Economic Modelling 29 (2012) 2115–2124

Contents lists available at SciVerse ScienceDirect

Economic Modelling

journal homepage: www.elsevier.com/locate/ecmod

Price setting behaviour in Latvia: Econometric evidence from CPI micro data ☆

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ARTICLE INFO

Article history:
Accepted 11 July 2012

JEL classification:
C23
D40
E31

Keywords:
Price setting behaviour
Panel logit model
Latvia
CPI micro data

ABSTRACT

This paper discovers the driving forces behind Latvian firms' decisions to adjust prices by using various panel logit models, which explain the probability of observing price change by a broad set of exogenous variables. The results show that the consumer price formation in Latvia is a combination of both state-dependent and time-dependent behaviours. On the one hand, frequency of price changes depends on inflation, demand conditions, and the size of last price changes. On the other hand, we observe some elements of time-dependent price setting like price truncation and strong seasonal pattern. We also find several important differences in the price setting behaviour in cases of price increases and decreases. The fact that frequency of price changes in Latvia depends on inflation as well as demand and supply conditions allows for faster price adjustment process in the event of high distortions in the economy.

1. Introduction

The question of price stickiness remains one of the most important issues in applied macroeconomics. The degree of various economic variables' reaction to shocks depends among other things on the price (and wage) flexibility. Moreover, price rigidity partly determines the speed of adjustment process after a shock. High price flexibility means a fast price adjustment and ensures that consequences of shocks will not last long. The issue of price flexibility becomes even more important for current and future members of the euro area due to the absence of independent monetary policy. In such circumstances a well functioning adjustment mechanism is a vital prerequisite for Latvia's successful membership in the Economic and Monetary Union (EMU).

The analysis of micro data on prices of individual products from individual outlets can provide a better understanding of the frequency and size of price change. The advantage of this approach is twofold: first, it allows for studying the price setting mechanism directly; second, it provides not only general information on aggregate price settings, but also the details at sectoral and individual product level. The most recent descriptive study on the degree of nominal rigidity of consumer prices in Latvia is conducted by Benkovskis et al. (2010) using the consumer prices micro data database. It reports that during the period of 2003–2009 Latvian consumer prices were flexible and the average duration of a price spell equalled to 3.5 months. International comparisons show that consumer prices in Latvia were on average more flexible than in the euro area countries. Moreover, the frequency of price changes in Latvia was increasing over time. Prior to 2008 this process was driven by the growing frequency of positive price changes. During the crisis period (2008–2009) the frequency of price changes increased further due to more often price reductions, thus proving that prices in Latvia are flexible also for downward revisions.

Still, the analysis of the factors which determine the frequency of price changes in Latvia is missing in Benkovskis et al. (2010). This paper is a follow-up to the abovementioned project and our goal now is to discover the driving forces behind firms' decisions to adjust product prices. To achieve the goal, we use various panel logit models, which explain the probability of observing a price change with a broad set of exogenous variables. The set of explanatory variables includes several macroeconomic indicators describing observed economic conditions like changes in prices and demand; it also includes characteristics of the preceding price changes, changes in tax rates, seasonal and sectoral dummies. The methodology used in this paper is similar to the one used by Aucremanne and Dhyne (2005) for Belgium, Lünnemann and Mathä (2005) for Luxembourg, Baumgartner et al. (2005) for Austria, and Baudry et al. (2007) for France.

We need to stress that the analysis of different stages of the price formation mechanism is left out of the scope of this paper. This limitation is due to the shortage of data. We do not have any survey evidence on price setting behaviour of Latvian firms, as in Fabiani et al. (2006) or Kwapil et al. (2007), neither we have micro-level data on production costs, as in Carlsson and Skans (2009). Therefore, we are

☆ The views expressed in this publication are those of the authors, employees of the Monetary Policy Department of the Bank of Latvia. The authors assume responsibility for any errors and omissions. The authors want to thank Oskars Alksnis (Central Statistical Bureau of Latvia), Mikael Carlsson (Sveriges Riksbank), Uldis Rutkaste and Kristine Vitola (Bank of Latvia) for their valuable comments and recommendations.

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doi:10.1016/j.econmod.2012.07.003

not able to distinguish, whether price rigidities appear due to cost rigidities or there is an incomplete path-through of costs to prices.

The remainder of the paper is as follows. In Section 2 we outline the database used and provide short descriptive evidence on the price setting behaviour in Latvia. Then, Section 3 briefly overviews theoretical models of price setting, provides some details on panel logit models for the probability of a price change and discusses the set of explanatory variables. Finally, Section 4 presents the results of estimations and summarises the most important features of the price formation mechanism in Latvia, while the last section draws some conclusions relevant both to macroeconomic modelling and economic policies.

2. Descriptive evidence on price setting behaviour in Latvia

The database used in the current research is provided by the Central Statistical Bureau (CSB) of Latvia and is a part of the database for calculations of Latvian CPI. The sample contains partially anonymous 6-digit COICOP records for prices of individual products (only 4-digit COICOP level is known) in a particular outlet at monthly frequency from January 2003 to December 2009. Although the choice of the sample period was motivated by the availability of micro data, it is rather beneficial as the sample covers the years when Latvian economy was close to its potential and inflation was low (2003), the boom period with high inflation (2004–2007) and financial crisis years (2008–2009) with deflation at the end of 2009. The total number of records is 590 016 for 185 products. There are 7024 individual product-outlet pairs with 13 to 71 outlet records per individual product every month (38 outlet records per product on average). Due to confidentiality restrictions, the statistical database used in this research does not contain data on products for which prices are available only from a very limited number of producers or outlets, e.g. heat, water and telecommunication services. Therefore, it is necessary to stress that the sample does not cover all products contained in the CPI basket (e.g. we have detailed information on 44.2% of CPI basket in 2009).

In addition to price levels, the CPI database provides information on two types of specific data issues which also need to be taken into account while performing the analysis of the price formation mechanism: first, the cases where the data point is estimated rather than observed (imputations), and, second, the cases where a product is replaced by another similar product. Imputations are used by the CSB in the event of a short-term absence of product in an outlet and for seasonal products.[1] Missed observations are obtained by extrapolating the data series based on the dynamics of other observable prices in the respective product group. Approximately 12% of price changes in the database can be attributed to price imputations. In this paper price imputations are taken into account in the analysis.[2] As regards product replacement, it almost always contains a shift in the price level, which, however, is not informative. Therefore, we exclude the price change at the moment of replacement and, consequently, produce inner-left and inner-right censored spells within the time series.

The main indicators that describe the price formation mechanism are the frequency of price changes, duration of price spells (inversely related to frequency), and size of price changes. Duration, frequency and size of price changes (together with a split into upward and downward price revisions for frequency and size of changes) are presented in Table 1. The frequency and duration have been calculated using frequency approach proposed by Bils and Klenow (2004).[3]

Our calculations state that each month during 2003–2009 on average 28.7% of consumer prices were adjusted. This means that the average duration of a price spell was approximately 3.5 month, indicating a high degree of price elasticity. The highest elasticity is observed for transport, communication, food and non-alcoholic beverages, and clothing and footwear prices. On the other hand, the lowest price elasticity is found for health, education, and restaurant and hotel prices. If we look at price elasticity by economic categories, the highest degree of price elasticity is observed for energy products (1.5 months) and unprocessed food (2.7 months), while the highest price rigidity is found for services (12.7 months). Several useful conclusions about the price formation mechanism can be drawn from analysing upward and downward price changes separately. During the investigated time period price increases occurred almost 1.6 times more often than price decreases: on average, 17.8% of prices were changed upwards each month, while only 11.0% of prices were revised downwards. This asymmetry, when the positive price changes were more probable than the negative ones, was typical for almost all groups and sectors. The only exceptions were communication prices as well as recreation and culture prices.

As to average size of price increases and decreases, here asymmetry was not so pronounced — the average consumer price increase during 2003–2009 was 10.3%, while average decrease was only slightly larger — 11.9%. Also for most part of price groups and categories the size of upward and downward price revisions was rather similar. The clear outlier in this respect was clothing and footwear, for which the size of positive price changes (7.3%) was significantly smaller than the size of negative price changes (21.2%). Overall, there was a strong negative correlation between price elasticity and average absolute size of price change. In groups with the most elastic prices (transport, communications) we observe the smallest price changes, both positive and negative, while in health, education as well as in restaurants and hotels prices were changed rarely but by a larger amount.

Another interesting question related to the price formation mechanism and frequency of price decreases is the role of sales. We define sales as a temporary price decrease (for one month) with a subsequent price increase to the previous level. The share of such temporary price decreases is analysed in Table 2.

Our calculations indicate that 13.5% cases of consumer price decreases were just temporary decreases or sales, therefore these decreases had no long-term effect on overall price level. Sales were mostly used in processed food (23.5% of all price decreases) and non-energy goods (15.3%) categories, while this practice was not typical for price formation in services and energy categories. Analysis of sales by product groups shows that sales were often used in miscellaneous goods and services (35%, obviously it mostly refers to goods), furnishing, household equipment and routine household maintenance (17.6%) as well as alcoholic beverages and tobacco (15.5%).

Finally, we can analyse Latvian consumer prices not only over the whole sample period but also in each particular month. As a result, we are able to draw a continuous time-line for frequencies of price changes during 2003–2009. Fig. 1 shows that the frequency of all price changes exhibited a clear upward change during the analysed time period. In 2003, the frequency of price changes fluctuated around 22%, while in 2009 it exceeded 30%. The increase over time was rather steady, although there was one noticeable spike at the beginning of 2009 when more than 60% of all prices were changed during one month. It can most probably be explained by a VAT rate increase in January 2009. The frequency of price changes was also high in February most likely due to the changes in excise tax rates and the lagged effects of the VAT increase.

It is possible to perform the same analysis of positive and negative price changes separately. Although the pattern is not as clear in this case, some interesting facts can be noted. First, until the end of 2008, the frequency of upward price changes exceeded that of downward price changes, this being especially pronounced in 2007. Then,

[1] Imputations are made in case of a short-term absence which does not exceed 2 months (for large outlets absence should not exceed 3 months). For seasonal products imputations are made if absence does not exceed 7 months.

[2] Conclusions obtained from the models are not significantly altered by ignoring price imputations. Results are available upon request.

[3] See Benkovskis et al. (2010) for detailed description and comparison of the duration and frequency approaches.