PRICE SETTING BEHAVIOUR AND INFLATION DYNAMICS IN LESOTHO [1]

Draft

PLEASE DO NOT QUOTE

Mamello A. Nchake

University of Cape Town, South Africa

Abstract

This paper uses a unique data set on monthly product prices at the retail level to analyse price setting behaviour within Lesotho since 2002. The results reveal substantial heterogeneity in the frequency, duration and size of price changes across retail outlets, region (rural vs. urban) and disaggregated product categories. Further, the paper reveals a close association between the frequency of price changes and aggregate inflation. Finally the results reveal that national inflation affects the frequency of price change more than local inflation. This paper therefore makes a number of contributions to the literature. Firstly, it contributes towards establishing the stylized facts on price setting behaviour within developing countries. Secondly, the distinction that retailers are able to make between local and national inflation differs with the conclusion made by Lucas (1973). Finally the results have implications for the validity of macroeconomic theory regarding price adjustments and the influence of monetary policy on inflation.

Keywords: price setting behavior, inflation, the frequency of price change.

[1] This paper is part of my PhD thesis prepared for the ESSA conference in Stellenbosch, South Africa, 2011. The views expressed in this paper are solely those of the author.

1. Introduction

Price setting behaviour forms an important part of economic theory. It also plays an important role in the formulation of public policy particularly, monetary policy. It has been a great challenge for monetary authorities to improve their knowledge of how the transmission mechanism of monetary policy works. It may even be more challenging for the monetary authority of a country which has adopted the monetary policy of another country such as in the case of Lesotho. For example, if prices are not linked, then it might be the case that South Africa (SA) monetary policy is not appropriate for Lesotho. Therefore, the knowledge of price setting behaviour is essential for Lesotho particularly for monetary policy.

Although price setting behaviour has been an important debate in the literature, most research on price setting behaviour has primarily been conducted in developed countries. [2] However, little has been done within the context of developing countries on price setting behaviour using disaggregated price level data.[3] The main challenge has been the availability of data at the disaggregated level. This study therefore intends to fill this gap by expanding the scope of this literature in developing countries. Most notably, in this study, we use a highly disaggregated price data that is available by product, by retail outlet and across time.

Analysing price setting behaviour using micro data therefore offers many insights about the validity and importance of macroeconomic theory. For example, inflation is a macroeconomic variable, but it is underpinned by microeconomic data, and is an aggregate measure of changes in prices at a unit level. But inflation may disguise different underlying patterns of price changes, such as price rigidities, which may cause real effects in the economy. Therefore, analysing prices at a unit level facilitates an understanding of actual pricing conduct at the most basic level (Creamer and Rankin, 2008). Studying price setting behaviour in Lesotho will thus add knowledge to the underlying patterns of price changes such as price rigidities and therefore inform monetary policy.

Theory of price setting behaviour show that most macroeconomic models assume slow price adjustments at least to generate short-run real effects on monetary policy. The classical theories assumed that monetary variables have no impact on real variables. Their argument is based on the idea that price changes are costless and instantaneous. In a Walrasian world, lags in price adjustment are long; three months elapses between the shock that would change prices and the firm's price response.

[2] For example, Bils and Klenow (2002) used individual price data for the U.S; Fabiani et al. (2004) used the survey data collected on Italian firms; Alvarez et al (2006, 2007) used consumer price micro data for Spain; Dabusinskas and Randveer (2006) did a study the Euro area and Estonia; Dyne et al (2006) studied the Euro area and the U.S.; Dias et al (2004) studied Portugal and; Fisher et al (2000) used Canadian data.

[3] Current studies include; Creamer and Rankin (2008) for SA; Kovanen (2006) for Sierra Leone; Julio and Zarate (2008) for Colombia; Gouvea (2007) for Brazil.

Recent evidence shows that money and prices can affect the real variables, at least in the short run. The New Keynesian argument is that prices are slow to adjust or are "sticky". In time-dependent pricing models, retailers review their prices at specific dates or discrete time intervals since price reviews and adjustments are costly. The length of the interval depends on the rate of inflation (in the absence of other shocks). When inflation is high and the firm's relative price is falling rapidly, profits also fall quickly and firms then review prices more frequently to make up for the declining profits.[4] On the other hand, state-dependent pricing model assumes that there is no routine in price reviewing; retailers will change their prices whenever there is a specific event (for example, a shock). Prices will therefore be fixed until there is sufficiently large shift in market conditions to warrant a change. This argument helps us understand that price setting behaviour is different among different retailers. Different theories assume different time frame for which prices take to changes. This will enable us to link theory and data and analyse whether price setting behaviour in Lesotho follow a state dependant or time dependant pricing rule.

Given the foregoing, the subject of this study is centred on the following research questions. What are the main stylised facts that characterise price setting behaviour in Lesotho? What is the role of inflation dynamics on price setting behaviour in Lesotho?

2. The Data

This paper draws on a unique data of highly disaggregated micro-level prices underlying consumer price index (CPI) in Lesotho. The distinctiveness of this data is that it is available by product, by retail outlet and by location. [5] The Bureau of Statistics Lesotho (BOS) collects the prices every month from various retail outlets across the 10 districts of Lesotho. It uses a direct approach to collect price data whereby enumerators physically pay visits to the selected retail stores in each district. Each individual price record for an item has information on the date (month and year), retail outlet, district, product category and unit codes and the price of that item. This approach therefore makes it possible for pricing history of individual items to be traced over a long period of time. Using this type of data has the advantage of explicitly controlling for aggregation effects that can impact on convergence estimates. Below are the characteristics of the data used in this study.

[4] These models allow for the discontinuous price adjustment although they assume that retailers are unable to adjust their prices to any shock between price adjustment dates.

[5] By location we mean rural and urban and also across the ten districts of Lesotho.

Table 1: Number of retail outlets per District

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

Table 1 displays the total number of outlets across districts that are in the data. The retail outlets are devided into urban and rural across the ten districts of Lesotho. There are fewer outlets in the rural areas except in Maseru which accounts for 50 percent of the total rural outlets. Urban outlets are also dominated by the Maseru district accounting for 25 percent of the total urban outlets in the data.[6] The products are grouped into more aggregated categories as shown in table 2 below and into relatively more disaggregated categories as shown in table 3.

Table 2: Number of products by product category

Product category	Number of Products
Food	91
Non-food	138
Total	**229**
Sub-product category	
Perishable	41
Non-perishable	50
Durable	59
Non-durable	56
Services	23
Total	**229**

Table 2 shows that 40 percent of the total products comprise of food items while 60 percent is non-food products, making a total of 229 product items. Food items are divided into perishable and non-perishable items while on the other hand, non-food comprise of durable, non-durable and services. As indicated in the table above, around 25 percent of the items are non-durable while perishables account for 18 percent of the total items in the sample while services account for only 10 percent of the total items.

[6] Maseru is the Capital city of Lesotho and therefore the biggest of all the districts in terms of commercial activities and geographical size.

Table 3: Number of products by product classification

Product classification	Number of products	Percent
Food	80	35.1
Non-alcoholic beverages	6	2.6
Alcoholic beverages	5	2.2
Tobacco and narcotics	3	1.3
Clothing and footwear	31	13.6
Fuel, electricity and water	9	4.0
Household furniture, appliances and repairs	42	18.4
Household operations	11	4.8
Medical care and related expenses	12	5.3
Transport and related expenses	12	5.3
Personal care	6	2.6
Communications	2	0.4
Recreation and entertainment	7	3.1
Education and related expenses	3	1.3
Total	**229**	**100.0**

We further divided the data into 14 sub-categories as indicated in table 3 above. The data contain mostly food items, which account for 35 percent of the total items, then household furniture appliance and repairs which make 18 percent of the total. It seems in general, there are relatively fewer services in the data, particularly communications and education.

This kind of data allows for more direct test of theories of price setting behaviour and makes it possible to estimate the long-run levels of price differentials in different locations within a country. Also, the specificity of prices by product definition enhances price comparability and minimizes the role of product heterogeneity in explaining price setting behaviour across geographic locations. We intend to examine the properties of monthly retail price data within Lesotho. Therefore, this will allow us to explore price setting behaviour by geographical location and by product level across retail outlets. Using this kind of data also enables a researcher to be able to analyse pricing conduct at the most disaggregated level. Our data also allows us to compare the stylised facts found in Lesotho with the international evidence.

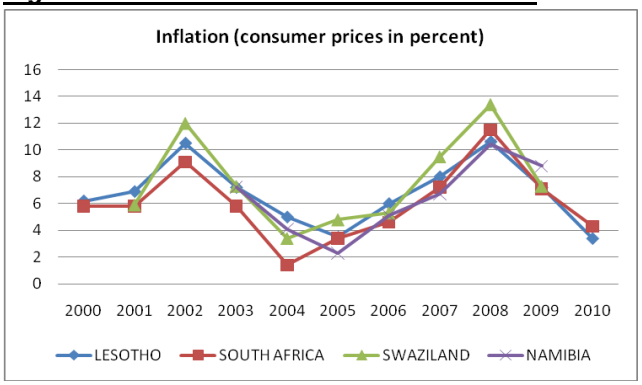
3. Facts about inflation and price setting behaviour in Lesotho

Lesotho is a member of a customs union and a monetary union.[7] The arrangement of the monetary union (CMA) is such that virtually all the monetary policy decisions are determined by the South African Reserve Bank (SARB). This implies that Lesotho essentially adopts monetary policy of SA. The Central Bank of Lesotho (CBL) is mandated primarily to maintain price stability, but it does not have domestic

[7] The customs union is the Southern African Customs Union (SACU) while the monetary union is the Common Monetary Area (CMA)

inflation target.[8] The benefits provided by provisions within CMA and the fact that Lesotho is highly open have enhanced intra-regional cross border trade between SA and the other three countries. As a result, Lesotho imports about 80 percent of its consumer goods from SA. Hence why there is a relationship between price developments in the two countries. Figure 1 below shows this relationship.

Figure 1: Inflation rates for CMA countries



Source: World Bank Development Indicators

The diagram shows that there were periods of low inflation and periods of high inflation in the past decade. In Lesotho, during 2002, inflation increased to 10.5 and went down to 5 and increased to 10.8 in 2008 after which, it started declining again. Similarly in SA, inflation increased to 9.1 2002, went down to as low as 1.4 in 2004 and increased again to reach the peak of 11.5 in 2008. The co-movement in inflation rates between Lesotho and SA can have implications on price setting behaviour in Lesotho.

4. Review of related literature

The use of micro data in recent years, where studies have examined individual retail price level data, have offered many insights on the importance of price setting behaviour. Romer (2006) discussed two main results emanating from this literature.[9] The first is on the degree of nominal price rigidity. He showed that prices are not necessarily flexible. Blinder (1998) focused on intermediate goods and services and found that the average frequency of price changes was about a year while Bils and Klenow (2004) and Klenow and Kryvtsov (2008) used micro data underlying CPI and found that it was between four and six months.

The second result is that there is a substantial persistent heterogeneity in terms of the frequency of price change across retailers across products.[10] Products differ significantly in how frequently their prices change. On one extreme are the products whose prices change at least once every month and these

[8] under CMA arrangement, Lesotho has also pegged its domestic currency to the SA rand. Domestic interest rates also follow those in SA. CBL can only use Open Market Operations (OMO) to control money supply.

[9] Klenow and Malin (2009) also summarised stylised features of price setting behaviour and the factors that contributed to frequency of price changes

[10] This was result was also found by Klenow and Malin (2009) Gopinath and Rigobon (2008) also found the same results

include fresh food, energy and airfares. On the other extreme are services whose prices change at least once a year. Unprocessed products such as fresh food are usually subject to costs of distribution and storage. Thus retailers are likely to pass these costs to consumers more quickly to avoid pricing their products below their marginal costs. [11] Products with more cyclical quantities, particularly transport and clothing have higher frequency of price change than product with less cyclical quantities such as medical care. In addition, durables appeared to change prices more frequently than non-durables and services, but if temporary price changes are included, non-durables had higher frequency than services (see also Bils and Klenow, 2004 and Klenow and Malin, 2010).

The degree of price adjustment also varies considerably across countries. As Alvarez (2008) argued, prices in the Euro area appeared to change less frequently than those in the U.S., which in turn also changed less frequently than those in high inflation developing countries (Brazil, Chile, Mexico, Sierra Leone, Slovakia). Kovanen (2006) argued that uncertainty about inflation, as measured by high inflation volatility, helps to explain why retailers change their prices more frequently. Álvarez (2008) provided a survey of the cross-country evidence based on micro price data. The study found a statistically significant positive relationship between the monthly frequency of price changes and the average monthly rate of inflation.[12] This evidence thus confirmed Taylor's (1999) conclusion that the frequency of price changes depends positively on the average rate of inflation.

In conclusion, we can point out four main results emanating from the literature, which form the hypotheses of this study. The first is that there a certain degree of price rigidity across consumer prices. On the other hand, there seem to be a significant heterogeneity across products. Some products such as perishable food products have higher frequency while services have the lowest frequency. Thirdly, there is also heterogeneity across countries whereby more developed countries have lower frequency of price change than developing countries. Literature also reflects the relationship between price setting behaviour and inflation. This shows the importance of using micro data in establishing product heterogeneity at the most basic level, which is important for monetary policy.

5. Methodological framework

In this section, we outline the different measures that are used to analyse the stylised facts that characterise price setting behaviour by products across different retail outlets in various locations of Lesotho. Our framework is at product-outlet level.[13] This is because estimation at a more aggregate level could lead to downward biased estimates of the median duration of price spells as a result of

[11] They are profit maximisers and would not want to price their products below their marginal costs

[12] Mackowiak and Smets (2009) also used Alvarez data but added a few additional countries and found similar results.

[13] Similar to that which was also used by Baharad and Eden (2004) and by Dias et al (2004)

heterogeneity at store level (Dias et al. 2004). We also specify the models that are used to analyse the relation between inflation dynamics and price setting behaviour in Lesotho.

5.1 Sample definitions

In this context an observation is a quote of a price of an **elementary product**, that is, a particular product or a service that is sold in a group of retail outlets, for example, maize meal. A **product category** then becomes a representation of elementary products that belong to the same broad category, for example, food. Earlier in this paper, it was mentioned that the enumerators from BOS collect the prices of the elementary products periodically (monthly) to develop a series of price quotes over time. This series is referred to as the **price path or price trajectory**.

In order to be able to assess the changes in the frequency of price changes, price spell and its duration need to be estimated. The frequency of price changes is the proportion of times a price for a product in a retail outlet is changed over T observation periods. The **price spell** is referred to as the time interval between two price changes. The **duration of the price spell** then becomes the amount of time between the two price changes.

5.2 Measurement of the frequency of price change

a) First create an indicator variable $X_{ijk,t}$ that account for positive and negative price changes as:

$$X_{ijk,t} = 1 \ if \ \ P_{ijk,t} \neq P_{ijkt-1}$$
$$X_{ijk,t} = 0 \ if \ \ P_{ijk,t} = P_{ijk,t-1} \qquad (1)$$

where

$P_{ijk,t} = \log price of \ product \ k, \ in outlet \ i, \ in district \ j, \ in \ month \ t$

$i = 1,.....,I \quad j = 1,.....,J \quad k = 1,.....,K \quad t = 1,.....,T;$

This indicator variable enables us to see whether the price of a product has changed within a particular period or not.

b) We then use the indicator variable derived in (1) to compute the frequency of price change for product *k* in retail outlet ***i*** in district *j* as:

$$F_{ijk-} = \left(1/T\right)\sum_{t=1}^{T} X_{ijk,t} \quad for \ all \ \ i = 1,.....,I; \ j = 1,.....,J; k = 1,.....,K \qquad (2)$$

and the fraction of retail outlets that changed the price of product k in district i at time t

$$FR_{k-j,t} = \left(1/J\right)\sum_{j=1}^{J} X_{ijk,t} \quad for \ all \ \ i = 1,.....,I \qquad (3)$$

The advantage of this method is that it measures the frequency of price change at the product level for which the successive price observations within a retail outlet are used.

5.3 Measurement of duration of price spells

The measures for the average duration of price spells are used to estimate the average length of period between the two price changes. Estimating the duration of price spells are essential in cases where the assumptions of stationarity and homogeneity of pricing conduct do not hold. In this study, we use the frequency approach which was also used by studies such as Bils and Klenow (2002) and Kovanen (2006). This approach first computes the frequency of price changes as the proportion of all price quotes that change in a given period and then derives the indirect measure of the 'inferred' duration of price spells. Based on this, we calculate the average duration of price spells as the inverse of the frequency of price changes:

$$duration_k = \frac{1}{F_k} \ \ for\ all\ \ k = 1,.....,K \qquad (4)$$

5.4 Measurement of the direction of price change

Here, we compute the share of times that the price changes were positive or negative throughout the sample for each sector:

$$D_{ijk,t} = 1 \ \ if \ \ P_{ijk,t} > P_{ijk,t-1} \ which\ indicates\ \ a\ \ price\ increase$$

$$and \ \ D_{ijk,t} = 0 \ if \ \ P_{ijk,t} < P_{ijk,t-1} \ \ which\ indicates \ \ \ a\ \ price\ decrease \qquad (5)$$

where

$$P_{ijk,t} = \log price\, of\ \ product\ k\ in\ outlet\ i\ in\ district\ \ j\ \ at\ month\ t$$

We ignore cases where $P_{ijk,t} = P_{ijk,t-1}$ because it means there was no price change.

5.5 Measurement of the size of the price change

To estimate the magnitude of price change, we use the following measure:

$$dP_{ijk,t} = \ln\left(P_{ijk,t}\right) - \ln\left(P_{ijk,t-1}\right) \qquad (6)$$

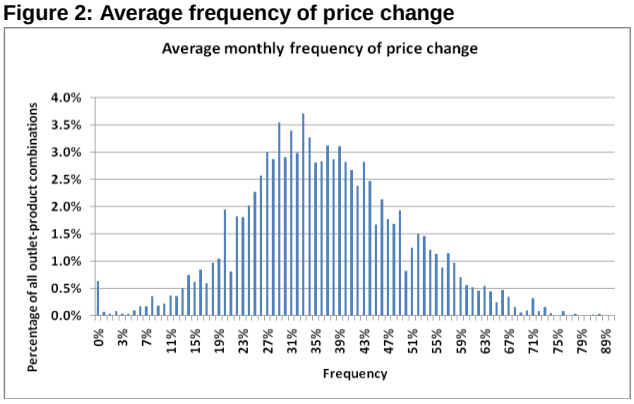
6. Empirical Analysis

In this section, we present and discuss some preliminary results from the descriptive statistics to outline the main stylised facts that characterise price setting behaviour in Lesotho.

6.1 The frequency of price change

A subject that will arise throughout the paper is the presence of a substantial heterogeneity in price-setting behaviour as can be observed from figure 2 below.

Figure 2: Average frequency of price change



The diagram shows that there is large and persistant heterogeneity in the pricing conduct is among different products and retail outlets in Lesotho.[14] The median frequency of price change is 0.36, implying that on average, 36 percent of prices of typical items sold in Lesotho change in a month.

Figure 3a: Monthly frequency of price changes

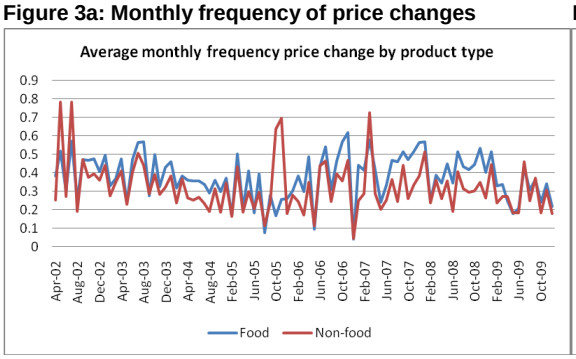
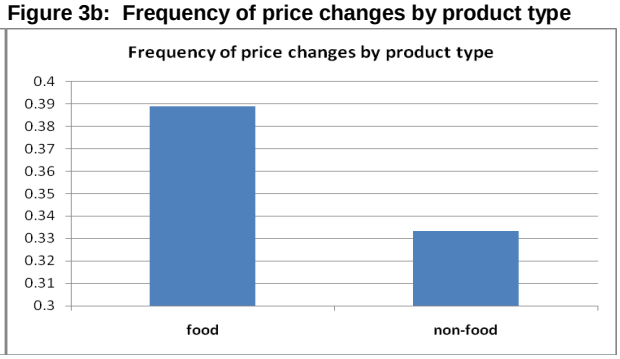


Figure 3b: Frequency of price changes by product type



There is also heterogeneity among food and non-food products. Food prices have higher frequency than non-food prices as depicted in the figures 3a and 3b above. Figure 3b shows that on average, around 39% of prices of food products change every month while about 33% of prices of non-food products change per month. By implied duration, prices of food take around 2.6 months to change while those of non-food products take 3 months.We can also observe that the average frequency of price changes for both food and non-food declined gradually until mid 2005 and increased marginally until 2007 and thereafter became more or less stable. But during most of the sampled period, the frequency of food price changes was higher than that of non-food as depicted in figure 3b. The flexibility of food prices could be influenced by a number of factors; supply side constraints which hinder agricultural productivity (particularly maize); high distribution costs due to underdeveloped road infrastructure and ; seasonality factors.

[14] This excludes products sampled from outlets measured for less than six months.

Figure 4a: Mothly frequency of price change

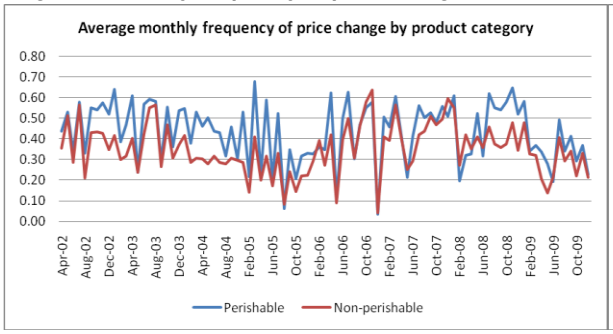
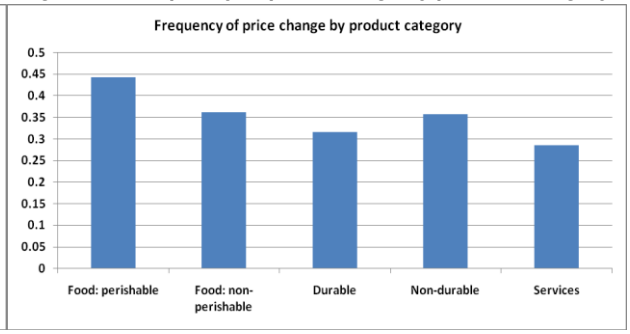


Figure 4b: Frequency of price change by product category



Disaggregating the product groups further into five categories as shown in figure 4b, we notice significant heterogeneity still persists. As depicted in figure 4b, among food products, the frequency of price change is higher for perishables (44 percent) than other products. On the other hand, only 28 percent of prices of services change every month. In other words, it takes longer (3.5 months) for prices of services to change than for prices of perishable products (2.3 months). This result conforms to what has been found by studies mentioned in the literature that services are universally sticky (Klenow and Malin, 2010). The stickiness of services may be caused by the fact that services are mostly non-tradable and thus are not subject to high transport and distribution costs. The lower frequency of price changes for services could also reflect the lower volatility of consumer demand for them. That is why it is easier for retailers to absorb the increases in the production costs of services, at least in the short run, to avoid frequent price adjustment. On the other hand, prices of perishable food products are relatively more flexible compared to other food products. This could be because generally unprocessed products such as fresh food are subject to relatively high distribution and storage costs which force retailers to pass these costs to consumers more quickly to avoid pricing below the marginal cost (Klenow and Malin, 2010). Figure 4a confirms the fact that perishables have been more volatile than non-perishables even across the entire sample period. This result is consistent with the results by Dias et al (2008) and Gouvea (2007).

Besides heterogeneity across products, the results also show that there is a significant heterogeneity across locations as shown in figures 6a and 6b below.

Figure 5a: Monthly frequency of price changes

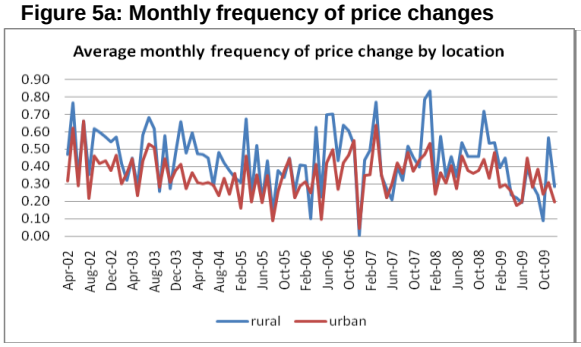
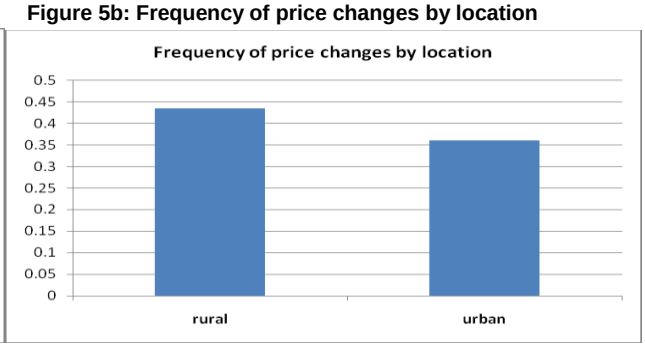


Figure 5b: Frequency of price changes by location



Prices in rural areas change more frequently than prices in urban areas. According to figure 5b, on average 43 percent of prices in rural areas change every month while 36 percent of prices in urban areas change every month. The implied duration therefore show that prices in rural areas take around 2.3 months to change while prices in urban areas take 2.8 months. The higher frequency in rural prices could reflect the higher distribution costs in the rural areas relative to outlets located in urban areas. Rural areas in Lesotho are mostly remote with mostly less developed road infrastructure compared to roads in urban areas. Therefore the costs of distributing products to the rural areas is relatively high for rural retailers than for urban retailers, thereby forcing retailers to review their prices more frequently.

6.2 Frequency of price increases and price decreases

Figure 6a: Monthly frequency of price changes

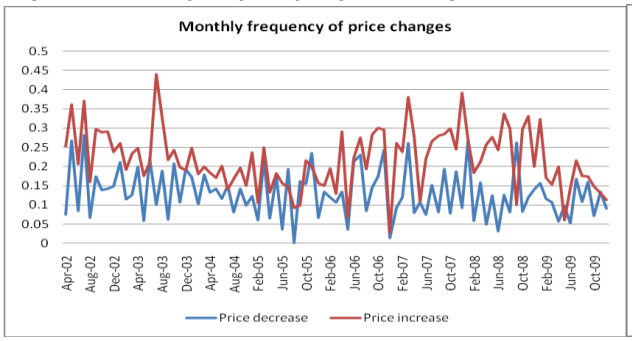


Figure 6b: Monthly frequency of price increase

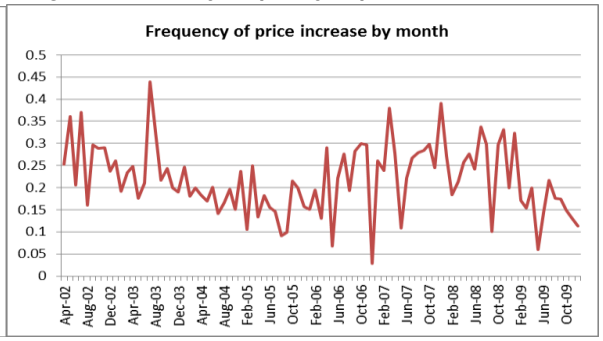


Figure 6b above shows that there is a higher frequency of price increases than price decreases throughout the sample period. Regarding the frequency of price decreases, there has been almost constant movement throughout the sample period but showing high volatility. With the frequency of price increase, there seem to be a downward movement from 2002 to 2005 and then an upward movement until 2008 and thereafter, the trend started going down again. Movements in the frequency of price increases generally follow changes in the inflation rate (in figure 1). There also seem to be a similarity between the frequency of price increases depicted in figure 6b and the frquency of price increases found by Creamer and Rankin (2008). This could reflect the relationship in inflation rates between Lesotho and SA as shown in figure 1 above. The highest proportion of price increases (39 percent) were evidenced in December 2007. This could be associated with inflationary pressures in the SA economy (Creamer and Rankin, 2008). This upward movement could also reflect increases in imported maize prices in the last months of the marketing season of 2006/07 in Lesotho (FAO special report, 2007).

Figure 7: Frequency of price changes by product category

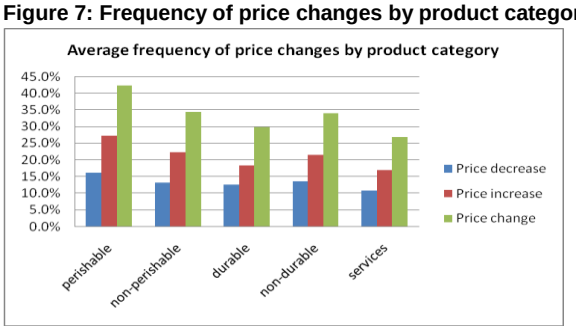


Figure 7 indicates that across all product categories, average frequency of price increases dominates the frequency of price decreases. There is also significant heterogeneity in price setting behaviour across different product categories. We can see that perishable food prices increase more frequently than any other product category while prices of services increase less frequently than other categories. Price decreases follow the similar pattern as the price increases with perishable products having the highest frequency and services having the lowest frequency. This result reproduces the result shown in figure 4b that perishable products generally have more frequent price changes while services have the least frequency in price changes.

Figure 8: Frequency of price changes by product group[15]

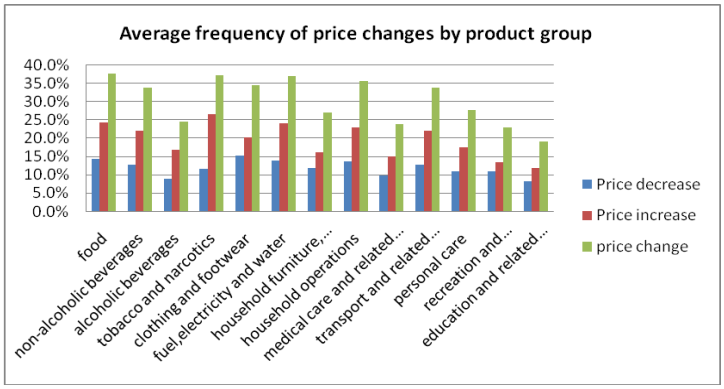


Figure 8 shows the frequency of price change, increase and decrease in the most disaggregated groupings. According to the diagram, there is heterogeneity in the price setting behaviour among different product groups. In general the frequency of price change is fairly high across all product groups. However, prices of food products seem to change more frequently than other groups while education and related expenses change relatively less frequently. As in figure 7, the frequency of price increases is greater than the average frequencies of price decreases across all product groups. Prices of tobacco and narcotics increase fairly more frequently while education and related expenses increase less frequently. On the other hand, education and related expenses are relatively stickier compared to other product

[15] For the detailed table with numerical figures, see appendix A

groups. Clothing and footwear prices decrease more frequently, which seems to be also the case with SA as mentioned in creamer and Rankin (2008). In fact in their paper, they showed that in footwear, the frequency of price decreases were greater than frequency of price increases. This could be explained by seasonal and end-of month discount sales in that product group.

6.3 Comparison with international evidence

Here we compare the results found in this study with the results found in other studies.

Table 4: Comparison with international evidence

Country	Frequency of price change	Mean duration (in months)
Lesotho (2002-09)	**36.4**	**2.7**
SA (2001-07)	17.1	4.2
Euro Area (1996-01)	15.1	6.6
USA (1998-03)	26.1	3.8
Spain (1993-01)	15	
France (1994-03)	18.9	
Slovakia (1997-01)	34	3.8
Brazil (1996-06)	37	2.7
Sierra Leone (1998-03)	51	

Source: Gouvea (2007); Creamer and Rankin (2008); and Coricelli and Horvath (2010)

Table 4 above shows the comparison of the results found in this paper with results found in other countries. On average, 36 percent of prices in Lesotho change every month. By implied mean duration, prices take 2.7 months to change in Lesotho. These results can be compared with the industrialised countries and the developing countries. In the US, the average frequency of price change was found to be 26.1 percent and the mean duration 3.8 months. Prices in the Euro area are the most rigid; the average frequency of 15.3 percent with the median duration of 6.6 months. On the other hand, Sierra Leone has the highest average frequency of price change of 51 percent mainly due to inflation uncertainty (Kovanen, 2006). Prices in Slovakia were also relatively flexible with the frequency of 34 percent while the duration was 3.8 months. Brazil prices could be directly comparable to Lesotho's prices which change more frequently than prices in Slovakia and SA. The frequency of price change in SA was found to be 17.1 percent (Creamer and Rankin, 2008) which shows that prices in SA are more rigid than prices in Lesotho. In fact, Lesotho's prices are twice more flexible than prices in SA.

In conclusion, in this study we find that there is a significant heterogeneity in price setting behaviour overtime in Lesotho across products and retail outlets. The results also show that frequency of price change is higher during periods of high inflation and lower during periods of low inflation. During these periods, there are more price increases than price decreases. There is also evidence of asymmetric pricing conduct across product categories and across locations. Prices of items sold in rural areas change more frequently that in urban areas. In the next section we look at the role of inflation on price setting behaviour in Lesotho as it has been implied in the data and the literature.

7. Price setting behaviour and product inflation in Lesotho

A number of theories have been advanced to explain this observed positive association between price setting behavior and some aspects of inflation. The menu cost approach builds on the assumption that price changes are costly, that is, they are subject to menu costs. When the costs of changing prices are high, inflation affects the frequency of price change (Sheshinski and Weiss, 1977).[16] The presence of fixed costs of adjustment in nominal prices encourages the firm to change its nominal prices in a discontinuous manner. When the benefits of changing prices are high or the costs are low, then firms will change their prices more frequently. When inflation is high, then the frequency of price change should be high because inflation causes the benefit of changing prices to increase overtime (Wolman, 2000).

On the other hand, the approach by Lucas (1973) based on incomplete information indicates that the inability of firms to differentiate between aggregate and local shocks causes the differences price setting behaviour. Therefore, the menu cost approach implies that price setting behaviour is affected by the expected inflation, while incomplete information approach implies that price setting behaviour is affected by the unexpected inflation (Lach and Tsiddon, 1992).[17] It follows therefore that several implications emanate from theory. Different approaches hypothesize diverse channels by which inflation affects price setting behaviour, explicitly or implicitly.

A number of studies have analysed the relationship between price setting behaviour and inflation. These include, Vinning and Elwertowski (1976); Parks (1978); Domberger (1987); Van Hoomissen (1988); Lach and Tsiddon (1992); Debelle and Lamont (1997) and; Loy and Weaver (1998). The general conclusion of this literature is that various measures of price setting behaviour are positively related to inflation.[18]

Given the foregoing, we empirically evaluate the importance of inflation on the frequency of price change to assess their relationship in the case of Lesotho. The frequency of price change is used as a measure of price setting behaviour.

a) In a simple specification, we test the relationship between the frequency and inflation:

$$Freq_{ijk,t} = \alpha + \beta_1 dlp_{ijg,t} + \mu_{ijk} \qquad (7)$$

Where:

$dlp_{ijg,t} = lp_{ijg,t} - lp_{ijg,t-1}$ which is monthly inflation for product group g in district j and rural/urban i. [19]

[16] These costs are categorised into; physical adjustment costs, managerial costs and customer costs. Physical costs involve the actual implementation of a price change while customer costs consist of the time spend conveying price changes to customers, time spend negotiating prices with customers and costs associated with loss of sales because of antagonizing customers. Managerial costs are also known as menu costs because they are usually assumed to be fixed (independent of the magnitude of price change). They include personnel time in decision making, recording, calculating and posting new prices.

[17] Lach and Tsiddon (1992) decomposed inflation into expected and unexpected inflation. Using disaggregated price data, they found that the effect of expected inflation on price setting behaviour is stronger than the effect of unexpected inflation

[18] Such measures include the frequency and the size of price change.

[19] see appendix for detailed description of the variables

b) We are also interested to see the effects of other aspects of inflation such as the lagged value of inflation. This has been constructed by creating a lagged value of product inflation in the previous quarter. This will enable us to analyse the effect of inflation persistence and compositional issues We include the product and district dummies to control for individual location specific characteristics:

$$Freq_{ijg,t} = \alpha + \beta_1 dlp_{ijg,t} + \beta_2 lag\_dlp_{g,t-1} + \beta_3 district + \beta_4 product + \beta_5 reteillocation + \mu_{ijk} \quad (7b)$$

c) We also include monthly dummies to control for time fixed effects.

$$Freq_{ijg,t} = \alpha + \beta_1 dlp_{ijg,t} + \beta_2 lag\_dlp_{g,t-1} + \beta_3 district + \beta_4 product + \beta_5 retaillocation + \delta_t + \mu_{ijk} \quad (7c)$$

d) The approach by Lucas (1973) proposes that because of imperfect information, firms tend to fail to distinguish between local and aggregate inflation shocks and thus set prices differently. This approach emphasises the role of unexpected inflation on the frequency of price change. We therefore test whether this hypothesis hold or not in the case of Lesotho:

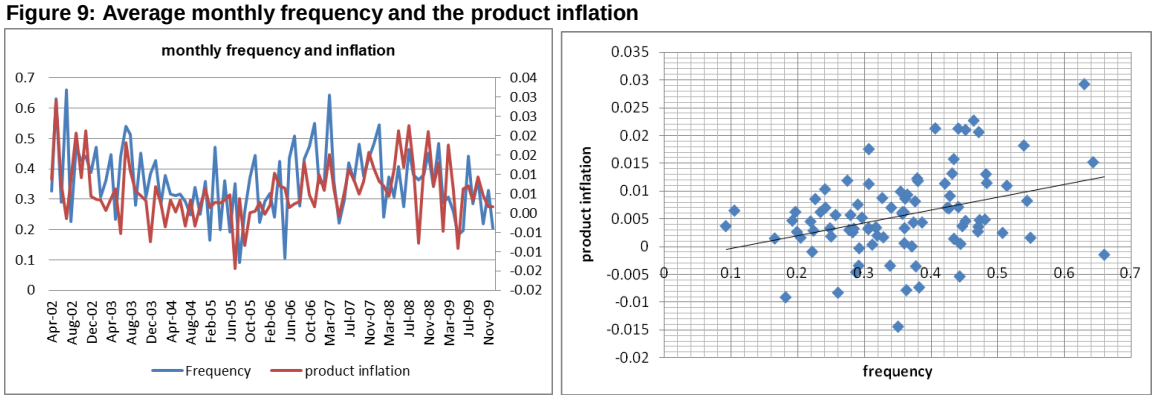
$$Freq_{ijg,t} = \alpha + \beta_1 dlp_{ijg,t} + \beta_2 lag\_dlp_{g,t-1} + \beta_3 district + \beta_4 product + \beta_5 dlp\_rural_{g,t} + \beta_6 dlp\_national_{g,t} + \beta_7 dlp\_all\_national_t + \beta_8 sd\_dlp_{g,t} + \delta_t + \mu_{ijk} \quad (7d)$$

Even in this case, we include monthly dummies to control for time fixed effects. Here, *dlp_national* which is the aggregate inflation across product groups is expected to capture this notion. If it is significant, it would mean that retailers can differentiate between local and national inflation and therefore make their decisions on whether to change their prices or not. However this variable does not say anything about the expects and unexpected inflation which will also be dealt with.

7.1 Discussion of results

In this section, we present and discuss the results found on the role of inflation dynamics on the frequency of price change in Lesotho. We first look at the simple descriptive relationship between product inflation and the frequency of price change to see if statistically, there is any relationship and the direction it takes. [20]

Figure 9: Average monthly frequency and the product inflation



(a) (b)

Figure 9(a) above shows that there is a similarity in the movement of the frequency of price change, product inflation and aggregate inflation. The diagram also show that there was a gradual decline in average price changes from 2002 until mid 2005 after which they started to increase until 2008. This movement follows the trend in the overall inflation rate as depicted in figure 1 above. A downward trend in the frequency of price change is related to the decline in inflation around the same period,while an upward movement is linked to an increase in inflation. Figure 9(b) on the other hand gives a visual result of the positive relationship between product inflation and the frequency of price change. We also estimated the correlation coefficient between the frequency of price change and inflation and found it to be positive and significant as found by Bils and Klenow (2004) as well as Álvarez (2008). However, although the descriptive results display a positive relationship between the frequency of price change and inflation, they do not take into consideration the other factors that might influence the relationship. This was by estimating specification (7) and (7d) above. The results are shown in table 5 below.

[20] We used individual product inflation instead of CPI indices because the former is superior. As mentioned by Cecchetti (1986), individual inflation reflects changes in demand or supply conditions in a given market which affect the optimal price. We measure individual product inflation by mean price changes within product groups.

Table 5: Estimated regressions of frequency of price change and inflation

	(1) Coefficient	(2) Coefficient	(3) Coefficient	(4) Coefficient	(5) Coefficient	(6) Coefficient
dlp	0.374***	0.482***	0.489***	0.398***	0.395***	0.383***
	(0.080)	(0.098)	(0.100)	(0.079)	(0.101)	(0.081)
lag_dlp		0.219**	0.208*	0.184*	0.169	0.183*
		(0.108)	(0.111)	(0.098)	(0.108)	(0.098)
I_dlp_rural		-0.186	-0.183	-0.101	-0.154	-0.097
		(0.209)	(0.206)	(0.164)	(0.212)	(0.165)
sd_dlp			-0.008			
			(0.023)			
dlp_national					0.171	0.097
					(0.200)	(0.152)
dlp_all_national					3.826***	Drops off
					(0.318)	
Dnov	0.620***	0.628***	0.628***	0.749***	0.868***	0.757***
	(0.017)	(0.017)	(0.017)	(0.020)	(0.025)	(0.024)
Djan	0.571***	0.573***	0.572***	0.704***	0.383***	0.698***
	(0.014)	(0.013)	(0.013)	(0.018)	(0.020)	(0.020)
Constant	0.309***	0.461***	0.461***	0.336***	0.440***	0.336***
	(0.002)	(0.010)	(0.010)	(0.015)	(0.010)	(0.015)
R^2	0.085	0.202	0.202	0.378	0.213	0.378
N	12597	11079	11079	11079	11079	11079
Fixed effects	None	Product, district	Product, district	Product, district, month	Product, district	Product, district, month

Notes: The data are not weighted. The dependant variable is the average frequency of price change. Regression (1) is the simplest model with only product inflation as an independent variable. Regression (2) and (3) include other controls while regression (4) includes time effects. Regression (5) and (6) analyse local and national inflation. Robust standard errors are in parenthesis below the estimated coefficients.
*** Significant at 1 percent level ** significant at 5 percent level * significant at 10 percent level.

From the table, we can see that the coefficient of product inflation is positive and significant at 1 percent in all the regressions. In the first column, we find that when the frequency of price change regressed only on inflation the coefficient is 0.374, implying that, inflation increases the frequency of price change by 0.37 on average. But we found that there is heterogeneity in the data. Therefore, in the second specification we include other variables such as inflation in the rural areas (I_dlp_rural), lagged inflation (lag_dlp), district dummies and product dummies. The coefficient of product inflation improves from 0.374 to 0.482 showing that the effect of an increase in product inflation increases frequency by 0.482. Lagged inflation (lag_dlp) is positive and significant at 5 percent level, showing positive effect of inflation persistence on the frequency of price change. In column (3) we included the variable for unexpected inflation (sd_dlp) which was found to be insignificant. This shows that unexpected inflation does not affect price setting behaviour. In the fourth specification, we controlled for time effects and the coefficient of product inflation declines to 0.39. Column (5) and (6) includes national inflation for all products (dlp _all_national) and inflation of product groups across time (dlp_national) . This was to analyse the effect of national inflation (relative to local inflation) on the frequency of price change. The results, in column (5), show that national inflation has a strong positive effect on the average frequency of price change but when we control for time effects, the national inflation drops off.

In the previous section where we analysed facts about price setting behaviour, we found that the frequency of price changes in food products were relatively higher than other products. In this section, we want to test the link between the frequency of price change and inflation in food products.

Table 6 below shows 13 different specifications on different product categories. In column 1, we test the effect of inflation in food products and find that it affects the frequency of price change by a large magnitude. In fact, the coefficient of food inflation is greater than the coefficients of other product categories. This could imply that in Lesotho, food inflation influences the decisions of retailers to change their prices of food more frequently. The results also show that inflation in household furniture, appliances and repairs; personal care; communications and; education and related expenses do not affect price setting behaviour in Lesotho. These results show some variation in the effect of inflation across sectors on price setting behaviour in Lesotho.

Table 6: Estimated regressions of frequency of price change and inflation by product categories

	(1) Coefficient	(2) Coefficient	(3) Coefficient	(4) Coefficient	(5) Coefficient	(6) Coefficient	
dlp	1.644***	0.791**	0.919***	1.447***	0.384**	0.981***	
	(0.575)	(0.358)	(0.206)	(0.343)	(0.185)	(0.242)	
I_dlp_rural	0.014	-0.375	-0.176	0.358	0.264	0.157	
	(0.796)	(0.476)	(0.343)	(0.533)	(0.478)	(0.585)	
Dnov	0.696***	0.154*	0.719***	1.172***	-0.030	0.120**	
	(0.035)	(0.089)	(0.073)	(0.093)	(0.041)	(0.047)	
Djan	0.579***		0.587***	0.502***	-0.049	-0.010	
	(0.028)		(0.059)	(0.095)	(0.042)	(0.050)	
Constant	0.394***	0.967***	0.356***	0.316***	0.867***	0.965***	
	(0.018)	(0.045)	(0.059)	(0.042)	(0.033)	(0.042)	
R^2	0.636	0.537	0.504	0.472	0.591	0.533	
N	918	917	907	918	918	918	
Fixed effects	Product, district, month	Product, district, month	Product, district, month	Product, district, month	Product, district, month	Product, district, month	
	(7) Coefficient	(8) Coefficient	(9) Coefficient	(10) Coefficient	(11) Coefficient	(12) Coefficient	(13) Coefficient
dlp	0.206	1.055***	0.474***	0.263*	0.138	0.002	0.203
	(0.217)	(0.390)	(0.129)	(0.149)	(0.257)	(0.169)	(0.154)
I_dlp_rural	0.040	-0.513	-0.330		-0.134	-0.115	-0.086
	(0.326)	(0.539)	(0.275)		(0.439)	(0.446)	(0.195)
Dnov	0.730***	0.177**		0.722***	0.499***	0.882***	0.534***
	(0.029)	(0.078)		(0.091)	(0.084)	(0.069)	(0.066)
Djan	0.689***		-0.083	0.716***	0.528***	0.886***	0.591***
	(0.032)		(0.086)	(0.078)	(0.079)	(0.052)	(0.075)
Constant	0.356***	1.044***	0.936***	0.168**	0.429***	0.002	0.272***
	(0.030)	(0.047)	(0.068)	(0.074)	(0.075)	(0.031)	(0.056)
R^2	0.702	0.574	0.493	0.498	0.489	0.486	0.565
N	918	921	909	734	918	881	868.000
Fixed effects	Product, district, month	Product, district, month	Product, district, month	Product, district, month	Product, district, month	Product, district, month	Product, district, month

Notes: The data are not weighted. The dependant variable is the average frequency of price change. *** Significant at 1 percent level ** significant at 5 percent level * significant at 10 percent level.

7.2 Further cross-examination

The table below shows the relationship between the size and the frequency of price change which also has implications on the relationship with inflation. We use this table to further interrogate the results found above.

Table 4: Size and Frequency of price changes

PRODUCT GROUP	FREQUENCY OF PRICE CHANGE			SIZE OF PRICE CHANGE		
	Price change	Price increase	Price decrease	Price change	Price increase	Price decrease
food	37.6%	23.9%	13.7%	1.7%	8.0%	-9.4%
non-alcoholic beverages	33.7%	21.5%	12.2%	1.4%	7.7%	-9.8%
alcoholic beverages	24.6%	16.4%	8.2%	3.8%	11.3%	-11.2%
tobacco and narcotics	37.1%	26.1%	11.0%	2.2%	5.4%	-5.4%
clothing and footwear	34.5%	19.9%	14.6%	1.0%	12.6%	-14.8%
fuel, electricity and water	37.0%	23.7%	13.3%	1.9%	8.3%	-9.5%
household furniture, appliances and repair	27.0%	15.6%	11.4%	1.1%	15.8%	-19.1%
household operations	35.6%	22.5%	13.1%	1.7%	8.4%	-9.6%
medical care and related expenses	23.7%	14.6%	9.2%	2.2%	14.7%	-17.7%
transport and related expenses	33.8%	21.6%	12.2%	1.4%	10.8%	-15.2%
personal care	27.6%	17.2%	10.4%	1.6%	10.0%	-12.4%
recreation and entertainment	22.8%	12.7%	10.1%	0.8%	17.0%	-19.4%
education and related expenses	19.1%	11.3%	7.7%	2.6%	22.2%	-26.0%

The size of price change normally co-moves with inflation because it is sensitive to movements in the relative shares of price increases and decreases. Table 4 shows that the average size of price decreases dominate the average size of price increases while the frequency of price increases dominated price decreases. This reflects a negative relationship between the size and the frequency of price change across all product groups. Those product groups whose prices change relatively more frequently, change by a relatively small magnitude and vice versa. For example, food products are fairly flexible (37%) compared to the rest of the products but the magnitude by which their prices change is relatively small (1.7%). As theory predicts, high frequency of price change leads to a small size of the price change. Firms with low net benefit from changing prices will change prices less frequently and will need to make large changes to bring the prices back to the desired level when a change is finally observed (Powers and Powers, 2001).

In the next stage, we are going to test this relationship by regressing the frequency of price change, increase and decrease on the size of price change, increase and decrease.

8. Conclusion

In this paper, we identify and analyse the main stylised facts that characterise price setting behaviour within the context of a small developing country such as Lesotho from 2002 to 2009. We also analysed the effect of inflation on price setting behaviour in Lesotho. The following facts are the main conclusion drawn from the results:

Fact 1: Degree of nominal price rigidity

In this study, we found that prices are relatively flexible in Lesotho; on average, 36% of prices change in a month and by implied mean duration, prices take 2.7 months to change in Lesotho. These results show that the prices in Lesotho change relatively more frequently than in the developed countries and SA. For example, in the US, prices take 3.8 months to change and in the Euro area, 6.6 months on average, (Gouvea, 2007) while in SA they 4.2 months (Creamer and Rankin, 2008). But the results are more or less in the same range with other developing countries such as Brazil and Sierra Leone where prices in Brazil take 2.7 months to change and in Sierra Leone 3 months.

Fact 2: Heterogeneity in price setting behaviour in products

We also found out that there is significant and persistent heterogeneity in price setting behaviour in Lesotho. This heterogeneity is realised across product groups. Prices in the food sector, particularly perishable food products, change most frequently. This could be because of the durability of perishable products that can force retailers to change prices frequently to avoid pricing below the marginal costs. Perishable products are also subject to seasonality. A significant seasonality in the data could be interpreted as evidence in favour of time-dependent pricing. This kind of pricing could be caused by weather, the timing of sales, institutional factors such as changes in regulated prices at specific periods of the year.

Prices in the services sector change relatively less frequently. Services are relatively non-tradable and have lower volatility of consumer demand hence lower frequency of price changes. Most services in Lesotho such as medical transport and education are subject to government pricing regulation and hence the reason why their prices delay to change.

Fact 3: Heterogeneity of price setting behaviour across locations

The results also showed that prices change more frequently in the rural areas than in the urban areas. This result could be linked to the fact that rural areas in Lesotho are less developed in terms of infrastructure (especially roads) than urban areas. Therefore, the distribution costs and other supply factors tend to compel rural retailers to review their prices more often than urban retailers.

Fact 4: The size and the frequency of price change:

There is a negative relationship between the frequency and the size of price change which shows that retailers who change their prices frequently change them by a small magnitude and vice versa. This shows asymmetries in price setting behaviour across product groups and it suggests some degree of downward price rigidity in the price setting behaviour in Lesotho.

Frequency of price change and inflation

In this study, we find that there is positive relationship between average frequency of price change and product inflation, and this is in line with the findings from other studies and the conclusions from theory. We also find that the previous inflation also influence the frequency of price change positively in Lesotho indicating that inflation persistence also affect price setting behaviour. These results are consistent with time-dependent pricing rule whereby inflation increases causes increases in the frequency of price change as shown in theory. In theory, Lucas (1973) mentioned that if there is incomplete information, price setting behaviour can be affected by unexpected inflation because firms cannot distinguish between local and aggregate shocks. In this case, unexpected inflation does not seem to affect price setting behaviour and this contradicts the conclusion by Lucas. This may reflect the fact that retailers consider expected inflation (dlp) rather than unexpected inflation in making decisions on how often to change prices. Finally, food inflation have the strongest effect on price setting behaviour in Lesotho. Retailers take more consideration in changes in inflation in the food sector than other sector when changing their prices.

References

Alvarez L. and I. Hernando (2005) "The Price setting behaviour of Spanish Firms: Evidence from Survey Data", *European Central Bank Working Paper,* no.538.

Alvarez 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,* vol. 4 (2-3): 575-584.

Álvarez, Luis J. (2008), "What Do Micro Price Data Tell Us on the Validity of the New Keynesian Phillips Curve*?" Economics – The Open-Access, Open-Assessment E-Journal,* **vol**. 2(19)

Baharad E. And B. Eden (2004) "Price Rigidity and Price Dispersion: Evidence from Micro Data," *Review of Economic Dynamics,* vol**.**7: 613-641.

Barro, R. J. (1972) "A theory of monopolistic price adjustment," *Review of Economic Studies,* vol. 39: 17-26.

Baudry L, Bihan H, Sevestre P, Tarrieu S (2004) "Price rigidity in France: some evidence from consumer price micro-data," *European Central Bank working paper,* no. 384.

Bils M. And Klenow P. (2004) "Some Evidence on the Importance of Sticky Prices*," Journal of Political Economy,* vol. 112: 947-985

Blinder, A.S. (1998) "Asking about Prices: A New Approach to Understanding Price Stickiness," Russell Sage foundation: New York.

Calvo, G. (1983) "Staggered prices in a utility-maximizing framework," *Journal of Monetary Economics*, vol.12: 383-398.

Creamer K. and N. A. Rankin (2008) "Price Setting in South Africa 2001–2007: Stylised Facts Using Consumer Price Micro Data," *Journal of Development Perspectives,* vol. 1: 93-118.

Coricelli F. and Horvath R. (2008) "Price setting and market structure: an empirical analysis of micro data," Institute of Economic Studies, Charles University in Prague, *IES Working Paper,* no. 23.

Cecchetti, Stephen G. (1986), "The Frequency of Price Adjustment: a Study of Newsstand Prices of Magazines," *Journal of Econometrics,* vol. 31: 255-274.

Debelle G. and O. Lamont (1997) Relative price variability and inflation: evidence from U.S. cities, *Journal of Political Economy*, vol. 105: 132-152.

Dhyne E. et al (2006) "Price Setting in the Euro Area and the United States: Some Facts from Individual Consumer Price Data," *Journal of Economic Perspectives,* vol. 20: 171-192.

Dias, M., D. Dias and P. Neves (2004) "Stylised Features of Price Setting Behaviour in Portugal: 1992-2001," *ECB Working Paper* 332.

Domberger S. (1987) “Relative price variability and inflation: a disaggregated analysis,” Journal of Political Economy, vol. 95: 547-66.

Fabiani, Silvia, A. Gatulli, and R. Sabbatini (2004) “The Pricing Behaviour of Italian Firms: New Survey Evidence on Price Stickiness,” *European Central Bank Working Paper,* no.333.

Food and Agriculture Organisation (2007), *Special Report for FAO/WFP Crop and Food Supply Assessment Mission to Lesotho*. Retrieved August 17, 2011, from www.fao.org/docrep/010/ah865e/ah865e00.htm

Goldberg P, K. Penelopi and M. M. Knetter (1997) "Goods prices and exchange rates: What have we learned?" *Journal of Economic Literature*, Vol 35(3): 1243-1272.

Gouvea S. (2007) “Price Rigidity in Brazil: Evidence from CPI Micro Data”, *Banco Central Do Brazil Working Paper,* Series 143.

Hall, S., M. Walsh and A. Yates (1997): “How do UK companies set prices?”, *Bank of England Working Paper,* no. 67.

Klenow, P. J. and O. Kryvtsov (2008), “State-Dependent or Time-Dependent Pricing: Does It Matter For Recent U.S. Inflation?” *Quarterly Journal of Economics*, Vol. 123: 863-904

Klenow P. J. and B.A. Malin (2010) “Microeconomic Evidence on Price setting,” *NBER working paper,* no. 15826

Klenow, P. J. and K. Oleksiy (2008) “State-Dependent or Time-Dependent Pricing: Does It Matter For Recent U.S. Inflation?” *Quarterly Journal of Economics*, vol. 123: 863-904.

Kovanen A. (2006) “Why do prices in Sierra Leone Change so often? A Case Study Using Micro Level Price Data”, *IMF Working Paper,* no. 06/53.

Lach S. and D. Tsiddon (1992) “The behaviour of prices and inflation: an empirical analysis of 17 disaggregated price data,” *Journal of Political Economy*, vol. 100: 349-89.

Nakamura, E. and J. Steinsson (2008a) “Five Facts about Prices: A Re-evaluation of Menu Cost Models,” *Quarterly Journal of Economics,* vol. 123: 1415-1464.

Parks R.W. (1978) “Inflation and relative price variability,” *Journal of Political Economy*, vol. 86: 79-95

Romer, D. (2006) "*Advanced Macroeconomics*" McGraw-Hill Irwin.

Sheshinski E, Weiss Y. (1977) “Inflation and costs of price adjustment," *Review of Economic Studies, vol.* 44: 287– 303

Taylor, J. B. (1980): "Aggregate Dynamics and Staggered Contracts", *Journal of Political Economy*, vol. 88: 1-23.

Taylor, J. B. (1999) “A Historical Analysis of Monetary Policy Rules" in J. B. Taylor ed. "*Monetary Policy Rule*", Chicago: University of Chicago Press, pp 319-348.

Van Hoomissen, T. (1988) “Price dispersion and inflation: evidence from Israel,” *Journal of Political Economy*, vol. 96: 1303-14.

Vining, D.R.Jr. and T.C. Elwertowski (1976) “The relationship between relative prices and the General Price level,” *American Economic Review*, vol. 66: 699-708.

Wang J., I. Masha, S. Kazuko and L. Harris (2007) "The Common Monetary Area in Southern Africa: Shocks, Adjustment and Policy Challenges," *IMF Working Paper*, no. 07/158.

Wolman A.L. (2000) "The frequency and Costs of Individual Price Adjustment," *Federal Reserve Bank of Richmond Economic Quarterly*, Vol. 86(4).

APPENDIX

DETAILED TABLE OF LIST OF VARIABLES	
Variable label	**Variable name**
dlp	individual product inflation measured by mean price change within product groups, across districts and rural and urban areas in each district
lag_dlp	individual product inflation in the previous quarter
dlp_rural	product inflation in the rural locations which is = dlp if location of outlet is rural and zero otherwise
dlp_national	National inflation across product groups across time
Dlp_all_national	National inflation across all products across time
Dnov	indicator variable =1 if month = Nov04 to control for a spike in November 2004
Djan	indicator variable =1 if month = Jan05 to control for a spike in January 2005