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## Smoke Screen: Estimating the Tax Pass-Through to Cigarette Prices in Pakistan

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# Smoke Screen: Estimating the Tax Pass-Through to Cigarette Prices in Pakistan

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**Abstract**

This paper estimates the magnitude and speed of tax pass-through across tobacco products at different price points in Pakistan by using a novel dataset of monthly observations on cigarette prices in 50 cities during the period 2004-2015. The pass-through of cigarette taxes to retail prices is found to occur within two months, but is mostly incomplete in magnitude. On average, a one-rupee tax increase is estimated to lead to an increase of only PRs 0.8 in retail cigarette prices. This is driven by the fact that tobacco manufacturers absorb a significant part of the tax increase. For the premium brand, however, I observe full pass-through, indicating possibilities of different demand elasticities across product tiers. These findings are likely to be attributable to competitive market pressures, especially at the budget end of the price spectrum, possibly stemming from changing consumption patterns with greater awareness of health risks as well as the impact of illicit domestic production.

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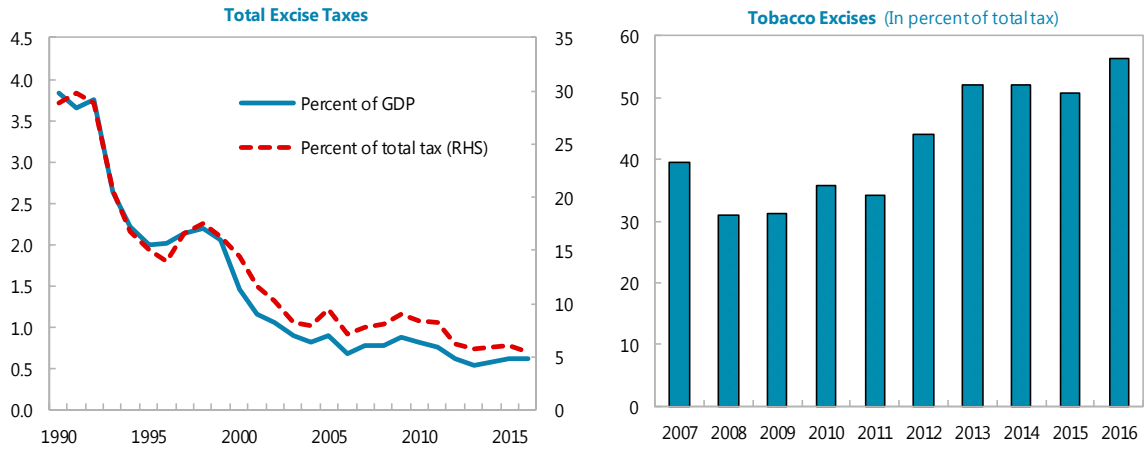
## I. INTRODUCTION

**Tax policy and administration can have a direct effect on retail prices and influence the behavior of consumers.** The effective taxation of tobacco products helps raise additional revenue and functions as a public health policy tool to discourage cigarette consumption. Empirical studies find a robust relationship between the incidence of cigarette taxation and smoking-related health problems.[1] However, while the use of tobacco taxes could be highly effective in reducing the prevalence of smoking, this channel depends partly on tobacco companies' strategy to pass tax increases to the prices paid by consumers across the cigarette price spectrum. The pass-through rate of a tax to the retail price depends on a wide range of factors including economic conditions as well as the extent to which producers choose to absorb tax increases by adjusting the profit margin. Therefore, the impact of tax changes on cigarette prices is critical for policymakers who are concerned about the implications for revenue collection and negative externalities of smoking. This issue also raises another interesting question on whether producers treat budget brands differently than premium brands and, considering the price elasticity of cigarette demand, opt not to shift the full extent of tax increases to the prices paid by consumers.

**In Pakistan, the tobacco sector accounts for about 4 percent of sales tax and excises collected at the federal level, but over 50 percent of total excises.** Pakistan is a major tobacco-producing country with historically high smoking prevalence rates. About 40 percent of the male population and 9 percent of the female population smoke regularly, consuming over 82 billion cigarettes on an annual basis. Pakistan's cigarette sector is dominated by two producers

**Figure 1. Tobacco Taxation in Pakistan**




Sources: Federal Board of Revenue; and author's calculations.

[1] Chaloupka, Straif, and Leon (2010), Bader, Boisclair, and Ferrence (2011), Chaloupka, Yurekli, and Fong (2012), and Kostova, Chaloupka, and Shang (2015) review the literature and provide evidence on the relationship between tobacco taxes, consumption and health outcomes. These findings indicate that a 10 percent increase in cigarette prices lowers consumption by about 4-6 percent, leading to significant improvements in public health.

owned by multinational tobacco firms. While the two firms have an overwhelming presence in the cigarette market, the level of concentration at the retail level is diluted by smuggling and illicit domestic production. To raise revenue and deter smoking as a public health objective, Pakistan has a minimum price of PRs 44 per pack of 20 cigarettes and imposes a complex multi-tiered tax structure with thresholds on tobacco products. In addition to the standard General Sales Tax (GST), the Federal Board of Revenue (FBR) levies a mix of *ad valorem* (percentage of product value) and *specific* (monetary value per quantity) excise taxes on factory-made cigarettes at different rates depending on price.[2] As shown in Figure 1, while the share of excise taxes declined from about 30 percent of total tax revenue in 1990 to 5.5 percent in 2016, the tobacco sector still accounts for 4 percent of sales tax and excises collected at the federal level, and the share of tobacco excises stands at 56 percent of total excise taxes (up from 36 percent in 2010).

**The extent to which taxes are passed through depends on demand and supply conditions and market competitiveness.** Standard economic theory predicts that taxes are fully passed through to consumers in a competitive market where firms are price takers. In less competitive markets, however, taxes can be shifted more (less) than proportionally to retail prices (Krzyzaniak and Musgrave, 1963; Stern, 1987; Delipalla and Keen, 1992). Ultimately, the amount of tax pass-through is an empirical question, and the extent of market power is not alone enough to explain the degree of tax pass-through, especially in the case of addictive tobacco products. While tax related and other price increases can lead to reductions in consumption, consumers can substitute away from products (and brands) that experience retail price increases at a higher rate.[3] Empirical studies in this area, however, yield contradictory findings depending on country- and sector-specific factors. According to Poterba (1996) and Besley and Rosen (1999), for example, retail prices in competitive markets move approximately in line with tax changes, but there is usually overshifting (raising the retail price more than the tax increase) in less competitive markets. With regards to the incidence of cigarette taxes, while Barzel (1976) and Harris (1987) report overshifting of the tax burden, more recent studies find either full pass-through (Espinosa and Evans, 2013) or undershifting (Harding, Leibtag, and Lovenheim, 2010). Sullivan and Dutkowsky (2012) reason that differences in data, time periods, control variables and estimation methods may explain the substantial variation in these empirical findings.

**The objective of this paper is to estimate and compare the speed and magnitude of the pass-through across cigarette brands at different price points in Pakistan.** There is no existing study investigating the extent to which tobacco taxes are passed through cigarette prices at the retail level in Pakistan. This paper is therefore the first attempt to shed light on the pass-through of cigarette taxes, combining two unique panel datasets to conduct the empirical

[2] A three-tier combination of *ad valorem* and *specific* excises with "price thresholds" was replaced in 2013 with a two-tier *specific* excise determined according to a single price threshold. This tiered system aims to keep cigarette prices affordable at the budget end of the product range and to generate more revenue from higher price brands.

[3] Greater ease of substitution, for example, between two cigarette brands would reduce the pass-through of cigarette taxes to retail prices.

analysis. The first contains product- and city-level monthly price data on four major factory-made cigarette brands in 50 cities across Pakistan between July 2004 and December 2015. While tobacco producers issue a "recommended retail price" for each cigarette brand, the final price paid by consumers is determined by the retailers in a given city. The second dataset is constructed by converting cigarette-related tax measures implemented by the FBR into the rupee-equivalent value over the same period. The analysis has important implications for maximizing revenue generated by tobacco-related taxes and assessing the extent to which current polices limit negative externalities associated with smoking.

**The empirical examination indicates that the pass-through of cigarette taxes to retail prices is fast but incomplete.** The pass-through of tax changes to the prices paid by consumers is almost instantaneous, with over 90 percent of the pass-through occurring contemporaneously over a two-month horizon. Its magnitude, however, is mostly incomplete across four major brands included in this analysis. A one-rupee increase in cigarette taxes is found to lead to an increase of only PRs 0.8 in retail cigarette prices, on average. In other words, cigarette taxes in Pakistan are undershifted by tobacco manufacturers to the prices paid by consumers. The effect of tax increases on retail cigarette prices is statistically significant for all four brands, and the magnitude of the pass-through coefficient varies for four cigarette brands included in the analysis. Tax pass-through is almost complete for the premium cigarette brand and significantly higher compared to budget and mid-range brands, indicating possibilities of different demand elasticities across product tiers. These findings may be attributable to competitive market pressures, especially at the budget end of the price spectrum, stemming from changing consumption patterns with greater awareness of health risks as well as the impact of smuggling and illicit domestic production. Accordingly, to achieve both revenue and health policy objectives, tax policy design should accordingly take into account specific market conditions across product tiers and administrative challenges in addressing illicit cigarette trade.

**The rest of this paper is structured as follows.** Section II describes the dataset used in this paper and provides a summary of descriptive statistics. Section III gives a brief description of the estimation methodology and discusses the main empirical results. Section IV concludes with a discussion of the magnitude of the tax pass-through rate and its policy implications.

## II. DATA

**The dataset used in this paper consists of monthly observations on four major cigarette brands in 50 cities during the period July 2004-December 2015.** The balanced panel of city-level retail cigarette price data is drawn from the Pakistan Bureau of Statistics (PBS). The PBS conducts monthly price surveys of consumer goods and services in a large number of cities to compute the Consumer Price Index (CPI), which include price information on four major factory-made cigarette brands. The coverage of cities in the CPI sample changed in July 2008 from 35 cities to 40 cities, which are presented in Appendix Table A1. Although the dataset covers 50 cities over the period July 2004-December 2015, additions and deletions of localities in the CPI basket keep the effective number of 40 cities in a given month. The "recommended retail price"

figures are obtained from Philip Morris International for K-2 and Morven Gold and from Pakistan Tobacco Company (subsidiary of British American Tobacco) for Capstan and Gold Leaf.

**Tax policy changes are obtained from the FBR and form the basis for the constructed series converting all cigarette taxes into the rupee-equivalent value.** There are two types of excises taxes—*specific* and *ad valorem*. A *specific* excise tax is levied based on quantity (e.g. a fixed amount per cigarette or weight of tobacco), while an *ad valorem* excise is levied based on value (e.g. a percentage of the factory price or retail price). Tobacco products are also subject to the standard GST rate, which is currently set at 17 percent.

**While tobacco producers issue a "recommended retail price" for each brand, the final price is determined by the retailer.** As there are more than 600,000 retail outlets selling cigarettes across Pakistan, cigarette prices show significant variation across four factory-made brands and over the period from July 2004 to December 2015. The sample mean of the budget brand (K-2) was PRs 21 per pack of 20 cigarettes with a minimum of PRs 6 and a maximum of PRs 60, while the average price of for a pack of premium-brand cigarette (Gold Leaf) was PRs 66 with a minimum of PRs 37 and a maximum of PRs 135. The prices of two mid-range brands (Capstan and Morven Gold), on the other hand were comparable and moved more or less in tandem over time from a minimum of PRs 14 to a maximum of PRs 70 per pack of 20 cigarettes. Cigarette taxes are determined by the FBR and accordingly vary over time due to periodic changes in excise taxes and the standard GST rate and occasional revisions in the structure of excises. Tobacco manufacturers pay cigarette taxes on the basis of the "recommended retail price" for each brand and the tax liability is created at the time of sale to distributors.

**It is important to analyze the time-series properties of the data to avoid spurious results due to the presence of unit roots.** I test for the presence of a unit root in all variables by applying the Im-Pesaran-Shin (2003) procedure, which is widely used in the empirical literature to conduct a panel unit root test. As expected, price variables are highly persistent and non-stationary in levels. Accordingly, the regression model is estimated in first differences.[4]

## III. Estimation Strategy and Results

**The estimation strategy aims to capture the dynamics of the brand-specific tax pass-through over time, as price adjustments may not occur instantaneously.** The purpose of the econometric analysis is to analyze the tax pass-through in cigarette prices across 50 cities in Pakistan over the period July 2004-December 2015. Following Benedek, De Mooij, Keen, and Wingender (2015), the pass-through rate of cigarette taxation to the prices paid by consumers is estimated in log differences according to the following panel regression model:

[4] The unit root test results are available upon request.

$$\Delta \ln(price_{c,t}) = \sum_{j=-12}^{12} \beta_j \Delta \ln(tax_{c,t+j}) + \delta \Delta \ln(cpi_{c,t}) + \eta_c + \nu_t + \varepsilon_{c,t}$$

where *price* is the retail price of a pack of 20 cigarettes including all taxes; *tax* is the amount of combined cigarette taxes (*ad valorem* and *specific* excises plus the GST) measured in rupees; and *cpi* is the consumer price index included as a control variable. The subscripts *c* and *t* denote city and time. The model is estimated separately for each cigarette brand in the sample to identify whether producers treat brands across the price spectrum differently in determining the extent of tax pass-through. The coefficient $\beta_j$ measures the fraction of tax changes passed through to consumer prices when adjusting in month *t+j*, with $j \in$ (-12, 12). This approach aims to capture the tax pass-through dynamics over a long time horizon, as producers may opt for adjusting the prices preemptively before the actual change in tax rates or with a lag in the following months after the actual change in tax rates. However, after experimenting with a range of lags and leads, I conclude that there is no preemptive tax-shifting and the adjustment process takes place within two months after a tax increase for all four cigarette brands included in the empirical analysis. Accordingly, the baseline regressions, presented in Table 1, include the coefficients for contemporaneous and t+1 values of cigarette taxation.

**If the cumulative pass-through coefficient is equal to one, the tax increase is fully passed through to consumers.** If $\beta_j$ is greater one, producers overshift of the tax burden. On the other hand, if $\beta_j$ is less than one, there is incomplete pass-through (undershifting) as producers do not fully reflect the tax increase. The coefficients $\eta_c$ and $\nu_t$ denote the time-invariant city effects and the time effects controlling for common aggregate shocks, respectively. $\varepsilon_{c,t}$ is an idiosyncratic error term that satisfies the standard assumptions of zero mean and constant variance. The model is estimated using the fixed effects approach, and robust standard errors are clustered at the city level to account for possible heteroskedasticity.[5]

**The empirical findings, displayed in Table 1, show that the burden of cigarette taxes is mostly undershifted to consumers.** The estimation results show that a one-rupee increase in tobacco taxes leads to an increase of about PRs 0.8 in retail prices on average, controlling for consumer price inflation and fixed effects. In other words, cigarette taxes in Pakistan are undershifted by tobacco manufacturers to the prices paid by consumers. The empirical analysis indicates that the speed of adjustment is almost instantaneous, with over 90 percent of the pass-through occurring contemporaneously (i.e., in the same month of the tax increase). Taken as a whole, the adjustment in cigarette prices following a tax increase happens within two months. The effect of tax increases on retail cigarette prices is statistically significant for all four brands, and the magnitude of the pass-through coefficient varies for four cigarette brands included in the analysis. The estimated tax pass-through coefficients are 0.73 for the budget cigarette brand (K-2), 0.69 and 0.84 for the mid-range brands (Capstan and Morven Gold), and 0.99 for the

[5] The fixed effects estimation is more appropriate than a random effects model as the unobservables captured by the fixed effect are likely to be correlated with the regressors.

premium brand (Gold Leaf). Tax pass-through is almost complete for the premium cigarette brand and significantly higher compared to budget and mid-range brands in Pakistan, indicating possibilities of different demand elasticities across product tiers. To perform robustness checks, I run the regressions excluding outliers and cities with incomplete data[6] and reach results, presented in Appendix Table 2, that reveal a similar pattern of tax pass-through across the product range with higher coefficients.

**Table 1. Tax Pass-Through to Retail Cigarette Prices**

| | *Budget* | *Mid-Range* | | *Premium* |
|---|---|---|---|---|
| **Brand** | **K-2** | **Capstan** | **Morven Gold** | **Gold Leaf** |
| Tax pass-through | | | | |
| Contemporaneous | **0.70*** ** | **0.69*** ** | **0.78*** ** | **0.82*** ** |
| | (0.034) | (0.022) | (0.023) | (0.060) |
| t+1 | 0.03 | 0.00 | 0.06 | **0.16*** |
| | (0.082) | (0.093) | (0.057) | (0.098) |
| CPI | 0.01 | **0.11*** ** | 0.00 | **0.06** ** |
| | (0.042) | (0.033) | (0.031) | (0.027) |
| Fixed effects | Yes | Yes | Yes | Yes |
| Number of observations | 4680 | 4680 | 4680 | 4680 |
| Number of cities | 40 | 40 | 40 | 40 |
| $R^2$ | 0.56 | 0.75 | 0.77 | 0.67 |
| F-statistic | 42.6 | 100.6 | 114.6 | 67.2 |
| [*p* -value] | 0.00 | 0.00 | 0.00 | 0.00 |

Note: Robust standard errors are reported in parantheses. ***, **, and * denote significance at the 1, 5, and 10 percent levels. All regressions include a constant term, which is not displayed in the table.
Sources: Author's calculations.

**The results presented in this paper, including the variation in tax pass-through across the price spectrum, may reflect a range of factors.** The tax-shifting behavior of tobacco producers are likely to be attributable to competitive market pressures, especially at the budget end of the price spectrum, stemming from changing consumption patterns with greater awareness of health risks and intensified efforts to control the distribution and pricing of cigarettes. First, the annual volume of cigarette consumption declined from 84.1 billion sticks in 2009 to 82.4 billion in 2015. Second, smuggling and illicit domestic production have a growing impact on the cigarette market. Illicit cigarettes are reportedly priced at an average of PRs 27 per pack, well below the minimum price of PRs 44 imposed by the government and the price of the cheapest brand (PRs 60). According to Nielsen (2016), the share of illicit cigarettes doubled from 14 percent in 2010 to 28 percent in 2015, putting more pressure on the country's legitimate tobacco producers to absorb tax increases, especially on budget and mid-range cigarette brands.

[6] This creates a balanced panel covering the period 2004-2015, but reduces the number of cities from 40 to 25.

## IV. CONCLUSION

**The pass-through of cigarette taxes to retail prices is found to occur within two months, but it is mostly incomplete in magnitude.** This paper estimates the magnitude and speed of tax pass-through across tobacco products at different price points in Pakistan by using a novel dataset of monthly observations on cigarette prices in 50 cities during the period 2004-2015. The pass-through of tax changes to the prices paid by consumers is almost instantaneous, with over 90 percent of the pass-through occurring contemporaneously and as whole taking place over a two-month horizon. The magnitude of tax pass-through, however, is mostly incomplete, as producers undershift tax increases to the prices paid by consumers. On average, a one-rupee increase in cigarette taxes is found to lead to an increase of only PRs 0.8 in retail cigarette prices. Across the price spectrum, tax pass-through is almost complete for the premium cigarette brand and significantly higher compared to budget and mid-range brands, indicating possibilities of different demand elasticities across the product range. These empirical findings are likely to be attributable to competitive market pressures, especially at the budget end of the price spectrum, stemming from changing consumption patterns with greater awareness of health risks as well as the impact of illicit domestic production.

**Tax policy and administration should take into account cigarette market conditions across the price spectrum and challenges in addressing illicit trade.** The structure of cigarette taxes is critical in determining the relative prices of different tobacco products and brands across the price spectrum and thereby influencing the behavior of consumers within a country. While tax policy can help reduce negative externalities associated with tobacco consumption, the taxation model needs to avoid providing incentives to switch down to cheaper cigarette brands in response to tax related and other price increases. Furthermore, consumers' price sensitivity and brand switching behavior and manufacturers' pricing strategy, including brand repositioning, differential tax shifting and cross-brand price subsidy, can have potential consequences of tax revenue collection at an aggregate level.[7] To this end, Pakistan should adopt a simpler structure of taxation without tiers to have a greater influence on the relative prices of different tobacco products across the price bands and strengthen administrative efforts against smuggling and illicit domestic production of cigarettes.

[7] The complexity of tier-based taxation of tobacco products raises vulnerability to tax avoidance as producers differentiate brands in order to qualify for lower tax brackets.

## Appendix Table 1. List of Cities

| Number of Cities | Base Year | |
|---|---|---|
| | 2000/01 | 2007/08 |
| 1 | Abbotabad | Abbotabad |
| 2 | Attock | Attock |
| 3 | Bahawalnagar | Bahawalnagar |
| 4 | Bahawalpur | Bahawalpur |
| 5 | Bannu | Bannu |
| 6 | D.G. Khan | D.G. Khan |
| 7 | D.I. Khan | D.I. Khan |
| 8 | Faisalabad | Dadu |
| 9 | Gujranwala | Dera Mrd. Jamali |
| 10 | Hyderabad | Fisalabad |
| 11 | Islamabad | Gawadar |
| 12 | Jehlum | Gujranwala |
| 13 | Jhang | Hyderabad |
| 14 | Karachi | Islamabad |
| 15 | Khuzdar | Jehlum |
| 16 | Kunri | Jhang |
| 17 | Lahore | Karachi |
| 18 | Larkana | Khuzdar |
| 19 | Loralai and Cantt | Lahore |
| 20 | Mardan | Larkana |
| 21 | Mianwali | Loralai and Cantt |
| 22 | Mirpur Khas | Mardan |
| 23 | Multan | Mianwali |
| 24 | Nawabshah | Mingora |
| 25 | Okara | Mir Pur Khas |
| 26 | Peshawar | Mithi |
| 27 | Quetta | Multan |
| 28 | Rawalpindi | Muzaffargarh |
| 29 | Samundari | Nawabshah |
| 30 | Sargodha | Peshawar |
| 31 | Shahdadpur | Quetta |
| 32 | Sialkot | Rahim Yar Khan |
| 33 | Sukkur | Rawalpindi |
| 34 | Turbat | Sahiwal |
| 35 | Vehari | Sargodha |
| 36 | | Sialkot |
| 37 | | Sukkur |
| 38 | | Turbat |
| 39 | | Vehari |
| 40 | | Wazirabad |
| | Removed in July 2008 | Added in July 2008 |

Source: Pakistan Bureau of Statistics.

**Appendix Table 2. Tax Pass-Through to Retail Cigarette Prices**

(Balanced panel excluding cities with incomplete data)

| | *Budget* | *Mid-Range* | | *Premium* |
|---|---|---|---|---|
| **Brand** | **K-2** | **Capstan** | **Morven Gold** | **Gold Leaf** |
| Tax pass-through | | | | |
| Contemporaneous | **0.77*** ** | **0.73*** ** | **0.81*** ** | **0.89*** ** |
| | (0.037) | (0.022) | (0.023) | (0.027) |
| t+1 | 0.03 | 0.00 | **0.11*** | **0.18**** |
| | (0.088) | (0.096) | (0.056) | (0.093) |
| CPI | 0.01 | **0.10**** | 0.04 | **0.11*** ** |
| | (0.054) | (0.040) | (0.036) | (0.031) |
| Fixed effects | Yes | Yes | Yes | Yes |
| Number of observations | 3400 | 3400 | 3400 | 3400 |
| Number of cities | 25 | 25 | 25 | 25 |
| $R^2$ | 0.57 | 0.77 | 0.81 | 0.74 |
| F-statistic | 31.2 | 78.8 | 100.2 | 68.5 |
| [*p* -value] | 0.00 | 0.00 | 0.00 | 0.00 |

Note: Robust standard errors are reported in parantheses. ***, **, and * denote significance at the 1, 5, and 10 percent levels. All regressions include a constant term, which is not displayed in the table.

Sources: Author's calculations.

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