Macroeconomic Costs and Benefits of Price Stability

Erik Haller Pedersen and Tom Wagener, Economics

INTRODUCTION

Today price stability is an objective of most central banks in the western world. The central banks of many countries have also been given considerable independence from policy-makers to determine monetary policy. Price stability is regarded as a central element of the framework for a sound and affluent economy. The notion that it is possible in the longer term to reduce unemployment permanently and stimulate economic growth by maintaining a higher rate of inflation no longer applies in theory or in practice. However, it is recognised that in the very short term, under certain circumstances, stronger growth can be achieved by inflating the economy, while the costs will not affect the economy until later. The literature describes an "inflation bias" in economic policy. In recent years this has led to an explicit division of labour in the economic policies of many countries, including Sweden, the UK and the euro area member states, whereby an independent central bank concentrates on maintaining price stability.

It is important to emphasise that a central bank's pursuance of price stability must be considered together with the rest of economic policy. An overall objective to maintain stable prices does not in itself mean that other social objectives such as employment or distribution policy are given lower priority. Meeting these objectives is the task of especially fiscal and structural policy, and thereby of the government and parliament. Monetary policy contributes to achieving these objectives mainly through the maintenance of price stability.

The costs and benefits of inflation, including the costs and benefits of pursuing price stability as a principal monetary-policy objective, are described in the following. The theoretical arguments in favour of and against price stability are considered, before turning to an account of Danish experience, with focus on the last 30 years.

1 In recent years extensive theoretical and empirical literature on monetary-policy objectives and strategies has been published. See the overview in Journal of Monetary Economics (1999), Special Issue and Lyngesen (1999).
PRINCIPAL CONCLUSIONS

Inflation – defined as a sustained increase in the general price level – in excess of a few per cent per annum has numerous negative consequences for a market economy. They include unintended redistribution of wealth between various groups in society, aggravation of imbalances in the economy and in the longer term, lower employment. The higher the inflation rate, and the stronger its fluctuation, the greater the negative effects will be.

Inflation, and not least uncertainty concerning the future inflation rate, tend to increase the element of uncertainty underlying the financial decisions of households and business enterprises with regard to savings, consumption, investments, etc., and thereby the utilisation of society's resources. Inflation generally encourages "short-sighted" economic decisions. It also complicates the planning of economic policy. Unexpected changes in the level of the rate of price increases lead to random redistribution as capital gains/losses between creditors (lenders) and debtors (borrowers), unless index-linking is applied to contractual undertakings. In the housing market inflation reinforces the differences in the terms applying to various groups of buyers.

High inflation, combined with the taxation system, in particular the taxation value of deductible interest payments, was a significant factor contributing to the imbalances in the Danish economy in the 1970s and the first part of the 1980s. The subsequent development is an example of how a credible economic policy can reduce the rate of price increases without imposing high real costs such as higher unemployment and a shortfall in growth. A key precondition was to eliminate the close correlation between wage and price increases via the automatic cost-of-living adjustments. Danish experience shows that the indexation of the economy did not solve the inflation problem, as is often described in the textbooks, but was actually part of the problem.

Price formation has strong inherent dynamics since inflation, via wage formation, is dependent on the expectations of future inflation. To avoid this self-amplifying effect it is vital that economic policy and the authorities' willingness to maintain price stability are credible.

A change in general attitudes was required to dispose of the notion that high nominal wage increases automatically implied higher real wages. Chart 1 shows the development in inflation and real wages in Denmark over the last 30 years. It supports the conclusion that a low inflation rate is an excellent safeguard against erosion of real wages.

There are weighty arguments against setting the inflation target at exactly zero, so in practice a low inflation objective is the most appropriate.
EXPECTED INFLATION

In the theoretical literature on the costs of inflation to the overall economy a distinction is normally made between the effects on the economy of respectively predicted and unpredicted inflation. In the first group of studies the channels through which inflation as an economic phenomenon affects the economy are analysed, while the focus of the second group is more specifically on the effects due to uncertainty concerning inflationary development.

Bailey (1956) is a classical reference with regard to the costs of completely expected inflation. The argument is that inflation is like a tax on the cash funds of the citizens, since via its impact on the nominal interest rate inflation increases the loss on holding non-interest-bearing cash rather than investing in interest-bearing securities, e.g. bonds. This is an incentive for the general public to reduce their holdings of cash funds, so that they have to make more frequent cash withdrawals for current transactions. It implies "shoe-leather costs" whereby the citizen has to go to the bank more frequently. Lucas (2000) presents a more recent overview of this literature.

Predicted inflation also entails macroeconomic costs in so far as collecting information on price trends and changing price tags, sales brochures, etc. require resources and time. These costs are termed "menu
costs", see Ball (1994). The costs also arise in the case of fully predicted inflation, but increase if the inflationary development cannot be predicted. The higher the rate of inflation, the higher the "menu costs".

The complex interaction between inflation and the tax system affects the economy, but it is difficult to separate the effects of inflation from the effects of the tax system itself, which has its own distorting effect. This effect should naturally be viewed in conjunction with the contribution of tax revenues to upholding the welfare state. The interaction between taxation and inflation has a distorting effect on the financial decisions of households and business enterprises, which can be avoided if price stability is maintained. The problem can be divided into two elements. On the one hand, inflation and the interest-rate level, and on the other inflation and the tax wedge, i.e. the difference between real interest rates before and after tax.

Regarding the influence of inflation on the interest-rate level, the question is how an expected price-increase rate spills over to the nominal interest rate. This issue was already discussed by Fisher at the end of the 19th century; Fisher (1896). The argument here is that inflation expectations affect the nominal interest rate in a 1:1 ratio, giving the Fisher equation. In a small open economy this mechanism means that expectations of 1-per-cent higher inflation spill over into expectations of currency depreciation at 1 per cent p.a. which again is transmitted into lifting the nominal domestic interest rate.

If taxes are introduced in the system it must be considered how inflation affects real interest rates. In a small open economy it is reasonable to assume that the real interest rate before tax is constant, corresponding to growth in the nominal interest rate on a par with inflation expectations, i.e. in accordance with the Fisher equation. This spillover mechanism implies that the real interest rate after tax declines in step with inflation, cf. Box 1. The same applies to the required yield on investments, thereby stimulating business investments.

In a small open economy with a fully credible exchange-rate objective such as Denmark's it can be argued that the nominal level of interest rates rather than the real interest rate before tax is determined by external factors. In this case an inflation rate which deviates from that of the outside world for a certain period will have a direct impact on the domestic real interest rates both before and after tax.

In a large closed economy such as the US the opposite is often assumed, i.e. that the real interest rate after tax is kept constant by the households' required return on savings. Therefore the nominal interest rate increases faster than inflation expectations. This implies that 1-per-cent higher inflation requires a 1.5-per-cent higher nominal interest rate before tax, if
the real interest rate after tax is to be unchanged with a tax rate of 33 per cent. In this spillover mechanism the real interest rate before tax increases in step with inflation, thereby dampening business investments.

In addition to its significance to the level of interest rates inflation also influences the difference (wedge) between real interest rates before and after tax. The higher the rate of inflation, the greater the wedge. For households this implies that the real level of taxation depends on the level of inflation, which thus acts as a hidden tax regulation mechanism. This does not enhance the transparency of the tax system.

Irrespective of the spillover assumption, in a ideal world business enterprises' investment considerations will be independent of the taxation aspects, i.e. taxation should not insert a wedge between the real interest rate and the required return on the investment project. In practice, the impact of the taxation rules is that inflation reduces the yield requirement in relation to the real interest rate, i.e. inflation resembles an element of tax subsidy, so that otherwise unprofitable investments may be profitable for a private individual, but not necessarily to society as a whole. The higher the rate of inflation, the lower the required yield in relation to the real interest rate. This may be attributed primarily to the full tax deductibility of the inflation component of the nominal interest rate, without the inflation gain on the value of the capital stock being taken into account as it arises\(^1\). The conclusion is that inflation distorts investments.

\(^1\) Cf. Samuelson (1964). The principal argument is that in a nominal tax system tax-related depreciation reflects the decrease in the nominal value of the object of depreciation. If the nominal value has increased, depreciation becomes additional revenue.
Feldstein (1999) carried out a very extensive empirical assessment of the interaction between the tax system, inflation and macroeconomic affluence based on the US economy. The main assumption in Feldstein's article is that the real interest rate after tax is constant. This assumption is most relevant to a large closed economy, as stated above. The conclusion of Feldstein's analysis is that reducing the rate of inflation entails considerable wealth gains, even in the case of a reduction from a low level, e.g. from 2 per cent p.a. to zero.

In theory, from a taxation aspect the inflation problem can be solved in several ways. One solution is to replace the nominal tax system with a real tax system. This would imply that the inflation element of the interest rate is not subject to taxation, which corresponds to the current rules for index-linked loans. However, none of the theoretical solutions are politically acceptable since they for example require complex administration and are difficult for laymen to understand. A case in point is the taxation of non-realised capital gains. In practice price stability is thus the only realistic means of reducing the inflation-generated distortion of savings and investment decisions.

**UNPREDICTED INFLATION**

The key adverse impact of unpredicted inflation on the economy is that it blurs the information value of prices. This is a serious problem in a market economy where confidence in the signal value of prices is an essential precondition for the functioning of the economy.

Uncertainty concerning future price levels will affect both the level and composition of investments. Inflation uncertainty in itself tends to increase the uncertainty of business enterprises' investment calculations and therefore normally has a dampening effect on investments, particularly those which generate returns after a long period of time. However, the argument can also be reversed. Inflation uncertainty makes real investments seem more attractive since they offer a certain degree of protection against inflationary erosion. However, an economic policy which promotes inflation is a highly unsuitable method of stimulating investment.

On the savings side, lenders tend to react to greater uncertainty by demanding a risk premium, which increases real borrowing costs. This dampens investments and thereby economic growth. Inflation not only promotes "shortsightedness" with regard to investment. In general, inflation uncertainty makes it less attractive for both households and business enterprises to enter into long-term nominal contracts.

Unpredicted inflation also gives rise to uncertainty concerning current price conditions. In a market economy relative prices, rather than the
actual price level, are of significance. Due to variations in productivity between sectors and individual business enterprises it will always be the case that some prices rise, while others fall, and others remain unchanged. Not even with price stability will there be any tendency for all prices to show parallel development, so that relative prices change constantly. These price signals are essential to the functioning of the economy since they determine consumption and investment decisions. Inflation is detrimental in so far as it directly affects relative prices or makes it more difficult for the players in the economy to determine the relative price structure. See Rankin (1994) for an estimate of the costs, as well as a bibliography.

In practice, the higher the rate of inflation, the greater the uncertainty of future inflation. This is the logical conclusion of the empirical observation that the higher the rate of inflation, the greater the variability of the rate of price increases, see e.g. Barro (1995).

In addition to the aforementioned effects unpredicted inflation leads to a redistribution of income and wealth among various groups in society which is not based on political decisions. With regard to earned income, an unpredicted leap in the rate of price increases will lead to redistribution from wage earners, who receive wages as fixed nominal amounts, to capital owners – who in principle can also be the wage earners themselves via their pension savings. Within the wage-earner group there will also be variation in how quickly and to what degree the individual groups are able to achieve compensation as higher wages. Inflation uncertainty is not conducive to long-term collective agreements.

With regard to wealth, an unexpected increase in inflation will entail redistribution from individuals with net worth as nominal assets, e.g. non-index-linked bonds or bank deposits, to individuals with debt. According to this mechanism higher inflation tends to erode the real value of nominal debt, thereby generating gains for debtors. The opposite is creditor losses. In the case of predicted inflation the burden of paying for the gain to the debtor will more or less fall to the debtor himself as a higher payment for the loan, i.e. a higher interest rate.

The macroeconomic costs of inflation-related redistribution of wages and wealth can be difficult to calculate precisely since in the macroeconomy there is always a winner for each loser (zero-sum game), although in the longer term the redistribution could have consequences for output. Whether the redistribution is desirable is thus purely a political issue. However, the distribution of capital gains will be inequitable since the distribution of net worth is more unequal than the distribution of income, just as inflation-based redistribution is completely random and not a suitable political redistribution instrument.
INFLATION AND GROWTH

The theoretical arguments presented above indicate almost unanimously a negative correlation between inflation, inflation variation and growth. However, an empirical proof of this is complicated. Inflation is determined in the interaction with other economic factors, such as growth, wage formation, etc. The empirical relationship which can be established between the two variables by regression analysis therefore cannot in the first instance be taken to reflect a causal relation from inflation to growth. In the short term the correlation can easily be the reverse, i.e. high growth leads to higher inflation. This must be taken into account in empirical study.

There is an extensive body of literature in which it is sought to prove correlation between inflation and growth, or in some cases productivity. See Briault (1995) for a critical review of this literature, and Fischer (1996). The analyses can either be based on time data, i.e. inflation and growth for a given country are correlated over time, or conducted as a cross-section whereby several countries are analysed at the same time. For high inflation rates exceeding 10 per cent p.a. the results are unequivocal: a significant negative correlation exists between inflation and growth. In general, inflation will undermine the usefulness of money as a unit of account and as a store of value, and at higher increase rates even as a means of transaction. Taken to the extreme, money will completely lose its functions in the economy. This is the case in periods of hyperinflation, see Cagan (1956) for an analysis of e.g. hyperinflation in Germany at the beginning of the 1920s.

The results are less apparent for more moderate price-increase rates. Economic growth is determined by other factors besides inflation, such as productivity development and changes in population levels. These factors can dominate the isolated effect of inflation, or may themselves be functions of inflation. Supply shocks such as oil-price increases may also complicate the analysis.

Chart 2 depicts inflation and growth for a number of countries in two periods. The Chart shows that in the second half of the 1990s growth on average was clearly higher than growth in the high-inflation period at the end of the 1970s and the beginning of the 1980s. Even within the period of high inflation there is a negative relationship between inflation and growth in different countries. On the other hand, the Chart also shows an example of how low inflation in itself does not guarantee high growth, cf. Japan, where both inflation and growth were close to zero in the late 1990s. Japan also distinguished itself in the 1970s, in this case with very high growth. The Chart's exact
configuration depends on the periods chosen, but the overall conclusion generally applies.

Barro (1995) seeks to isolate the inflationary effect empirically. The conclusion is that an increase of 10 percentage points in the rate of price increases will reduce growth by 0.2-0.3 percentage points per year. Other analyses show a sensitivity of at least the same level. In general, it seems reasonable to conclude that the actual development supports the view that low inflation is a characteristic of well-functioning, well-balanced economies. Furthermore, inflation is typically lower in more affluent than in poorer economies.

THE COSTS OF REDUCING INFLATION

There is some disagreement on how inflation can be reduced with minimum loss of affluence, but combating inflation is essentially a question of the credibility of economic policy, since ultimately the authorities are responsible for the future inflation rate. This applies regardless of whether the initial inflationary shock is created by the authorities themselves, or can be attributed to external factors. Credibility, as well as rule-based as opposed to discretionary economic policy, are discussed extensively in the available literature, but will not be reviewed here, although it is clear that in practice a precondition for credibility is an inflation target close to zero, and not, for example, 8 per cent. Achiev-

---

Note: The selected countries are: the USA, Japan, Germany, France, the UK, Spain, the Netherlands, Belgium, Sweden, Austria and Denmark. The inflation target is the deflator for private consumption used in the national accounts.
ing credibility in the combating of inflation can take a long time, and the future inflation rate can very well be subject to considerable uncertainty, even though the current inflation rate is low. The independence of the central bank alone can make a significant contribution to building up the credibility of a stability-oriented economic policy.

The prevailing opinion among the economic and political authorities in most western market economies in the post-war period up to the 1970s was that a negative correlation existed between inflation and unemployment. This is the Phillips curve, named after an influential article by Phillips in the late 1950s, Phillips (1958), which empirically documented this correlation on the basis of British data.

The concept of the Phillips curve met with great approval among economic policy-makers, but from the outset the notion of a simple choice between inflation and unemployment was criticised by certain parties in the academic world. The argument was that the simple relationship would collapse if the authorities were to use it systematically to press unemployment below its "natural" level, also called structural unemployment. In that case the population would adapt their inflation expectations and wage demands to reflect the actual development. The consequence would be rising inflation. In the literature this is known as the "expectation-augmented Phillips curve", cf. Box 2. In the long term the expectation-augmented Phillips curve is vertical, since there is no long-term trade-off between unemployment and inflation, nor is there any correlation between nominal wage increases and real wages in the long term. Real income per capita is determined by real-economic fundamentals such as productivity and endowment with natural resources. Furthermore, attempts to force the nominal wage-increase rate above the rate of productivity increase will result in rising inflation and/or – in a small open economy – a growing current-account deficit.

Although the prevailing viewpoint today, supported by both the theoretical and empirical literature, is that there is no long-term trade-off between unemployment and inflation, many factors indicate a short-term correlation. This implies that reducing a given inflation rate can be associated with costs such as unemployment and loss of growth. Such costs are typically non-recurring, while the benefits of low inflation are permanent. If the costs are high enough, however, they can in principle exceed the discounted value of the permanent gain.

The costs of reducing inflation can be measured as a "sacrifice ratio", which is the percentage loss in GDP per percentage point of the inflation decrease. There is no reason to believe that the costs are constant and theoretically they can be zero, cf. the following description of Danish experience. Moreover, it is not given that the costs of reducing
inflation are independent of the level of inflation. The costs will probably be higher the closer the inflation reduction target is to zero, see Akerlof (1996).

The expectation-augmented Phillips curve describes inflation as a function of the difference between actual and structural unemployment and inflation expectations. There is a tendency for structural unemployment to rise when actual unemployment increases, a phenomenon called
"hysteresis" in the literature. Hysteresis signifies that the costs in terms of loss of economic growth of reducing inflation once it has risen may be considerable. In macroeconomic terms it is therefore important to maintain a fixed moderate rate of inflation.

A significant point that can be concluded from the expectation-augmented Phillips curve is that the actual inflation rate depends on the expectations of future inflation. This emphasises the central role of expectations in price formation, implying that inflation may have its own inherent dynamics if there is a lack of confidence in economic policy in general and monetary policy in particular.

ARGUMENTS AGAINST ABSOLUTE PRICE STABILITY

As argued above, in practice price stability has to be defined as an inflation rate close to zero, but why not exactly zero? The classical argument is that while inflation is like sand in the price formation process, it is like oil on the labour market, cf. Fischer (1996). Nominal wages are typically assumed to be rigid when decreasing, and in certain cases the same perhaps applies to the nominal rate of increase. A supply shock such as an oil price increase, or a falling order intake for an individual business enterprise, may require a slower rate of increase or even a direct decrease in real wages for a period of time if redundancies are to be avoided. This process can be facilitated by a positive rate of price increases.

Wage rigidity is more a convention than a structural characteristic of the economy, however, and as such can be changed. For example, it is possible that a long period of low inflation will enhance wage flexibility even in nominal terms. A similar conclusion can be drawn from the fact that many business enterprises use bonus schemes as a supplement to wages and salaries. This makes it easier to adjust real wages downwards. Significant productivity improvements in themselves make it easier to adjust relative wages, without necessarily implying a reduction in nominal rates.

Another argument against absolute price stability is that the limit for downward adjustment of the nominal interest rate is zero. With a zero inflation rate the authorities therefore have no scope to generate negative short-term real interest rates, which might be appropriate in a deep recession.

It is generally accepted that the consumer price index tends to overestimate the true rate of price increases. This is another argument in favour of an inflation target above zero. Finally, the move from low inflation to

---

1 See a criticism of this argument in Issing (2000) and the discussion in King (1999).
zero inflation may entail greater costs than benefits. All in all, there are important arguments against an inflation target of exactly zero.

**DENMARK’S EXPERIENCE OF INFLATION**

The course of Denmark’s economy in the 20th century is very different from the 19th century economy in terms of price development. From 1820 until 1900 the background to economic growth was a stable average price level, while economic growth in the 20th century was followed by strong price increases. At the same time real growth was significantly stronger. The price level at the end of the 20th century was more than 50 times higher than at the beginning of the century, cf. Chart 3. The average rate of price increases was just over 4 per cent p.a., but was subject to considerable fluctuation. Not surprisingly, inflation was high in periods of war, i.e. during the first and second world wars and during the Korean war in the early 1950s. The period after the first world war was followed by a long period of deflation, i.e. a falling price level. The period after the other two wars was also followed by periods of moderate price increases.

In view of the economic stagnation, mass unemployment and political polarisation experienced in the 1930s, after the war the general view of economic policy-makers in the western market economies was that full employment should be given top priority in economic policy. Another

<table>
<thead>
<tr>
<th>INDEX OF RETAIL PRICES FOR DENMARK</th>
<th>Chart 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Index 1820 = 100</td>
<td></td>
</tr>
<tr>
<td>5,000</td>
<td></td>
</tr>
<tr>
<td>1,000</td>
<td></td>
</tr>
<tr>
<td>500</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
</tr>
<tr>
<td>1800 1825 1850 1875 1900 1925 1950 1975 2000</td>
<td></td>
</tr>
</tbody>
</table>

Sources: Svend Åge Hansen (1984), Jørgen Pedersen (1930) and Statistics Denmark, 10-Year Statistical Overview.

Note: Logarithmic scale.
high priority was a low inflation target. It was realised at an early stage that there could be a conflict between the two targets, but generally policy-makers were optimistic about achieving both. The prevailing view was that on planning economic policy, policy-makers had to choose be-
tween unemployment and inflation, so if they opted for a lower unemployment rate, a slightly higher inflation rate could be tolerated.

The development in the 1970s with both high unemployment and a high and rising rate of inflation – stagflation – in many ways confirmed the criticism of policy-makers’ application of the Phillips curve concept to economic policy. There was talk of the collapse of the Phillips curve. This was the background to the reorientation of economic policy in many western countries after 1980, with greater focus on price stability as a central element of the economic framework. This meant a more independent role for monetary policy, which in the preceding decades had been overshadowed by fiscal policy. Chart 2 clearly shows the result of this reorientation of economic policy.

Charts 4 and 5 show the development in Denmark’s inflation rate and long-term yield vis-à-vis Germany, which is the OECD country which has pursued the most consistent anti-inflationary, stability-oriented economic policy in the period after the second world war. This should be viewed in the light of e.g. the consequences of the hyperinflation of the 1920s. During the 1970s, like most other OECD countries Denmark’s economic performance was significantly poorer than Germany’s, with lower growth and greater imbalances, even though the external supply shocks as significant oil price increases in 1973 and 1979 had an equal effect on all countries. It is not our intention here to undertake an in-depth analysis of the stagflation of the 1970s, but merely to point out a few of the

---

**WAGE-INCREASE RATES AND INFLATION IN DENMARK AND GERMANY**

<table>
<thead>
<tr>
<th>Year</th>
<th>Denmark</th>
<th>Germany</th>
</tr>
</thead>
<tbody>
<tr>
<td>1961</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1962</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1963</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1964</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1965</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1966</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1967</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1968</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1969</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1970</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1971</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1972</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1973</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1974</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1975</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1976</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1977</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1978</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1979</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1980</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1981</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1982</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1983</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1984</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1985</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1986</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1987</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1988</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1989</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1990</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1991</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1992</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1993</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1994</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1995</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1996</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1997</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1998</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>1999</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
</tbody>
</table>

---

**Legend:**
- Blue line: Rate of wage increase in Denmark
- Orange line: Rate of wage increase in Germany
- Purple line: Inflation in Denmark
- Green line: Inflation in Germany
factors contributing to Denmark's especially poor inflation performance in this period.  

A special characteristic of Denmark was the automatic cost-of-living adjustment whereby wage earners were compensated for cost-of-living increases, subject to a certain time lag. A number of other countries, but not Germany, had similar systems, but these were less systematic and widespread than in Denmark. The tax system, transfer income rates, etc. were also index-linked to a certain degree. The degree of index-linking was thus higher in the Danish economy than in most other economies.

The rising inflation at the beginning of the 1970s was followed by increasing unemployment. It was sought to reduce the high unemployment rate with an expansionary fiscal policy, but without success. In the monetary area a fixed-exchange-rate policy was pursued in principle within the currency snake, but in practice the krone was devalued repeatedly vis-à-vis the strong currencies in the snake, including the D-mark. In general, these were not offensive devaluations to achieve a competitive edge, but accommodating policy measures intended to rectify the loss of competitiveness as a consequence of preceding excessive wage increases. The wage increases were excessive due to such factors as expectations of continued high inflation, which turned out to be a self-fulfilling prophecy in the light of the automatic cost-of-living adjustment and devaluations. The interplay between actual inflation, expected inflation, wage formation and the fiscal and exchange-rate policies pursued are thus key elements of the economy's course in the 1970s. The two significant supply shocks, i.e. the oil price increases in 1973 and 1979, were allowed to trigger a wage-price spiral, cf. Chart 6, via an inappropriate economic-policy response and an inopportune structural framework, i.e. the cost-of-living adjustments. Even the economists had insufficient understanding of these interrelations at that time. The index-linking in the economy was part of the problem, and not the solution – as it is often presented in some of the theoretical literature. Other countries reaped similar experience, see e.g. the description of Israel in Patinkin (1993).

The combination of inflation and Denmark's tax system at that time meant that for many people the real interest rate after tax was negative for long periods from the 1960s up to the first half of the 1980s, cf. Table 1.

Private households' real interest rates after tax depended on the marginal tax rate and thus varied from one borrower to the next. The neg-
ative real interest rate after tax was an incentive to spend more on housing and less on private savings and was a significant factor behind the permanent macroeconomic imbalances during this period. In addition, this framework was an incentive to accumulate debt in the household sector, leading to an increasing loss of revenue in the general government sector due to the tax deductibility of interest payments. At the same time the rate of taxation of pension fund yields was zero up to the introduction of the real-interest tax in 1983. This factor contributed to the central-government finance deficit as from the mid-1970s. Various credit restrictions and other credit-policy measures were introduced to dampen credit-financed consumption and housing investments.

The problems accelerated towards the end of the 1970s. In 1979 the krone was devalued a couple more times to make up for the preceding loss of competitiveness due to excessive wage increases. Nevertheless, there was fear of further devaluations. The long-term yield differential to Germany, which is an indicator of the spread in inflation expectations, rose to a historically high level of approximately 10 percentage points. Together with a dramatic increase in the central-government finance deficit this fuelled the debate of whether Denmark was heading for an economic abyss.

The restructuring of economic policy began towards the end of the 1970s with the first signs of the elimination of cost-of-living adjustments being the freezing and the lapse of certain cost-of-living adjustments. The decisive step towards restoring the credibility of economic policy and eliminating inflation expectations was taken in the autumn of 1982 when the new government refrained from adjusting the exchange rate and instead announced that a fixed-exchange-rate policy would now be pursued. Soon afterwards the remaining part of the cost-of-living adjustment was suspended – and abolished completely by law in 1986 – while at the same time fiscal policy was tightened. The market reacted quickly and strongly. Inflation and the nominal interest rate plummeted immediately and in the following years Denmark was able to follow the downward trend in international interest rates.
The reduction of inflation from 1982 and in the ensuing years was surprising in terms of its pace and because it did not have any immediate real costs such as loss of growth. On the contrary, the following period was characterised by strong domestic cyclical development. The Danish upswing drew considerable international attention since the boom immediately followed a considerable fiscal-policy tightening, see e.g. Giavazzi and Pagano (1990) and Bergman and Hutchinson (1999). A factor contributing to the boom was that it took a long time for the households to realise that the decline in the nominal interest rate did not necessarily mean that the real interest rate fell. Indeed it increased. The reversal in 1986 was stronger and more sustained than would otherwise have been the case.

The formation of expectations entails that a fixed, credible inflation target in itself contributes to keeping inflation at a low level. Large countries like Germany have typically achieved this by stating low inflation as a key objective of the central bank. As a small open economy Denmark pursued another strategy and via its announced fixed-exchange-rate policy "imported" the anti-inflation policy pursued by the central banks in the core EMS countries. The fixed-exchange-rate policy ultimately proved its worth during the most recent upswing when the rate of price increases remained moderate for an entire business cycle. Furthermore, the recent collective agreements in the private labour market, which now cover a four-year period, reflect confidence in the economic framework, including price development. The principal argument in favour of the automatic cost-of-living adjustments in previous times was in fact that such adjustments were a precondition for employees to agree to two-year collective agreements, cf. Reasons for Inflation (in Danish) (1966).

The fact that inflation was successfully kept at a relatively stable and low level in Denmark throughout the 1990s is not only a consequence of the fixed-exchange-rate policy, but also of a more smoothly functioning labour market. Part of this success can be attributed to politically determined structural reforms to achieve a more flexible framework for the labour market, but some of the success can be attributed to the improved understanding among wage earners of the international terms to which the economy and business enterprises are subject. It is now accepted that wage demands cannot be made without consideration of the international competitiveness of business enterprises. Previously this understanding did not always exist, and together with the structural reforms it ensures that all in all the Danish labour market is well-prepared for the future, including if Denmark decides to adopt the euro.
BIBLIOGRAPHY


*Housing, inflation and tax* (1987), Nordic Council of Ministers.


Lyngesen, H. (1999), Monetary-Policy Strategies (in Danish), *Nationaløkonomisk Tidsskrift*, no. 3.

Pedersen, Jørgen (1930), Money Wages in Denmark (in Danish).


Statistics Denmark, 10-Year Statistical Overview, Statistics Denmark, various volumes.