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Economic Research Informing  
Tobacco Control Policy

# *Affordability of Tobacco Products*

## The Case of Cigarettes

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HEALTH RESEARCH  
AND POLICY**



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## Suggested Citation

Blecher E. Affordability of Tobacco Products: The Case of Cigarettes. Tobacconomics White Paper. Chicago, IL: Tobacconomics, Health Policy Center, Institute for Health Research and Policy, University of Illinois at Chicago, 2020. [www.tobacconomics.org](http://www.tobacconomics.org)

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This publication is funded by Bloomberg Philanthropies.

## About Tobacconomics

Tobacconomics is a collaboration of leading researchers who have been studying the economics of tobacco control policy for nearly 30 years. The team is dedicated to helping researchers, advocates and policymakers access the latest and best research about what is working—or not working—to curb tobacco consumption and its economic impact. As a program of the University of Illinois at Chicago, Tobacconomics is not affiliated with any tobacco manufacturer. Visit [www.tobacconomics.org](http://www.tobacconomics.org) or follow us on Twitter [www.twitter.com/tobacconomics](https://www.twitter.com/tobacconomics).

## Introduction

Increases in taxes that result in increased prices reduce tobacco use (IARC, 2011). Tobacco taxes are considered the most effective tobacco control policy and have the ability to reduce tobacco use dramatically over time. However, rapid economic growth can offset increases in taxes and prices and so limit their impact on consumption, and in some cases even lead to increases in tobacco use. Simultaneously considering the impact of price and income introduces the concept of affordability, which is broadly defined as the ratio of price to income. The purpose of this White Paper is to introduce tobacco tax practitioners to the concept of affordability, and to explain how to measure and interpret it and how to apply the concept to the implementation of effective tobacco tax policies.

The relationship between price and consumption is formalized in economics by the demand function. As the price of a product increases, consumers demand less of it; as the price of a product decreases, consumers demand more of it. This relationship is summarized by a useful metric, the price elasticity of demand, which measures the percentage change in consumption as a result of a percentage change in price. If the change in consumption is less than proportional to the change in price, the product is price inelastic; if the change in consumption is more than proportional to the change in price, the product is price elastic.

Tobacco is relatively price inelastic, and the most recent research review suggests that the elasticity is around -0.4 for high-income countries (HICs) and between -0.4 and -0.8 for low- and middle-income countries (LMICs) (IARC, 2011). This means that for every 10 percent increase in price, consumption is expected to decline by approximately 4 percent in HICs and between 4 and 8 percent in LMICs, all else, including income, being constant.

Income, as well as price, influences demand. Generally, an increase in income causes an increase in demand, and thus, an increase in consumption. This increase in demand is an increase in the demand at each and every price, a so-called outward shift of the demand curve. This means that for each price, consumers now consume more of that product. For most goods and services, increases in income allow consumers to consume more. When additional income is spent on goods and services like health and education, it enhances human well-being. In contrast, additional income spent on goods like tobacco, which are harmful to health and cause significant negative externalities, can lead to a considerable welfare loss.

Increases in income, however, vary across countries and over time. From the 1960s until the end of the 20th century, economic growth rates in HICs and LMICs were highly correlated. Figure 1 shows the real per capita GDP growth rates from 1961 to 2018. In 28 out of the 39 years from 1961 to 1999, real per capita GDP growth in HICs exceeded that of LMICs. From 2000 to 2018, real per capita GDP growth in HICs has been lower than in LMICs in all 19 years. That is a significant change of fortunes and has been driven by dramatic increases in economic growth in LMICs. Per capita GDP growth in LMICs between 2000 and 2018 averaged 4.0 percent per year, significantly higher than 1.3 percent and 1.0 percent in the 1980s and 1990s, respectively.

As countries experience rapid rates of economic growth, such as many LMICs have experienced in the last two decades, increases in taxes that increase prices in line with the inflation rate may not be sufficient to reduce tobacco use. Hence the focus has shifted from tax increases that increase the retail price to tax increases that reduce the affordability of cigarettes over time.

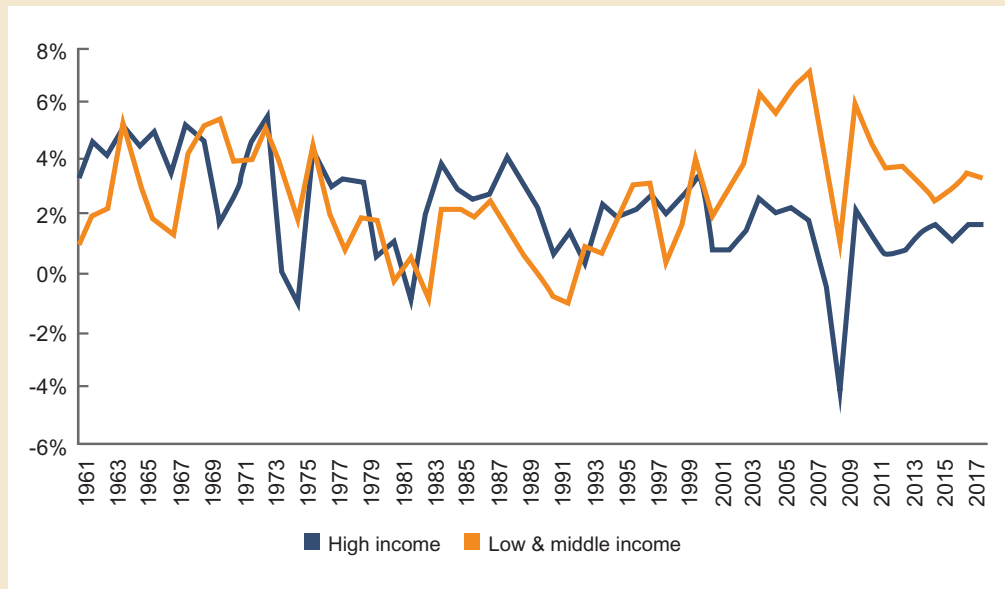
The purpose of this White Paper is to describe and update the recent trends in

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*As countries experience rapid rates of economic growth, the focus of tobacco taxation must shift from tax increases that increase the retail price to tax increases that reduce the affordability of cigarettes over time.*

**Figure 1**

**Trends in Global Economic Growth (Real per capita GDP), 1961–2018**



Source: World Bank World Development Indicators.

affordability globally and examine the use of affordability as a metric in tobacco tax policy. This involves a discussion of the appropriate methods, the presentation and interpretation of results, and the application of affordability as a benchmark for tobacco tax policy practice. Specifically, it is designed to assist practitioners to better understand and apply the concept of tobacco affordability in their work. Furthermore, it will highlight the interpretation and appropriate uses of the concept. The findings of the White Paper can be condensed into the following key messages:

- Rapid economic growth in many low- and middle-income countries has made cigarettes more affordable over time, which has been driving increases in tobacco use in these countries.

- Long-term trends show that cigarettes have become less affordable in high-income countries; however, in low- and middle-income countries cigarettes have generally become more affordable. This trend has changed in recent years with greater progress being made in reducing cigarette affordability in low- and middle-income countries.
- Increases in tobacco taxes are the policy tool that governments use to raise prices faster than income so as to reduce the affordability of cigarettes over time.
- Countries that have increased taxes to the extent that it has reduced the affordability of cigarettes have experienced significant reductions in tobacco use. Conversely, countries that have not experienced declines in cigarette affordability have not experienced declines in tobacco use.

- Tax increases by themselves may not be sufficient to reduce affordability. Countries need to ensure that taxes are structured appropriately to ensure that increases in taxes are able to increase prices and reduce affordability. A greater reliance on uniform specific taxes will ensure that tax increases result in the largest reductions in affordability.
- Tracking the affordability of cigarettes over time is important to ensure that affordability becomes an anchor for regular (for example, annual) tax changes, ensuring that cigarettes become less affordable over time.
- One should take caution when interpreting affordability statistics.

Comparisons of affordability within a particular country over time are important and useful, but comparing affordability between countries has limited use. Furthermore, cross-country comparisons of affordability have been manipulated by the tobacco industry in order to oppose tobacco tax increases.

The White Paper is divided into four sections. The first briefly describes the literature and reviews the most recent global trends. The second presents an update of the most recent trends in affordability. The third presents a series of case studies for various countries, including several that have increased taxes and reduced affordability, as well as other



*A greater reliance on uniform specific taxes will ensure that tax increases result in the largest reductions in affordability.*

**Table 1**  
**Selected Summary of Global Affordability Literature**

Authors	Year	Countries	Time	Methods	Data	Results
Lal and Scollo	2002	16 HICs	1995–2002	Big Mac Index	EIU	Became relatively more expensive (less affordable) than Big Mac hamburgers in 15 of 16 countries
Guindon et al.	2002	25 HICs, 11 LMICs	1990–2000	MoL	EIU, UBS	Less affordable in 76 percent of HICs, 64 percent of LMICs
Blecher and van Walbeek	2004	28 HICs, 42 LMICs	1990–2001	RIP	EIU, World Bank	Less affordable in 61 percent of HICs, 43 percent of LMICs
Kan	2007	60 cities	2006	Similar to MoL	EIU, UBS	Affordability “remained high” in most cities
Blecher and van Walbeek	2009	32 HICs, 45 LMICs	1990–2006	RIP, MoL	EIU, World Bank, UBS	More affordable since 1990 in LMICs and at an increasingly rapid rate since 2000
Yurekli et al.	2016	40 HICs, 46 LMICs	1990–2012	RIP	EIU, World Bank	Less affordable in 55 percent of HICs and 28 percent of LMICs since 2008, less affordable in all income groups

countries that have seen rapid increases in affordability. The fourth section focuses on applications of affordability in the context of tobacco tax policy, including misrepresentation by the tobacco industry, and the use of the affordability concept to advance tobacco tax policy.

## Measuring Affordability

The literature on affordability has developed methods for measuring affordability and has assessed the trends in affordability of tobacco products since the early 1990s. Generally, affordability has been defined as the ratio of price to income. Various measures of price and income can be used, each with distinct advantages and disadvantages. Various metrics have also been developed, mostly aligned with the data sources used.

The two most widely used metrics are the Relative Income Price (RIP) (Blecher and van Walbeek, 2004) and the Minutes of Labor (MoL) (Guindon et al., 2002). The RIP is defined as the percentage of per capita GDP required to purchase 100 packs of cigarettes. The MoL method estimates the minutes of work required to purchase a pack of cigarettes. Table 1 shows a selection of important contributions to the global affordability literature. This shows the development of the literature over time and how it has increased the coverage of countries as well as the changing trends in affordability over time.

These analyses vary not only in the metric used but also in data used. For price data, Blecher and van Walbeek (2004) use the lowest price available, since this describes the affordability of the most affordable cigarette. The World Health Organization (WHO) use the most popular price category when measuring with the RIP method, since this applies to the largest segment of the market. A further alternative price measure is the weighted average price. Blecher and van Walbeek (2004) use price data from the Economist

Intelligence Unit (EIU). This database collects the prices of two cigarette brands (Marlboro or nearest equivalent and a local brand) in two retail settings (supermarket and mid-priced store). The data are collected on a city level, but the analysis is conducted at the country level. If only a single city is included, then it represents the country. If multiple cities are included, the simple average is used. However, an additional city added to the series after the start is not included in the average. They use the lowest of the four prices.

Income should always focus on individual income and can range from quite narrow to very broad. Blecher and van Walbeek (2004) use per capita GDP as the measure of income as this is available for almost all countries in all years and is the broadest measure of income. Per capita GDP data are extracted from the World Bank's World Development Indicators database. In order to estimate the RIP, the data are collected and analyzed in local currencies. In some countries and years where there were problems with data resulting from macroeconomic shocks, however, prices and income were substituted in US dollars. Guindon et al. (2002) use wage data, which are more tangible but are impeded by the frequency of data (globally comparable data are only available every three years) and coverage. Wage data may also make international comparability difficult.

For the analysis and comparison of nominal and real prices all analyses are conducted in US dollars. Consumer price index data are also sourced from the World Bank's World Development Indicators database to convert nominal prices into real prices (to adjust for inflation).

When estimating large cross-country models of affordability, it is appropriate to use the same definition of price and income for all countries in all years. This



ensures comparability across country and time. This might affect the choice of data as one might wish to select a data source that gives data for the greatest number of countries. However, if the goal is to measure affordability in a single country over time, the definition of price and income may differ since one only requires intertemporal comparability in a single country. This may seem trivial, but it is a necessary distinction as it is important to recognize that locally sourced data may have a higher degree of accuracy and precision.

The literature has generally focused on national-level or aggregate estimates of affordability that allow comparison over time. More recently, individual country studies have begun to emerge that estimate and analyze not only affordability over time but also the variation of affordability within a country at the individual level, generally across income groups. This analysis is useful, as it reveals how variation in cigarette prices and inequalities in income within a country influences aggregate tobacco use. The policy implications are significant, since tax structures dramatically affect variation in prices within a country. Poorly designed tax structures, including *ad valorem* systems and tiered systems, result in greater variation in prices, which encourages consumers to trade down to cheaper products in response to price increases. The most notable contributions to this literature are Nargis et al. (2019) and Partos et al. (2019), which investigate affordability variations within Bangladesh and the United Kingdom, respectively, and Nargis et al. (2019) and Hu et al. (2019), which investigate affordability variations within China.

## Trends in Affordability

Table 1 also shows the results in prior literature. The conclusion from prior literature is that while cigarettes have been becoming less affordable in HICs over time,

they have been becoming more affordable in LMICs with this trend accelerating in the 2000s. However, the most recent literature suggests that this is no longer the case and cigarettes may be becoming less affordable over time in all income groups.

The purpose of this section is to update these trends to examine them in more detail using updated data from 1990 to 2018, applying the RIP methodology and data replicating and updating Blecher and van Walbeek (2004). There are 88 countries in the sample, but this number drops as low as 66 in the first year due to the lack of available data. Of the 88 countries, 41 are HICs and 47 are LMICs based on the World Bank's 2018 income classifications.

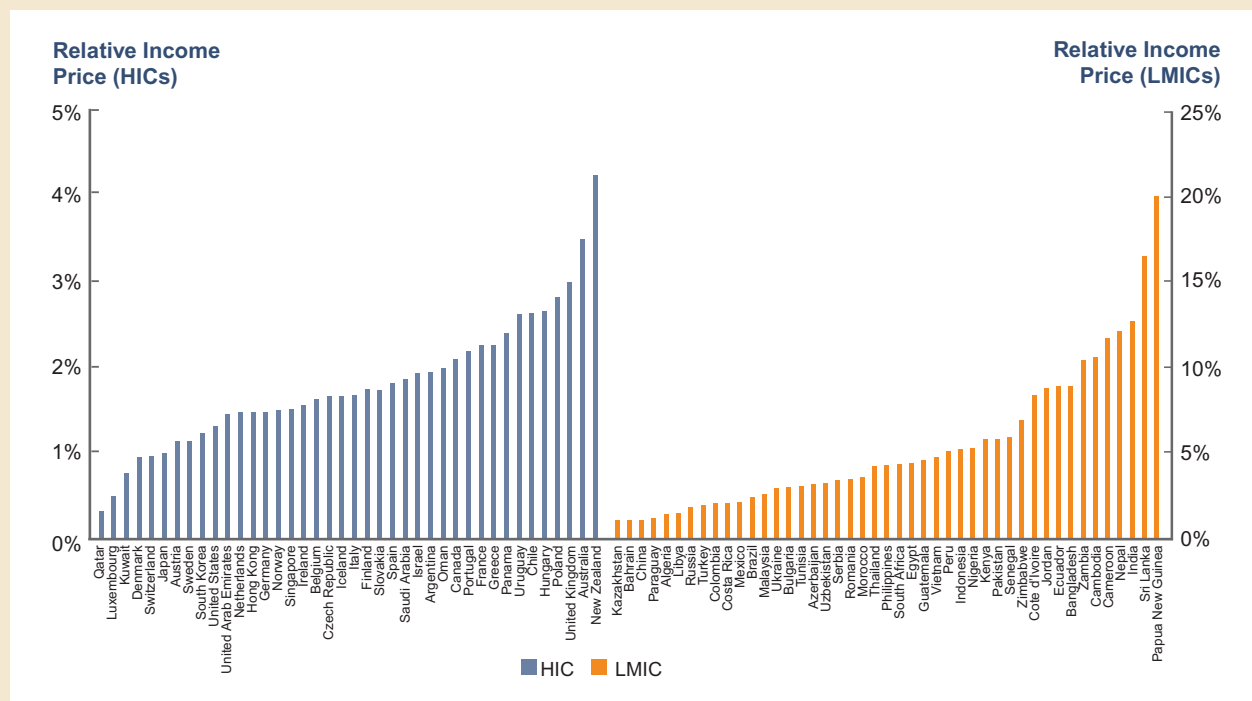
Figure 2 shows the distribution of the RIP for all countries in the sample, ordered from most affordable to least affordable, within two income categories (HICs and LMICs). In 2018, the most affordable country for smokers is Qatar, in which only 0.3 percent of per capita GDP is required to purchase 100 packs of cigarettes. The least affordable country is Papua New Guinea, with a RIP of 40.9 percent. The figure is drawn with separate axes for HICs and LMICs. The reason for this is the large difference between the RIP in HICs and LMICs, driven mostly by the large differences in per capita GDP between HICs and LMICs. In addition to the between country differences, one can see substantial variation within each income group.

One should be cautious when comparing RIP between two countries since the difference in RIP is determined more by the difference in per capita GDP than by the difference in price. This variation can be measured by the coefficient of variation (the ratio of the standard deviation to the mean) of prices and per capita GDP. The higher the value of the statistic, the greater the variation. In 1990 it was 0.78 and 1.16 for prices and per capita GDP, respectively, and by 2018 this was 0.88 and 1.05, respectively.



*If the goal is to measure affordability in a single country over time, locally sourced data may have a higher degree of accuracy and precision than data sourced from multiple countries.*

**Figure 2**  
Relative Income Price, 2018



Source: Author's calculations from EIU and World Bank data.

Table 2 shows the RIP of the average and median country as well as the standard deviation and coefficient of variation of RIP in both HICs and LMICs in 1990 and 2018. In the middle columns it also shows, for 2018, the values for those countries that were in the sample in 1990. The average and median RIP in HICs has increased between 1990 and 2018, meaning that cigarettes have become less affordable in HICs over that period; however, in LMICs, the average and median RIP have decreased, meaning that cigarettes have become more affordable in LMICs. These results are consistent with those in the earlier literature (Blecher and van Walbeek, 2010). Even as incomes have increased dramatically in LMICs, as described earlier in Figure 1, the increase in affordability of cigarettes was also influenced by declining prices (in real

terms) in LMICs (Table 2). The declining affordability in HICs was driven by rapidly increasing real prices.

Table 2 only shows the situation in two years, the first and last years in our sample, but an important question is what happened in the years in between. Figure 3 shows the RIP of the median HIC and LMIC, for all the years. The trend shows that while cigarettes became slightly less affordable in the median LMIC in the 1990s, the trend changed in the 2000–2010 period. During this time, cigarettes became more affordable, and quite dramatically so, very likely as a result of the boom in incomes experienced during this time (see Figure 1). However, in the 2010s, the trend reverses, and the RIP in the median country increases (that is, cigarettes become less affordable).



When comparing RIP between two countries, the difference in RIP is determined more by the difference in per capita GDP than by the difference in price.



**Table 2**

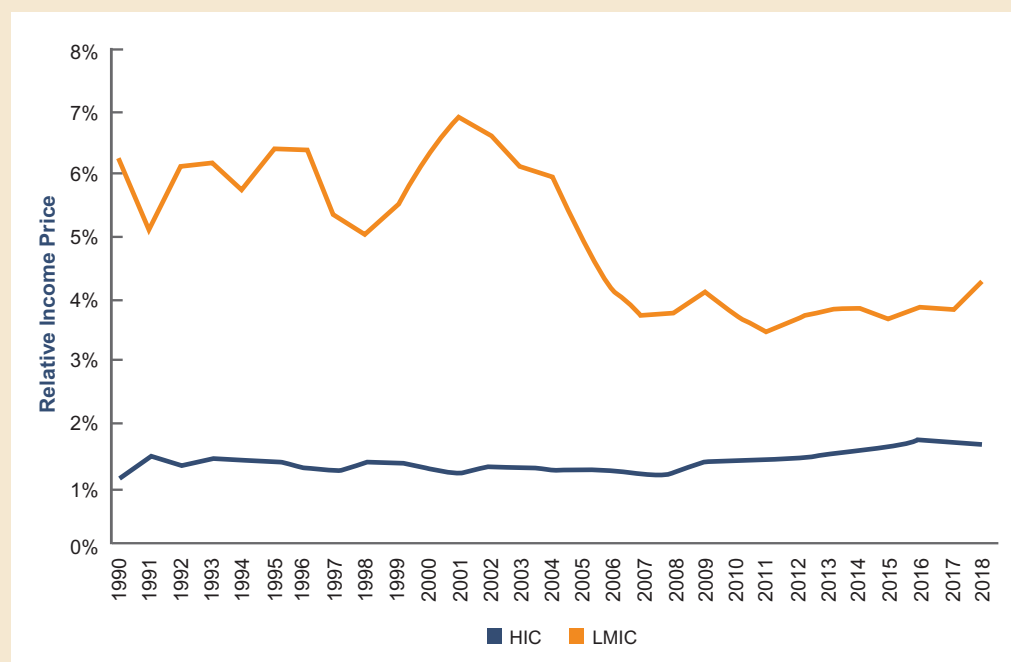
**Summary Statistics, 1990 and 2018**

Indicator	Measure	1990		2018 (1990 sample)		2018	
		HICs	LMICs	HICs	LMICs	HICs	LMICs
<b>Price (Nominal)</b>	Observations	35	34	35	34	40	47
	Mean	\$1.85	\$0.83	\$7.15	\$2.06	\$6.85	\$1.98
	Median	\$1.69	\$0.76	\$5.96	\$1.50	\$5.77	\$1.50
	SD	\$1.20	\$0.45	\$3.62	\$1.44	\$3.70	\$1.37
	CV	0.65	0.54	0.51	0.70	0.54	0.69
<b>Price (Constant 2018 Prices)</b>	Observations	35	34	35	34	40	47
	Mean	\$5.94	\$2.65	\$7.15	\$2.06	\$6.85	\$1.98
	Median	\$5.42	\$2.42	\$5.96	\$1.50	\$5.77	\$1.50
	SD	\$3.85	\$1.44	\$3.62	\$1.44	\$3.70	\$1.37
	CV	0.65	0.54	0.51	0.70	0.54	0.69
<b>RIP</b>	Observations	34	32	34	30	40	45
	Mean	1.4 %	10.1 %	1.9 %	5.6 %	1.8 %	5.5 %
	Median	1.2 %	6.2 %	1.7 %	4.4 %	1.7 %	4.3 %
	SD	0.8 %	9.7 %	0.8 %	4.5 %	0.8 %	4.2 %
	CV	0.58	0.96	0.41	0.81	0.43	0.77

Source: Author's calculations from EIU and World Bank data.

**Figure 3**

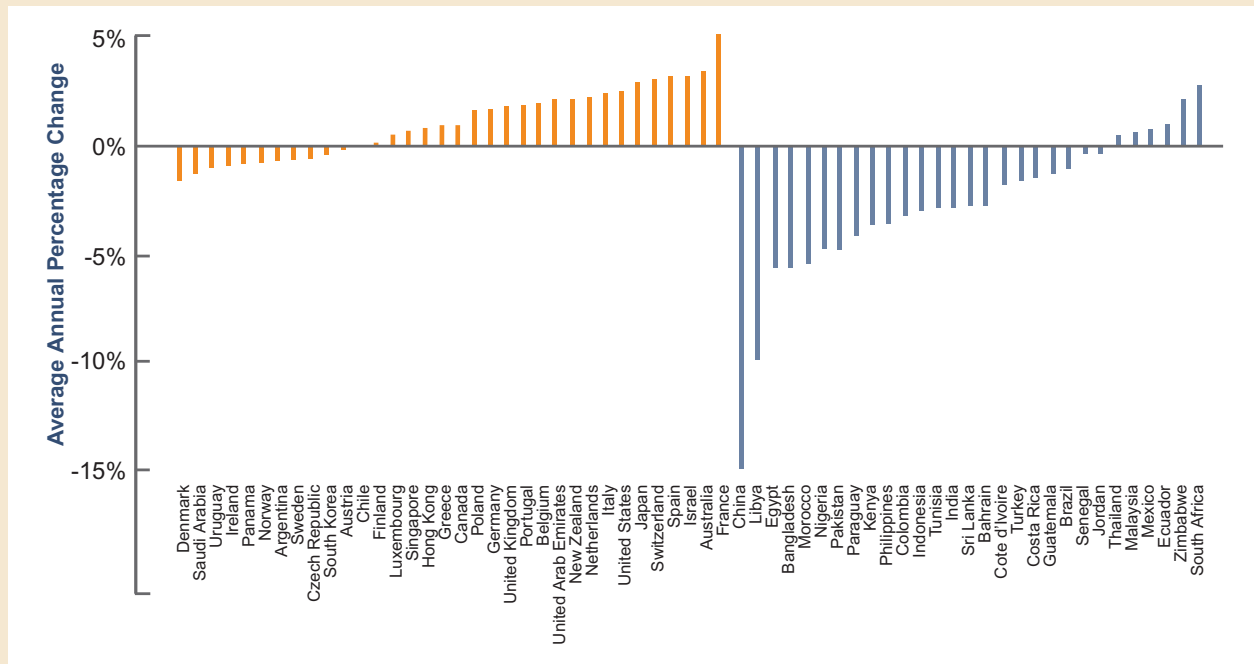
**Relative Income Price in Median Country, 1990–2018**



Source: Author's calculations from EIU and World Bank data.

**Figure 4**

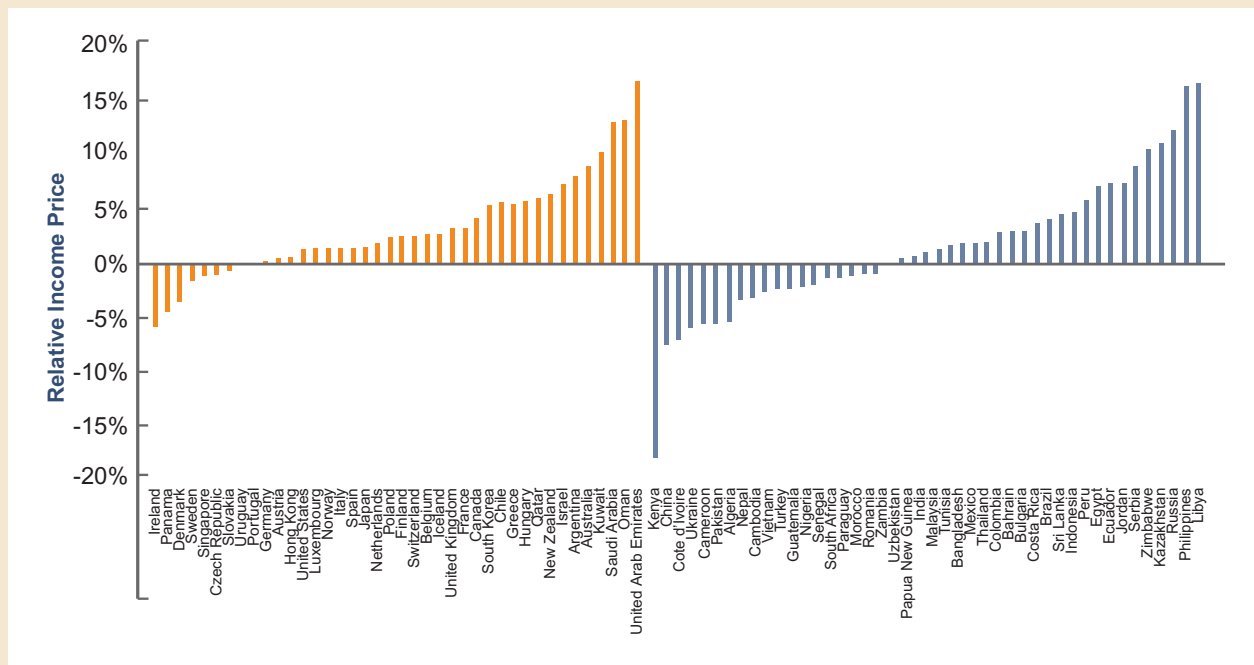
**Average Annual Percentage Change in Relative Income Price, 1990–2018**



Source: Author's calculations from EIU and World Bank data.

**Figure 5**

**Average Annual Percentage Change in Relative Income Price, 2010–2018**



Source: Author's calculations from EIU and World Bank data.

**Table 3****Average Annual Percentage Change of RIP in Median and Average Country**

	Median HICs	Median LMICs	Mean HICs	Mean LMICs
1990–2018	1.0 %	-2.7 %	1.0 %	-2.7 %
1990–2000	0.2 %	-2.0 %	0.2 %	-1.5 %
2000–2010	0.0 %	-5.6 %	-0.5 %	-6.5 %
2010–2018	2.6 %	1.1 %	3.3 %	1.5 %

Source: Author's calculations from EIU and World Bank data.

In order to analyze the trends in affordability in individual countries over time, the average annual percentage change (AAPC) is included in the RIP measure. The AAPC is estimated by fitting a regression line and estimating its slope rather than estimating the compounded growth rate (based on the first and last value), which would be more susceptible to outliers at the start and the end of the period. The AAPC is estimated for each country, and the results are displayed in Figure 4.

Over the complete period of analysis, from 1990 to 2018, the majority of HICs (23 of 34 countries) have seen cigarettes become less affordable, while only 6 of 29 LMICs have seen a decline in cigarette affordability. However, given the trends in Figure 4, which show dramatic changes in affordability in LMICs during the 2000–2010 period, the sample is narrowed to show the same analysis for the more recent sub-period, from 2010 to 2018, in Figure 5. This gives a very different picture, with the majority of both HICs and LMICs seeing cigarettes become less affordable (32 of 40 HICs, 26 of 45 LMICs).

Table 3 summarizes the AAPC in the median and average country for the full sample, as well as for subsamples. These results indicate remarkable progress and a change in the affordability of cigarettes. In order to understand what has driven these changes, the change in affordability is

decomposed by separating it into price and income components. The decomposition is achieved by estimating the AAPC of real price and real per capita GDP (the two components of RIP). While the RIP is normally calculated in nominal terms, this is done in real terms to strip out the effects of inflation on the individual measures, which would normally cancel each other out when calculating the RIP.

Figures 6 and 7 display the decomposition of the AAPC in the RIP for HICs and LMICs, respectively. In each figure, the countries are ordered by change in affordability over time, from the country which has become the most affordable over time to that which has become the least affordable. The change in real price and the change in real per capita GDP are shown in the bars.

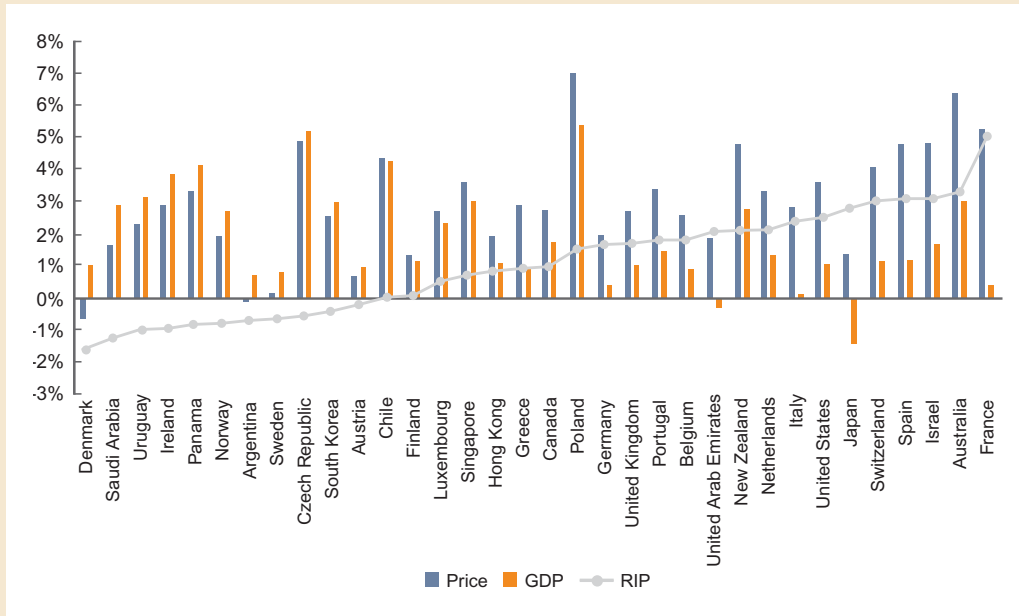
What is immediately evident is that countries to the right of the figures, that is, where cigarettes have become less affordable over time, have significantly larger increases in real price than in real incomes. On the other hand, countries to the left of the figures, that is, where cigarettes have become more affordable over time, have significantly smaller increases in real prices over time. Hence, increases in real prices that are larger than the increase in real incomes are required to reduce affordability over time. Countries that have experienced the most rapid



*Increases in real prices that are larger than the increase in real incomes are required to reduce affordability over time.*

**Figure 6**

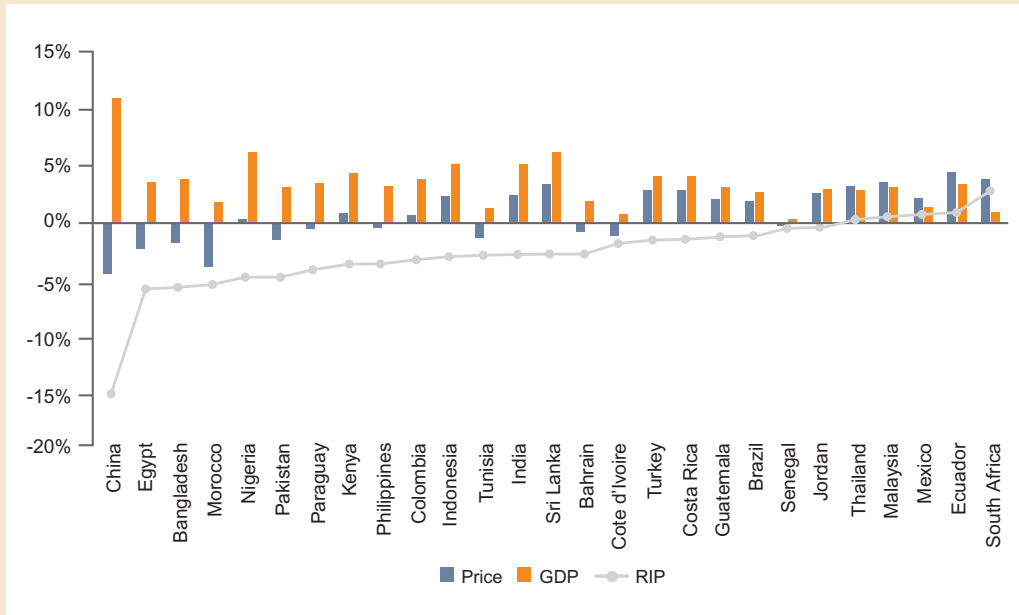
**Decomposition of Average Annual Percentage Change in Relative Income Price for High-Income Countries, 1990–2018**



Source: Author's calculations from EIU and World Bank data.

**Figure 7**

**Decomposition of Average Annual Percentage Change in Relative Income Price for Low- and Middle-Income Countries, 1990–2018**



Source: Author's calculations from EIU and World Bank data.

increases in affordability have not only experienced rapid economic growth but, in many cases, also declines in real prices.

## Country Case Studies

In order to better illustrate the trends in affordability and show how affordability affects consumption at the country level, several country case studies are presented below. The countries presented here are all LMICs with relatively high consumption of cigarettes that have experienced substantial changes in cigarette affordability over time. The countries selected also illustrate several different types of tobacco tax policy reform. In the countries with decreasing affordability, declines in affordability were the result of deliberate tax policies in the presence of economic growth. On the other hand, the countries that show increases in affordability have all experienced particularly rapid economic growth coupled with poorly designed tobacco tax policies.

For most countries, the same affordability metrics and data as the global analysis are used. These are combined with tax-paid or legal sales/consumption data from GlobalData and/or Euromonitor. For global analyses, consistent data and methods are required. However, as discussed earlier, when considering single-country analyses, locally sourced data may provide a greater degree of accuracy and show longer-term trends. A study of South Africa is included, specifically to show such a long-term trend using local government data.

### ***South Africa, the Philippines, Brazil and Mexico: Using Tax Increases to Reduce Affordability Over Time***

South Africa, the Philippines, and Brazil are recognized examples of countries that have used tobacco tax reforms and increases to reduce tobacco use over time.

All three countries are LMICs that, at times, have experienced rapid economic growth but have responded by ensuring that cigarettes became less affordable over time.

### **South Africa**

Figure 8 shows the trends in affordability and sales volumes in South Africa between 1961 and 2017. Figure 9 shows the relationship between cigarette excise taxes per pack in inflation-adjusted terms and affordability during the same period.

Between 1961 and 1991, cigarettes became conspicuously more affordable in South Africa with the RIP dropping from 5.8 percent of per capita GDP required to purchase 100 packs in 1961 to 1.9 percent in 1991. This was a result of the taxes per pack declining by 72 percent in inflation-adjusted terms during this period. As cigarettes became more affordable, sales increased, from 29 packs per person per year in 1961 to 50 packs per person by 1991. However, from 1991, large annual increases in excise taxes resulted in higher prices, which reduced affordability dramatically. Inflation-adjusted excise taxes per pack increased by 251 percent by 2001, and the RIP rose rapidly to 3.9 percent by 2001, coinciding with a rapid decline in sales to 28 packs per person per year, a decline of 44 percent.

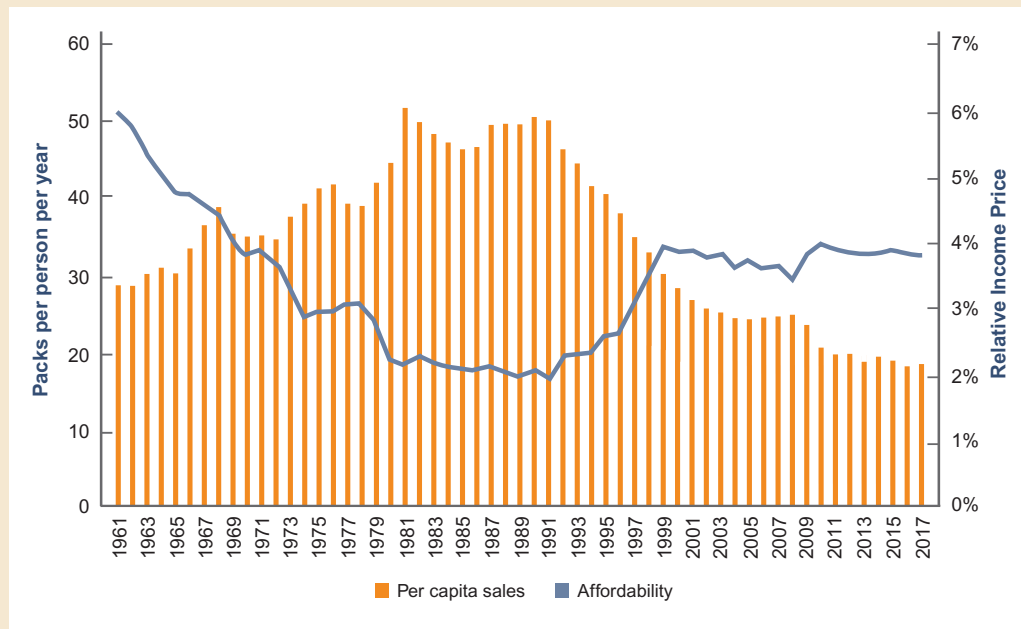
From 2001 to 2008, cigarettes became more affordable again, albeit slowly, as tax and price increases were offset by rapid economic growth, and sales rose again, also slowly. However, as affordability declined once more from 2008 to 2011, sales began to fall again. An important observation is that prices rose far more rapidly than the excise tax since the early 1990s. This resulted in larger declines in affordability and, thus, larger declines in consumption than would otherwise have been the case. The over-shifting can largely be ascribed to the uniform specific tax that

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*The South African case shows a very clear example of how rapidly reducing the affordability of cigarettes over time results in lower consumption.*

**Figure 8**

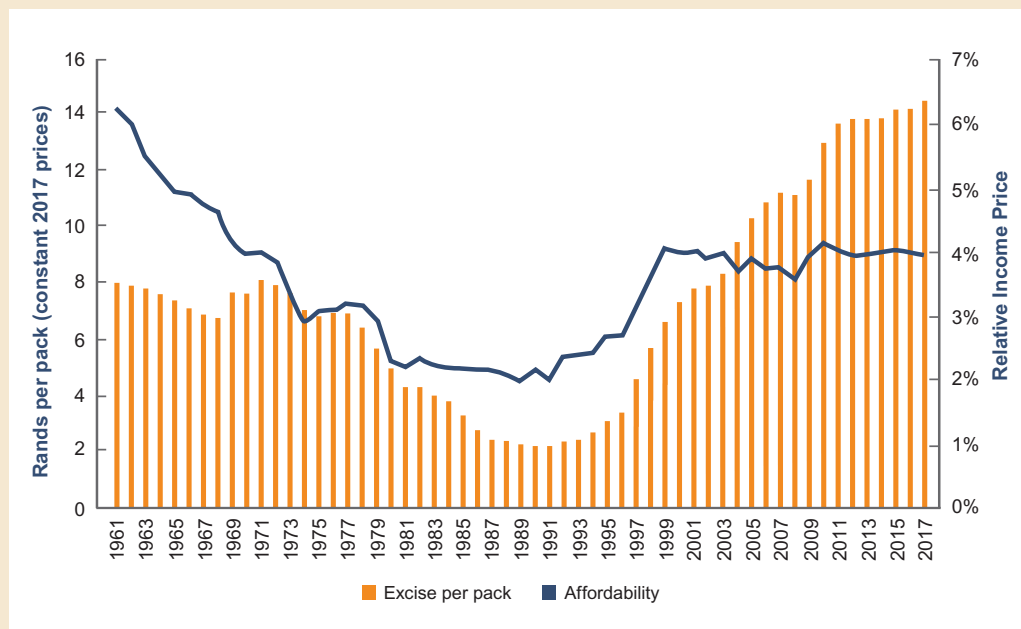
**Relative Income Price and Cigarette Consumption in South Africa**



Source: REEP, StatsSA, National Treasury.

**Figure 9**

**Relative Income Price and Cigarette Excise Tax in South Africa**



Source: REEP, StatsSA, National Treasury.



South Africa levies, which encourages over-shifting. The South African case shows a very clear example of how rapidly reducing the affordability of cigarettes over time results in lower consumption.

### The Philippines

Figure 10 shows the trends in affordability and sales volumes in the Philippines between 1990 and 2017. Cigarettes became consistently more affordable in the Philippines from 1990 until 2012 as economic growth and a weak tax policy more than offset any tax and price increases. Figure 11 shows the tax rates and tax structure in the Philippines from 2012 to 2017. The figure shows the four tax tiers that existed until 2012, with rates varying from Peso 2.72 per pack on the lowest tier to Peso 27.2 per pack on the highest. This variation in taxes led to great variation in prices, which also generated opportunities for manufacturers to avoid tax increases

and for consumers to trade down to cheaper brands in response to tax and price increases. This increase in affordability coincided with relatively unchanged per capita cigarette sales until 2012.

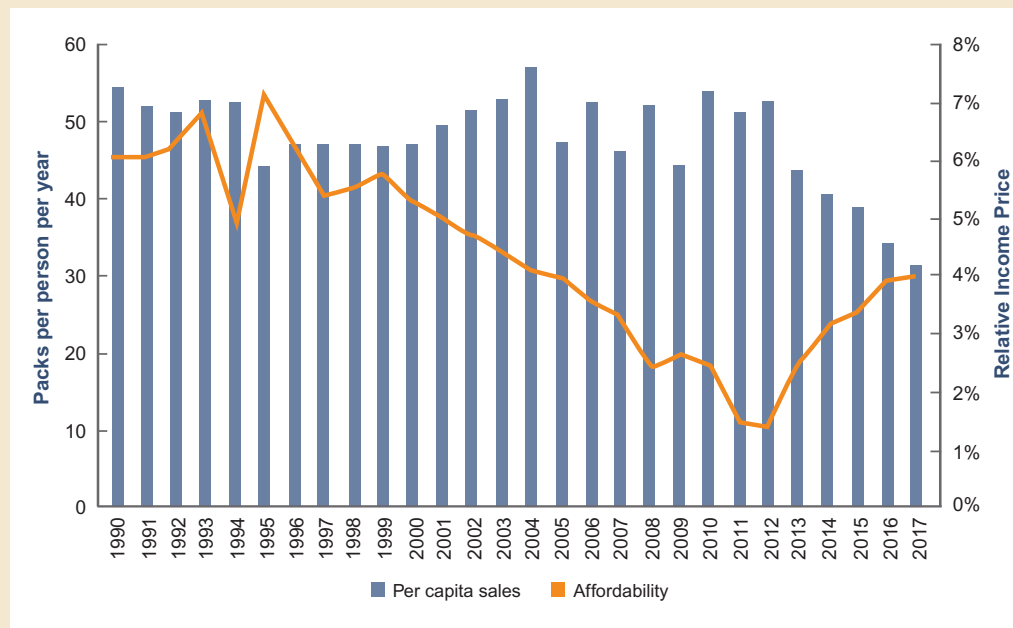
However, in 2012, the Philippines embarked on one of the most ambitious tobacco tax reforms in the world, which saw the multiple tiers consolidated into a uniform specific tax of Peso 30 per pack by 2017. This resulted in taxes on the cheapest brands rising more than tenfold. The RIP increased from 1.5 percent in 2012 to 4.1 percent by 2017, coinciding with a 42 percent decline in sales from 53 packs per person per year in 2012 to 31 packs per person per year in 2017. Again, the Philippines case shows that rapid increases in taxes and rapid declines in the affordability of cigarettes cause rapid and large declines in cigarettes sales. It is important to note that both South Africa and the Philippines also experienced very



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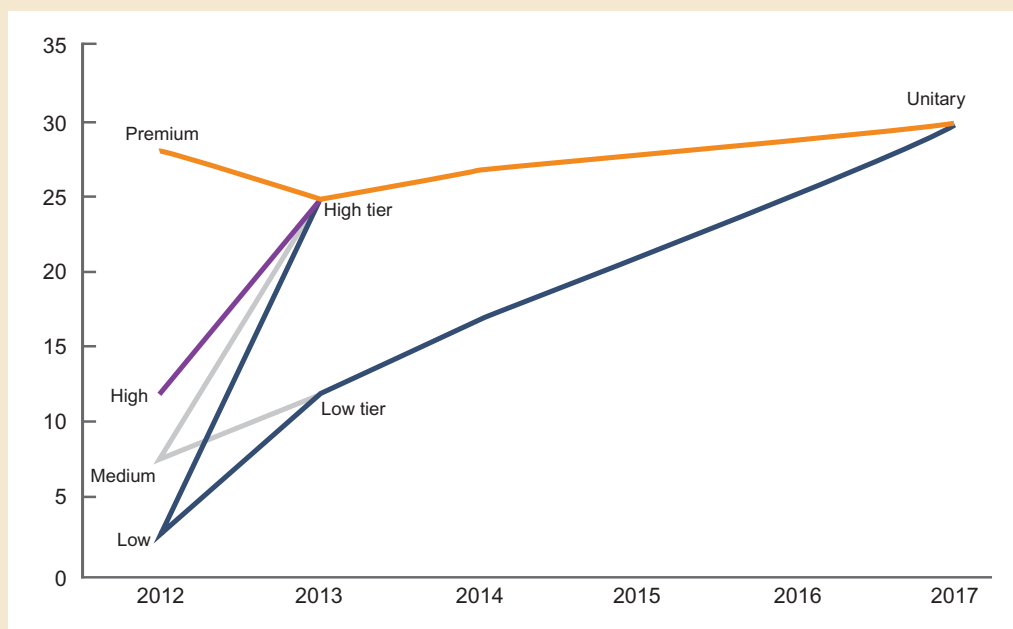
**Figure 10**

### Relative Income Price and Cigarette Consumption in the Philippines



Source: Author's calculations from EIU, World Bank, and Euromonitor data.

**Figure 11**  
**Tax Reform in the Philippines, 2012–2017**



Source: Philippines Tobacco Tax Reform. Campaign for Tobacco-Free Kids. June 2017.

rapid increases in tax revenues as a result of these interventions.

### Brazil

Brazil experienced several macroeconomic shocks in the early 1990s, mostly as a result of hyperinflation. This makes analysis of the affordability metrics during this time very difficult. However, from 1995 to 2008 (Figure 12), as economic stability returned, cigarettes became considerably more affordable with the RIP declining from 2.8 percent to 1.8 percent. During this time, per capita sales remained relatively flat (although sales declined from 1995 to 1998, they remained unchanged until 2008). Tobacco tax policy changed considerably during this time period. Between 1999 and 2014, Brazil reformed the multi-tiered tax system to a simpler uniform mixed tax structure. Through this reform, Brazil substantially increased taxes (World Bank, 2019),

resulting in the affordability trend changing remarkably with the RIP increasing from 1.8 percent in 2008 to 2.7 percent in 2017. This coincided with a significant decline in per capita sales, from 28.3 to 13.9 cigarette packs per person per year during the same time period, a decline of 51 percent.

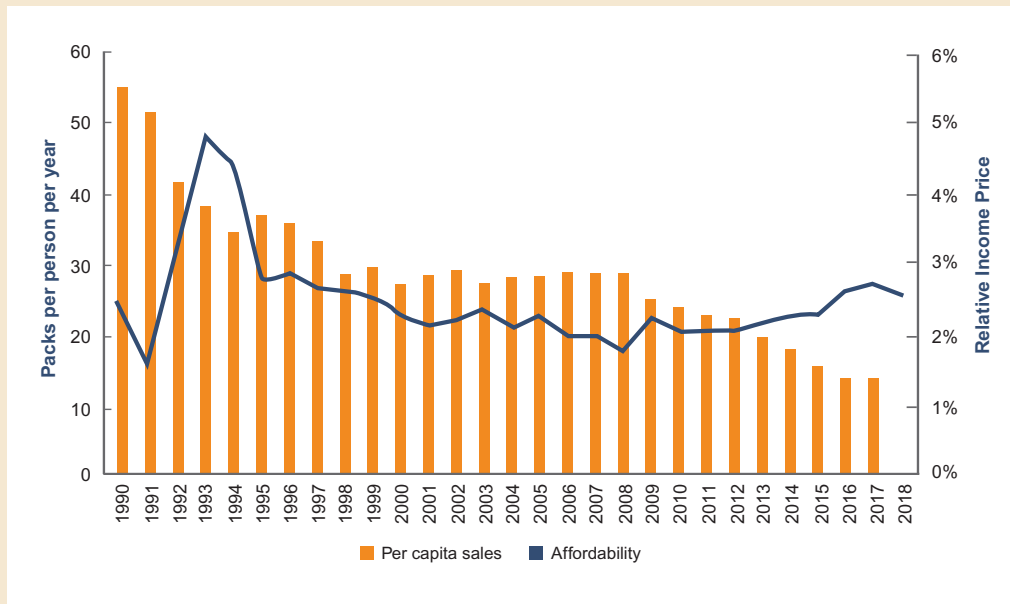
### Mexico

Mexico also experienced hyperinflation in the early 1990s with similar distortions to the data. However, cigarettes became dramatically less affordable over time throughout much of the 1990s and 2000s (Figure 13). Until 2009, Mexico’s tobacco tax was an *ad valorem* tax, and it included tiers until 2005. The tax was reformed in 2010 to include a specific component, which was increased substantially in 2011 (Sáenz de Miera Juárez, 2013). The increase in the specific tax resulted in a substantial increase in the RIP from 1.9

“  
 Between 1999 and 2014, Brazil reformed their multi-tiered tax system to a simpler uniform mixed tax structure, substantially increasing taxes and lowering affordability. These reforms coincided with a 51 percent decline in per capita sales.”

**Figure 12**

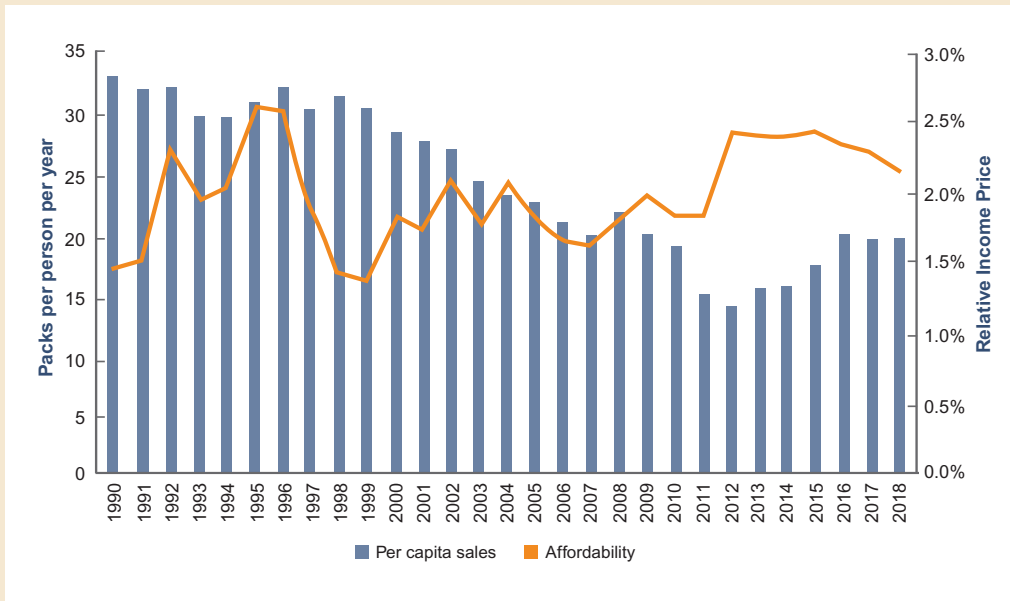
**Relative Income Price and Cigarette Consumption in Brazil**



Source: Author's calculations from EIU, World Bank, and Euromonitor data.

**Figure 13**

**Relative Income Price and Cigarette Consumption in Mexico**



Source: Author's calculations from EIU, World Bank, and Euromonitor data.

percent to 2.4 percent, coinciding with a decline in per capita sales of 55 percent. However, the specific tax was not adjusted for either inflation or income growth until 2019. Since 2012, affordability has stabilized, and the RIP has fallen to 1.8 percent in 2018. This decrease in the RIP coincided with a rebound in sales, which increased by 40 percent, although they were still well below the levels of the late 1990s. Mexico is an example of a country that saw significant declines in affordability and decreases in tobacco use, but it is also an example of a country that undid some of its previous good work, by not increasing the excise tax sufficiently in subsequent years.

### ***Vietnam, Bangladesh, and Indonesia: Rapid Economic Growth and Weak Tobacco Tax Policies***

Since the economic reforms of the early 1990s, Vietnam has been one of the most rapidly growing economies in the world. Between 1990 and 2018, real per capita GDP growth averaged 5.5 percent, dwarfing that of nearly all other LMICs. This meteoric rise in incomes resulted in a dramatic increase in cigarette affordability. Similarly, Bangladesh experienced a rapid rise in incomes. Its real per capita GDP growth has averaged 3.9 percent during the same period, also higher than most other LMICs. Indonesia experienced 3.5 percent economic growth during this period, which is remarkable given the effects of the Asian financial crisis in 1998 and 1999 (excluding these years, average GDP growth in Indonesia was 4.3 percent per year).

Such increases in income make all goods and services rapidly more affordable, thus increasing their consumption. Vietnam, Bangladesh, and Indonesia have attempted to counteract these increases by raising tobacco taxes but, owing to poorly

designed tax structures, increases in taxes have had negligible effects on reducing affordability.

### **Vietnam**

Figure 14 shows the RIP and cigarette sales in Vietnam between 1990 and 2018 (RIP is only available from 1994). Between 1994 and 2018, the RIP in Vietnam declined from 31 percent to 5 percent, while per capita sales more than tripled between 1990 and 2013. The rapid rise in affordability is not just a function of rapidly growing incomes but also of a poorly designed tax structure. Vietnam applies an *ad valorem* tax on the ex-factory price. The current rate is 70 percent and, while this may seem to be a substantial amount, the very small tax base means that this translates into an excise tax share of retail price of 28 percent, well below the 70 percent recommended by the World Health Organization (see Blecher and Le, 2018).

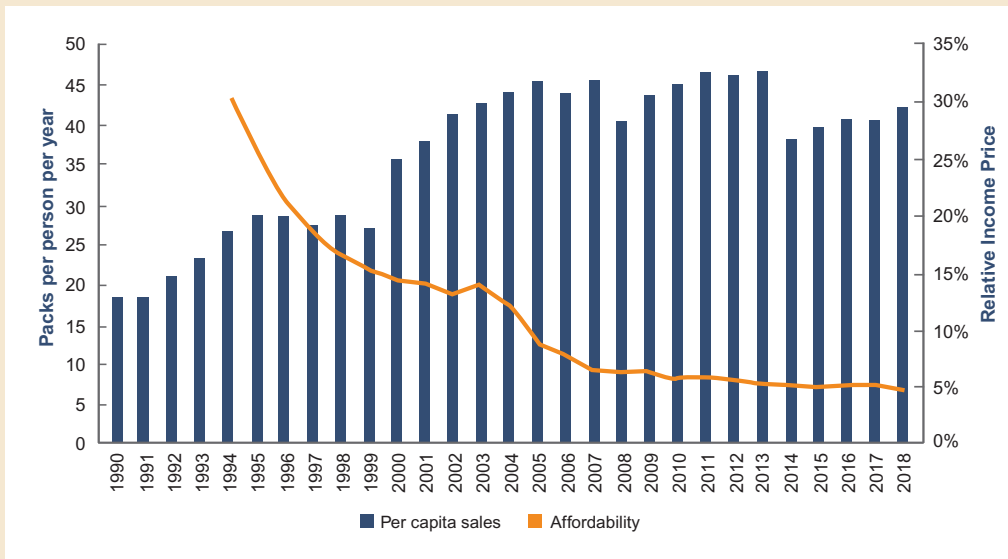
Furthermore, Vietnam's tax structure has meant that increases in the tax rate over time have not resulted in price increases, as the tax increases have been under-shifted. Figure 15 shows the tax rates, the tax base (that is, the ex-factory price), and the tax base plus excise tax, in inflation-adjusted terms from 2006 to 2016. This illustrates how tax increases have been under-shifted and thus how the increases in tax rates did not result in an increase in the value of the tax. One can clearly see how the tax base declines in the two years when tax increases occur (2008 and 2016), resulting in no increase in the value of the tax. In addition to tax increases, reforms in the tax structure to ensure that tax increases result in price increases will be necessary if the trends in cigarette affordability in Vietnam are to be reversed.



*In addition to tax increases, reforms in the tax structure to ensure that tax increases result in price increases will be necessary if the trends in cigarette affordability in Vietnam are to be reversed.*

**Figure 14**

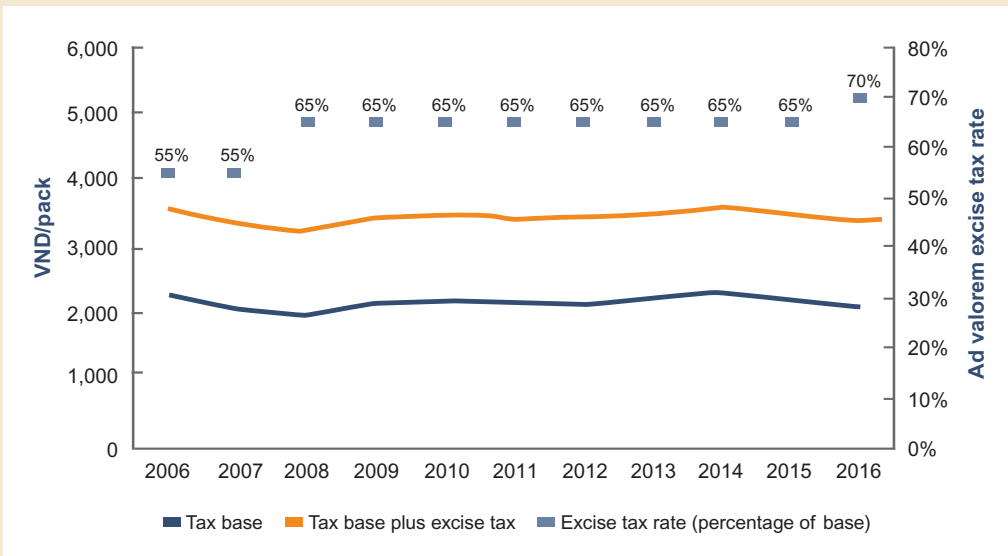
**Relative Income Price and Cigarette Consumption in Vietnam**



Source: Author's calculations from EIU, World Bank, and Euromonitor data.

**Figure 15**

**Average Tax Base and Excise Tax Added to the Base per Pack of Cigarettes in Vietnam (in inflation-adjusted terms), 2006–2016**



Source: Blecher and Le (2018).



Rapid economic growth before and after the Asian financial crisis, combined with Indonesia's complex tax structure, made cigarettes become rapidly more affordable over time, resulting in significant increases in sales.

## Bangladesh

Figure 16 shows the RIP and cigarette sales in Bangladesh between 1990 and 2018. The figure shows one-way traffic until 2010, with cigarettes becoming dramatically more affordable, dropping from a RIP of 41 percent in 1990 to 9 percent in 2010. This coincided with an increase in per capita sales of 129 percent during the same period. Since 2010, significant increases in prices have turned the tide on affordability with the RIP increasing to 13 percent in 2015. Since 2015, per capita sales have remained relatively flat.

## Indonesia

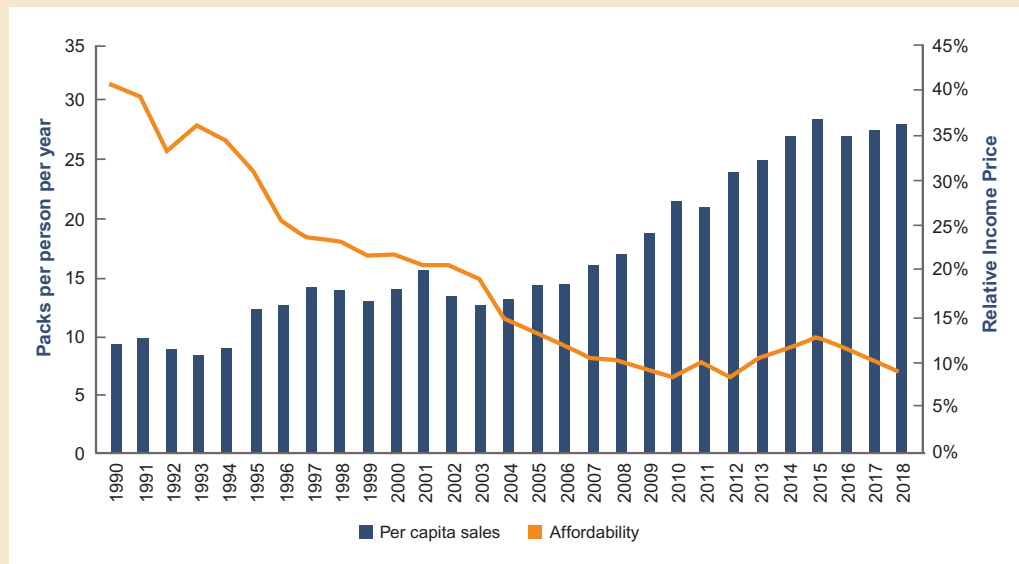
Figure 17 shows the RIP and cigarette sales in Indonesia between 1990 and 2017. Historically, Indonesia has had some of the lowest cigarette taxes and prices in the world. Furthermore, Indonesia has a very complex tax structure, which has perpetuated low prices. This tax structure

has a number of tiers that result in a wide distribution of taxes and, thus, prices. Until 2006, Indonesia had an *ad valorem* system with 9 tiers, which was reformed initially to a mixed system in 2007 and then to a tiered specific system in 2009. In 2009, there were 19 excise tax tiers, with the rates varying from Rp 40 per stick to Rp 290 per stick. Since 2009, the number of tiers has been reduced to the current 10 tiers, ranging from Rp 100 per stick to Rp 625 per stick. While the structure has undergone several reforms in recent years that have reduced the number of tiers and moved toward a specific tax system, it is still a major contributor to low prices.

Rapid economic growth, averaging 5.2 percent in per capita terms between 1990 and 1997 (before the Asian financial crisis) and 3.9 percent from 2000 to 2017 (after the Asian financial crisis), combined with Indonesia's complex tax structure, has meant that cigarettes have become rapidly more affordable over time, resulting in significant increases in sales. Three

**Figure 16**

**Relative Income Price and Cigarette Consumption in Bangladesh**

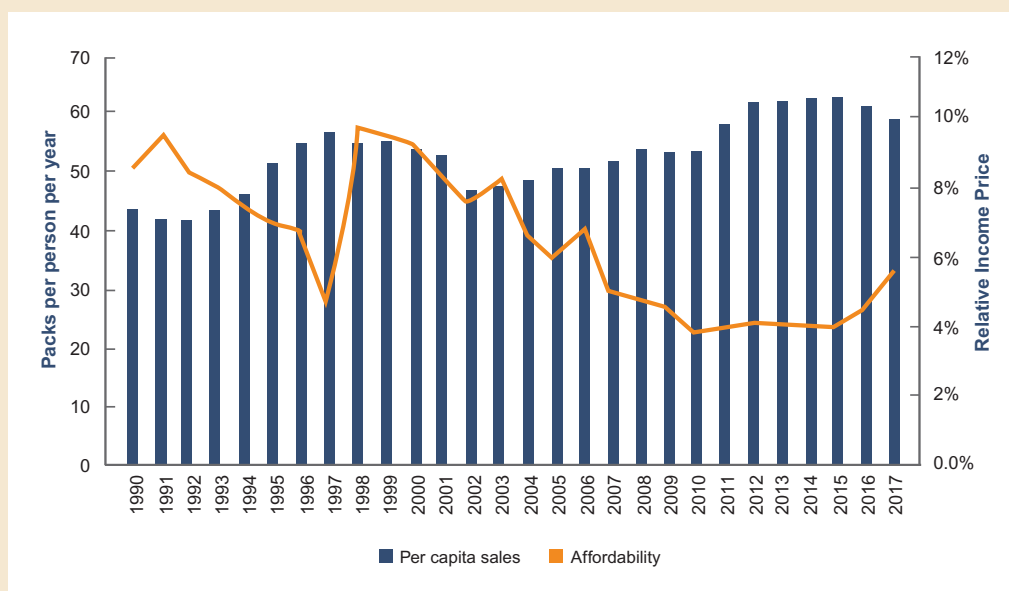


Source: Author's calculations from EIU, World Bank, and Euromonitor data.



Figure 17

### Relative Income Price and Cigarette Consumption in Indonesia



Source: Author's calculations from EIU, World Bank, and Euromonitor data.

distinct periods are obvious from the figure. Between 1990 and 1997, rapid economic growth and declining prices saw cigarettes become twice as affordable, contributing to a 30 percent increase in per capita sales. The Asian financial crisis caused a macroeconomic shock, making cigarettes less affordable again but also causing a slight decline in sales. The period after the Asian financial crisis saw cigarettes again become more affordable over time, through 2010, and then remain relatively unchanged until 2015, coinciding with consistent increases in per capita sales.

By 2015, cigarettes were more than twice as affordable as in 1990, and per capita cigarette sales were 40 percent higher. Both 2016 and 2017 saw the largest increases in cigarette excise taxes in Indonesia, by more than 10 percent in each year (the same occurred in 2018, although there was no increase in 2019, but an increase of more than 20 percent is

projected for 2020). The steep decline in affordability in those two years as a result of the tax increases saw an immediate impact with a 6 percent decline in per capita sales. A more detailed discussion of cigarette affordability in Indonesia is given by Zheng et al. (2018), albeit covering a shorter time period (2002–2017).

### Affordability in a Policy Context

When the World Bank published its seminal publication on the economics of tobacco control, *Curbing the Epidemic*, in 1999, it recommended that governments raise tobacco taxes and benchmark their rates such that tax accounts for two-thirds to four-fifths of the retail price of cigarettes (World Bank, 1999). There were no recommendations in terms of the magnitude and frequency of tax increases. Furthermore, it made no recommendations as per the appropriate tax structures to impose which, as seen in the case studies, are of crucial importance.



*As more rapid economic growth in emerging economies becomes the norm, there has been a shift from evaluating the success of tax increases by increases in real prices to their effect on the affordability of tobacco products over time.*

In the two decades that have passed, considerable progress has been made on tobacco taxation, particularly in LMICs.

The experience gained over this time has contributed to a large number of case studies that now serve as the basis of a more developed understanding of best practice policy on tobacco taxation. These include contributions by the WHO (WHO Technical Manual on Tobacco Tax Administration, 2010), the WHO Framework Convention on Tobacco Control (Guidelines for Implementation of Article 6 of the WHO FCTC. Price and tax measures to reduce the demand for tobacco, 2014), the World Bank (Economics of Tobacco Taxation Toolkit, 2018), and the International Monetary Fund (How to Design and Enforce Tobacco Excises, 2016).

A key part of these best practices is that countries should not only focus on tax targets but also on raising taxes over time, since it is not high taxes per se that cause declines in tobacco use over time but increasing taxes and prices. Furthermore, there has been a shift from evaluating the success of tax increases by increases in real prices to their effect on the affordability of tobacco products over time. This shift in thinking has occurred as a result of the development of methods to measure affordability, but is also due to a global economic transition where more rapid economic growth in emerging economies is the norm.

### ***Benchmarking***

While best practices on tobacco tax policy recommend that countries implement uniform specific taxes or mixed systems with larger specific tax components, they also recognize that a problem with specific tax systems is that the specific tax can be eroded by inflation. This is a bigger challenge in countries with higher inflation than in those with lower inflation, and it is

also less of a challenge in contemporary times when inflation is generally lower than previous decades. In order to overcome this problem, some countries have sought to benchmark specific taxes to consumer prices to ensure that they are not eroded. Several countries, including Costa Rica, Turkey, and Australia (U.S. National Cancer Institute and World Health Organization, 2016), have benchmarked specific taxes to inflation through an automatic adjustment. This is over any regular increases in tax that are designed to increase taxes in real terms.

More recently, Australia has adjusted its benchmark from inflation to nominal wages, effectively benchmarking the tax increase to a measure of affordability. However, as can be seen from the following examples, simply maintaining affordability may not be sufficient to reduce tobacco use or even to stop tobacco use from rising. Australia, for instance, has benchmarked tobacco excise to inflation since 1984, and, since March 2014, to affordability. An evaluation showed that this was not associated with a decrease in tobacco use, but it may have been a deterrent to an increase in tobacco use (Wilkinson, 2019a).

However, in more recent years, Australia has substantially increased excise taxes (by 25 percent in 2010 and 12.5 percent in each year from 2013 to 2017). Table 4 shows excise tax increases in Australia from 2009 (the year before the 25 percent increase in 2010) until 2019 and clearly shows the distinction between automatic increases and deliberate increases. The deliberate increases resulted in immediate declines in smoking prevalence (Wilkinson, 2019b). The conclusion drawn from Australia is that benchmarking to inflation or affordability may not be sufficient, and increases in tobacco taxes to significantly reduce affordability are necessary.

**Table 4****Cigarette Taxes in Australia, 2009–2019**

Date	Dollar per cigarette	Percentage change	Comment
Feb-09	0.25679		
Aug-09	0.25833	0.6 %	Automatic adjustment
Feb-10	0.26220	1.5 %	Automatic adjustment
Apr-10	0.32775	25.0 %	Once off 25 % increases
Aug-10	0.33267	1.5 %	Automatic adjustment
Feb-11	0.33633	1.1 %	Automatic adjustment
Aug-11	0.34474	2.5 %	Automatic adjustment
Feb-12	0.34681	0.6 %	Automatic adjustment
Aug-12	0.34889	0.6 %	Automatic adjustment
Feb-13	0.35447	1.6 %	Automatic adjustment
Aug-13	0.35731	0.8 %	Automatic adjustment
Dec-13	0.40197	12.5 %	Once off 12.5 % increase
Mar-14	0.40639	1.1 %	Automatic adjustment
Sep-14	0.46268	13.9 %	Recurring 12.5 % increase in addition to automatic adjustment
Mar-15	0.47008	1.6 %	Automatic adjustment
Sep-15	0.53096	13.0 %	Recurring 12.5 % increase in addition to automatic adjustment
Mar-16	0.53733	1.2 %	Automatic adjustment
Sep-16	0.61054	13.6 %	Recurring 12.5 % increase in addition to automatic adjustment
Mar-17	0.61726	1.1 %	Automatic adjustment
Sep-17	0.69858	13.2 %	Recurring 12.5 % increase in addition to automatic adjustment
Mar-18	0.71046	1.7 %	Automatic adjustment
Sep-18	0.80726	13.6 %	Recurring 12.5 % increase in addition to automatic adjustment
Mar-19	0.81775	1.3 %	Automatic adjustment
Sep-19	0.93653	14.5 %	Recurring 12.5 % increase in addition to automatic adjustment

Source: Scollo and Bayly (2019).



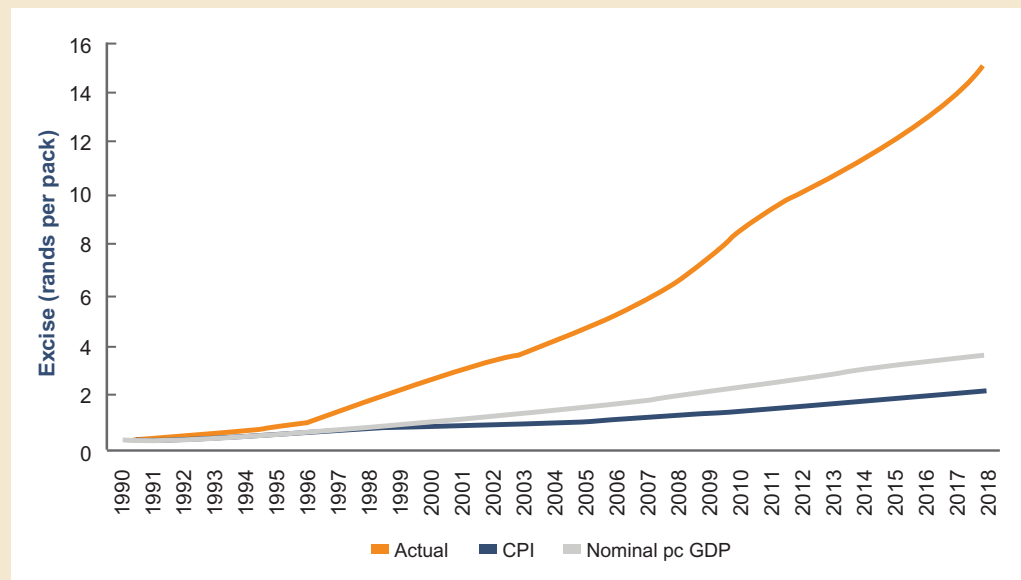
The simulation shows that the massive declines in tobacco use in South Africa did not result from benchmarking tax increases to inflation or income growth, but were instead caused by tax increases that far surpassed inflation and income growth to ensure that cigarettes became less affordable over time.

To illustrate the effects of benchmarking, Figure 18 below returns to the example of South Africa and shows a simulation of the effects of excise taxes benchmarked to inflation, or to nominal GDP (that is, benchmarking to affordability). The simulation begins in 1990, the year in which excise taxes began to be increased. As shown in Figure 18, excise taxes in 1990 were R0.35 per pack, and to maintain its value relative to inflation that amount would have had to increase to R2.26 per pack by 2018. However, if the excise were to maintain its level of affordability (as measured by nominal per capita GDP) excise taxes would have had to increase to

R3.70 per pack by 2018, 63 percent more. The actual excise tax increased to R15.21 per pack. The simulation shows that the massive declines in tobacco use in South Africa did not result from benchmarking tax increases to inflation or income growth, but were instead caused by tax increases that far surpassed inflation and income growth to ensure that cigarettes became less affordable over time.

Examples like these show why more recent policy recommendations (see Box 1) from WHO and the World Bank recognize the need to significantly reduce the affordability of cigarettes.

**Figure 18**  
**Simulation of Inflation and Affordability Benchmarking in South Africa, 1990–2018**



Source: Author's calculations from Economics of Tobacco Control Project, StatsSA, National Treasury, World Bank data.

## Box 1

### Affordability and Best Practice Policy Recommendations

#### According to the WHO Technical Manual on Tobacco Tax Administration, 2010:

In order to maximize the public health impact of higher tobacco taxes, while at the same time generating higher revenues, governments should raise taxes so as to raise prices and reduce the affordability of tobacco products. In many LMICs, tobacco use increases with incomes and incomes are rising faster than tobacco product prices so that these products are becoming more affordable. In order to reduce affordability, tax increases need to result in real price increases that are higher than the increases in real incomes.

#### The WHO Framework Convention on Tobacco Control (Guidelines for Implementation of Article 6 of the WHO FCTC. Price and tax measures to reduce the demand for tobacco, 2014) advises that:

When establishing or increasing their national levels of taxation Parties should take into account – among other things – both price elasticity and income elasticity of demand, as well as inflation and changes in household income, to make tobacco products less affordable over time in order to reduce consumption and prevalence. Therefore, Parties should consider having regular adjustment processes or procedures for periodic revaluation of tobacco tax levels.

#### And the World Bank (Economics of Tobacco Taxation Toolkit, 2018) recommends that:

There should be at least occasional sharp increases in specific excises, as this has a more dramatic impact on current behavior. In between these major increases, governments should index specific excise to exceed, or at least keep pace with, affordability – i.e., with nominal (current price) per capita income. This means taking account both of the inflation rate (monthly or biannually if the inflation rate changes dramatically) and of the annual income growth rate to ensure that cigarettes and other tobacco products become increasingly less affordable.

“

*In order to reduce tobacco consumption, it is necessary to increase taxes regularly, and by large enough magnitudes to ensure that price increases are significantly larger than increases in income.*

#### ***Appropriate methods, data, presentation and interpretation***

Affordability as a concept is open to misinterpretation and misuse, and sometimes exploitatively so by those opposing tobacco tax increases. One mistaken interpretation is for people to use affordability as an absolute term, when in fact it is simply a relative term. For example, it is not correct to say that cigarettes are affordable or unaffordable,

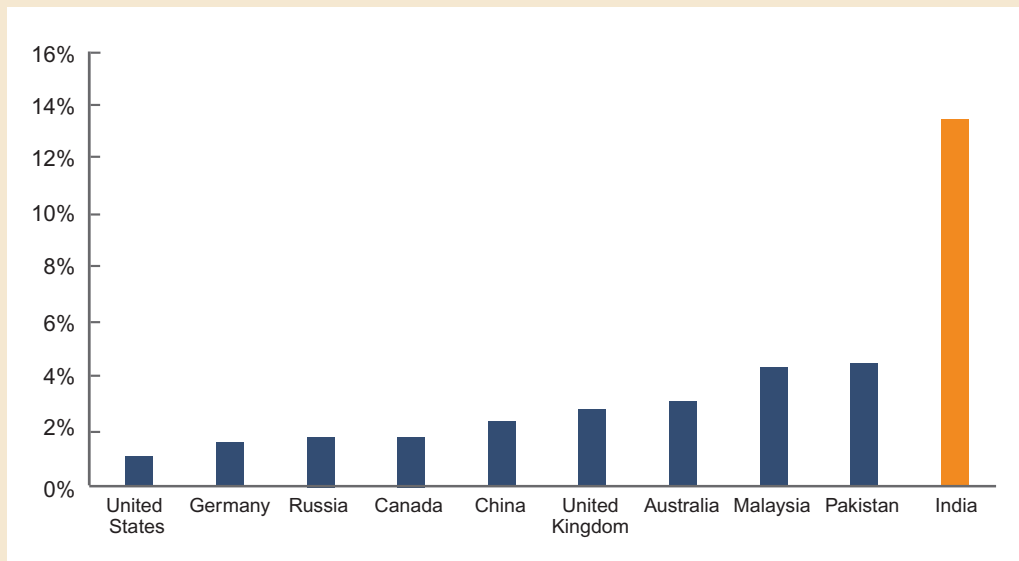
but rather to make a comparison, for example, that cigarettes have become more or less affordable in a given country over time. A second, more concerning error, is the comparison of affordability across two or more very different countries, particularly countries with very different levels of development and/or income. This is often used by those opposing tobacco tax increases to argue that increases are bad policy because cigarettes are already “unaffordable”.

For example, in India, the Tobacco Institute of India (2019), a tobacco-industry trade association, has argued that “cigarettes are least affordable in India”. Using data from the WHO Report on the Global Tobacco Epidemic from 2017, they compare the RIP of India to nine other countries showing that the RIP in India is higher than in all the other countries (see Figure 19). While that is factually correct, those nine countries are randomly, or possibly carefully, chosen to ensure the result. Using the same data source, we show the entire sample of 185 countries (Figure 20), showing that there were 24 countries with less affordable cigarettes than India.

What drives the result is that there is significantly less variation in cigarette prices globally (coefficient of variation in

2018 USD prices is 0.87) than there is in per capita income (coefficient of variation in 2018 per capita GDP in USD is 1.05). That means that the variation in income, rather than the variation in prices, determines the variation in affordability across countries. This was discussed earlier in reference to Figure 2 where the variation between RIP in HICs and LMICs was so great that figure was drawn with separate axes. It is likely deliberate that nearly all the countries in the sample chosen by the Tobacco Institute of India have higher per capita GDP than India. The lesson is that one should be cautious in making cross-country comparisons in affordability since the country chosen for comparison determines the conclusion that one might draw, rather than the actual country of interest.

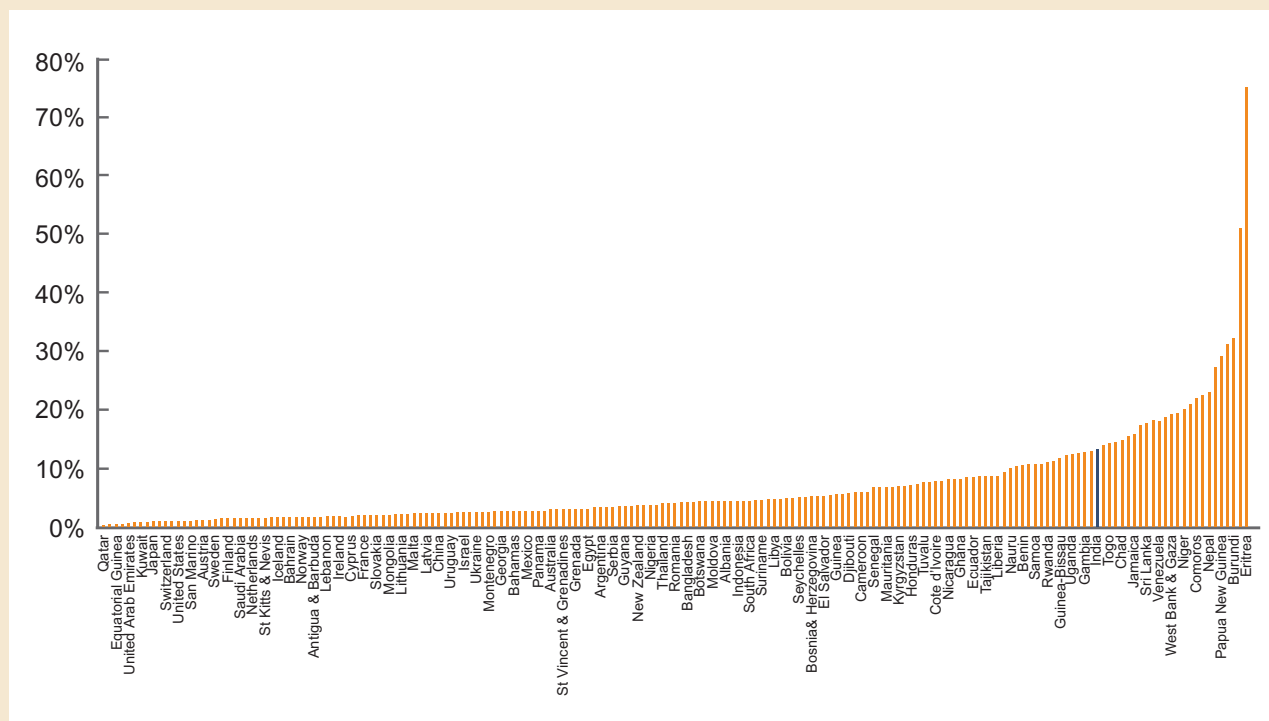
**Figure 19**  
**Relative Income Price in 2016 (10 countries)**



Source: Tobacco Institute of India (2019).



**Figure 20**  
**Relative Income Price in 2016 (full sample)**



Source: Tobacco Institute of India (2019).

## Conclusion and Recommendations

In past decades, rapid rates of economic growth, particularly in LMICs, have made cigarettes more affordable over time. However, since 2010 cigarettes have become less affordable in the majority of LMICs. Case studies from countries that have raised tobacco taxes have shown that tobacco tax increases are the key driver in making cigarettes less affordable over time, and the reductions in cigarette affordability have reduced tobacco use in these countries. Furthermore, other case studies show that in the absence of tobacco tax increases or where poorly-designed tax structures are implemented, increases in income result in increasingly affordable cigarettes and rising tobacco use.

In recent years, the success and popularity of affordability as a way to measure policy progress in tobacco taxation has meant the application of the same techniques to other products associated with non-communicable diseases. Relative to results on affordability of other products such as beer and sugar-sweetened beverages, cigarettes have become less affordable over time. Blecher et al. (2017) and Blecher et al. (2018) applied the RIP methodology to sugar-sweetened beverages and beer. Blecher et al. (2017) found that in 79 of 82 countries, sugar-sweetened beverages became more affordable between 1990 and 2016, and that the increase in affordability was more rapid in LMICs than in HICs. Blecher et al. (2018) found that beer became more affordable in 72 of 81 countries between 1990 and 2016.

Comparing these results to studies on the affordability of cigarettes, there has been significant progress in achieving the policy goal of making cigarettes less affordable over time.

Results show that from 1990 to 2018, cigarettes have become less affordable in only 29 out of 63 countries (46 percent). A more important result though is how trends in cigarette affordability have changed in recent years. Between 2010 and 2018, cigarettes became less affordable in 58 out of 85 (68 percent) countries. In that context, tobacco tax policy has had significant success in reducing the affordability of tobacco products; however, the question of how affordability is best applied to tobacco tax policy remains.

The key policy recommendation is that countries need to raise taxes regularly, and also by large amounts. In order to reduce

tobacco consumption, it is necessary to increase taxes regularly, and by large enough magnitudes to ensure that price increases are significantly larger than increases in income. The larger the tax increase, the more rapidly cigarette affordability will decline. The examples presented in this paper show that the countries that experienced the most significant declines in consumption were the ones with the most dramatic declines in affordability.

Furthermore, as the case studies have shown, tax increases alone may not be sufficient. Countries need to ensure that tax structures are well designed to ensure that tax increases result in price increases. As such, countries should move toward specific tax systems, or mixed tax systems with large specific components in line with WHO recommendations.



*The key policy recommendation is that countries need to raise taxes regularly, and also by large amounts.*

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