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# The costs of inflation – what have we learned?

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This article reviews what we know about the long-run impact of inflation on economic growth. Economic theory tells us that both high inflation and deflation adversely affect the economy. Inflation tends to benefit the wealthy at the expense of the poor and those on fixed incomes and it reduces economic growth over the long term. The experiences of New Zealand and other industrialised countries since World War II generally support this negative long-term relationship between inflation and growth. The experience of Japan illustrates the negative impact of deflation. There is general agreement that both high inflation and deflation impact negatively on the economy. Recent empirical studies have estimated the level of inflation at which its long-run impact on growth becomes materially negative. For industrialised countries, this level is about 3 percent, while for developing countries it is around 11 to 12 percent.

## 1 Introduction

*Our economic system will work best when producers and consumers, employers and employees, can proceed with full confidence that the average level of prices will behave in a known way in the future – preferably that it will be highly stable.*

Milton Friedman<sup>1</sup>

One of the basic principles of economics is that inflation is bad for economic growth. There is strong evidence that very high inflation is damaging to an economy – as was seen in Germany in the 1920s and currently in Zimbabwe. Equally, negative inflation (deflation) appears to be incompatible with healthy economic growth, as in Japan during the 1990s and early this decade. It seems clear that both high inflation and deflation impact negatively on a society's standard of living and on individuals' quality of life. But "there is less conclusive evidence whether moderate inflation is harmful or not".<sup>2</sup>

This article discusses the reasons why inflation is bad for an economy. Section 2 summarises the reasons economists give for how inflation impacts on the economy. These include redistributive costs (inflation benefits some people at the expense of others) and negative effects on the level of output and the rate of growth (inflation creates damaging inefficiencies in the economy). In line with much of the

literature, in this paper we focus on inflation's effects on growth.

How do the data support this theory? In section 3, the record of inflation and economic growth in industrialised countries since the end of World War II reveals that periods of low inflation have generally been associated with higher and more stable growth than when inflation has been high and variable.

Section 4 summarises the findings of studies that use sophisticated econometric techniques that aim at verifying the impact of inflation on economic activity. These techniques take account of other factors that may drive both inflation and output growth and influence the correlations observed in the data. Recent studies have estimated the rates of inflation above which the negative effects of inflation appear. Section 5 concludes.

## 2 Costs of inflation: theoretical arguments

This section summarises theoretical arguments concerning the negative long-run impacts of inflation on the economy.<sup>3</sup> In general, inflation impacts negatively on growth and the distribution of income or wealth. The impact of inflation depends on whether it is anticipated or not. Anticipated inflation impacts negatively on growth, through the cost of

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<sup>1</sup> Friedman (1968), p.13.

<sup>2</sup> Bernanke *et al.* (1990), p.17.

<sup>3</sup> In the short term (for example, within three years), there is generally a positive relationship between inflation and economic growth. When economic activity rises above its potential level, inflation rises. This relationship is known as the Phillips curve.

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changing prices, the cost of holding cash, and variability in relative prices. Through the tax system, it also reduces real value of savings and fixed incomes. Unanticipated inflation has both redistributive consequences and negative effects on growth.<sup>4</sup>

### **The impact of anticipated inflation on economic activity and growth**

The higher the general rate of inflation, the more often firms must change prices. This comes at a cost, whether in printing new menus, re-pricing of items on display in retail stores, updating computer files, or in the potential negative impact on customer loyalty. Because of the cost involved in changing prices, some firms delay doing so, thus resulting in variability in price changes among firms. Faced with this variability, both individuals and firms need to spend more time and resources obtaining relevant information before making decisions. Thus inflation reduces the level of productive economic activity.

Inflation creates costs of holding cash and balances in non-interest bearing bank accounts. To overcome these costs, people tend to hold less cash, and maintain higher balances in interest-bearing accounts, withdrawing only when they need it. Potentially, there are costs to this activity also, both in the time needed and in possible missed opportunities due to not having cash on hand.

### **The redistributive effects of anticipated inflation**

Inflation causes a deterioration of the real value of incomes fixed in nominal terms, such as benefits. This is usually overcome by governments indexing benefits to the rate of inflation. However, because benefits are usually adjusted by the previous period's inflation rate, their purchasing power deteriorates between indexation adjustments.

Inflation also causes loss of both income and savings through the progressive income tax system. Firstly, with a general wage and price increase, individuals can find their

incomes creeping up into higher tax brackets, and being subject to higher marginal rates of income tax. Secondly, the tax that is charged on the interest earned on bank deposits is based on the nominal (rather than real) value of deposits. Therefore both the portion of the interest that goes towards maintaining the deposit's purchasing power and the portion that is real income from the deposit are taxed. To illustrate this, if we assume that the rate of inflation and the interest rate paid on a bank deposit are both 5 percent, the interest paid is just sufficient to maintain the real value (purchasing power) of the deposit at a constant level. Any income tax on this interest will therefore reduce the real value of the deposit.

### **Redistributive effects of unanticipated inflation**

In the case of long-term loans, if inflation is different from that which is anticipated, the return that the borrower eventually pays the lender differs from what each anticipated. If the inflation is higher than that expected when the loan was negotiated, the borrower gains at the expense of the lender. Those paying off mortgages at fixed rates of interest will benefit, while those who hold fixed interest-bearing bank accounts suffer. Thus there is, in effect, a wealth transfer from the latter group to the former. The reverse will be true if inflation is lower than anticipated.

Unanticipated inflation benefits borrowers because inflation causes the real value of their debt to diminish. Because debt is usually stated in nominal terms (it is not indexed to inflation), its real value declines as the price level increases. As their incomes rise in line with the general increase in the price level over time, borrowers find it easier to repay loans, as inflation reduces the value of their loan and repayments relative to their increasing incomes.

Another way to look at it is that unanticipated inflation causes the real value of savings to decline, especially when real interest rates are negative. That is, when the inflation rate is higher than the interest paid on savings, the purchasing power of savings is reduced. Thus, the financial worth of savers goes down. We note that those on fixed incomes are affected in two ways by inflation – by the reduction of the real value of both their incomes and their savings.

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<sup>4</sup> More detailed accounts of the arguments in this section can be found in Johnson (1993) and Briault (1995).

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## Inflation variability and uncertainty impacts on economic activity

When inflation is high, it is usually volatile as well. Why is this so? Milton Friedman suggested that it can be the result of the way government policies are adjusted.<sup>5</sup> In this view, high inflation itself is usually the result of government policies (such as welfare policies) involving strong growth in government spending. But because governments also usually value stable prices, they react strongly against the inflation that eventually emerges, thus switching from one spending policy direction to another.

Variable inflation increases uncertainty throughout the economy – including uncertainty about the size and timing of future monetary policy responses.<sup>6</sup> Additionally, high inflation may be volatile and associated with uncertainty because it may be caused by a real shock to the economy or by a government losing control of the economy.<sup>7</sup>

Uncertainty impacts on investment, because it makes the planning of future development more difficult. It increases the cost of gathering relevant information upon which sound decisions can be made.<sup>8</sup> Firms may therefore delay planned investment projects until economic conditions are more stable, or demand a higher nominal rate of return for those they do undertake. These behaviours in turn impact negatively on output growth.

Increased volatility of inflation also reduces the effectiveness of the market by shortening the length of commitments (such as contracts and bank term deposits) to less than would be optimal in the absence of such volatility. But, because some contracts are fixed, people cannot immediately adjust the length of their existing commitments to the changed optimal length. Thus, sudden inflation exacerbates the rigidity or inefficiency in the market presented by fixed contracts.

High inflation has a tendency to become persistent through the wage-price spiral and through inflation expectations. Firstly, in wage-setting, negotiators take account of the general rise in prices and demand at least as much an increase, thus putting up firms' costs, which firms then pass through

to consumers in higher prices. Secondly, inflation easily leads to expectations within the economy of continuing inflation. While the wage-price spiral and inflation expectations do not constitute costs of inflation themselves, they add to the persistence of inflation and therefore add to any of the negative effects of inflation. It is very costly to bring high inflation back to lower levels. Countries typically experience recessions when tight monetary policies are needed to reduce inflation from high rates, as was experienced in New Zealand in the early 1990s.

Deflation (negative inflation) is also damaging to economic growth, as the experience of Japan during the 1990s illustrates. The main reason for this is that falling prices cause demand to stall, as consumers delay purchasing goods until some future when prices are expected to be even lower. Additionally, because nominal interest rates cannot be decreased below zero, under deflation the central bank cannot reduce the policy interest rate low enough to stimulate demand.<sup>9</sup>

## The overall impact of inflation

From the above, it is clear that there are both redistributive and growth costs of inflation (whether inflation is anticipated or not). It is the poor and those on fixed incomes that suffer the most from redistributive effects – because the real value of their savings and incomes decline. They lack the financial resources or knowledge to purchase assets whose prices tend to rise with inflation. Those with higher wealth and disposable income are more able to avoid inflation, by buying more sophisticated financial assets or property. They also have more access to credit and therefore stand to benefit from the reduced real value of debt if inflation increases unexpectedly. These inflation avoidance activities therefore tend to accentuate the unequal burden of inflation on the poor and less well educated. They also divert resources from productive investment.

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<sup>5</sup> Friedman (1977), p.466.

<sup>6</sup> Ball (1992), p.371.

<sup>7</sup> Fischer (1994), p.276.

<sup>8</sup> Greville and Reddell (1990).

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<sup>9</sup> Equally, a rate of inflation of between 0 and 1 percent is a potential source of risk to an economy. Such a low rate can easily turn negative. There is also an upward bias in inflation statistics – thus an economy could actually be experiencing the negative effects of deflation when the official inflation rate is positive, but less than 1 percent (Fischer (1994), p 284).

The mechanisms through which inflation affects economic activity and growth are less clear. While the costs to firms of changing prices and the costs of holding cash balances are easy to understand, they do not constitute a major cost to economic activity. However, the distortion of relative price signals that results from inflation has a far greater impact on the economy, because it can reduce economic growth.

Relative prices are important because firms and individuals make decisions on what to produce and purchase, based on the prices they observe. For example, an increase in demand for a good tends to cause an increase in its price, relative to the prices of other goods. Observing the price increase, firms have an incentive to produce more of the good. In turn, these firms will demand more of the inputs needed to produce the good. The outcome of this process is an efficient re-allocation of the economy's resources towards producing what is needed in the economy, as signalled by the movement in relative prices. The re-allocation is necessary for economic growth. If there is inflation, relative price movements are distorted or obscured, impeding growth.

Inflation can distort relative prices because the prices of individual goods tend not to rise in a uniform manner when there is inflation. Individual firms increase prices at different times. As a result, under inflation, some of the relative price movements that occur will no longer be consistent with signalling the efficient allocation of resources.

Inflation obscures relative price movements by making it less clear to decision-makers whether an increase in the price of a good is a change in its relative price or part of the general increase in prices. For example, an individual who is looking to invest might see certain prices increasing. Does the price rise represent a relative price movement in the industry the investor is looking at, or just a general inflation adjustment?

The answer matters for whether the person should invest. A wrong decision will be costly to the individual, but also costly to economic growth as a whole, because of the incorrect resource allocation.

### 3 Inflation in recent historical perspective

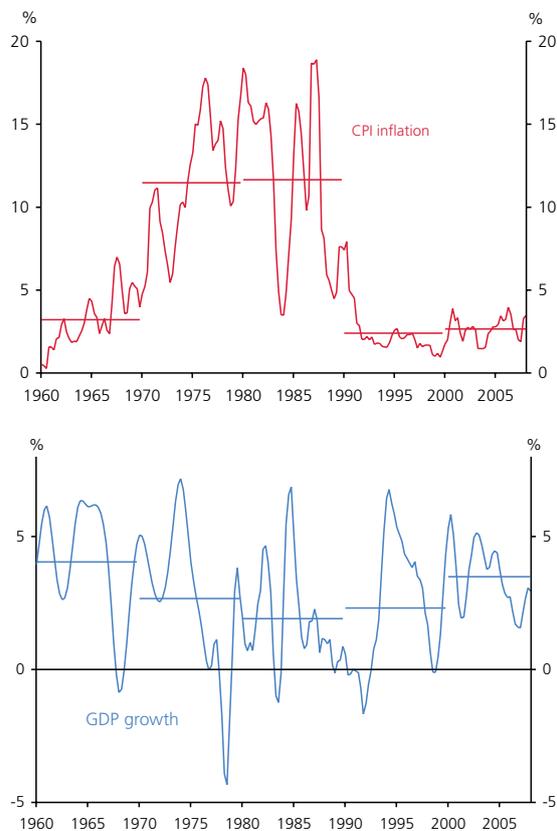
The evidence that inflation impacts negatively on economic growth is now well accepted by economists and policy-makers. In this section, we illustrate by looking at the inflation and growth record of New Zealand and other countries. A caveat to this exercise is that there are many determinants to growth (apart from inflation), and making inferences about causality requires more sophisticated econometric analysis – which we discuss in the next section.

The activity and inflation profiles of industrialised countries during the past 60 years, since the end of World War II, can be broadly divided into four periods, below.

The New Zealand data (figure 1, overleaf) is generally in line with this categorisation. The most striking feature of the inflation profile is the high and highly volatile inflation during the 1970s and early 1980s compared with the lower inflation before and after. We see that this period of high inflation is associated with lower growth than during the 1960s, when inflation was lower. Since the early 1990s, New Zealand has experienced low inflation – due to the commitment of the central bank to price stability, and to favourable global conditions (principally, the emergence of Asia as a major exporter of cheap manufactured goods). During this period, average GDP growth has risen.

Period	Economic activity	Inflation
1. 1950s and 1960s	rapid growth	moderate inflation
2. 1970 to mid-1980s	slower, volatile growth	high inflation
3. 1990 to 2007	sustained moderate growth	low inflation
4. 2007 to present	slowing activity	rising inflation

**Figure 1**  
**Inflation and GDP growth in New Zealand:**  
**1960 – present**

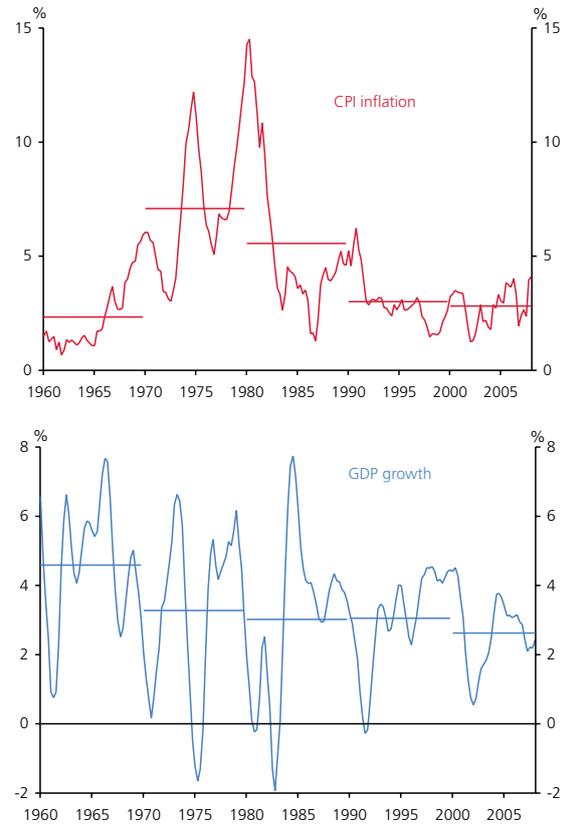


Horizontal lines indicate average levels for each decade.

Graphs for the US, the UK and Australia (figures 2-4) show similar profiles for inflation as that for New Zealand, with much higher rates during the 1970s and 1980s. Likewise, these countries experienced declines in GDP growth during the 1970s and 1980s relative to levels of the 1960s. However, they do not display an obvious increase in GDP growth from the 1990s (except for the US in the current decade) as we might expect on the basis of the theoretical considerations discussed earlier.

Overall, a casual observation of these inflation and activity profiles supports the theory that high inflation is associated with low GDP growth. Japan from 1990 to 2007 illustrates the phenomenon that deflation is also harmful to growth (figure 5). When the US and other industrialised countries were experiencing prolonged growth in output and low inflation, Japan was suffering from deflation and a contraction in activity that followed the bursting of housing and stock market asset price bubbles.

**Figure 2**  
**United States**



**Figure 3**  
**United Kingdom**

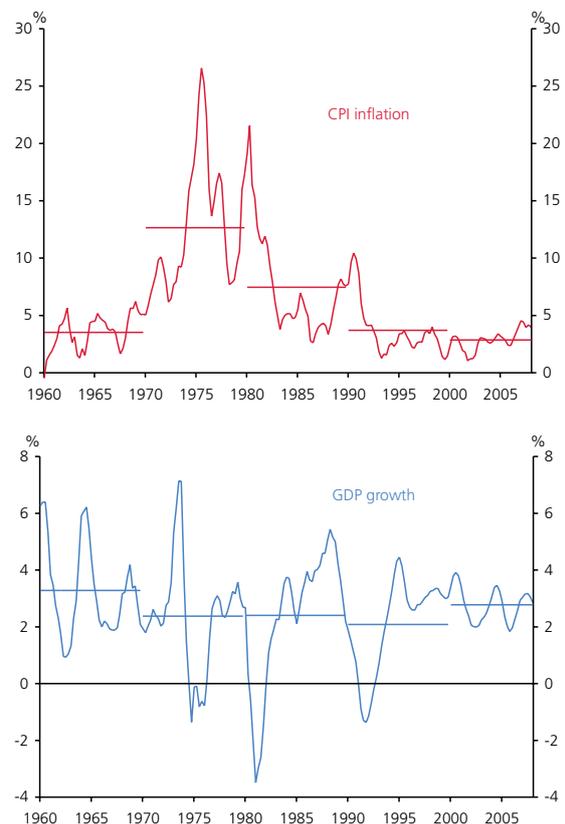


Figure 4  
Australia

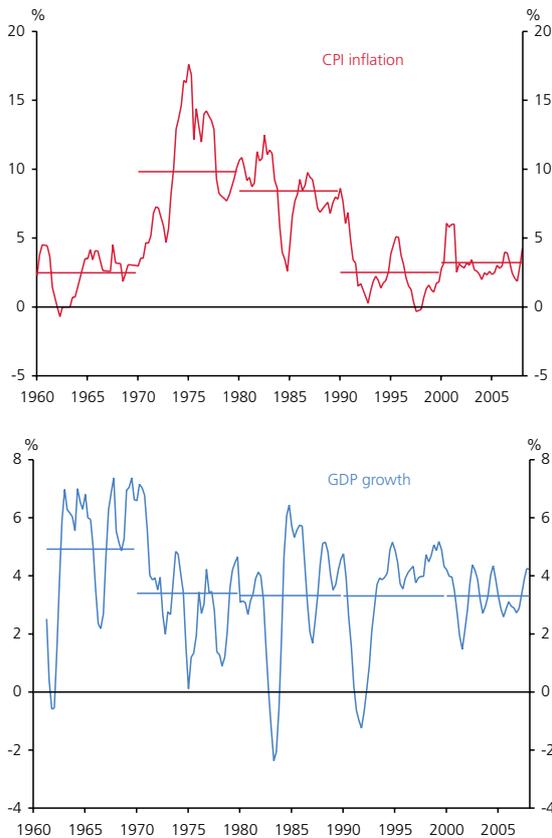
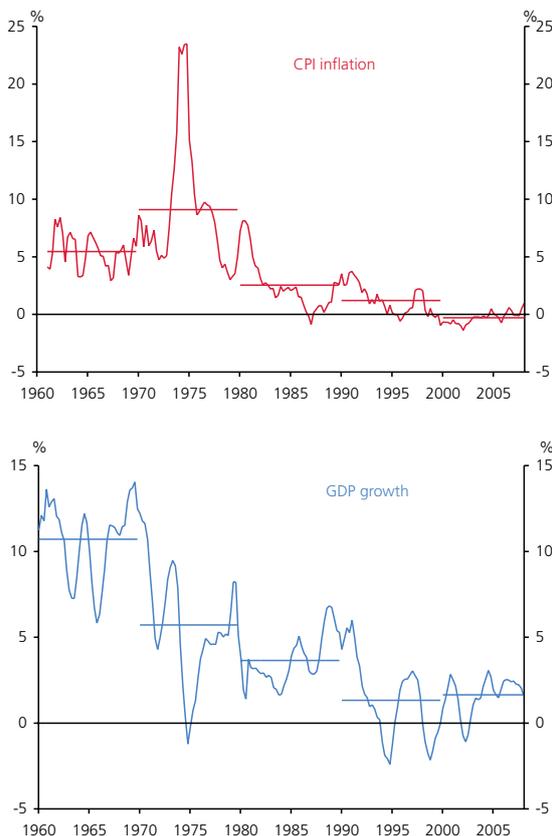


Figure 5  
Japan



## 4 Summary of the empirical literature

In the previous section, we looked at the inflation and GDP growth experiences of a number of countries. The determinants of GDP growth, though, are more complex than the inflation rate alone. In this section, we outline the main complexities in the inflation-growth relationship before summarising the findings of empirical studies that have tested whether there is a negative relationship between inflation and economic growth, taking account of these other factors.

There is the issue of causation. High rates of inflation tend to be associated with lower growth, as the empirical studies show us. But does inflation cause lower growth? Or are there other common factors influencing both? High inflation may be associated with low economic growth because both are the result of government policies that are damaging to the economy. High inflation may therefore be a symptom of bad economic management – an indicator that the government is running a set of policies inconsistent with sustained economic growth.<sup>10</sup>

Other common factors could be driving the negative relationship between inflation and growth. While improved monetary policy is recognised to have made a considerable contribution to the ‘Great Moderation’ (the period since the mid-1980s, during which lower, more stable inflation has occurred with higher, less volatile growth), other factors may have been just as important. These include changes in the structural features of the economy (such as improved business practices, technology, and financial innovation) and good luck (favourable economic shocks – such as the lower prices of consumer goods imported from Asia).<sup>11</sup>

The general consensus from the empirical studies is that growth is significantly and negatively related to inflation. However, the relationship between inflation and growth is different for different rates of inflation. At very low positive rates of inflation, the growth rate seems to be independent of inflation, while higher rates of inflation (and negative inflation) significantly damage growth. It is now generally

<sup>10</sup> Fischer (1993), p.437.

<sup>11</sup> Bernanke (2004) and Ferguson (2006).

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accepted that the threshold level of inflation for industrialised countries is in the low single digits, while that for developing countries is higher.

Early studies assumed a linear relationship (that is, that an increase in inflation of a certain amount would have the same effect on growth at all levels of inflation). Fischer (1993) was among the first to investigate a non-linear relationship – that different levels of inflation (above a certain threshold level of inflation) impact differently on growth. Arbitrarily choosing a threshold rate of 15 percent inflation, he found that for positive rates of inflation below 15 percent, an increase in inflation is associated with an increase in growth, while above 15 percent, an increase in inflation is associated with a reduction in growth.

Subsequent studies have focused on estimating formally the level at which the impact of inflation on growth changes, by using more sophisticated econometric techniques.<sup>12</sup> An influential paper by Khan and Senhadji (2001) estimated the threshold levels at which inflation impacts negatively on growth as between 1 and 3 percent for industrialised countries, and 11 and 12 percent for developing countries. Subsequent studies have confirmed their finding.<sup>13</sup>

The findings of this research support central bankers' goal of maintaining low levels of inflation (in low single digits for industrialised countries, and at least close to single digits for developing countries) – and that doing so is conducive to improved economic performance.<sup>14</sup>

## 5 Conclusion

It is well recognised that high and volatile inflation is detrimental to economic growth. In this paper, we have outlined the theoretical arguments why this is so, noting that both anticipated and unanticipated inflation have costs in terms of redistribution and their impact on activity and growth.

In considering the evidence, we noted that the inflation-growth experiences of New Zealand and some other

industrialised countries were generally in line with the theory. The high inflation during the 1970s and early 1980s was associated with lower and more volatile growth than in previous decades, while lower inflation since then has occurred during a prolonged period of expansion. However, we recognise that there are many determinants of growth apart from inflation.

Recent empirical studies that investigate the inflation-growth relationship have focused on estimating the levels of inflation at which the impact of inflation on growth changes. There is now general agreement that for industrialised countries this threshold is about 3 percent, while for developing countries it is around 11 to 12 percent.

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<sup>12</sup> Brook *et al.* (2002) summarises this literature.

<sup>13</sup> For example, Drukker *et al.* (2005).

<sup>14</sup> Khan and Senhadji (2001, p. 20).

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