

■ Increased competition and inflation

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Inflation has been low in the past decade, in Sweden as well as internationally. It is commonly believed that one reason for this is increased competition. In this study, a dynamic general equilibrium model estimated on data for Sweden is used to show how increased competition affects inflation.

Inflation in Sweden dropped from around 6 per cent in the early 1990s to around 2 per cent a decade later (see Table 1). Inflation also fell in many other countries. The global rate of inflation decreased in this period from 30 to 4 per cent. This was mostly due to inflation in developing countries, where the rate plummeted from 53 to 6 per cent. In the industrialised countries the rate slowed from 4 to 2 per cent.

Table 1. CPI in Sweden and globally.
Percentage annual rate

	1980–84	1985–89	1990–94	1995–99	2000–04
Sweden	10.3	5.6	5.8	0.8	1.6
Global average	14.1	15.5	30.4	8.4	3.9
Industrialised countries	8.7	3.9	3.8	2.0	1.8
Developing countries	31.4	48.0	53.2	13.1	5.6

Sources: Rogoff (2003) and the Riksbank.

How is this remarkable slowdown of inflation in the 1990s to be explained? One reason that is often mentioned is increased competition. The globalisation process, with the expansion of trade and greater openness, is presumed to lead to more competition in product and labour markets. Firms react to stronger competition by cutting profit margins and price mark-ups, which leads to lower prices.

This view was aptly summarised in a speech in 2004 by Riksbank Deputy Governor Kristina Persson: "... the slackening in price trends is a result of many factors that are partly connected with globalisation:

- Increased world trade and more operators lead to greater competition
- Deregulation and privatisation will also mean that competition increases

¹ The author is grateful for comments on earlier drafts of this article from Jesper Lindé, Kerstin Mitlid, Marianne Sterner, Staffan Viotti and Peter Welz.

- A greater degree of specialisation and utilisation of comparative advantages (which is known as global labour reallocation) lead to increased productivity and efficiency
- More production in typically low-wage countries leads to lower costs

All of this indicates that international price pressure should be lower during the coming years at a given point in the economic cycle”.

Among academic economists, Rogoff (2003) has argued that increased competition is a major reason of inflation's slowdown: "... the mutually reinforcing effects of globalization, deregulation, and widespread reduction of the role of government have no doubt sharply increased competition and lowered 'quasi-rents' to monopolistic firms and unions throughout much of the world." He stresses that besides having a direct impact on inflation, a smaller mark-up exerts an indirect effect that leads to greater price and wage flexibility. With smaller mark-ups, firms are more prone to adjust prices in the event of shocks. To the extent that the real economic effects of monetary policy have to do with price and wage rigidities, the effects will be less marked if prices are adjusted more quickly. That leaves central banks with less incentive for and possibilities of stabilising GDP, which should result in a less activist monetary policy and a stronger focus on stabilising inflation.

It should be borne in mind that increased competition is not the only explanation that is put forward for the slowdown in inflation. Another example is improvements in monetary policy. A number of monetary policy reforms in the 1990s led, for example, to greater central bank independence. Many countries introduced a specific target for inflation. These developments also induced central banks to become more transparent, which calls for clearer communication and better analyses.

Another common explanation is sounder fiscal policies. In Sweden, for instance, large public sector deficits in the early 1990s were transformed into surpluses in the early 2000s. While it is true that an improvement in the public finances was not a global phenomenon in the 1990s, it may have contributed in some countries. Finally there is stronger productivity growth, which serves as an explanation for the United States but less so for Europe and other regions. For a fuller discussion of these alternative explanations, see Rogoff (2003) and the references there.

The focus of this study is, however, on the relationship between increased competition and inflation. The purpose is to clarify how inflation is affected by increased competition in product and labour markets. The degree of competition is measured in terms of price and wage mark-ups. Decreased mark-ups lead more or less by definition to a lower price level. In the period during which prices are adjusted to a lower level, price

movements (inflation) also decrease. So the impact of increased competition on inflation is transient. But due to the number of factors that are involved, it is hard to tell how large the impact will be and how long the adjustment will take. The following factors are considered in this study:²

- *The type of market that is exposed to competition.* The quantitative effects differ according to whether competition increases in the product as opposed to the labour market. In the product market, moreover, a distinction is made between the markets for domestic and imported consumer goods, respectively.^{3,4} As we shall see, the effects on inflation also differ depending on which of these two markets is exposed to competition.
- *The degree of price and wage rigidities in the economy.*
- *Monetary policy.* As inflation is a monetary phenomenon, the central bank can, in principle, keep inflation completely stable in the event of increased competition. However, that would entail costs in the form of large fluctuations in interest rates and GDP.

EMPIRICAL STUDIES POINT TO THE IMPORTANCE OF DEREGULATIONS

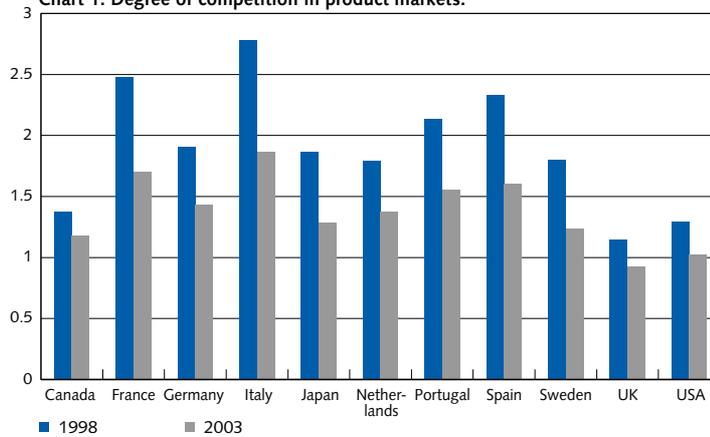
This study's results are largely theoretical. There is, however, an interesting body of empirical literature on estimating how the degree of competition changes over time. The OECD, for example, has presented a number of studies in this field. In a recent publication (OECD 2006), survey data are used to calculate a variety of indicators of the degree of competition. The indicators, for instance of state control, barriers to entrepreneurship and barriers to trade and investments, are combined into a weighted aggregate measure. Chart 1 presents the degree of competition in product markets in a number of countries in 1998 and 2003. The value of the indicator ranges from 0 to 6 and the lower the value, the greater is the degree of competition. Product market regulation in 1998 was higher than in 2003 in every country, which points to deregulation being a global phenomenon.

² One important factor that is not considered here but is discussed in Asplund & Friberg (1998) is the type of competition.

³ The model also includes markets for imported investment goods and export goods but increased competition's effects on these markets are not analysed here.

⁴ The analysis is simplified by making no distinction between goods and services. In practice, domestic goods consist predominantly of services.

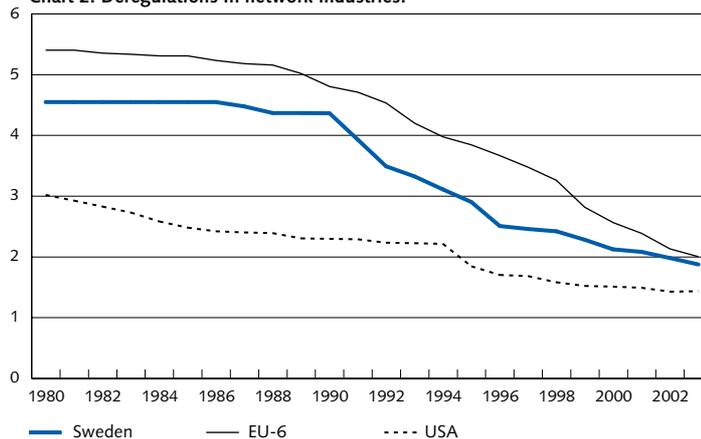
Chart 1. Degree of competition in product markets.



Sources: OECD and the Riksbank.

The broad indicator of product market reforms that is reproduced in Chart 1 has been calculated only for 1998 and 2003. To obtain a picture of developments over a longer period, the OECD has calculated an indicator of regulation in energy, transport and communications. This indicator summarises regulatory provisions in seven sectors: telecoms, electricity, gas, post, rail, air passenger transport, and road. The period from 1980 to 2003 is presented in Chart 2 for Sweden, EU-6 and the United States.⁵ Here, too, the indicator's value ranges from 0 to 6, with 0 as the most liberal situation. This indicator shows that the process of deregulation began in earnest in the early 1990s in Sweden and EU-6 and some years later in the United States.

Chart 2. Deregulations in network industries.



Sources: OECD and the Riksbank.

⁵ EU-6 comprises the EU member states that are most important economically: the United Kingdom, France, Germany, Spain, Italy and the Netherlands.

It is worth noting that explicit attempts to measure price mark-ups tend to find little evidence of increased competition in the past decade and a half. In one such study (Bowman 2003), of the 20 OECD countries that were included, only four (Portugal, Japan, Greece and Norway) had a price mark-up in the early 2000s that was lower than a decade earlier. In Sweden, for example, the mark-up was somewhat higher at the beginning of the 2000s. However, studies of this type produce results that are rather uncertain. Data on production costs, for example, are difficult to come by. Instead, the inverse of real unit labour costs is often used to measure the price mark-up, which is correct only under certain special circumstances.

LABOUR MARKET REFORMS ARE LIKELY

Labour markets have been subject to relatively fewer reforms than product markets. But there is reason to suppose that such reforms will occur as globalisation continues. Persson & Radetzki (2006) argue that the global economy can expect a huge supply shock when China, India and Eastern Europe enter the world market. Major wage cuts will be needed, for example, to keep labour markets intact. Moreover, according to Calmfors (2006, translated here): "In the first place we should adjust by means of structural changes and increased productivity. But greater wage flexibility may be called for, too. Possible ways of achieving this are more decentralised wage formation, longer working hours, lower compensation for unemployment, tax rebates on low-pay income and a shift in the balance of strength between the parties in the labour market." Under these circumstances it is also relevant to look at the consequences for inflation of increased competition in the labour market.

This study continues as follows. The theory and model that are used to illustrate the relationship between increased competition and inflation are presented in the next section, followed by an account of how inflation is affected by increased competition in product and labour markets. The article ends with some concluding comments.

The dynamic general equilibrium model

Analysing how increased competition affects inflation calls for a theoretical framework or model. The purpose of the model is to illustrate, in simple but consistent terms, the basic mechanisms that determine how inflation is affected by increased competition in product and labour markets. This study starts from a dynamic general equilibrium model based on New-Keynesian theory and estimated on data for Sweden. The model is consistent with a number of well-known facts about long-term

growth and has proved capable of explaining a large part of the short-run fluctuations in the main macro variables. The model is, moreover, used regularly in the Riksbank's forecasting work. For a fuller description of the model, see Adolfson et al. (2005, 2007).

The model is constructed to describe a small, open economy, which means that the domestic economy does not influence either interest rates, GDP or inflation in other countries. Households and firms therefore take these variables as given in their decisions. In a dynamic general equilibrium model, households strive to maximise utility over the life cycle and firms aim to maximise profits over time. Prices are the mechanism that generates an equilibrium where supply balances demand in every market.

An important feature of the model is that prices and wages are characterised by rigidity. This means that in the event of a change in the economy, for instance an increase in competition, prices and wages adjust gradually, not immediately. According to Apel et al. (2004), firms in Sweden alter their prices approximately once a year on average. In order to reproduce this behaviour, the model assumes that those who set prices and wages can do so only at certain (randomly given) points in time. The frequency of the adjustments has been estimated with Bayesian methods and turns out to differ between markets. In the market for domestic products, prices are changed once a year on average, which agrees with the findings in Apel et al. (2004). The frequency is the same in the labour market, that is, wages are altered once a year on average. In the market for imported products, on the other hand, prices are considerably more rigid and are changed every second year on average.

Monetary policy is described by a Taylor rule, which means that the central bank reacts to changes in the rates of inflation and GDP. An increase in prices and/or GDP causes the central bank to react by raising its policy rate to stabilise the fluctuations in these variables. In this way, the central bank takes the real economy into consideration in its policy rate decisions.

COMPETITION AND INFLATION IN THE MODEL

Product and labour markets are characterised by monopolistic competition. In product markets this means that there is a large number of firms which compete with each other by turning out similar but not identical products. Due to this product differentiation, the products are close but not perfect substitutes for each other. With many firms in the market, each one produces just a small share of the total supply, which means that the prices charged by one firm do not affect the pricing strategies

of other firms. Moreover, each firm faces a negatively sloped demand curve and can therefore choose the price that maximises profit, given this demand curve.

Monopolistic competition is a market structure with perfect competition and monopoly as the polar cases. Perfect competition obtains if the products are perfect substitutes; a market with only one firm is a monopoly. Oligopolistic competition, a market structure characterised by strategic interaction between firms, is not included in the model. Due to the complications involved in modelling the strategic interaction, oligopolistic competition tends to be disregarded in macro models of this type.

In a model with monopolistic competition, firms maximise profits by setting the price, P , as a mark-up, λ , on the marginal cost, MC :⁶

$$(1) \quad P = (1 + \lambda) \cdot MC$$

The mark-up in turn is a function of the elasticity of product substitution. A high substitution propensity gives a low mark-up. As the substitution propensity approaches infinity, the mark-up approaches zero per cent, $\lambda = 0$, and the market is then in a state of perfect competition. Note that a permanent reduction of the mark-up gives a permanently lower price level. In other words, a reduced mark-up's impact on changes in the price level (i.e. inflation) is only transient. A permanent effect on inflation from increased competition would therefore require a continuous reduction of mark-ups. As mark-ups cannot be less than zero per cent, that is clearly not possible.

Two types of firm are included in the model, domestic firms that supply domestic products and import firms that supply foreign products. Marginal costs differ between these two types of firm. Domestic firms produce products with the aid of labour and capital, so their marginal costs depend on wages and interest rates. Higher wages and interest rates entail higher marginal costs. Import firms purchase products from abroad and sell them on to households. Their marginal costs accordingly depend on prices abroad and exchange rates. Higher prices abroad and a weaker exchange rate lead to higher marginal costs.

As Sweden is a small open economy, it is reasonable to assume that prices abroad are not affected by changes in competition in Sweden. In the scenarios presented in the next section, the price of imported products is therefore determined primarily by exchange rate movements. The exchange rate is, among other things, determined by conditions for interest rate parity, with the interest rate differential with the rest of the

⁶ The marginal cost is the additional cost of adding one unit to output; in general, this does not equal the cost of producing the last unit.

world as the main driving force. A high interest rate in Sweden compared with abroad entails an expected weakening of the exchange rate; that is, the future exchange rate must be weaker than at present. The weakening can, in principle, occur in one of two ways or as a combination of them: a stronger current level with the future level unchanged or an unchanged current level with a weaker future level. Conversely, of course, a low domestic interest rate compared with abroad entails an expected strengthening of the exchange rate.

The division of products into domestic and imported items follows the method Statistics Sweden uses to calculate CPI inflation. This is done as a weighted combination of price movements for domestic and imported products. Taking π^{dom} and π^{imp} to denote domestic and imported product price movements, respectively, CPI inflation, π^{CPI} , is written:

$$(2) \quad \pi^{\text{CPI}} = (1 - \omega) \cdot \pi^{\text{dom}} + \omega \cdot \pi^{\text{imp}}$$

where ω is the weight for price movements for imported products and is set to 0.27. Thus, for domestic products a reduced domestic mark-up mainly affects π^{dom} and a reduced mark-up on imported products mainly affects π^{imp} .

The labour market is likewise represented by a model of monopolistic competition, which means that there is a large number of households whose services are close but not perfect substitutes. The market power of households accordingly resembles what they would have if they were organised in trade unions. In other words, households are wage-setters. In this capacity they weigh the marginal utility of leisure time against the marginal utility of the income they can earn, given the demand for labour.⁷ The strength of households' wage-setting power is expressed as a wage mark-up.

With monopolistic competition, households/trade unions maximise utility by setting the wage, W , as a mark-up on the marginal rate of substitution for leisure time in terms of consumption, MRS :

$$(3) \quad W = (1 + \lambda^w) \cdot \text{MRS}$$

The marginal rate of substitution represents the amount of consumption households are prepared to abstain from in order to obtain an additional unit of leisure time. In the special case of perfect competition in the labour market, $\lambda^w = 0$, households choose the combination of consumption and leisure time that gives equality between the marginal rate of

⁷ Marginal utility measures the change in total utility that results from consuming one additional unit of a product.

substitution and the wage. This means that households' preference for increased leisure time in exchange for decreased consumption equals the alternative cost, that is, the wage.⁸ The market power of households enables them to obtain a wage that is higher than the value they assign to leisure time.

The wage mark-up affects prices in the economy via its impact on wages and thereby the firm's marginal cost. A reduced mark-up leads to a lower wage, given that the marginal rate of substitution does not increase. The firm then has a lower marginal cost and cuts its prices. In general, however, there tends to be some increase in the marginal rate of substitution, which means that the wage does not fall as much as would otherwise have been the case. A lower wage strengthens labour demand and that leads to an increased labour supply, which reduces leisure time. With less leisure time, the value households assign to leisure time rises, giving an increase in the marginal rate of substitution.

ESTIMATING PRICE AND WAGE MARK-UPS

Price and wage mark-ups are commonly used in economic literature to measure the degree of competition. They have been estimated for the markets considered here with Bayesian methods. This gave price mark-ups of 22 per cent for domestic products and 8 per cent for imported products. Typical estimates for Europe and the United States are around 35 and 23 per cent, respectively, see Bayoumi et al. (2004). This indicates that competition in product markets in Sweden is higher than in Europe but much the same as in the United States. The wage mark-up is set in the model to 30 per cent, which is a typical value for European economies according to Bayoumi et al. (2004).

WHAT DETERMINES INCREASED COMPETITION'S IMPACT ON INFLATION?

To what extent is a reduction of the price or wage mark-up likely to affect inflation? Equations (1) and (3) suggest that a 1 per cent reduction in either case would lower the price level 1 per cent. However, this need not be the case, for a number of reasons. The pass-through will be smaller as a rule, as explained in the next section, where the following reasons are discussed:

⁸ The wage measures what households lose by choosing more leisure time, that is, it measures leisure time's alternative cost. Alternative cost is the yield obtainable from the best alternative utilisation of a particular resource; in other words, the yield that is lost by choosing some other alternative.

- The marginal cost for domestic firms consists of wage and interest expenditures. A price cut for domestic products leads to increased demand from households. Output then rises and with it firms' demand for labour and capital. That pulls wages and interest rates up. A reduced price mark-up on imported products tends to push up the marginal cost for import firms because the exchange rate weakens. Finally, a lower wage mark-up tends to push up the marginal rate of substitution for leisure time relative to consumption. It follows that the quantitative effects on inflation vary with the type of market that is exposed to competition. The quantitative effects on inflation of increased competition in product markets differ from those associated with increased competition in the labour market. Neither are the quantitative effects of increased competition necessarily the same in markets for domestic compared with imported products.
- Due to rigidities, prices and wages do not immediately adjust to a shock in the economy. There is therefore less than a full pass-through to prices from a reduction of price and wage mark-ups.
- Monetary policy. Inflation is a monetary phenomenon and its development is accordingly determined by the central bank. In principle, a price fall generated by increased competition can be countered by the central bank cutting its policy rate. However, sizeable interest rate cuts are liable to lead to large fluctuations in GDP.

Quantitative analysis of increased competition

This section presents inflation's dynamic adjustment to increased competition in product and labour markets. The focus is on inflation but the account also includes the adjustment of the interest rate and GDP. For simplicity's sake, the price and wage mark-ups are assumed to decrease 1 percentage point in period 1 and then gradually return at a uniform rate that brings them back to the long-term (initial) value after 6–7 years. The duration of the reduction determines how long it takes for inflation to adjust: the longer the duration, the more protracted the adjustment. The paths are plotted in the charts as deviations from the long-term levels. For the three measures of inflation, π^{cpi} , π^{dom} and π^{imp} , and the interest rate, the deviations are plotted in percentage points (at quarterly rates) and for GDP as the percentage deviation from steady state (at an annual rate). The results are shown for 12 quarters (3 years) ahead.

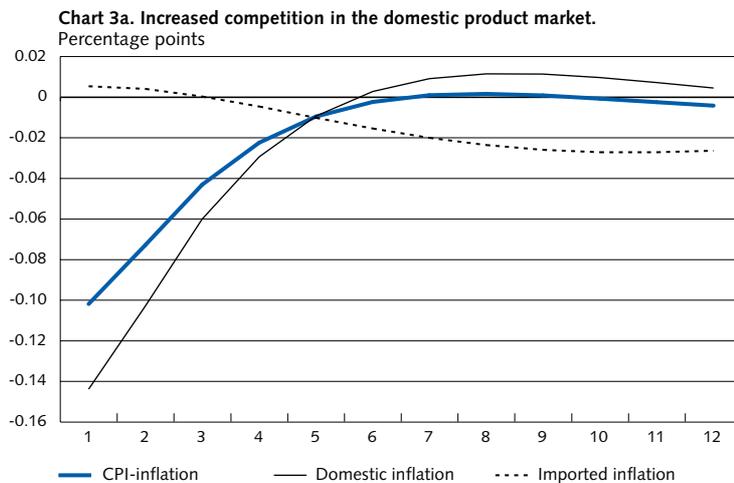
Three different scenarios are studied. The price mark-up is reduced by domestic firms in the first scenario and by import firms in the second. The third scenario is a reduction of the trade unions' wage mark-up. The purpose of the scenarios is to estimate increased competition's quantita-

tive impact on inflation and also discuss the economic relationships that drive the adjustment.

INCREASED COMPETITION IN THE DOMESTIC PRODUCT MARKET

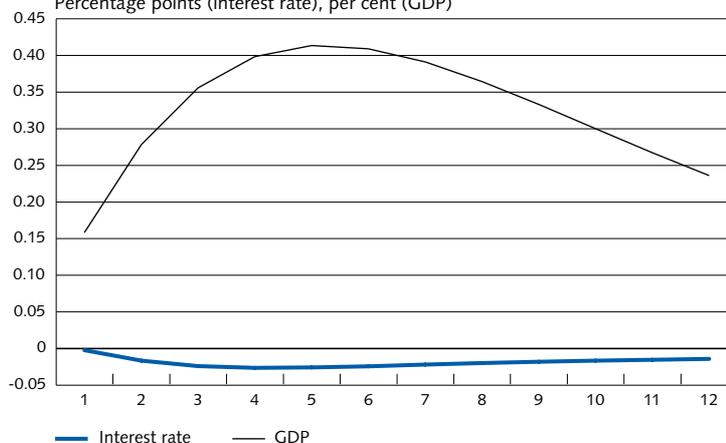
The first scenario – the impact on inflation from domestic firms reducing their price mark-up – is intended to illustrate a situation where foreign firms, in China and India for example, that have lower costs start to sell their products in the domestic market. This forces domestic firms to lower price mark-ups in order to stay in the market. The mark-up is assumed to fall from 22 to 21 per cent, that is, by one percentage point.

The dynamic paths for inflation, the interest rate and GDP are shown in Charts 3a and 3b. Domestic inflation slows by around 0.15 percentage points initially. A larger pass-through is essentially precluded by the factors that were discussed in the preceding section. Due to price and wage rigidities, the adjustment to a change in competition is only gradual. Firms' marginal cost tends to rise. The central bank, finally, lowers the policy rate to avoid an excessive deviation from the inflation target. As the central bank takes the real economy into consideration, the interest rate cut is relatively moderate, 0.03 percentage points at the most.



Source: The Riksbank.

Chart 3b. Increased competition in the domestic product market.
Percentage points (interest rate), per cent (GDP)



Source: The Riksbank.

The price of imported products tends to rise initially and then falls. A lower interest rate leads to a weakening of the exchange rate, which makes imported products somewhat more costly. The CPI accordingly fall 0.10 percentage points initially.

The lower prices stimulate demand and after a year or so GDP has risen approximately 0.40 per cent. This illustrates the tendency for increased competition to enhance welfare, for households as well as firms. The welfare benefits consist as a rule of a more efficient allocation of the economy's resources and an increase in the cost efficiency of firms. Increased competition also generates gains in efficiency as the utilisation of technology benefits from innovations and less efficient firms are closed. However, the model used in this study only accounts for the allocation of resources becoming more efficient. An optimal resource allocation requires, among other things, that the price equals the marginal cost and the wage equals the marginal rate of substitution between leisure time and consumption. In other words, it requires perfect competition in product and labour markets.

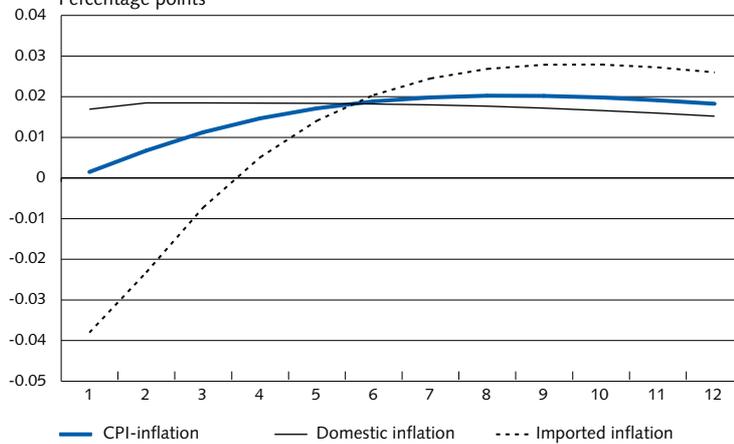
INCREASED COMPETITION IN THE MARKET FOR IMPORTED PRODUCTS

The second scenario – the impact of a reduced price mark-up on imported products – illustrates a situation where increased competition in the rest of the world leads to a price fall for imported products. Note that the state of competition among firms producing domestic products is not affected; in other words, the price mark-up on domestic products is unchanged. Domestic firms adjust prices only insofar as their marginal cost changes. This scenario may seem less plausible. It would probably

be more reasonable to combine a decreased price mark-up on imported products with a resultant reduction of the price mark-up on domestic products. Here, however, these two types of price mark-up are studied separately because this provides information about which of them is most important for the development of inflation.

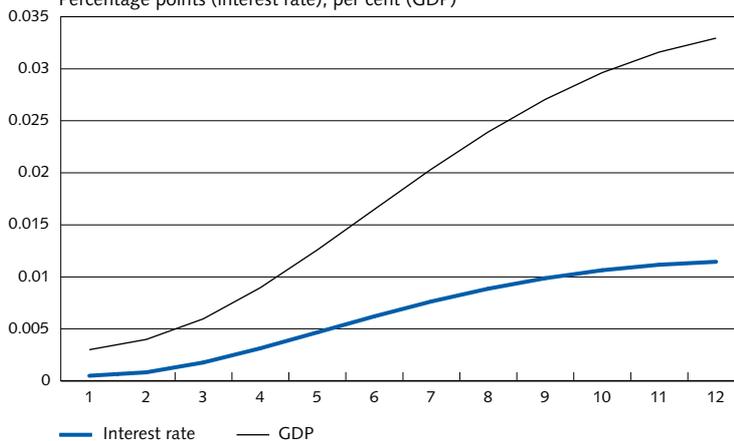
In this scenario the price mark-up on imported products is lowered 1 percentage point, from 8 to 7 per cent. As a result, the price of imported products falls 0.04 percentage points (see Charts 4a and 4b). The low pass-through is mainly due to prices in this part of the economy being relatively rigid. On average, consumer prices for imported products are adjusted only every second year. Another reason for the low pass-through is that a weakening of the exchange rate increases import firms' marginal cost.

Chart 4a. Increased competition in the market for imported products.
Percentage points



Source: The Riksbank.

Chart 4b. Increased competition in the market for imported products.
Percentage points (interest rate), per cent (GDP)



Source: The Riksbank.

A weaker exchange rate leads to increased exports and thereby to higher output and stronger demand for labour. That fuels wage demands and raises the marginal cost of domestic firms. However, the addition to costs is virtually negligible and the domestic price rise stops at under 0.02 percentage points. This leads to some increase in the CPI, where domestic products weigh much more heavily than imported products. The CPI increase reaches a high of 0.02 percentage points after about two years. Higher inflation and GDP growth lead to some increase in the interest rate.

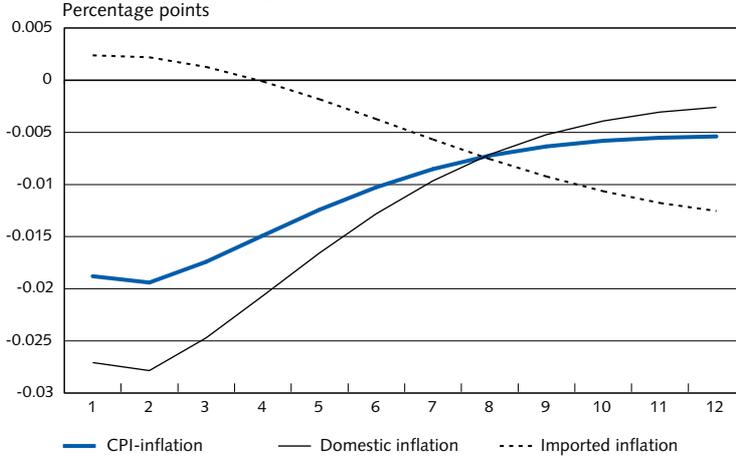
These two scenarios illustrate an important point. The CPI effect of increased competition in the rest of the world depends above all on how the competitive situation for domestic firms is affected. If the lower price mark-up applies only to imported products, the effect on inflation will be marginal. Indeed, as we have just seen, in such a scenario inflation may even rise. If price mark-ups fall for domestic products, too, on the other hand, the effect will be stronger, though in quantitative terms it is still relatively small.

INCREASED COMPETITION IN THE LABOUR MARKET

The third and last scenario shows how inflation is affected by increased competition in the labour market (see Charts 5a and 5b). The wage mark-up is assumed to fall from 30 to 29 per cent. This tends to push wages down. Due to wage rigidities, the pass-through is only partial in the short run. The weaker development of wages reduces the marginal cost for domestic firms and thereby lowers prices. As there are also price rigidities, the pass-through from the lower marginal cost is likewise only partial. The final result is a domestic price fall of less than 0.03 percentage points.

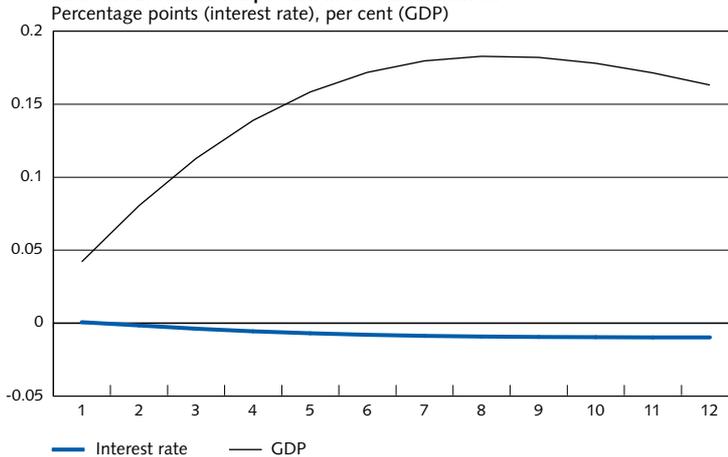
Low wages reduce the cost of hiring labour, which enables firms to expand production. The increase in GDP amounts at the most to 0.20 per cent. As prices fall, the central bank lowers the interest rate even though GDP increases. A lower interest rate leads to a weaker exchange rate, which entails some initial increase in the price of imported products. The CPI falls around 0.02 percentage points. Increased competition in the labour market accordingly has little quantitative effect on inflation.

Chart 5a. Increased competition in the labour market.



Source: The Riksbank.

Chart 5b. Increased competition in the labour market.



Source: The Riksbank.

INCREASED COMPETITION WITH FLEXIBLE PRICES AND WAGES

We have just seen that, as a rule, increased competition has effects on inflation that are small. An important reason for this is that prices and wages are relatively rigid. In a much-quoted article, Rogoff (2003) argues that increased competition should lead to less price and wage rigidity. In the model that is used in this study, however, changes in competition do not affect the degree of price and wage rigidity. But in order to illustrate Rogoff's point, we shall now look at how the results differ when prices and wages are less rigid. For the sake of simplicity we assume that prices and wages are completely flexible. That gives an upper limit for the quantitative importance of price and wage rigidities.

Chart 6 shows how inflation is affected when the price mark-up on domestic products is lowered 1 percentage point and prices and wages are entirely flexible. The price of domestic products falls 0.40 percentage points initially compared with 0.15 percentage points with price and wage rigidities. The pass-through to the CPI is approximately 0.25 percentage points as against 0.10 percentage points with rigid prices and wages.

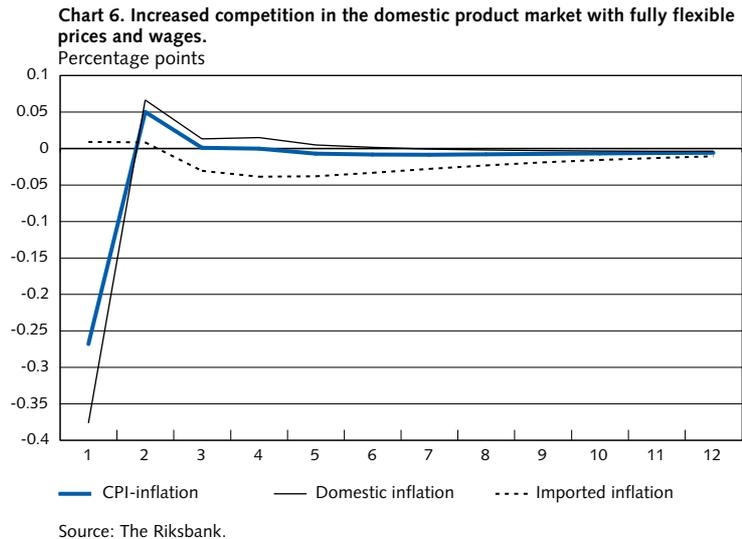
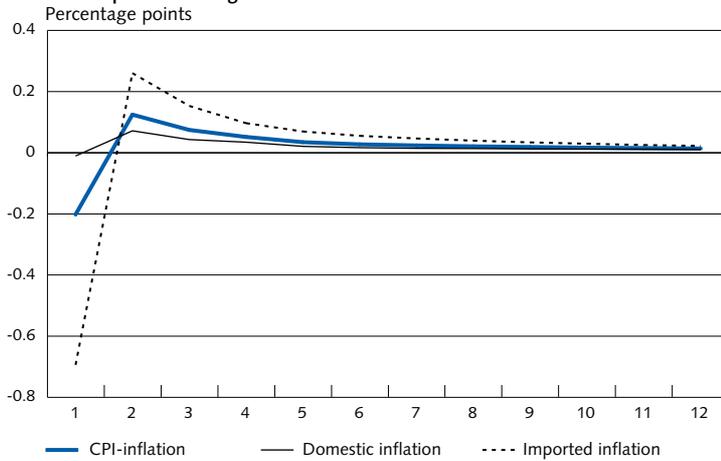


Chart 7 shows the effect on inflation when import firms lower their price mark-up 1 percentage point. The price of imported products then falls as much as 0.70 percentage points compared with the marginal price fall of 0.04 percentage points with price and wage rigidities. As mentioned earlier, the large difference has to do with price rigidities being relatively strong in this sector. Another point to note is that in this case the CPI falls, in quantitative terms by 0.20 percentage points.

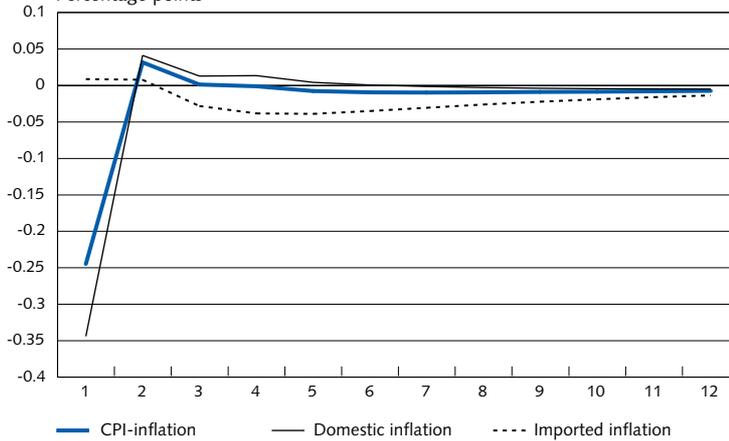
The extent to which prices are affected by increased competition in the labour market is largely dependent on the degree of wage flexibility. The pass-through from a lower wage mark-up to wages increases as wages become more flexible. Price rigidities are important, too, because they affect the extent to which the change in the marginal cost is passed on to prices. With fully flexible prices and wages, the pass-through to domestic prices is 0.35 percentage points (see Chart 8). As we saw in the preceding section, with price and wage rigidities the pass-through is less than 0.03 percentage points. The pass-through to the CPI is 0.25 percentage point as against 0.02 percentage points with price and wage rigidities.

Chart 7. Increased competition in the market for imported products with fully flexible prices and wages.



Source: The Riksbank.

Chart 8. Increased competition in the labour market with fully flexible prices and wages.



Source: The Riksbank.

To sum up, this section shows that price and wage rigidities are of major importance for the quantitative outcome. They are particularly important for the result of a lower wage mark-up and a lower price mark-up on imported products.

INCREASED COMPETITION AND MONETARY POLICY'S RESPONSE

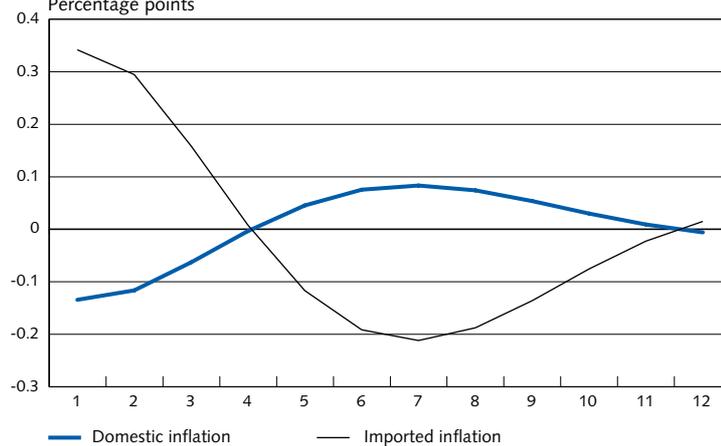
In the results presented above, the central bank chose to refrain from stabilising inflation completely when competition increased. Consideration was paid to the real economy; the fluctuations in GDP were stabilised in addition to the development of inflation. As it is possible in principle for a central bank to keep inflation completely stable, it is of interest to study what the effects of such a policy would be. There would, of course,

be no fluctuations in inflation but considerably larger fluctuations in the interest rate and thereby in GDP. The purpose of this section is to present the magnitude of these fluctuations. The focus is on the result of a lower price mark-up on domestic products. As we have seen, the CPI effects of a lower price mark-up on imported products and a lower wage mark-up are virtually negligible.

Chart 9 presents a scenario where the price mark-up on domestic products falls 1 percentage point and the central bank chooses to keep the CPI completely stable. Under these circumstances, the domestic price level falls approximately 0.15 percentage points initially. An unchanged CPI then requires an increase in imported prices. In quantitative terms, the increase needs to be approximately 0.35 percentage points. To achieve this, the central bank lowers the interest rate approximately 1 percentage point, which weakens the exchange rate and makes imported products more costly. The marked interest rate cut leads to large fluctuations in GDP, with an increase that reaches as much as 1.2 per cent. An increase in GDP may seem positive but a central bank that takes the real economy into consideration is intent on reducing the fluctuations around some “normal” level of GDP, in this case the steady state.⁹ In other words, the central bank tries to avoid positive as well as negative deviations.

Briefly, then, this scenario shows that it is relatively costly for the central bank to keep the CPI completely stable. Large fluctuations occur in the interest rate as well as in GDP. It is therefore reasonable to expect that the central bank allows changes in competition to affect inflation. As we have seen, even when the central bank takes the real economy into consideration, the fluctuations in the CPI are relatively moderate.

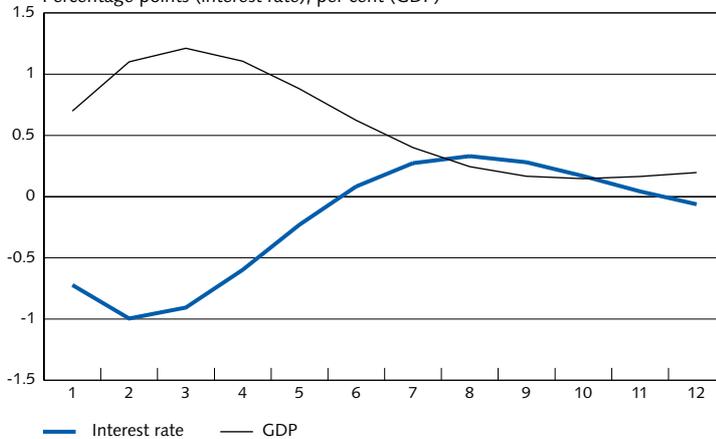
Chart 9a. Increased competition in the domestic product market with complete central bank stabilisation of the CPI.
Percentage points



Source: The Riksbank.

⁹ There are a number of different ways to define the “normal” level, see Palmqvist (2007) for a discussion.

Chart 9b. Increased competition in the domestic product market with complete central bank stabilisation of the CPI.
Percentage points (interest rate), per cent (GDP)



Source: The Riksbank.

Concluding comments

This study aims at quantifying how increased competition affects inflation. It looks at the effects when price and wage mark-ups are lowered 1 percentage point in period 1, followed by a return at a uniform rate to the initial levels. The return is assumed to take approximately 6–7 years.

Increased competition turns out to have quantitative effects on the CPI that are small. A 1 percentage point reduction of the price mark-up on domestic products has an initial impact of 0.10 percentage points on the CPI. The CPI effects of increased competition in the imported products market and the labour market are virtually negligible.

A major reason why increased competition's impact on inflation is relatively small is that prices and wages in Sweden are relatively rigid. As we have seen, if prices and wages were fully flexible, the quantitative effects would be considerably larger. In a much-quoted study, Rogoff (2003) argues that price and wage rigidities are dependent on the degree of competition; increased competition leads to more flexible prices and wages. In that case, this model may underestimate increased competition's quantitative impact on prices. There are, however, other theories that point to increased competition leading to greater price and wage rigidities. Briefly, one such theory, presented by Woodford (2003), envisages that the risk of losing market share makes firms averse to their prices differing too much from the average price level. Increased competition accentuates the risk of losing market share and makes firms less prone to alter prices. So in theory there is no clear foundation for how price and wage rigidities are affected by increased competition. It may therefore be reasonable to assume, as we have done in the present model, that price and wage rigidities are independent of the degree of competition.

Finally, what conclusions can be drawn from this study of increased competition and its importance for inflation? The aim has been to discuss and quantify the relationship with the aid of a specific model. The account shows that the relationship between competition and inflation is complex, which rules out any simple conclusions. Still, the general picture presented here does suggest that increased competition's quantitative effects on inflation are relatively moderate. This also agrees with the conclusion in Asplund & Friberg (1998): "Having completed this survey, our reading of the evidence is that the primary explanation of low inflation rates in many countries in the last decade is not intensified competition." Instead, one of the primary reasons of the low inflation in Sweden in 2004–06 is presumably increased productivity; for an analysis of this, see Adolfson et al. (2007)

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