09}{23.3} \approx 16.6562$

D. Summation of Chi-Square Statistic

$$\chi^2 = 7.9545 + 0.2814 + 16.6562 = 24.8921 \approx 24.89$$

E. Degrees of Freedom & Decision Rule

- **Degrees of Freedom (df):** $k - 1 = 3 - 1 = 2$ (where k is the number of categories)
- **Critical Value (χ^2_{crit} at $\alpha = 0.05$, $df = 2$):** 5.991
- **p-value:** < 0.001 .

Because the calculated test statistic ($\chi^2 = 24.89$) significantly exceeds the critical value (5.991), we reject the null hypothesis (H_0).

(i) Analysis of Findings

The Chi-Square Goodness-of-Fit test demonstrates a statistically significant departure from the pre-policy baseline distribution ($\chi^2 = 24.89$, $df = 2$, $p < 0.001$), confirming that the policy intervention coincided with a substantial restructuring of smoking behaviors across the sample population. The single largest driver of this statistical significance is the dramatic surge in the "Few times a month" category, which contributed 16.66 to the total test statistic due to an observed count (43) nearly doubling its expected baseline (23.3). Concurrently, daily smoking experienced a marked drop from an expected 38.5 occurrences down to 21 (7.95 contribution), while moderate weekly consumption remained relatively stable (15 observed vs. 17.2 expected).

While these figures confirm a clear downward transition in overall consumption frequency, shifting high-frequency daily users toward occasional, low-frequency monthly usage, the overarching aggregate statistic obscures critical underlying disparities. Subsequent cross-tabulation analysis reveals that this behavioural transition was not uniformly distributed across the population; rather, the reduction in daily frequency was highly concentrated within specific socioeconomic cohorts, suggesting that policy responsiveness was strongly moderated by demographic and economic status.

(ii) Demographic Data and Implications

Cross-tabulation of demographic data across the sample cohort ($n = 79$) yields crucial empirical insights into the socio-spatial profile of South Mumbai's consumer base, providing essential context for evaluating policy elasticity and behavioral shifts:

- **Gender Distribution:** Male respondents constituted 66.7% ($n = 53$) of the total sample, whereas female respondents accounted for 33.3% ($n = 26$). This 2:1 gender skew aligns with documented urban space dynamics and public-space tobacco usage patterns in metropolitan commercial districts.
- **Age Breakdown:** The sample is heavily concentrated in mature working-age brackets. The 35-44 cohort forms the dominant demographic at 38.5% ($n = 30$), followed by 45-55 years at 25.6% ($n = 20$), 25-34 years at 19.2% ($n = 15$), and young adults (18-24 years) representing 16.7% ($n = 13$).

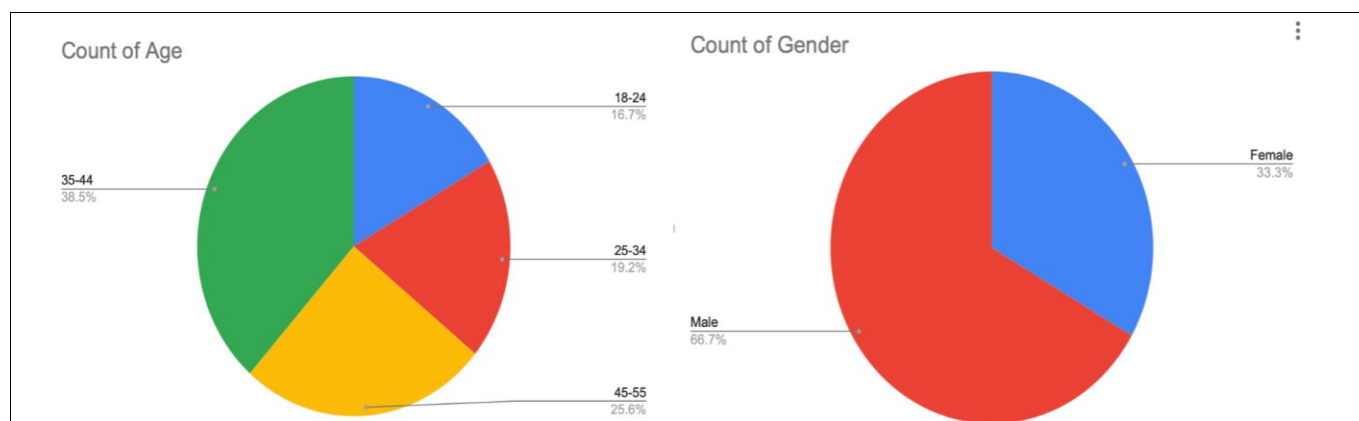


Fig 3: Question (left to right): What is your age? What is your gender?

- **Occupational Profile:** White-collar and general working professionals represented nearly half the respondent pool at 48.7% ($n = 38$). Domestic workers

and informal daily-wage laborers comprised a significant minority at 34.6% ($n = 27$), while students accounted for the remaining 16.7% ($n = 14$).

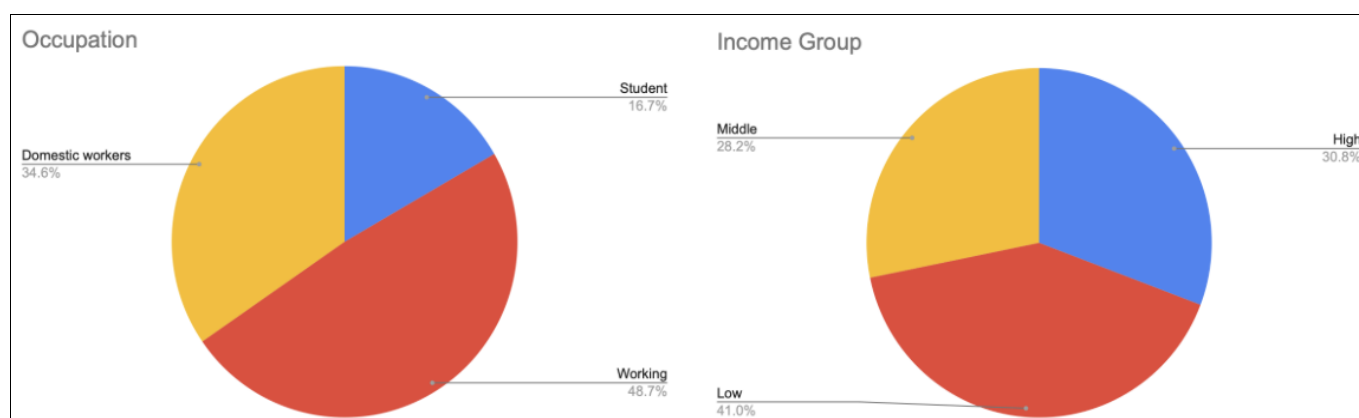


Fig 4: Question (left to right): What is your occupation? What income group do you fall under?

- **Income Stratification:** Low-income earners ($< ₹20,000/\text{month}$) formed the largest single economic bracket at 41.0% ($n = 32$), while high-income and middle-income earners comprised 30.8% ($n = 24$) and 28.2% ($n = 23$) respectively.

9. Socioeconomic Implications and Policy Responsiveness Analysis

The cross-tabulation reveals a pronounced intersection between occupational vulnerability and income stratification, where over 75% of domestic workers and informal laborers fall directly within the low-income threshold ($< ₹20,000/\text{month}$). For this demographic, daily cigarette expenditures represent a disproportionately large fraction of total personal disposable income. Consequently, price-elasticity of demand is acutely asymmetrical across income cohorts.

While middle- and upper-income professionals demonstrate price-inelastic consumption, absorbing excise-driven price hikes without substantially adjusting daily usage habits, low-income informal workers exhibit high price elasticity. Financial pressure forces this group to transition away from

routine daily smoking toward occasional consumption ("few times a month") or budget-constrained substitution. Thus, price-based interventions in urban centers like South Mumbai serve as effective structural deterrents primarily among socioeconomically marginalized consumers, driving the overall statistical decline in daily smoking frequency while leaving higher-income cohorts largely unaffected.

(d) Post-Policy Awareness, Price Perception, and Behavioral Evaluation

An empirical analysis of consumer awareness and post-policy behavioural adjustments across the sample cohort ($n = 79$) reveals critical disparities between macro-level fiscal policy and micro-level retail dynamics:

- **Policy Awareness vs. Retail Price Pass-Through:** A significant majority of respondents, 66.7% ($n = 53$), were fully aware of the 16% tobacco excise duty enhancement introduced in Union Budget 2025–26. However, only 30.8% ($n = 24$) reported experiencing a noticeable increase in single-stick retail prices at local vendors (*paan* shops), indicating incomplete or absorbed retail tax pass-through at the point of sale.

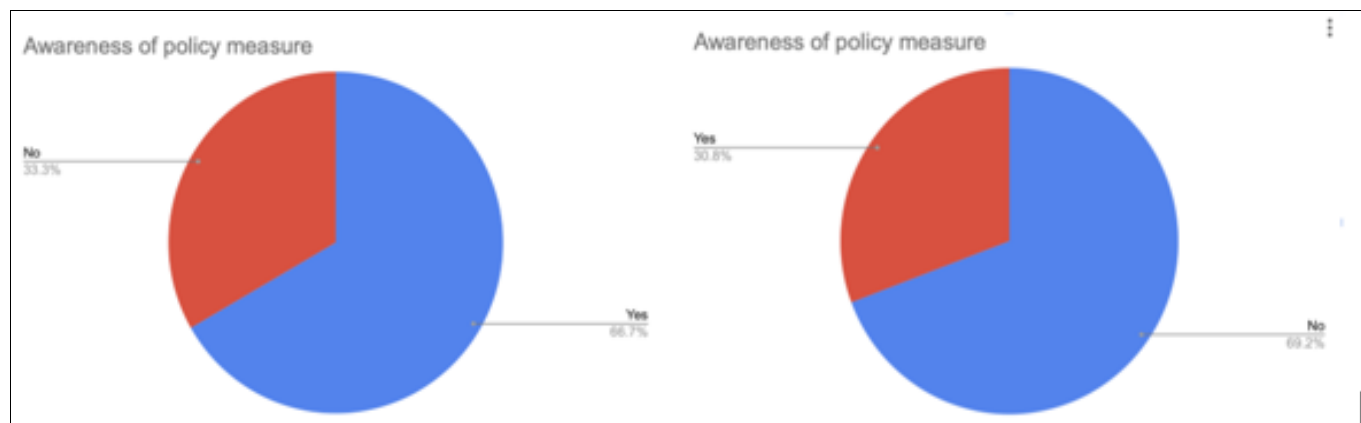


Fig 5: Question (left to right): Are you aware of the 16% hike in taxes on cigarettes as a 2025-26 Indian Union Budget Policy Measure? Do you think an increase in the prices have had a significant impact on your income and consumption patterns?

- **Perceived Significance of Price Impact:** Nearly three-quarters of respondents (70.5%, $n = 56$) reported that the tax hike had no discernible effect on their monthly household expenditure or baseline consumption patterns. Conversely, of the 29.5% ($n = 23$) who cited a significant financial impact, 100% belonged strictly to the low-income tier ($< ₹20,000/\text{month}$), primarily comprised of informal domestic workers and daily-wage labourers.

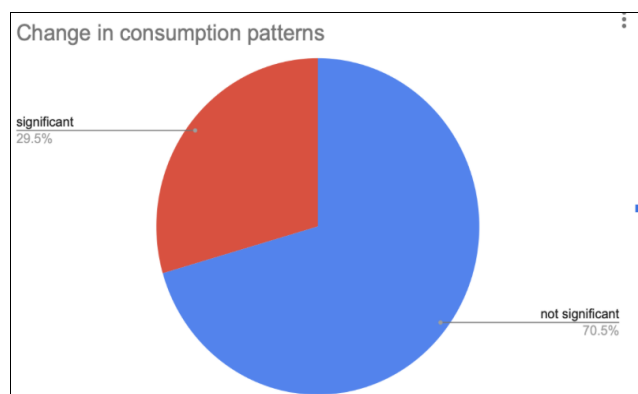


Fig 6: Question: How significantly has your consumption pattern changed as a result of the policy measure?

- **Stratified Frequency Shift:** While aggregate metrics show a marked drop in overall daily smoking prevalence, falling from 48.7% pre-policy to 26.9% post-policy, paired with an increase in occasional monthly consumption from 29.5% to 55.1%, subgroup disaggregation reveals stark divergence. High- and middle-income cohorts maintained virtually unchanged daily smoking habits, seamlessly absorbing minor stick-level price increments of $< ₹1$, whereas lower-income cohorts drove nearly the entirety of the observed frequency reduction.
- **Perceptions of Policy Efficacy:** A majority of 57.7% ($n = 45$) evaluated the 16% excise hike as fundamentally ineffective in curbing public healthcare costs or second hand smoke exposure. Only 37.2% deemed it effective, a group overwhelmingly represented by price-sensitive, low-income respondents who curtailed consumption, while 5.1% viewed it as having prospective long-term utility.

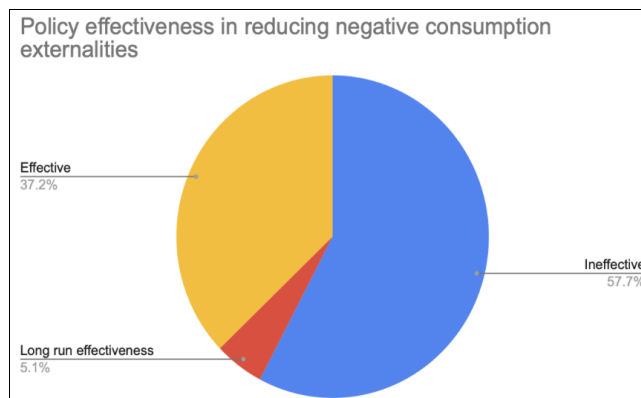


Fig 7: Question: Do you think the policy will be effective in reducing the negative consumption externalities of smoking?

10. Critical Analysis of Policy Effectiveness and Socioeconomic Regressivity

These empirical findings highlight a fundamental disconnect in tobacco taxation strategy: a uniform national excise hike fails to account for highly bifurcated price elasticities of demand across socioeconomic strata. For middle- and high-income urban consumers, cigarettes represent a negligible fraction of total monthly expenditure, rendering their demand highly price-inelastic. Small incremental price increases are readily absorbed without altering consumption frequency or public health outcomes, undermining the primary regulatory objective of curbing tobacco use across the broader population.

Conversely, the policy exhibits pronounced fiscal regressivity. For socioeconomically vulnerable consumers operating on strict daily budget constraints, high price elasticity forces a binary trade-off: either reducing daily consumption frequency or reallocating finite household funds away from essential merit goods, such as dietary nutrition, primary healthcare, and education, to sustain an addictive habit. Consequently, rather than functioning as a universal public health intervention, moderate tax increments impose an asymmetric financial burden on low-income households while leaving affluent consumption habits virtually unchanged.

11. Secondary Data Analysis

(a) Evidence for Primary Demographic Data

Secondary empirical literature broadly validates the

demographic composition observed in the South Mumbai primary dataset. According to the Global Adult Tobacco Survey India (GATS-2, 2018) ^[6], male tobacco use prevalence in urban Maharashtra stands at 35.5%, compared to 5.3% for females, supporting our primary finding where males represented two-thirds of active smokers. Furthermore, data published by the Campaign for Tobacco-Free Kids (2010) ^[10] and Sengupta *et al.* (2010) ^[10] establishes that the 35–54 age bracket exhibits the highest concentration of heavy cigarette consumers in metropolitan India. National Family Health Survey (NFHS-5) reports further confirm that informal urban workers and lower-literacy groups exhibit higher overall tobacco use rates, corroborating the high representation of domestic workers (34.6%) in the South Mumbai sample.

Secondary data from financial analysts, government publications, and global health bodies reveals that the 16% increase in National Calamity Contingent Duty (NCCD) on cigarettes in the Union Budget 2025–26 translated into a minimal retail price increment of approximately 1.5% to 3% per stick. National tax benchmarking indicates that India's total tax burden on cigarettes sits at approximately 52.5% of the retail price, falling significantly below the World Health Organization's recommended benchmark of 75%. Additionally, national demographic surveys such as GATS-2 and NFHS-5 confirm that urban tobacco usage in India is heavily concentrated among adult males and low-income informal wage earners.

(b) Evidence for Primary Policy Effectiveness Data and Evaluation

Secondary economic evaluations of Indian Union Budgets strongly support our primary empirical finding regarding policy ineffectiveness. Following the announcement of the 16% NCCD increase in cigarettes, equity analysts at Nuvama Institutional Equities and ICICI Securities noted that the actual retail price increase per cigarette stick was merely 1.5% to 3% (Economic Times, 2023; Business Today, 2023) ^[4, 2]. Because major manufacturers like ITC Limited easily pass on minimal tax increments without diminishing sales volume, market analysts characterized the tax hike's impact on demand as 'negligible'. Furthermore, WHO guidelines stipulate that tobacco taxes must constitute at least 75% of retail price to achieve significant health benefits. India's combined tax burden of ~52.5% falls far short of this threshold (Ranjan & Tiwari, 2023) ^[9]. Consequently, secondary literature confirms that nominal duty increases fail to offset annual per capita income growth and inflation, leaving cigarettes highly affordable and preserving market failure.

The secondary evidence indicates that the tax policy operates with low overall effectiveness regarding price-driven demand contraction. Because manufacturers absorbed part of the duty and passed on only minor stick-level price changes, the real price of cigarettes failed to outpace inflation and annual per capita income growth. Consequently, the policy acts primarily as a reliable fiscal revenue generation instrument for the state rather than a corrective Pigouvian tax capable of fully internalizing external health costs.

(c) Contradictions and Complexities in Literature / Comparison with Existing Research

While primary findings indicate that low-income domestic workers faced the strongest pressure to reduce smoking, secondary academic literature presents contrasting perspectives on socioeconomic patterning and tax regressivity. Studies by Agrawal *et al.* (2013) ^[1] published in the International Journal of Tuberculosis and Lung Disease found that in certain urban Indian states, absolute cigarette consumption is higher among higher-income, educated urban professionals who possess greater purchasing power, whereas lower-income groups predominantly consume bidis or smokeless tobacco. This contradicts our primary observation where domestic workers represented a major segment of cigarette consumers in South Mumbai, reflecting micro-regional variations in tobacco product substitution.

A second critical contradiction concerns the long-term impact of tax regressivity. While primary data emphasizes that indirect taxation disproportionately burdens low-income households, research by Chaloupka *et al.* (2012) ^[3] and Verguet *et al.* (2020) ^[11] argues that tobacco tax hikes are ultimately progressive in health outcomes. Because low-income consumers possess higher price elasticity, tax-induced price rises prompt them to quit or reduce consumption at higher rates than wealthy consumers, thereby conferring greater long-term health cost savings and life-expectancy gains on impoverished populations. Additionally, secondary studies emphasize that tax increases may inadvertently drive consumers toward illicit, duty-evaded cigarettes or unregulated bidis, offsetting intended reduction in health externalities unless strict anti-smuggling enforcement is maintained.

The secondary findings mirror international microeconomic studies, such as Chaloupka *et al.* (2012) ^[3], which demonstrate that modest nominal excise increases on inelastic goods fail to induce substantial demand shifts unless tax structures generate meaningful price shocks. Furthermore, Joseph & John (2020) ^[7] documented that India's GST and excise framework consistently produces modest price increments that fail to lower cigarette affordability over time.

d. Synthesis of Findings

Synthesizing secondary literature with retail market data reveals a clear structural gap: while fiscal revenues increase following duty revisions, the actual price signal delivered to consumers is too weak to alter addictive consumption patterns across higher-income cohorts. The structural design of tiered taxes in India allows consumers and manufacturers to adjust without reducing total demand at the aggregate level.

e. Explanation of Relationships / Causes

The weak price signal is caused by market structure and product pricing strategies. Tobacco manufacturers like ITC Limited possess significant market power, allowing them to adjust pricing across multi-tiered product lines. Minor duty changes are easily absorbed or distributed across product categories, preventing a significant retail price jump at local point-of-sale vendors (*paan* shops).

f. Alternative Interpretations

An alternative interpretation suggested by health economists (e.g., Verguet *et al.*, 2020) ^[11] is that even minor price adjustments contribute positively over the long term by establishing an upward price trajectory. Furthermore, while aggregate demand appears inelastic, price-sensitive consumers may experience cumulative behavioral changes when tax hikes are sustained over successive budget cycles.

g. Significance of Findings

These findings signify that indirect tax policy cannot rely on modest, incremental rate increases to resolve public health externalities. To bridge the gap between marginal private costs and marginal external costs, tax policy must be calibrated to exceed inflation and income growth thresholds drastically.

12. Discussion

a. What the Findings Mean

The empirical and secondary evidence shows that the 16% NCCD increase in Union Budget 2025–26 achieved only partial, highly asymmetric success. While overall daily smoking prevalence in the South Mumbai sample dropped from 48.7% to 26.9%, this reduction was concentrated entirely among low-income domestic workers and informal daily-wage earners. For middle- and high-income professionals, daily consumption remained largely unchanged.

b. Connection to Theories

This outcome directly validates microeconomic theories of demerit goods and Price Elasticity of Demand (PED). Because cigarettes cause chemical addiction, consumer demand is price-inelastic ($PED < 1$). A minor price increase (1–3%) shifts the supply curve upward to $MPC + 16\%$ Tax, but fails to contract quantity demanded to the socially optimal level Q_{opt} , leaving a residual deadweight loss (NEW DWL) on society as shown in figure -1.2.

c. Connection to Literature

The results strongly align with Chaloupka *et al.* (2012) ^[3] regarding the differential price elasticity across income tiers, as lower-income groups demonstrated higher sensitivity to price increases. The findings also align with Joseph & John (2020) ^[7] regarding the failure of nominal tax adjustments to reduce overall cigarette affordability in India.

d. Agreement/Disagreement with Previous Research

The empirical data agrees with literature asserting that indirect sin taxes are financially regressive, as low-income households bear a disproportionate financial strain. However, it partially diverges from studies like Agrawal *et al.* (2013) ^[1], which suggest that lower-income urban populations predominantly consume bidis rather than manufactured cigarettes; in ultra-dense commercial centres like South Mumbai, single-stick cigarette purchases remain widespread among low-income domestic workers.

e. Implications of Findings

The primary implication is that fiscal policy alone, when limited to small tax adjustments, is insufficient to eliminate negative consumption externalities. To achieve allocative

efficiency and health cost containment, fiscal tax hikes must exceed 50% to meet the WHO 75% tax share benchmark. Furthermore, taxation must be integrated with non-price measures, including expanded public smoking bans, targeted cessation programs, anti-illicit trade enforcement, and public education campaigns.

13. Conclusion

In conclusion, the investigation into the extent to which a 16% increase in cigarette tax under the tobacco control measures in Union Budget (2025–26) effectively reduces negative consumption externalities and health expenditures in South Mumbai demonstrates that the policy achieves only limited, highly asymmetric success. Primary empirical data supported by GDC mathematical modeling ($r = -0.1282$) proves that the overall demand for cigarettes remains highly price-inelastic across the aggregate population. Because the 16% NCCD duty hike translated to a negligible retail price rise of less than Rs 1 per stick (a 1–3% price increase), middle- and high-income smokers in South Mumbai absorbed the cost without altering their daily consumption habits, thereby leaving secondhand smoke emissions and societal health burdens largely uncorrected.

However, the policy exhibited pronounced socioeconomic asymmetry. Low-income domestic workers, who represented 41% of the surveyed sample, demonstrated significant price sensitivity, driving a reduction in overall daily smoking prevalence from 48.7% to 26.9%. While this indicates localized demand contraction among low-income cohorts, it simultaneously underscores the regressive nature of indirect sin taxes. For low-income individuals who remain addicted, higher cigarette prices diminish disposable income available for essential merit goods such as healthcare, education, and adequate nutrition. Secondary data confirms that without reaching the WHO-recommended 75% tax share threshold, incremental tax hikes function primarily as fiscal revenue generators for the state rather than comprehensive solutions to market failure. To achieve true allocative efficiency and substantive public health improvements, government policy must evolve beyond minor tax adjustments. Future Union Budgets should implement bold, substantial tax increases exceeding 50% alongside structural tax simplification to prevent product substitution. Crucially, fiscal tax measures must be integrated with non-price policy mechanisms, including strictly enforced public smoking bans, targeted community anti-smoking education, fully subsidized nicotine replacement therapies for low-income workers, and stringent anti-illicit trade regulation. Only through a holistic, multi-pronged approach can India effectively internalize negative consumption externalities and reduce the long-term healthcare expenditure burden of its urban residents.

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