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Summary

Recent years have seen the development of a substantial literature on tobacco taxation that has both noted its effectiveness as a tobacco control tool, and provided modelling of its implications. However, studies of tobacco taxation and tobacco consumption have largely ignored a crucial aspect of the market for cigarettes in many low- and middle-income countries – the prevalence of loose (single) cigarettes being sold, rather than cigarette packs.

We argue that ignoring this market leaves room for unexpected dynamics and unintended policy effects. We develop this argument by establishing four aspects of the market for loose cigarettes. First, we show that it is sizeable and widespread. Second, we note that it has a consumer base that is on average poorer and younger than the overall population of smokers. Third, we show that the price dynamics for loose cigarettes are different to those for packs, that the price for a loose cigarette is typically higher than the equivalent per-cigarette price of a cigarette bought in a pack, and that the price of loose cigarettes and cigarette packs do not always move in parallel. Fourth, based on these dynamics, we show how the features of the loose cigarette market can affect the effectiveness of tobacco control policy, and in particular tobacco taxation. For example, we highlight that insufficient attention to the market for loose cigarettes might lead to a lower than anticipated effect of tax increases on demand, or might result in tax increases not being passed on to the consumers of loose cigarettes at all. Consequently, in order to ensure that tobacco tax increases immediately feed through to all consumers, policymakers in countries with markets for loose cigarettes should prioritise large rather than incremental tax increases.

Keywords: tobacco taxation; cigarettes; tobacco control.

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Acronyms

ITC	International Tobacco Control
LIMC	Low- and middle-income countries
REEP	Research Unit on the Economics of Excisable Products
WHO	World Health Organization

1 Introduction

Recent years have seen the development of a substantial literature on tobacco taxation, built upon continually expanding databases and models of tobacco demand, consumption, and the effects of price and tax changes (Chaloupka et al. 2011; Blecher and Ross 2013) . From this, a set of guidelines on tobacco taxation have fed into policy recommendations and international agreements. Notably, the past years have also seen a remarkable and very welcome expansion of research on tobacco in low- and middle-income countries, both with respect to expanding data availability, and with policy analysis that speaks to their particular contexts (i.e. Chisha et al. 2019; Ross 2017; Vellios et al. 2020). However, as we argue in this paper, these analyses have largely overlooked one crucial aspect of cigarette markets in many low- and middle-income countries today. While most work on cigarette consumption and taxation assumes that cigarettes are being sold and bought in packs, usually of 20, this often does not capture the reality on the ground. Many smokers are buying single, loose cigarettes, either from legal shops, or often from informal vendors.[1] For example, recent survey evidence from the International Tobacco Control (ITC) Policy Evaluation Project suggests that in India, Kenya and Zambia, more than two-thirds of smokers bought their last cigarette as a loose cigarette, and not as a pack.

In this paper, we argue that in order to accurately understand cigarette consumption in low- and middle-income countries (LMICs), and particularly in Africa, and to devise effective tobacco tax policy, it is important to recognise the unique features of this market. Ignoring it leaves room for unexpected dynamics and unintended policy effects, especially around tobacco control, smokers stopping smoking, and the equity implications of tobacco taxation. We develop this argument by establishing four aspects of the market for loose cigarettes:

1. We show that it is sizeable and widespread.
2. We note that it has a consumer base that is different from the overall population of smokers. In particular, the smokers of loose cigarettes are likely to be poorer and younger than the average smoker.
3. We show that the price dynamics for loose cigarettes are different than those for packs. In general, the price for a loose cigarette is higher than the equivalent per-cigarette price of a cigarette bought in a pack. In addition, as a response to external market changes, the price for loose cigarettes and for cigarette packs do not always move in parallel.
4. Based on these dynamics, we show how the features of loose cigarette markets can affect the effectiveness of tobacco control policy, and in particular tobacco taxation. We highlight that in contexts where there is a large market for loose cigarettes, smaller tax increases may result in a lower than anticipated effect of tax increases on demand, or in tax increases not being passed on to the consumers of loose cigarettes at all. We argue that, consequently, the prevalence of loose cigarette markets provide an argument for larger, rather than incremental, increases in tobacco taxation in many LMICs.

Our argument here is intended to introduce and draw attention to a previously overlooked aspect of tobacco consumption. We draw on publicly available data, and in particular surveys of smokers collected by the ITC, and surveys of cigarette prices that have been collected by the Research Unit on the Economics of Excisable Products (REEP) of the University of Cape Town. Given the lack of attention previously paid to this, there are limitations to the data that

[1] Throughout this article, we use ‘loose cigarettes’ to refer to single cigarettes sold out of a pack. In different contexts and articles these are also sometimes referred to as single cigarettes, sticks, and single stick cigarettes..

is available, and we argue in this paper for a more systematic focus on this topic in tobacco control research. This article seeks to provide an introduction to the market for loose cigarettes, an empirical exploration of some of its recent dynamics with a focus on low- and middle-income countries, and a model that outlines how the features of this market interact with tobacco tax policy. Consequently, this article contributes both to the academic literature on tobacco consumption and control, and to the literature on the implication of tobacco tax policy, particularly in context of known low- and middle-income countries, and countries with substantial informal sectors.

The remainder of the paper is structured as follows. Section 2 briefly introduces the literature on tobacco consumption and taxation in a low- and middle-income country context. Section 3 introduces the data on which this paper is based. Sections 4 to 6 establish the main empirical points of the paper – that loose cigarette markets are sizeable, the consumer base is different, and their price moves differently to the price of packs. Section 7 discusses the policy relevance of these findings for taxation, while Section 8 outlines the need for future research and data collection in this area.

2 Literature review

Recent years have seen an expanding empirical literature within the field of tobacco control that has focused on tobacco taxation (Chaloupka et al. 2011; Fuchs Tarlovsky et al. 2019; Blecher and Ross 2013). Highlighting tobacco taxation as an effective tool to both decrease consumption and finance the costs of tobacco-related health outcomes, and despite substantial industry pushback (Smith et al. 2013), this literature has found a large policy audience. In recent years, the World Health Organization (WHO) in particular has highlighted the effectiveness of tobacco taxation (WHO 2021), and Article 6 of the WHO Framework Convention on Tobacco emphasises 'price and tax measures are an effective and important means of reducing tobacco consumption', and encourages their adoption. While much of the literature on tobacco taxation was originally focused on high-income countries, recently this has increased in LMICs. This has been particularly important given the often rising smoking rates and low tax rates in many of these countries (Blecher and Ross 2013). Mathers and Loncar (2006) project that 6.8 million out of a total of 8.3 million tobacco-related deaths across the globe by 2030 will occur in LMICs. A study of the National Cancer Institute (2017) suggests that a 10 per cent increase in the price of tobacco in LMICs, however, could reduce consumption by 5 per cent.

While more data collection and specialised surveys have led to a substantially improved evidence base on tobacco usage and prices in many LMICs, we find that empirical accounts of these markets largely overlook a critical feature – there are only a very small number of studies that engage with the existence of markets for loose cigarettes. Notably, while prices per pack and prices per cigarette are both commonly used metrics, there is often no explicit discussion of the fact that per-cigarette prices might be different if cigarettes are bought as loose cigarettes.

Most of the few studies on loose cigarettes that exist focus on establishing the existence and size of these markets. Notably, some of this work has been conducted in high-income countries, and has found that loose cigarette sales are not exclusively an LMIC phenomenon. Stillman et al. (2014) survey young African American adults in Baltimore, finding that almost two-thirds of them report having seen single cigarettes being sold on the

street. Von Lampe et al. (2018) find a similarly active market in the Bronx. Singh et al. (2017) find 57 per cent of smokers in India consume loose cigarettes. This corrects the (self-described) back-of-the-envelope calculation by Lal et al. (2015), which estimates that 'nearly 75 per cent of all cigarettes are sold as single sticks annually' in India. These efforts to estimate the share of loose cigarettes in larger markets share a lack of data availability and a focus on collecting new data.

Among another small number of studies, there is an attempt to examine the relationship between smoking loose cigarettes and smokers trying to reduce their consumption or quit smoking. This is noted by von Lampe et al. (2018); three studies focusing on Mexico (Thrasher et al. 2009; Thrasher et al. 2011; Hall et al. 2015) also examine the use of loose cigarettes by smokers as a potential strategy to reduce harm.

However, there are almost no studies that examine the particular price dynamics in these markets, or their effect on tobacco taxation and tobacco control. The only example that we are aware of is a study by Maldonado et al. (2020), which finds that the price for loose cigarettes increased comparatively less than the price for packs after a tax rise in Colombia. To the best of our knowledge, there is no study that tries to provide a generalised account of these dynamics, and in particular their effect on tobacco tax policies. There is also no study that examines these dynamics in Africa, or Asia apart from India. While some of the studies cited here draw on ITC data (i.e. Hall et al. 2015), our study is the first on this issue to make use of substantial cigarette price data in Africa collected over the past few years by REEP.

3 Data and method

This paper relies on two main sources of data – the African Cigarettes Prices Project from REEP, and data from all low- and middle-income countries covered by the ITC Policy Evaluation Project that include information on loose cigarette prices.[2] To the best of our knowledge, these are the only two sources of data on tobacco consumption or pricing that also cover loose cigarettes and include a time component. Some information on loose cigarette consumption and pricing is available through the Global Adult Tobacco Surveys managed by the Centres for Disease Control and Prevention (CDC), but in the vast majority of cases this survey was only carried out once in each country. Both of the data sources we use ensure coverage of each country in at least two years.

The Data on Aliments, Tobacco and Alcohol in Africa Project based at REEP at the University of Cape Town has been collecting prices of cigarettes sold at retail outlets and from street vendors in a number of African countries between 2016 and 2021.[3] While ten rounds of the survey exist, here we draw on the publicly available data, which includes 2020.[4] Critically, its information about cigarette prices differentiates between cigarettes sold as loose cigarettes and those sold as packs. It also includes information about the brands as well as features of the store – whether they are street vendors, kiosks or retail outlets. The data is best described as a repeated cross-section rather than a panel – it does not present a

[2] The only middle-income country that was not included from those for which ITC had data is Vietnam, as we could not verify the availability of data on loose cigarettes.

[3] For more information see Research Unit on the Economics of Excisable Products, African Cigarette Prices 2016-2021 [dataset], version 1.5, Cape Town: REEP [producer], 2022, Cape Town: DataFirst [distributor], 2022, DOI: https://doi.org/10.25828/nvz2-ah77.

[4] See Appendix B for a full breakdown of the number of rounds used by country.

nationally representative sample of retail outlets, as selection was purposive rather than based on an underlying sampling frame. As its authors note, this may have caused some geographic bias, for example against poorer areas that are more difficult for enumerators to access. Nonetheless, the data is useful for our purposes, not merely for its specific treatment of loose cigarettes, but also because of its large number of price observations (e.g., it includes 50,219 price observations over 5 years in South Africa).

We also draw on data from ITC – this is based on a set of multi-country surveys that allow researchers to compare the success of different tobacco control policies promoted by the WHO. Multiple waves of nationally representative surveys have been implemented in each of the 28 countries covered by the projects – most of which are high-income countries – targeting non-smokers, smokers, and users of other tobacco products such as chewing tobacco. The survey includes different types of information on both the respondents – gender, age, income and level of education, and, if any, their tobacco use – where they most recently bought tobacco, in what form, which brand, and at what price. The data is collected in a panel format, although not all respondents could be tracked for each wave, so it is possible to track changes in tobacco consumption over time – such as switching between consuming loose and packed cigarettes.[5] As mentioned earlier, we initially targeted all ITC data from low and middle-income countries where we could find evidence of loose cigarette consumption – Bangladesh, India, Kenya, Malaysia, Thailand and Zambia. However, after an initial examination of the data, we decided to exclude Malaysia from the analysis, as loose cigarettes accounted for less than 5 per cent of consumption in five of the six survey waves.[6]

There are two consequences of the limited availability of data on the sale and consumption of loose cigarettes. The first is that, although we believe that the phenomena we are trying to illustrate occur in a number of low- and middle-income countries around the world, the vast majority of those covered in the remainder of the paper are in sub-Saharan Africa, as these are covered in the REEP data.

The second is that we mainly limit our analysis to exploratory statistics, such as testing for correlation or significant differences amongst variables, although we also perform a couple of multivariate regressions in cases in which enough data is available. As the next sections demonstrate, this level of analysis is sufficient to make our general case, but highlights the importance of further data collection in this area. A final limitation we want to raise is that, in much of the discussion, we differentiate between ‘pack smokers’ and ‘loose cigarette smokers’. We are aware that this is a simplification: there is very likely a subset of smokers who might buy both packed and loose cigarettes interchangeably. However, the most common structure of surveys of smokers asks them if their last cigarette purchase was packed or single. More attention to this topic in future data collection will be valuable.

4 A large market

As the previous section highlights, there is still only a limited amount of systematic data available on the size of the market for loose cigarettes around the world. However, the available data is sufficient to note that in many LMICs there is a large market for loose cigarettes, both with respect to consumption and retail dynamics.

[5] Due to attrition, most of our analysis uses this data as a repeated cross-section rather than a panel.

[6] Summary statistics for both datasets are provided in Appendix B.

Table 1 gives data on cigarette consumption from selected ITC surveys in countries in which data on loose cigarettes is available. Both the scope and heterogeneity of loose cigarette purchases are notable. At least one-third of consumers in the most recent survey reported that their last cigarette purchase was of loose cigarettes in all five countries. Notably, this proportion ranges from just under 34 per cent in Thailand to over 80 per cent in Zambia and Kenya. In India, the largest market within this group, over three-quarters of smokers bought their last cigarette as a loose cigarette, suggesting a larger market share than was estimated by Singh et al. (2017). While this only represents a snapshot and shows substantial variation, it also highlights that these markets are sizeable enough to deserve our attention, and to have a relevant impact on smoking dynamics.

Table 1 Loose cigarettes as % of consumption in Bangladesh, India, Kenya, Thailand and Zambia

	Most recent wave	Minimum across waves
Bangladesh	59.9	57.9
India	77.0	73.3
Kenya	84.7	84.7
Thailand	33.9	27.1
Zambia	80.4	80.4

Source: Authors elaboration on ITC data. Shares calculated after excluding roll-your-own and bidis, as these were included in specific waves in some of the countries covered by ITC.

The REEP data on cigarette prices does not provide data on the proportion of consumers who buy loose cigarettes, but an indication of how many stores sell loose cigarettes. Table 2 provides an overview of this breakdown both by country and by seller type. Even though stores are not randomly sampled, and hence do not translate to proportional estimates of market share or availability, we still get a clear sense that across many countries in Africa there is a substantial market for loose cigarettes. As with the consumer data above, we find substantial variation. For example, very few stores in Malawi, but over 90 per cent of stores in Ethiopia, Lesotho and Kenya, sell loose cigarettes. Across the cases covered here, more than one-third of stores were offering loose cigarettes to customers. Table 2 also looks at the proportion of brands that are sold both as loose cigarettes and as packs in at least some stores in each country. It presents a picture of a partially overlapping and partly segmented market. Apart from Tanzania and Kenya, there are no countries where all cigarettes sold in packs are also sold as loose cigarettes. However, in all cases except Botswana, at least one-third of the brands sold as packs in these countries are also sold as loose cigarettes.

The data also suggests that street vendors are most likely to have loose cigarettes on offer. This does not seem surprising as street vendors typically operate informally, and might be less likely to follow regulation on the sale of cigarettes. Similarly, they might have a poorer consumer base, or sell loose cigarettes as an additional service for their customers, which very few formal retail stores do. Even though these do not present nationally representative averages, this data substantiates widely available anecdotal accounts that loose cigarette markets in sub-Saharan Africa are substantial, though heterogeneous, and they are closely related to informal distribution networks.

Table 2 Loose cigarette supply structure across sub-Saharan Africa

Country	Number of shops surveyed	% all shops selling loose cigarettes	% formal shops selling loose cigarettes	% informal shops selling loose cigarettes	% brands sold both loose and in packs
Botswana	900	58.2	0.8	97.9	20.9
Chad	67	31.3	0.0	36.8	62.5
Ethiopia	1,120	98.4	0.0	98.9	47.6
Ghana	103	59.2	17.7	23.5	50.0
Kenya	78	92.3	0.0	100.0	100.0
Lesotho	6,135	97.4	65.2	99.9	43.1
Madagascar	52	75.0	21.4	100.0	70.0
Malawi	322	6.8	3.9	4.1	38.5
Mozambique	104	87.5	0.0	98.8	78.6
Namibia	976	19.8	3.6	100.0	39.4
Nigeria	59	54.2	0.0	36.4	38.4
South Africa	4,051	82.0	26.5	97.8	63.9
Tanzania	185	81.6	41.5	98.3	100.0
Uganda	38	71.1	0.0	100.0	42.9
Zambia	102	47.0	23.3	58.8	55.6
Zimbabwe	4,189	71.2	31.5	79.5	73.5
Average		64.6	14.7	76.9	57.8

Source: Authors' elaboration on REEP data.

5 Consumers

Technically, the substantial size of the market for loose cigarettes is not necessarily a point of concern for the study of tobacco and tobacco control policy, if that market is very similar to the market for cigarettes bought in packs. However, as we outline in this and the subsequent section, this is not the case – these markets are different in critical respects. To start with, there are notable differences between their respective consumer bases.

There are two reasons to expect that buyers of loose cigarettes will on average have a lower income than buyers of packs. First, we know that, because they do not have easy access to cash, people on lower incomes typically make routine consumer purchases in smaller quantities, despite paying higher unit costs (Karnani 2006; Singh et al. 2009). Second, people on lower incomes may already make more purchases of other products from the informal vendors who are most likely to sell loose cigarettes.

We are able to test the relationship between income and loose cigarette consumption by looking at the demographic profile of the consumers of loose cigarettes in Bangladesh, India, Kenya, Thailand and Zambia, for which the relevant ITC data is available. Table 3 summarises the results of a random effects logistic regression on smokers' characteristics in these countries across multiple waves, where the dependent variable is a dummy indicating the choice to buy loose cigarettes rather than a pack when they last bought cigarettes. The results show that in all countries except Zambia, a lower income is substantially and

statistically significantly correlated with the choice to buy loose cigarettes rather than packs. Notably, we also find that in four out of the five countries a younger age (at the time of recruitment to the survey) is also significantly correlated with the decision to buy loose cigarettes, as is a lower level of education, though this is only significant in India, Kenya and Thailand.

Table 3 Loose cigarette buyer profiles

	Bangladesh	India	Kenya	Thailand	Zambia
Gender	-0.152 (0.232)	0.757 (0.698)	-0.093 (0.373)	0.705*** (0.210)	0.183 (0.584)
Income	-0.074* (0.041)	-0.486*** (0.087)	-0.644*** (0.131)	-0.355*** (0.069)	0.258* (0.135)
Education	-0.012 (0.013)	-0.028** (0.012)	-0.030* (0.017)	-0.090** (0.040)	-0.048 (0.091)
Age	-0.014*** (0.002)	-0.021*** (0.004)	-0.002 (0.006)	-0.023*** (0.005)	-0.025** (0.009)
N (obs)	7,734	2,968	1,392	5,355	1,150
N (groups)	3,930	1,828	1,198	2,296	969
Waves	4	3	2	6	2

Source: Random-effects logistic regressions based on ITC data. The depended variable is a dummy variable equal to 1 if a respondent last bought loose cigarettes and 0 if they bought a pack, income is an ordered categorical variable ranging from 1 (low) to 3 (high), education is a categorical variable ranging from 1 (illiterate) to 3 (secondary or tertiary education), gender is a dummy equal to 1 if the respondent is female. Age is indicated at the point of recruitment to the survey. * indicate statistical significance at the *10%, **5% and ***1% level.

While clearly more data is needed on this issue – data availability also restricts our ability to add further controls here – what is available provides strong support for the hypothesis that the consumer profile for loose cigarettes is substantially different to that for packs, and in most cases it seems to correlate with less income and being younger.[7] Consequently, understanding the particular dynamics of the loose cigarette market is important to assess the equity dimensions of tobacco tax policies, as well as the impact of price measures on young people starting to smoke.

6 Price differences

The market for loose cigarettes and the market for cigarettes sold in packs not only differ in their consumer base – they also differ in their prices. This section argues that even where the same brands are being sold both as loose cigarettes and as packs, the price per cigarette differs substantially, and moves differently, depending on how they are sold. We highlight three dynamics:

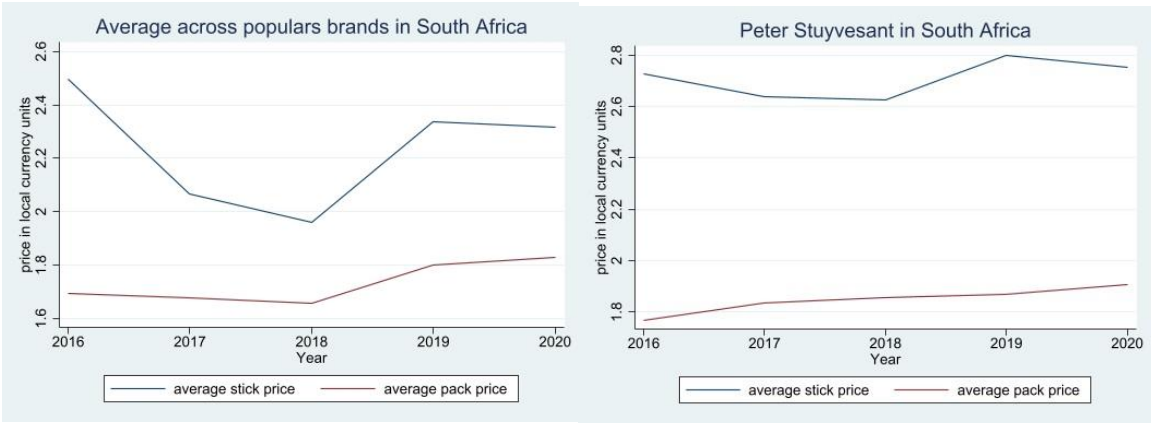
1. Per-cigarette price of cigarettes sold as loose cigarettes and as packs are different – loose cigarettes tend to be more expensive.
2. These prices tend to move differently over time, and in response to price shocks.
3. Loose cigarette prices are shaped by a currency denomination effect – they tend to cluster around rounded values of the local currency more than per-cigarette price of cigarettes sold in packs.

[7] For the purpose of this article, we assume that each respondent is either a pack or a loose cigarette smoker. We are aware that this is a simplification, as consumers might have a more complicated pattern of consumption between the two. However, the current structure of all tobacco consumption surveys, which invariably ask some version of the question 'The last time that you bought tobacco, in which form did you buy it?', does not allow for any empirical quantification of the relevance of this phenomenon. This should be considered in future work on the topic.

In order to conduct this analysis, we have traced the average per-cigarette price for cigarettes sold as loose cigarettes and cigarettes sold in packs, for common brands for each country in the REEP dataset for which a sample size of over 2,000 observations is available. We present this full analysis in Appendix A, and draw on illustrative examples in this section.

First, the most noticeable trend across the countries analysed is that the average price of loose cigarettes, averaged over popular brands,[8] or only focused on the single most popular brand, is higher than the average per-cigarette price of cigarettes bought in packs.[9] There is, at least on average, a clear positive price markup for loose cigarettes.[10] In many cases this markup can be substantial. It is also highly variable between countries – we have found average markups ranging from 5.1 per cent in Tanzania to 54.3 per cent in Namibia. Figure 1 illustrates this for South Africa, where the per-cigarette price of the most popular brand, Peter Stuyvesant, is on average almost 50 per cent higher when bought as a loose cigarette.[11]

Figure 1 Nominal per-cigarette price of loose cigarettes and cigarettes sold in packs in South Africa, 2016-2020



Source: Authors' elaboration from REEP data, prices expressed in nominal local currency units. 'Average pack price' here refers not to a pack but to the average price of a single cigarette sold in a pack. See Appendix A for further details.

Second, the example of South Africa also illustrates another key point that is visible across the wider set of countries: the per-cigarette price of loose cigarettes and packs do not always move in perfect parallel, and the gap between them can increase and reduce over time. Again, Appendix A provides further illustrations – if we look, for example, at the price for the Master brand, the most popular brand in Tanzania, we see a substantial gap in 2017, which then disappears in 2018 and 2019, when prices move almost in perfect unison, before a gap re-emerges in 2020. Once again, while this data analysis is primarily descriptive and

8 These are defined as all brands accounting for at least 1% of price observations in the specific country. As the REEP data is not randomly sampled these do not indicate a representative measure of brand popularity, but due to the low inclusion threshold of 1% should provide a reasonable overview of frequently consumed brands.

9 The only exception to this in our data is Tanzania in 2018.

10 For those countries where enough data is available, we calculate average markups by aggregating the difference in price between cigarettes of the same brand and sub-brand sold as both loose cigarettes and packs in the same store. We present further analysis on these markups in Appendix A. We find that, while they are positive in the vast majority of stores (95.4% of the sample for which the analysis was conducted), there are a small number of cases where markups can be negative. This is most common in Ethiopia, where we find it to be the case in 10.8% of brand-store pairs, highlighting the need for further research into markups and market structure.

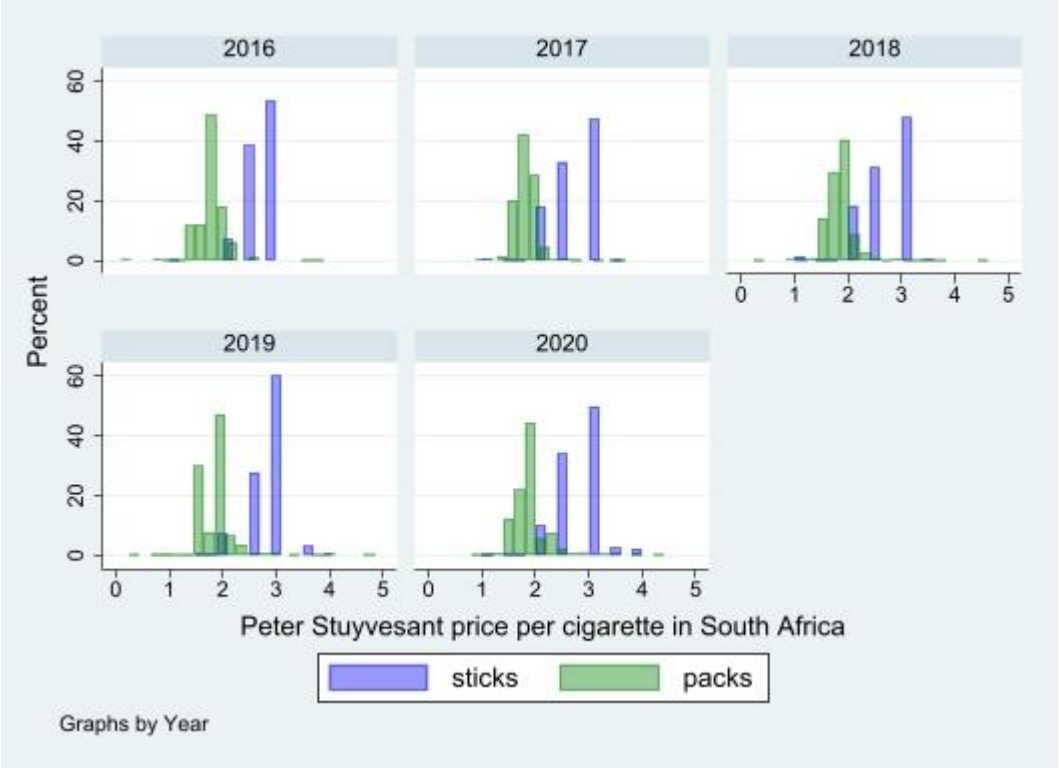
11 We recognise that, given the non-representativity of the sample, average prices, both across brands and for a specific brand, might not be that informative. However, we are convinced that using the average across multiple brands brings some evidence that the phenomenon we observe is not driven by any specific brand, but rather represents a real underlying market dynamic. To demonstrate that the results do not depend on the specific summary statistic we report, Appendix A replicates all brand-specific graphs using the median rather than the average, which yields almost identical results – if anything, the denomination effect is even clearer.

illustrative, it provides some first indications of more substantial differences in the workings and internal dynamics of these two markets.

Third, the data also provides a strong indication for one of the drivers of these different price movements and the changes in markups over time – what we call the denomination effect. When we look at a frequency distribution for specific price points of per-cigarette prices for major brands, we find that the price for loose cigarettes closely sticks to round values of the currency denomination, while per-cigarette prices for packs do not. This is intuitive – as packed cigarettes are bought in larger quantities, an increase in the price of a pack of one or two local currency units allows a smaller increase relative to currency units of the per-cigarette price. At the same time, the price for loose cigarettes is constrained by the availability of small currency denominations.

Figure 2 illustrates the dynamic for the case of South Africa. It shows a range of features that we find commonly across similar cases, and which are summarised in Appendix A. While the per-cigarette price in packs shows a relatively smooth distribution across the average price, the price for loose cigarettes is tightly clustered to different round denominations. Nonetheless, half-steps between round denominational values also exist – here, the 2.5 mark is particularly noticeable. In South Africa, this could indicate the use of 50 cent pieces, while in other contexts it can also indicate the sale of two loose cigarettes for a 'rounded' price.

Figure 2 Distribution of nominal price of loose and packed Peter Stuyvesant cigarettes in South Africa, 2016-2020



Source: Authors' elaboration on REEP data, all prices expressed in nominal local currency unit.

This denomination effect provides some explanation as to why the size of the markup that we observe changes over time, as loose cigarettes prices remain 'sticky' around certain

denominational values, while the per-cigarette price in packs adjusts more smoothly to overall price levels.[12]

Unfortunately, data availability currently restrains us from exploring cross-country heterogeneity, and in particular how denomination effects interact with market dynamics. As shown above, there is substantial evidence for the existence of a denomination effect, and an average markup. In countries where we had price data for both shops and street sellers selling the same brand as both loose cigarettes and in packs, we examined whether this markup was higher for street vendors or stores. Of the 11 countries for which this data was available, we found that the relative markup was significantly and statistically higher for street vendors in six of them (Lesotho, Madagascar, Malawi, Namibia, South Africa and Zimbabwe), while it was higher in shops in three countries (Mozambique, Tanzania and Zambia).[13] We could not find a statistically significant difference in the level of markup in two other countries (Botswana and Ethiopia).[14] Again, further data collection, including on different outlets and their location, is needed to fully understand what drives these differentiated dynamics.

7 Policy relevance: taxation

The preceding sections have outlined, both in terms of consumer profile and price dynamics, how the market for loose cigarettes differs from the wider market for cigarettes bought in packs. This section outlines how these differences can have practical consequences for policymaking. While there are a variety of tobacco control policy areas for which the existence of a substantial market for loose cigarettes is important – for example, the effectiveness of warning labels or health information on packs is less important in a context where many people do not buy cigarette packs – this section particularly focuses on tobacco taxation.

The tobacco control argument for tobacco taxation is based on the idea that higher taxes increase the price of tobacco products, which in turn decreases the overall smoking prevalence by leading to smokers giving up smoking, less people starting to smoke, and those who continue to smoke reducing the amount they smoke (Chaloupka et al. 2011; Blecher and Ross 2013). There is a substantial evidence base for these wider relationships, and we find it unlikely that our considerations around the market for loose cigarettes will

[12] It is important to note that, depending on the denomination and underlying inflation, denomination effects may weaken over time and potentially become cyclical. If we assume low but positive rates of inflation, inflation will gradually push the price of packs towards a level where loose cigarette vendors will increase the price for loose cigarettes toward the next higher denominational point. While we do not have data available to expand on this here, we expect that denomination effects interact with market structures. For example, we can hypothesise that some vendors who sell loose cigarettes, in particular small-scale street vendors, are themselves not buying packs from wholesalers, but from other retailers. Consequently, their position in the distribution value chain might also be driving some markup. We can also hypothesise that there might be an uneven distribution of loose cigarettes and packed cigarettes between rural and urban areas, and that transport costs might be unevenly distributed between the two different markets. We can also imagine that there might be different levels of competition between the two markets – a lower level of competition for the loose cigarette market might lead to vendors being able to put a higher markup without losing customers to other vendors or brands. More data is needed to examine these dynamics.

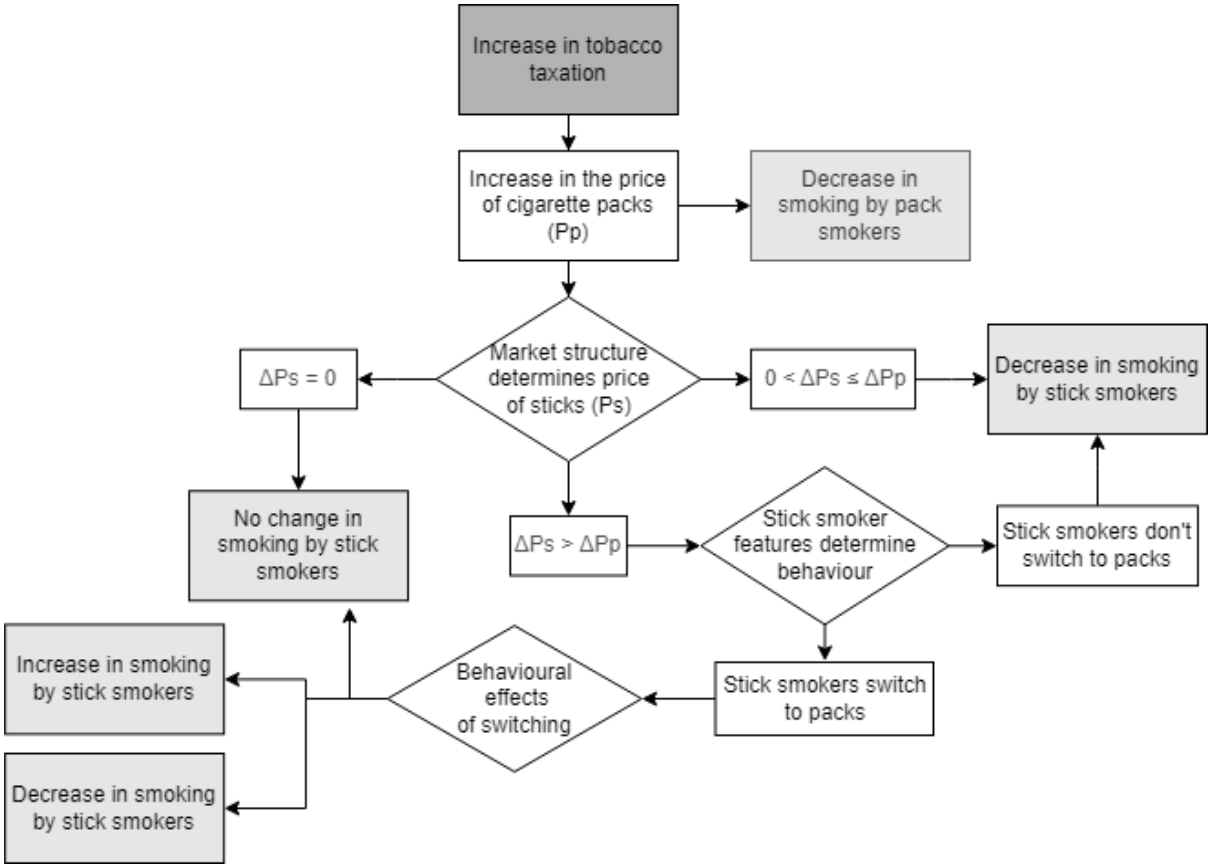
[13] This could be related to the heterogeneous legality (or permissibility) of selling loose cigarettes around the continent, which likely affects outlets differently.

[14] While we do not find a statistically significant difference in the markup between street vendors and other retailers in Ethiopia, we note that there is currently unpublished data that suggests there might be a difference in the markups. This suggests that our null result on this point might be affected by the comparatively lower number of observations that the REEP data contains for Ethiopia, and that more research is needed on this point.

negate them. However, we argue that markets for loose cigarettes can have a direct effect on the outcomes and effectiveness of tobacco tax increases.

Figure 3 summarises these relationships step-by-step in a simple model. To illustrate these dynamics, we assume the existence of a single brand, and a negative price elasticity of demand for loose cigarette and pack smokers. First, an increase in tobacco taxation directly affects the price of cigarette packs. Consequently, we assume, in line with the substantial literature on the topic, that we will see some reduction in consumption among pack smokers, in line with the intended effects of the tobacco tax increase.[15] However, the effect of the increase in tobacco taxation on the price of loose cigarettes is less certain. As we have outlined, the prices do not always move in perfect parallel. While we assume here, in line with our findings, that the per-cigarette price for loose cigarettes is always higher than that for cigarettes sold in packs, we also assume that prices do not always move in parallel. Consequently, the exact size of markup following the tax increase is dependent on unobserved features of the market for loose cigarettes. The unit price for loose cigarettes could increase more or less relative to the per-cigarette price for cigarettes sold in packs. Crucially, due to the 'stickiness' that the denomination effect discussed above introduces to the price of loose cigarettes, a comparatively small increase in tobacco taxation, and a subsequently small increase in the price of packs, may not be passed on to consumers for loose cigarettes at all.

Figure 3 Potential impact of changes in tobacco tax on overall cigarette consumption, mediated by the existence of loose cigarette markets



Source: Authors' elaboration.

[15] For simplicity, we have combined a decrease in smoking through reduced consumption and a decrease in smoking through giving up or never starting smoking as one process in this graph and discussion.

The fact that a change in taxation can have different effects on the absolute and relative price of loose cigarettes has further consequences for potential changes in consumption among consumers of loose cigarettes. In line with our assumptions about pack smokers, we also assume that among smokers of loose cigarettes there will be a decrease in consumption if the per-cigarette price of loose cigarettes increases, and if that increase is lower than or equal to the increase in the per-cigarette price of cigarettes sold in packs. Consequently, if the increase in the price of cigarette packs is not passed on to consumers of loose cigarettes, it is reasonable to suggest that there will also be no decrease in consumption among loose cigarette smokers. This would then fundamentally undermine one of the key goals of tobacco taxation – especially in contexts where a large subsection of total smokers are consumers of loose cigarettes, and where increases are small and incremental. If the goal of tobacco taxation is a direct and immediate effect across actual and potential cigarette consumption of different population segments, then the size of the loose cigarette market provides a direct argument for larger increases in tobacco tax in LMIC contexts.

However, another complication emerges in a context where the price of loose cigarettes increases relatively more than the per-cigarette price of cigarettes sold in packs. Depending on the behaviour of loose cigarette smokers, we could see a larger reduction in consumption on aggregate – or instead a large proportion of consumers switching to buying cigarette packs with a comparatively lower per-cigarette price. If this happens, the effects on total consumption among former buyers of loose cigarettes becomes more difficult to estimate. Here, the key question is how the fact that they are now buying cigarettes in a larger quantity, and potentially at a lower per-cigarette price than previously, affects both their purchases and their active smoking behaviour. We could imagine that the high up-front cost at every purchase of a new pack could motivate smokers to quit smoking. However, we can also imagine that the presence of a larger number of cigarettes constantly available after one pack has been purchased could lead previously occasional smokers to smoke more cigarettes per day than previously. This is particularly relevant, as some literature has noted that many smokers smoke loose cigarettes to help them reduce their consumption (Singh et al. 2017; Thrasher et al. 2011; Thrasher et al. 2009; Hall et al. 2015). Depending on the nature of these behavioural effects of switching to packs, we can imagine that the total consumption among originally loose cigarette consumers can decrease, stay the same, or even increase compared to before the tax rise.

We have included this simplified model in order to illustrate two points. First, to show that the existence of large markets for loose cigarettes can have substantial consequences for the outcomes of tobacco control policies such as tobacco taxation. In more common cases, it could affect their effectiveness and the distribution of that effect among different groups. While we have focused here on the effects on overall consumption, it follows that the features of the market for loose cigarettes can also affect the overall tax income generated by such reforms, and influence substitution effects between different brands and types of tobacco. Furthermore, it can shape the equity effects of tobacco tax reforms, given that, as we highlight above, consumers of loose cigarettes tend to have a lower income than consumers in packs. A particularly important outcome of this discussion is that policymakers should be cautious of small and incremental increases in tobacco taxation, as these are more likely to lead to a scenario where tax increases are not passed on to loose cigarettes, and consequently substantial parts of the market.[16]

[16] As noted above, inflation might over time lead to passing on tax increases to buyers of loose cigarette despite the denomination effect. This may only be in the medium to long run, and also be influenced by the actual structure of tobacco taxes – ad valorem or specific.

Second, this type of model provides us with a more precise sense of the dynamics that we need to understand in order to estimate the effects of tobacco taxation on the actual cigarette markets prevailing in most middle- and low-income countries. Here, the model suggests three areas of which we currently only have a very limited understanding. First, how do market structures shape the size of the per-cigarette price difference between loose cigarettes and packs, and how it changes in reaction to price shocks such as high inflation or taxation? We could imagine a wide variety of features of these markets that could play a role here – the relative size of the consumer base for loose cigarettes, government policy towards their sale, the prevalence of street vendors, the level of diversification and competition, and the nature of the denomination effect, to name just a few. However, we currently do not have sufficient data to examine these relationships in detail or predict market reactions based on pre-existing factors. Second, we have limited information on the likelihood of consumers of loose cigarettes switching to buying packs, and its determinants beyond the relative price difference. Again, features of the market such as competition and the availability of alternative brands, as well as features of the specific consumer such as income, could play a role here. As highlighted in Table 4, we find some indication that switching does happen, and that it is connected to price dynamics. However, the available data does not allow us to explore this any further.[17] Finally, we have no information on the effects of switching towards packs on consumption intensity among former buyers of loose cigarettes, nor on the existence of consumers indifferent between acquiring loose cigarettes or packs. We expand on this lack of understanding and data-crucial market dynamics that can affect tobacco tax policy in the following section.

Table 4 Frequency and share of smokers switching between loose and packed cigarettes, by country

	Packs to loose		Loose to packs	
	Frequency	**Smokers' share**	**Frequency**	**Smokers' share**
Bangladesh	447	5.3%	729	8.7%
India	132	4.3%	155	5.1%
Kenya	16	0.9%	49	2.8%
Thailand	602	7.4%	27	0.3%
Zambia	7	0.9%	15	1.9%

Source: Authors' elaboration on ITC data, switching is defined as a difference in the type of tobacco last acquire by a respondent in two consecutive waves.

8 A research agenda

This paper highlights a critical aspect of cigarette markets in low- and middle-income countries that has so far been largely ignored, both empirically and theoretically, by the literature on tobacco usage and tobacco control policy. Based on data from low- and middle-income countries in Africa and Asia, we show that the market for loose cigarettes is substantial. We have also shown that it differs from the wider market of cigarettes in critical respects – the price of loose cigarettes is higher than that of cigarettes sold in packs in almost all cases we could investigate, and at times moves differently in reaction to wider

[17] We did explore the relationship between switching behaviour and price of loose cigarettes/packs through both pairwise correlation and multivariate regression. These correlations were almost consistently significant, but the signs were not consistent across specification using relative and absolute prices. This is not surprising, as data availability limited the subset of the covariates that we could include, and even then missing observations led to a significantly unbalanced panel.

economic changes such as inflation or changes in taxation. We have also shown that the consumer base for loose cigarettes is markedly different from the overall consumer base of packs, at least with respect to their average income and age. Based on these observations, we have argued that a better understanding of the market for loose cigarettes is critical in order to formulate effective tobacco control policy. Using the case of tobacco taxation, we have shown that insufficient attention to the market for loose cigarettes can undermine the targeted outcomes of tax increases. We have highlighted in particular the fact that, at least in the short to medium term, small incremental tax increases might not be passed on to consumers of loose cigarettes at all. This is something of potentially great significance in LMICs, as changes in their tobacco tax rates are often small, incremental and infrequent, so that discrepancies amongst tax burdens of packed and loose cigarettes might last for years depending on inflation rates.

While much of the analysis here is constrained by the limited availability of data, this paper is intended to serve as a call for new research and data collection on this critical issue. We have highlighted specific aspects of the market for cigarettes for which we require a greater understanding – the determinants of the price markup on loose cigarettes, the determinants of switching to packs among loose cigarette smokers, and the effects of switching on smoking intensity. While these are the main aspects that emerged from our argument here, there are wider features of the market for loose cigarettes that warrant further attention – the role of social networks and ties in the consumption of loose cigarettes, the effects of government policy towards informal vendors selling cigarettes, their effects on substitution dynamics within cigarette markets, and on attempts by smokers to reduce their consumption, the relative income elasticities of demand among smokers of loose and packed cigarettes, the relationship between loose cigarettes and the distribution of illicit products, to name just a few.

What these areas have in common is a dire need for more large-scale and systematic data collection on this issue. First and foremost there is a need for more data on the price of loose cigarettes, alongside features of the respective sellers, such as whether they also sell packs, whether they are stores or informal vendors, and where they are located. Apart from the data collected by REEP and used in this article, we are not aware of any price data for loose cigarettes with a sufficiently high number of observations to allow sophisticated analysis. Furthermore, inclusion of data on smoking loose cigarettes in longer-term panel data would allow more research on switching between loose cigarettes and packs and on its effects on smoking intensity. This could be complemented with more data, qualitative and quantitative, on the structure of the market for loose cigarettes in LMICs.

Finally, as we have highlighted throughout this paper, the features of this market are of acute relevance to practical policymaking on tobacco control and taxation. New policy proposals in this area in LMICs would do well to both build and support additional data-gathering in this area, and include explicit discussions, when policy goals are set, about the effects that they expect and wish to have on smokers of loose cigarettes. We hope that this paper contributes to the beginning of these discussions.

Appendices

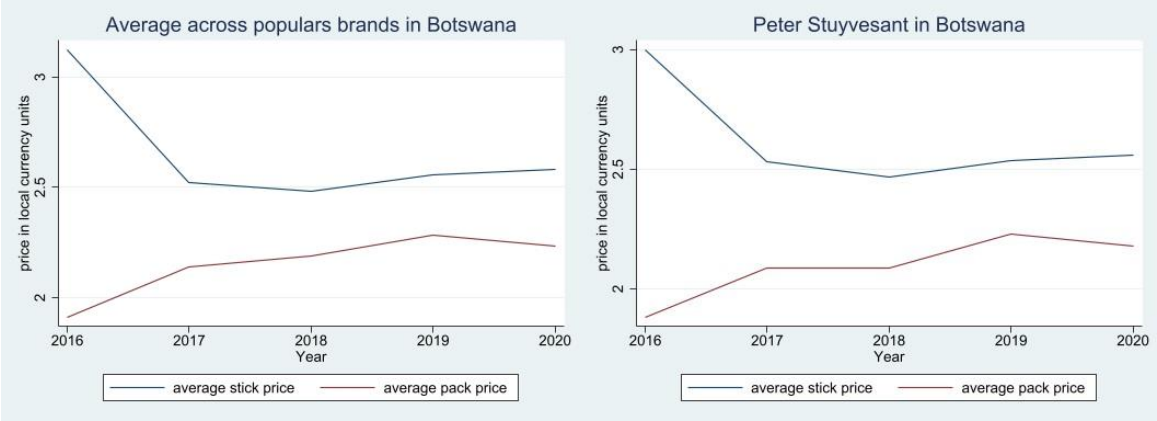
Appendix A

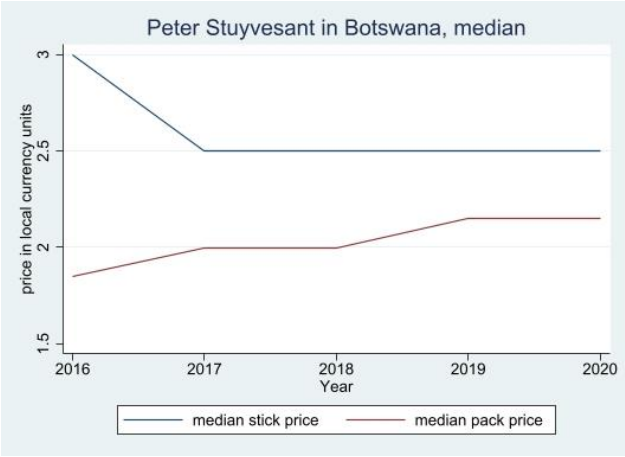
Price data for all countries in the REEP dataset

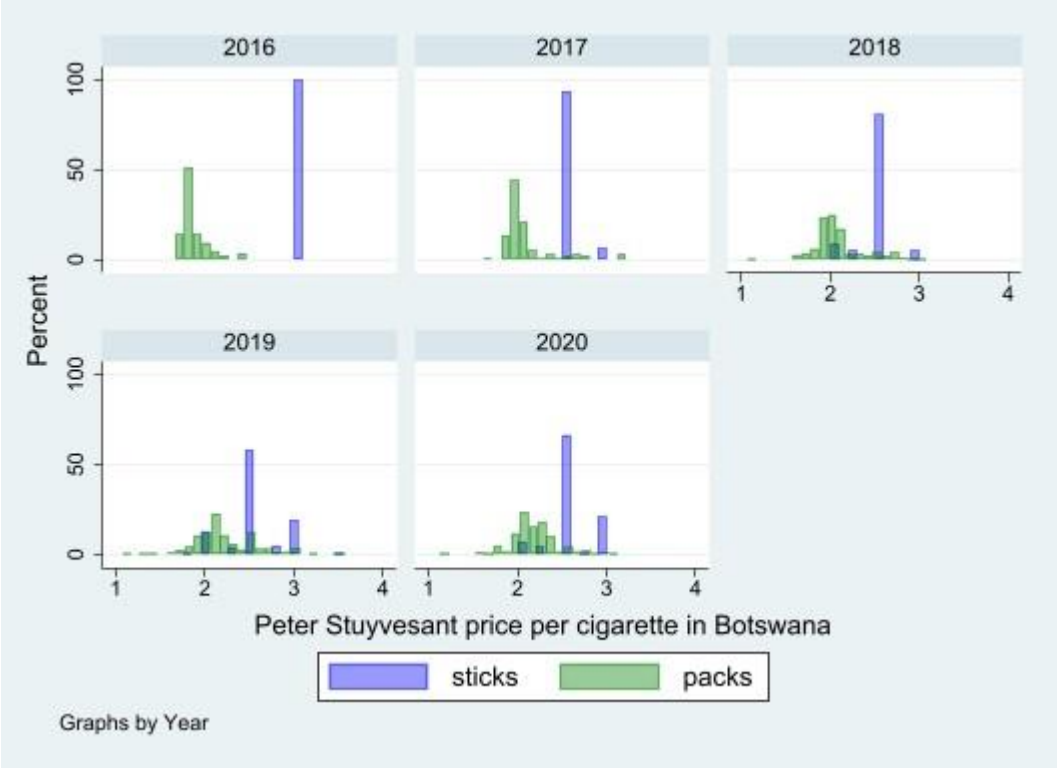
This appendix illustrates, for each country in the REEP dataset for which a sample size of over 2,000 observations is available (excluding Malawi, for which loose cigarette prices represent less than 10 per cent of the observations for the main brand):

1. The trend in nominal prices (per cigarette) of loose cigarettes and cigarettes sold in packs, averaged over the price of every brand that makes up at least 2 per cent of the total prices recorded.
2. The trend in prices (per cigarette) of loose cigarettes and cigarettes sold in packs of the dominant brand in the country that is sold as both loose cigarettes and as packs (dominant brand defined as the brand that has the highest peak market share at any year for which data is available), both averaged across all price points and using only the median price.
3. The distribution/histogram of the price (per cigarette) of loose cigarettes and cigarettes sold in packs of the dominant brand over time.
4. The average markup applied to loose cigarettes, expressed as share of the price of a packed one, as well as its standard deviation and the share of brand-store pairs for which the markup is negative (selling loose cigarettes at a lower price than packed cigarettes).

Botswana

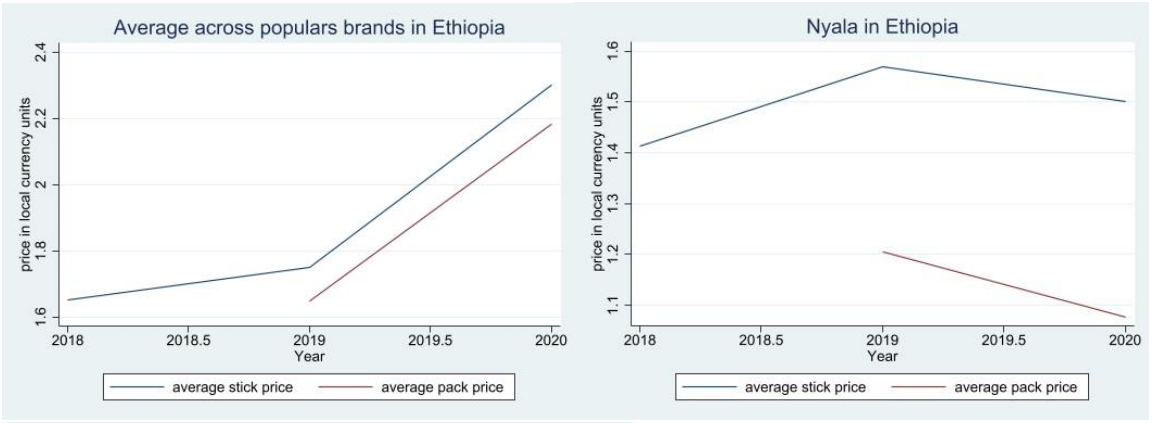


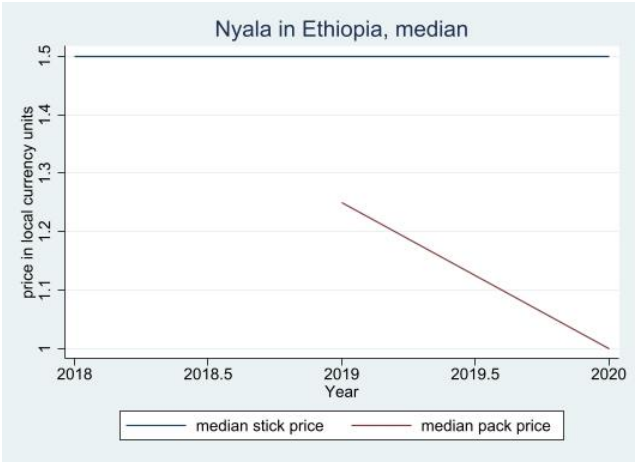


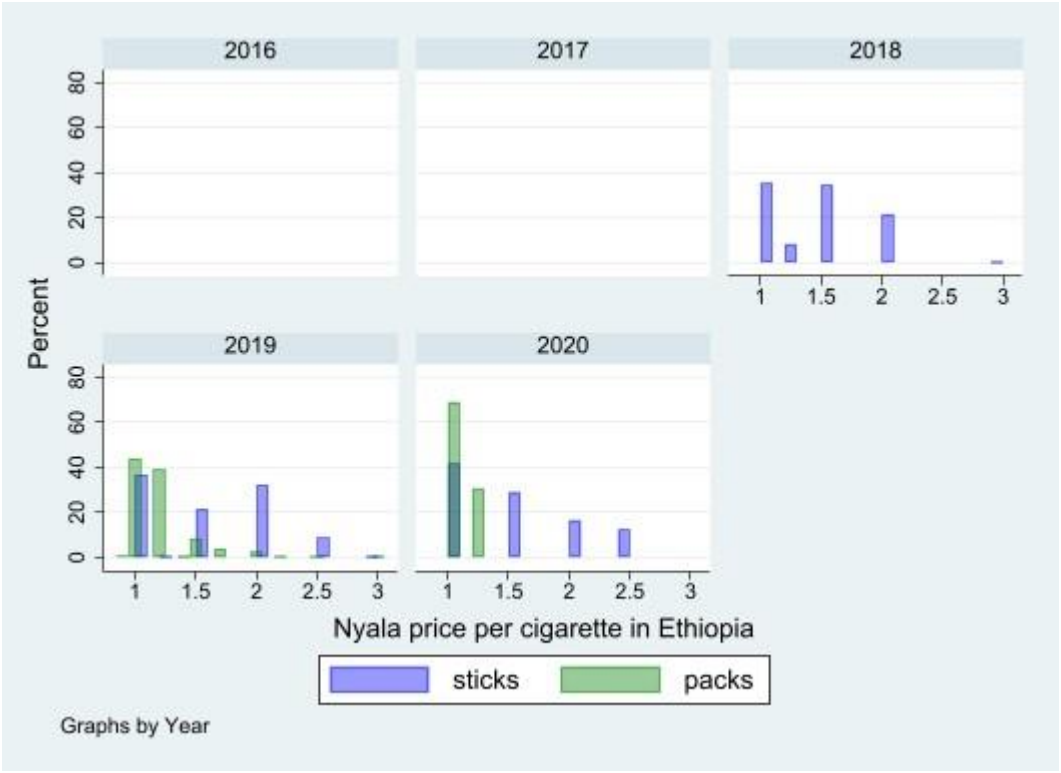


Markup on loose as a share of packed cigarette price	Average	Standard deviation	Negative share
	6.5%	14.2%	0.0%

Ethiopia

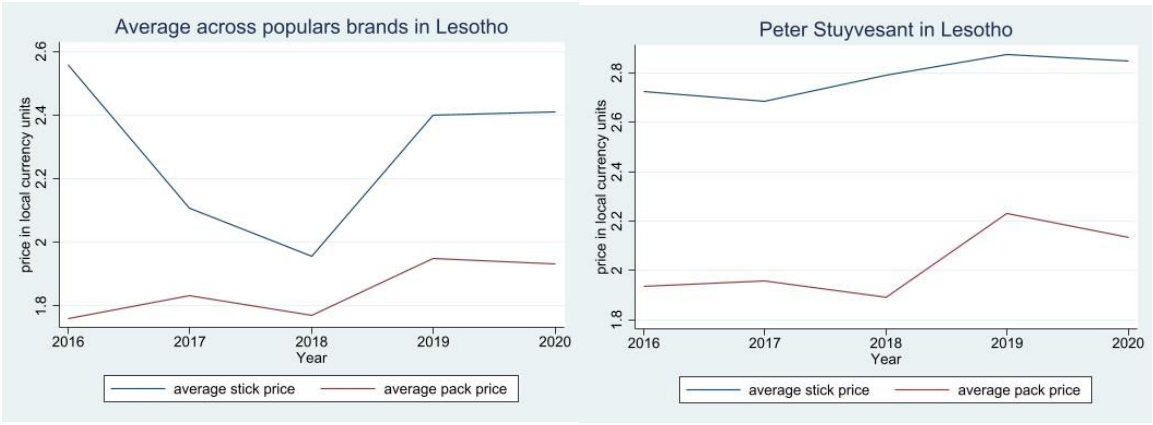


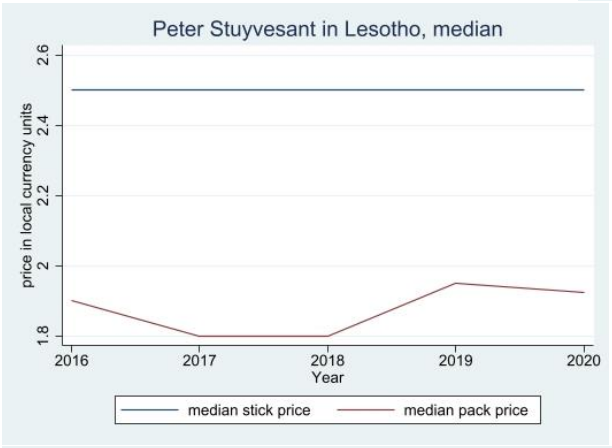


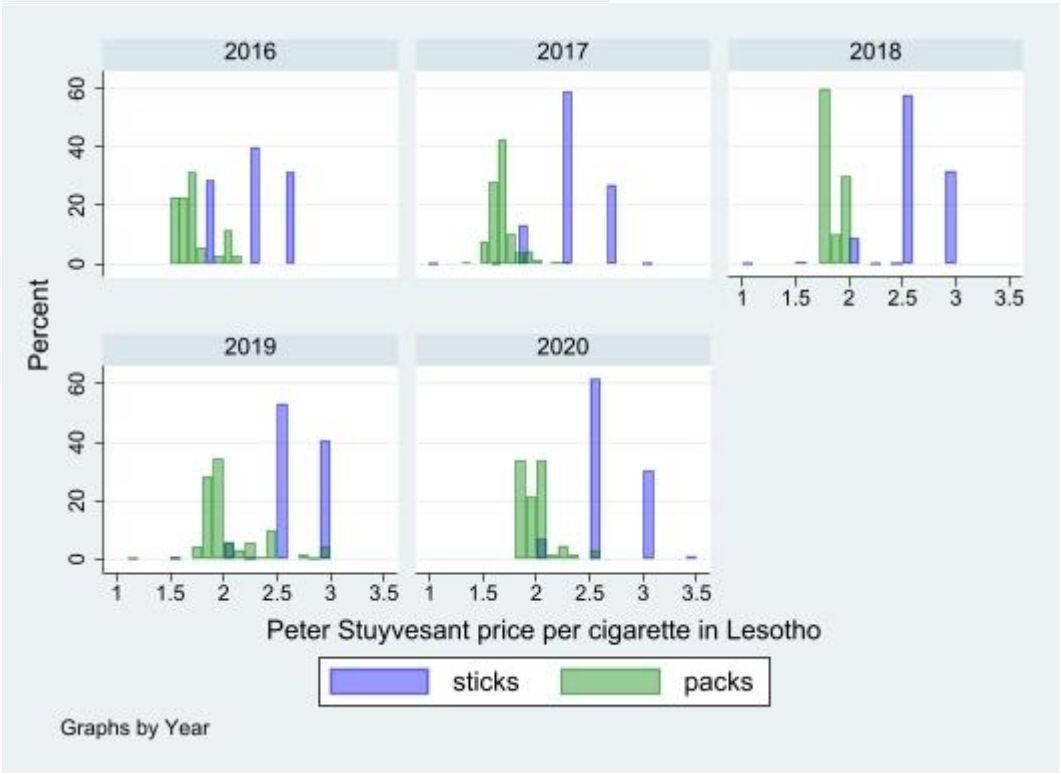


Markup on loose as a share of packed cigarette price	Average	Standard deviation	Negative share
	18.3%	36.6%	10.8%

Lesotho

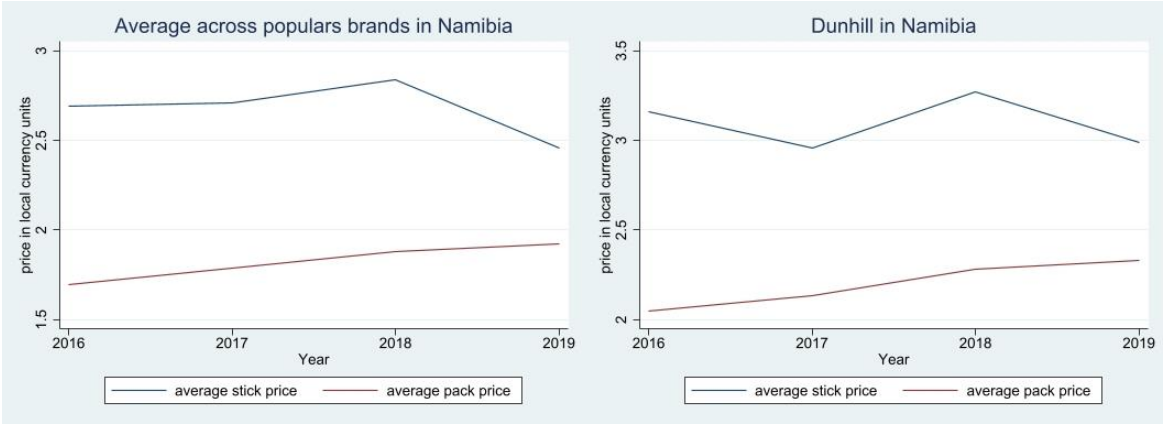


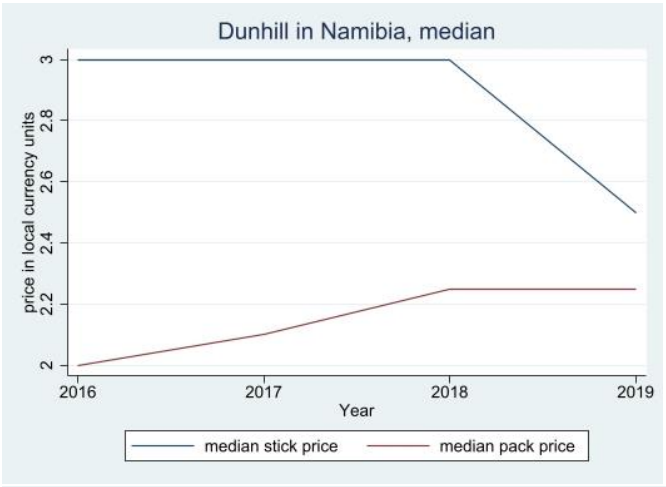


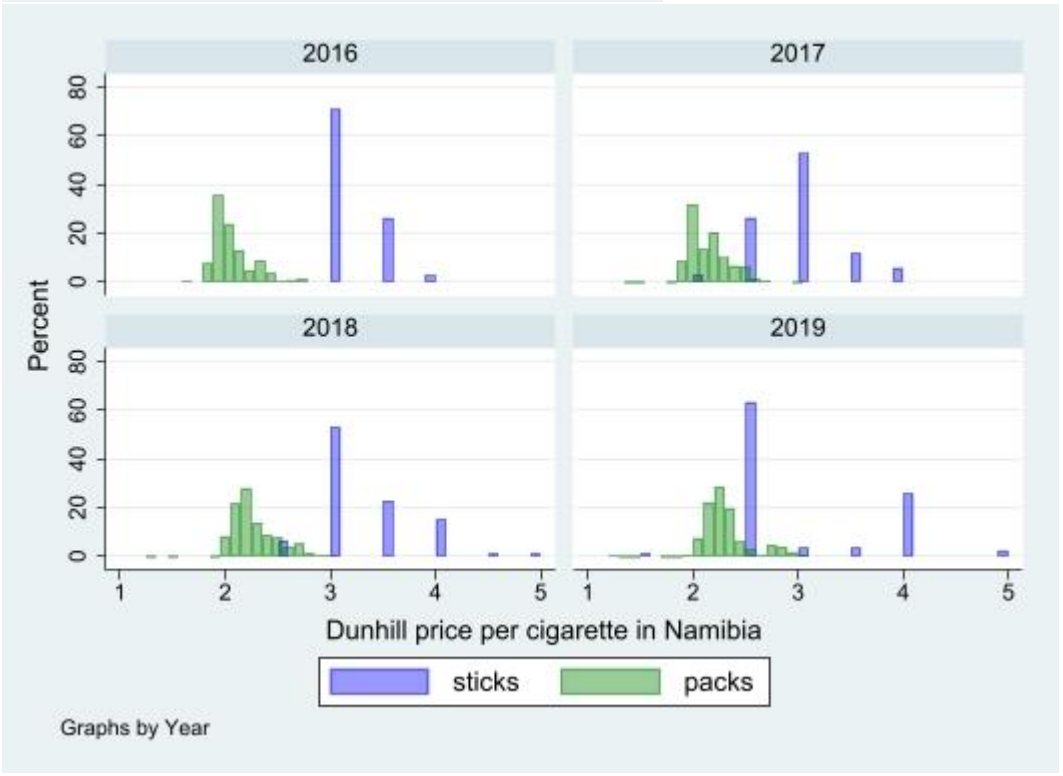


Markup on loose as a share of packed cigarette price	Average	Standard deviation	Negative share
	27.4%	22.7%	1.0%

Namibia

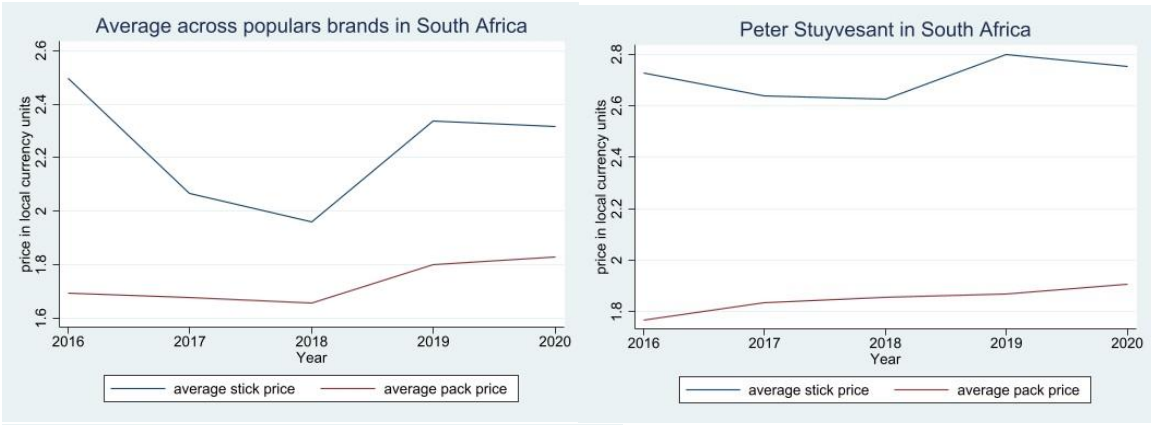


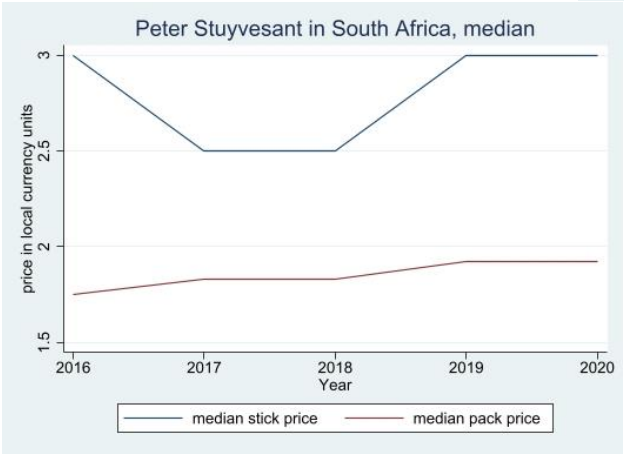


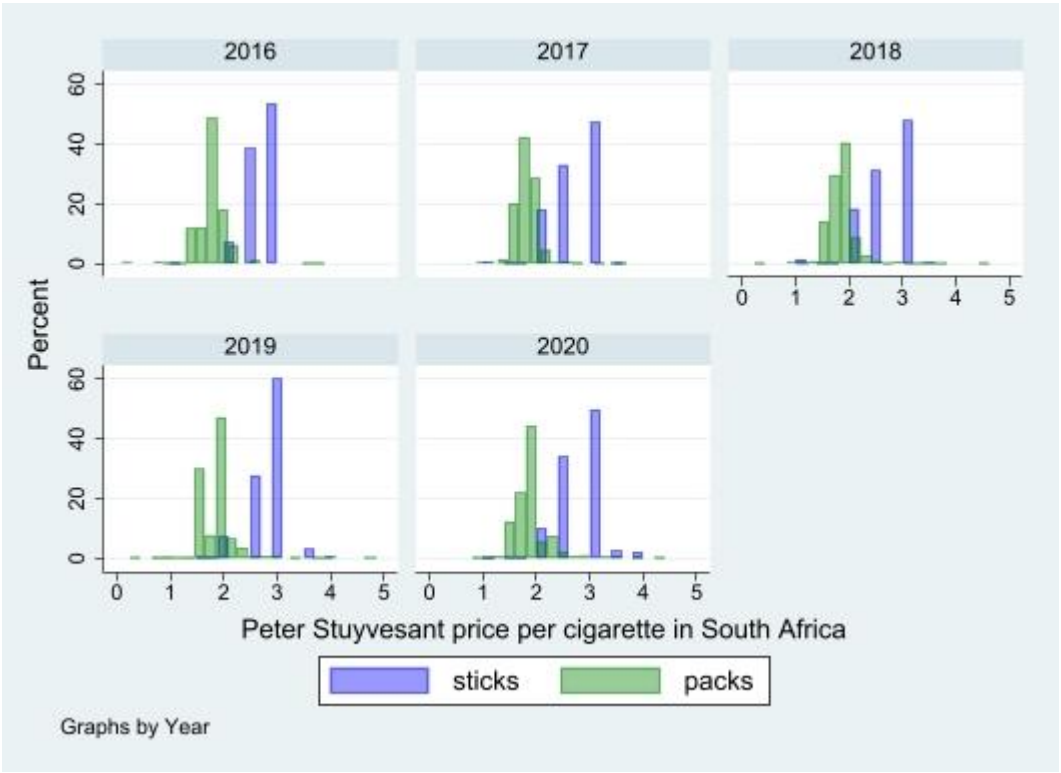


Markup on loose as a share of packed cigarette price	Average	Standard deviation	Negative share
	54.3%	46.9%	0.0%

South Africa

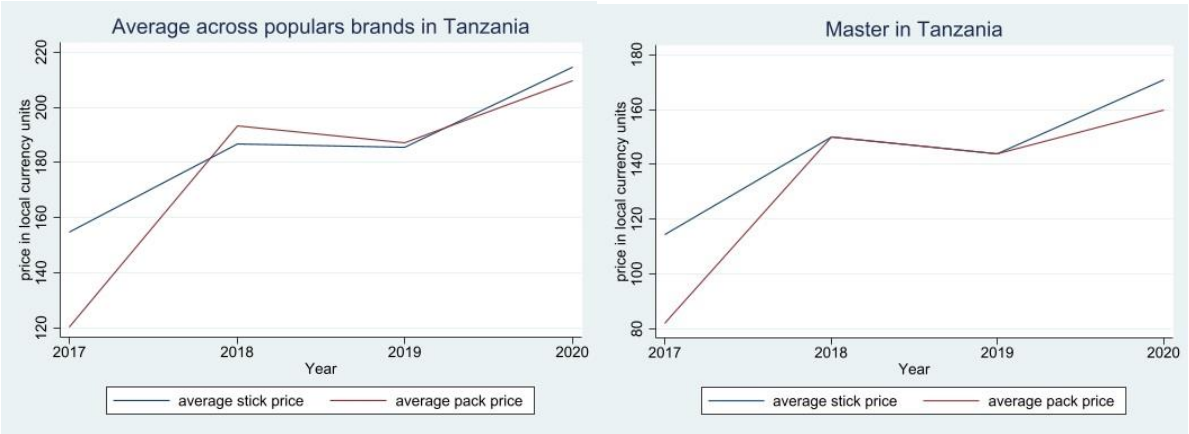


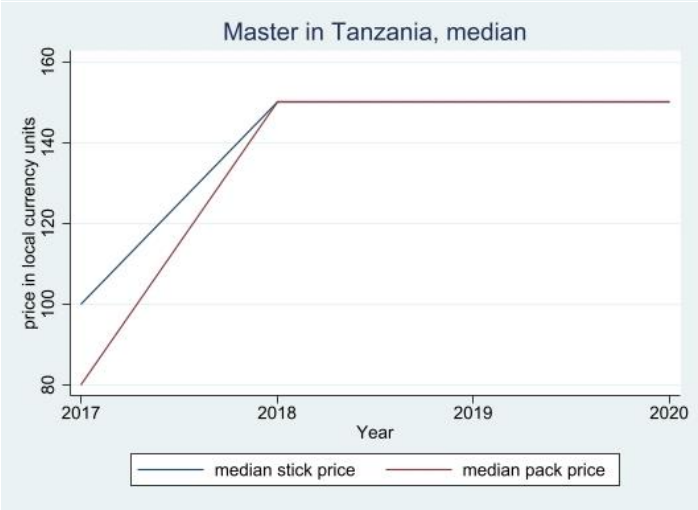


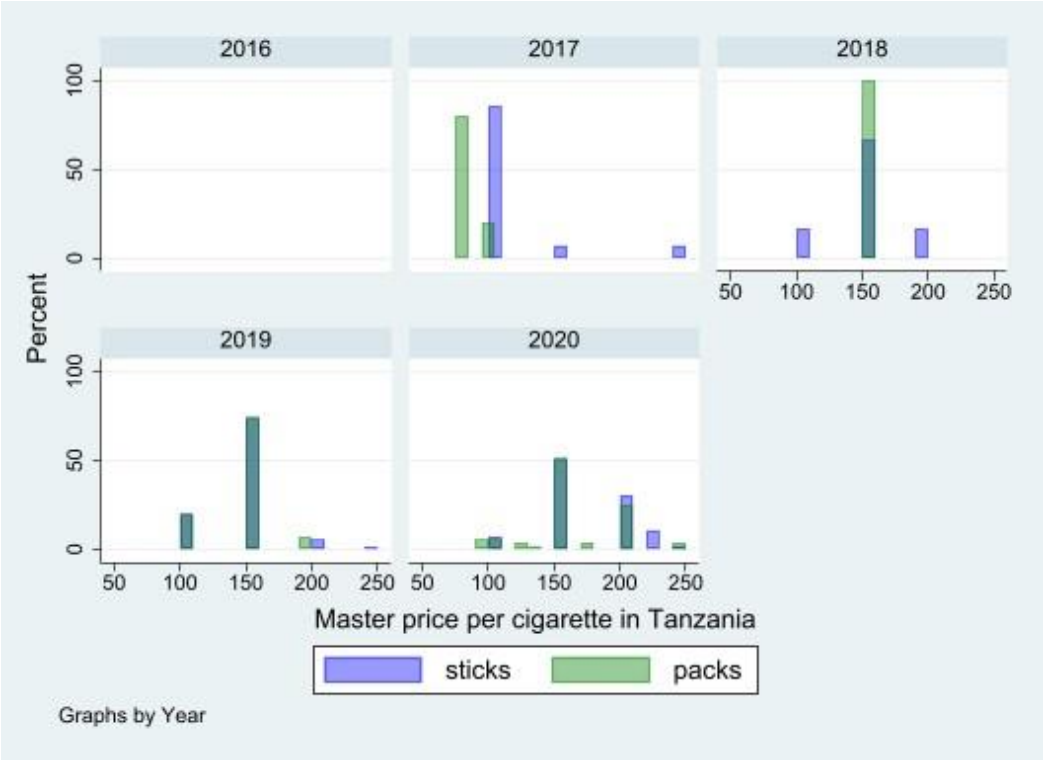


Markup on loose as a share of packed cigarette price	Average	Standard deviation	Negative share
	28.6%	27.0%	3.0%

Tanzania

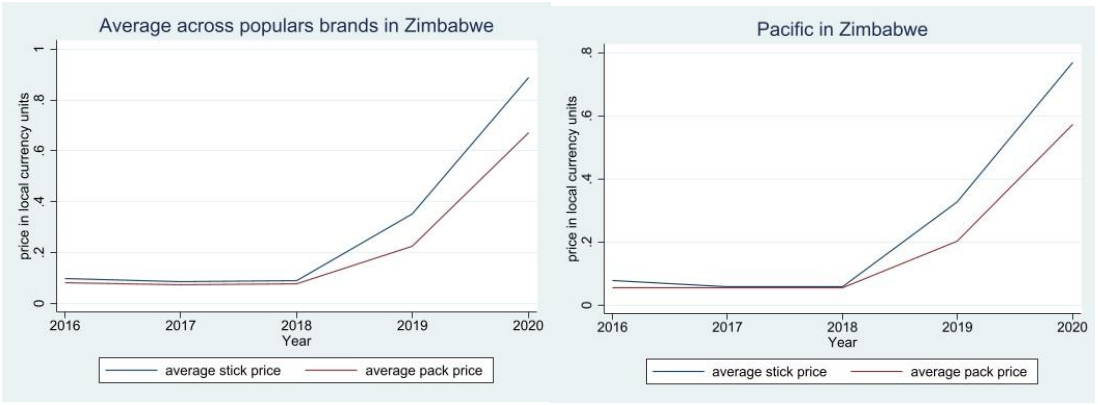


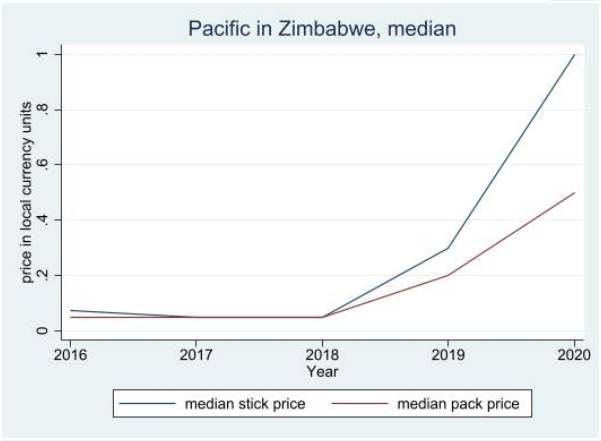


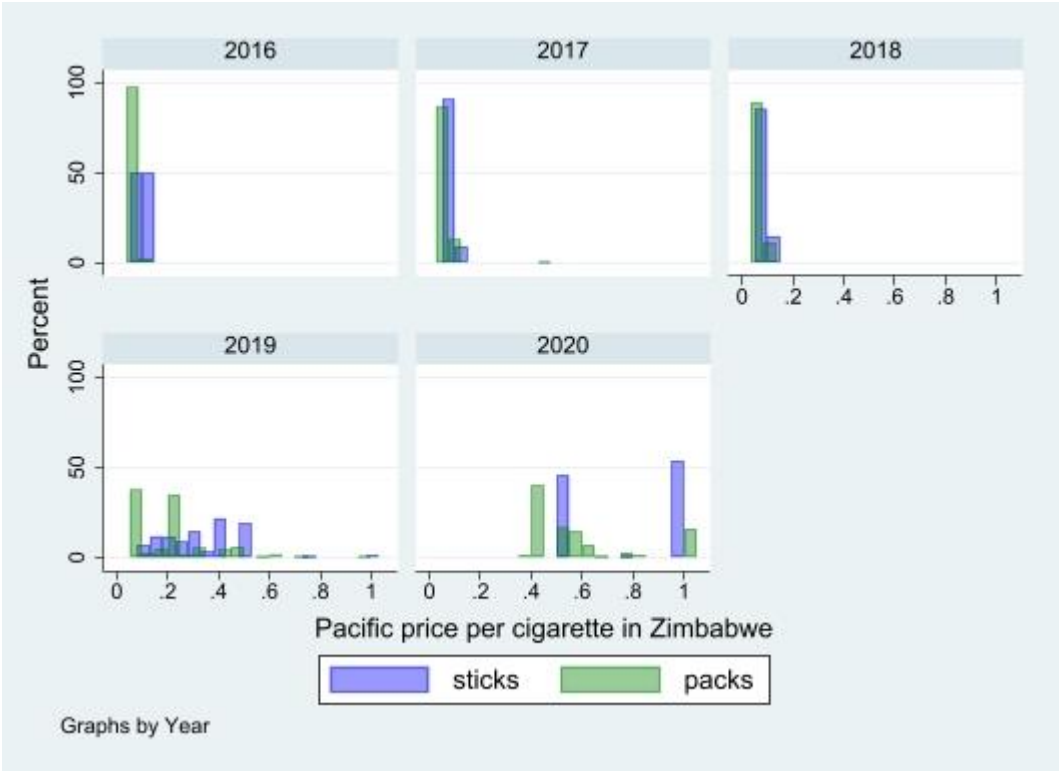


Markup on loose as a share of packed cigarette price	Average	Standard deviation	Negative share
	5.1%	20.9%	5.6%

Zimbabwe







Markup on loose as a share of packed cigarette price	Average	Standard deviation	Negative share
	17.4%	29.8%	6.2%

Appendix B Summary statistics

Table B1 Summary statistics from REEP data

Country	Observations	Rounds	Years	Main brand	Shop type		
					Retail	Spaza/ kiosk	Street vendor
Botswana	9,934	8	2016-2020	Peter Stuyvesant	83.93%	2.18%	13.88%
Chad	250	1	2019-2020	Fine	4.40%	9.20%	86.40%
Eswatini	723	3	2016-2020	Dunhill	96.82%	1.38%	1.80%
Ethiopia	5,989	3	2018-2020	Nyala	-	4.51%	95.49%
Ghana	485	1	2017-2018	Pall Mall	16.29%	61.65%	22.06%
Kenya	349	1	2018-2019	Sportsman	12.89%	64.18%	22.92%
Lesotho	25,653	9	2016-2020	Dunhill	9.69%	15.52%	74.78%
Madagascar	367	2	2019-2020	Good Look	24.52%	38.15%	37.33%
Malawi	2,334	4	2017-2020	Pall Mall	27.08%	18.34%	54.58%
Mauritius	232	1	2016	Dunhill	100.00 %	-	-
Mozambique	850	2	2019-2020	Pall Mall	19.18%	4.47%	76.35%
Namibia	25,919	9	2016-2020	Camel	96.83%	1.32%	1.85%
Nigeria	740	2	2018-2020	Benson & Hedges	11.22%	73.51%	15.27%
South Africa	45,410	8	2016-2020	Peter Stuyvesant	54.34%	16.28%	29.38%
Tanzania	2,137	3	2017-2020	Embassy	28.69%	9.45%	61.86%
Uganda	128	2	2016-2019	Dunhill	29.69%	57.03%	13.28%
Zambia	556	5	2017-2019	Peter Stuyvesant	49.10%	43.17%	7.73%
Zimbabwe	22,046	8	2016-2020	Pacific	27.24%	15.40%	57.36%

Table B2 ITC Summary statistics

Country	Observations	Waves	Years	Consumption	
				Packed	Loose
Bangladesh	8,243	4	2009-2015	33.01%	66.99%
India	3,052	3	2007-2013	23.97%	76.03%
Kenya	1,776	2	2012-2018	12.70%	87.30%
Thailand	8,146	6	2005-2014	63.12%	36.88%
Zambia	813	2	2012-2014	17.90%	82.10%

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