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PRICE-SETTING BEHAVIOUR IN LESOTHO: STYLISED FACTS FROM CONSUMER RETAIL PRICES

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Abstract
This paper documents some of the main features of price-setting behaviour by retail outlets in Lesotho over the period March 2002 to December 2009. These features include the frequency, size, duration and synchronisation of price changes. In addition, the paper compares price-setting behaviour in Lesotho and South Africa using a comparable set of products. The findings reveal considerable heterogeneity in price-setting behaviour across products, outlets, locations and time. Variations in inflation are strongly correlated with the average size of price changes, but rising inflation raises the frequency of price increases and reduces the frequency of price decreases. Price decreases constitute an important determinant of inflation movements. Surprisingly, the frequency and size of price changes in Lesotho differ substantially from those in South Africa, despite the presence of common retail chains and their joint membership in a customs union and common monetary area. These findings open up opportunities for further research into the sources of heterogeneity across products and Lesotho and South Africa in the setting of prices.
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1. INTRODUCTION

In economic theory, prices are the equilibrating variables that ensure markets clear. Yet evidence of price rigidities is widespread, indicating that firms do not respond instantaneously to shocks (Blinder *et al.*, 1998; Klenow and Malin, 2011). The nature of these rigidities determines how cost and demand shocks permeate through the economy. For example, in modern micro-founded macro models, monetary shocks lead to longer-

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lasting real output effects if firms adjust prices every *n*th period or randomly, as in the time-dependent pricing (TDP) models of Taylor (1980) and Calvo (1983), than in the case of state-dependent pricing (SDP) models where the timing of price changes is dependent on the external environment. Within the trade literature, if prices are rigid, then consumer gains from liberalisation are reduced and complementary policies to establish markets, improve competition and deepen market integration may be required (McCulloch *et al*., 2001). Understanding price-setting behaviour at the micro level is therefore crucial for the design and implementation of public policies including monetary, exchange rate, competition and trade policy.

Analysis of pricing behaviour at the firm-level data has grown rapidly in response to the increased availability of micro price data (Klenow and Malin, 2011), particularly in advanced economies.[1] Yet, price-setting behaviour of firms in emerging economies, where economic shocks are frequent, inflation rates are often high and variable, and weak infrastructure, poor distribution networks and 'thin' markets create frictions to price adjustments can be expected to be very different.

This study contributes to the theoretical and empirical literature on price-setting behaviour in emerging countries using a unique database of monthly product prices by retail outlet for Lesotho, a low-income African country. The data covers 229 product items, collected from 345 retail outlets by the Lesotho Bureau of Statistics (BOS) as part of their consumer price index (CPI) calculations over the period March 2002 to December 2009.

The paper makes three contributions. Firstly, it documents the stylised facts regarding the frequency and size of price changes characterising price-setting behaviour by retail outlets in Lesotho. Secondly, it decomposes inflation and the variance of inflation into its constituent components – the frequency and the size of price changes. Following Klenow and Malin (2011), these decompositions are used to distinguish between various theories of price setting. Thirdly, the paper compares these results to other countries and South Africa in particular.

The remainder of the paper is structured as follows. Section 2 provides a description of the data. Section 3 presents the evidence on the frequency of price changes, while section 4 focuses on the size of price changes. In section 5, the dynamic features of price changes are explored. This is followed in section 6 by a comparison of price setting in Lesotho and South Africa. Section 7 concludes the paper.

2. DESCRIPTION OF THE DATA

This study uses unique unpublished data of highly disaggregated product prices underlying the monthly CPI in Lesotho, obtained directly from the BOS.

The BOS uses a direct approach to collect price data whereby two enumerators in each district visit the same retail outlets in the first two working weeks of every month. Prices

[1] For example, Bils and Klenow (2004) for the United States; Fabiani *et al*. (2006) for Italy; Álvarez *et al*. (2006) and Álvarez and Hernando (2007a) for Spain; Dabusinskas and Randveer (2006) for the Euro area and Estonia; Dhyne *et al*. (2006) for the Euro area and the United States; Dias *et al*. (2004) for Portugal; Fisher and Koniezcny (2000) for Canada; and Bunn and Ellis (2012) for the UK. Current studies on emerging economies include: Creamer and Rankin (2008) for South Africa; Kovanen (2006) for Sierra Leone; Gouvea (2007) for Brazil; and Julio and Zarate (2008) for Colombia. See Klenow and Malin (2011) for a review of micro price studies.

of products where there is little variation across the country, such as fuel, electricity and water charges, are collected centrally. Prices of some products are collected on a quarterly (transport fares and fuel), bi-annual (school fees and hospital fees) and annual (water and electricity charges) basis.[2] Many of these prices are state regulated.[3]

The raw sample of data spans the period March 2002-December 2009 (93 months) and contains 398,092 elementary price records (termed price quotes), each with information on the date (month and year), retail outlet, district, product (including brand in many cases) and unit codes and the price of that item. This datum makes it possible for the pricing history of individual items, within individual retail outlets, to be traced over a long period of time. The longitudinal string of prices for a particular product item at a particular outlet is termed a 'quote line'.

A limitation of the data is that it is not possible to identify price changes associated with temporary promotions and seasonal sales and does not record any price for an item that is temporary out of stock (including seasonal products). The BOS instead imputes the price using the growth rate of the same item obtained from an alternative outlet.[4] An item that is permanently out of the sample may be replaced by a similar product within that outlet.

The data required extensive cleaning. Product items that lacked descriptions were dropped, and quote lines were removed if they contained less than six months of data. To eliminate outliers due to possible coding errors, price quotes were dropped if they differed by more than 150 log points from the median price quote. The final sample consists of 345 outlets, 229 product items and 366,765 price quotes.[5] Food, household and clothing products are the most numerous price records (Table 1), and altogether, the sample of products makes up 78.9% of the CPI basket.

Urban outlets outnumber rural ones in the sample, and the Maseru district, in which the capital city is located, dominates in terms of both urban and rural outlets (Table 2). The remaining outlets are distributed fairly equally across other districts.

3. FREQUENCY OF PRICE CHANGES

3.1 Measurement

The periodicity with which prices are changed is a key measure of price flexibility. Two interrelated measures are commonly used: the frequency of price changes and the duration of price spells (Álvarez and Hernando, 2004). In this study, we measure the frequency of price change as a fraction of non-zero price change observations divided by all price observations for the selected sample.

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[2] Prices of electricity and water charges are not included in the sample, but transport fares, school fees and fuel prices are included.

[3] There is a band within which outlets are to set regulated prices. These include fees for church and community schools, hospital fees and fuel prices. Transport fares are usually fixed. The government announces the changes and publicises the prices to the entire country according to the type, size of the transport mode as well as the route.

[4] The alternative outlet has to have similar characteristics (*e.g.* location, size and type) as the substituted outlet.

[5] The raw data covered 12 urban centres and 45 rural centres across the 10 districts of Lesotho. Four hundred seventy-one product items were collected across 698 outlets, of which 305 were located in rural areas and 396 in urban areas.

Table 1. Price records by major product group

Product group	Price quotes		Product items		Weighting in CPI
	Number	Percent	Number	Percent	Percent
Goods					
Food	182,090	49.65	80	34.07	35.35
Non-alcoholic beverages	21,062	5.74	8	3.54	0.68
Alcoholic beverages	4,836	1.32	5	2.21	1.00
Tobacco and narcotics	9,094	2.48	3	1.33	0.20
Clothing and footwear	34,407	9.38	31	13.72	15.32
Fuel	20,401	5.56	13	5.75	7.71
Household furniture and equipment	29,644	8.08	39	17.26	5.31
Household operations	24,301	6.63	8	3.54	3.49
Transport equipment	786	0.21	3	1.33	1.50
Communications	87	0.02	1	0.44	0.30
Personal care	14,758	4.02	6	2.65	2.31
Services					
Medical care and health expenses	4,298	1.17	11	4.87	1.92
Recreation and culture	5,262	1.43	7	3.1	1.43
Education	2,249	0.61	2	0.88	1.34
Transport services	663	0.18	2	0.88	0.86
Other goods and services	12,827	3.5	10	4.42	1.15
Total	366,765	100	229	100	79.87

Notes: Sample runs from March 2002 through December 2009. Consumer price index (CPI) weights are obtained for 180 product groupings from the Lesotho Bureau of Statistics. The weights are calculated on the basis of the 2002/2003 Household Budget Survey and are consistent throughout the whole period.

Table 2. Number of retail outlets per district

District	Number of outlets		Total
	Rural	Urban	
Maseru	14	78	92
Butha-Buthe	0	24	24
Leribe	1	35	36
Berea	1	32	33
Mafeteng	1	27	28
Mohale's Hoek	1	28	29
Quthing	2	25	27
Qacha's' Neck	0	26	26
Mokhotlong	4	24	28
Thaba-Tseka	4	18	22
Total	28	317	345

We calculate the frequency of price change differently depending on the unit of analysis. For example, the frequency of price change for a specific product k sold at a specific store i over the full period T is calculated as:

$$Freq_{ik} = \left(\frac{1}{T_{ik} - 1}\right) \sum_{t=2}^{T_{ik}} I_{ikt} \tag{1}$$

where T_{ik} is the number of monthly observations of the price p_{ikt}; $I_{ik,t}$ is an indicator variable equal to 1 if $p_{ikt} \neq p_{ikt-1}$ and 0 if $p_{ikt} = p_{ikt-1}$. Given the frequency of data available, we assume that prices change once within a given month (or within a quarter or year for those products for which data are collected on a quarterly or annual basis), which may underestimate the actual frequency of price changes. For example, Bunn and Ellis (2012) find much higher frequencies of price change for the UK when using weekly scanner data compared to monthly CPI microdata.

We use the product and outlet-specific measure of frequency to compute the average frequency across outlets at the product level over the period T ($Freq_k$). This is calculated as the simple average of $Freq_{ik}$ for each product (k) with each outlet having equal weight. The aggregate frequency across products ($Freq$) is computed as the simple or CPI weighted average of $Freq_k$ across the sample of products.[6]

Frequency is closely linked to duration of price spells – the higher the frequency of price changes, the shorter the duration. For large samples, the inverse of the frequency of price changes can be used a consistent estimator of the average duration of price spells (Baudry *et al.*, 2004). This is the approach followed in this paper – average duration is measured as the inverse of the average frequency.[7] For individual outlet i, the duration of the price spell for product k is therefore calculated as:

$$duration_{ik} = \left(\frac{1}{Freq_{ik}} \right) \tag{2}$$

Similarly, average duration across outlets at the product level is calculated as the inverse of $Freq_k$, while aggregate duration across all products is computed as the inverse of $Freq$.

3.2 The Frequency of Price Change

Across the 229 products in Lesotho, just under a third of all product items change price every month (Table 3), implying that individual prices change on average every 3.2 months. The frequency of price changes is slightly higher if products are weighted by the CPI expenditure share, reflecting the greater weight placed on food and fuel products that are characterised by a relatively high frequency of price changes (see later), and the implied duration is consequently lower (2.7 months). These frequency estimates are based

Table 3. Summary of the level and dispersion of frequency across products in Lesotho

	Frequency	**Standard deviation of frequency across outlets**	**Implied duration**
Mean (simple average)	0.312	0.111	3.204
Median	0.316	0.115	3.166
Mean (weighted average)	0.371	0.119	2.692
Median (weighted average)	0.379	0.116	2.639

Notes: The time period covers March 2002-December 2009. Frequencies are calculated as the simple average (median) or weighted average (median) of $Freq_{ik}$ across the 229 product items. Consumer price index (CPI) expenditure shares are used as weights. The standard deviation reflects the simple or weighted average of the standard deviation of $Freq_{ik}$ across outlets within each product item. Implied durations are calculated as the inverse of the mean or median frequency.

[6] CPI weights are obtained for 180 product groupings. These product groupings are more aggregated than the elementary product items used in the analysis. Each CPI weight category includes on average 2.3 product items (maximum of 9, minimum of 1) that differ in terms of unit of measurement, brand or product description. To calculate weighted average values across product items, the CPI weights are disaggregated to each product item using the number of price records as weights.

[7] The drawback of this approach is that it calculates the inverse of the average frequency of price change instead of the average of the inverse of the frequency of price change (Baharad and Eden, 2004; Baudry *et al.*, 2004; Gouvea, 2007). The problem with the latter is that some frequencies of price changes may be close to zero, leading to extremely high durations that distort the aggregate duration. The former measure will be smaller or equal to the latter because of Jensen's inequality.

on posted prices including temporary sales, but because sales prices are likely to be more transient and prices often return to their original level (Nakamura and Steinsson, 2008), the frequency of (non-sale) regular price changes in Lesotho is likely to be lower.

The frequency of price changes in Lesotho, at 37.1%, is substantially higher than in South Africa (17.1%) (Creamer *et al.*, 2012) and many developed countries including the Euro area (15.1%) (Dhyne *et al.*, 2006) and the UK (19%) (Bunn and Ellis, 2012), but similar to that of posted prices in the United States (36.2%) (Klenow and Kryvtsov, 2008) and Brazil (37%) (Gouvea, 2007), and lower than Sierra Leone (51%) (Kovanen, 2006).

3.3 The Frequency of Price Change across Products and Locations

All studies using micro price data find considerable heterogeneity in the frequency of price changes (Klenow and Malin, 2011). This is the case for Lesotho, too (Figure 1), and similar to other micro price studies (Bils and Klenow, 2004; Dhyne *et al.*, 2006; Klenow and Malin, 2011; Bunn and Ellis, 2012, Creamer *et al.*, 2012), the frequency of price changes differs substantially across products. For example, for a quarter of all product items, the frequency of price change exceeds 40% (implied duration of 2.5 months or less), and for 24% of all product items, the frequency of price change is at most 24% (the implied duration of four months or less).

Table 4 shows that price changes and the implied duration of price spells also differ by products category and location (urban and rural).

The prices of goods change more frequently than the prices of services – the implied mean duration of price changes for goods is 2.6 months compared with 8 months for services and is in line with empirical evidence from other countries (Kovanen, 2006; Gouvea, 2007; Klenow and Malin, 2011), including South Africa (Creamer *et al.*, 2012).

This stickiness in services may be explained by various factors: services are mostly non-tradable and are not subject to high transport and distribution costs; they are less

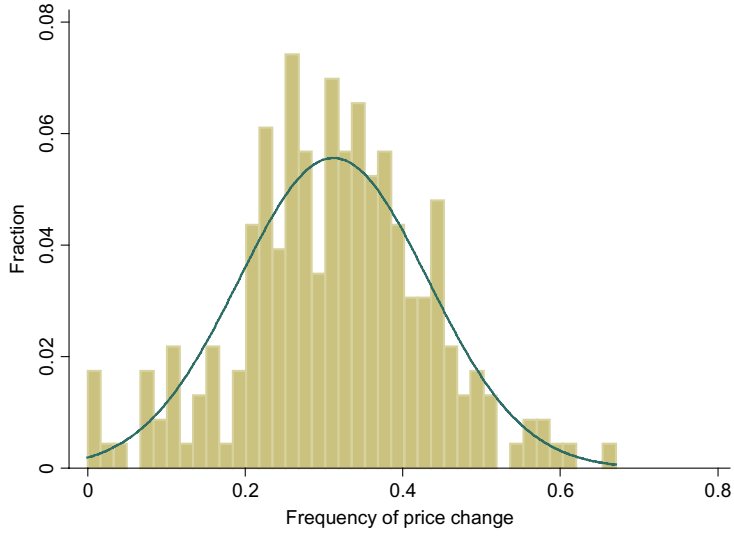

Figure 1. Average frequency of price change
Notes: Author's calculations using the average frequency of price change ($Freq_k$) for 229 product items.

Table 4. The frequency of price changes and duration of price spells across product groups and locations, 2002-2009

	Simple average	Median	Implied mean duration
Food	0.440	0.447	2.275
Non-alcoholic beverages	0.351	0.383	2.851
Alcoholic beverages	0.228	0.266	4.384
Tobacco and narcotics	0.370	0.365	2.704
Clothing and footwear	0.357	0.376	2.803
Fuel	0.405	0.384	2.467
Household furniture and equipment	0.259	0.249	3.867
Household operations	0.373	0.372	2.680
Transport equipment	0.277	0.308	3.607
Communications	0.000	0.000	
Personal care	0.314	0.322	3.187
Medical care and health expenses	0.135	0.084	7.407
Recreation and culture	0.218	0.229	4.587
Education	0.087	0.087	11.553
Transport services	0.187	0.113	5.345
Other goods and services	0.293	0.217	3.412
Goods	0.386	0.392	2.593
Perishable food	0.482	0.502	2.074
Non-perishable food	0.409	0.423	2.447
Durable goods	0.317	0.316	3.153
Non-durable goods	0.360	0.375	2.775
Services	0.125	0.102	8.006
Rural	0.367	0.378	2.724
Urban	0.406	0.411	2.460
Total	0.371	0.379	2.692

Notes: Communications is made up entirely of the cost of landline to landline calls. These did not change over the sample period. Aggregate frequencies at the major group level (or higher) are calculated as the simple average (median) or weighted average of $Freq_k$ across products items within that product group. The rural and urban frequencies are based on an overlapping sample of 149 products. The gap is significantly different from zero (based on a regression of outlet by product frequencies on a dummy variable for rural areas and product fixed effects). Implied durations are calculated as the inverse of the mean frequency.

exposed to external shocks affecting the cost of purchasing and accessing traded goods, including transport costs; and the stickiness is affected by the inclusion of education services (a frequency of 8.7%) and medical services (13.5%) where prices often only change on an annual basis.

Table 4 also indicates that prices of food products change on average more frequently (44.2%) than non-food products, and within the food category, prices of perishable products are more flexible (48.1%) than non-perishables (40.9%). Unprocessed products such as fresh food are subject to relatively high distribution and storage costs that force retailers to pass these costs to consumers more quickly to avoid pricing below the marginal cost (Klenow and Malin, 2011). The supply of perishable foods is also more likely to be affected by variable weather patterns. Relatively high frequencies for food products are also found by Coricelli and Horváth (2010) for Slovakia, Bunn and Ellis (2012) for the UK and Creamer *et al*. (2012) for South Africa.

For non-food products, the implied mean duration of price spells for non-durable products (2.8 months) is lower than for durable products (3.2 months). This result contrasts with that of Klenow and Malin (2011) who report a weighted implied mean duration of three months for durable goods and 5.8 months for non-durables for the United States between 1988 and 2009.

Price-setting behaviour also differs between rural and urban areas as the final two rows of Table 4 show. To avoid product composition effects (the composition of products in

rural areas is strongly biased towards the more flexible food products), the comparison of frequencies is based on a sample of 149 products where price data is collected in rural and urban areas. Prices change less frequently in rural areas (36.7%) compared with urban areas (40.6%). The difference is small, but statistically significant.[8] Many factors may account for this difference. High transaction costs associated with poor rural transport and communication infrastructure restrict cross-regional and intraregional competition, enabling retail outlets to segment rural from urban markets. Consequently, regional variations in cost and demand shocks, firm menu costs and market power give rise to differences in price setting. Market power possessed by firms *e.g.* is shown theoretically (Powers and Powers, 2001) and empirically (Álvarez and Hernando, 2007b) to be associated with greater price rigidity.

3.4 Outlet Attributes and Heterogeneity in Price Setting

The previous section examined differences in product characteristics as a source of variation in the frequency of price changes by outlets, yet price-setting behaviour differs enormously across outlets even for the same product. This suggests that outlet attributes are a further factor explaining the heterogeneity of price-setting behaviour.

The second column of Table 3 presents the mean and median of the standard deviation in the frequency of price changes across outlets for each of the 229 product items. On average, the standard deviation in the frequency of price changes across outlets within each product line is 0.11, or 35% of the mean frequency.[9] This variation in the frequency of price changes within product lines is in fact very similar to the variation in the average product frequency ($Freq_k$) across product items (standard deviation equals 0.12). Differences in outlet attributes therefore appear to be as important as product-specific characteristics in explaining the overall variation in the frequency of price change at the outlet/product level ($Freq_{ik}$).

One such outlet attribute is firm size – prices change more often in large outlets (Fabiani *et al*. 2007). The Lesotho data corroborates this finding. Using the number of product items recorded within each outlet as an (imperfect) indicator of firm size, we estimate a significant positive association between firm size and the frequency of price change at the product/outlet level ($Freq_{ik}$) for Lesotho.[10]

3.5 Frequency of Price Decreases and Price Increases

The total frequency of price changes is the sum of the frequency of price increases and decreases. Analysing each of these components separately is useful, particularly when they may display offsetting movements in response to aggregate shocks.

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[8] Based on weighted least squares estimates of the frequency of price change at the outlet/product level ($Freq_{ik}$) on a rural dummy variable, product fixed effects and district fixed effects. The frequency of price change in rural areas is estimated to be 4.4 percentage points lower than in urban areas.

[9] Across major groups, heterogeneity in price-setting behaviour across outlets is greater within goods (standard deviation equals 0.114) compared with services (0.074), and in food (0.125), fuel (0.124), household operations (0.124) and non-alcoholic beverages (0.12) compared with other major groups.

[10] The number of products collected from each outlet ranges from 1 to 117 with a mean (median) of 68.2 (78). The estimates control for unobserved district and product characteristics through use of fixed effects. The coefficient on size (in natural logarithm) is 0.033.

Table 5. The frequency of price increase and decreases across major group, 2002-2009

	Weighted Frequency of price change	Frequency of price increase	Frequency of price decrease
Food	0.440	0.273	0.167
Non-alcoholic beverages	0.351	0.212	0.138
Alcoholic beverages	0.228	0.147	0.082
Tobacco and narcotics	0.370	0.254	0.115
Clothing and footwear	0.357	0.204	0.152
Fuel	0.405	0.241	0.164
Household furniture and equipment	0.259	0.155	0.104
Household operations	0.373	0.234	0.139
Medical care and health expenses	0.135	0.083	0.052
Transport equipment	0.277	0.174	0.103
Transport services	0.187	0.125	0.062
Recreation and culture	0.218	0.124	0.094
Education	0.087	0.051	0.035
Personal care	0.314	0.205	0.109
Other goods and services	0.293	0.176	0.117
Goods	0.386	0.235	0.151
Perishable food	0.482	0.297	0.185
Non-perishable food	0.409	0.254	0.154
Durable goods	0.317	0.184	0.133
Non-durable goods	0.360	0.218	0.142
Services	0.125	0.078	0.047
Total	0.371	0.226	0.145

Note: Aggregate frequencies are calculated as the simple average (median) or weighted average frequency across products items.

Table 5 presents the weighted average frequency of price increases and price decreases across product items by major group and more aggregated product groups.[11] The weighted average frequency of price increases (22.6%) exceeds the frequency of price decreases (14.5%) across all product categories and is consistent with the findings for South Africa, 11.1% frequency of increases and a 6% frequency of decreases (Creamer *et al.*, 2012). These results do not necessarily imply asymmetry in pricing as these results are not conditional upon the inflationary environment. For example, Klenow and Kryvtsov (2008) find that rising inflation in the United States raises the frequency of price increases but lowers the frequency of price decreases. These relationships are explored in more detail later.

There is substantial heterogeneity across products – the highest frequency of price increases and decreases is for perishable food products (29.7% for increases and 18.5% for decreases) and the lowest frequency for services (7.8% for increases and 4.7% for decreases). Those products with high frequencies of price increases are also those with high frequencies of price decreases (*e.g.* clothing and footwear, food and beverages), and at the most disaggregated 229 product item level, the correlation coefficient between the two is 0.8. This corresponds with the product subclass level results for Spain by Álvarez and Hernando (2004) and more broadly for the sample of Euro countries analysed by Dhyne *et al.* (2006). This might be explained by product-specific characteristics such as differences in cost structure are therefore a key determinant of price flexibility. Dhyne *et al.* (2006:177) *e.g.* find that goods with relatively large inputs of labour (such as services) are subject to lower degree of price flexibility while goods with large intermediate inputs experience more frequent price changes in the Euro Area.

[11] Frequency of price increase (decrease) at the product/outlet level is calculated as the share of all positive (negative) price changes within a quote line.

4. SIZE OF PRICE CHANGES

The size of price changes captures the intensive margin (IM) behind inflation whereas the frequency measures the extensive margin (EM; how often prices change). We calculate the size of price changes at the outlet/product level as the month-on-month log difference in prices where $p_{ikt} \neq p_{ikt-1}$. For each quote line, we then take the average of the absolute value of each of these log price differences over the full period (April 2002-December 2009). This is denoted as $|dp_{ik}|$ and measures the average size of price changes of product k in outlet i over the period. The average size of price changes at the product item level ($|dp_k|$) is then calculated as the simple average of $|dp_{ik}|$ across outlets. Finally, the aggregate size of price changes across products ($|dp|$) is computed as the simple or expenditure share weighted average of $|dp_k|$ across the sample of products. The average size of price increases and decreases are calculated following the same procedure, except that the sample of non-zero price changes is restricted to either price increases or price decreases.

The results are presented in Table 6 and show that aggregate price changes are large in absolute terms. The weighted mean size of price changes across all products is 12.7% (Table 6), which is comparable with those of Klenow and Kryvtsov (2008) for the United States (14% for posted prices) and Gouvea (2007) for Brazil (16%), but slightly higher than for South Africa (10.7%) (Creamer *et al*., 2012) and the Euro area (8-10%) (Dhyne *et al*., 2006).

There is also substantial heterogeneity in the size of price changes across product items. Most large absolute price changes are found in services (39.1%), particularly medical care and health services (47.3%) and education services (36.4%). Price changes for non-food products are also large (around 13%) compared with food products (9.4%). These findings are broadly consistent with those found by Bunn and Ellis (2012) for the UK.

Table 6. The size of price changes, price increases and decreases by major product categories, 2002-2009

	Weighted Price change	**Price increase**	**Price decrease**
Food	0.094	0.088	0.108
Non-alcoholic beverages	0.090	0.084	0.096
Alcoholic beverages	0.158	0.158	0.124
Tobacco and narcotics	0.067	0.068	0.068
Clothing and footwear	0.133	0.124	0.144
Fuel	0.090	0.085	0.107
Household furniture and equipment	0.201	0.180	0.234
Household operations	0.092	0.089	0.098
Medical care and health expenses	0.473	0.475	0.279
Transport equipment	0.111	0.097	0.136
Transport services	0.233	0.205	0.331
Recreation and culture	0.204	0.201	0.210
Education	0.364	0.380	0.363
Personal care	0.100	0.097	0.109
Other goods and services	0.223	0.207	0.250
Goods	0.113	0.106	0.127
Perishable food	0.122	0.116	0.141
Non-perishable food	0.084	0.078	0.093
Durable goods	0.130	0.122	0.143
Non-durable goods	0.129	0.120	0.145
Services	0.391	0.387	0.347
Total	0.127	0.120	0.137

Note: The aggregate magnitude of price changes are calculated as the simple or weighted average of the mean absolute size of price change across outlets within each product item.

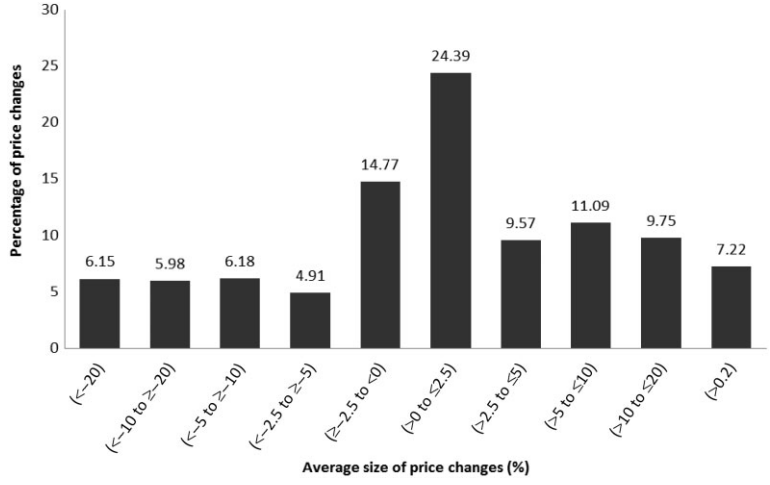

Figure 2. Distribution of the average size of price changes (April 2002-December 2009)
Note: Based on the average absolute price change at the outlet/product level ($|dp_{ik}|$) over the period April 2002-December 2009.

The large average *absolute* size of price change far exceeds the average price change across products (2.2%) and is explained by the combination of offsetting price increases and decreases. As shown earlier, price decreases are very common, although the frequency of decreases is slightly lower than for price increases. However, the average size of price decreases (13.7%) is larger than of price increases (12%). This holds for most of the major product categories with the exception of alcoholic beverages, medical services and education services, and is similar to the results for the Euro area (Álvarez and Hernando, 2004; Dhyne *et al.*, 2006) and South Africa (Creamer *et al.* 2012).[12]

The size of price increases and decreases for services are particularly large, averaging close to 40%. This reflects the long duration of price changes in the services sector. Prices of services do not change frequently, and outlets tend to make large adjustments to prices when they do so.

Figure 2 plots the distribution of price changes between 2002 and 2009 for Lesotho using the average absolute size of price change at the retail/outlet level ($|dp_{ik}|$) and shows that while price changes are on average large, many price changes are small. Nearly 40% of absolute price changes are equal to 2.5% or less, and over half (53.6%) are less than or equal to 5%. This exceeds the corresponding shares for posted prices in the United States (39.8%) (Klenow and Kryvtsov, 2008) and Brazil (over 33%) (Barros *et al.*, 2009 in Klenow and Malin, 2011:258), and far exceeds the share for South Africa (19.6%) (Creamer *et al.*, 2012).[13] The relatively fat tails of the histogram indicates the existence of large average absolute price changes despite the many small price changes that occur.

[12] Dhyne *et al.* (2006) report a larger average size of price decreases (10%) than price increases (8%) for the Euro area. For South Africa, Creamer *et al.* (2012) report average price increases of 10.7% and price decreases of 12.3%.

[13] The results for South Africa are derived from Figure 2 from Creamer *et al.* (2012), which also include the share of zero price changes.

The combination of large absolute price changes with many small prices changes provides some insight into the determinants of price change. The large absolute price increases and decreases suggest the presence of substantial idiosyncratic shocks to demand, productivity, marginal costs and/or desired mark-ups (Klenow and Kryvtsov, 2008:878). These idiosyncratic shocks specific to outlets or industries give rise to offsetting price increases and decreases, leading to a lower average price change than the average absolute price change. Idiosyncratic shocks appear to be relatively important compared with aggregate shocks in determining price changes in Lesotho.

The presence of many small price changes is indicative of a wide range of menu costs across items and/or time (Klenow and Kryvtsov, 2008). The small and large price changes reflect small and large menu costs, respectively. This heterogeneity in menu costs combined with idiosyncratic shocks to the outlet or product help to explain the heterogeneity in the frequency and size of price changes across outlets and products in Lesotho.

5. DYNAMIC FEATURES OF PRICE CHANGES

Aggregate inflation is explained by the frequency and size of price changes together and the dynamic features of the data can help to distinguish between the various theories of price-setting behaviour.

5.1 Decomposing Inflation into Frequency and Size of Price Changes

Klenow and Kryvtsov (2008) decompose inflation (π_t) into the fraction of items with price changes and the size of those price changes as follows:

$$\pi_t = \underbrace{\left(\sum_k w_{kt} I_{kt}\right)}_{freq_t} \underbrace{\left(\frac{\sum_k w_{kt}\left(p_{kt} - p_{kt-1}\right)}{\sum_k w_{kt} I_{kt}}\right)}_{dp_t} \tag{3}$$

w_{kt} is the sample weight of product item i, and p_{kt} denotes the log price of product k in month t. The first term in the function is the weighted average frequency of price change (EM or $freq_t$). The second term is the average size of those price changes (IM or dp_t).

In addition to allowing us to identify the sources of changes in inflation, the decomposition helps to distinguish between some TDP models and SDP models (Klenow and Malin, 2011:258). In the TDP models of Taylor (1980) and Calvo (1983), price changes are staggered and the frequency of price changes is unrelated to the business cycle or inflation. The size of price changes (IM) is the primary source of changes in inflation. In contrast, if the frequency of price changes is closely synchronised with changes in the inflation, this would provide evidence for a SDP model.

Figure 3 presents a visual decomposition of inflation into its IM and EM. It shows a strong positive association between the average size of price changes and inflation. In contrast, the frequency of price change is more stable and less closely linked to inflation. This is confirmed by simple regressions of the frequency on inflation presented in the final three columns of Table 7. The coefficient on frequency is not significantly different from zero, whereas the results for the size of price change indicate that a 1 percentage point

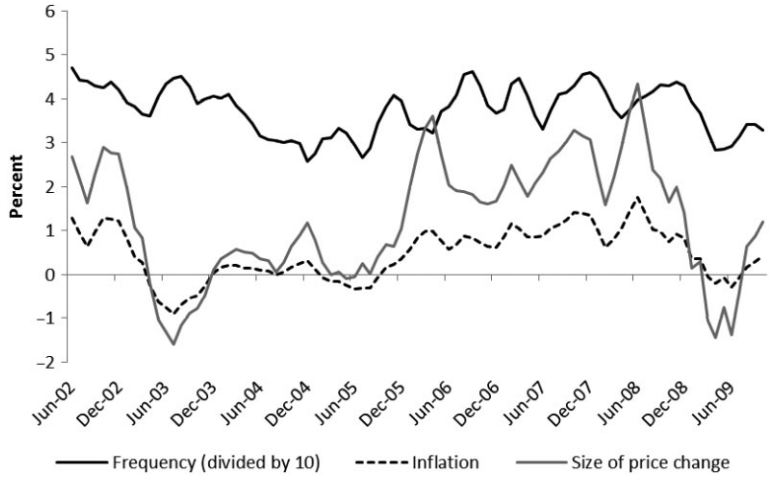

Figure 3. Extensive and intensive margins of inflation
Note: The figure displays the four-month moving averages for each variable. Product-level averages are aggregated up using Lesotho CPI expenditure weights. The monthly product level averages are in turn calculated as the simple average of the outlet-level values for that product.

Table 7. Time series moments for price changes

Variable	Mean	Standard deviation	Regression on π		
	(%)	(%)	Coefficient	Standard error	p-stat
π	0.50	1.01			
freq	37.81	12.30	1.61	1.74	0.36
dp	1.29	2.54	2.39	0.16	0.00
$freq^+$	23.20	8.17	4.60	0.80	0.00
$freq^-$	14.61	7.67	−2.99	1.11	0.01
dp^+	9.36	6.63	−0.12	0.70	0.86
dp^-	−9.69	7.16	1.45	0.82	0.08
pos = $freq^+ dp^+$	2.21	1.91	0.54	0.26	0.04
neg = $freq^- dp^-$	−1.71	1.82	0.46	0.26	0.09

Notes: The entries for means, standard deviation and cross-correlations are estimated from monthly observations. The columns of regressions coefficient and standard errors are obtained by regressing the corresponding variable in column 1 on inflation and monthly seasonal dummy variables. The monthly values of the variables are weighted means across product items. The product item level values are calculated as the simple average of the variable across outlets in each month. The consumer price index (CPI) expenditure weights are obtained from the Lesotho Bureau of Statistics.

increase in inflation is associated with a 2.4 percen%age point increase in the size of price change.[14]

These results are very similar to those of Klenow and Kryvtsov (2008) for the United States and suggest that movements in inflation are driven by variations in the size of price

[14] We also follow Klenow and Kryvtsov (2008) and decompose the variance of inflation over time into a component attributable to the variation in the size of price changes (IM) and a component attributable to the variation in the frequency and its covariance with price changes (EM):

$$\mathrm{var}(\pi_t) = \underbrace{\mathrm{var}(dp_t)\cdot\overline{freq}^2}_{IM} + \underbrace{\mathrm{var}(freq_t)\cdot\overline{dlp}^2 + 2\,\overline{freq}\cdot\overline{dp}\cdot\mathrm{cov}(dp_t, freq_t) + \mathrm{O}_t}_{EM}$$

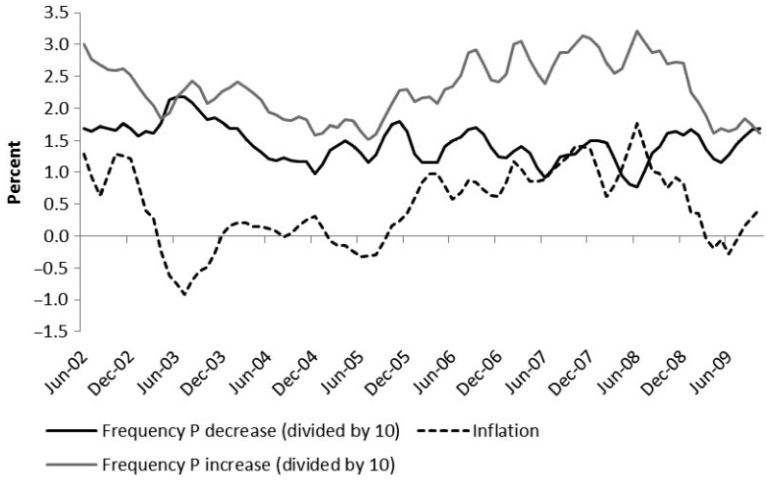

Figure 4. Inflation and the frequency of price increases and decreases in Lesotho
Notes: *The figure displays the four-month moving averages for each variable. Product-level averages are aggregated up using Lesotho CPI expenditure weights. The monthly product-level averages are in turn calculated as the simple average of the outlet-level value.*

changes rather than variations in frequency of price changes.[15] Consequently, there appears to be limited synchronisation of price changes across outlets over the business cycle in Lesotho, which would be anticipated in a TDP framework. The implication is that monetary shocks will have persistent real effects on the economy.

This interpretation of the trends, however, is debated by Gagnon (2009) who points out that the correlation between frequency and inflation is low as movements in the frequency of price increases ($freq^+$) and price decreases ($freq^-$) partly offset each other. As inflation rises, $freq^+$ increases as firms raise prices, but at the same time $freq^-$ falls. This outcome is evident in the Lesotho data presented in Figure 4 where there is a strong co-movement of $freq^+$ with inflation and a weaker negative association between $freq^-$ and inflation. The regression estimates presented in Table 7 also show that a 1 percentage point increase in inflation is associated with a 4.6 percentage point change in $freq^+$, but a 3 percentage point reduction in $freq^-$.

In an apparent contradiction to the finding for the average size of price changes, the size of price increases and decreases are not significantly correlated with inflation (Table 7). But as emphasised by Gagnon (2009), the average size of price changes can be calculated as $dp_t = s_t \cdot dp_t^+ - (1\text{-}s_t) \cdot dp_t^-$, where dp_t^+ (dp_t^-) denotes the absolute size of price increases (decreases) and s_t denotes the fraction of items with rising prices, $freq^+/(freq^+ + freq^-)$. Our results suggest that the dominance of the average size of price

We find that the IM accounts for 94.9% of the variance in inflation in Lesotho. This is remarkably close to the 94% for posted prices in the United States found by Klenow and Kryvtsov (2008) and lends further support for TDP behaviour in Lesotho.

[15] Álvarez and Hernando (2004) find similar, but weaker, relationships for Spain. In contrast, Creamer *et al.* (2012) find a close positive association between frequency and inflation for South Africa.

changes in the variation in inflation in Lesotho is driven by the offsetting movements in $freq^+$ and $freq^-$, rather than in dp_t^+ and dp_t^-. This provides evidence of strong state dependence in price setting.

An additional benefit of the decomposition of inflation by Gagnon (2009) is that it allows us to identify the relative importance of price increases and price decreases in inflation movements. Drawing on the final two rows of Table 7, we note that the average inflation of 0.5% per month is comprised of a weighted average 2.21% increase in prices offset by a weighted average decrease in prices of 1.71%. If we follow Klenow and Kryvtsov (2008) and additively decompose the *variance* of inflation into positive and negative terms, we find that 44% of the variation in retail price inflation can be traced back to variation in the inflation contribution of price decreases, with the remaining variation attributed to price increases.[16]

In conclusion, the decomposition of inflation reveals important dynamics in price setting in Lesotho. Outlets respond to increases in inflation by raising prices more often and reducing prices less frequently, rather than adjusting the size of price changes. This provides evidence for SDP behaviour in Lesotho and highlights the important role played by reductions in prices in inflation movements.

5.2 Duration of Price Spells and Hazard Functions

A further dynamic is the relationship between the probability of price changes and the age of the price, which is commonly analysed by looking at the shape of the hazard function. A price hazard function represents the conditional probability of a change in price of a product, given the elapsed number of periods since the last price change.[17] An upward sloping hazard function would arise if price changes become more likely the longer they have remained unchanged. If the probability of a price change is exogenous and fixed, as is assumed in many macro models (called Calvo pricing after Calvo (1983)), the hazard function is flat.

Figure 5 plots hazard rates for selected disaggregated product groups across retail outlets in Lesotho using uncensored cells, where survival bias is attenuated.[18] Disaggregated groups are used because combining firms that are heterogeneous in their price-setting behaviour leads to downward sloping hazard function in response to survival bias (Álvarez *et al.*, 2005). Generally, the hazards for goods are upward sloping, suggesting that the probability of price change for consumer goods increases as more time elapses

[16] $\mathrm{var}(\pi_t) = \underbrace{\mathrm{var}(pos_t) + \mathrm{cov}(pos_t, neg_t)}_{\textit{positive term}} + \underbrace{\mathrm{var}(neg_t) + \mathrm{cov}(pos_t, neg_t)}_{\textit{negative term}}$ where $pos_t = freq_t^+ \; dp_t^+$ and $neg_t = freq_t^- \; dp_t^-$.

[17] More formally, the hazard rate $h(\tau)$ is expressed as the probability that a price (p_t) will change after t periods conditional on it having remained constant in the previous $\tau - 1$ periods:

$$h(\tau) = {}_{\tau \to 0} \Pr\{p_{t+\tau} \neq p_{t+\tau-1} \mid p_{t+\tau-1} = p_{t+\tau-2} = \ldots p_t\}$$

[18] This paper defines t as any given date in the time line, with $t \in [0, +\infty)$. In discrete time, the timeline is divided into several periods of the same length. The timeline in our case is discrete, with an equal size of one month. Following the tradition in statistics, the first observation of a duration is recorded at $t = 0$. A period is selected by the date at the end of that period. For example, the first period means (0, 1], the second period means (1, 2] and the nth period means $(n - 1, n]$. Note that the time here means analysis time rather than calendar time. Duration could begin at any point in calendar time, but it always starts at 0 in analysis time.

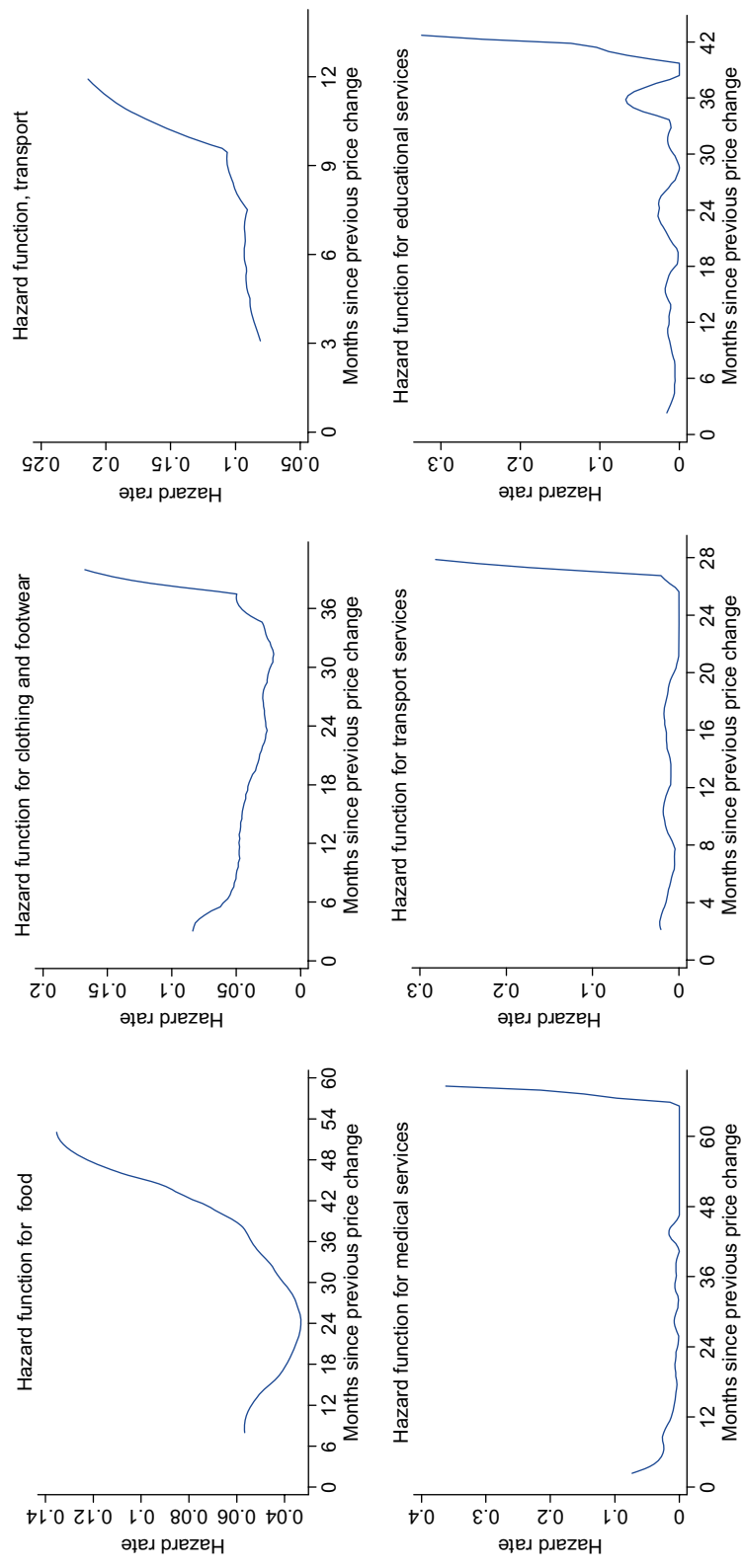

Figure 5. Hazard functions by product categories

since the last price change. The hazard for food products and transport equipment are upward sloping while the hazard for clothing and footwear declines slightly in the beginning and then increases. The observed pattern in the clothing and footwear sector may reflect the presence of heterogeneity in price-setting behaviour associated with variation in product quality within each group. The disaggregated hazard functions for services are generally flat with a spike at the end of the period.[19]

These results are comparable with those of Creamer *et al*. (2012) for South Africa.[20] Overall, they suggest that goods markets are characterised by SDP behaviour, whereas services are characterised by TDP behaviour.

5.3 The Size and Duration of Price Changes

In time-dependent models, the size of price changes is expected to be increasing in the duration of price spells as more shocks accumulate the longer the spell between price changes (Klenow and Malin, 2011). Menu costs can also drive a positive association between duration and the size of price changes as firms postpone price changes until the desired adjustment is large enough to warrant paying the menu cost (Álvarez and Hernando, 2004:24).

Figure 6 plots the simple average size of price changes against the duration of price spell for Lesotho data and shows a positive relationship between the mean size of price change and the duration of price spells. This is similar to South Africa (Creamer *et al*., 2012) and the UK (Bunn and Ellis, 2012), but contrasts with the United States and Spain where no relationship is evident (Álvarez and Hernando, 2004; Klenow and Kryvtsov, 2008).[21]

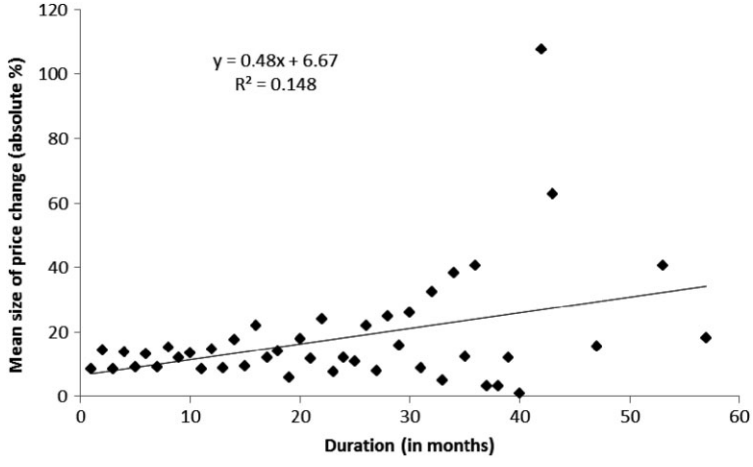

Figure 6. The size of price changes by age (2002-2009)
Note: Each observation reflects the simple (*not* weighted) mean absolute size of price change per duration using the entire sample period.

[19] Bunn and Ellis (2012) also find flat hazard rates for services in the UK.

[20] Their result for the United States contrasts those of Nakamura and Steinsson (2008) who find somewhat downward-sloping hazard functions for goods and flat hazards with a spike around 12 months for services.

[21] Significant positive associations between the frequency of price change and duration are estimated using product by outlet-level data for various categories of goods, but not for services.

6. COMPARISON WITH SOUTH AFRICA

Product markets in Lesotho should be highly integrated with those in South Africa because it is a geographical 'island' within South Africa, and South African retail chains dominate its supermarket industry. Furthermore, both countries are members of the Southern African Customs Union, and Lesotho's currency is pegged to South Africa's. Thus, the differences in price changes identified earlier are unanticipated and might reflect differences in time periods and products. To explore this further, we construct a sample of 126 matched products over the period March 2002-December 2007, which is comparable with the South African data from Creamer *et al.* (2012).

This does not change the results (Table 8) – prices in Lesotho are more flexible than in South Africa, changing on average once every 2.4 months (frequency of 41%) compared with once every 5.9 months in South Africa (frequency of 17%); and the frequency of increases and decreases in Lesotho also exceed those in South Africa.

Higher frequencies of price change are observed in Lesotho for all major groups, but relative frequencies across products are similar in both countries. The simple correlation coefficient across products of the average frequency of price change in both countries is 0.41. If we focus on the frequency of price increases, the correlation coefficient falls to 0.38 but rises again to 0.41 for the frequency of price decreases.

Although the frequency of price changes differ, if the South African and Lesotho markets were highly integrated, we would nevertheless anticipate a close correlation over time in various indicators of price-setting behaviour (inflation rates, the frequency of price changes and the size of price changes).

Evidence that inflation rates are correlated is shown in Figure 7 using the sample of matched products. From 2002 to mid-2005, inflation rates fell in both countries. Month-on-month inflations rates then rose in both countries, although the increase was stronger in Lesotho. Product-level regressions of aggregate monthly inflation rates in Lesotho on

Table 8. Comparison of weighted average frequency of price change in Lesotho and South Africa by major group

	Lesotho			**South Africa**		
	Frequency of price change	**Frequency of price increase**	**Frequency of price decrease**	**Frequency of price change**	**Frequency of price increase**	**Frequency of price decrease**
Food	0.465	0.290	0.175	0.223	0.126	0.097
Non-alcoholic beverages	0.405	0.243	0.163	0.234	0.119	0.115
Alcoholic beverages	0.271	0.174	0.096	0.102	0.086	0.016
Tobacco and narcotics	0.389	0.275	0.114	0.151	0.134	0.016
Clothing and footwear	0.392	0.224	0.168	0.067	0.033	0.033
Fuel	0.358	0.222	0.136	0.155	0.104	0.051
Household furniture and equipment	0.235	0.130	0.105	0.125	0.069	0.056
Household operations	0.389	0.240	0.149	0.144	0.099	0.045
Medical care and health expenses	0.157	0.067	0.090	0.143	0.099	0.045
Recreation and culture	0.319	0.166	0.153	0.070	0.046	0.024
Education	0.302	0.194	0.108	0.176	0.114	0.063
Personal care	0.335	0.093	0.241	0.150	0.099	0.051
Total	0.410	0.249	0.161	0.171	0.099	0.071

Notes: Weighted average of the product level average over the full period, March 2002-Dec 2007. Aggregate frequencies are calculated as the weighted average of the product level frequencies. Product-level frequencies are calculated as the simple average of monthly average frequency for each product over the period March 2002-Dec 2007. Consumer price index (CPI) expenditure shares for Lesotho are used as weights. The sample consists of 126 matched products that together make up 49.7% of the expenditure in the CPI basket.

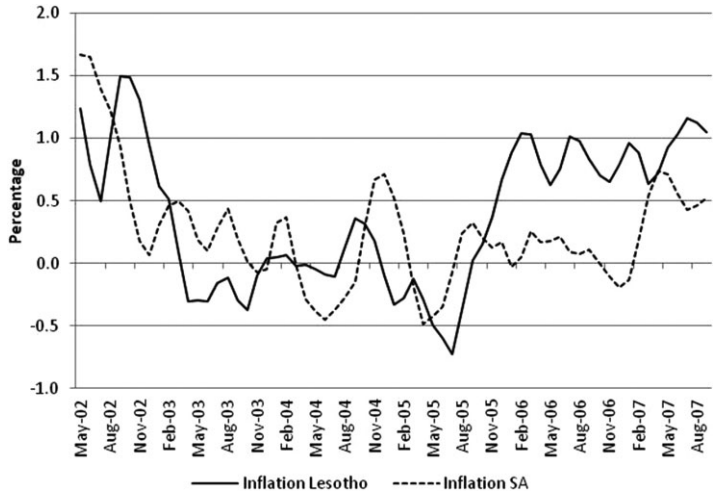

Figure 7. Four-month moving average of monthly inflation for Lesotho and South Africa
Notes: The figure displays the four-month moving average of month-on-month price changes in Lesotho and South Africa. Product-level averages are aggregated up using Lesotho CPI expenditure weights. The monthly product-level averages are in turn calculated as the simple average of the outlet-level value.

the inflation rates in South Africa show that the relationship at the product level is significant. However, the coefficient is small and explains only a small share of the variation in average price changes in Lesotho.[22]

Figure 8 compares the four-month average trends in the frequency of price increases (part a) and decreases (part b) in Lesotho and South Africa. There is a close correlation between the frequency of price increases but no relationship for the frequency of price decreases.[23] Price increases and price decreases are not correlated across the two countries. The positive correlation between inflation in Lesotho and South Africa therefore appears to be driven by co-movements in the frequency of price changes (more precisely increases), rather than the size of price changes. The dissimilarity in the size of price changes over time merits further enquiry.

7. CONCLUSION AND POLICY IMPLICATIONS

This paper presents new evidence on price-setting behaviour in Lesotho using micro price data for the period March 2002 and December 2009 and corroborates much of the existing international evidence presented in Klenow and Malin (2011). We find substantial heterogeneity in the frequency of price changes across products, outlets and time. Average price changes are found to be large in absolute terms, but many small price

[22] A coefficient of 0.084 (standard error of 0.03, adjusted $R^2 = 0.06$) is estimated. Estimates are based on a product by time-level panel of price-setting indicators. The panel consists of monthly averages for 126 products from March 2002 to December 2009. All regressions include monthly fixed effects and product fixed effects.
[23] The product-level regression analysis corroborates these findings.

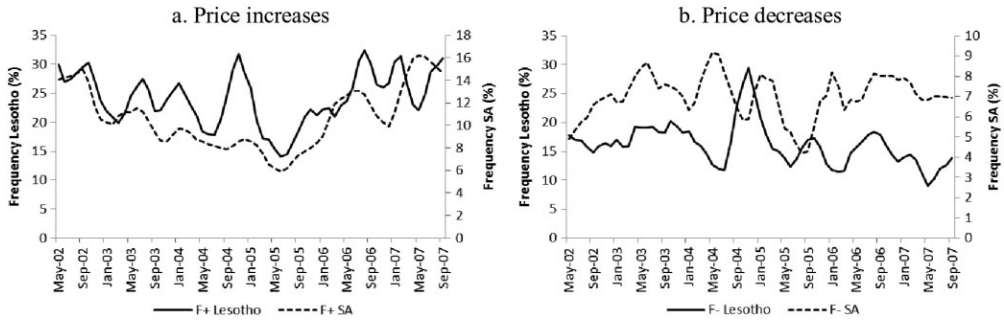

Figure 8. Four-month moving average frequency of price increases and decreases for Lesotho and South Africa
Notes: The figure displays the four-month moving average month-on-month price changes in Lesotho and South Africa. Product-level averages are aggregated up using Lesotho CPI expenditure weights. The monthly product-level averages are in turn calculated as the simple average of the outlet-level value.

changes occur, suggesting that price changes in Lesotho are driven by a combination of idiosyncratic productivity or cost shocks, together with a wide range of menu costs across products and time.

Fluctuations in the frequency of price change play an important part in the dynamics of inflation in Lesotho. Rising inflation is closely correlated with a higher frequency of price increases and a lower frequency of price decreases, but is not correlated with changes in the average size of price increases and decreases. This provides evidence for SDP behaviour. The decomposition results also highlight the importance of both price increases and price decreases in driving inflation movements.

Finally, the paper compares price-setting behaviour in Lesotho and South Africa using a common sample of products over a common period. Surprisingly, the frequency and size of price changes in Lesotho differ substantially from those in South Africa despite the presence of common retail chains and their joint membership in a customs union and common monetary area. Prices appear to be considerably more flexible in Lesotho than South Africa.

This paper identifies some important areas for further research. The stark differences in price setting between South Africa and Lesotho, despite trade and monetary policy initiatives to increase integration, require further analysis. The vast difference in price-setting behaviour by outlets selling similar products requires explanation. This type of research will require information on retail outlet-level characteristics that can be obtained from firm surveys. Survey data will also enable researchers to investigate the role of market frictions and distribution networks in driving price differences between markets and regions in Lesotho.

REFERENCES

ÁLVAREZ, L. J., BURRIEL, P. and HERNANDO, I. (2005). *Do Decreasing Hazard Functions for Price Changes Make any Sense?* Working Paper No. 463, European Central Bank.
——— and HERNANDO, I. (2004). *Price Setting Behaviour in Spain: Stylised Facts Using Consumer Price Microdata.* Working Paper No. 416, European Central Bank.

——— and ——— (2007a). The price setting behaviour of Spanish firms: Evidence from survey data. In S. Fabiani, C. Loupias, F. Martins and R. Sabbatini (eds), *Pricing Decisions in the Euro Area: How Firms Set Prices and Why*. Oxford, UK: Oxford University Press, 165-181.
——— and ——— (2007b). Competition and price adjustment in the Euro Area. In S. Fabiani, C. Loupias, F. Martins, and R. Sabbatini (eds), *Pricing Decisions in the Euro Area: How Firms Set Prices and Why*. Oxford, UK: Oxford University Press, 200-217.
ÁLVAREZ, L., DHYNE, E., HOEBERICHTS, M., KWAPIL, C., LE BIHAN, H., LUNNEMANN, P., MARTINS, F., SABBATINI, R., STAHL, H., VERMEULEN, P. and VILMUNEN, J. (2006). Sticky prices in the Euro Area: A summary of new micro evidence. *Journal of the European Economic Association*, 4(2-3): 575-584.
BAHARAD, E. and EDEN, B. (2004). Price rigidity and price dispersion: Evidence from micro data. *Review of Economic Dynamics*, 7(3): 613-641.
BARROS, R., BONOMO, M., CARVALHO, C. and MATOS, S. (2009). Price setting in a variable macroeconomic environment: Evidence from Brazilian CPI. Getulio Vargas Foundation and Federal Reserve Bank of New York, Unpublished paper.
BAUDRY, L., LE BIHAN, H., SEVESTRE, P. and TARRIEU, S. (2004). *Price Rigidity: Evidence from the French CPI Macro-Data.* Working Paper No. 384, European Central Bank.
BILS, M. and KLENOW, P. J. (2004). Some evidence on the importance of sticky prices. *Journal of Political Economy*, 112(5): 947-985.
BLINDER, A., CANETTI, E., LEBOW, D. and RUDD, J. (1998). *Asking About Prices: A New Approach to Understanding Price Stickiness*. New York: Russell Sage Foundation.
BUNN, P. and ELLIS, C. (2012). Examining the behaviour of individual UK consumer prices. *Economic Journal*, 122: F35-F55.
CALVO, G. A. (1983). Staggered prices in a utility-maximizing framework. *Journal of Monetary Economics*, 12(3): 383-398.
CORICELLI, F. and HORVÁTH, R. (2010). Price setting and market structure: An empirical analysis of micro data in Slovakia. *Managerial and Decision Economics*, 31(2-3): 209-233.
CREAMER, K., FARRELL, G. and RANKIN, N. (2012). What price-level data can tell us about pricing conduct in South Africa. *South African Journal of Economics*, 80(4): 490-509.
——— and RANKIN, N. A. (2008). Price setting in South Africa 2001-2007-stylised facts using consumer price micro data. *Journal of Development Perspectives*, 1(4): 93-118.
DABUSINSKAS, A. and RANDVEER, M. (2006). *Comparison of Pricing Behaviour of Firms in the Euro Area and Estonia*. Working Paper No. 2006-08, Bank of Estonia.
DHYNE, E., ÁLVAREZ, L. J., LE BIHAN, H., VERONESE, G., DIAS, D., HOFFMANN, J. and VILMUNEN, J. (2006). Price changes in the Euro Area and the United States: Some facts from individual consumer price data. *The Journal of Economic Perspectives*, 20(2): 171-192.
DIAS, M., DIAS, D. and NEVES, P. D. (2004). *Stylised Features of Price Setting Behaviour in Portugal: 1992-2001*. Working Paper No. 332, European Central Bank.
FABIANI, S., GATTULLI, A., SABBATINI, R. and VERONESE, G. (2006). Consumer price setting in Italy. *Giornale Degli Economisti e Annali Di Economia*, 55(1): 31-74.
———, GATTULLI, A. and ———. (2007). The pricing behavior of Italian firms. New survey evidence on price stickiness. In S. Fabiani, C. Loupias, F. Martins, R. Sabbatini (eds), *Pricing Decisions in the Euro Area: How Firms Set Prices and Why*. Oxford, UK: Oxford University Press.
FISHER, T. C. G. and KONIEZCNY, J. D. (2000). Synchronization of price changes by multiproduct firms: Evidence from Canadian newspaper prices. *Economics Letters*, 68: 271-277.
GAGNON, E (2009). Price setting during low and high inflation: Evidence from Mexico. *The Quarterly Journal of Economics*, 124(3): 1221-1263.
GOUVEA, S. (2007). *Price Rigidity in Brazil: Evidence from CPI Micro Data*. Working Paper No. 143, Central Bank of Brazil.
JULIO, J. and ZARATE, H. (2008). *The Price Setting Behaviour in Colombia: Evidence from the PPI Micro Data*. Borradores de Economia No. 483, Banco de la Republica, Colombia.
KLENOW, P. J. and KRYVTSOV, O. (2008). State-dependent or time-dependent pricing: Does it matter for recent US inflation? *The Quarterly Journal of Economics*, 123(3): 863-904.
——— and MALIN, B. (2011). Microeconomic evidence on price-setting. In B. Friedman and M. Woodford (eds), *Handbook of Monetary Economics Volume 3*. Amsterdam: Elsevier, 231-284.
KOVANEN, A. (2006). *Why Do Prices in Sierra Leone Change So Often? A Case Study Using Micro-Level Price Data*. Working Paper WP/06/53, International Monetary Fund.
MCCULLOCH, N., WINTERS, L. A. and CIRERA, X. (2001). *Trade Liberalization and Poverty: A Handbook*. London: CEPR and DFID.
NAKAMURA, E. and STEINSSON, J. (2008). Five facts about prices: A re-evaluation of menu cost models. *The Quarterly Journal of Economics*, 123(4): 1415-1464.
POWERS, E. and POWERS, N. (2001) The size and frequency of price changes: Evidence from grocery stores. *Review of Industrial Organization*, 18(4): 397-416.
TAYLOR, J. B. (1980). Aggregate dynamics and staggered contracts. *The Journal of Political Economy*, 88(1): 1-23.