Unclassified **ECO/WKP(98)4**

Organisation de Coopération et de Développement Economiques
Organisation for Economic Co-operation and Development

OLIS : 11-Mar-1998
Dist. : 17-Mar-1998

English text only

ECONOMICS DEPARTMENT

ECO/WKP(98)4
Unclassified

MONETARY POLICY WHEN INFLATION IS LOW : ECONOMICS DEPARTMENT WORKING PAPERS No. 191

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English text only

ABSTRACT/RÉSUMÉ

This paper examines several key issues concerning the implications for monetary policy of the achievement of low inflation in OECD countries during the 1990s. In particular, the analysis considers whether there have been improvements in monetary policy transmission mechanisms that lower inflation vulnerabilities, or make it easier to reduce inflation pressures when they arise; and the further benefits and costs likely to be involved in lowering inflation to zero, or in attempting to maintain a stable price level. The analysis supports three main observations. First, there have been significant changes, particularly in inflation expectations and in monetary policy frameworks, that should help in containing inflation and lowering the costs of doing so. However, except in the United States and the United Kingdom, there is little evidence yet of fundamental changes in wage and price behaviour underlying the flexibility of labour and product markets; although it is possible that this reflects insufficient time for such changes to have become manifest. Second, despite the improvements that have occurred, the present low inflation environment cannot be taken for granted. In particular, to maintain that environment, policy will have to continue to be forward-looking in responding to prospective inflation pressures before they can accumulate. Third, the case for lowering inflation further is strongest for those countries with fairly flexible labour and product markets. In countries where considerable rigidities remain, the main priorities are to preserve the low levels of inflation that have been attained while pursuing structural reforms to improve market functioning.

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Cet article examine quelques questions-clés concernant les conséquences pour la politique monétaire de l'obtention d'une faible inflation dans les pays de l'OCDE au cours des années 90. En particulier l'étude examine si des améliorations dans les mécanismes de transmission de la politique monétaire permettent d'abaisser les risques d'inflation, ou de réduire plus facilement les poussées inflationnistes quand elles surgissent; elle examine aussi les bénéfices et les coûts supplémentaires que sont susceptibles d'entraîner un abaissement de l'inflation au niveau zéro ou le maintien des prix à un niveau stable. L'analyse confirme trois observations majeures. Tout d'abord il y a eu des changements importants, en particulier dans les anticipations inflationnistes et dans les systèmes de politique monétaire, qui devraient contribuer à contenir l'inflation et à abaisser le coût de cette maîtrise. Toutefois, mis à part aux États-Unis et au Royaume-Uni, il n'apparaît pas encore clairement que des changements fondamentaux du comportement des prix et des salaires qui sous-tendent la flexibilité des marchés du travail et des produits aient eu lieu; mais il est possible aussi que le recul soit insuffisant pour que ces changements deviennent évidents. En second lieu, malgré les progrès accomplis, l'environnement actuel de faible inflation ne peut être considéré comme acquis. En particulier pour maintenir cet environnement il faut poursuivre une politique dynamique prête à réagir aux pressions inflationnistes avant qu'elles ne puissent s'accumuler. En troisième lieu, les arguments en faveur d'une nouvelle baisse de l'inflation sont plus forts dans les pays où les marchés du travail et des produits sont relativement flexibles. Dans les pays où de fortes rigidités persistent, les priorités essentielles consistent à préserver les faibles niveaux d'inflation atteints tout en poursuivant les réformes structurelles pour améliorer le fonctionnement du marché.

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MONETARY POLICY WHEN INFLATION IS LOW

Charles Pigott and Hans Christiansen [1]

I. Introduction

1. This paper examines a key issue concerning the achievement of low inflation by OECD countries during the 1990s.

- Have there been improvements in monetary policy transmission mechanisms that lower inflation vulnerability and make it easier to reduce inflation pressures when they do arise?

A consideration of the implications for the future conduct of monetary policy follows the analysis. To provide further background for this discussion, the paper reviews the costs of inflation, the issues attaching to the maintenance of a stable price level and the arguments for maintaining some (low) inflation. In addition, the accompanying Appendix summarises other "exogenous" forces that have helped to restrain actual or potential inflation pressures in the current environment.

2. The main conclusions can be stated as follows:

- There have been significant changes in inflation expectations and monetary policy frameworks, as well as structural reforms to labour and product markets, that ultimately should have favourable effects on inflation transmission mechanisms. These improvements should raise the effectiveness of monetary policy in maintaining the present low inflation environment; they also may help to lower the costs of going further, compared with the costs experienced historically, although this is less clear.

- The favourable changes are already evident to some degree in financial markets and their reactions to monetary policy. However, except in the United States and the United Kingdom, there is little evidence of a substantial change in wage and price behaviour as yet, but this may reflect insufficient time for the changes to have manifested themselves.

- Despite the improvements that have been made, the present low inflation environment should not be taken for granted. The experiences of the 1980s suggest that the possibility of significant policy mistakes from time to time cannot be excluded. To contain inflation, policy will have to continue to be forward looking, responding to prospective inflation pressures before they are allowed to accumulate.

1. The authors would like to thank Ignazio Visco, Michael Feiner, Mike Kennedy and Angel Palerm for helpful and useful comments. Thanks are also due to Flavia Terribile and Sebastian Schich; to Laure Meuro for statistical assistance and to Paula Simonin and Evelyn McCaffrey for secretarial skills. The views expressed in this paper are those of the authors and are not necessarily shared by the OECD.

II. Have transmission mechanisms become more favourable to inflation control?

3. Three key elements of the monetary/inflation transmission mechanism largely determine the vulnerability of aggregate wages and prices to disturbances to costs or demand and the difficulty of containing inflation pressures once they have arisen. The first is the state of inflation expectations and their response to monetary policy actions; the second concerns the responses of longer-term interest rates and exchange rates to monetary policy versus other factors; and the third involves the behavioural relations determining wage and prices.

Inflation expectations

4. Inflation expectations have played a key role in helping to bring down inflation and to contain it, once reduced (BIS, 1996; Brayton *et al*., 1997). In particular, improvements in expected inflation were an important policy "lever" in aiding authorities to lower inflation in Italy during the first half of the 1980s, and again in the 1990s, as well as in helping to keep it down in the face of the disturbances to prices experienced in recent years (Visco, 1995; Gressani *et al*., 1988; Gaiotti and Nicoletti-Altimari, 1996). Increases in official interest rates in Italy in more recent years have been found to lower expected inflation nearly immediately and by a significant amount (Buttiglione *et al*., 1997a). Links of this sort can help to reinforce monetary policy actions to contain actual or threatened inflation pressures. Largely for this reason, the link between monetary policy actions and inflation expectations has also assumed increased importance in Canada in helping authorities to hit, as well as maintain the credibility of, their official inflation target (Zelmer, 1995).

5. The impressive decline in private sector inflation expectations in OECD countries is amply documented by direct surveys or estimates from indexed bonds (Figures 1 and 2). According to the *Economist* poll of forecasters (Table 1), consumer price inflation is expected to average about 1¾ to 2½ per cent in 1998 for the larger OECD countries, slightly above the level expected for this year. The fall in the dispersion of the near-term survey of forecasts for the United States (Figure 1, upper panel) and Canada (Table 2) also suggests that uncertainty about medium-term inflation prospects there has declined.

6. More remarkable is the apparent decline in longer-term expected inflation; it is now expected to average below 2 per cent over the next 5-10 years in the three largest continental European countries and about 3 per cent over the next ten years in the United States and the United Kingdom. Evidence for Canada indicates that longer-term inflation expectations have fallen to within the official target band (Amano *et al*., 1996). The *Consensus Forecasters'* survey suggests that long-term anticipated inflation has fallen below 2.5 per cent for the major European countries. A similar impression, for a wider group of European countries, is conveyed by the general convergence of long-term forward interest rates of prospective EMU members with Germany of those countries likely to join EMU in 1999 (Figure 3); one plausible interpretation of this convergence is that the market believes that the EMU's inflation performance will be comparable to that observed in the past for Germany[2].

7. The process of solidifying expectations of low inflation should be helped by the changes in monetary policy frameworks that have been instituted over the past ten years. These include changes in central banks' legal charters establishing low inflation or price stability as the overriding objective of monetary policy; and legislation that increases the independence and accountability of monetary authorities in pursuing that goal. Also important are changes in central bank operating procedures that serve to increase the transparency of

2. Strictly speaking, the convergence implies only that inflation rates will converge for members -- a necessary condition for maintaining a single currency zone. The pattern is equally consistent with a view that EMU inflation will be somewhat higher than that maintained by Germany in the past.

policy and facilitate its communication to markets and the public, such as the publication of regular inflation reports that explain the rationale of policy actions. The improved frameworks are likely to be especially effective in restraining political pressures to raise inflation (e.g. "political business cycles") or assuring the public that authorities will not try to achieve temporarily output gains at the expense of some inflation ("time inconsistency" problems). Indeed, the changes have already had important effects in improving credibility, reducing market uncertainty and increasing the predictability of financial market reactions to policy (Amano *et al*., 1996; Perrier, 1997; BIS, 1996).

8. There have also been changes in fiscal policy frameworks that should be beneficial to inflation expectations. These include the Stability and Growth Pact in Europe; the 1997 agreement to achieve a balanced budget by 2002 in the United States; measures that have eliminated the federal deficit in Canada and reduced other components of the general government deficit (OECD, 1997a, Canada); and the sharp deficit reductions in Italy (where evidence suggests that fiscal imbalances have an important influence on inflation expectations (Gaiotti and Nicoletti-Altimari, 1996)).

Some caveats

9. Fully realising the benefits of a low inflation environment is likely to require that expectations of future inflation need to be not only low but "firmly rooted" (that is, credible)[3]. In this sense, the public has to be convinced that there has been a genuine regime change and not simply another episode of low inflation that proves to be temporary (Gagnon, 1997), as was the case with the short-lived drop in inflation in many countries after the first oil-price shock, or with a number of the inflation reductions in Europe during the first half of the 1980s. Changes in fundamental behaviour underlying reactions in labour and product markets, such as pricing strategies or contract durations, are unlikely to occur unless expectations of low inflation over the long term are firmly rooted in this sense. Conversely, once credibility is established, it tends to be very robust.

10. Considerable time is likely to be required to establish firmly rooted low inflation expectations, especially for countries with a past history of periodic alternations in inflation. The very gradual decline in long-term interest rates in most OECD countries after the early 1980s suggests that markets have "long memories" of past inflation episodes and are slow to adjust their long-term expectations (Gagnon, 1996). The current higher level of nominal and real long-term interest rates now, compared with the first half of the 1960s when inflation was similarly low (Figure 4), is attributable in large part to declining national saving rates and other real factors (Group of Ten, 1995). However, they may also reflect a residual perceived risk that inflation could rise again (Gagnon, 1996 and 1997; Group of Ten, 1995).

11. Thus, there is probably some way to go in firmly establishing the credibility of low inflation regimes. This impression is further strengthened by the fact that the improved monetary and fiscal policy frameworks are relatively new. At least in most of continental Europe and Japan, these frameworks have yet to be fully tested against the pressures that can emerge during the advanced stage of recovery. Concerns about the potential adverse effects of fiscal imbalances on inflation control seem to have played a role in aggravating the 1994 increases in long-term interest rates (Group of Ten, 1995; OECD, 1996a; Orr *et al*., 1995).

3. More formally, there must be confidence, not only that inflation will remain low under the current and the more likely future conditions, but also under less probable but more adverse circumstances that might occur -- and in particular under circumstances that have led to high inflation in the past. In this sense, survey measures cannot be expected to fully reveal the degree to which inflation expectations have become firmly rooted.

Reactions of exchange rates and interest rates

12. The development and globalization of financial markets have affected the monetary transmission mechanism in several ways that bear on efforts to contain inflation. Most obviously, the exchange rate has become a key element of the transmission mechanism (BIS, 1989 and 1996), not only for smaller and relatively open economies but even for the larger economies, notably the United States (de Kock and Deleire, 1994; Mauskopf, 1990). The linkage between monetary policy and exchange rates was an important factor in past monetary policy efforts to lower inflation in a large number of countries over the past decade and a half. At least in principle, the greater importance of the exchange rate in transmission means that prices react more quickly to monetary policy shifts. The importance of expectations, which are critical to the response of exchange rates to monetary policy actions, has been further increased as a result.

13. Well-developed financial markets along with a low inflation environment can provide automatic stabilisers that help in controlling inflation. For example, a surge in real growth above its sustainable potential rate tends to raise real interest rates and the real exchange rate which in turn helps to bring growth back down. The financial market reactions effectively serve to reinforce monetary policy and to reduce the amount of tightening that would otherwise have to be undertaken. Expectations that monetary policy will continue to contain inflation are, of course, critical to such benign reactions. In particular, the reaction of long-term interest rates to policy interest rates should depend importantly upon past success in controlling inflation. There is some empirical evidence to support this presumption: increases in policy rates have been found to lower longer-term forward interest rates for Germany, the Netherlands and Belgium; while raising them for other countries with a less favourable inflation record, notably Italy, the United Kingdom and Sweden, as well as for the United States (Buttiglione, *et al*., 1997b). Responses of long-term interest rates to policy rates observed across countries tend to be lower the more favourable the inflation record; and the responses seem to have fallen for Italy and France as their inflation performances have improved (Christiansen and Pigott, 1997). From this perspective, the relatively low response typically found for German long-term interest rates to changes in policy rates (Hardy, 1996; Hammersland and Vikøren, 1997) may be a reflection of the credibility of German monetary policy[4].

Some caveats

14. A complicating feature of asset prices is that their movements are affected by a wide range of developments not directly related to monetary policy actions[5]. Exchange rates are influenced by current account balances, external debt positions, shifts in productivity, political uncertainties and many other factors over which monetary policy has little or no control. Empirical relations can account for only a fraction of the variation in long-term interest rates -- and even then monetary policy factors are not the only explanatory variables (Akhtar, 1995). It has been difficult to find stable empirical relations to account for exchange rate movements (Frankel and Rose, 1994). Thus improvements in inflation performance or monetary policy credibility alone do not guarantee against financial market fluctuations disruptive to monetary policy objectives. For example, the fluctuations in long-term interest rates and exchange rates during 1993-95 impeded the recoveries in much of continental Europe and Japan (OECD, 1996b), thereby raising the costs of keeping inflation low. The bond market fluctuations, particularly the spill-over of US monetary tightening in 1994 to long-term interest rates in Europe and Japan, seems to have been accentuated by portfolio reactions of international traders who have become increasingly important in these markets (Borio and McCauley, 1996). Moreover, real effective exchange rates have remained quite variable despite the achievement of low inflation and its convergence across countries (Gruen, 1996) (Table 3 and Figure 5). These and other observations have

4. Indeed, the Buttiglione *et al*. results suggest that a rise in German policy interest rates lowers long-term nominal interest rates slightly. However, this result is not typical of other studies on German long-term interest rates.

5. The Secretariat has recently looked into the issue of how monetary policy should respond to asset prices with more of a focus on equity markets. See OECD (1997d).

fuelled suspicions that markets may have become more prone to disruptive fluctuations with liberalisation and globalization, at least under some circumstances (Andersen and White, 1996).

15. The decline in the information content of traditional monetary policy indicators represents another problematic side-effect of financial market changes. Relations between money and credit aggregates and the economy have become less stable since the late 1970s and, except for Germany and Switzerland, their use as intermediate targets has been abandoned (Shigehara, 1997; Friedman, 1992). The task of interpreting movements in long-term interest rates, exchange rates and other asset prices in terms of their implications for the economy and the stance of monetary policy has also become more difficult.

Wage and price behaviour

16. The sensitivity of sectoral price and wage changes to increases in demand, costs or prices of competing products is an important factor in determining the ease with which inflation disturbances can gather momentum and of the costs of reducing inflation pressures when they arise. High "nominal" flexibility (in the responsiveness of wages and prices to nominal demand changes) helps to make inflation reduction less costly; but it increases the vulnerability of aggregate prices to positive fluctuations in nominal demand, for example those produced by shifts in the demand for money. This latter consideration by itself would suggest that countries that have been found to have relatively high sacrifice ratios arising from wage/price rigidities would also be more resistant to renewed inflation disturbances at low levels of inflation. High "real" flexibility (in real wages and relative prices) both reduces the vulnerability of underlying inflation to temporary increases in costs and tempers the output losses incurred in inflation reduction. And factors that make for a low structural unemployment rate (the "natural" rate, NAIRU or NAWRU, by various definitions) are also helpful in containing inflation by allowing higher output and employment than would otherwise be possible.

17. In theory, a low inflation environment tends to reduce nominal flexibility, either because price setters are less likely to confuse transient nominal with real shocks in such a setting (Lucas, 1975); or because "menu costs" may lead to less frequent changes in wages and prices (Edey *et al*., 1995). The original work on this issue (Lucas, 1973), using cross-country evidence, found that very high inflation countries do have more nominal flexibility in this sense than low inflation countries, although the finding has proven to be sensitive to the country sample considered (Arak, 1977). More recent evidence from cross-country comparisons implies lowering inflation from moderate levels is proportionately more costly than lowering it from higher levels (Andersen, 1992; de Kock and Ghaleb, 1995): this also suggests that nominal rigidities are higher in a low inflation environment.

18. This effect, however, is very difficult to verify given that sacrifice ratios tend to be quite unstable and their determinants relatively unknown (Edey *et al.*, 1995; Lipsett and James, 1995). Moreover, there also is some evidence that nominal wage and price responses are asymmetric, in the sense that, at any given average level of inflation, prices rise more in response to positive demand shock than they fall in response to a negative shock (Ball and Mankiw, 1994; Laxton *et al*., 1995; Turner, 1995; Dupasquier and Rickens, 1997). These findings, although tentative, imply that the buffer to inflation disturbances at low levels of inflation, provided by wage/price inertia may be less than past disinflationary periods would appear to suggest. Finally, to the extent that rigidity of prices to downward movements are responsible, the asymmetry could be greater in a low inflation environment than when inflation is higher (Ball and Mankiw, 1994).

19. Real flexibility may also have increased with the current low inflation environment. Price and wage decisions in individual sectors may become more restrained by domestic competition, or by foreign competitors operating in a low inflation environment, particularly in a single currency bloc such as the prospective EMU. Indeed it has been argued that excess supplies created by weak demand in Europe and Japan have helped to

restrain inflation in the United States (Greenspan, 1997; OECD, 1997b, *United States*), although for reasons given in the Appendix, the effect from this source has probably been small compared with other factors.

20. These and other institutional and behavioural factors affecting wage and price behaviour tend to change slowly, however, and may not lead as readily to greater flexibility in the real economy. For example, the behaviour in these markets is heavily influenced by structural policies and other institutional factors, some of which[6] are positively related to the natural rate of unemployment or the level of real wage rigidities (Davis *et al.*, 1997; Scarpetta, 1996; OECD, 1994b; Elmeskov, 1993). Reforms that increase incentives to take and remain in employment and to liberalise employers' flexibility would help improve real wage flexibility (Davis *et al.*, 1997; Fabiani, *et al.*, 1997). More generally, factors that raise the competitiveness of labour and product markets will lower "wedges" between labour costs and the compensation received by workers, increase the supply elasticity of key inputs such as energy or land, contribute to real flexibility. Accordingly, they should help reduce the inflation vulnerabilities from sector specific or temporary disturbances to costs or real demand.

21. Evidence as to the extent to which there actually have been shifts in wage and price behavioural relations is mixed. For the United States, increases in wage, as well as overall, compensation (Figure 6) have been more restrained during this recovery than past relations would suggest (Lown and Rich, 1997; OECD, 1997a, *United States*). The unemployment rate has been below previous estimates of the natural rate for nearly a year. Simulations of wage equations similar to those developed in Elmeskov (1993) indicate that since 1992, growth in overall labour compensation has averaged nearly 1.4 per cent less per year than the relations estimated on pre-1992 data would have predicted (Table 4). Other evidence indicates that most of the gap reflects lower than expected growth in wages, rather than the slowdown in fringe benefits; moreover, the apparent restraint in wage increases has been largely responsible for the unexpected moderation in inflation for the period as a whole (Lown and Rich, 1997). However that evidence also suggests that the drop in inflation after 1995 is partly attributable to other factors**,** particularly as the decline was accompanied by essentially unchanged growth in labour compensation.

22. Less clear are the factors behind the apparent restraint in wages and prices in the United States. One explanation cites an increase in workers' concerns over job-security, derived in part from the past recession when unemployment rates rose even among managers and other skilled segments previously relatively insulated from the effects of economic downturns (OECD, 1997a, *United States*). Such concerns would tend to lower the structural unemployment rate by reducing voluntary quit-rates and reservation wages of job-searchers -- although by how much is unclear. Another possible candidate is the 1996 welfare reform, which seems to have effectively increased labour supply by encouraging recipients of social assistance to find jobs. Some of the restraint in prices may stem from capacity utilisation rates that are not yet above levels that have sparked inflationary pressures in the past (Figure 7). While it seems likely that there has been a significant fall in the structural unemployment rate, the extent of the decline is unclear. Nor is it clear to what extent the unusual restraint in wage and price increases will last, particularly if, as seems likely over the near term, capacity pressures in labour and product markets continue to increase.

6. These include: the level of minimum wages (relative to average wages); the generosity of unemployment benefits; restrictions on hours and pay scales; and deficiencies in job skills and information about job opportunities.

23. Direct evidence for other countries that price/wage relations have shifted is more difficult to find. This is not entirely surprising: there is considerable slack in labour markets in Canada, Europe and Japan; and output gaps in most of these cases are still so wide that, judged against past experience, rising inflation would be unlikely. Indeed, it is surprising that inflation has not fallen further in several countries where substantial excess capacity has remained over the past several years[7]. Some evidence of a change in behaviour is provided by the relatively subdued reactions of prices in the United Kingdom, Canada, Italy and several other continental European countries to their currency depreciations in 1992 and 1993 (OECD, 1993). However, while the price responses were lower in relation to the exchange rate declines than observed historically, they also came against a background of declining overall inflation, weak or slowing real growth, rising unemployment and relatively tight macroeconomic policies -- conditions that tend to dampen the "pass-through" of exchange rates to domestic prices. Some studies suggest that once these conditions are accounted for, the responses of prices to exchange rates in European countries during the early 1990s are consistent with past behavioural relations (Amitrano *et al.*, 1997; De Grauwe and Tullio, 1994). This conclusion is also supported by studies of Phillips Curve relations for ERM countries which also find little or no evidence of either a fall in "sacrifice ratios" or other shifts during the latter 1980s or early 1990s (Egebo and Englander, 1992; Andersen, 1992; de Kock and Ghaleb, 1995; Davis *et al.*, 1997). Finally, simulations of labour compensation relations similar to that considered earlier for the United States do not suggest that compensation increases have been unusually restrained in Canada, the largest continental European countries or Japan (Table 4). The evidence presented there suggests that recent experience does not represent a break from past behaviour. The exception is the United Kingdom (as well as the United States) where past reforms to labour markets have arguably been the most extensive of any of the other large countries.

Some caveats

24. The progress that has been made in structural reforms has almost certainly lagged lowering inflation and improving monetary policy frameworks. Table 5 provides a rough summary of recent structural reform efforts; it is based on the extensive analyses in OECD *Economic Surveys* over the past two years and the Secretariat's report on *Regulatory Reform* (OECD, 1997b). There has been progress, although far from complete, in continental Europe, where labour markets are generally seen as the most rigid. Improvements in product market deregulation and other reforms, while important, have also been uneven and incomplete. The limited prospects in these areas is another possible reason why wage and price relations do not seem to have changed appreciably in many countries.

III. Should inflation be lowered further?

25. The discussion in the preceding section indicates that factors are now in place that should ultimately help to make it easier to contain inflation at current low levels. A separate, although related, question is whether it should be lowered further and by how much. This in turn depends on whether the benefits of eliminating the inflation that remains would outweigh the potential costs. The question about how far it should go depends on how the economy might function in lowering inflation and possibly price level stability. Some of the main arguments against going further have been summarised by Krugman (1996) who, citing the findings

7. The authors are indebted to Charles Freedman, Deputy Governor of the Bank of Canada, for bringing this point to their attention, as well as for other useful comments. He further suggested that the stabilisation of inflation in Canada at a low but positive rate was attributable in part to the authorities' inflation target, which implies that they will seek to prevent inflation from falling below the one per cent floor, as well as from rising above the three per cent upper bound of the range.

of Akerlof *et al.* (1996), suggested that monetary policy should aim at reducing unemployment to its lowest sustainable level given a stable low inflation at around three to four per cent.

The benefits of lowering inflation

26. The costs of even low inflation are generally linked to uncertainty about future relative prices (Hess and Morris, 1996; Edey, 1994) and the interaction of inflation with nominal tax systems (Briault, 1995). The uncertainty effects, although difficult to quantify empirically, may well be the most important. Moreover, the flare-ups in inflation following the oil crises coincided with larger volatility of output in and among countries. This suggests that the return to low inflation has helped reduce risks of real output fluctuations. As for the interactions of inflation and tax systems, recent work, based on partial equilibrium results, has shown that the largest effects derive from the introduction of an inflation-wedge between pre-tax and after-tax real interest rates[8]. This wedge, which increases with inflation, leads to a re-distribution of personal consumption over the life-cycle whereby individuals incur a welfare loss and GDP is lowered. The channel through which this works is current savings and investment. When inflation lowers overall saving, investment will also fall, *ceteris paribus*, lowering the capital stock and eventually *per capita* income[9]. An additional tax/inflation factor in those countries, where it exists, is the implicit tax-subsidy to housing[10] *vis-à-vis* other forms of consumption in the case of inflation which leads to a significant over-consumption of housing services.

27. Recent attempts to quantify the effects of inflation on GDP have focused on inflation taxes and the interaction between tax systems and inflation. Based on inflation taxes and on the size of the wedge between pre-tax and after-tax real interest rates they calculate the average loss in households' life-time consumption expressed at discounted present values (Table 6). These studies[11] find a significant long-term gain in GDP of close to one percentage point from reducing inflation from an already low level for most countries[12]. Such estimates must, however, be interpreted with some caution. First, they do not include the welfare loss incurred when governments have to increase statutory tax rates to recoup lost revenue -- an argument raised recently by Pecorino (1997). Some of the studies that try to quantify this effect generally found it lowered the beneficial impact by about half. Second, while higher inflation lowers GDP and measured consumption, their impact on welfare is partially mitigated by the increased leisure which also results. Third, the estimated benefits are discounted values of future changes in consumption over a large number of years, assuming an unchanged macroeconomic environment. This makes them sensitive to the underlying choice of assumptions, notably period length and discount factors.

Price stability versus zero inflation

28. Some economists have analysed the implications of zero inflation compared with outright price-level stability. Coulombe (1997) argues that economic agents are not better off if they expect inflation to vary between -1 and +1 per cent as opposed to an expected inflation of say 1 to 3 per cent, since their preference is for knowing the future price *level*. A policy of price stability would require monetary authorities to redress all

8. Among the many references, see Black *et al.*, 1994; Feldstein, 1996; Bakhshi *et al.*, 1997; Tödter and Ziebarth, 1997; and Dolado *et al.*, 1997.

9 The actual mechanisms involved are discussed in some detail by Cohen *et al.* (1997).

10. Nominal mortgage interest rates are tax-deductible, while the imputed rents from owner-occupied housing are untaxed or taxed below market values

11. An exception is Rao Aiyagari (1997) who finds smaller benefits.

12 This long-term effect on the level of GDP corresponds closely to the findings of Andres and Hernando (1997).

price-level shocks. If fully credible, it would eliminate most of the uncertainties about future prices and some of the uncertainty about relative prices[13]. The benefits of moving to a regime of price stability are thus higher than those of moving to zero inflation.

29. This analysis does not, however, explicitly allow for the fact that, given the inevitably unforeseen disturbances to which economies are subject, maintaining a price level target may involve greater fluctuations in policy instruments, and thus possibly in output, than a zero inflation target. A number of studies of alternative policy rules in an explicitly stochastic setting provide some insight into the relative benefits of the two types of rules in this context[14]. The studies examine various monetary policy rules (i.e. "reaction functions" relating changes in policy instruments to policy targets along with actual or projected inflation, real output, and, in some cases other variables) in the context of macroeconomic models in which such disturbances are explicitly accounted for[15]. Not surprisingly, all these studies (cited in Table 7) indicate that inflation cannot be controlled perfectly under the "best" rules considered, the majority of the studies imply that simulated inflation can be confined within a band of 3 to 6 percentage points only about two-thirds of the time. The results indicate that the choice between inflation and price level targets depends upon the relative importance attached to the variability of the price level, inflation and output. Price level rules could involve greater output variability than a zero inflation target (Lebow *et al*., 1992; Haldane and Salmon, 1995), but they naturally entail less variability in the price level, and much less uncertainty in the expected future price level. On the other hand, in models with "asymmetric" price responses, a price level target tends to be superior to an inflation target in that it leads to a higher average level of output (Black *et al*., 1997), although the difference in performance in terms of output variability is estimated to be modest. Moreover, Svensson (1996) argues that in the case of a high degree of unemployment persistence, price-level targets could lead to lower output variability than inflation targeting.

Some costs that could be incurred

30. It has been argued that low as opposed to zero inflation has certain beneficial effects on the economy. For example, demand shocks could necessitate temporarily negative real interest rates which would be very difficult to achieve in the absence of inflation (Summers, 1991). However, there is little hard evidence that monetary authorities have resorted to this tool during past periods of higher inflation; if anything, incidences of negative real interest rates were often associated with policy mistakes (Edey *et al.*, 1995). An argument that has received more attention recently in favour of maintaining a low inflation rate is that it "greases the wheels" of the labour market because nominal wages are downward rigid. According to this view, downward adjustment of aggregate real wages is difficult to impossible in the absence of inflation and this leaves the economy vulnerable to slumps in aggregate demand that could lead to, potentially permanent, increases in the level of unemployment (Akerlof *et al.*, 1996). To support this view, the authors carried out surveys of the wage developments of individuals who have remained in their job for at least a year. They find that the share of individuals who have experienced a wage reduction is much smaller -- almost zero -- than reported in US macroeconomic studies such as the Panel Study of Income Dynamics; against this background they conclude that most evidence of downward nominal wage flexibility reflects reporting errors. Comparable evidence of downward wage rigidity has recently been found in Canadian and New Zealand data (Fortin, 1996; Hogan, 1997; Chappel, 1996). It has been contested, however, by Card and Hyslop (1996) who found evidence of considerable downward nominal wage flexibility on the sectoral level.

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13 This is also argued by Tödter and Ziebarth (1997).

14. These include Judd and Motley (1992) and Lebow, *et al.* (1992) for the United States; Haldane and Salmon (1997) for the United Kingdom; and Black *et al. (*1997) and Fillion and Tetlow (1993) for Canada.

15. More particularly, the estimated models are subjected to shocks drawn from a distribution comparable to that observed historically (as estimated from the model).

31. The long-term costs of disinflation depend on the degree of real wage flexibility -- i.e. the persistence of unemployment. Obviously, if there is hysteresis in unemployment (the worst-case described by Akerlof *et al.*, 1996), the output losses would become permanent. The degree of persistence in unemployment across OECD countries in recent decades has been the subject of several studies (Elmeskov, 1993; Ball, 1996; Scarpetta, 1996). Generally, these empirical studies find evidence of unemployment persistence, which is short of total hysteresis and varies significantly across countries. A tentative ranking of countries according to the degree of persistence (Table 8) is broadly consistent with estimates by Andersen (1992). The continental European countries come across as having particularly persistent unemployment while persistence is relatively low for the United States and Japan. Neely and Waller (1997) concluded, for the United States, that the lost output following a 10 percentage point disinflation is recouped in 10 to 15 years; however, most of the gains are reaped within the fist half of the period. The costs are likely to be higher and take longer to recoup in those countries with relatively rigid labour and product markets.

IV. The implications for monetary policy

32. The overall implications of the evidence reviewed here are that the foundation for maintaining a credible and lasting inflation environment has improved, even though the benefits are not yet fully apparent nor is their ultimate extent yet clear. This observation raises two concrete questions for monetary policy:

- What are the most critical requirements to maintain the present low inflation environment, that is to avoid "backsliding"?

- Should countries proceed to lower inflation further and under what circumstances?

33. On the first question, while inflation has been subdued, its risks have clearly not disappeared. Indeed in certain respects, longer-term inflation risks are somewhat understated by present conditions, given that factors, such as those that are holding down inflation in the United States, noted in the Appendix, cannot be expected to last indefinitely. While the signs of improvement in transmission mechanisms are encouraging, evidence on their extent is still tentative. The studies cited in the above section underscore that there are likely to be noticeable variations in inflation under the best of circumstances (indeed that is why official inflation targets are generally specified in terms of a band). These studies may understate the precision with which inflation can be controlled, to the extent that the "art" of monetary policy formulation can improve on mechanical rules derived from empirical models. However, given the imperfect information about the structure of the economy available to policymakers, and the possibility that estimated models may not adequately capture the extent or nature of future shocks to the economy, it is also possible that such models have overstated the true ability of policymakers to control inflation. This caveat is reinforced by the fact that the information content of monetary and credit aggregates and other traditional monetary policy indicators has declined in most cases.

34. Given these considerations, continued adherence to lessons acquired in past inflation episodes remains critical to preserving the success that has been attained during the 1990s. Particularly important is that policy formation be "forward looking" in the sense that instruments respond to prospective inflation pressures in a sufficiently decisive way to prevent underlying inflation from increasing (Svensson, 1997). The simulations cited in the above section confirm historical experience that forward-looking policies are likely to produce lower and less variable inflation as well as less variable output (Haldane and Salmon, 1995; Clark *et al*., 1995; Fillion and Tetlow, 1993). Policy has also become more aggressive since the 1980s in responding to inflation as opposed to output (Table 9)[16]. The development of increasingly sophisticated empirical models of the

16. However the studies summarised in Table 7 indicate that the variations in policy interest rates required to achieve the maximal possible control of inflation may have to be considerably greater than typically observed in practice, even in recent years.

economy that explicitly take account of expectations has also helped in implementing forward-looking policy strategies and making them more systematic (Siviero, *et al.*, 1997). Svensson (1997) recommends that policy should respond in a consistent fashion to deviations of the model-based inflation forecast from the central bank's target inflation rate and that the central bank make public the details of its forecasts.

35. On the second question, if countries do wish to eliminate remaining inflation, one way to pursue this objective is to follow an "opportunistic" approach (Orphanides and Wilcox, 1996) of locking in inflation gains that occur when demand is weak, or under other circumstances. Using this approach, authorities would allow inflation to decline but not to rise again subsequently. In the United States, inflation seems to have been reduced opportunistically even while a very favourable growth performance has been sustained. Going further beyond zero inflation to a price level target has considerable theoretical appeal, particularly if reducing uncertainty about the price level over long horizons is a major priority, or if there are important asymmetries in price responses to demand. However, as yet, the empirical evidence of the costs and benefits of this approach does not seem strong enough to justify adoption of such a strategy at this point; neither does the evidence suggest that the possibility should be ruled out of consideration at a later time.

36. Finally, the overall evidence indicates that the case for going to lower inflation within the near future is significantly stronger for those countries, such as the United States and the United Kingdom, where labour and product markets are both relatively flexible. The case is probably weaker for European countries, where substantial rigidities in these markets remain and where, for that reason, the costs of lowering inflation further are likely to be substantially higher. Accordingly, a case can be made that structural reforms to achieve these ends should take precedence over lowering inflation further.

APPENDIX

Factors which have helped contain inflation

37. In addition to the changes in inflation vulnerability discussed in the remainder of this paper, some special factors have helped contain inflation in most OECD economies in recent years. One of the most important of these factors has been the weakness in the prices of oil and other basic commodities. Relative prices of these commodities have been in secular decline since the early 1980s (Reinhart and Wickham, 1994), reflecting increasing world market supply (Borensztein and Reinhart, 1994) as well as depressed demand in the industrial world due to technological innovation (OECD, 1994a).

38. Indications about vulnerabilities of prices to shifts in money demand are mixed. There were expectations during the 1980s that completion of major financial innovations underway along with lower inflation would restore stability to the relations between key money aggregates and nominal GDP (Shigehara, 1997). While the variability of money velocities -- admittedly only a rough indicator of the stability of money demand relations -- has been lower during this decade than during the 1980s in three Anglo-Saxon countries, it has changed little in Japan and major continental European nations (see following table).

United States

39. In addition to the weakness in commodity prices, some additional factors have been at play in the US economy which have helped contain inflationary pressures far better than usual during the recent recovery. Some of these are listed below.

- A drop in the annual rate of increase in medical costs from nearly 10 per cent to virtually zero. Much of this slowdown reflects the shift of managed care plans and other one-off effects of increased pressure by employers and governments for cost savings (OECD, 1996b, *United States*).

- It has been argued that the high level of excess capacity in Europe and Japan has helped to restrain US price increases. Import prices have been quite subdued since 1992 and have fallen since 1995. However, exchange rate changes, in particular the real effective appreciation of the dollar over the last three years, explain much of this restraint (see Orr, 1994).

- In addition, productivity gains in key sectors have allegedly been stronger than official figures would suggest OECD, 1997a, Greenspan, 1997). However, recent revisions to US national accounts data do not suggest that the gains have been understated to more than a small degree.

Europe and Japan

40. In Europe and Japan, deregulation and structural reform have produced some modest but noticeable one-off effects on inflation (OECD, 1997b). Further reforms, such as the “big bang” in financial services in Japan, the changes likely to flow over time from the restructuring of financial services in the EMU and, if implemented, other reforms that have been proposed should exert further downward pressures on costs and prices. Apart from structural reforms, reductions in social security and other charges have resulted in one-off reductions in costs in certain sectors. However, there have also been tax increases or other measures that increase costs.

Standard deviation of changes of money velocity

	United States	Japan	Germany	France	Italy	United Kingdom	Canada	Belgium	Netherlands	Sweden	Switzerland
	M2	M2+CDs	M3	M2	M2	M4	M2	M1+quasi money	M1+quasi money	M1+quasi money	M1+quasi money
1970s	0.020	0.020[1]	0.023	n.a.	0.028	0.046	0.036	0.029	0.065[1]	0.0585	0.155
1980s	0.024	0.009	0.019	0.019	0.026	0.020	0.034	0.018	0.211	0.104	0.248
1990s	0.014	0.010	0.023	0.018	0.024	0.012	0.025	0.024	0.017	0.115	0.110

1. M2 only.
Source: Secretariat estimates.

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Table 1. ***The Economist*** **poll of consumer price forecasts**

	1997	1998
United States	2.4	2.5
Japan	1.5	0.9
Germany	1.8	2.1
France	1.3	1.7
Italy	1.9	2.4
United Kingdom	3.0	3.3
Canada	1.9	2.1
Belgium	1.7	2.1
Netherlands	2.3	2.6
Sweden	0.9	2.1
Switzerland	0.7	1.2

Source: The Economist, December 6th-12th 1997, p. 116.

Table 2 . **Standard deviation of inflation forecasts for Canada**

Year	Standard deviation
1984	1.17
1985	0.62
1986	0.96
1987	0.49
1988	0.46
1989	0.62
1990	0.42
1991	0.33
1992	0.59
1993	0.55
1994	0.40
1995	0.37
1996	0.45

Source: Conference Board.

Table 3. **Standard deviations of changes of exchange rates**[1]

	United States	Japan	Germany	France
1970s	2.24	4.51	2.54	2.50
1980s	3.14	4.49	1.76	1.63
1990s	2.53	4.95	1.63	1.16

1. Percentage changes in real exchange rates calculated from quarterly data.

Source: Secretariat estimates.

Table 4. **Predicted versus actual wage inflation**[1]

	Average annual differences 1993-1996 (Actual minus predicted)[2]	R^2	Standard error	Significance probability of forecast errors[3]
United States	-1.4	0.70	1.0	0.1
Japan	0.6	0.89	2.5	19.8
Germany	-0.8	0.96	0.7	32.5
France	0.2	0.89	1.5	96.7
Italy	-0.6	0.90	2.0	65.0
United Kingdom	-3.4	0.80	2.3	2.7
Canada	-0.8	0.82	1.6	66.8

1. Wage equations based on Elmeskov (1993). The predicted wage inflation is taken from relations of the following form estimated over 1970-1992.

$$dL(W) = c + a1*dL(W-1) + a2*dL(PC-1) + a3*dL(PY-1) + a4*L(UNR) + a5*dL(UNR)$$

where dL refers to the change in log; L is log; W is the wage rate of the business sector; PC is the consumer price index; PY is the GDP deflator; and UNR is the unemployment rate.

2. A minus sign indicates annual inflation has been lower than predicted by the behavioural relation.

3. Chow likelihood-ratio forecast test. Hypothesis: there is no structural break in 1992. A low probability indicates a likely break.

Source: Secretariat estimates.

Table 5. **Summary of recent structural reform measures with potential effects on the flexibility of labour and product markets**

	Measure		
	Labour markets	**Product markets**	**Remarks**
United States	Welfare reform (1996).		
	Active labour market policies to improve education (1997).		Goals' 2000 programme
	[Minimum wage increases (1992-97)].		
		Deregulations: electricity (1992); telecommunications (1996); agriculture (1996).	
		Trade: NAFTA (1993).	
Japan	Measures to increase participation by older workers (1994-95).		
	Relaxation of rules governing employment agencies to allow more liberal use of temporary workers (1997).		
		Telecommunications: ending of segmentation in the provision of national and international telephone call services (1997).	
		Energy: liberalisation of imports on refined products; provisions to auction surplus electricity (1995).	
		Airlines: relaxation of some fare controls (1996); allocation of airport slots to new companies (1997).	
		Other deregulations: trucking (1990); relaxation of land use/transfer restrictions (1996) and on zoning (1997).	
		Financial services deregulation (ongoing).	
		Retain distribution to allow larger discount outlets (1990, 1992, 1994).	
		Trade: measures to liberalise foreign access to construction, shipping, financial services.	

Table 5. (continued)

	Measure		
	Labour markets	**Product markets**	**Remarks**
Germany	Social security changes to reduce net benefits from health and sick leave (1996).		Wage negotiations maintained sick leave but with trade-off on other benefits.
	Unemployment benefit criteria tightened (1996-1997).		
	Measures to increase labour supply of older workers, part-time workers (1996).		50 point action programme
	Measures to liberalise work arrangements, including relaxation of employee protection laws (1996-97).		
	Active labour market policies (1994-96) promoting job re-entry; encouraging hiring of long-term unemployed; enhancing access to training.		
		Subsidies to former east-Germany being tightened to promote more competitive markets.	
		Incentives for new firms, improved access to capital markets (1996-97).	
		Deregulation measures in: trucking (1994); telecommunications (1996); energy, including initial steps towards liberalising markets for electricity (1997).	
		Full privatisation of the state airline (1997); partial privatisation of telecommunications (1996).	Privatisation efforts are continuing in a number of sectors
		Retail sales: some liberalisation of shop hours (1996).	

Table 5. (continued)

	Measure		
	Labour markets	**Product markets**	**Remarks**
France	Incentives (1992-93) to hire household, part-time, low wage workers.		
	Working arrangements: liberalised working hours (1993); [tightening of restrictions on mass redundancies]; [government proposed measure to lower the statutory work week to 35 hours beginning in 2000].		
	Active labour market policies: measures to improve targeting of programmes (1996).		
		Measures to improve corporate governance, access to capital by strengthening the role of the stock market and increasing market transparency.	
		Deregulation measures (1990s): rail, air transport, electricity, road freight.	Mainly under EU mandated reforms; full opening of EU road freight to cross-border competition in 1998.
		Telecommunications; measures to liberalise access in certain segments; and partial privatisation (1997).	
		[Limits on large retailers under “Loi Royer” (1990)]	

Table 5. (continued)

	Measure		
	Labour markets	**Product markets**	**Remarks**
Italy	Removal of the wage indexation scheme *(scala mobile)* in 1992 and establishment of a two-tier wage bargaining system in 1993.		
	Reform of public employment regulations (1992).		
	Pension reforms (1992 and 1995): shift from an earnings-based system to one where benefits are linked to contributions; increase in contribution rates.		
	Labour market reform in 1997 promoting more flexible forms of employment contracts.		
		Establishment of the Anti-Trust commission (1990).	
		Stock market law (1991).	
		Reform of the national Health System (1992).	
		Privatisation of major state entities (1993-ongoing).	
		New rules for public procurement (1995). Deregulation measures; energy (1996); telecommunications (1997)	
		Initiatives to modify corporate governance (1997).	
United Kingdom	Unemployment benefits: replacement of benefits with a Job Seekers' allowance (1996) with more strict job search requirements; and prospective cuts in lone parent and other benefits for new claimants		Extensive labour/product market reforms undertaken throughout 1980s.
	Incentives to hire longer-term unemployed part-time workers (1995-96). Active labour market policies to assist in job-search and hiring, including the "Welfare to Work" programme (beginning 1998) to promote employment of those on welfare.		
		Deregulation: electricity (1990); telecommunications (1991); airlines (1997)	
		Retail sector deregulations (1990s)	

Table 5. (continued)

	Measure		
	Labour markets	**Product markets**	**Remarks**
Canada	{Increases in minimum wage}		
	Tightening of unemployment benefits criteria (1996).		
	Relaxation of impediments to labour mobility across provinces (1995).		1995 Agreement on Internal Trade
	Reductions in unemployment insurance contributions (1996); [Prospective increases in pension levies for employers/employees]		
	Active labour market policies on placement, Training/education (1996).		
		Privatisations of certain government agencies and enterprises (since 1992).	
		Liberalisation of internal trade (1995)	1995 Agreement on Internal Trade
		Ongoing financial sector reforms	
		Trade: NAFTA (1993)	
Belgium	Law on Competitiveness (1989) aiming at wage moderation; "global plan" (1993), reducing social security charges, making wage indexation less perfect and tightening unemployment schemes. Personalised support plan (1993) for training of unemployed		
	Multi-year employment plan (1995), aiming to reduce labour costs, increase labour flexibility, and improve training. "Contract for the Future" (1996), aiming to restrain growth in wage and overall labour costs.		
		New competition Law (1993) to safeguard and encourage effective competition.	
		Deregulation measures in telecommunications (1995); privatisation of state telecom (Belgacom) company, and granting of licenses to more than one company.	

Table 5. (continued)

	Measure		
	Labour markets	**Product markets**	**Remarks**
Netherlands	General tax reductions, with specific reductions targeted at low wage earners (1995 onwards)		
	Active labour market policies to: increase participation of groups with low employment chances (1990); train long-term unemployed (early 1990s); Youth Work Guarantee Law (1992) to increase training of youngsters; reform of the Public Employment Service (1994).		
		Reforms to competition law to counter anti-competitive practices (1993-94); further reforms to foster competition will take effect in 1998.	
		Other competition measures: to limit regulation and administrative burdens (1995); and revised Establishment Law to encourage formation of new enterprises (1996).	
		Distribution: extension of shop opening hours (1996).	
Sweden	Social insurance; reductions in replacement rate of social insurance programmes (1990s); tightening of eligibility criteria for unemployment benefits (1996).		{Replacement rates to be raised moderately in 1998, but will remain below early 1990s}.
	Tax reforms to lower marginal tax rates and broaden tax base (1990-91); [partially ofset by tax rate increases in 1993 and further increase in employee contribution rate to social insurance in 1997].		
	Some relaxation of rules governing employment protection (1996-97).		
	Active labour market policies: reduced in scope (1993 and onwards), but combined with increased capacity in adult, tertiary education programmes to stimulate human capital formation.		
		Electricity market (1996): measures to introduce competition in generation and distribution.	
		Other deregulation measures: in domestic civil aviation (1992); and Telecom Act to establish an open telecommunications market (1993).	

Table 5. (continued)

	Measure		
	Labour markets	**Product markets**	**Remarks**
Switzerland	Reform of unemployment insurance (1996), restricting access to benefits; shifting from passive income support to active labour market policies to increase labour flexibility (1997).		
		New Cartel Act (1996) prohibiting the elimination of effective competition; Inter-cantonal agreement on public procurement applying Uruguay Round agreements (1996).	
Memorandum item: Trade reforms applicable to all or most countries		GATT Agreement (1994) European Single Market Programme (1987)	Ongoing reforms mandated in transportation, utilities, financial services.

Notes: Entries are measures that potentially lower structural unemployment or improve real flexibility; entries in [ ] tend to have unfavourable effects in this respect. Most entries refer to a range of measures encompassing a number of legislative actions.

Sources: Compilation taken from OECD *Economic Surveys* for 1996-1997 and the country notes from Chapter 1, Volume 2 of the OECD 1997 report on *Regulatory Reform*. The compilation includes only those measures instituted over the past several years.

Table 6. **Estimated benefits of reducing inflation one percentage point**

(Summary of findings in recent literature)

Country	Authors	Estimated long-term gain in GDP[1]
United States	Feldstein (1996)	0.43 to 0.78
Germany	Tödter and Ziebarth (1997)	1.02
United Kingdom	Bakhshi *et al.* (1997)	0.23
Canada	Black *et al.* (1994)	0.96 to 1.68
Sweden[2]	Persson *et al.* (1996)	0.36
Spain	Dolado *et al.* (1997)	0.85 to 1.43

1. Not including the effects of possible compensatory tax increases.
2. Government revenue foregone due to disinflation.

Table 7. **Summary of studies on monetary policy rules**[1]

Study	Country	Standard deviation of inflation over four quarters
Judd and Motley (1992)	United States	1
Lebow, Roberts and Stockton (1992)	United States	¾ - 1¼
Fillion and Tetlow (1993)	Canada	1½ - 1¾
Black, Maklem and Rose (1997)	Canada	1
Haldane and Salmon (1995)	United Kingdom	3

1. Figures derived from stochastic simulations of empirical macroeconomic models using various monetary policy rules. The standard deviations correspond to rules that produce the lowest output variability, subject to the assumed inflation target being achieved. The distribution of disturbances used corresponds to that experienced over the 1970s-1990s.

Table 8. **Persistence in unemployment: ranking of countries**

(Low ranking indicates low degree of persistence)

	Ranking [1]
United States	1
Japan	2
Germany	13
France	11
Italy	16
United Kingdom	7
Canada	7
Belgium	17
Netherlands	12
Sweden	5

1. Scarpetta works with two alternative specifications. The ranking is based on the average degree of persistence in the two.

Source: Scarpetta (1996).

Table 9**. Taylor rules for interest rates**

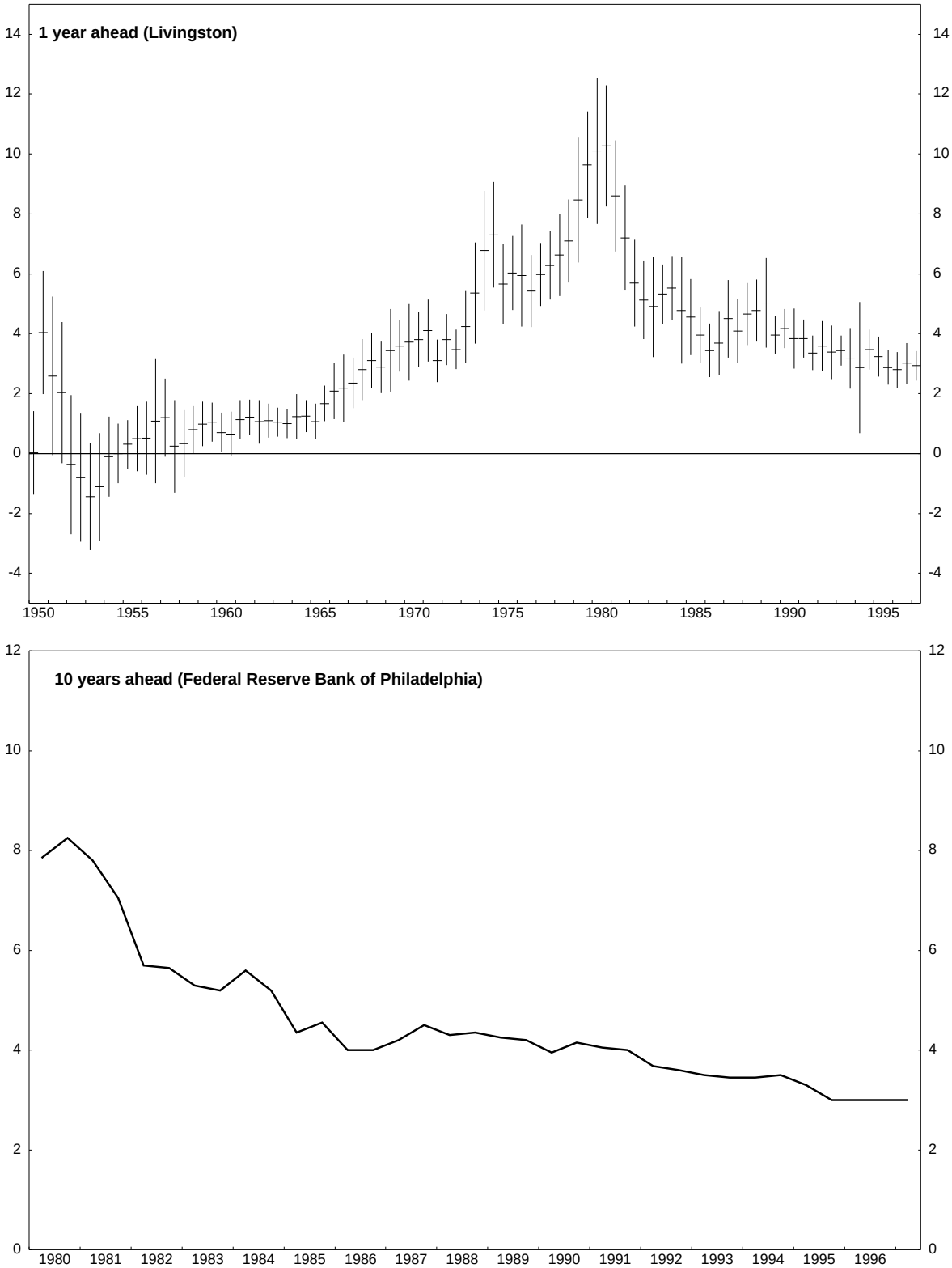
	Reaction of short interest rates[1]				Correlation[2]	
	1968-1979		1980-1996		1968-1979	1980-1996
Regression weights on	Inflation	Output gap	Inflation	Output gap	R squared	R squared
United States	0.36	0.67	1.05	(-0.03)	0.28	0.71
Japan	0.54	0.72	0.87	0.37	0.55	0.69
Germany	0.52	0.94	0.80	0.53	0.29	0.72
France	0.40	0.96	0.53	0.53	0.19	0.75
Italy	0.53	(0.14)	0.63	(-0.12)	0.60	0.79
United Kingdom	0.14	1.11	0.61	0.49	0.06	0.66
Canada	(0.24)	1.05	0.92	0.50	0.55	0.81

1. Estimates from regression of 3 month interest rate on actual inflation over the past year and the real output gap. Using quarterly data.
2. Correlation between a hypothetical interest rate using weights of 0.5 on the inflation differential and output gap, and the actual nominal interest rate.

( ) estimate is not statistically different from zero.

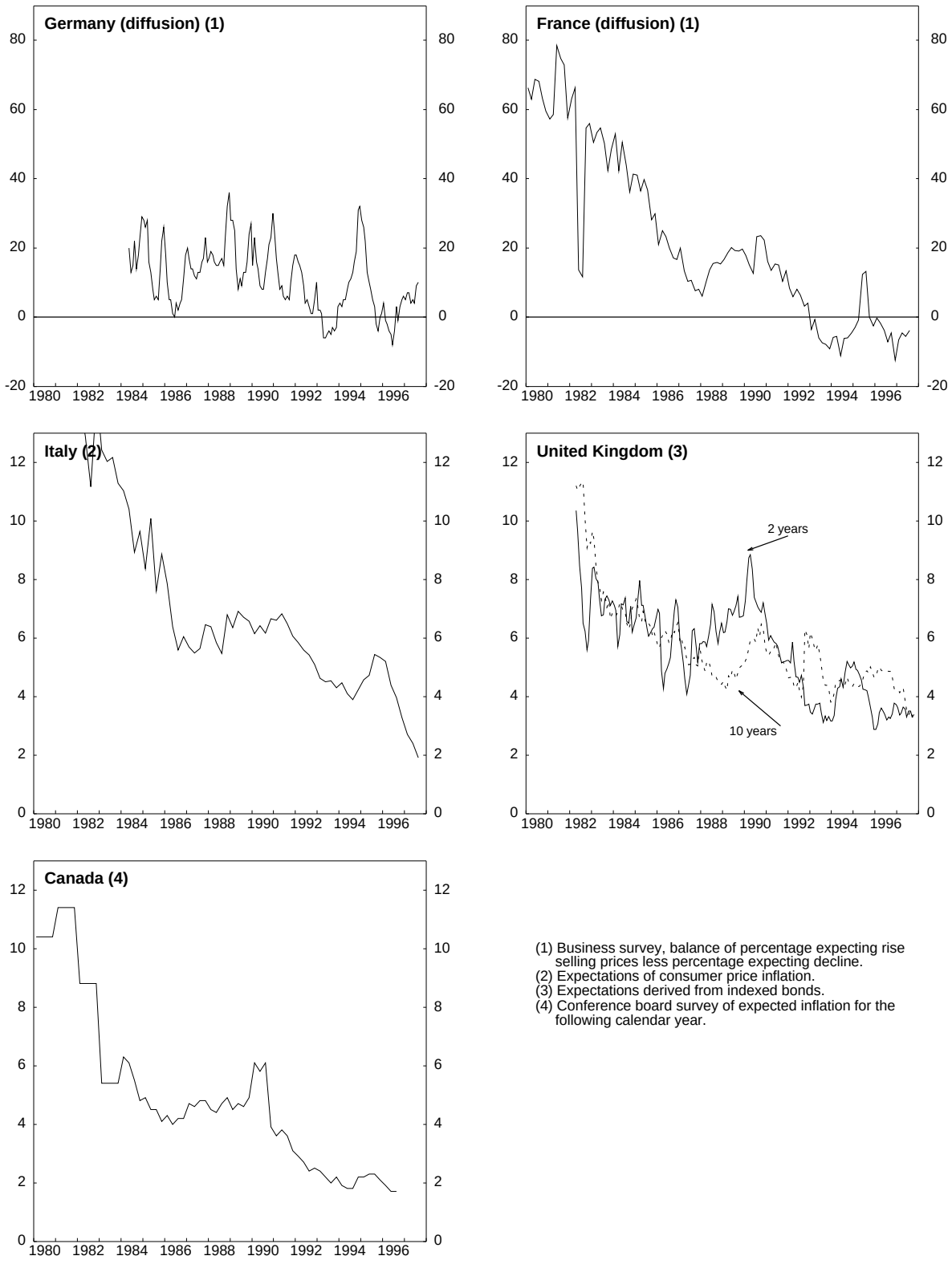
Source: Secretariat estimates.

Figure 1. Inflation expectations for the United States



Notes: Data refer to the mean value of CPI forecasts from a panel of participants. The Livingston panel consists of consumers; the Federal Reserve Bank of professional forecasters. The vertical lines in the upper panel denote the dispersion of the forecasts among those surveyed.

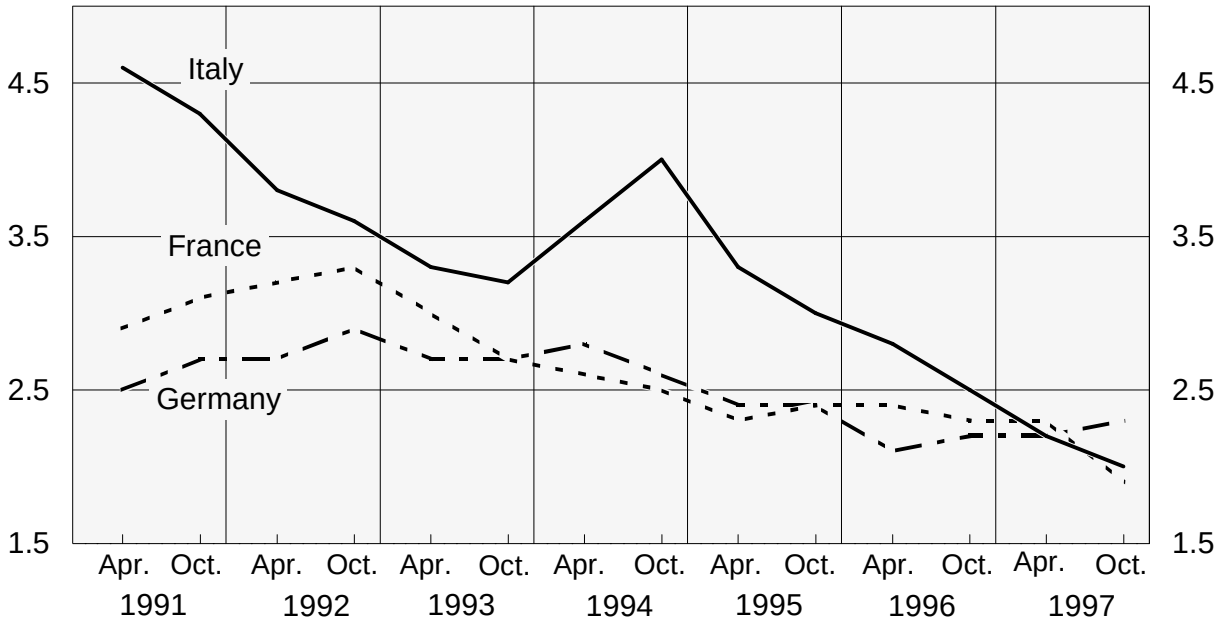
Figure 2. Inflation expectations for other countries



(1) Business survey, balance of percentage expecting rise selling prices less percentage expecting decline.
(2) Expectations of consumer price inflation.
(3) Expectations derived from indexed bonds.
(4) Conference board survey of expected inflation for the following calendar year.

Figure 2 (cont.) **Professional forecasters' expectations of consumer price inflation over the long term (1)**

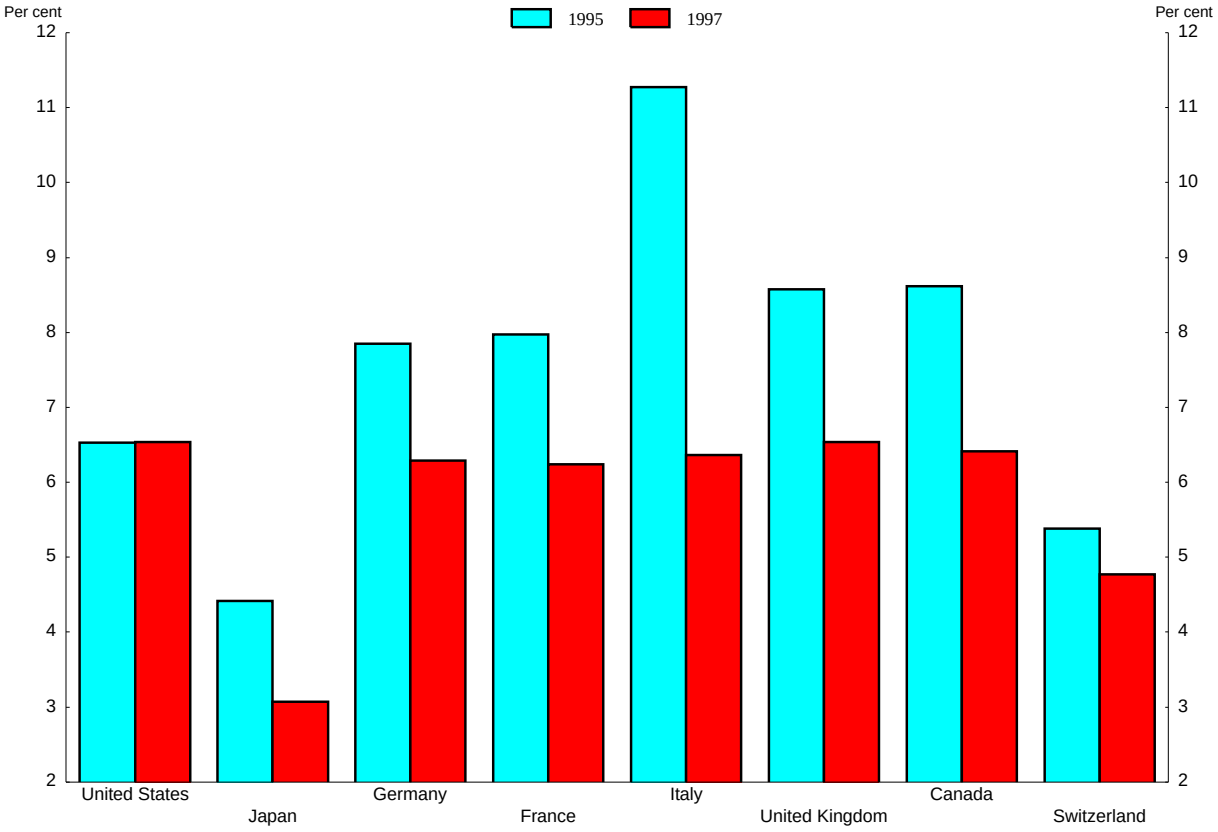
(percentage changes)



(1) *Consensus Forecasts* survey of average inflation expected between 5 and 10 years after the year of the survey (e.g. average inflation expected between 2003 and 2007, expressed in the surveys carried out in 1997). Surveys are taken at half-yearly intervals.

Source: Banca d'Italia (1997), *Economic Bulletin* , No. 29, October.

Figure 3. Implied five-year forward rates five years ahead as of December 1995 and December 1997 (1)



Source: Bloomberg.

1. Implied forward rates are calculated from quotations of swap rates. The forward rates apply to the year 2000 and 2002, respectively.

Figure 4. Interest rates on long-term government bonds

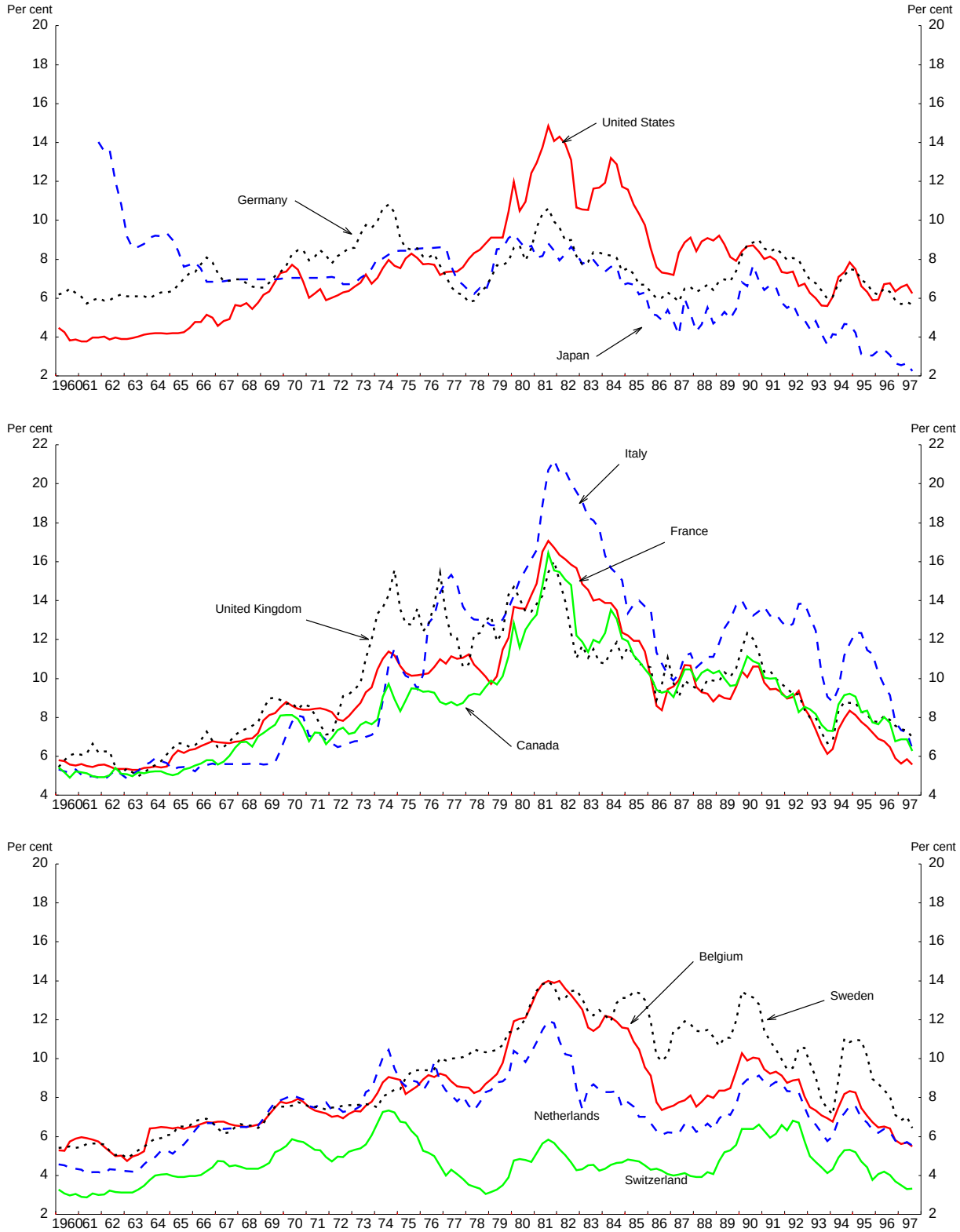
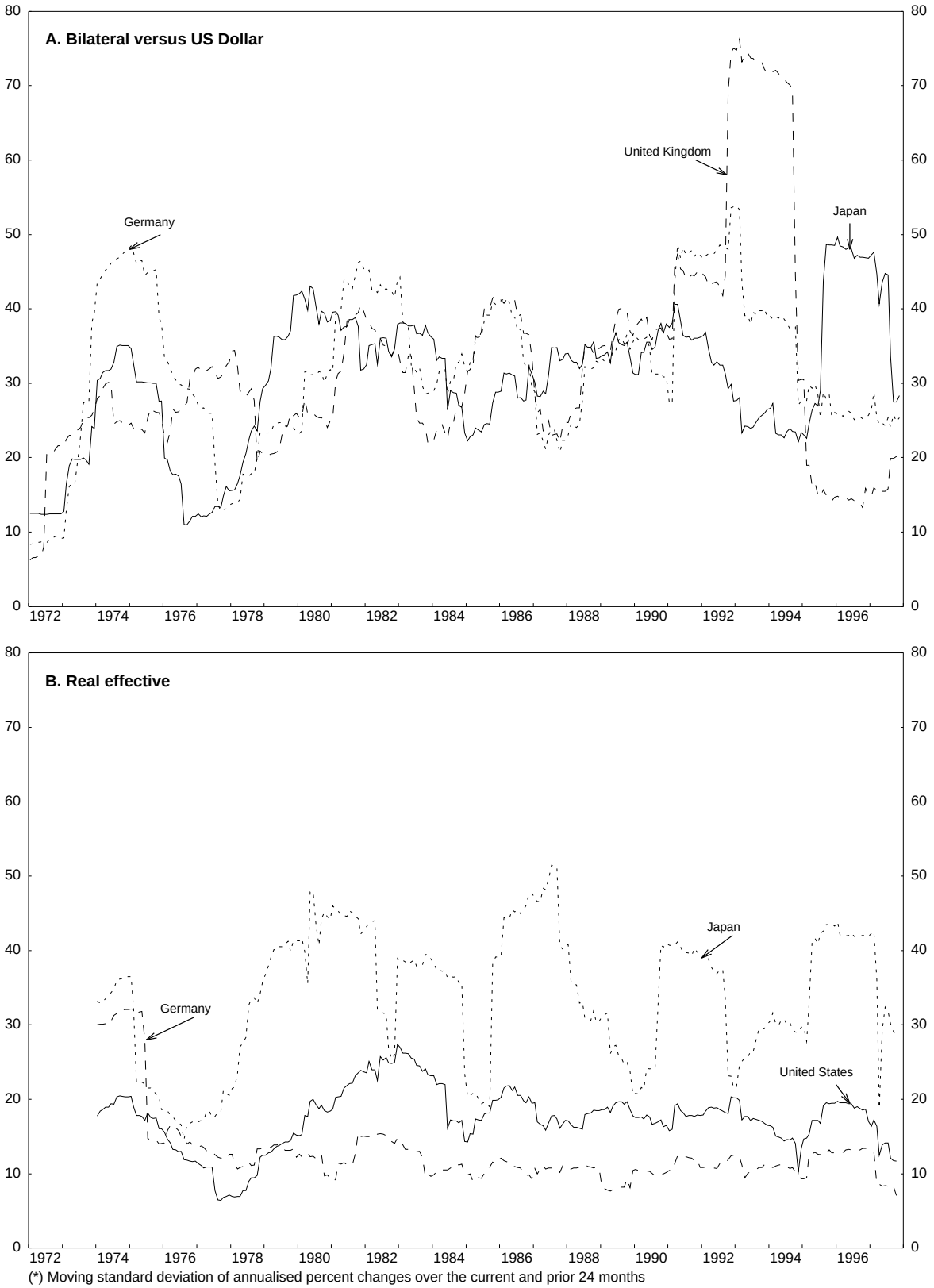


Figure 5. Exchange rate volatility (*)



(*) Moving standard deviation of annualised percent changes over the current and prior 24 months

Figure 5 (con't). Exchange rate volatility

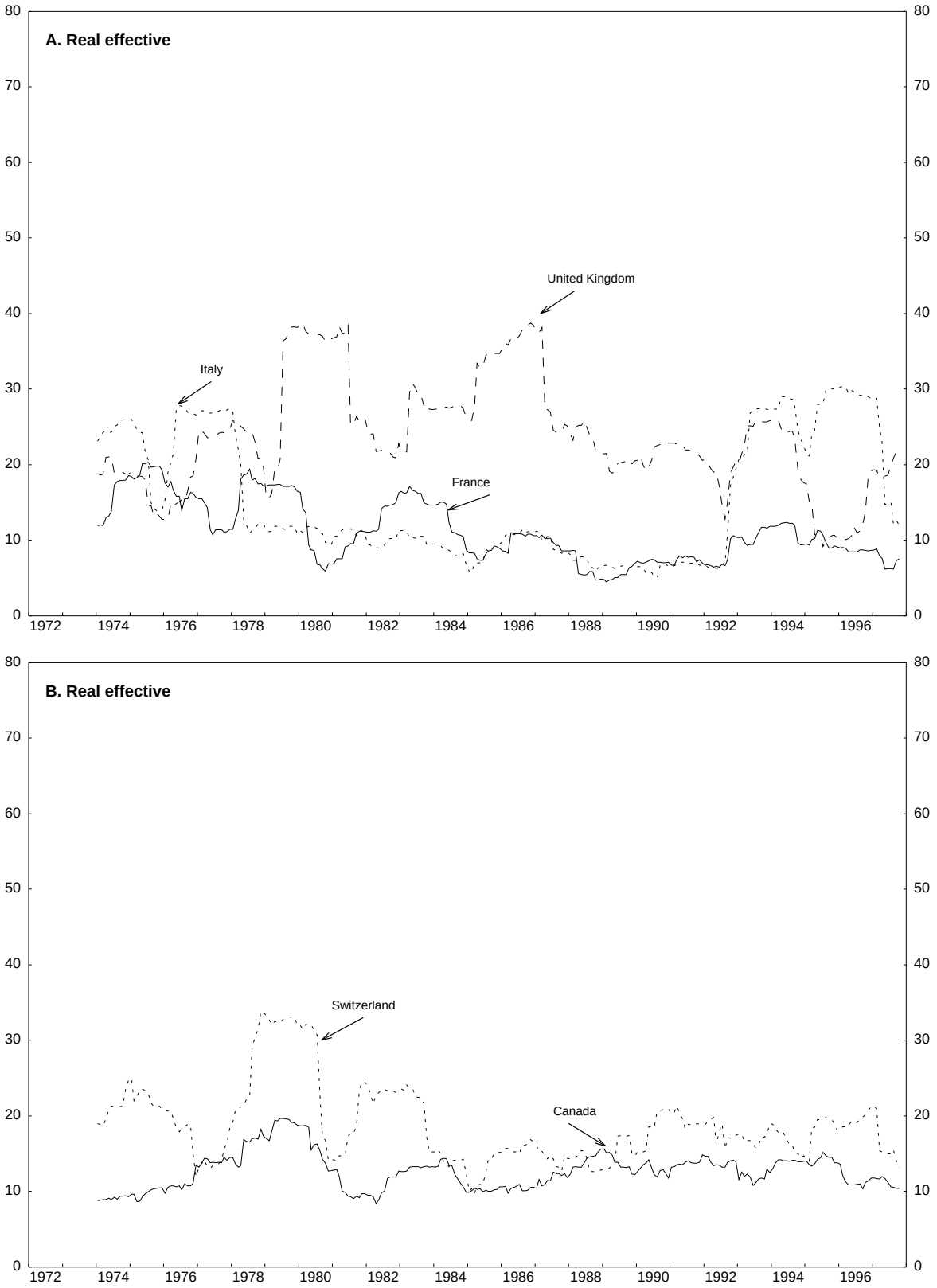
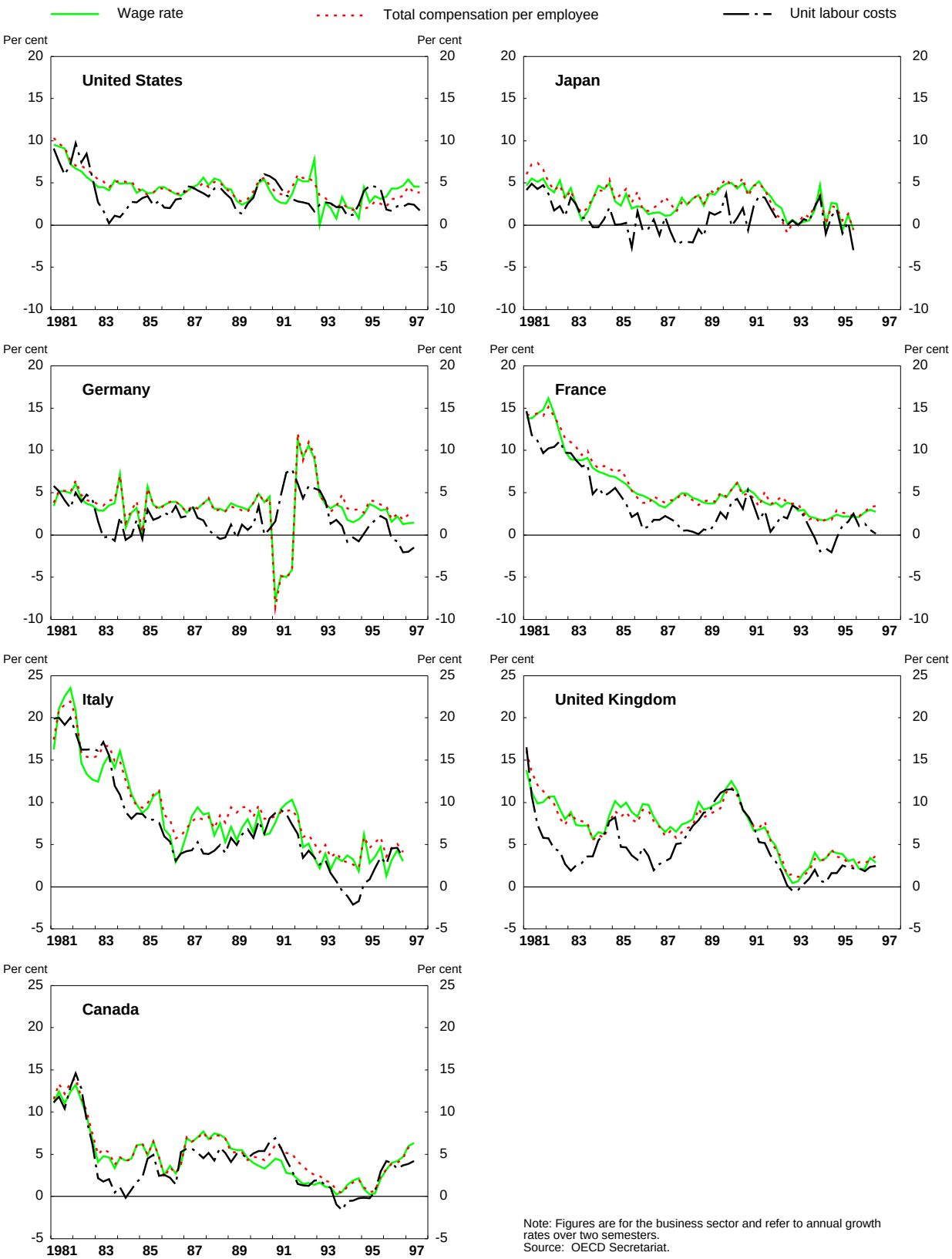


Figure 6. Increases in labour compensation and unit labour costs

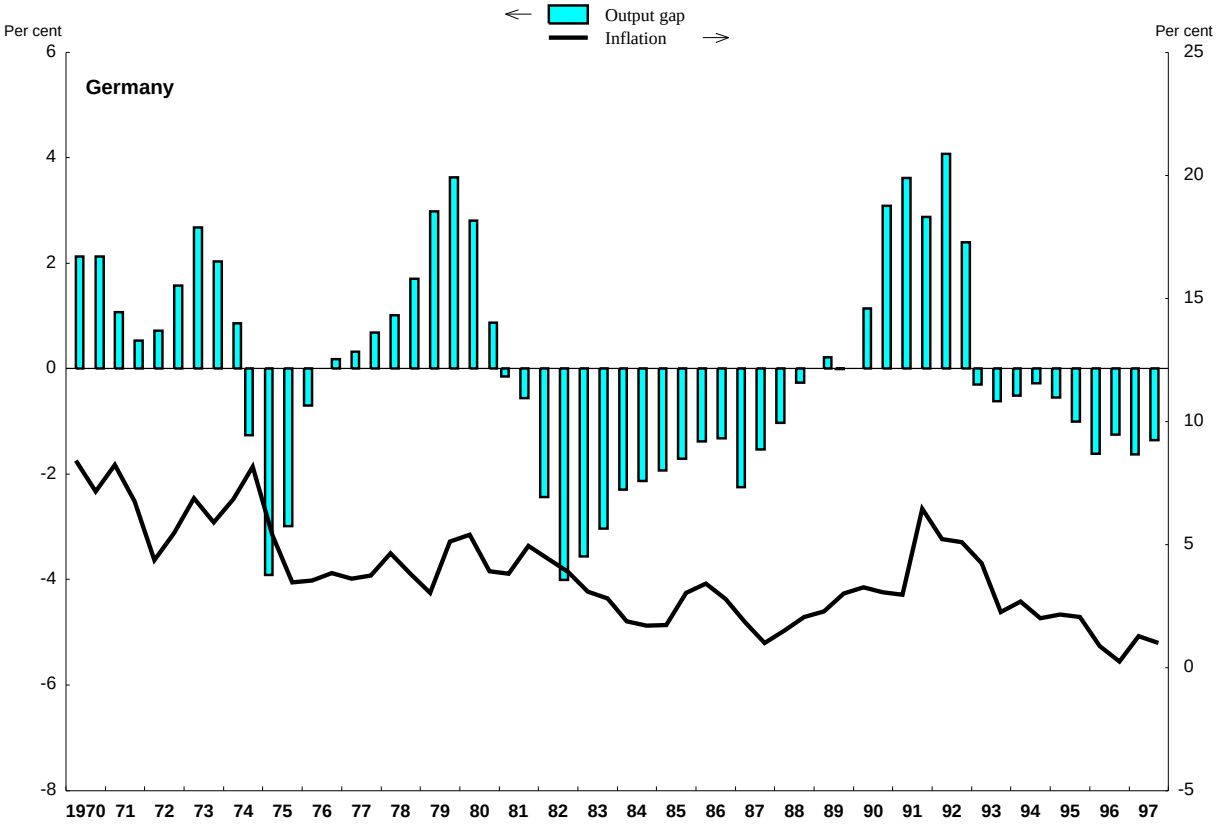


Note: Figures are for the business sector and refer to annual growth rates over two semesters.
Source: OECD Secretariat.

Figure 7. Inflation and output gap (1)

1. Output: percent difference between actual and potential output.Inflation: annualized inflation in the GDP deflator over 2 semesters.

Figure 7. Inflation and output gap (cont.)



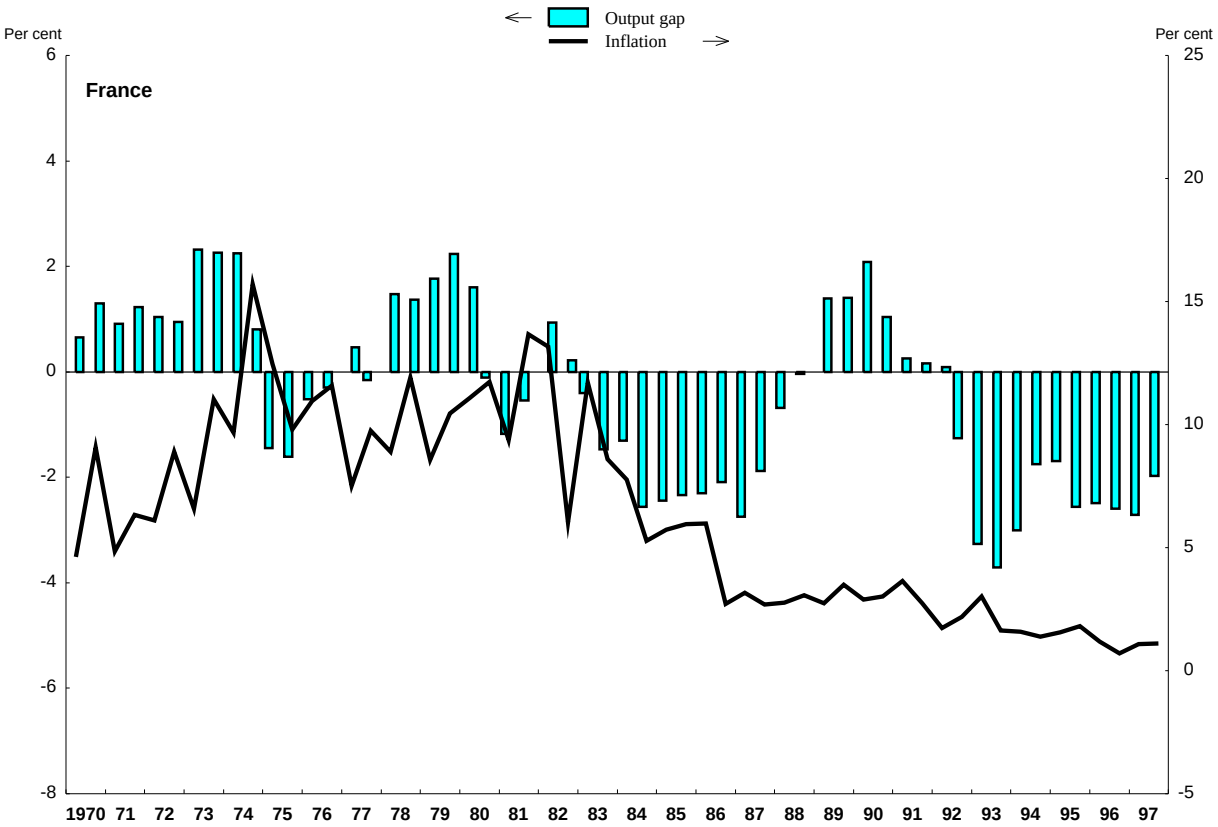
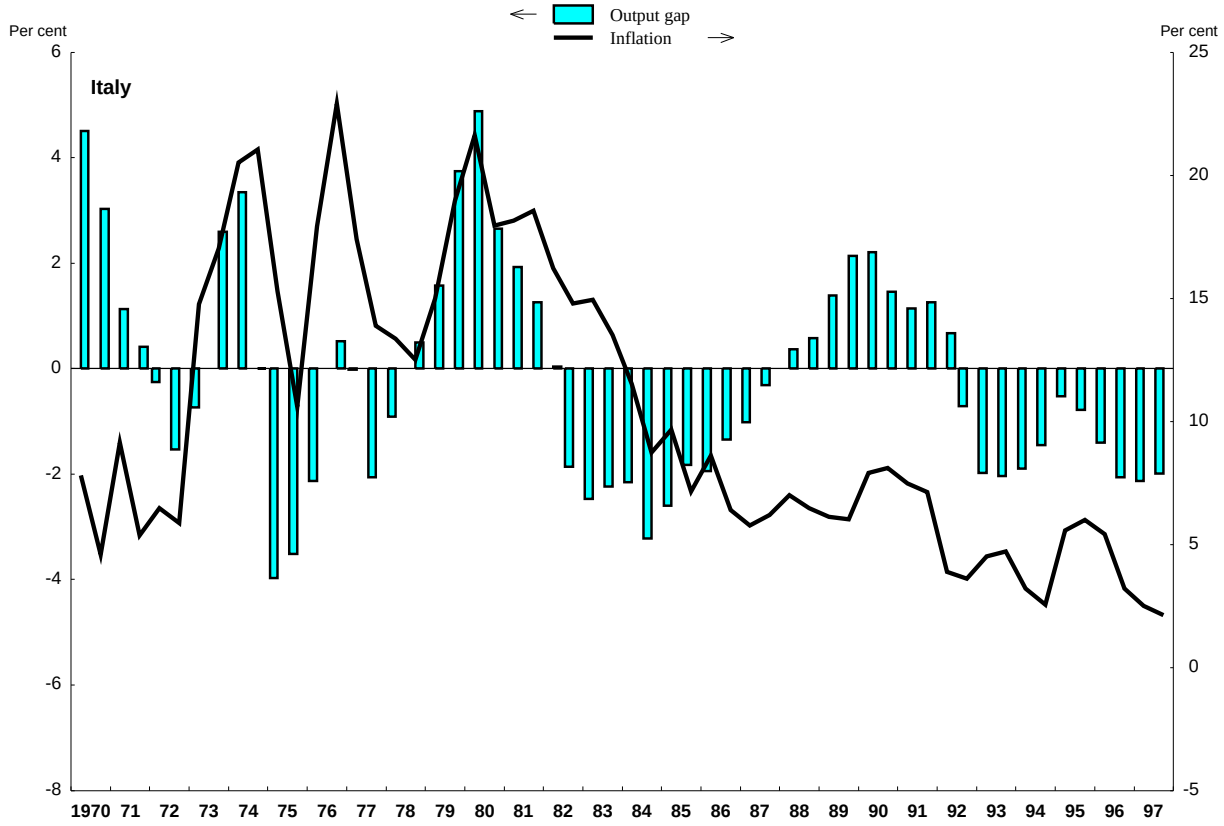


Figure 7. Inflation and output gap (cont.)



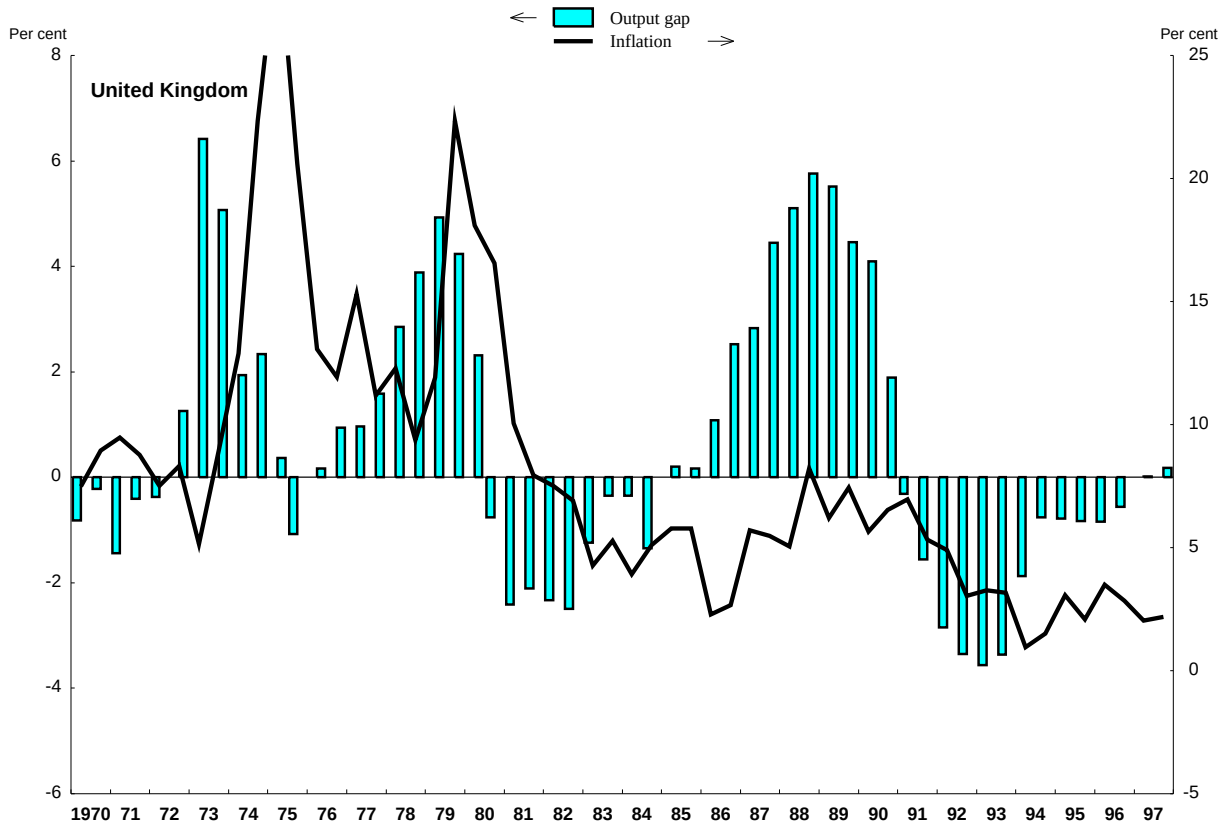
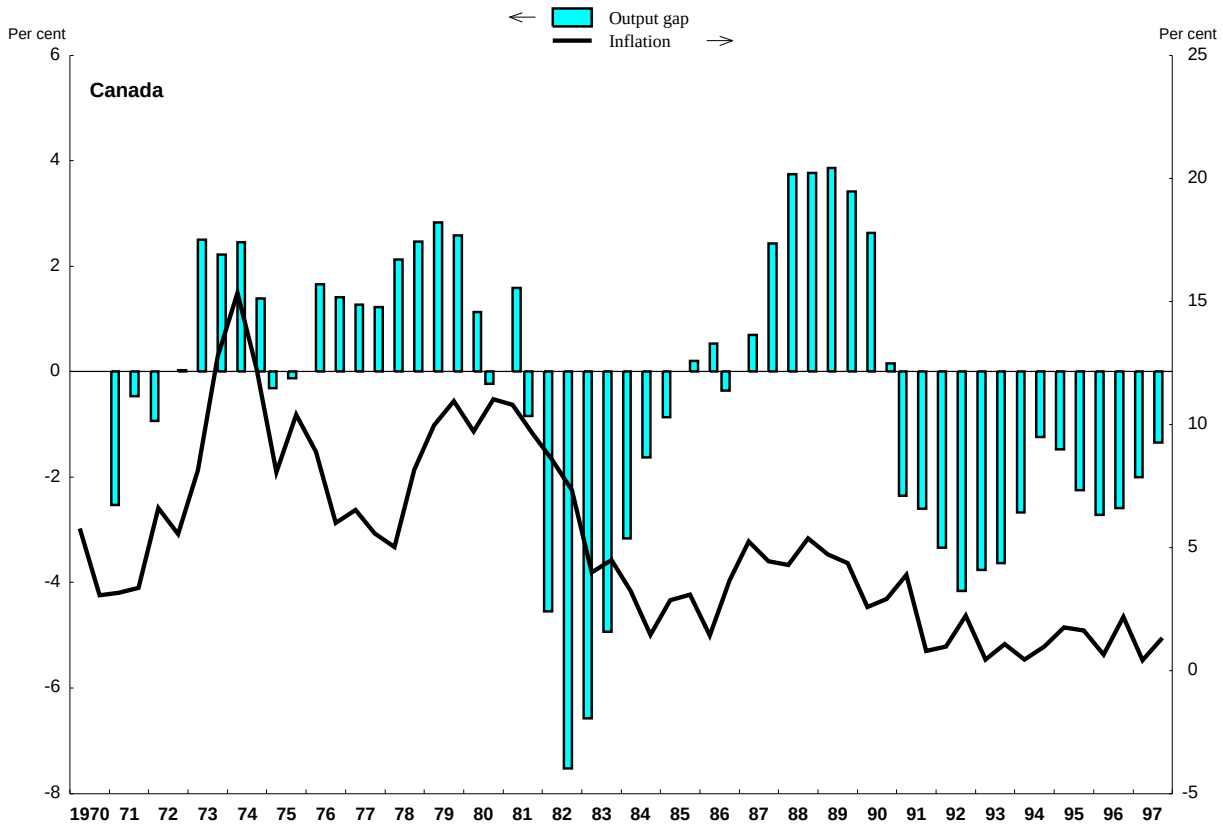


Figure 7. Inflation and output gap (cont.)



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