

Réka Juhász: The optimal rate of inflation and the inflation target: international experience and the Hungarian perspective

This article discusses the main factors considered in defining the country's inflation target which was revised this year. Three key issues are covered: the theoretical and empirical literature dealing with the optimal level of inflation, international best practice and individual, country-specific factors that may justify deviation in any direction from best practice. The article finds that the 3% inflation target set by the MNB is consistent with all the three aspects reviewed and, consequently, contributes to the MNB achieving its primary statutory objective of price stability.

INTRODUCTION

The primary objective of the Magyar Nemzeti Bank is to achieve and maintain price stability. Price stability is not a virtue in itself: this objective stems from the consideration that monetary policy can best contribute to maximising social welfare and promoting economic growth by achieving price stability. The medium-term inflation target plays a key role in the MNB's inflation-targeting framework, as the Monetary Council determines the monetary policy course in order to ensure that the inflation target is met on the time horizon relevant for policy. It is therefore crucial that the inflation target set by the authorities is as close as possible to a level of inflation which is optimal for the economy in question.

The article provides an overview of the issues considered in defining the inflation target which was revised by the Hungarian monetary authorities this year. According to the theoretical results, inflation above the optimal level imposes considerable costs on society. Despite this, however, the optimal rate of inflation is not zero, as there are a number of considerations which call for a small, positive rate of inflation. Part of the empirical literature tests for this 'non-linearity' between inflation and economic growth, i.e. it measures whether there is a threshold level, above which the costs of inflation will outweigh the benefits. The studies presented in the article reinforce the notion that there is indeed such a threshold. Above this level, it can be demonstrated that inflation leads to a significant loss in economic growth.

The article also examines the variety of targets set by other central banks within a best practice inflation-targeting regime, as well as the targets adopted by countries at similar stages of development which share common structural features with Hungary, for example, the Visegrád countries. Concentrating on these aspects and taking into account

unique factors (those specific to Hungary) that may influence the optimal rate of inflation, we can define an optimal inflation target for the Hungarian economy.

THEORETICAL ISSUES RELATING TO THE OPTIMAL LEVEL OF INFLATION

In searching for the rate of inflation which ensures the highest level of social welfare for an economy, the factors that may make inflation costly must be taken into account. Therefore, in the following we present the so-called static and dynamic (measurable in terms of output sacrifice) welfare costs of inflation. However, other considerations which claim that small positive inflation is preferable may also exist. For this reason, we will discuss such arguments in greater detail in the second part of this chapter.

Economic agents are directly faced with static welfare losses of inflation in a high inflation environment. The so-called menu costs are the direct costs of physically changing nominal prices. Because the costs of adjusting prices are not negligible, firms change their prices less frequently than would be justified and, consequently, price and wage rigidities may develop. This, in turn, leads to a welfare loss, as firms are unable to adjust to the shocks that they receive in a proper and timely fashion.

In an inflationary environment, prices undergo more frequent changes, which makes it more difficult for economic agents to compare prices and, ultimately, to make optimal decisions. Prices carry important information about the economy. In a high inflation environment, it is more difficult to find out whether the price of a good has changed in relation to that of another (which would then lead to a reallocation of resources), or if its price has simply adjusted to the inflation environment (which would not cause such a reallocation).

Shoe-leather costs of inflation relate to the phenomenon that, with higher inflation, the costs of holding money increase and, consequently, agents strive to hold less of it. An explanation for this is that cash required for conducting transactions entails cost of time. In addition, it is also conceivable that demand will fall, as agents would like to reduce the number of transactions made at these higher prices.

Inflation results in a welfare loss to society through the tax regime in numerous ways. First, in most cases the base for taxes payable on various incomes is determined by some sort of nominal quantity (e.g. nominal income in the case of personal income tax, and nominal return in the case of capital income). This means that, given a constant level of real income and high inflation, the tax burden increases. This, in turn, adds to the dead-weight loss caused by the distortions of the tax regime. Another channel relates to accounting for depreciation. As the amount of depreciation deductible under law is also defined in nominal terms, in a high inflation environment there may be a shift in fixed investment activity towards projects of a shorter economic lifespan, to the detriment of projects with a longer lifespan.

High inflation increases the risk premia on financial investments. This effect is evident at both the micro and macro levels. Considering the micro level, economic agents require a higher return in exchange for the higher risks that they take. The extra return required relative to the risk-free interest rate is called risk premium. In a high inflation environment, uncertainty surrounding future inflation also increases and, consequently, financial investors demand an inflation risk premium of some sort. A higher expected return will lead to a decline in investment activity, as fewer projects pay off at a higher real interest rate. At the macro level, it is widespread practice in closely integrated financial markets for investors and credit rating agencies to judge the creditworthiness of a given country based on a set of chosen macroeconomic indicators. Price stability is ascribed an important role in this process – investors will expect a higher risk premium if inflation is higher.

The dynamic cost of inflation is evident through the fact that persistently high inflation reduces the rate of economic growth through various channels. In a comprehensive survey of the literature, Temple (2000) reviewed the channels through which inflation negatively affects economic growth. He found that inflation has the greatest effect on growth by impeding investment activity.

These examples clearly illustrate that high inflation imposes severe, immediate and future cost burdens on economic agents; consequently, achieving and maintaining price stability significantly improves the long-term welfare of members of society. The above discussion could lead one to infer that price stability, i.e. zero inflation is the optimal inflation target. There are, however, some considerations which may justify small positive rates of inflation. Basically, three arguments can be put forward in favour of positive inflation: the distortion in the price index, the need to avoid the danger of deflation, and asymmetric price rigidities. During the recent period, the academic literature has not only attempted to document these effects extensively, it has also sought to measure empirically the rates of positive inflation justified by the various effects. The results are discussed below.

First, the consumer price index is the most widely used measure of inflation. Experience has shown, however, that the CPI often contains a certain amount of distortion and, moreover, it tends to slightly overestimate actual inflation. The method of calculating the average is predisposed to introduce an upward bias into the price index;¹ the greater the bias, the more dispersed the changes in the prices of goods are. Moreover, as the consumer price index is calculated on the basis of a fixed representative consumption basket, it does not take into account the fact that consumers substitute away from more expensive goods towards cheaper ones in response to movements in relative prices. In addition, individuals can choose not only between goods, but also between shops and, therefore, retail prices should be weighted according to the shops where purchases have been made in a given period. But prices are always registered in the same shops. And, finally, using a fixed consumption basket implicitly assumes that the quality of goods are held constant over time. However, product quality tends to improve and, consequently, the portion of changes in prices justified by quality improvement feeds through into higher inflation. In a comprehensive survey of the empirical literature for a number of countries, the IMF estimated the consumer price index bias to be between 0.5%-1.0%, i.e. actual inflation tended to be lower by this margin than observed inflation (Faulkner–MacDonagh et al., 2003).

Avoiding deflation is the second argument in favour of small positive inflation. Although, as we saw earlier, inflation involves numerous costs, economists believe that deflation is much more harmful. This is well illustrated by the example of Japan in the 1990s. If prices begin to fall, economic agents

¹ This distortion results from the fact that inflation is defined as the weighted arithmetic average of changes in the prices of goods comprising the consumption basket. If the price of a product rises by HUF 1 in year 1, and falls by HUF 1 in year 2, then the indicator will show slightly positive inflation on the average of the two years.

will postpone consumption, in the expectation that prices will continue to fall into the future.² The decline in prices and the contraction in demand may trigger a so-called deflationary spiral, where the two processes, mutually reinforcing each other, generate an ever deeper recession. A deflationary environment may also undermine the efficiency of monetary policy. As the nominal interest rate cannot be negative (given that the return on money is zero), it may be the case that the real interest rate would have to fall further, but there is no room left. This situation is called a liquidity trap. Central banks take great care to protect the economy from prolonged deflation and to escape liquidity traps. They can achieve this goal mainly by setting inflation targets above zero. Empirical research has found that, with a 1%-2% average inflation rate in advanced economies, the probability of deflation and a liquidity trap developing is acceptably low.

The third reason why positive inflation is preferred to zero inflation is found in the theory of asymmetric nominal price and wage rigidities. This idea is based on the notion that the economy continuously receives exogenous shocks which encourage economic agents to adjust (e.g. to change prices and wages). For some reason, it is easier to raise prices or wages than to reduce them. As a consequence, the number of price and wage cuts will lag behind that of price and wage rises. Downwardly rigid prices or wages tend to weaken the economy's ability to adjust, and in this way cause an efficiency loss. If this suggestion is empirically relevant, then a small positive rate of inflation will help the economy to continue growing steadily. In other words, with a small positive inflation, economic adjustment may occur more easily in real terms, as, with inflation above zero, fewer companies would have to reduce their prices or wages.

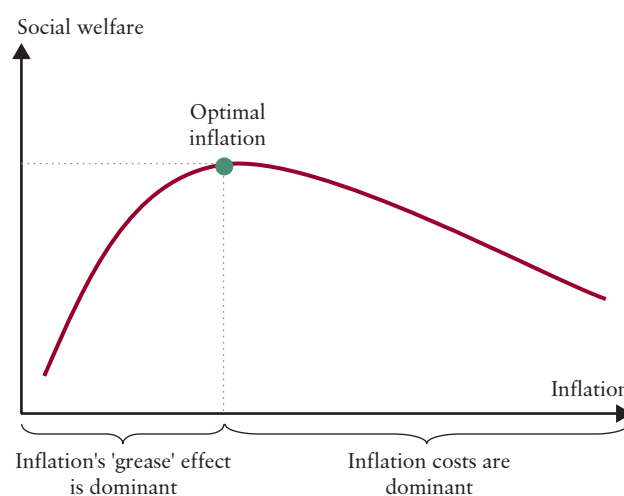
The results of empirical research on downwardly rigid prices in advanced economies are slightly contradictory. While Peltzmann (2000) found for the US that asymmetry is present across most sectors, research carried out in the euro area established that prices are not overly rigid downwards (Dhyne et al., 2005).³

In contrast, the survey results available for downwardly rigid wages are much more robust. Employee resistance to nominal wage cuts is basically linked to money illusion and to the notion that, to a certain degree, employees prefer not too wide wage differences in similar jobs (Akerlof–Dickens–Perry, 1996). Surveys conducted among corporate managers

have shown that management takes into account resistance to wage cuts in setting employees' wages (Bewley, 1999). In their experience, wage cuts reduce employee performance; consequently, in certain cases they are better off if they fire the employee. The International Wage Flexibility Project (IWFP) compares nominal wage rigidities based on standard indicators (Dickens et al., 2006); and the series of research projects by the Wage Dynamic Network, established by the ECB, is currently underway. Based on the results of empirical research, the degree of nominal wage rigidity exhibits significant dispersion across countries. This dispersion may be explained by the different labour market institutions (e.g. the importance of trade unions) and by the differences in employee preferences. Using the empirical results, a couple of studies (Fahr–Smets, 2008; and Fagan–Messina, 2008) analysed the optimal level of inflation with asymmetrical nominal wage rigidities in a general equilibrium model framework. Based on the calculations, downward nominal wage rigidities raise the level of optimal inflation by 0-2 percentage points, depending on the strength of the rigidities.

The theoretical considerations presented so far have dealt with the costs of inflation, as well as with the arguments in favour of a small, positive level of inflation. These two opposing influences are called '*grease and sand*' effects in the academic literature. It implies that small positive inflation is conducive to steady economic growth (particularly if asymmetric nominal price or wage rigidities are relevant),

Chart 1
Non-linear relationship between inflation and social welfare



² In the strict sense, this statement is true if real wages rise, i.e. if the fall in prices is not followed by a decline in nominal wages of similar magnitude. As we will see later, there is serious theoretical and empirical evidence in favour of downwardly rigid wages.

³ It is important to note that it is not necessarily downwardly rigid wages that are in the background of less frequent price reductions compared with price increases. Examples for this are Tsiddon (1993) and Ball–Mankiw (1994).

offsets the distortions of the consumer price index and reduces the risk of deflation. Above a certain level, however, it is the costs of inflation that become dominant, and from that point inflation causes a welfare loss and reduces the long-term rate of economic growth. Due to these considerations, optimal inflation can be found where the costs and the benefits of positive inflation balance out. Chart 1 plots this non-linear relationship.

EMPIRICAL RESULTS ON OPTIMAL INFLATION

The key proposition of the theoretical literature discussed in the previous section can be summarised as follows. The relationship between inflation and social welfare is not linear. This means that, to a certain level, inflation has a positive, greasing effect on the economy. Above this level, however, the costs become dominant, and inflation will cause significant damage to society. The optimal level of inflation is where the costs and benefits balance out. The empirical literature has tested this proposition in two different approaches. Earlier research mainly concentrated on demonstrating the damaging effects of high inflation, and in particular on quantifying the dynamic costs (measurable in terms of output sacrifice). Above and beyond demonstrating the general negative effects, research has more recently analysed whether there is a threshold level, above which inflation exerts a negative influence and where this threshold level actually lies.

Both approaches have reinforced the prediction of the theoretical literature. Early results showed that inflation above the optimal level is indeed harmful to economic growth. More recent research, in turn, has confirmed that the relationship is not linear, i.e. that there is a threshold level. Before giving a detailed account of the results, it is useful to look at some methodological problems.

One of the most important tasks for empirical analysts is to find persuasive evidence that the relationship discovered between the two variables is more than a correlation, and that there is indeed a causal relationship in the background. In this particular case, this means that if we identify a negative correlation between inflation and growth, it does not necessarily imply that inflation has a harmful effect on growth. It could be the case, for example, that there is a negative supply shock in the background that raises inflation and simultaneously slows the rate of economic growth. If such exogenous shocks are dominant in the relationship between inflation and growth, it may be the case that the results are based on a spurious regression.

Problems such as this are especially serious in estimating growth equations and, therefore well thought-over, sophisticated estimation methods are required to test the assumed relationship in a convincing way. In addition, as discussed in detail in the previous section, the question of linearity is a key issue in estimating the effect of inflation on growth, which increases the complexity of the problem. If we erroneously estimate a linear relationship, the results will be downward biased (Ghosh–Phillips, 1998). We will see that this key factor proves crucial in evaluating the results. Consequently, it is important to always bear in mind the potential shortcomings of the methodology used.

Early studies succeeded in identifying a significant negative relationship between inflation and economic growth. For example, Barro (1995) found that a 10 percentage point rise in inflation reduces the rate of per capita real income growth by 0.2-0.3 percentage points. The author also estimated the relationship with regards to the rate of investment, where a 10 percentage point rise in inflation reduced the investment rate by 0.4-0.6 percentage points. This confirms Temple's (2000) theoretical result, according to which the investment rate is an important channel through which inflation exerts its negative influence.

A common problem with these studies is that the results are very sensitive to the choice of sample. In other words, the posited relationship exists only if the sample contains observations of episodes of relatively high inflation. For example, in Barro's study the results are not significant, if observations of inflation above 50% per year are eliminated from the sample. In the authors' judgement, lower inflation data themselves do not contain sufficient information to clearly isolate the relationship between inflation and growth (Barro, 1995). One of the most important criticisms against investigations based on this kind of methodology is that it assumes a linear relationship between inflation and growth, whereas there are strong theoretical arguments in favour of a non-linear relationship.

Although we have succeeded in demonstrating that high (double-digit) rates of inflation indeed cause significant damage to growth, the interesting question is whether or not more moderate inflation causes a loss in output. Due in part to the doubts raised about earlier investigations, more recent research has explicitly tested the 'non-linearity' hypothesis. The starting point has been that the reason why earlier investigations may have been unable to demonstrate the assumed relationship at more moderate levels of inflation was that they did not take into account the non-linearity which

⁴ See also Fischer (1993), or Bruno–Easterly (1998).

introduced a downward bias into the estimation (Ghosh–Phillips, 1998).

Empirical results have confirmed this criticism, as more recent investigations have succeeded in confirming the theoretical predictions from two aspects.⁵ First, it has been proven that the relationship between inflation and economic growth is, in fact, not linear, i.e. all of the empirical investigations that we have discussed above have found a threshold in the relationship between inflation and growth. So, the ‘*grease and sand*’ effects of inflation, noted earlier, hold; small positive inflation may be a factor contributing to steady economic growth. Above a certain level, however, costs become dominant.

Second, these investigations identify a negative relationship between the two variables even at much lower levels of inflation. This means that the threshold level, above which the costs of inflation become dominant, can be found at single-digit inflation rates in all of the studies reviewed. With respect to advanced economies, the studies that we have surveyed found this threshold level at different levels of inflation, due to the different methodologies applied, the different cross-country sample, and the analysis of different periods. Some studies have found this threshold within the group of advanced economies at 1%, others at 8%. This, however, does not mean that an inflation target can be chosen arbitrarily from this range for a number of reasons.

First, these studies have only taken into account output loss as the cost of inflation. As we saw in the previous section, however, inflation does not only have dynamic welfare costs – we have also demonstrated numerous, significant static welfare costs. These studies have not explicitly taken into account such costs and, therefore, it is wise to choose an inflation target from among the lower values.

Second, the investigations have generally identified an asymmetric non-linear relationship between inflation and growth. Although all analyses have found that inflation above the threshold level clearly has a negative effect on growth, generally there is no demonstrable positive relationship between inflation and growth below the threshold level, i.e. the results are not significant.⁶ This means that there is a lower probability that a central bank will face considerable real economic costs by setting an excessively low value as its inflation target, compared to a central bank that determines its target at an excessively high level. Consequently, it is wise to choose one of the lower values to be the inflation target.

Finally, different countries exhibit significant differences both in terms of structural features and in their level of development. Therefore, the studies discussed in this article reveal a general rather than a country-specific relationship; the threshold level is not equal to an inflation target relevant for every country. In setting the inflation target, country-specific and structural features must be taken into account which would justify some deviation from international best practice. In the case of Hungary, we will discuss these factors in the final section.

But first we will present another type of empirical evidence: targets adopted by other central banks. Before discussing the country-specific factors that should be taken into account in the case of Hungary, we must know what is best practice inflation-targeting. The next section explores this issue.

INFLATION TARGETS IN OTHER COUNTRIES

As we saw earlier, inflation exceeding the optimal level causes significant costs to society. The empirical and theoretical literature serves as useful guidance with respect to the optimal level of inflation; however, it may also be useful to expand our knowledge through studying a different kind of empirical evidence. As was mentioned above, the inflation target set by other central banks provide an important point of reference.

Currently, 24 central banks pursue an inflation target. Some central banks which do not use an explicit inflation target also communicate a numerical value for inflation they consider to be consistent with price stability. Chart 2 plots the inflation targets of central banks that have adopted an inflation-targeting regime, with the targets in ascending order. Central banks targeting a band have been arranged according to the middle of the target band for inflation.

In the countries considered to be best practice, i.e. in the United Kingdom, Canada, Sweden and New Zealand, the inflation target is 2%, except in New Zealand, where an interval between 1%-3% has been set as a band. Looking at economies at a similar stage of development to Hungary, for example, the Visegrad countries (the Czech Republic, Poland and Slovakia) in our geographical vicinity, we find that the targets do not significantly deviate from the Hungarian target. These countries have set inflation targets of 3%, 2.5% and 2%, respectively. Finally, the practice adopted by the European Central Bank is very important for Hungary, due

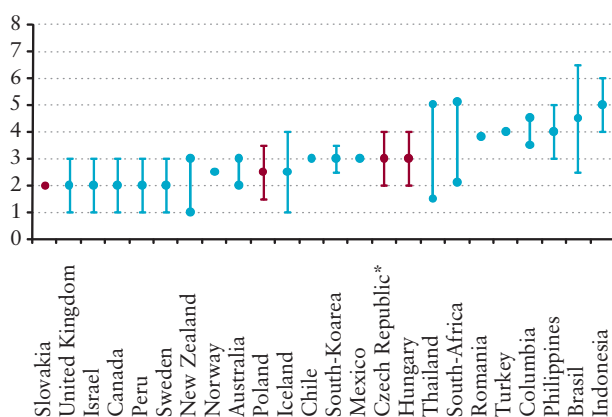
⁵ The studies examined are: Ghosh–Phillips (1998), Khan–Senhadji (2001), and Burdhekin et al. (2004). Brook et al. (2002) also provide a good summary of the earlier and also the more recent empirical literature.

⁶ A positive and significant relationship was found by Khan and Senhadji (2001) below the 1% threshold level. However, the results are not robust; when the frequency of the data is changed, results are not significant.

Chart 2

Inflation targets in inflation-targeting countries

(March-April 2008)



Sources: Websites of central banks.

* Based on a decision taken in spring 2007, the inflation target will be set at 2% from January 2010.

Note: Data for Turkey and Korea are for 2007. In the case of South Africa and Thailand, the target is not the consumer price index, but core inflation. For this reason, the targets have been adjusted by the difference between average the CPI and core inflation in the past 7 years, for the sake of comparability.

to the country's prospective entry into ERM-II. Although the ECB does not belong to the group of central banks pursuing an explicit inflation target, its price stability objective of inflation 'below but close to 2%' is a crucial point of reference.

Based on the chart and in light of the foregoing, the conclusion can be drawn that in the majority of countries pursuing an inflation-targeting regime, central banks have set the inflation target at around 2%-3%.

SOME RESULTS RELEVANT FOR HUNGARY

The previous two chapters confirm the view that a 3% inflation target is in line with both the general guidance of theory and international best practice. Beyond that, it is worth considering whether a unique structural feature of the Hungarian economy justifies significant deviation in the inflation target. In this section we examine what level of inflation is justified by the arguments in favour of positive inflation, discussed in the section on theoretical issues. We will see that there is no robust result which would justify a significant difference in the inflation target compared to international practice.

Any estimate for the distortion in the consumer price index is fairly uncertain, as no empirical study on Hungary has been written. General theoretical intuition and the empirical investigations conducted in emerging economies have found that in these countries the distortion in the CPI is greater than in advanced economies.⁷ A major reason for this is that the introduction of new products and quality improvement have a greater distorting effect. However, with progress made in convergence, this effect is likely to diminish. In the case of Hungary, we reason that the majority of changes, resulting mainly from economic transition (introduction of new products; market entry by multinational business chains and hypermarkets; improvement in the quality of goods; transformation of the consumption mix), which may have significantly influenced the degree of distortion, have already taken place. Nevertheless, the amount of distortion may be slightly above 0.5-1 percentage point experienced in advanced economies.

Empirical results suggest that the 1%-2% inflation level required in order to reduce the danger of deflation in advanced economies is similar for emerging countries. Analysing the experience of emerging and transition economies within the inflation-targeting framework, Amato-Gerlach (2002) found that, although economic shocks are generally greater in these countries, real interest rates are higher and, therefore, they do not see any reason to adjust the inflation target upwards. An IMF study on deflation risk (Faulkner-MacDonagh et al., 2003) organised countries into four groups with respect to the risk of deflation. They judged riskiness on the basis of various price indices, indicators of inflation expectations, measures of the output gap, asset prices and various money market indicators. The CEE region was only represented by Poland in the sample, with a placing in the low-risk group.

Examining asymmetric nominal price rigidities, Gábel and Reiff (2008) found that the number of price reductions is not significantly lower than the number of price rises, similarly to the euro area, i.e. there is no evidence of significant downward price rigidity. With respect to asymmetric nominal wage rigidities, the available results are scarce. In this case, the following aspects should be taken into account in comparison with advanced economies. (1) Productivity growth is faster in Hungary than in the euro area. As a result, assuming the same average inflation rates, Hungarian wages may grow faster. So, the average of the distribution of wage adjustments will be higher and, consequently, the cost caused by nominal wage rigidity

⁷ Filho-Chamon (2007) found a 3 percentage point distortion for Mexico and a 1.5-3 percentage point distortion for Brazil. Filer-Hanousek (2000) also found a 3 percentage point distortion for the Czech Republic. However, Podpiera (2003) estimated the error in the Czech Republic consumer price index to be between -0.83 and 0.5 percentage points.

lower. (2) Firms must adjust to much greater shocks than euro-area member countries, due to the fact that Hungary is a transition economy. This is why the distribution of wage adjustments is much wider, which, in turn, increases the costs involved in nominal wage rigidity. (3) The degree of nominal wage rigidity (i.e. the percentage of employees potentially affected by rigidity whose wages will not change) is smaller than in the euro area, which is an advantage with respect to the relative costs of wage rigidity (*Analysis of the Convergence Process*, 2008, MNB).

Based on these considerations, it can be seen that the factors do not point in the same direction and, consequently, it is difficult to judge whether the costs of nominal wage rigidity are lower or higher in Hungary than in the euro area, assuming the same average inflation rate. Research into wage rigidities, involving European countries and coordinated by the ECB, is currently underway. Preliminary results of the project suggest that in Hungary, nominal wage rigidities do not justify a higher inflation target than the levels typical in more advanced economies.

CONCLUSIONS

We have examined the optimal inflation target for Hungary from three different perspectives. First, we analysed what guidance is offered by the theoretical and empirical literature. The theoretical results suggest that the relationship between inflation and welfare is not linear. Small positive inflation contributes to the smooth functioning of the economy. Above a certain level, however, static and dynamic welfare costs of inflation will dominate and, consequently, the effect will be negative. Optimal inflation can be found where costs and benefits balance out. The empirical literature has confirmed the assumption of 'non-linearity' and has demonstrated that inflation in excess of the optimal level causes significant damage to the economy. For advanced economies, some of the studies analysed identified the threshold level at 1% while others at 8%. It is important to note that the results have been estimated on a sample including many countries and, therefore, provide some kind of average. Consequently, they are not necessarily authoritative for a given country with unique structural features in defining the optimal rate of inflation and the inflation target.

Based on this consideration, in the following section we examined the issue in the context of international central bank practice. We surveyed the inflation targets set by other central banks and found that the majority of them choose a low, 2%-3% target. Finally, we examined the various considerations that might justify having a significantly different inflation target. Taking into the account that Hungary is a transition economy and other structural

features, we did not find evidence which would justify setting a significantly different target in Hungary compared to international practice.

To summarise, the 3% inflation target is consistent with both guidance provided by the theoretical and empirical literature and international best practice. We found that there is no country-specific factor in the case of Hungary which would justify a significant deviation from best practice.

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