

# Péter Gábor and Ádám Reiff: The effect of the change in VAT rates on the consumer price index

*In the autumn of 2006 the Magyar Nemzeti Bank launched a series of research projects on the pricing of products and services with non-regulated prices, which is expected to last for one and a half years. Store-level price quotes used for the Hungarian CSO's (Central Statistical Office) consumer price index calculation serve as a basis for the research. As a first step, we examined how earlier changes in VAT rates (the VAT increase in January 2004 and the VAT cut in January 2006) influenced the prices of products and services. Our analysis is of particular importance as the VAT rate of certain products increased again in September 2006. Our findings show that while a larger part of the VAT increase was transmitted into consumer prices within a few months, the VAT cut reduced consumer prices to a much smaller extent, thus adding to the profit of stores – at least in the short run.*

## INTRODUCTION

According to the Central Bank Act, 'the primary objective of the MNB shall be to achieve and maintain price stability'. In practice, the MNB attempts to meet this goal through inflation targeting, meaning that the Bank tries to bring future inflation rates in line with the pre-determined inflation target (which is currently 3%).

In the course of the practical implementation of the inflation targeting system, it is of crucial importance that the Bank appropriately forecast the magnitude of expected inflation, since the necessary steps are determined by the relationship between expected inflation and the inflation target. If expected inflation exceeds the inflation target, the Bank may tighten monetary conditions (e.g. raise the interest rate), whereas if expected inflation remains below the inflation target, monetary loosening becomes possible (e.g. interest rate cut).

In the course of the practical implementation of inflation targeting, it is of identical importance that the MNB appropriately evaluate inflation data which have already become known. For example, in the event of an unexpected increase in the inflation rate it may be important to identify the main reasons behind the increase. It is obvious that if the increase in inflation is attributable mainly to one-off, non-recurrent events the effect of which ceases as time goes by, the Bank does not need to react as strictly as if

the increase in inflation had been caused exclusively by market events.

In this paper, the inflationary effect of changes in VAT rates is examined. This is particularly important because of two reasons. On the one hand, it is clear that any change in VAT rates substantially affects the consumer price index published by the CSO. On the other hand, it can be known in advance that VAT changes lead to a transitory increase in the inflation rate, and their impact dies out later.<sup>1</sup> Therefore, for the sake of a proper assessment of inflation processes it is of key importance to separate the effect of the VAT increase from the price increase which takes place due to market processes.<sup>2</sup>

Relative to other EU member states, VAT changes in Hungary have been frequent recently (Table 1). In this paper we investigate the increase of the middle tax rate in January 2004 and the cut of the upper tax rate in January 2006. Our main finding is that the effects of VAT increase and VAT cut are not symmetrical at all: while the 3 percentage point VAT hike in January 2004 increased the price level of the affected products by approximately 2.5% on average, the 5 percentage point VAT cut in January 2006 reduced the price level of the affected products by around a mere 1% on average.

Among others, the analysis will also investigate how long it takes for the change in VAT rates to be transmitted into prices.

<sup>1</sup> For example, the VAT increase in September 2006 only influences the inflation figures published between September 2006 and August 2007 (for instance, in September 2006 because the calculated inflation figure compares the September 2006 consumer prices of the affected products, when the VAT rate was 20%, to the September 2005 consumer prices, when the VAT rate was 15%), whereas from September 2007 on it does not have a direct impact on the price index.

<sup>2</sup> If the VAT rates change, the repricing of products and services is not automatic at all, as it will be confirmed by our findings. For example, in the event of a VAT increase, companies exposed to sharp market competition typically increase their prices to a lesser extent than non-competing companies.

**Table 1****Changes in VAT rates in Hungary between 2004 and 2006**

	Upper	Middle	Lower
Until 31 Dec. 2003	25%	12%	0%
From 1 Jan. 2004	25%	15%	5%
From 1 Jan. 2006	20%	15%	5%
From 1 Sep. 2006	20%		5%

According to our findings, the short-run (1-2 months) effect of a VAT hike exceeds the longer-term price level increase, since stores implement certain price rises planned for a later date simultaneously with the price hike caused by the rise in VAT. It is also to be noted that the VAT hike also increases the prices of products which are not directly affected by the hike.

In the case of certain products in some product categories (e.g. consumer durables), it can be observed that consumer prices decline even before a VAT cut becomes effective, although this is not a general phenomenon. In the event of a VAT hike, in turn, it cannot be detected at all that stores, in preparation for the VAT hike, increase their prices before the hike comes into effect.

## DATA AND METHODOLOGY

Our analyses were carried out on the basis of store-level price quotes used for the consumer price index calculation of the CSO.

Every month the CSO publishes the inflation figure calculated for a given month on the basis of the change (relative to the previous month and previous year) in the consumer price of a so-called consumer basket. Those products and services are included in the consumer basket which are frequently bought by households, weighted in accordance with the income spent on them. The list of products and services in the consumer basket and their weighting are updated annually, according to changes in consumer habits.

The consumer basket is quite detailed. For example, in 2006 it contained 896 narrowly defined products and services (so-called 'representative items'). In this paper we analyze changes in the prices of 770 representative items; their total weight in the consumer basket is 76.99% in 2006. The missing products either have regulated prices

(e.g. kindergarten and school catering, electric energy, pipeline gas, highway toll stickers) or the data collection methodology of the CSO does not allow for an examination of their pricing (e.g. new and used cars).

As a result, our data set contains the prices of 770 representative items recorded with a monthly frequency at various outlets between January 2002 and May 2006. For example, in the above mentioned period, for the representative item 'bony pork rib with tenderloin' we have a total of 6,887 observations from 158 different outlets.<sup>3</sup> Accordingly, in case of this representative item the data set includes  $(6887/158=)$  43.6 quotes per outlet on average, but for 102 of the 158 shops we have data from each month of the period (i.e. from the whole 53-month observation period). It is true for all the representative items in the data set that the list of observed outlets is mainly unchanged, therefore, the store-level developments in prices of various representative items and the pricing behaviour of different stores can well be investigated from the existing price quotes.

Per representative item, on average, there are approximately 4,791 observations in the database, i.e. the total number of observations is close to 3.7 million  $(770 \times 4791)$ .

The effect of the change in VAT rates on inflation was quantified on the basis of a simple statistical model. The starting point of this model is that the change in the observed average price of representative items relative to the average price of the previous month is composed of the price rises and price reductions of individual outlets, so the effects of price reductions and price hikes can be separated:

$$\begin{aligned} \text{Average price change} = & (\text{Proportion of price-increasing} \\ & \text{outlets}) \times (\text{Average magnitude of price hike}) - \\ & - (\text{Proportion of price-reducing outlets}) \times \\ & \times (\text{Average magnitude of price reduction}). \end{aligned}$$

<sup>3</sup> These 158 shops cover the whole territory of the country in a sense that all counties are represented (21 of the shops are in Budapest, 8 in Baranya County, etc.).

Therefore, if, for example, in a given month 20% of observed stores raised their prices by an average of 12%, and the price declined by an average of 8% in 5% of observed stores, the average price change was  $(0.2) \times (12\%) - (0.05) \times (8\%) = 2\%$ .

We presume that the change in the VAT rates influences inflation through the four terms on the right-hand side of the above equation. In the case of a VAT increase, for example, it is likely that

- the proportion of price-increasing outlets will grow, and the proportion of price-reducing outlets will decline;
- the average price hike of price-increasing outlets and the average price reduction of price-reducing outlets will change.

In order to obtain a reliable estimate, we expressed the price effect of the VAT increase in such a way so that we can precisely estimate all terms. For example, the price effect of the VAT increase *through the increasing willingness of stores to raise prices* can be written as follows:

Price-increasing effect of VAT increase (due to increasing willingness to raise prices) =  
 = (Original proportion of price-increasing outlets) x  
 (Increase in the size of average price increase) +  
 + (Increase in the proportion of price-increasing outlets) x  
 x (Original average price increase) +  
 + (Increase in the proportion of price-increasing outlets) x  
 x (Increase in the size of average price increase).<sup>4</sup>

In the case of a VAT increase the price effect through stores' *declining willingness to reduce prices* can be quantified similarly. Overall, the total price-increasing effect of a VAT increase can be calculated by estimating:

- the original proportion of price-reducing and price-increasing outlets (without VAT increase);
- the original size of the average price reduction and price increase (without the VAT increase);
- the increase in the proportion of price-increasing outlets due to the VAT increase, as well as the decline in

the proportion of price-reducing outlets due to the VAT increase;

- the changes in the sizes of the average price increases and price reductions due to the VAT increase.

Based on our data set, each of these can be precisely estimated over a 1 to 3-month time horizon using statistical/ econometrical methods.<sup>5</sup> Given that the change in the VAT rate can have different effects on the pricing of various products (for example, due to differences in the strength of market competition), these quantities were separately estimated for all representative items in the database, then the effect of the VAT change on the price level was calculated on the level of the representative items. The total effect was determined as the weighted average of product-level effects according to the weights in the consumer basket.

## INFLATIONARY EFFECT OF THE VAT RISE IN JANUARY 2004

As of 1 January 2004, the middle VAT rate of 12% increased to 15%, which affected 213 representative items of the 770 in our data set. Most of the affected representative items were foods, but the weight of services, and of electricity and other goods is also significant. The weight of the affected clothing and footwear is negligible, whereas no consumer durables were affected by the VAT increase in January 2004.

If in January 2004 all stores had completely passed on the increase in VAT to consumers, the price level would have grown by  $115/112 - 1 = 2.68\%$ . So we have to compare the observed inflationary effects of the different representative items with this 'theoretical' value.

In line with the previous section, the inflationary effect of the VAT increase was estimated separately for each group of representative items. The effect of the VAT increase on the January 2004 inflation figure is shown in Table 3, for each product group.

According to the results, the increase in the middle VAT rate in January 2004 had the greatest effect on food prices: at a 1-, 2- and 3-month horizon it increased the prices of

<sup>4</sup> Consider again a numerical example: let us suppose that in the absence of a VAT hike 20% of stores increase their prices by an average of 12%, and in the event of a VAT hike 50% of stores by an average of 10%. Then the price increase through the stores' increased willingness to raise prices is  $(0.5) \times (10\%) - (0.2) \times (12\%) = 2.6\%$ . According to the decomposition, this is composed of the following: on the one hand, 20% of shops that raise their prices anyway increase by 2% less:  $(0.2) \times (-2\%) = -0.4\%$  (first term). On the other hand, however, 30% of shops, which increase only because of the VAT hike, increase by 10% instead of 0:  $(0.3) \times 10\% = 3\%$  (the sum of the second and third terms). The total effect is indeed 2.6%.

<sup>5</sup> Due to the shortness of the observation period (approximately 4.5 years), the estimation of effects longer than 1-3 months becomes unreliable. The short-term effects presented can mainly be used for the proper assessment of inflation figures received after the VAT change.

**Table 2**

**Breakdown of representative items affected by the January 2004 increase in the middle VAT rate according to product groups**

Product categories	Affected representative items	
	number	CPI-weight
Food, alcoholic beverages, tobacco	154	18.52
Clothing and footwear	2	0.03
Consumer durable goods	0	0.00
Electricity, gas and other fuels and other goods	28	3.66
Services	29	3.27
Total	213	25.48

affected products by 2.72%, 3.31% and 2.95%, respectively. This contributed to an increase of the consumer price index by 0.50, 0.61 and 0.55 percentage point, respectively. Note the timing of the VAT effect on food prices: the effect of the VAT increase is the greatest at a 2-month horizon, then at a 3-month horizon it is somewhat smaller. A possible explanation is that due to the VAT increase even those stores decided to raise their prices which would not have changed if the VAT had not been increased. Without the VAT increase these stores would have considered only slight price increase as necessary, the costs of which would have exceeded the expected benefit of the price increase.<sup>6</sup> However, due to the VAT increase, the magnitude of the

necessary price increase became large enough to take on the costs of the price rise. Therefore, the resulting actual price increase did not only contain the VAT-effect, but also a moderate intention to raise prices which would not have happened if the VAT had not been increased. Of course, most of these intentions to raise prices would have materialised somewhat later even without the VAT increase (when the necessary price of the stores would have been far enough from the actual price). Overall, due to the VAT increase, some stores brought forward their price hikes which would have been carried out later anyway. These *brought-forward price hikes* may explain the timing of the VAT effect on food prices.<sup>7</sup>

**Table 3**

**Estimated inflationary effect of the January 2004 increase in the middle VAT rate on the products affected by the change (by product groups)**

Product categories		Price increase after VAT-increase			Effect to CPI		
		1 month	2 months	3 months	1 month	2 months	3 months
Food, alcoholic beverages, tobacco	18.520	2.72	3.31	2.95	0.50	0.61	0.55
Clothing and footwear	0.033	0.40	0.58	-0.38	0.00	0.00	0.00
Consumer durable goods	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Electricity, gas and other fuels and other goods	3.659	1.55	1.70	1.16	0.06	0.06	0.04
Services	3.268	0.54	1.08	1.48	0.02	0.04	0.05
Total	25.480	2.27	2.79	2.50	0.58	0.71	0.64

<sup>6</sup> In addition to direct costs (e.g. printing new catalogues), price hikes may entail indirect costs as well. They include, among others, the costs of convincing buyers that the price increase was justified, and that it is still worthwhile for them to do their shopping at the given outlet. Due to these costs, stores tend to change their prices only infrequently, and the actually observed price may be different from the one that they would consider necessary without the costs of changing the prices. In the text, the difference between this necessary price and the actual price is called necessary price change.

<sup>7</sup> We call the attention that the *brought-forward price* hike discussed here is not the same as the *brought-forward VAT increase* discussed later. *Brought-forward price hike* means that when the VAT increase enters into effect, shops implement even those price hikes that were planned for a later date (together with the price hike due to the VAT increase). *Brought-forward VAT increase*, in turn, means that shops include the effect of the VAT increase in their prices prior to entry into force.

**Table 4**

**Estimated inflationary effect of the January 2004 increase in the middle VAT rate on products not affected by the increase (by product groups)**

Product categories	CPI-weight	Price increase after VAT-increase			Effect to CPI		
		1 month	2 months	3 months	1 month	2 months	3 months
Food, alcoholic beverages, tobacco	3.778	0.77	1.20	1.58	0.03	0.05	0.06
Clothing and footwear	5.272	0.13	1.00	0.52	0.01	0.05	0.03
Consumer durable goods	4.976	0.39	0.64	0.53	0.02	0.03	0.03
Electricity, gas and other fuels and other goods	10.925	0.34	0.25	0.53	0.04	0.03	0.06
Services	11.301	0.56	1.25	1.47	0.06	0.14	0.17
Total	36.251	0.48	0.84	1.01	0.16	0.30	0.34

In the case of the other product groups, a relatively strong effect of around 1.5% was observed in the 'electricity and other goods' category, while in case of 'services' and of 'clothing and footwear' the average effect is smaller (although in respect of services it is increasing over time). Overall, in line with the relative weights in the consumer basket, the effect of the VAT increase on the consumer price index almost entirely stems from the price level increase of food products: the total effect at a 1-, 2- and 3-month horizon is 0.58, 0.71 and 0.64 percentage point, respectively.

With respect to the January 2004 VAT increase we also examined whether this change influenced the price levels of products and services of which the VAT rate remained unchanged (non-affected products). The effects on the prices of these products<sup>8</sup> are shown in Table 4 for each product group.

According to the results, the largest impact (exceeding 1%) can be observed in case of those product groups (food, services), within which there is the greatest mixture of affected and non-affected representative items. A possible explanation for this is that within product groups, where individual products are presumably close substitutes of each other, the relative price level of individual products is independent from the relative VAT content over the long run. Overall, the observed effect on non-affected products (due to their higher weight in the consumer basket) increased the consumer price index by approximately 0.3

percentage point at a 2 to 3-month horizon. Accordingly, through the market products examined here, the VAT increase in January 2004 lifted the consumer price indices measured in early 2004 by approximately 1 percentage point, or more precisely by 0.74, 1.01 and 0.98 percentage points at a 1-, 2- and 3-month horizon, respectively.<sup>9</sup>

## INFLATIONARY EFFECT OF THE VAT CUT IN JANUARY 2006

From 1 January 2006, the upper VAT rate was reduced from 25% to 20%. Among the affected products food and non-regulated energy have the largest weight, but the change affected numerous products and services from other product categories as well.

Similarly to the VAT increase, in the case of the cut it is also easy to calculate that a complete and immediate pass-through of the VAT cut to the prices of the affected products would have caused a 4% ( $120/125-1$ ) decrease in their prices.

The estimated effects of the VAT cut are shown in Table 6. According to the results, stores reduced the prices of the affected goods only by one-fourth of the size of the VAT cut, which is much less than their reaction to the VAT increase. The prices of services, for example, did not decline at all after the VAT cut. The largest effect can be detected in durable goods, although even in this case the price reduction was less than 2%.

<sup>8</sup> We did not include alcohol and tobacco products in non-affected products. The underlying reason is that although the VAT rate of these products did not change in January 2004, the excise duty on such products was modified, thus in terms of tax change they cannot be considered 'non-affected'. We also omitted vehicle fuels from the range of non-affected products, as we could not separate the VAT effect from the effect of the sharp price movements in the world market in early 2004 (and in general as well). The total weight of the disregarded products (alcohol, tobacco, vehicle fuel) in the consumer basket is significant, at 13.495%.

<sup>9</sup> If we add the price hikes (which is often automatic and equal to the VAT increase) of regulated products to this, the total effect is, of course, even greater.

**Table 5****Composition of representative items affected by the January 2006 cut in the upper VAT rate, by product category**

Product categories	Affected representative items	
	number	CPI-weight
Food, alcoholic beverages, tobacco	63	12.53
Clothing and footwear	136	4.26
Consumer durable goods	72	4.91
Electricity, gas and other fuels and other goods	160	15.17
Services	47	8.74
Total	478	45.60

From a marketing point of view, if stores wish to increase their market shares it may be profitable for them to reduce prices before the VAT cut (brought-forward VAT cut). In fact, some chain stores, mainly ones that sell electronic appliances, did make use of this opportunity at the end of 2005. However, according to our estimates, this behaviour was not common, and thus it did not have a measurable impact on the price index.

Overall, the VAT cut – at least in the short run – mainly increased the profit of stores. However, when analysing the stores' pricing behaviour, one must take into account that over the longer term the prices of most products increase. Accordingly, if a shop did not reduce the price of a product, it did not have to increase its prices at a later stage. This kind of behaviour can be quite common in case of products with relatively high inflation, when the next price increase is expected to take place in the short run. An example of this phenomenon can be the difference between the effects of the VAT cut on services and

on durable goods: in the services sector, where inflation had been higher for a longer time, the short-term effect of the VAT cut was much smaller than in the case of durable goods.<sup>10</sup>

## CONCLUSIONS

Based on store-level price data, in this paper we examined the inflation effects of the January 2004 VAT increase and the January 2006 VAT cut. Although the affected products are quite different in these two cases, we can still draw some general conclusions.

The *common feature* of the January 2004 VAT increase and the January 2006 VAT cut is that the effect of changing the tax rates was not immediately and not automatically reflected in the prices set by the various stores: in both cases, stores do not change all the prices, and the size of the changes (if any) are not necessarily in line with the magnitude of the VAT change.

**Table 6****Estimated inflationary effect of the January 2006 VAT rate cut on the affected products***(by product category)*

Product categories	CPI-weight	Price decrease after VAT-cut			Effect to CPI		
		Brought-forward	1 month	2 months	Brought-forward	1 month	2 months
Food, alcoholic beverages, tobacco	12.528	0.19	-0.43	-0.61	0.02	-0.05	-0.08
Clothing and footwear	4.256	0.42	-1.86	-0.75	0.02	-0.08	-0.03
Consumer durable goods	4.912	0.29	-1.69	-1.67	0.01	-0.08	-0.08
Electricity, gas and other fuels and other goods	15.173	-0.15	-1.32	-1.63	-0.02	-0.20	-0.25
Services	8.736	0.41	0.22	-0.09	0.04	0.02	-0.01
Total	45.604	0.15	-0.87	-0.97	0.07	-0.40	-0.44

<sup>10</sup> Of course, this can be explained by several other factors. For example, in case of the durable goods, competition is probably much fiercer than in the services sector.

The most important *difference* between the VAT increase and VAT decrease is in the magnitude and timing of reactions. While most stores react to the VAT increase relatively quickly, in the case of a VAT cut prices decline by only one-fourth of what would be justified by the VAT cut. Moreover, in the case of a VAT increase we found that some stores bring forward price hikes planned for a later date, which influences the timing of the effect of the VAT increase: the VAT increase fuelled inflation to a higher extent at a 2-month horizon, while its effect was already smaller at a 3-month horizon. No similar dynamics were experienced in case of a VAT cut.

In some relatively competitive sectors (e.g. durable goods) we found that prices decline before the VAT cut becomes effective, whereas no such phenomenon

could be detected in case of the VAT increase. One possible explanation of this may be that while bringing forward the VAT cut may lead to a competitive advantage, bringing the VAT increase forward, in turn, results in a competitive disadvantage. Nevertheless, it was not a general phenomenon that stores changed their prices before the VAT change became effective in either cases.

The VAT change may also affect the prices of non-affected products. This effect may be particularly strong if there are substitutes for the non-affected products that are affected by the change. For example, after the 2004 January VAT increase the price increase of non-affected products had a measurable impact (0.2-0.3 percentage points) on the overall consumer price index.