

# An Analysis of Cigarette Affordability

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"Over the past decade a clear dichotomy has developed between developed and developing countries. Cigarettes are becoming less affordable in developed countries and much more affordable in developing countries."



- Monitor** tobacco use and prevention policies
- Protect** people from tobacco smoke
- Offer** help to quit tobacco use
- Warn** about the dangers of tobacco
- Enforce** bans on tobacco advertising, promotion and sponsorship
- Raise** taxes on tobacco

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## Executive Summary

Cigarette affordability is determined by the interaction of consumers' income levels and cigarette prices. Affordability measures based on per capita gross domestic product, GDP (termed the Relative Income Price, or RIP), were calculated for 77 countries, while affordability measures based on the Union Bank of Switzerland (UBS) survey of earnings (minutes of labour required to buy a pack of cigarettes) were calculated for 52 countries.

Expressed in a common currency, cigarettes were about four times more expensive in developed countries than in developing countries in 2006. There is a high degree of variance in cigarette prices within groups of countries with similar levels of development. Not surprisingly, countries with strong tobacco control policies and countries where prices are high in absolute terms tend to have the highest cigarette prices.

Despite cigarettes being more expensive in developed countries in absolute terms, they are on average more affordable than in developing countries, especially if per capita GDP is used as the measure of income. If one uses UBS data as the measure of income, the finding that cigarettes are less affordable in developing countries is less pronounced. We argue that per capita GDP is a more comprehensive and representative measure of income than the UBS's survey of wages, especially for developing countries, and that the RIP is thus a better measure of affordability.

Since 1990, cigarettes have become steadily less affordable in most developed countries. Of the 32 developed countries in the sample, cigarettes became more affordable in 13 (41%) and less affordable in 19 (59%) countries since 1990, using the RIP measure of affordability. In contrast, among the 45 developing

countries in the sample, cigarettes became more affordable in 28 (62%) and less affordable in 17 (38%) countries. Since 2000, and especially since 2003, cigarettes in developing countries have rapidly become more affordable.

It is well-known that price increases, usually through increased taxes, are particularly effective in reducing the demand for cigarettes. While there have been many positive developments in tobacco control in the last decade, the most powerful tobacco control tool – increasing prices and taxes and thus decreasing cigarette affordability – appears to have been ignored in many countries.

Although there is some methodological debate about how to best calculate affordability, the central message of this paper is that cigarette affordability is an important determinant of consumption. Economic studies should not focus on prices and taxes without also considering incomes. If increasing the excise tax is an important component of a country's tobacco control strategy, the benchmark should be set in terms of affordability, rather than in terms of real prices. In particular, policy recommendations that focus on only the real price of cigarettes, but do not consider the issue of affordability, may not be appropriate for countries experiencing very rapid economic growth. For example, in China, where per capita GDP has been growing at a rate of about 10 percent per year, cigarettes would become increasingly affordable even if the real price of cigarettes were to increase by 5 percent per year.

If policy makers aim to make cigarettes less affordable, they should raise taxes so that the nominal price of cigarettes increases by more than the sum of the inflation rate and the real per capita income growth rate.

## I. Introduction

Tobacco control economists have consistently promoted excise tax increases as an appropriate and effective tobacco control strategy.<sup>1,2</sup> Higher taxes increase the retail price and decrease the demand for cigarettes. Numerous studies over the past decades have shown that consumer demand for cigarettes is heavily influenced by changes in their price.<sup>3,4</sup> By raising the excise tax, policy makers are able to raise the retail price of cigarettes, making the product less affordable. The focus of economic studies in tobacco control is often on the implications (in the form of reduced demand, reduced smoking prevalence, increased government revenue, etc.) of an increase in the excise tax and/or price of cigarettes.<sup>5,6</sup>

In recent decades some countries, mainly in Asia, have achieved unprecedented rapid growth rates. China and India have experienced per capita GDP increases of nearly 10 percent per year, followed by other populous countries like Indonesia, Vietnam and Bangladesh with only slightly lower growth rates. This rapid economic growth increases people's disposable and discretionary income, in both actual and relative terms. A survey of the literature indicates that the demand for cigarettes generally increases with the average level of income, especially in developing countries.<sup>4</sup>

Tax (and by implication price) increases, together with legislation, are two tobacco control levers over

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which policy makers have direct control. Policy makers have little control over the level of or growth in average incomes. But the growth in average per capita income does have a huge impact on the demand for cigarettes. This paper argues that policy makers should not only focus on price and tax, but on affordability as well.

Affordability considers the simultaneous effect of income and cigarette price on a person's buying decision. Most studies to date consider price and income effects in isolation. One can investigate the *level* of affordability (usually in a comparative context at a point in time) or *changes* in affordability over time. Both are analysed in this paper. A number of definitions of affordability have been developed in the recent past, but affordability essentially refers to the quantity of resources (in terms of time or money) required to buy a pack of cigarettes.

We have two aims. First, we present the latest affordability statistics and trends in cigarette affordability for as many countries as possible. And second, we address certain methodological issues, especially regarding the measurement of income, when calculating affordability measures.

## II. Existing Information on Cigarette Affordability

A limited number of published studies have explicitly investigated the affordability of cigarettes. Scollo<sup>7</sup> and Lal and Scollo<sup>8</sup> compared the price of cigarettes to that of a McDonald's Big Mac hamburger. They found that between 1995 and 2002 cigarettes had become relatively more expensive than Big Mac hamburgers in 15 of the 16 countries included in the two surveys. While this is encouraging from a tobacco control perspective, the conclusion is limited to high-income countries, because only these countries were included in the sample. Another criticism is that these studies use the price of the Big Mac hamburger as the reference point, rather than income. As such, they did not investigate affordability *per se*, but simply the price of cigarettes relative to an internationally standardised product (i.e. the Big Mac).

Guindon et al<sup>9</sup> used a more explicit measure of income by considering the time needed to work to purchase a pack of cigarettes. Based on average hourly earnings of 12 occupations monitored by the UBS survey of earnings, they calculated the average number of working minutes required to purchase a pack of local brand or Marlboro (or equivalent) cigarettes. They found that between 1990 and 2000 cigarettes became more affordable in six of the 25 (24%) developed countries and in four of the 11 (36%) developing countries in the sample. However, for a majority of both developed and developing countries, cigarettes became less affordable.

Earlier studies focused primarily on high-income countries and used cross-sectional data at discrete

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**Despite being more expensive when expressed in a common currency... cigarettes [are] generally more affordable in developed countries.**

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**... cigarettes [will] become more affordable in fast-growing emerging economies if cigarette prices do not keep pace with the rate of economic growth.**

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points in time. Blecher and van Walbeek<sup>10</sup> considered a larger sample of 70 countries, of which 28 were developed and 42 were developing. They defined affordability in terms of per capita gross domestic product (GDP), which is a more encompassing definition of income than average earnings of selected occupations. Despite being more expensive when expressed in a common currency, Blecher and van Walbeek found that cigarettes were generally more *affordable* in developed countries. During the 1990s cigarettes became more affordable in 11 (39%) and less affordable in 17 (61%) of the 28 developed countries examined. Of the 42 developing countries considered, cigarettes become more affordable in 24 (57%) and less affordable in 18 (43%) countries.

Kan<sup>11</sup> investigated the affordability of cigarettes in 60 cities in 2006. Using a similar methodology to that used by Guindon et al,<sup>9</sup> Kan calculated the percentage of daily income required to purchase a pack of cigarettes. Rather than using the average earnings of all 14 occupations monitored by the UBS, Kan considered the seven occupations with the lowest earnings, on the grounds that (1) the average wage is not distorted by the inclusion of highly paid occupations, and (2) it better reflects the income patterns of the poor (who, in many countries, are more likely to smoke, and typically spend a larger proportion of their income on cigarettes than do the rich). Kan found that cigarettes remained highly affordable in most cities surveyed, and concluded that there is room for further tax increases. Kan also warned that cigarettes would become more affordable in fast-growing emerging economies if cigarette prices do not keep pace with the rate of economic growth.

### III. Deriving Affordability Measures

Since affordability incorporates price and income components, the challenge is to obtain data that accurately reflect both.

#### Price Data

Price data were drawn from the Economist Intelligence Unit's (EIU) World Cost-of-Living Survey.\* This survey is conducted every six months in order to assess the prices of goods and services in 120 of the world's major cities. The prices used in this study were collected in the first week of September, and cover each year for the period 1990 to 2006. For most countries a single city is monitored. In countries where multiple cities are monitored,<sup>†</sup> an unweighted average price is calculated. In 1990 the survey included 103 cities in 69 countries. By 2006 this number had risen to 120 cities in 77 countries. Over the period of investigation, the EIU expanded the coverage of their survey to include cities in countries that were already represented in the survey in 1990.<sup>#</sup> Such cities were excluded from the analysis because they could bias the average price if the average cost of living differs significantly between the incumbent city (or cities) and newly included cities.

The survey considers the prices of two cigarette brands: Marlboro (or the nearest international equivalent) and a popular local brand, sold at two types of outlets: high-volume supermarket, and mid-price retail outlet. Since the emphasis is on affordability, the lowest of the four prices was selected for each year. In practically all cases this was the local brand, sold at the supermarket.

The EIU collects price data in local currency. Calculating affordability measures does not require that the price data be converted to a common currency, because income data are also collected in local currency. However, to compare cigarette *prices* among countries, a common currency is required. To do this, all prices were converted to the US dollar using the market exchange rates on the day of the survey, as published by the EIU. As an alternative to using market exchange rates, one can convert local currency prices to a common currency using purchasing power parity (PPP) conversion factors. PPP conversion factors take into account that the cost of living differs among countries.

#### Income Data

While price is conceptually quite easy to comprehend, income is more complex. First, how does one define income? Should one use a broad definition (e.g. per capita GDP) or a narrow definition of income (e.g. after-tax income)? While a broad definition is less sensitive to differences in tax regimes and government's role in providing goods, services and grants, a narrow definition is typically better understood by the public. Most people can, for example, comprehend, "A London teacher's net hourly earnings in 2006 were £ 8.65" better than, "Per capita GDP in the UK in 2006 was £ 21,084." Second, there is the issue of income distribution. Two countries may have a similar average level of income, but if the income distributions are dissimilar, affordability measures in such countries would not be comparable. Given a similar price, cigarettes are likely to be more affordable in a middle-income country with a relatively equal income distribution than in a country with a

\* The EIU graciously provided us the data, but typically sell the data to clients. The EIU website for purchase is <http://store.eiu.com/product/130000213.html>.

<sup>†</sup> In 2006 countries with multiple cities monitored were Australia (5), Brazil (2), Canada (4), China (5), France (2), Germany (5), India (2), Italy (2), Japan (2), New Zealand (2), Russia (2), Saudi Arabia (3), Spain (2), the UAE (2), the UK (2), the US (16) and Vietnam (2).

<sup>#</sup> These countries were China, Russia, the United Kingdom, the United States and Vietnam. See the Annex for a list of the cities that are and are not included in the analysis.



similar average level of income, but where a large proportion of the population may be desperately poor.

Two income measures are used. Per capita gross domestic product (GDP) is a broad measure of income and has the advantage that it is calculated using a consistent methodology. Despite the drawback that it does not take differences in the distribution of income into account, it is generally regarded as a good indicator of average living standards. GDP data were drawn from the World Bank's World Development Indicators online database.<sup>12</sup> Local currency aggregate GDP was converted into per capita terms using population statistics from the same database.

The second income measure is the Union Bank of Switzerland (UBS) survey of earnings.<sup>13</sup> This survey determines gross and net hourly earnings in a number of occupations in the most important commercial cities around the world. We used four surveys (1997, 2000, 2003, and 2006) to construct a time series of median earnings. The surveys were based on 12 occupations in 1997 and 2000, 13 in 2003 and 14 in 2006.\*

### Measures of Affordability

The Relative Income Price (RIP) is a broad measure of affordability developed by Blecher and van Walbeek.<sup>10</sup> The RIP calculates the percentage of per capita GDP required to purchase 100 packs of cigarettes. The higher the RIP, the less affordable cigarettes are, and vice versa.

The RIP was calculated for each year in the period 1990 to 2006 for all available countries. Some countries experienced hyperinflation during the period under investigation, which complicated the data

analysis. In some cases manual adjustments were required to make the GDP data and the price data comparable. These are indicated in the Annex.<sup>†</sup>

The “minutes of labour” method was developed by Guindon et al.<sup>9</sup> It is defined as the minutes of labour required to purchase the cheapest pack of cigarettes (as surveyed by the EIU), based on net earnings.<sup>#</sup> There are a number of variations of this methodology. Guindon et al.<sup>9</sup> use the weighted average of all occupations as calculated by the UBS. Alternatively one may choose to use the simple average (mean) or the median. In this paper we use the median for calculating the “minutes of labour method” because it is not affected by outliers of earnings in specific occupations.

Kan<sup>11</sup> defines affordability as the percentage of daily income required to buy a pack of cigarettes. We did not use Kan's measure in this paper because it is essentially the reciprocal of Guindon's “minutes of labour” method. However, Kan's focus on lower-paying jobs is useful in the context of affordability of cigarettes among the poor. Thus we specify an additional affordability measure as the number of minutes required to buy a pack of cigarettes by a person earning a relatively low wage. Following Kan's lead, we did this by calculating the median net wage of the lowest paid half of the occupations surveyed by UBS.\*\*

### Other Methodological Issues

The typical way to determine whether cigarettes have become more or less affordable in the 16 years since 1990 would be to calculate the compound growth rate between 1990 and 2006  $\left[ \left\{ \left( \frac{Y_{2006}}{Y_{1990}} \right)^{1/16} - 1 \right\} \times 100 \right]$ .

\* The occupations used in 1997 and 2000 were: primary school teachers, bus drivers, automobile mechanics, building labourers, skilled industrial workers, cooks, department managers, engineers, bank credit clerks, secretaries, saleswomen, and female industrial workers. The additional occupation in 2003 was product manager, and the additional occupation in 2006 was call center agent.

† Furthermore, the observation for Poland in 1992 was excluded due to an extreme outlying value (one-tenth the value of the preceding year and one-sixth the value in the following year). Libya was excluded entirely since that data series was very volatile.

# Although Guindon et al calculate the measure using both the international and local brands of cigarettes, we use the cheapest pack of cigarettes for all measures.

\*\* The six lowest-paid occupations were used in 1997, 2000 and 2003 while the seven lowest-paid occupations were used in 2006. These occupations vary from country to country and, within a country, from year to year.

If no information on prices and/or affordability is available for the period between the starting and ending years, this is the appropriate procedure. However, if the intermediate values are known and the starting and/or ending values are outliers, i.e. significantly different from the underlying trend, the calculated growth rate will be unrepresentative of the true trend. To prevent such distortions, a constant growth regression line was fitted to all observations.<sup>14</sup> This entails fitting the regression line  $\ln(Y_t) = \alpha + \beta t + \varepsilon_t$  where  $t = 0, 1, 2, \dots$ . The estimated value of  $\beta$  is the estimated growth rate of the variable Y. An advantage of this approach is that even if some values are missing (even at the end points), one can still estimate the value of  $\beta$ .

Although we have taken all reasonable measures to ensure that the data are correct, a variety of factors (e.g. changes in currencies, hyperinflation, temporary spikes in cigarette prices, errors in collection, volatile exchange rates) could result in incorrect and possibly outlier values. Of the two measures of central tendency (mean and median), we typically used the median, because it is not susceptible to the influence of outliers,

whereas the mean is. When calculating correlations, we typically used Spearman rank correlations, rather than simple (Pearson) correlations, for two reasons. Firstly, Spearman correlations do not assume a linear relationship, whereas the Pearson correlations do. Secondly, Spearman correlations are not affected by outliers, whereas Pearson correlations are. Zar's<sup>15</sup> tables were used to test the significance of the Spearman coefficients.

The sample consists of 77 countries (based on 110 cities for which price data were available) when per capita GDP was used as the measure of income, and 52 countries (68 cities) when UBS data were used. The World Bank's most recent classification of July 2007<sup>16</sup> was used to divide the countries into four income categories (first number refers to GDP data; the second number to UBS data): high (32 [29] countries),\* upper-middle (18 [13] countries), lower-middle (17 [6] countries) and low-income countries (10 [4] countries). Low- and middle-income countries together represent developing nations, while high-income countries represent developed nations.

\* Taiwan is not classified because it is not recognised as a country by the World Bank. It is not included in the RIP measures since no GDP data are recorded by the World Bank, but it is included in the UBS measures since both price and wage data are available. For the purposes of this research we classify Taiwan as a high-income country.

## IV. Global Cigarette Affordability

### Cigarette Affordability, 2006

Conventional wisdom tells us that cigarette prices, expressed in a common currency, are much higher in developed countries than in developing countries.<sup>1,2</sup> Since cigarette price and tax data (expressed in a common currency) are often easily accessible, these are typically the focus of cross-sectional studies. However, as will be shown below, an understanding of cigarette price differences is useful in some situations, but cigarette prices by themselves are not necessarily a good indicator of affordability. Nevertheless, we consider cigarette prices in some detail here, since it forms the standard against which we compare the affordability measures.

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**... an understanding of cigarette price differences is useful in some situations, but cigarette prices by themselves are not necessarily a good indicator of affordability.**

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In Graph 4.1 countries are ranked according to their development status (high-, upper-middle-, lower-middle- and low-income) and then according to the US dollar price per pack of cigarettes in 2006. Cigarettes are, on average, between three and four times more expensive in wealthier countries than in poorer countries. However, among the developing countries in the sample, we find that average US dollar-denoted prices in upper-middle-, lower-middle- and low-income countries are similar.

A second feature of Graph 4.1 is the very large variability in the US dollar prices among countries with a similar level of development. For high-income countries the coefficient of variation (CV) is 0.50 (with a median price of \$4.27, a mean price of \$4.42, and

standard deviation of \$2.19) while among developing countries the CV is 0.45 (with a median of \$1.21, a mean of \$1.31, and standard deviation of \$0.59). Countries with high costs of living (e.g. Norway and Iceland) and those that have taken strong tobacco control action (e.g. Australia, Canada, Ireland, New Zealand, and the United Kingdom) have the most expensive cigarettes. Among high-income countries, Middle Eastern countries tend to have the cheapest cigarettes.

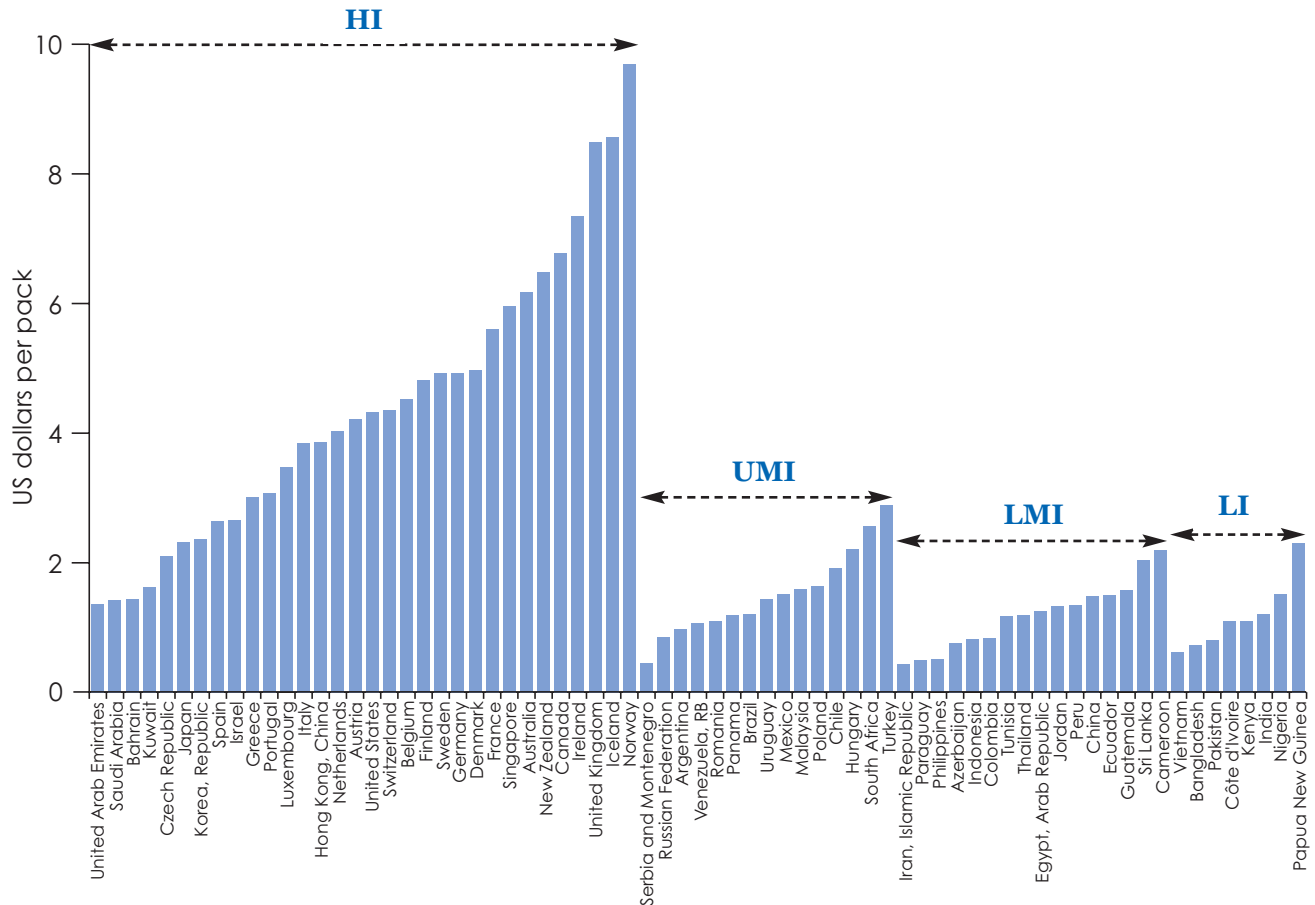
Do excise tax rates adequately explain the differences in retail prices? Based on data published in a recent World Health Organization report,<sup>17</sup> we calculated a correlation coefficient of 0.40 ( $n = 120$ ,  $P < 0.001$ ) between US dollar-denominated retail prices and the national excise tax burden (i.e. excise tax as percentage of the retail price, but excluding provincial/state, local, and general sales taxes). While the correlation between the tax burden and the retail price is significantly positive, most of the variation in retail prices is explained by other factors, such as differences in production costs, market power of cigarette manufacturers and importers, logistical chain efficiencies and differences in wholesaler and retailer mark-ups.

Graph 4.1 is certainly useful in some circumstances. To know that cigarettes are very expensive in Norway is useful information for a smoker travelling to that country. Similarly, multinational cigarette companies would be interested to know the after-tax prices, expressed in a common currency. (The prices shown in Graph 4.1 are the tax-inclusive prices). However, one cannot infer anything about the affordability of cigarettes from Graph 4.1, because it does not incorporate the level of income.

Rather than using market exchange rates to convert local currency prices to internationally standardised prices, one could use purchasing power parity (PPP) conversion factors.\* This approach

\* Whereas market exchange rates are readily available on a daily basis, PPP conversion factors are calculated annually as the ratio of the price levels between countries. The PPP conversion factors are derived from a comprehensive basket of goods and services, including non-tradables (i.e. electricity, water, etc.)

Graph 4.1: Price Per Pack of Cigarettes Expressed in US Dollars, 2006



Note: The figure does not include countries that have no observation for 2006. HI — high income, UMI — upper-middle income, LMI — lower-middle income, LI — low income

Source: Economist Intelligence Unit.

accounts for the fact that costs of living vary among countries, but still does not consider the impact of differences in the level of income between countries. As such, it is still a price measure, rather than an affordability measure.

The correlation coefficient between the two cigarette price measures, calculated using the two different currency conversions, is 0.91 ( $n = 67$ ,  $P < 0.001$ ). A graphical representation (not shown) reveals a similar picture as Graph 4.1, i.e. higher prices in developed countries, lower prices in developing

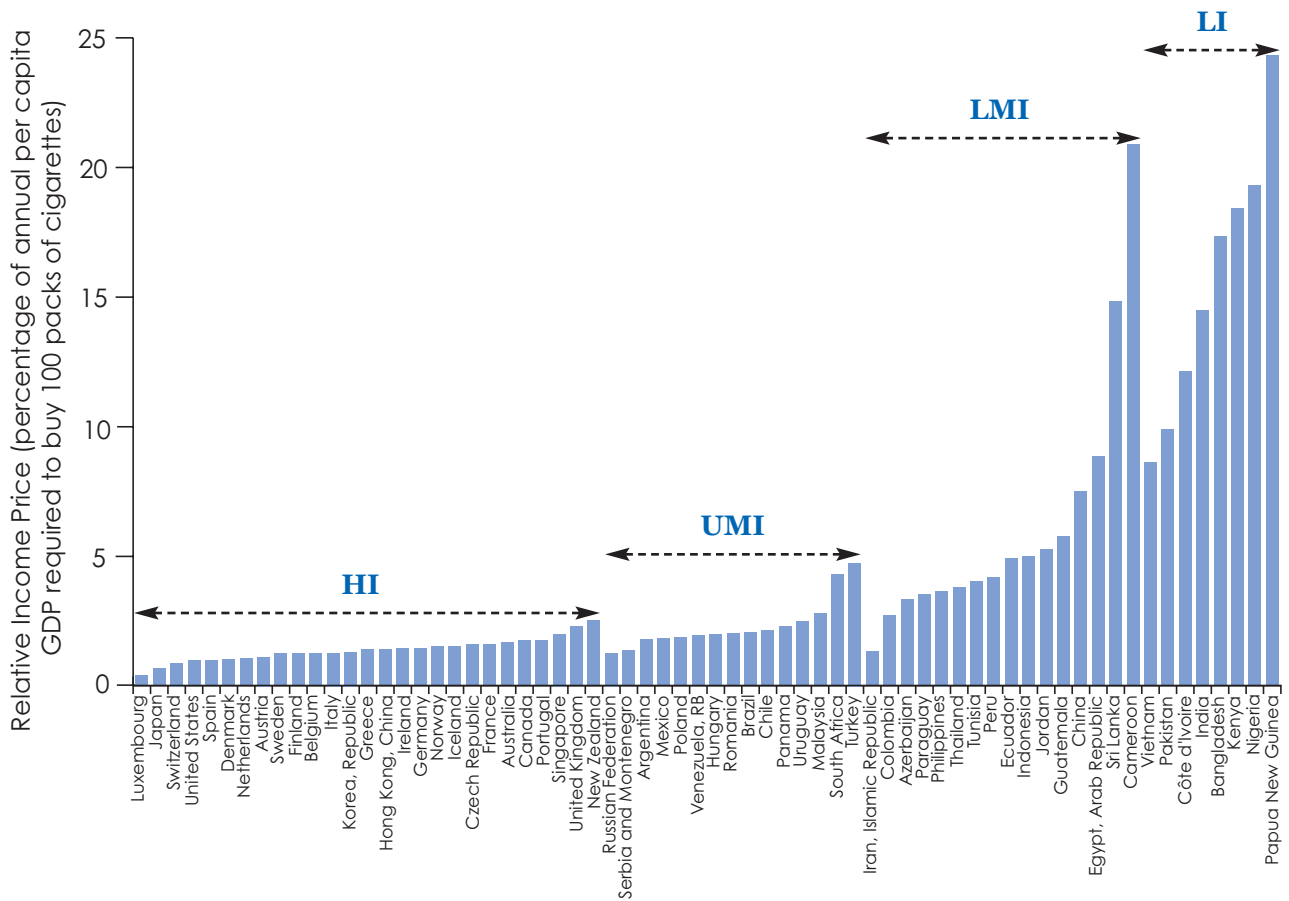
countries, and a high degree of variation in prices among countries with a similar level of development. Relative to cigarette prices obtained using the market exchange rate as the method of conversion, PPP-adjusted prices in developing countries are substantially higher, but do not change much in developed countries. Using this price measure, cigarettes are less than twice as expensive in developed countries than in developing countries, compared to three to four times more expensive if the market exchange rate is used for the conversion (see Table 4.2 on page 13). Since this paper investigates affordability,

rather than different price measures, technical issues about price measurement are not discussed further.

The Relative Income Price of cigarettes (RIP) — the percentage of per capita GDP required to buy 100 packs of cigarettes — is shown in Graph 4.2. The lower this percentage, the more affordable the cigarettes are. The countries are again sorted, first by development status, and then by RIP.

... even though cigarettes in high-income countries are about three to four times more expensive in absolute terms than in developing countries, per capita GDP in high-income countries exceeds per capita GDP in less-developed countries by a much greater multiple....

Graph 4.2: Relative Income Price (RIP) of cigarettes, 2006<sup>a</sup>



<sup>a</sup> The Relative Income Price (RIP) represents the percentage of per capita GDP required to purchase 100 packs of cigarettes. The lower the percentage, the more affordable cigarettes are.

Note: The figure does not include countries that have no observation for 2006. HI — high income, UMI — upper-middle income, LMI — lower-middle income, LI — low income

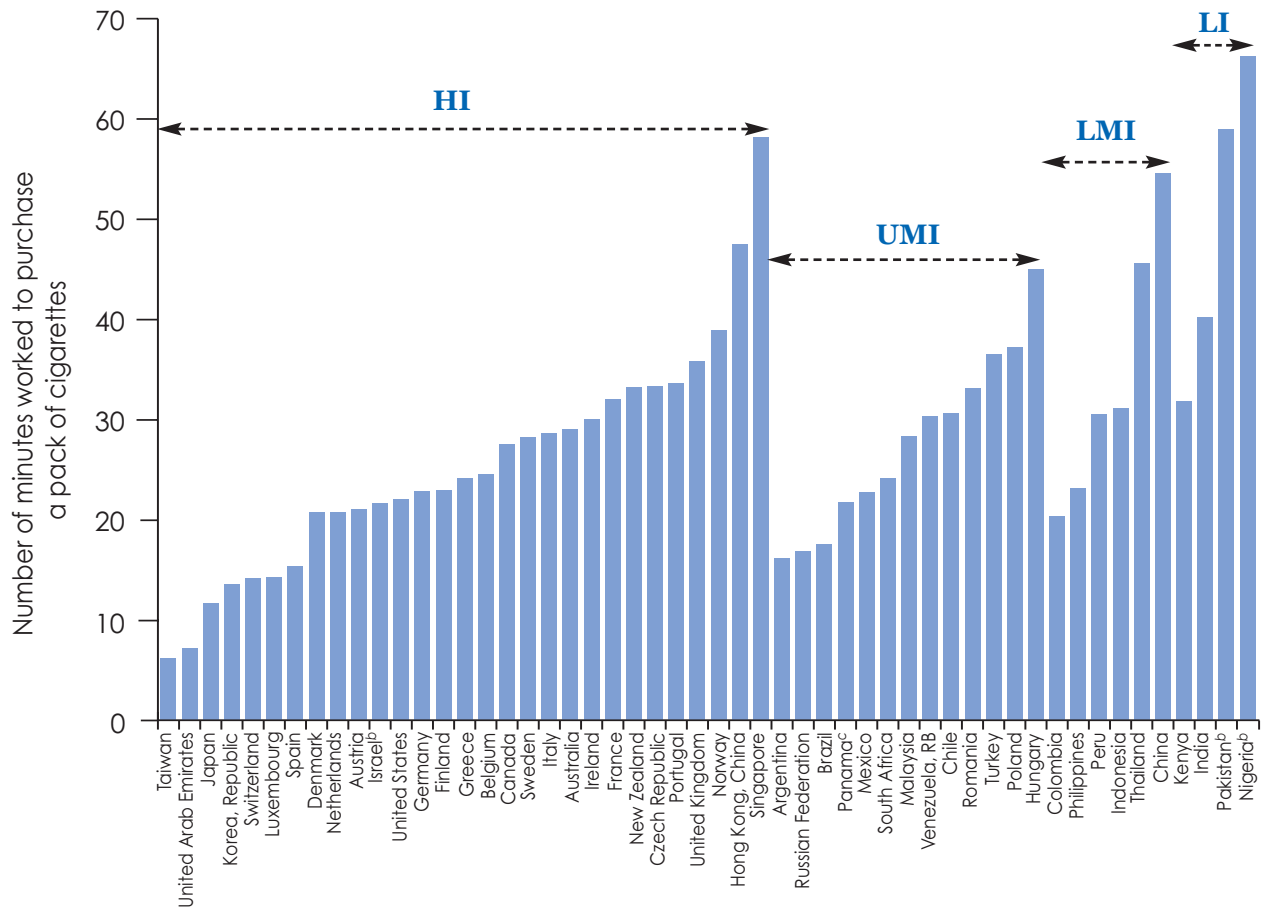
Sources: Economist Intelligence Unit and World Bank.

Using this measure of affordability, cigarettes are significantly more affordable in high-income countries, compared to middle-income and especially low-income countries, despite the fact that they are typically more expensive in absolute terms in high-income countries. This is explained by the fact that, even though cigarettes in high-income countries are about three to four times more expensive in absolute terms than in developing countries, per capita GDP in high-income countries exceeds per capita GDP (in common currency using market exchange rates) in less-developed countries by a much greater multiple (almost 8 times higher than

middle-income countries and about 49 times higher than low-income countries in 2006).

Graphs 4.3 and 4.4 indicate the number of minutes of work required to buy a pack of cigarettes in 2006, based on the UBS survey. The greater the number of minutes required to purchase a pack of cigarettes, the less affordable the product is. For both figures, the countries are sorted, first according to development status, and then according to minutes of labour required to buy a pack of cigarettes. Graph 4.3 approximates Guindon’s methodology and aims to estimate

**Graph 4.3: Number of Minutes Worked to Purchase a Pack of Cigarettes (median of all occupations), 2006<sup>a</sup>**

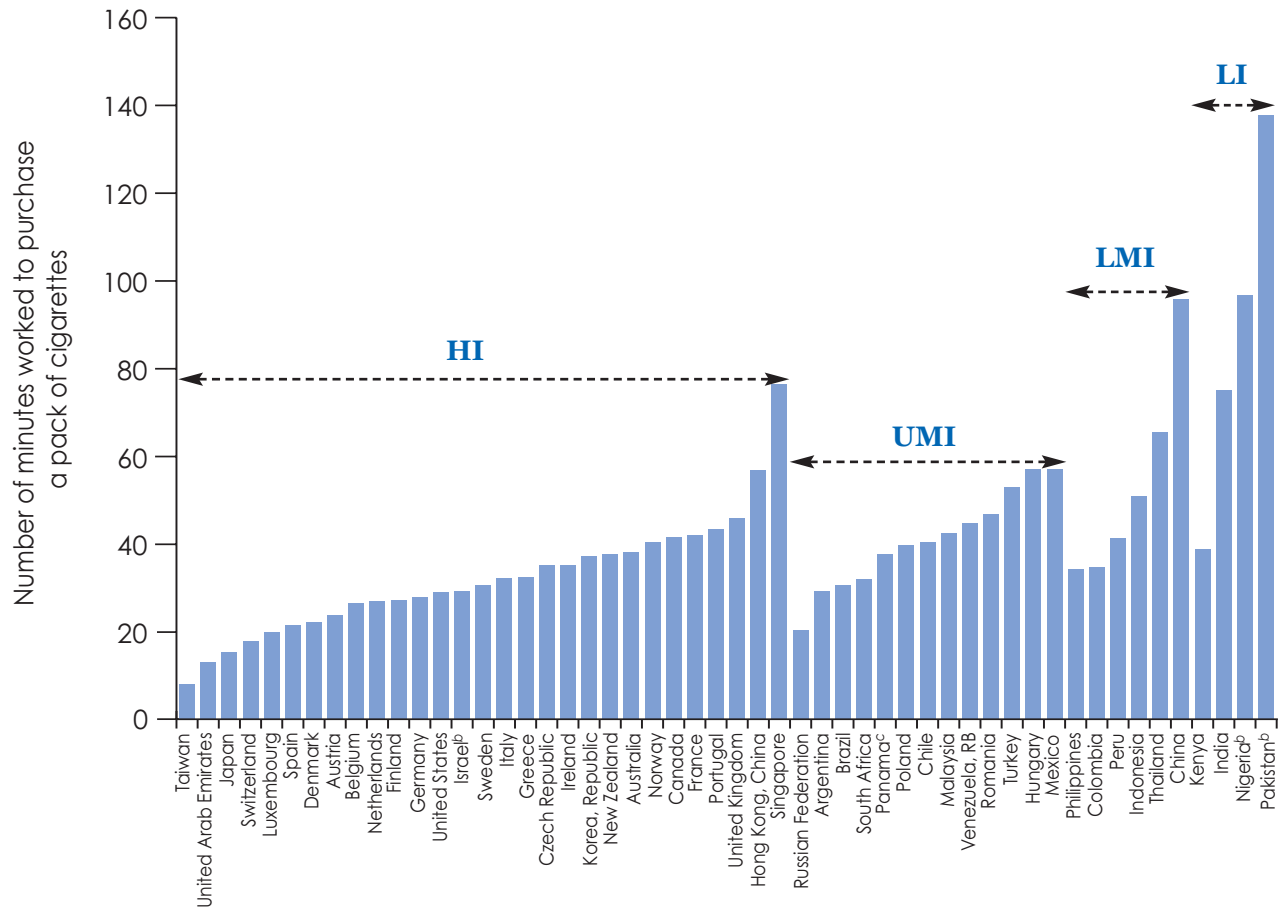


<sup>a</sup> The greater the number of minutes worked, the less affordable the pack of cigarettes.

Note: <sup>b</sup> 2003 data; <sup>c</sup> 2000 data. HI — high income, UMI — upper-middle income, LMI — lower-middle income, LI — low income

Sources: Economist Intelligence Unit and Union Bank of Switzerland.

**Graph 4.4: Number of Minutes Worked to Purchase a Pack of Cigarettes (median of seven lowest-paid occupations), 2006<sup>a</sup>**



<sup>a</sup> The greater the number of minutes worked, the less affordable the pack of cigarettes.

Note: <sup>b</sup> 2003 data; <sup>c</sup> 2000 data. HI — high income, UMI — upper-middle income, LMI — lower-middle income, LI — low income

Sources: Economist Intelligence Unit and Union Bank of Switzerland.

affordability of cigarettes for the median employed person.\* Graph 4.4 is derived from Kan's<sup>11</sup> methodology and is based on the median wage earned by the seven occupations, as with the lowest earnings surveyed by the UBS. Graph 4.4 thus specifically focuses on the affordability of cigarettes among poorer employed people. By construction, the numbers in Graph 4.4 are always higher than the numbers in Graph 4.3.

The relatively few observations for middle-income, and especially low-income countries prevent us from

making strong conclusions. Nevertheless, what Graph 4.3 does suggest is that the level of cigarette affordability, using the “minutes of labour” method, does *not* vary significantly among high-, middle-, and even low-income countries. While there is a high degree of variation in cigarette affordability within groups of countries with similar levels of development, there is not much variation *among* the averages (and medians) of the different groups. The mean, median, and standard deviation of high-, upper-middle-, and lower-middle-income countries are not statistically different.

\* Guindon et al use the weighted average while we use the median, since it is less prone to outliers.

Graph 4.3 stands in stark contrast to Graph 4.2, which found that cigarette affordability decreases sharply as we move from high-income to low-income countries.

Graph 4.4 presents the median minutes of labour required to buy a pack of cigarettes by workers in the seven occupations, as with the lowest earnings. As with Graph 4.3, the degree of within-group variation is high. However, as one moves from high- to low-income countries, there is a suggestion that cigarettes, on average, become relatively less affordable in the respective countries (see also Table 4.2). What this implies is that poorly remunerated occupations in middle- and low-income countries yield comparatively lower earnings in such countries than in high-income countries.

Spearman rank correlation coefficients were calculated for the three different affordability indices for four years in order to determine the degree of correlation among them, and these are shown in Table 4.1. Consider the results for all countries first. While all coefficients are positive and significantly different

**... the choice of income measure in calculating affordability is very important.**

from zero, the correlations, especially between RIP and Guindon's "minutes of labour" approach, are modest. The correlation coefficient between the two "minutes of labour" measures is consistently high, presumably because they are derived from the same data sources. The correlation between the RIP and Kan's "minutes of labour" measure is noticeably higher than the correlation between the RIP and Guindon's measure. Even though they are conceptually very different, the RIP and Kan's affordability measures seem to measure similar things. The choice of income measure in calculating affordability is very important.

In the lower half of Table 4.1 Spearman correlations between the different affordability measures are shown separately for high-income and developing countries. It is immediately obvious that the correlations among the different affordability measures are much higher for developed countries than for developing countries. Most Spearman

**Table 4.1: Spearman Rank Correlation Coefficients Among the Different Affordability Measures, for Developed and Developing Countries**

Group of countries	Year of Survey	Number of Observations	RIP—Guindon	RIP—Kan	Guindon—Kan
All countries	1997	44	0.442*	0.558*	0.943*
	2000	45	0.477*	0.596*	0.923*
	2003	49	0.531*	0.702*	0.867*
	2006	45	0.367*	0.499*	0.844*
High-income (developed) countries	1997	27	0.882*	0.871*	0.975*
	2000	27	0.837*	0.820*	0.965*
	2003	28	0.874*	0.930*	0.915*
	2006	26	0.857*	0.877*	0.924*
Developing countries	1997	17	0.578**	0.556**	0.944*
	2000	18	0.379	0.472	0.856*
	2003	21	0.506**	0.700*	0.896*
	2006	19	0.296	0.412	0.893*

Note: \*Significantly different from zero at the 1 percent level; \*\*Significantly different from zero at the 5 percent level.

Sources: Calculated from data provided by the Economist Intelligence Unit, Union Bank of Switzerland, and World Bank.



correlation coefficients for developed countries are in the 0.85 to 0.95 range, while for developing countries they are in the 0.3 to 0.7 range (excluding the Guindon-Kan correlations). In fact, for developing countries the correlations between the RIP and “minutes of labour” affordability measures are not significant for some years, including 2006.

Table 4.2 is a summary of the three affordability measures and the price, expressed in a common currency. Four statistics are shown in each case: the mean, median, standard deviation, and coefficient of variation. A number of features stand out. The data confirm that cigarettes are more expensive (in absolute terms) in wealthier countries compared to poorer

**... price, by itself, is a misleading indicator  
of affordability, since it does not take  
income into account.**

countries. The median price (converted to US dollars using market exchange rates) in high-income countries is four times higher than in low-income countries, and between three and 3.5 times higher than in middle-income countries. Using PPP-adjusted prices, the median price in developed countries is nearly two times higher than in developing countries. However, price by itself is a misleading indicator of affordability, since it does not take income into account. In fact, based on this sample of countries, price, expressed in a

**Table 4.2: Summary of Affordability Indices in 2006**

Indicator	Unit	Measure	HI countries	UMI countries	LMI countries	LI countries
Price	USD per pack (nominal, converted with market exchange rates)	Observations	32	15	16	8
		Mean	\$4.42	\$1.51	\$1.19	\$1.17
		Median	\$4.27	\$1.44	\$1.23	\$1.10
		Std. dev.	\$2.19	\$0.66	\$0.52	\$0.54
		CV	0.50	0.44	0.44	0.46
Price	USD per pack (nominal, converted using PPP conversion factors)	Observations	31	14	15	7
		Mean	\$4.08	\$2.32	\$2.44	\$2.22
		Median	\$3.78	\$2.15	\$2.27	\$2.21
		Std. dev.	\$1.52	\$0.76	\$1.07	\$0.56
		CV	0.40	0.35	0.47	0.25
Relative income price (RIP) (Blecher & van Walbeek's measure)	Percentage of per capita GDP to buy 100 packs	Observations	27	15	16	8
		Mean	1.39%	2.33%	6.23%	15.56%
		Median	1.42%	2.02%	4.56%	15.91%
		Std. dev.	0.46%	0.97%	5.00%	5.28%
		CV	0.33	0.41	0.80	0.34
Median minutes of labour (14 occupations) (Guindon's measure)	No. of working minutes to buy one pack of cigarettes	Observations	29 <sup>a</sup>	13 <sup>a</sup>	6	4 <sup>a</sup>
		Mean	25.5 min	27.8 min	34.3 min	49.3 min
		Median	24.2 min	28.4 min	30.9 min	49.6 min
		Std. dev.	11.4 min	8.8 min	13.3 min	16.0 min
		CV	0.45	0.32	0.39	0.32
Median minutes of labour (7 lowest-paid occupations) (Kan's measure)	No. of working minutes to buy one pack of cigarettes	Observations	29 <sup>a</sup>	13 <sup>a</sup>	6	4 <sup>a</sup>
		Mean	32.2 min	40.9 min	53.7 min	87.1 min
		Median	30.6 min	40.5 min	46.1 min	85.8 min
		Std. dev.	13.6 min	11.1 min	23.7 min	41.4 min
		CV	0.42	0.27	0.44	0.48

Note: <sup>a</sup> Where data did not exist for 2006, data for 2003 or 2000 were used. Countries affected are Israel (HI, 2003), Panama (UMI, 2000), Nigeria (LI, 2003) and Pakistan (LI, 2003).

Sources: Economist Intelligence Unit, Union Bank of Switzerland and World Bank.

common currency using both market exchange rates and PPP conversion factors, is unrelated, or even negatively related, to the affordability measures.\* Recalling that an increase in the affordability measure implies that cigarettes become less affordable, this means that cigarettes tend to be more affordable in countries where the price is higher. This is not meant to suggest that price is not important. But equally important to determining affordability is the average level of income.

The RIP provides strong support for the hypothesis that cigarettes are significantly less affordable in middle- and especially low-income countries than in high-income countries. To a lesser extent this hypothesis is supported by Kan's "minutes of labour" approach as well. The minutes of labour required to buy one pack of cigarettes increases by a factor of 2.8 (31 minutes vs. 86 minutes) as one moves from high-income to low-income countries. For upper-middle- and lower-middle-income countries, the factors are 1.3 and 1.5, respectively.

### Trends in Cigarette Affordability, 1990 to 2006

The previous discussion considered the situation in the most recent year (2006) for which data was available. An equally important issue concerns *trends* in affordability. One would expect that, given the increased awareness of the dangers of smoking and the increased activism of tobacco control lobby groups around the world, a majority of governments would have implemented strategies to make cigarettes less affordable. This section briefly investigates trends in cigarette affordability since 1990. We first consider growth rates in cigarette prices and the three

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**High-income countries, as a group, have been able to consistently reduce the affordability of cigarettes.**

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**... cigarettes have generally become more affordable in developing countries between 1997 and 2006.**

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affordability measures for the period 1997 to 2006. We are limited to this period because the "minutes of labour" affordability measures were available only for the years 1997, 2000, 2003, and 2006. Subsequently, we use the RIP to consider trends in cigarette affordability for a longer period (1990–2006).

Table 4.3 shows the average annual growth rates in the US dollar price of cigarettes and the three affordability measures for the periods 1997–2000, 2000–2003, 2003–2006, and 1997–2006. Countries were divided into two groups: high-income (developed) and developing countries. The growth rates are based on the median values for the appropriate groups of countries for the relevant years.

Table 4.3 reveals a consistent picture regarding trends in cigarette affordability over the period 1997–2006. High-income countries, as a group, have been able to consistently *reduce* the affordability of cigarettes. All three affordability measures indicate a decrease in cigarette affordability in each of the different sub-periods. Throughout the 10-year period, cigarettes have become less affordable at the rate of about 3 percent per annum.

Despite minor inconsistencies among the three affordability measures, Table 4.3 indicates that cigarettes have generally become *more* affordable in developing countries between 1997 and 2006. Two measures (the RIP and Kan's "minutes of labour" method) certainly indicate this. In the period 2003 to 2006 all three measures indicate that cigarettes have become significantly more affordable in developing countries. For two measures, the RIP (–5.7 percent per year) and Kan's "minutes of labour" measure

\* Spearman's correlation coefficient between the US dollar price (calculated using market exchange rates) and the RIP, Guindon's "minutes of labour," and Kan's "minutes of labour" affordability measures are –0.50, –0.44, and –0.74, respectively. All correlations are significant at the 5 percent level.

**Table 4.3: Growth Rates in Cigarette Price and Affordability Measures for 1997–2006, Based on the Median for the Country Categories<sup>a</sup>**

Indicator	Unit	Country category	1997–2000	2000–2003	2003–2006	1997–2006
Price <sup>b</sup>	USD per pack (nominal, converted with market exchange rates)	High-income	1.1% (31)	14.4% (32)	5.3% (32)	6.8% (31)
		Developing	-0.3% (44)	3.4% (46)	5.1% (41)	2.7% (39)
Relative income price (RIP)	Percentage of per capita GDP to buy 100 packs	High-income	2.4% (31)	1.7% (32)	1.9% (27)	2.0% (27)
		Developing	5.4% (44)	-4.9% (44)	-5.7% (39)	-1.8% (39)
Median minutes of labour (14 occupations) (Guindon's measure)	No. of working minutes to buy one pack of cigarettes	High-income	4.2% (28)	2.6% (28)	3.1% (28)	3.3% (28)
		Developing	21% (17)	0.4% (18)	-1.4% (19)	1.1% (17)
Median minutes of labour (7 lowest-paid occupations) (Kan's measure)	No. of working minutes to buy one pack of cigarettes	High-income	2.0% (28)	4.7% (28)	3.2% (28)	3.3% (28)
		Developing	4.7% (17)	0.6% (18)	-5.4% (19)	-0.4% (19)

Note: Number of observations is shown in parentheses.

<sup>a</sup> These growth rates were calculated according to the standard formula:  $[(Y_t/Y_{t-p})^{1/p} - 1] \times 100$ . It was impossible to calculate growth rates with a constant growth regression model, because in-between values for the "minutes of labour" affordability measure are not available as the surveys were not conducted by the UBS in these years.

<sup>b</sup> The growth rates in the price of cigarettes are included for completeness only, and are not discussed further, since these numbers are affected mainly by macroeconomic factors such as global inflation trends and changes in exchange rates.

Sources: Economist Intelligence Unit, Union Bank of Switzerland, and World Bank.

(-5.4 percent per year), the decreases were substantial, while Guindon's "minutes of labour" measure suggests a less dramatic decrease (-1.4 percent per year). These years (2003–2006) saw rapid economic growth in many developing countries. The price of cigarettes

obviously did not keep pace with income growth and, as a result, cigarettes became more affordable.

Table 4.4 considers trends in cigarette affordability over a longer period (1990–2006) using the RIP as the measure of affordability. The growth

**Table 4.4: Average Annual Percentage Change in Median Country RIP, 1990–2006 and Sub-Periods**

Period	High-income countries (n=32)	Upper-middle-income countries (n=19)	Lower-middle-income countries (n=17)	Low-income countries (n=10)	Developing countries (n=46)
1990–1995	2.4%	0.6%	-1.6%	1.7%	0.8%
1995–2000	1.8%	0.7%	-0.5%	1.0%	0.7%
2000–2003	1.3%	-5.8%	-2.5%	1.3%	-4.9%
2003–2006	1.9%	-7.0%	-9.3%	-6.0%	-5.4%
1990–2006	0.8%	-1.3%	-1.5%	-0.7%	-1.2%

The Relative Income Price (RIP) represents the percentage of per capita GDP required to purchase 100 packs of cigarettes. If the growth in the RIP is negative, cigarettes have become more affordable, while if the growth rate is greater than zero, cigarettes have become less affordable.

Sources: Economist Intelligence Unit, Union Bank of Switzerland, and World Bank.

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**... [there is] a clear dichotomy between developed and developing countries. Cigarettes are becoming less affordable in developed countries and much more affordable in developing countries.**

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rates were calculated according to the regression method discussed earlier, and thus differ slightly from comparable figures in Table 4.3.\*

Among high-income countries there has been a consistent increase in the RIP of between 1 and 2 percent per year, over the period as a whole and in each of the sub-periods. This finding is consistent with the findings in Table 4.3. However, the experience in high-income countries differs markedly from the experience in developing countries. The RIP increased among upper-, middle-, and low-income countries during the 1990s, but decreased in the post-2000 period. Among lower-middle-income countries the RIP has been decreasing ever since 1990. The decrease

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**Some developing countries in Asia and Europe have experienced very rapid increases in cigarette affordability. In most cases, the increases in cigarette affordability can be ascribed to rapid increases in incomes, more than to decreases in the real price of cigarettes.**

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was sharpest in the 2003 to 2006 period in all categories of developing countries. Table 4.4 indicates a clear dichotomy between developed and developing countries. Cigarettes are becoming less affordable in developed countries and much more affordable in developing countries.

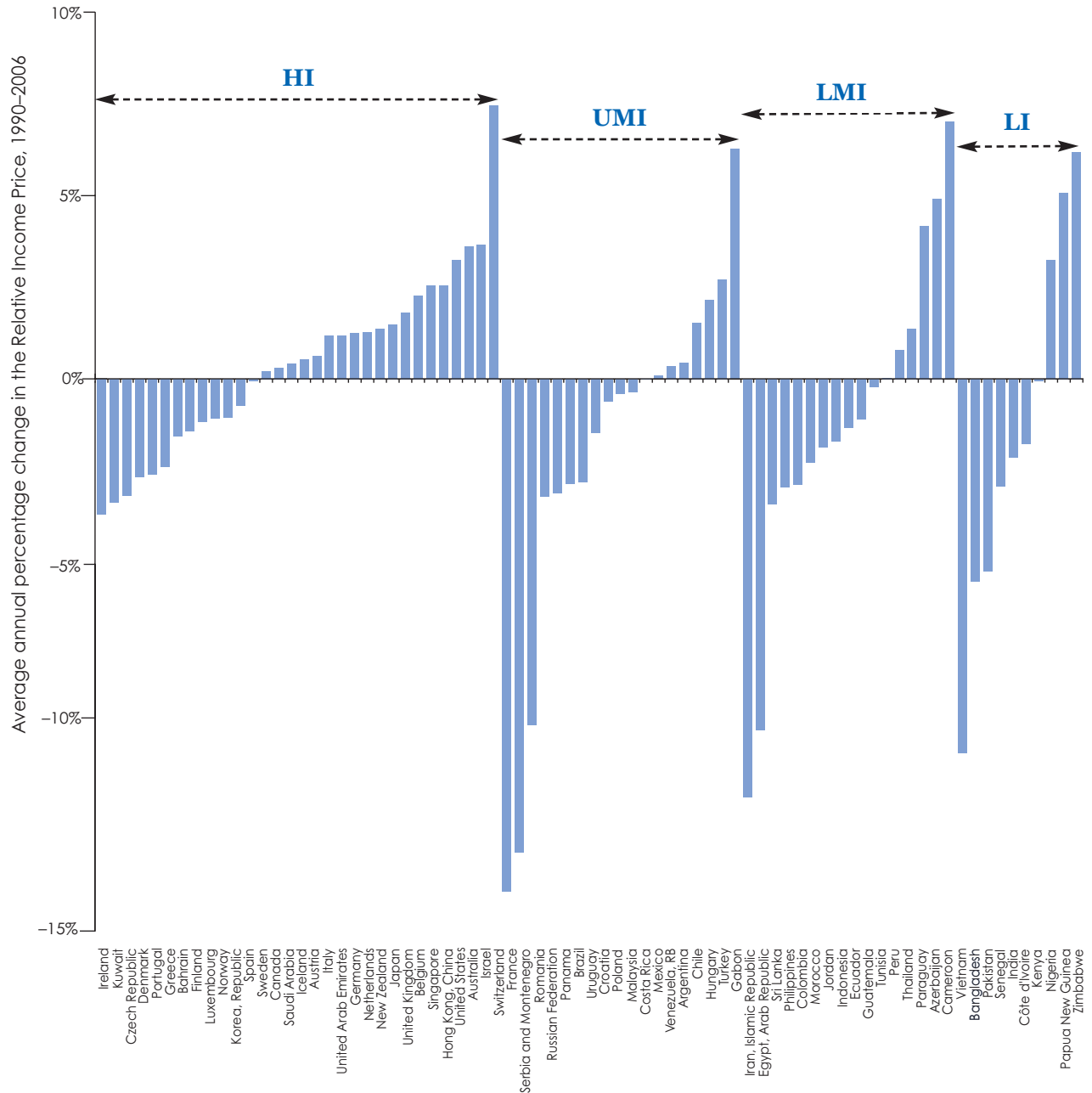
Graph 4.5 indicates the growth in cigarette affordability for individual countries for the period 1990–2006. The countries are again sorted, first by development status, and then by growth in affordability. Positive RIP growth means that cigarettes have become less affordable, while negative RIP growth implies that cigarettes have become more affordable. Of the 77 countries represented in Graph 4.5,<sup>†</sup> cigarettes became more affordable in 41 (53%) and less affordable in 36 (47%) countries. As mentioned previously, among high-income countries the situation is somewhat more encouraging, where cigarette affordability declined in 19 of the 32 countries (59%). However, among developing countries, cigarettes became more affordable among 28 of the 45 countries (62%), while they became less affordable in the remaining 17 countries (38%).

Some developing countries in Asia and Europe have experienced very rapid increases in cigarette affordability. In most cases, the increases in cigarette affordability can be ascribed to rapid increases in incomes, more than to decreases in the real price of cigarettes. However, as tariff barriers have been dismantled and economies have liberalised, the real price of cigarettes has decreased in some countries as well (e.g. Vietnam, Bangladesh, Iran, the Russian Federation, Côte d'Ivoire, and Senegal).

\* The data exhibit some unexpected characteristics in that the growth rates calculated for some of the sub-periods bear no similarity to the growth rates of the entire sample period. As an example, the growth rate for high-income countries over the period 1990 to 2006 is less than the calculated growth rates for any of the sub-periods. While this is mathematically not possible, it is possible if the underlying trend is estimated by statistical means, as is the case here. Since the median country changes from year to year, we are not considering the growth in a particular country, but rather the country that turns out to be the median country in any particular year.

<sup>†</sup> Graph 4.5 also includes some countries that do not have statistics available through 2006, but do have them through 2005 or an earlier year. Nine countries have data only through 2005 while two countries have data only through 2002. See the Annex for details.

**Graph 4.5: Average Annual Percentage Change in the RIP, 1990–2006<sup>a</sup>**



<sup>a</sup> The Relative Income Price (RIP) represents the percentage of per capita GDP required to purchase 100 packs of cigarettes. If the percentage change in the RIP is positive it implies that cigarettes have become less affordable, while a negative percentage change in the RIP implies that cigarettes have become more affordable.

Note. HI — high income, UMI — upper-middle income, LMI — lower-middle income, LI — low income

Sources: Economist Intelligence Unit and World Bank.

## V. Discussion and Conclusions

This paper introduced a number of affordability measures, which were based on the same price data but different income data. It was found that the choice of income variable has a large impact on the affordability measure. Despite these methodological differences, the central message of this paper is that policy makers should not focus on cigarette taxes and prices exclusively, but must also consider cigarette affordability.\*

In Table 4.1 correlation coefficients among the different affordability measures were calculated separately for developed and developing countries. The high correlation among the three affordability measures for high-income countries (mostly in the 0.85 to 0.95 range) is encouraging, because it suggests that the choice of income (at least between per capita GDP and the UBS earnings survey) does not matter much for these countries. However, we cannot say this about developing countries, where the correlation coefficients are typically in the 0.3 to 0.7 range. For developing countries, cigarettes are more affordable if one uses UBS earnings and less affordable if one uses per capita GDP as income proxies. The evidence suggests that the UBS's choice of occupations is more representative of the occupational distribution in developed countries, while it represents only the top-

end of the occupational distribution in developing countries. On the other hand, per capita GDP aims to account for the whole income distribution, including unskilled, poorly remunerated and subsistence workers. Given that the UBS survey covers only a small (typically unrepresentative) portion of the labour markets in developing countries, we recommend caution in the interpretation of affordability measures based on UBS survey data for developing countries.

We believe that one cannot pass objective judgment on the level of cigarette affordability for any individual country at any particular point in time. The fact that the “median person” in Australia has to work 29 minutes to buy a pack of cigarettes, does not objectively indicate whether cigarettes are affordable or not. Similarly, if it requires 4.3 percent of annual per capita GDP to buy 100 packs of cigarettes in South Africa, that in itself does not say whether cigarettes are affordable or not. The level of cigarette affordability is useful only in a comparative context. This can either be in comparison to other countries, or in comparison with past levels of affordability in the same country.

Consider a cross-sectional comparison of cigarette affordability first. Irrespective of the measure used, there is a high degree of variation in the level of cigarette affordability across countries, even among countries that the World Bank classifies into similar income groupings.

\* The reason for the differences in the affordability measures based on per capita GDP and minutes of labour has to do with representativeness of the income data. Per capita GDP measures average output (and thus income) of a representative person in a country. While there are many criticisms against per capita GDP as a measure of income, it is designed to be the most encompassing and broadest measure of economic activity. The UBS survey of earnings is not designed to be representative of average earnings in the country as a whole. First, within a particular country, it focuses on only a small number of cities, usually the commercial centres. Earnings in commercial centres are typically higher than in other cities, and urban earnings are typically higher than rural earnings, especially in developing countries. Second, even though the UBS aims to survey earnings among a representative cross-section of occupations, most occupations surveyed require some or even substantial training. Unskilled occupations, e.g. gardeners, rubbish collectors, cleaners and domestic servants, are not included in the UBS survey. Third, the UBS surveys only formal sector employers. Wages in the informal sector are typically much lower than in the formal sector, and these are not covered in the UBS survey. Fourth, the UBS considers only employed persons. An unemployed person would not be represented in the UBS survey at all. Fifth, the UBS does not take into consideration the average size of the family that depends on income of the primary wage earner. In developing countries families are typically larger than in developed countries. In terms of these five issues, developing countries differ notably from developed countries. In developing countries the urban/rural wage differential is larger, the unemployment rate is higher, the labour participation rate (especially among women) is lower, the average number of dependents is higher, and the proportion of people working in low-wage menial jobs and in the informal sector is higher than in developed countries. All these factors suggest that the UBS survey incorporates only a small portion of the labour market in developing countries.

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**... countries that experience rapid economic growth face tobacco control challenges that slower-growing countries do not face.**

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Second, considering changes in cigarette affordability over time, there is a wide divergence between the experiences of developed and developing countries. Cigarettes have become less affordable in most developed countries since 1990. The decreasing trend has been remarkably consistent throughout this 17-year period. This suggests that, at least at an aggregated level, developed countries are actively trying to discourage smoking by making cigarettes less affordable through fiscal and, possibly, other means. It is also possible that tobacco companies have increased the retail price by increasing the real net-of-tax price, as has happened, amongst others, in Jamaica,<sup>18</sup> South Africa,<sup>4</sup> and the United States.<sup>19</sup>

In many developing countries cigarettes have become much more affordable since 1990. In many large, populous countries in Asia, particularly China, Pakistan, Bangladesh and Vietnam, cigarettes have become more affordable at the rate of 5 percent or more each year.

Many countries have experienced unprecedented economic growth in the past decade or two. While this creates great opportunities (e.g. reducing poverty and

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**To the extent that tobacco control is a priority area for government and policy makers, tobacco prices and taxes should be adjusted against some standard of affordability, not against a standard of a real price or a real tax only.**

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increasing people's standard of living), it creates tobacco control challenges as well. The Spearman correlation coefficient between the average growth rate for the period 1990 to 2006 and the average growth in the RIP over the same period is  $-0.27$  ( $n = 77$ ,  $P < 0.02$ ). This suggests that countries that experience rapid economic growth are likely to find cigarettes becoming more affordable.

This paper argues that countries that experience rapid economic growth face tobacco control challenges that slower-growing countries do not face. To the extent that tobacco control is a priority area for government and policy makers, tobacco prices and taxes should be adjusted against some standard of affordability, not only against a standard of a real price or a real tax.

For example, the comment, "Tax rates should be increased so that the prices of all tobacco products increase by at least 5 percent in real terms every year," which has been ascribed to the World Health Organization and the World Bank,<sup>5</sup> focuses on price, not affordability. It is not appropriate in all contexts, especially not for rapidly growing countries. Perhaps a more useful and more general comment would be, "Tax (or price) should be increased such that cigarettes become increasingly less affordable." This recommendation implies that the nominal price of cigarettes should increase by at least the sum of the inflation rate, the real per capita income growth rate and a small interaction effect. For China, with inflation of about 8 percent and a per capita income growth rate, of about 10 percent, nominal cigarette prices would have to increase by 18.8 percent [ $\{(1.10)(1.08) - 1\} \times 100$ ] each year to prevent cigarettes from becoming more affordable. In South Africa, with a more modest per capita growth rate of about 4 percent, and with an inflation rate similar to China's, nominal cigarette prices would have to increase by 12.3 percent [ $\{(1.04)(1.08) - 1\} \times 100$ ] each year to prevent cigarettes from becoming more affordable.

This paper's central message is that, despite methodological and data issues, policy makers should focus more on the affordability of cigarettes and less on the (real) price in isolation of income. A price-based policy prescription ("The real price should increase by X percent") may not be sufficient to reduce the

affordability of cigarettes in fast-growing countries. An affordability-based policy prescription ("The excise tax (or price) should be adjusted so that cigarettes become less affordable by X percent per year") is more general and possibly more useful as a tobacco control target, especially in rapidly growing countries.



## VI. Recommendations

- In international comparisons, cigarette prices should not only be evaluated in money terms but also in terms of their affordability.
- A tobacco control strategy in which increasing cigarette excise taxes plays an important role should set its benchmark in terms of cigarette affordability, rather than in terms of real (i.e. inflation-adjusted) prices. As such, countries should include the measurement and analysis of affordability measures in their tobacco control programs.
- If cigarettes are to become less affordable, the excise tax should be adjusted such that the nominal retail price of cigarettes increases by at least the sum of the inflation rate and the per capita economic growth rate.
- Countries that experience very rapid economic growth face greater tobacco control challenges than other countries, since growing incomes rapidly increase the affordability of cigarettes, *ceteris paribus*.
- For developing countries the Relative Income Price affordability measure (based on per capita GDP) is most appropriate since it uses the most inclusive and representative income measure.
- Affordability measures only make sense in a comparative context. Thus, in any country, one can compare trends in affordability over time. Alternatively, at any given point in time, one can compare affordability among countries.

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## Annex A

Table A1: Countries Included in the EIU Price Database and World Bank Income Group Classification

Country	Cities included	Cities excluded	World Bank class
Argentina	Buenos Aires		Upper middle income
Australia	Adelaide, Brisbane, Melbourne, Perth, Sydney		High income
Austria	Vienna		High income
Azerbaijan	Baku (1998)		Lower middle income
Bahrain	Bahrain		High income
Bangladesh	Dhaka		Low income
Belgium	Brussels		High income
Brazil	Sao Paulo, Rio De Janeiro		Upper middle income
Cameroon	Douala(1991)		Lower middle income
Canada	Calgary, Montreal, Toronto, Vancouver		High income
Chile	Santiago		Upper middle income
China	Beijing	Guangzhou (1993), Shanghai (1993), Shenzhen (1999), Tianjin(1999)	Lower middle income
Colombia	Bogota		Lower middle income
Costa Rica	San Jose		Upper middle income
Côte d'Ivoire	Abidjan		Low income
Croatia	Zagreb (1998)		Upper middle income
Czech Republic	Prague		High income
Denmark	Copenhagen		High income
Ecuador	Quito		Lower middle income
Egypt	Cairo		Lower middle income
Finland	Helsinki		High income
France	Lyon, Paris		High income
Gabon	Libreville (1991)		Upper middle income
Germany	Berlin, Düsseldorf, Frankfurt, Hamburg, Munich		High income
Greece	Athens		High income
Guatemala	Guatemala City		Lower middle income
Hong Kong	Hong Kong		High income
Hungary	Budapest		Upper middle income
Iceland	Reykjavik (1999)		High income
India	Mumbai, New Delhi		Low income
Indonesia	Jakarta		Lower middle income
Iran	Tehran		Lower middle income
Ireland	Dublin		High income
Israel	Tel Aviv		High income
Italy	Milan, Rome		High income
Japan	Osaka/Kobe, Tokyo		High income
Jordan	Amman		Lower middle income
Kenya	Nairobi		Low income

**Table A1 (continued): Countries Included in the EIU Price Database and World Bank Income Group Classification**

Country	Cities included	Cities excluded	World Bank class
Korea	Seoul		High income
Kuwait	Kuwait (1995)		High income
Luxembourg	Luxembourg		High income
Malaysia	Kuala Lumpur		Upper middle income
Mexico	Mexico City		Upper middle income
Morocco	Casablanca		Lower middle income
Netherlands	Amsterdam		High income
New Zealand	Auckland, Wellington		High income
Nigeria	Lagos		Low income
Norway	Oslo		High income
Pakistan	Karachi		Low income
Panama	Panama City		Upper middle income
Papua New Guinea	Port Moresby		Low income
Paraguay	Asuncion		Lower middle income
Peru	Lima (1991)		Lower middle income
Philippines	Manila		Lower middle income
Poland	Warsaw		Upper middle income
Portugal	Lisbon		High income
Romania	Bucharest (1994)		Upper middle income
Russia	Moscow	St Petersburg (1994)	Upper middle income
Saudi Arabia	Al Khobar, Jeddah, Riyadh		High income
Senegal	Dakar		Low income
Serbia (Montenegro)	Belgrade		Upper middle income
Singapore	Singapore		High income
South Africa	Johannesburg		Upper middle income
Spain	Barcelona, Madrid		High income
Sri Lanka	Colombo		Lower middle income
Sweden	Stockholm		High income
Switzerland	Zurich		High income
Thailand	Bangkok		Lower middle income
Tunisia	Tunis		Lower middle income
Turkey	Istanbul		Upper middle income
United Arab Emirates	Abu Dhabi, Dubai		High income
United Kingdom	London	Manchester (1998)	High income
United States	Atlanta, Boston, Chicago, Cleveland, Detroit, Houston, Los Angeles, Miami, New York, Pittsburgh, San Francisco, Seattle, Washington DC	Honolulu (1992), Lexington (1998), Minneapolis (1998)	High income
Uruguay	Montevideo		Upper middle income
Venezuela	Caracas		Upper middle income
Vietnam	Ho Chi Minh City (1993)	Hanoi (1994)	Low income
Zimbabwe	Harare		Low income

Note: Most cities were surveyed annually by the EIU since 1990. The number in parentheses indicates the first year of inclusion in the EIU survey.

**Table A2: Adjustments Made to RIP Dataset, Adjusting for Hyperinflation**

Country	Years	Adjustment
Argentina	1990, 1991	Divided by 10 000
Azerbaijan	1998 to 2005	Divided by 10 000
Brazil	1990 to 1993	Copied USD series
Ecuador	1990 to 1999	Copied USD series
Jordan	2001 to 2003	Divided by 1 000
Mexico	1990 to 1992	Divided by 1 000
Poland	1990 to 1994	Divided by 10 000
Romania	1994 to 2002	Divided by 10 000
Russia	1990 to 1997	Copied USD series
Turkey	2003 to 2006	Multiplied by 1 000 000
Uruguay	1990 to 1992	Divided by 1 000

*This table indicates adjustments made to the RIP series. Often in countries where there have been problems with hyperinflation, a number of decimal places are removed from the currency. This takes place formally when the state or central bank makes an official announcement. Alternatively this takes place informally when the public just ignores a number of decimal places. We use different sources for prices and incomes, and under hyperinflationary conditions, one source may make an adjustment while the other does not. This results in extreme values for the RIP which are not in line with the values prior to or after the hyperinflationary adjustment is made. We make adjustments to the RIP to account for this either by manually adjusting the decimal places by dividing or multiplying by a factor of 1 000, 10 000, or 1 000 000 or by calculating prices in US dollars instead of the local currency.*

## Annex B

Table B1: Relative Income Price

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Argentina	2.41	2.28	1.85	1.79	1.67	1.69	1.62	1.65	1.63	1.74	1.75	2.29	1.93	2.12	2.40	2.19	1.79
Australia	0.97	0.99	1.09	1.32	1.30	1.40	1.41	1.48	1.52	1.52	1.57	1.67	1.60	1.61	1.63	1.72	1.67
Austria	1.12	1.10	1.09	1.18	1.17	1.24	1.27	1.21	1.19	1.22	1.20	1.20	1.23	1.27	1.26	1.27	1.12
Azerbaijan	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	2.30	2.11	2.56	2.29	4.72	4.03	3.41	2.34	3.34
Bahrain	1.55	1.24	1.24	1.03	1.03	0.96	0.97	1.17	1.38	1.45	1.23	1.15	1.10	1.06	0.95	0.82	n.a.
Bangladesh	41.48	38.53	32.80	35.55	33.66	30.54	28.61	26.88	26.00	24.16	24.47	23.33	23.55	21.82	16.72	15.30	17.34
Belgium	0.93	0.87	0.91	1.10	1.17	1.22	1.23	1.17	1.16	1.16	1.15	1.16	1.14	1.27	1.22	1.32	1.26
Brazil	2.47	2.11	3.53	4.82	4.51	2.74	2.91	2.70	2.67	2.57	2.36	2.13	2.18	2.37	2.13	2.26	2.07
Cameroon	n.a.	7.17	7.71	7.04	12.96	11.75	13.95	15.70	14.74	14.15	12.36	15.03	14.27	19.89	23.09	22.19	20.90
Canada	1.62	1.91	2.00	2.00	1.32	1.34	1.27	1.30	1.33	1.24	1.27	1.29	1.88	1.91	1.88	1.80	1.76
Chile	2.74	2.32	2.54	2.74	2.38	2.24	2.48	2.26	2.47	2.46	3.23	3.04	2.89	3.12	2.76	2.45	2.13
China	27.54	53.23	43.73	20.01	29.67	29.73	27.37	25.70	26.49	25.17	15.27	11.60	10.64	9.49	8.11	7.09	7.52
Colombia	4.83	5.13	5.29	4.26	2.24	2.40	2.40	2.10	2.53	2.82	2.98	4.36	3.38	3.10	2.97	2.99	2.71
Costa Rica	3.04	4.13	3.31	2.17	2.56	2.31	2.38	2.01	1.91	1.57	1.56	2.63	2.37	3.99	3.48	3.02	n.a.
Côte d'Ivoire	17.22	17.68	13.72	13.35	15.53	13.44	12.22	11.39	10.61	10.38	11.27	11.02	11.91	11.03	15.30	12.86	12.12
Croatia	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	2.78	3.21	3.25	2.95	2.70	n.a.	n.a.	n.a.	n.a.
Czech Republic	2.73	2.37	2.68	2.68	2.27	1.90	1.72	2.16	1.80	1.98	1.83	1.91	1.66	1.62	1.72	1.69	1.59
Denmark	1.65	1.58	1.53	1.56	1.49	1.46	1.43	1.41	1.39	1.34	1.28	1.28	1.31	1.28	1.10	1.03	1.03
Ecuador	8.58	7.43	5.67	7.47	7.03	5.80	4.46	3.64	2.80	3.89	6.18	8.81	7.63	6.73	5.99	5.44	4.93
Egypt	17.37	16.85	14.78	13.88	13.22	11.55	10.47	9.56	9.02	8.58	7.91	8.60	10.15	12.38	11.23	9.97	8.85
Finland	1.60	1.80	1.54	1.43	1.57	1.50	1.51	1.42	1.42	1.47	1.41	1.36	1.37	1.40	1.34	1.35	1.26
France	0.49	0.47	0.53	0.66	0.86	0.85	1.12	1.09	1.04	1.11	1.12	1.15	1.19	1.32	1.64	1.60	1.60
Gabon	n.a.	2.53	2.69	2.68	2.33	3.89	3.40	3.27	3.95	3.73	3.03	3.23	3.30	n.a.	n.a.	n.a.	n.a.
Germany	1.15	1.12	1.08	1.15	1.12	1.12	1.11	1.03	1.03	1.06	1.07	1.14	1.18	1.20	1.25	1.43	1.46
Greece	1.98	2.18	2.05	1.79	1.78	1.63	1.81	1.57	1.57	1.64	1.28	1.55	1.53	1.59	1.48	1.38	1.42
Guatemala	5.57	6.93	5.17	8.16	7.18	6.56	5.77	5.80	5.16	5.40	5.59	5.55	6.43	6.68	6.80	6.26	5.77
Hong Kong	0.76	1.50	1.33	1.43	1.33	1.27	1.20	1.19	1.52	1.56	1.52	1.81	1.70	1.76	1.71	1.51	1.43
Hungary	1.59	1.29	1.41	1.75	1.47	1.67	1.44	1.49	2.19	1.93	1.70	1.58	1.45	1.52	1.85	2.01	1.99
Iceland	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1.59	1.53	1.52	1.58	1.70	1.62	1.66	1.52
India	25.40	22.55	23.59	23.03	21.25	18.83	17.68	22.19	21.16	20.22	19.57	23.99	22.61	21.17	15.89	15.80	14.48
Indonesia	7.75	8.46	7.61	7.81	7.21	6.79	6.61	4.10	9.46	9.26	8.90	7.93	7.27	8.00	6.26	5.70	5.01
Iran	7.70	5.55	6.34	5.71	5.11	6.02	4.82	4.16	4.13	3.30	4.17	3.65	2.69	2.36	1.89	1.58	1.34
Ireland	2.38	2.45	2.51	2.41	2.41	2.27	2.25	2.13	1.79	1.64	1.72	1.59	1.55	1.65	1.64	1.59	1.45
Israel	0.89	0.92	0.95	1.07	0.96	1.03	0.99	1.06	1.03	1.05	1.02	1.37	1.60	1.46	1.43	1.50	n.a.
Italy	1.07	1.06	0.94	1.12	1.04	0.89	1.14	1.03	1.01	1.03	0.98	0.98	0.96	0.97	1.17	1.20	1.27
Japan	0.62	0.59	0.57	0.57	0.57	0.56	0.55	0.57	0.58	0.64	0.65	0.64	0.66	0.70	0.70	0.69	0.68
Jordan	5.94	6.21	5.69	6.84	6.34	6.05	6.16	4.34	4.34	4.46	5.60	5.41	5.19	5.00	4.58	4.80	5.28
Kenya	17.89	18.35	18.88	27.77	26.45	23.41	18.28	18.59	17.24	19.85	22.20	18.45	25.21	23.56	20.95	18.90	18.41
Korea	1.15	1.53	1.70	1.52	1.31	1.13	0.91	0.94	0.96	1.76	1.62	1.22	1.04	1.12	0.99	1.19	1.31
Kuwait	n.a.	1.18	n.a.	n.a.	n.a.	0.78	0.70	0.75	0.87	0.78	0.64	0.72	0.91	0.79	0.66	0.51	n.a.
Luxembourg	0.49	0.43	0.45	0.48	0.48	0.49	0.49	0.45	0.44	0.41	0.40	0.41	0.41	0.42	0.41	0.42	0.40
Malaysia	3.60	3.39	3.37	3.03	1.83	1.61	1.45	1.75	2.09	2.17	2.75	2.88	2.72	2.54	2.65	2.51	2.78
Mexico	1.46	1.52	2.19	2.38	2.48	3.22	3.11	2.22	1.73	1.68	2.14	2.04	2.39	1.90	2.25	1.97	1.82
Morocco	9.08	4.07	15.50	15.38	13.96	20.64	21.03	21.43	11.51	11.62	11.65	10.91	10.64	10.20	9.75	4.94	n.a.
Netherlands	0.82	0.79	0.96	1.11	1.08	1.06	1.05	0.93	0.96	0.99	0.98	1.10	1.11	1.12	1.10	1.07	1.05

Table B1 continued: Relative Income Price

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
New Zealand	1.99	2.44	2.39	2.31	2.22	2.15	2.19	2.19	2.49	2.38	2.72	2.74	2.72	2.66	2.54	2.53	2.51
Nigeria	12.68	6.22	16.14	21.30	42.84	27.56	19.84	31.35	33.47	30.28	21.35	31.18	30.31	23.24	20.40	22.20	19.32
Norway	1.83	1.88	1.90	1.86	1.93	1.86	1.81	1.82	1.92	2.06	1.71	1.64	1.85	1.79	1.66	1.55	1.51
Pakistan	26.49	22.87	19.79	20.09	18.36	15.74	14.79	12.70	12.78	11.47	9.10	11.89	12.51	12.93	12.13	11.36	9.90
Panama	4.54	3.79	3.78	3.53	3.38	3.72	3.51	2.76	2.85	2.78	3.05	3.06	2.99	2.89	2.69	2.50	2.31
Papua New Guinea	13.77	13.93	14.57	18.28	14.43	15.52	17.75	16.13	17.20	n.a.	25.90	31.28	28.51	27.00	27.37	26.87	24.30
Paraguay	2.93	2.36	2.77	2.86	3.37	3.68	4.94	5.06	4.75	5.99	7.37	7.42	6.95	5.89	4.18	3.91	3.52
Peru	n.a.	5.40	6.03	5.32	4.28	3.65	3.63	3.13	3.32	4.39	4.60	6.69	6.67	5.46	5.80	4.92	4.18
Philippines	5.96	6.01	6.15	6.66	4.74	7.00	6.11	5.29	6.01	6.11	5.53	5.21	4.86	4.55	4.20	3.99	3.67
Poland	1.70	3.22	n.a.	1.85	2.32	1.77	1.92	2.14	2.09	2.31	2.12	2.21	2.22	2.04	1.86	1.91	1.89
Portugal	1.66	1.65	1.88	1.77	1.67	1.65	1.83	1.62	1.65	1.66	1.61	1.57	0.15	1.59	1.62	1.72	1.76
Romania	n.a.	n.a.	n.a.	n.a.	5.02	4.09	5.81	8.03	6.02	5.35	6.70	4.74	2.73	2.53	2.29	2.33	2.02
Russia	0.97	4.10	4.53	4.45	3.75	3.75	4.91	5.17	6.42	5.46	3.60	2.94	2.41	2.84	2.28	1.79	1.28
Saudi Arabia	1.05	1.33	1.22	1.39	1.41	1.38	1.31	1.47	1.80	1.65	1.30	1.36	1.40	1.40	1.32	1.06	n.a.
Senegal	10.28	10.58	10.57	11.26	13.18	12.25	11.84	7.52	7.17	6.90	6.64	6.34	9.38	8.95	8.48	8.05	n.a.
Serbia (Montenegro)	n.a.	n.a.	n.a.	n.a.	5.58	4.54	4.24	3.99	3.27	15.44	13.22	2.11	1.79	1.70	1.42	1.16	1.36
Singapore	1.41	1.56	1.48	1.55	1.46	1.42	1.35	1.28	1.48	1.47	1.48	1.67	1.56	1.98	2.03	2.15	2.01
South Africa	2.11	2.00	2.20	2.23	2.26	2.32	2.56	3.37	3.36	4.38	4.46	4.56	4.49	4.36	4.92	4.42	4.31
Spain	0.97	1.00	0.92	0.99	1.01	1.03	1.07	1.02	0.98	0.81	0.76	0.80	0.79	0.97	0.92	0.96	0.98
Sri Lanka	27.29	25.60	24.17	21.19	20.08	20.37	20.29	18.77	18.44	18.94	20.01	18.63	18.02	18.58	16.30	15.76	14.82
Sweden	1.27	1.13	1.24	1.54	1.48	1.51	1.50	2.07	1.54	1.46	1.42	1.42	1.41	1.37	1.31	1.32	1.24
Switzerland	0.55	0.54	0.52	0.54	0.58	0.67	0.64	0.65	0.72	0.79	0.80	0.80	0.81	0.83	0.86	0.90	0.89
Thailand	3.25	4.42	3.97	2.70	3.02	2.65	2.43	2.52	3.78	3.81	3.74	4.59	4.36	4.05	3.73	3.44	3.81
Tunisia	7.54	4.15	3.72	3.90	4.24	3.68	12.87	11.91	11.17	10.35	9.69	9.08	5.88	4.58	4.25	4.31	4.02
Turkey	3.57	4.09	3.04	3.60	4.70	2.78	3.40	4.44	3.43	3.85	3.52	4.80	4.39	5.11	4.96	4.44	4.75
United Arab Emirates	0.36	0.56	0.58	0.58	0.63	0.61	0.57	0.56	0.72	0.64	0.59	0.68	0.72	0.66	0.59	0.45	n.a.
United Kingdom	1.86	2.01	2.09	2.18	1.98	2.22	2.12	2.11	2.23	2.52	2.65	2.54	2.57	2.33	2.36	2.41	2.30
United States	0.73	0.83	0.82	0.81	0.76	0.74	0.74	0.70	0.76	0.92	1.02	1.09	1.14	1.10	1.05	1.01	0.98
Uruguay	4.00	3.87	3.39	3.11	2.90	2.84	2.67	2.38	2.38	2.50	2.44	2.41	2.66	2.62	2.18	2.44	2.49
Venezuela	1.97	2.68	2.33	2.36	2.96	2.75	3.08	2.57	3.23	3.22	2.75	2.51	2.92	3.44	2.46	2.20	1.94
Vietnam	n.a.	n.a.	n.a.	41.13	36.94	28.70	24.04	20.45	20.14	18.41	16.70	16.35	14.88	15.83	13.80	10.10	8.64
Zimbabwe	4.92	4.54	6.80	6.03	5.79	6.62	7.01	6.51	5.33	6.83	8.24	10.68	9.02	7.81	18.96	11.91	n.a.

The Relative Income Price (RIP) represents the percentage of per capita GDP required to purchase 100 packs of cigarettes. The lower the percentage, the more affordable the cigarettes are.

n.a. - data not available



**Table B2: Minutes of Work Required to Purchase a Packet of Cigarettes**

Country	Median of all occupations				Median of lowest half			
	1997	2000	2003	2006	1997	2000	2003	2006
Argentina	19.8	20.1	20.3	16.2	23.6	21.2	42.2	29.3
Australia	28.0	26.6	35.2	29.1	30.2	27.6	37.0	38.1
Austria	19.3	20.2	23.2	21.1	24.7	25.5	28.2	23.9
Belgium	19.9	21.4	19.3	24.6	26.2	27.2	28.2	26.6
Brazil	22.1	19.5	18.9	17.6	28.4	27.2	33.5	30.7
Canada	12.1	16.4	27.5	27.6	15.0	19.8	35.4	41.5
Chile	n.a.	27.5	29.3	30.7	n.a.	48.4	48.2	40.5
China	78.4	56.3	41.9	54.6	124.4	66.0	48.7	95.7
Colombia	12.1	17.2	18.7	20.4	20.4	27.1	28.9	34.7
Czech Republic	37.4	n.a.	39.8	33.3	41.8	n.a.	45.6	35.2
Denmark	24.8	24.7	22.3	20.8	27.5	27.4	23.3	22.3
Egypt	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Finland	28.3	29.7	24.4	23.0	33.9	34.4	28.6	27.3
France	18.5	18.9	23.0	32.0	24.2	23.5	32.2	42.1
Germany	17.8	20.1	19.7	22.9	21.9	23.1	25.2	27.9
Greece	17.6	16.7	21.4	24.2	22.3	20.9	30.1	32.5
Hong Kong	28.0	29.1	34.2	47.5	32.3	33.6	46.8	56.9
Hungary	45.3	52.2	25.0	45.0	57.6	69.0	38.3	57.0
India	77.8	76.7	108.6	40.2	104.4	107.4	131.8	75.0
Indonesia	15.7	44.9	36.9	31.2	28.7	114.2	101.8	51.0
Ireland	36.1	33.2	30.7	30.1	42.1	37.3	36.2	35.2
Israel	17.7	15.7	21.7	n.a.	22.8	21.5	29.3	n.a.
Italy	18.0	21.1	20.7	28.7	20.7	24.3	25.9	32.2
Japan	7.9	9.2	9.5	11.7	10.9	10.5	12.7	15.3
Kenya	83.5	105.9	67.7	31.8	168.5	188.9	137.5	38.8
Korea	9.8	16.5	11.9	13.6	12.8	21.4	27.8	37.3
Luxembourg	8.7	10.0	12.1	14.3	13.6	15.5	16.3	20.0
Malaysia	10.8	20.7	19.8	28.4	25.8	50.6	30.6	42.6
Mexico	31.2	40.9	32.0	22.8	41.7	45.9	52.7	57.1
Netherlands	14.9	18.2	21.8	20.8	19.9	22.7	24.2	27.0
New Zealand	n.a.	37.2	43.1	33.2	n.a.	41.8	57.8	37.8
Nigeria	n.a.	n.a.	66.2	n.a.	n.a.	n.a.	96.7	n.a.
Norway	40.1	44.8	37.1	38.9	42.6	46.5	38.6	40.5
Pakistan	n.a.	n.a.	59.0	n.a.	n.a.	n.a.	137.8	n.a.
Panama	20.6	21.8	n.a.	n.a.	30.2	37.7	n.a.	n.a.
Peru	n.a.	n.a.	37.0	30.6	n.a.	n.a.	55.2	41.3
Philippines	30.8	35.8	21.0	23.2	46.5	47.4	38.7	34.2
Poland	37.2	43.3	32.9	37.2	45.3	55.0	41.3	39.7
Portugal	24.3	27.0	25.9	33.6	31.4	33.9	36.8	43.3
Romania	n.a.	n.a.	34.0	33.1	n.a.	n.a.	52.7	46.8
Russia	64.2	47.1	34.6	16.9	155.9	114.4	39.1	20.3
Singapore	39.2	40.4	45.1	58.2	55.4	49.8	61.4	76.4
South Africa	18.3	21.9	24.4	24.2	29.0	28.1	34.9	32.1
Spain	12.2	11.9	16.1	15.4	16.1	14.1	21.5	21.6
Sweden	41.3	29.5	27.8	28.3	45.1	31.8	29.3	30.6
Switzerland	8.9	12.8	12.0	14.2	11.5	15.9	15.9	17.9
Taiwan	7.1	6.8	5.6	6.2	8.3	8.0	10.6	8.2
Thailand	12.4	18.7	27.8	45.6	31.5	39.9	62.3	65.4
Turkey	n.a.	n.a.	n.a.	36.5	n.a.	n.a.	n.a.	52.9
United Arab Emirates	10.0	10.2	13.5	7.2	13.5	13.4	20.6	13.2
United Kingdom	31.3	45.3	35.6	35.8	42.3	55.8	45.4	45.8
United States	13.7	23.0	21.6	22.1	17.6	27.1	26.7	29.0
Venezuela	29.7	27.3	29.4	30.4	41.8	39.1	63.1	44.8





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