

# Globalisation and OECD Consumer Price Inflation

by

Nigel Pain, Isabell Koske and Marte Sollie

Introduction . . . . .	2
Recent trends in inflation and global economic conditions . . . . .	3
Imports from emerging markets and inflation . . . . .	5
Estimates of the direct impact of imports from non-OECD Asia on OECD consumer price inflation . . . . .	6
Estimates of the direct impact of imports from the non-OECD on OECD import price inflation . . . . .	7
The impact of non-OECD output growth on commodity prices . . . . .	8
Demand growth in the non-OECD . . . . .	8
Estimates of the impact of output growth on commodity prices . . . .	10
Estimates of the impact of non-OECD growth on commodity prices . . . . .	11
The impact of globalisation on consumer price inflation . . . . .	14
Existing studies of globalisation and inflation . . . . .	14
Testing for the impact of globalisation . . . . .	18
Summary of empirical results . . . . .	20
Quantifying the overall impact of globalisation . . . . .	22
Concluding remarks . . . . .	24
Notes . . . . .	27
Bibliography . . . . .	30

---

The authors are members of the Macroeconomic Analysis and Systems Management Division and Country Studies 4 Division of the Economics Department of the OECD. They are grateful to Pete Richardson, Michael Feiner, Jørgen Elmeskov and other colleagues in the Economics Department for helpful comments and suggestions, and to Diane Scott for assistance in preparing the document.

---

## Introduction

Over the past 25 years consumer price inflation has moderated considerably in all OECD economies, and also worldwide. The decline in OECD inflation from above 10% in the early 1980s to around 2% over the decade from 1995-2005 has been accompanied by a reduction in the variability of inflation and cross-country dispersion. These developments have coincided with a marked increase in the extent of globalisation, with the production of many goods and services becoming increasingly internationalised and the level of trade in goods and services between the OECD and non-OECD economies rising as a share of OECD GDP.

Ultimately, inflation should be determined by monetary policy. But many other factors can influence inflation and in the short to medium term it can be difficult to assess whether any observed moderation in inflation results from monetary policy, structural factors – such as globalisation – or just good fortune. Globalisation itself, as reflected in trade and foreign direct investment, potentially affects inflation through a variety of channels (IMF, 2006a; Kohn, 2006). Enhanced trade integration with lower-cost economies may help to hold down domestic inflation by depressing trade prices and increasing the share of imports in domestic demand. Related to this, enhanced product market competition may have reduced the mark-ups of domestic producers. These forces and the internationalisation of production may also have helped to raise the cyclical influence of global capacity utilisation on domestic price inflation (Borio and Filardo, 2006). Against this must be set the extent to which the strong globalisation-related growth in many non-OECD economies, and especially China, is putting upward pressure on the prices of many commodities.

This paper explores some of these issues in order to quantify the contribution of particular aspects of globalisation to the decline in OECD inflation. In doing so, the study extends the recent literature on this topic in several respects. In particular, wider allowance is made for possible price level effects from globalisation, a larger number of countries are included in the sample and the separate impacts of commodity and non-commodity import prices are considered.

The analysis suggests that the inflation process in OECD countries has indeed changed around the mid-1990s, around the time at which the extent of globalisation began to rise markedly. Accounting for this structural change leads to several important findings. Of these, the most notable is that the impact of import prices on consumer prices is higher after the break in all countries. In addition, the short to medium-term response of inflation to domestic cyclical output variations is found to have declined over the past decade, implying an increase in the sacrifice ratio. By contrast, inflation has become more sensitive to foreign economic conditions, working through import prices.

A simulation exercise reveals that globalisation has, on balance, contributed to lower inflation in most OECD economies. Although strong GDP growth in the non-OECD economies has pushed up real oil and metals prices in OECD economies, this has been more than offset by the disinflationary impact of declining import prices of goods and

services. Nonetheless, the net effect is small, with globalisation having been associated with a decline in the rate of consumer price inflation of between 0 to  $\frac{1}{4}$  percentage point per annum since 2000.

The paper is organised as follows. First, it provides a short overview of inflation-related developments and some key indicators of the world economy that are drawn on in the analytical work. Next, it presents the findings of recent studies on the impact of non-OECD economies on consumer and import price inflation in OECD economies. The paper then continues by discussing the key findings from new estimates of the influence of non-OECD economies on selected commodity prices. The wider importance of globalisation and international trade for consumer price inflation is addressed in the subsequent section, which first reviews the range of evidence based on existing studies and then provides new estimates based on an econometric analysis of the factors determining consumer price inflation in the OECD economies. This is followed by an evaluation of the overall impact of commodity and non-commodity prices on consumer prices, using these new estimates in a scenario analysis. The final section summarises the key findings and concludes with a number of policy implications.

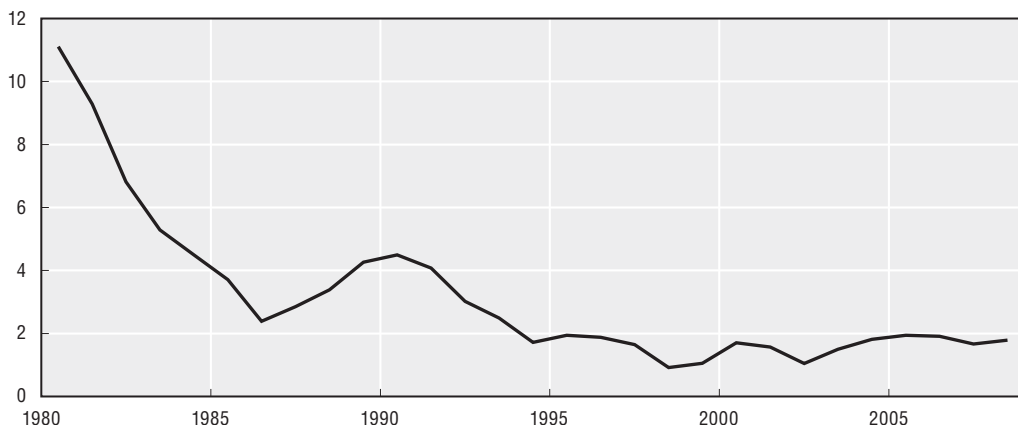
## Recent trends in inflation and global economic conditions

Over the past 25 years inflation has fallen considerably across OECD countries. In 1980 the annual inflation rate was over 10% in many OECD countries compared with an average annual rate of 2 to 3% since the second half of the 1990s (see Figure 1). Much of this decline occurred during the first half of the 1980s when average inflation fell by more than 1 percentage point per annum. Inflation rates continued to decline in subsequent years, though much more slowly. This fall in average inflation rates has been accompanied by decline in inflation variability and also in inflation expectations. On average across OECD countries, the standard deviation of annual consumer price inflation has declined from above 3% in the early 1980s to around 0.5% in recent years.

A number of different factors have contributed to the fall in both average inflation and inflation variability; the focus here is on the role of external factors. Figure 2 compares the evolution of the aggregate price deflator for imported goods and services with domestic producer prices in manufacturing over the period 1980 to 2005. On average, import prices

Figure 1. **Consumer price inflation in the G7 economies**

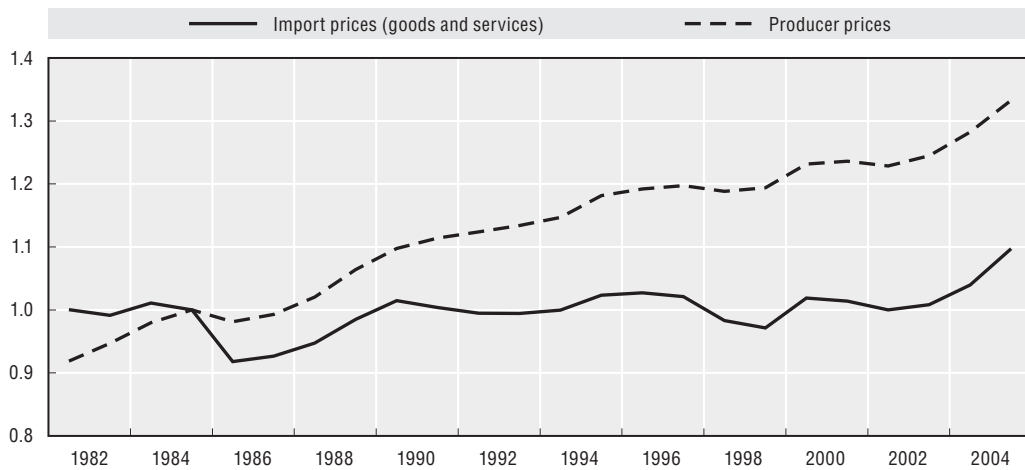
In per cent



Source: OECD Economic Outlook database.

Figure 2. **Import prices and producer prices in the G7 economies**

1985 = 1



Note: The producer price index covers all manufacturing goods.

Source: OECD Economic Outlook database, OECD Main Economic Indicators database.

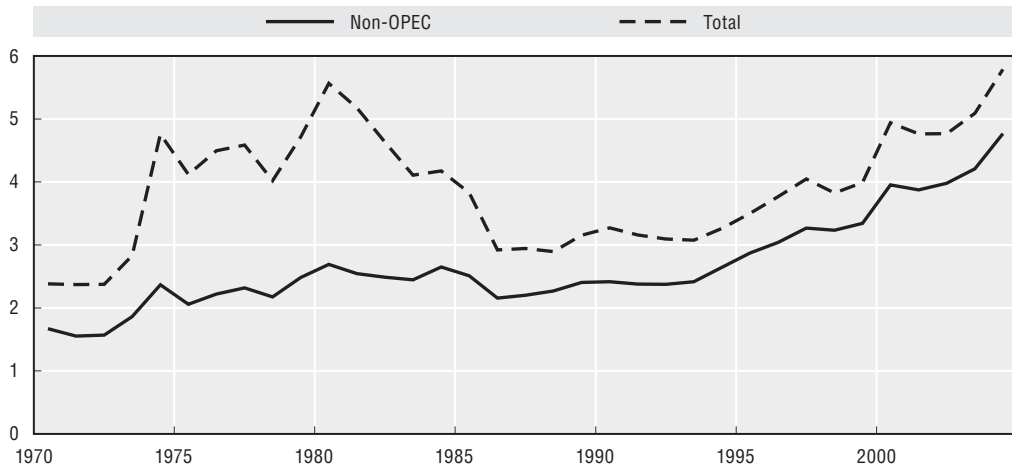
declined relative to producer prices during this period.<sup>1</sup> Non-commodity import prices have risen at a very moderate rate since the early 1990s and in some countries have even declined. More recently, the modest rate of non-commodity import price inflation has been partly offset by rising prices for commodity imports.

Low import price inflation in OECD countries can in part be attributed to the rising trade integration of low-cost countries from Asia and Latin America. Since the beginning of the 1990s the share of non-OECD countries in total world trade has increased markedly: from about a quarter of total world trade in 1990 to about a third in 2005. The rise in the trade share of non-OECD countries reflects the increasing openness of these countries as well as higher GDP growth rates compared with OECD countries. Between 1980 and 2005 the GDP of non-OECD countries grew by 5% per annum on average, compared with growth of 3% per annum in the OECD countries.

The integration of non-OECD countries into international trade and production networks has also progressed since the mid-1990s, albeit from a low level. One indicator of this is the global stock of foreign direct investment relative to global GDP, which increased throughout the 1990s (see Pain et al., 2007, Figure 1). Although this increase was mainly due to higher intra-OECD flows, inward FDI to non-OECD countries also picked up, particularly in the mid-1990s. Coinciding with the rise in international FDI flows, imports of OECD countries from non-OECD countries also rose markedly from the mid-1990s onwards (see Figure 3). In part, this trend reflects the recent strengthening of oil and other commodity prices. But it mainly reflects the increasing extent of international sourcing of finished and intermediate goods and services from the non-oil producing countries in the non-OECD.

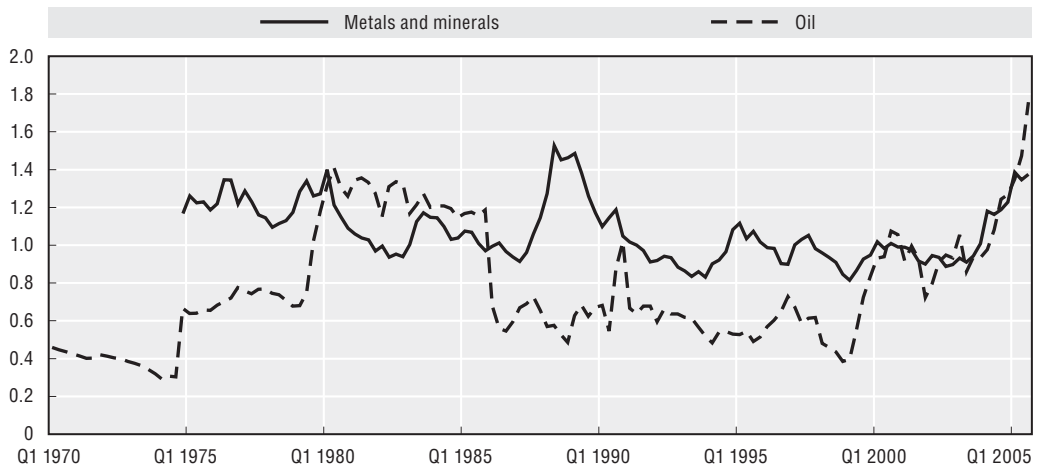
During 2002 to 2005 the prices of several commodities moved towards or past historical peaks in real terms, when expressed relative to weighted world export prices in US dollars (Figure 4).<sup>2</sup> These increases have been especially marked for real oil and metals prices. Between the fourth quarter of 2003 and the fourth quarter of 2005, oil prices rose by 74% in real terms, with metals prices increasing by 47% in real terms.<sup>3</sup> Additional increases occurred in 2006. The size and persistence of recent increases is unusual but, as can be seen from Figure 4, not outside all historical experience.

Figure 3. **OECD imports from non-OECD countries**  
Per cent of GDP, current prices



Source: OECD International Trade Statistics database and Economic Outlook database.

Figure 4. **Real oil and metals prices**  
2000 = 1; deflated by world export prices in US dollar terms



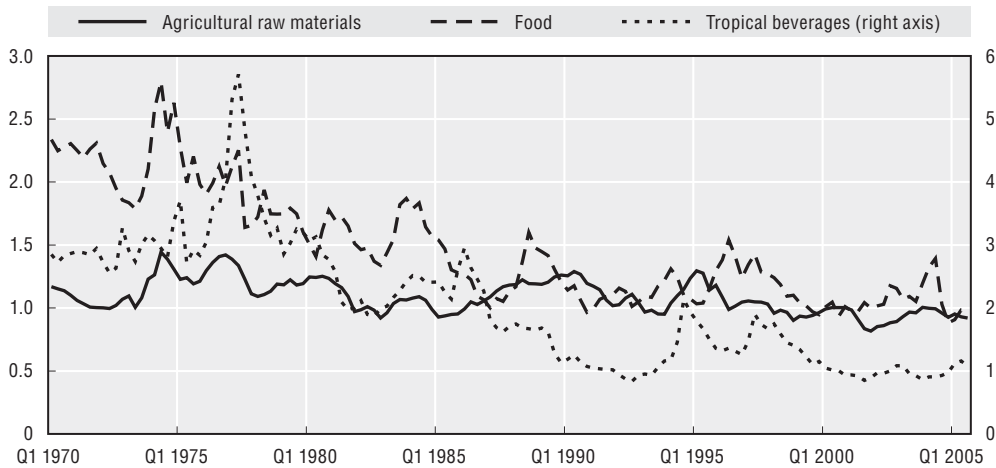
Source: OECD Economic Outlook database.

In contrast to oil and metals prices, the real prices of agricultural raw materials, foods and tropical beverages did not increase significantly over 2002-05 and remained well below historical peaks at the end of 2005 (Figure 5). The broad agricultural commodity groups also comprise bio fuels, so that changes in oil prices can be propagated to other commodity prices (IMF, 2006b). Up to the end of 2005, however, any such spillovers appeared to have been limited.

### Imports from emerging markets and inflation

The increasing importance of China and other lower-cost producers in global production networks is likely to have placed downward pressure on the global prices of many goods and services, and hence import prices in OECD countries, through several

Figure 5. **Real agricultural prices**  
2000 = 1; deflated by world export prices in US dollar terms



Source: OECD Economic Outlook database.

different channels. This section discusses the findings from a number of studies that have sought to estimate the initial impact of imports from lower-cost producers on either domestic inflation or on the growth rate of import prices.

### **Estimates of the direct impact of imports from non-OECD Asia on OECD consumer price inflation**

Using a simple accounting framework, a recent study by the OECD shows that over the past decade imports from China and, to a lesser extent, other dynamic Asian economies, have placed downward pressure on the rate of consumer price inflation in the United States and the euro area (OECD, 2006). In the reported calculations this arises from two sources – an increase in import penetration by lower-price Asian producers, and the differences between the rate of growth of their export prices and producer prices in the importing economies. Overall, the combined impact effect of imports from China and other dynamic Asian economies is estimated to have reduced domestic inflation in the United States by 0.1 percentage point per annum on average from 1996 to 2005. In the euro area, it is estimated to have reduced domestic inflation by 0.3 percentage points per annum between 2000 and 2005. Prior to that point, the effect was negligible.

Although this would appear to suggest that trade with lower-cost producers is placing downward pressure on domestic prices in OECD economies, the eventual effect on inflation is less clear as the calculations show only *ex ante* effects. The extent to which they eventually lead to lower consumer price inflation will depend on the effect they have on the behaviour of other competitors and domestically generated inflation.<sup>4</sup> The latter will depend on whether the initial impacts are accommodated by the stance of monetary policy in the importing economy. Deflationary pressures on the general price level can, at least in principle, be offset eventually by monetary policy relaxation, although this does depend on the extent to which they are recognised, estimated accurately and acted upon promptly.<sup>5</sup>

Such estimates provide only a partial view of the effects on OECD economies of increased trade with lower-cost producers in Asia and elsewhere. In particular, there is no allowance for any offsetting effects of higher world commodity prices that may result from strong growth in comparatively commodity-intensive economies such as China.

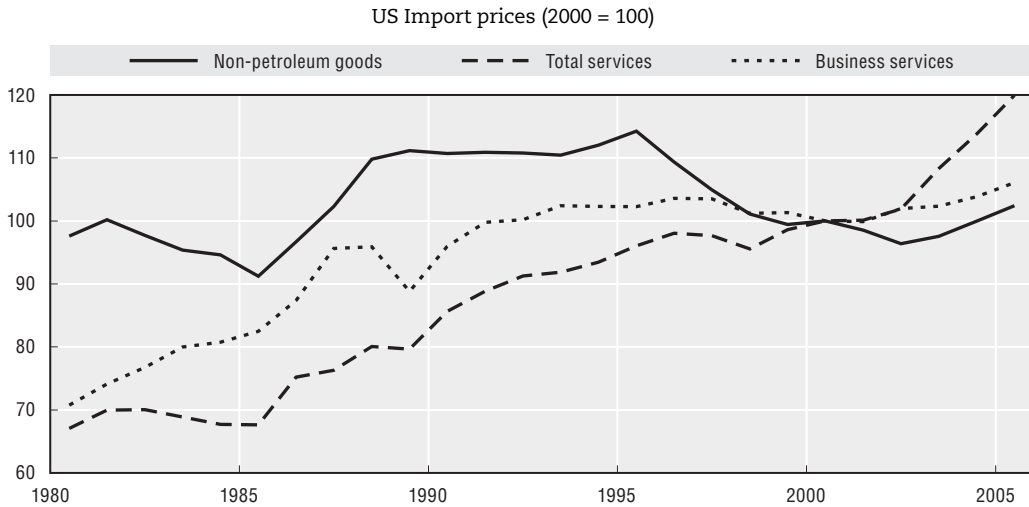
### **Estimates of the direct impact of imports from the non-OECD on OECD import price inflation**

The results of OECD (2006) are broadly comparable with those reported in other recent studies of the impact of the switch of sourcing to low-cost countries, although most of these other studies consider the impact on trade prices in the importing country rather than on consumer prices. For the United Kingdom, estimates suggest that the move to low-cost producers during the period 2000-04 reduced the rate of world export price inflation to the United Kingdom<sup>6</sup> by 0.55 percentage point per annum on average (Nickell, 2005).<sup>7</sup> For the United States, Kamin *et al.* (2006) estimate that the growing share of imports from China lowered import price inflation by around 0.8 percentage point per annum on average between 1993-2002, all else being equal. The direct impact of this on consumer price inflation during this period would have been small, at around 0.1 percentage point or less, similar to the estimates in OECD (2006).<sup>8</sup>

Over the decade 1993-2002, only Japan and Korea are estimated to have experienced a reduction in import prices as a result of trade with China similar to that in the United States (Kamin *et al.*, 2006). For the median OECD economy, import price inflation is estimated to have declined by only 0.13 percentage points per year on average. Many of these economies, especially those in Europe, have a smaller share of their trade with Asian economies than the United States and Japan do. On the other hand, these economies are likely to have received additional benefits from low-cost imports from other economies, especially those in Central and Eastern Europe, and the size of any effect is likely to have become larger in more recent years due to the further rapid increase in import penetration by lower-cost producers.

The *ex ante* effects of low-cost production on trade prices are likely to be concentrated in particular sectors of the economy. Using data for the euro area from 1995 to 2005, estimates produced by the European Central Bank indicate that the combined impact of the rising import penetration of low-cost producers in the manufacturing sector, and the differentials in inflation between them and other producers, has dampened euro area manufacturing import price growth by approximately 2 percentage points per annum (ECB, 2006). In contrast to the studies discussed above, these calculations also include an allowance for the impact of production in regions other than Asia.<sup>9</sup> Feyzioglu and Willard (2006) find that the impact of trade with China on inflation in the United States and Japan is relatively strong on particular items such as household furnishings and food, rather than on the general consumer price level.

Overall, it appears reasonable to conclude that rising levels of imports from all lower-cost producers will have acted directly to reduce non-commodity import price inflation by up to 1 to 2% per annum in most OECD economies over the past decade, with globalisation-related effects in goods prices also being reflected in some services prices as well. To date, there have been no studies of the impact of service sector offshoring on the prices of imported services in the OECD economies. Some possible evidence on this is provided in Figure 6, which shows import price deflators from the United States national accounts. Up until the early-1990s the price of imported business services, a category which will include imported services that were moved offshore from the United States, rose faster than the prices of other service imports. But since that time, prices of business service imports have broadly stagnated whereas those of other service imports have continued to rise, suggesting that a globalisation effect may be present.<sup>10</sup>

Figure 6. **Goods and services import prices in the United States**

Source: Bureau of Economic Analysis, United States.

Changes in the domestic price level that stem from developments in only a few sectors of the economy may be less likely to generate a monetary policy response than equivalent changes in the domestic price level that are widespread throughout the economy (Rogoff, 2006). If so, the initial impact of an appreciation in the terms of trade (due to declining import costs) may be to push inflation below the medium-term target trajectory of the monetary authorities. The extent to which it does so, and the time over which this is allowed to persist, will depend not only on the behaviour of import prices but also on whether there are adverse effects on policy credibility and inflation expectations (Bean, 2006).

## The impact of non-OECD output growth on commodity prices

Strong growth in China and other emerging markets in recent years has coincided with a sizable increase in global commodity prices. This section discusses the extent to which these developments are related, focussing in particular on the linkages between macroeconomic conditions, including the relatively higher rate of growth in non-OECD economies, and oil and non-oil commodity prices. Using the “reduced form” equations for a selection of commodities reported by Pain *et al.* (2006), calculations are reported of what might have happened to commodity prices over the past five years if the non-OECD economies had not grown faster than the OECD economies. Such calculations, although only illustrative, help to evaluate the impact of growth in emerging markets on commodity prices and may thereby also help to indicate whether prices will continue to rise beyond the current high price levels or whether these are only temporary.

### **Demand growth in the non-OECD**

Earlier periods of rapid growth in real oil prices in the mid and late 1970s were characterised by marked constraints on oil production, notably by producers in OPEC. In contrast, the present upturn in oil prices has occurred at a time when the growth rates of both oil consumption and oil production have accelerated (IEA, 2006, Table 1). Over the decade to 2001 global oil demand rose by 1.4% per annum on average. In the subsequent four years demand growth accelerated to an average rate of 2% per annum.



Table 1. Regression results, 1980-94

	$\alpha_0$	$\alpha_1$	$\alpha_2$	$\beta_1$	$\beta_2$	$\beta_3$	$\beta_4$	$\gamma_0$	$\gamma_1$	$\gamma_2$	$\gamma_3$	$\gamma_4$	$\delta_0$	$\delta_1$	$\delta_2$	$\delta_3$	$\delta_4$	$\alpha_3$
AUS	-0.031 [0.216]	-0.047 [0.000]	2.074 [0.000]		0.084 [0.000]	0.263 [0.000]		0.061 [0.000]	0.012 [0.011]	-0.022 [0.009]			0.059 [0.000]		0.033 [0.000]			0.00068 [0.000]
AUT	0.016 [0.657]	-0.022 [0.000]	0.378 [0.007]	0.118 [0.000]	0.269 [0.000]	0.263 [0.000]		0.020 [0.000]	0.116 [0.000]	0.060 [0.000]			0.016 [0.103]	0.027 [0.019]		0.020 [0.043]		0.00031 [0.001]
BEL	0.091 [0.017]	-0.022 [0.000]	2.074 [0.000]	0.858 [0.000]	-0.426 [0.000]	0.099 [0.000]		0.182 [0.000]	-0.141 [0.000]	0.060 [0.023]	-0.046 [0.012]		0.193 [0.000]	-0.130 [0.000]		0.020 [0.043]		0.00012 [0.000]
CAN	0.039 [0.017]	-0.059 [0.000]	2.074 [0.000]	0.118 [0.000]				0.020 [0.000]	0.039 [0.000]				0.193 [0.000]		0.077 [0.000]	0.020 [0.043]	0.032 [0.025]	0.00025 [0.000]
DNK	0.029 [0.172]	-0.059 [0.000]	0.378 [0.007]	0.118 [0.000]	0.084 [0.000]	0.303 [0.000]		0.182 [0.000]					0.016 [0.103]	0.072 [0.000]				0.00025 [0.000]
FIN	0.039 [0.176]	-0.047 [0.000]	2.074 [0.000]	-0.172 [0.000]	0.084 [0.000]	0.099 [0.000]		0.020 [0.000]	0.039 [0.000]	0.021 [0.016]			0.016 [0.103]	0.027 [0.019]	0.077 [0.000]		0.032 [0.025]	0.00026 [0.000]
FRA	0.025 [0.02]	-0.059 [0.000]	0.378 [0.007]	0.480 [0.000]		0.099 [0.000]		0.084 [0.000]	-0.033 [0.000]	0.028 [0.000]			0.016 [0.103]	0.072 [0.000]				0.00025 [0.000]
DEU	0.079 [0.052]	-0.022 [0.000]	0.378 [0.007]	0.118 [0.000]	0.269 [0.000]			0.104 [0.000]	-0.033 [0.000]		0.060 [0.000]		0.104 [0.000]		0.033 [0.000]	0.020 [0.043]		0.00012 [0.000]
GRC	0.552 [0.000]	-0.047 [0.000]	0.378 [0.007]		0.084 [0.000]	0.408 [0.000]		0.020 [0.000]		0.028 [0.000]					0.033 [0.000]	0.020 [0.043]	0.032 [0.025]	0.00068 [0.000]
IRL	-0.008 [0.871]	-0.022 [0.000]	2.074 [0.000]	0.118 [0.000]	0.084 [0.000]	0.212 [0.000]		0.084 [0.000]		0.060 [0.023]	-0.046 [0.012]		0.059 [0.000]		0.033 [0.000]			0.00051 [0.000]
ITA	0.047 [0.014]	-0.059 [0.000]	2.074 [0.000]	0.232 [0.000]		0.099 [0.000]		0.061 [0.000]	0.012 [0.011]				0.016 [0.103]	0.027 [0.019]	0.033 [0.000]			0.00033 [0.001]
JPN	0.049 [0.159]	-0.022 [0.000]	0.378 [0.007]		0.084 [0.000]	0.099 [0.000]		0.020 [0.000]	0.012 [0.011]				0.104 [0.000]	0.027 [0.019]				0.00012 [0.001]
KOR	0.038 [0.402]	-0.047 [0.000]	0.378 [0.007]	-0.172 [0.000]		0.099 [0.000]		0.061 [0.000]	0.039 [0.000]						0.033 [0.000]	0.032 [0.025]		0.00026 [0.000]
NLD	0.057 [0.362]	-0.022 [0.000]	0.378 [0.007]	-0.213 [0.000]	0.084 [0.000]	0.212 [0.000]		0.084 [0.000]	0.037 [0.001]	0.028 [0.000]	0.021 [0.016]		0.193 [0.000]	0.072 [0.000]	0.077 [0.000]	0.020 [0.043]		0.00031 [0.000]
NOR	0.037 [0.356]	-0.059 [0.000]	2.074 [0.000]		-0.426 [0.000]	0.099 [0.000]		0.020 [0.000]	0.037 [0.001]				0.016 [0.103]		0.077 [0.000]		0.235 [0.000]	0.00025 [0.000]
PRT	0.081 [0.000]	-0.047 [0.000]	2.074 [0.000]	0.480 [0.000]	0.084 [0.000]			0.104 [0.000]	-0.033 [0.000]				0.022 [0.000]	-0.130 [0.000]		0.020 [0.043]	0.032 [0.025]	0.00020 [0.000]
ESP	0.103 [0.013]	-0.047 [0.000]	2.074 [0.000]	-0.172 [0.000]	0.269 [0.000]	0.099 [0.000]			0.037 [0.001]	0.028 [0.000]	0.021 [0.016]		0.016 [0.103]	0.180 [0.001]	0.033 [0.000]	0.020 [0.043]	0.032 [0.025]	0.00020 [0.000]
SWE	0.074 [0.331]	-0.022 [0.000]	2.074 [0.000]	0.118 [0.000]		0.099 [0.000]		0.104 [0.000]					0.022 [0.000]	0.072 [0.000]	0.033 [0.000]	0.020 [0.043]		0.00009 [0.000]
CHE	0.033 [0.315]	-0.022 [0.000]	2.074 [0.000]	0.480 [0.000]	0.084 [0.000]			0.061 [0.000]		0.028 [0.000]			0.059 [0.000]	0.027 [0.019]	0.033 [0.000]			0.00012 [0.001]
GBR	0.013 [0.795]	-0.022 [0.000]	2.074 [0.000]			0.099 [0.000]		0.303 [0.000]	0.039 [0.000]	0.028 [0.000]			0.193 [0.000]	0.072 [0.000]	0.077 [0.000]	-0.145 [0.000]	0.032 [0.025]	0.00009 [0.000]
USA	0.095 [0.001]	-0.022 [0.000]	2.074 [0.000]	0.118 [0.000]		0.099 [0.000]		0.104 [0.000]					0.016 [0.103]			0.020 [0.043]		0.00012 [0.001]

Note: The numbers in parentheses are the p-values of exclusion restrictions on the coefficients.

The acceleration in global demand is more than accounted for by developments in non-OECD economies, where demand growth accelerated to just under 4% per annum on average from 2001 to 2005, after averaging 1½ per cent per annum in the previous decade. In China, average annual demand growth rose from just under 6½ per cent to just below 9% per annum. By 2005 the non-OECD economies accounted for 40% of total global oil consumption, with one-fifth of this being due to China.<sup>11</sup>

The acceleration in oil demand in the non-OECD economies in recent years reflects in part strong output growth, especially in industrial sectors, a higher level of energy consumption per unit of output than the average OECD economy (OECD, 2005; Markandya *et al.*, 2006) and rising private usage of motor vehicles. Strong world trade growth may also have contributed because of the associated growth in demand for aviation and shipping transportation.

Although the growth in final demand for oil would appear to have been the primary factor behind the recent rise in oil prices, this need not mean that other factors have been absent. Almost certainly there has been increasing precautionary demand as well, with concerns about possible supply disruptions in the Middle East and the possibility of short to medium-term supply shortages because of low rates of past investment and natural disasters all acting to raise risk premia. Speculation may also have played a role (IMF, 2006b).

The non-oil commodity group contains a wide range of different commodities, with few common elements in their prices. Metals and, to a lesser extent, agricultural raw materials are the most likely to be affected by a rise in the level of activity in commodity-intensive economies, as well as by the business cycle. China has also been a significant influence behind the strong global growth in demand for many metals over the past few years. During the period 2002-05, the growth in demand from China accounted for almost all of the increase in global demand for nickel and tin, and over half of the increase in demand for aluminium, copper and steel, reflected in marked increases in the share of China in total global consumption.<sup>12</sup>

### **Estimates of the impact of output growth on commodity prices**

To obtain a more precise estimate of the impact of the recent rapid output growth in the non-OECD countries on commodity prices, reduced-form price equations were estimated by Pain *et al.* (2006) for five main commodity groups – oil, metals and minerals, agricultural raw materials, food and tropical beverages. The oil price measure used was the price of Brent crude, while for the remaining commodity groupings the prices variables considered are the aggregate price indices compiled by the Hamburg Institute of World Economics (HWWA).<sup>13</sup> The equations relate real prices to measures of the level and growth of global activity, as well as measures of the share of world trade and world GDP accounted for by non-OECD economies.<sup>14</sup> Measures of the global output gap, and output gaps in the OECD and the non-OECD economies were also included in the analysis.<sup>15</sup> It is well established that the global output gap is an important factor behind the cyclical behaviour of commodity prices, especially when output growth is above potential (Adams and Ichino, 1995; Rae and Turner, 2001).<sup>16</sup>

The econometric estimates in Pain *et al.* (2006, Appendix 2) provide significant empirical evidence that the present upturn in real oil and metals prices has been amplified by the rapid output growth in emerging markets. For oil, two statistically similar specifications were obtained. In the first, the effects of strong growth in the non-OECD economies are reflected in a long-run levels term in the volume of world GDP and in a

dynamic term in the share of the non-OECD economies in the level of world trade. A limitation of this equation, estimated over a sample from the mid-1980s to 2005, is that the long-run income elasticity is very high, at 1.7%, almost certainly reflecting the strong growth in oil demand and real oil prices over the estimation sample.

The second specification sought to test directly for the possible recent impact of strong growth in the non-OECD by including a variable for the differential between the rates of GDP growth in the non-OECD and the OECD starting in 2001. The coefficient on this term is both positive and statistically significant. Incorporating the additional measure also causes the long-run income elasticity to halve, although it remains significantly different from zero (at the 10% level).<sup>17</sup>

For metals prices in real terms, recent demand-related pressures were also found to be best reflected by the differential between the rates of GDP growth in the non-OECD and the OECD. In effect, this corresponds to the rate of change of the non-OECD share of world GDP. The level of world GDP and the non-OECD trade share measure were not found to be significant determinants of metals prices. No significant effects from any of these variables were found for the three agricultural commodity prices either. The differences between these findings and those for oil prices are likely to stem from supply being more elastic for non-oil commodities, with any initial increase in demand more rapidly offset by an expansion in supply.

An implication of these results is that a period in which growth in the non-OECD economies is faster than that in the OECD economies will ultimately have only a temporary positive impact on the level of real metals prices. In contrast, the impact on real oil prices will be permanent because the higher level of global GDP that results is implicitly taken to imply a permanent increase in the level of oil demand with supply being less than fully elastic. In practice it seems unlikely that the longer-term difference in the impact on metals and oil prices would be as pronounced as this, even if such a feature is present in the comparatively short sample used for estimation.

Fluctuations in output gaps are also found to have a significant short to medium-term influence on each of the commodity prices by Pain *et al.* (2006), although there are marked differences in the size and direction of the effect on individual commodities. An increase in global output relative to trend is found to raise initially the real price of each commodity group. This change quickly fades for the prices of food and tropical beverages, but is found to persist for several years for oil prices and, to a lesser extent, metals and agricultural raw materials prices. For oil prices, the impact of an increase in the global output gap is found to be larger if it coincides with an increase in the non-OECD output gap, consistent with what might be expected given the different industrial structures in the OECD and the non-OECD.

### **Estimates of the impact of non-OECD growth on commodity prices**

In order to quantify the impact of the strong growth in the non-OECD economies on commodity prices in recent years the econometric equations were simulated under two assumptions. Firstly, that the share of the non-OECD in world trade remained unchanged from the average level in the year 2000, and secondly that GDP in the non-OECD economies grew only at the rate of OECD GDP from 2000. The resulting calculations of the change in prices are only suggestive, but serve to illustrate the possible orders of magnitude involved. As the non-OECD share of world trade and GDP rose throughout the period from 2001-05, the alternative path implies an increasingly large divergence from the actual outturn.<sup>18</sup> As a result, the impact on real prices of the change also increases in size over time.

For oil prices, the impact of holding the non-OECD trade share fixed at its level in 2000, and letting non-OECD GDP grow in line with OECD GDP, is to bring about a decline relative to baseline of just over 40% in the level of the real oil price by the end of 2005 (Figure 7a) when using the second oil price equation. In nominal terms this is equivalent to a decline to just under \$35 per barrel in the price of oil in the fourth quarter of 2005. Although this represents a sizable difference from the actual outturn, it does not entirely remove the strong growth in oil prices after 2002, as can be seen from Figure 7b. In the alternative oil price specification without the extra variable for the growth differential from 2001, the real oil price was lowered by some 20% by the end of 2005 from its baseline level.

Figure 7a. **Removing the impact of non-OECD growth on real oil prices**  
Percentage deviations from baseline

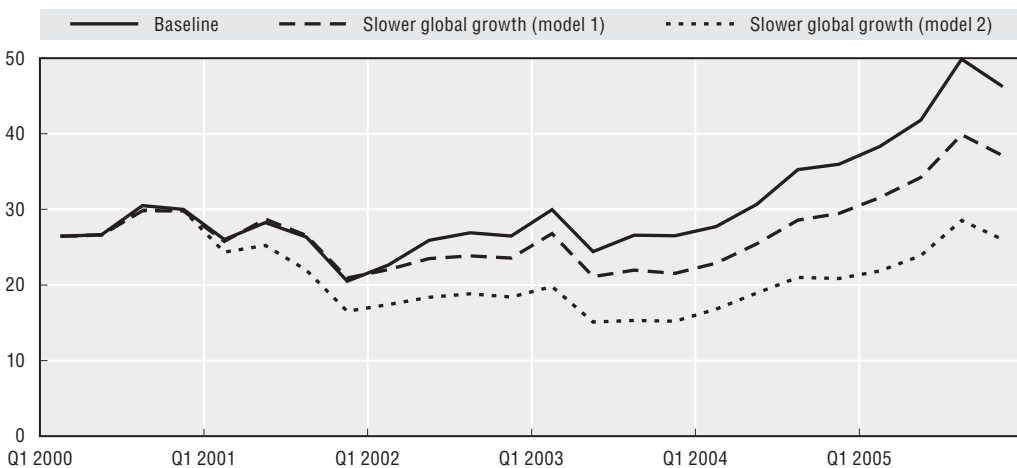
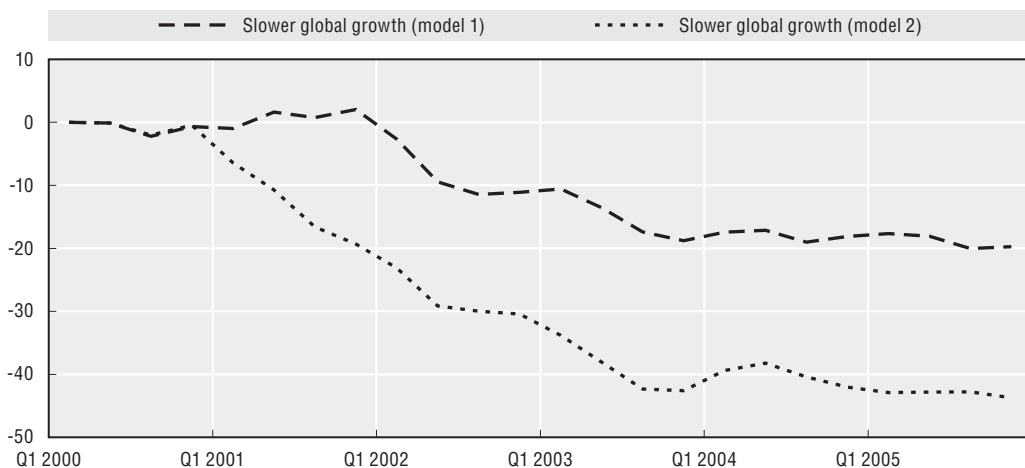
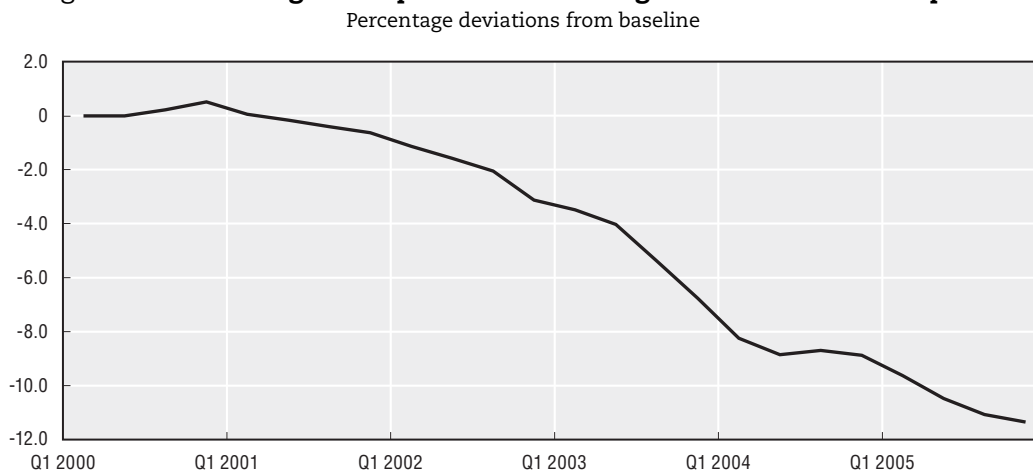
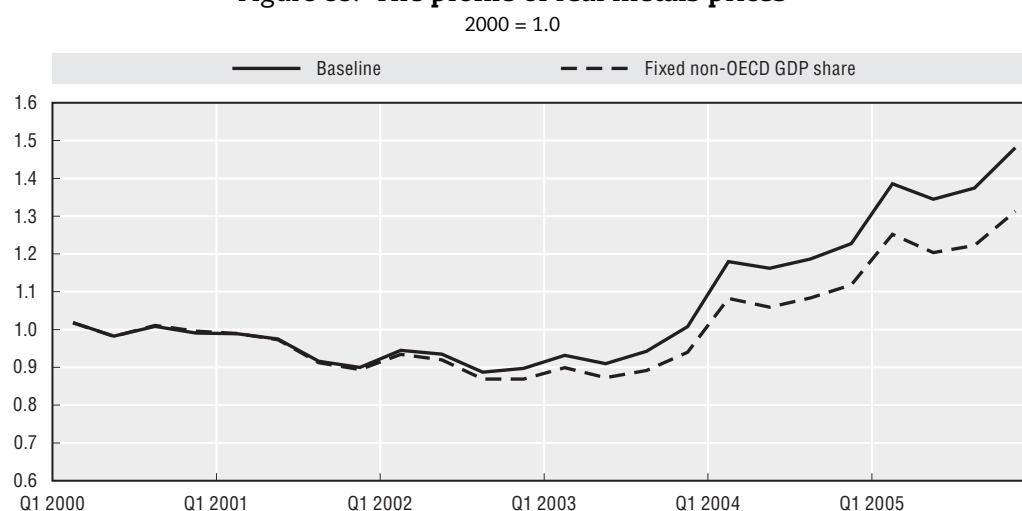


Figure 7b. **The profile of real oil prices**  
\$ per barrel, 2000 prices



For metals prices, corresponding estimates are also based on the assumption that GDP in the non-OECD economies grew at the rate of OECD GDP from 2000. The resulting changes in the profile of metals prices are smaller than for oil prices, with the real metals price being about 10% lower by the fourth quarter of 2005 than would otherwise have been the case. This accounts for only a small fraction of the actual growth in metals prices after 2002 (Figures 8a and 8b).

Figure 8a. **Removing the impact of non-OECD growth on real metals prices**Figure 8b. **The profile of real metals prices**

The alternative profile of oil prices also has a small impact on the prices of agricultural raw materials, reducing these prices by between 1-1½ per cent over the course of 2003-05 in the scenario in which oil prices declined by just over 40% by the end of 2005. The prices of food and tropical beverages remain unchanged.

Other analytical studies have also suggested that strong output growth could have a sizable effect on commodity prices. A related scenario for future oil demand in China is considered in CBO (2006), with oil demand in China from 2006 to 2010 rising by 7½ per cent per annum, similar to the rate seen from 2000 to 2005. This is estimated to be associated with an increase of \$14 per barrel in real oil prices, which would be equivalent to an increase of almost 25% on the average price of a barrel of Brent crude oil in 2005. Adams and Ichino (1995) estimate that a sustained rise of 0.5 percentage point in the annual rate of growth of world GDP is associated with increases of almost 12 and 10% in real oil and metals prices respectively, after six years.

The scenario analysis of the impact of reduced levels of activity in the non-OECD economies does not consider short-term cyclical influences on prices, with world and non-OECD output gaps being left unchanged. However, if slower growth originated at least

in part from the demand side, it could be argued that they should also weaken.<sup>19</sup> In order to evaluate the sensitivity of commodity prices to cyclical changes in output gaps, a second set of scenarios was constructed in which the output gap was changed for a short period of time. Two alternative paths were considered – a 2 percentage-point reduction in output lasting for one year and a 1 percentage point reduction in demand relative to potential lasting for two years. Both changes would imply relatively large movements in the world output gap compared with those seen over the estimation period.

The results of this exercise, again holding world export prices and all other factors constant, also illustrate the different sensitivities of each real commodity price to cyclical influences (Figure 9). The largest and most persistent effect is on real oil prices, with prices reduced by up to 20-25% in the two scenarios, and returning back to their baseline levels only after five years. The real prices of agricultural raw materials and metals initially fall by up to 8 and 10% respectively, before rising and returning above the baseline level after two years, which is consistent with what might be expected in these markets as supply responds to the initial demand-driven reduction in prices. The real prices of food and tropical beverages initially decline by between 5 and 10% in the first year in which the output gaps are reduced, before rising above previous levels in the second year.

Overall, it is clear that the recent period of strong output and trade growth in the non-OECD economies and, by extension, the increasing internationalisation of production and offshoring from the OECD to the non-OECD economies, has placed significant upward pressure on the prices of many commodities. This is especially so for oil. The impact varies across commodities and has also built up over time. However, it is equally clear that growth in the non-OECD is not the only factor behind the recent acceleration in commodity prices after 2002.

## **The impact of globalisation on consumer price inflation**

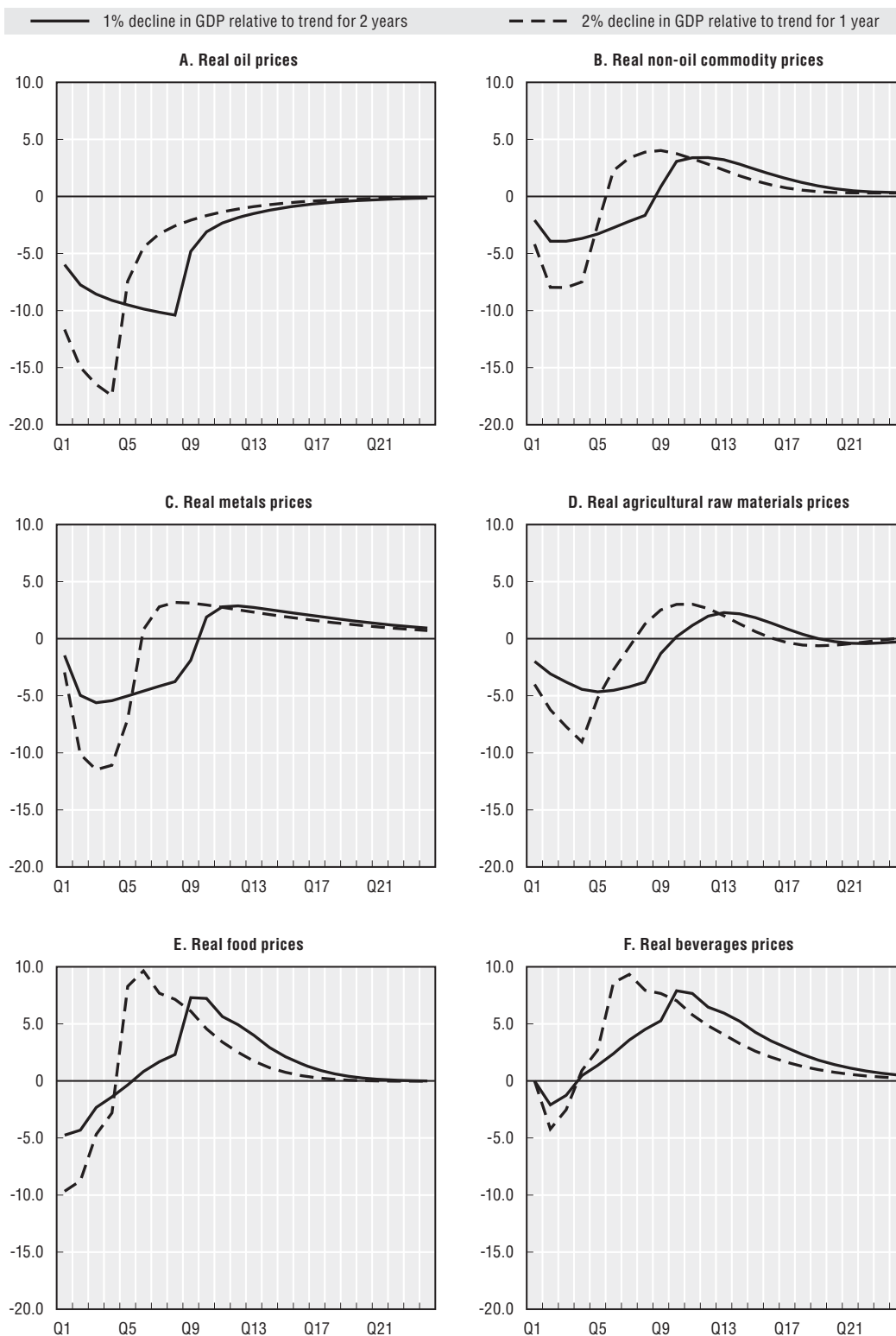
This section provides an overview of the main findings from existing studies and then presents new empirical estimates of the wider impact of globalisation on consumer price inflation in OECD economies. The new evidence includes tests of whether inflation dynamics changed in the mid-1990s when the extent of globalisation began to increase. Given that the determinants of domestic inflation process are found to have changed around that time, the following section then explores the size of the impact of globalisation by conducting a scenario analysis, which explicitly distinguishes between the impact via non-commodity and commodity import prices.

### ***Existing studies of globalisation and inflation***

Although there is a sizeable literature on the determinants of inflation in OECD countries (Melick and Galati, 2006), only a few papers assess the impact of globalisation on inflation directly. Other studies find evidence of structural changes in the inflation process that may possibly be related to aspects of globalisation, but this is not tested explicitly.

Several general conclusions emerge from this literature. Firstly, imports from low-cost countries contribute to lower domestic inflation via both a direct accounting effect and also an indirect effect, whereby lower cost imports put pressure on domestic producers in import-competing industries to lower their prices. The size of this indirect effect appears to be positively related to the intensity of foreign competition. Secondly, increased trade integration appears to have changed the intensity of the response of inflation to cyclical output fluctuations in OECD economies. With the prices of many domestic goods being

**Figure 9. Real commodity prices**  
 Per cent effect of a temporary increase in output gaps



determined increasingly by global demand and supply conditions, domestic inflation has become less sensitive to measures of domestic economic slack and more sensitive to measures of foreign economic slack. Thirdly, global competition is generally found to have reduced the extent to which exporting firms are passing through exchange rate changes into domestic currency prices. Finally, inflation persistence seems to have declined in many countries over the past decades, helped by greater central bank credibility. A more detailed overview of several recent studies is given below.

The existing literature also suggests that the results of these studies vary across countries and are sensitive to the sample period that is used. The general conclusions drawn in the previous paragraph do not necessarily apply to all OECD countries. In particular, the evidence of changes in inflation persistence and the relative influence of domestic and foreign economic conditions on inflation is sensitive to the countries included in the estimation sample.<sup>20</sup> For these reasons, the empirical work below allows for the possibility of different coefficients across countries, rather than simply imposing common coefficients on all.

### **Trade openness and inflation**

Several studies have examined the relationship between trade openness and the level of inflation both for the economy as a whole and for particular manufacturing industries. One approach has been to directly estimate the “mechanical” impact of imported goods from lower-cost economies on inflation in the importing economies (Kamin *et al.*, 2006; OECD, 2006). They typically find that lower cost imports place a modest, *ex ante* downward impact on consumer price inflation, with a more marked impact on import price inflation. These effects are found to vary over time and across countries. More generally, the impact of enhanced trade openness on consumer price inflation has also been found to be sensitive to the countries included in the estimation sample. Typically, smaller estimates are found for developed economies than for developing ones (Temple, 2002; Wu and Lin, 2006).

The impact of globalisation on inflation is explored in IMF (2006a), using a Phillips curve framework in which current inflation is related to lagged inflation, import price inflation, the change in the oil price, and the output gap. To account for the impact of globalisation, interaction terms are introduced, with past inflation being interacted with a measure of monetary credibility, import price inflation being interacted with import penetration, and the output gap being interacted with openness, monetary credibility, average inflation, and a wage bargaining index. The model is estimated for a panel of eight countries (the G7 countries and Australia) over the period 1960 to 2004. The sensitivity of inflation to the domestic output gap is found to have fallen over the sample period.<sup>21</sup> The key factor behind this decline is found to be trade openness. In general, import prices are found to have only a small influence on domestic inflation. Although a fall in import prices drives down consumer price inflation initially, the effect vanishes after about two years.

A number of studies have shown that industry-level price inflation is significantly related to measures of import competition (Gamber and Hung, 2001; Chen *et al.*, 2004; IMF, 2006a). Gamber and Hung (2001) relate price inflation in 44 industries in the United States to import price inflation and an interaction term between import price inflation and industry-level import penetration, which is a measure of the intensity of foreign competition. Both terms are found to have statistically significant coefficients, suggesting that the impact of import prices on domestic prices is positively related to the intensity of foreign competition. In a related study using data for a sample of manufacturing industries



in seven European Union member states, Chen *et al.* (2004) estimate that the observed increase in openness over the sample period reduced industry mark-ups by 1.6 percentage points on average.<sup>22</sup> Although the impact of the mark-up and productivity effects at the sectoral level is marked, reducing inflation by 0.3 percentage points per annum on average in the industries concerned, the impact is minimal at the economy wide level.

The determinants of changes in producer prices for 16 manufacturing industries in 11 OECD countries are also explored in IMF (2006a). It is found that changes in relative producer prices in a certain sector (measured by the deviation of producer prices in that sector from average producer prices across all sectors) are negatively related to changes in that sector's exposure to globalisation as measured by its import-to production ratio. On average, a 1 percentage-point increase in the import-to-production ratio is estimated to reduce relative producer prices by 0.1%.<sup>23</sup> The contribution of increased openness to lower inflation appears to be twice as strong in low-tech sectors as in high-tech sectors. Moreover, the impact has increased over time; about 40% of the decline in relative prices of the manufacturing sector since 1995 is explained by openness, compared with only 25% during the 1980s and early 1990s.

### ***The influence of foreign capacity on domestic inflation***

A number of studies have sought to test directly whether measures of foreign output gaps or capacity utilisation have a direct impact on domestic inflation. The findings from such studies have been mixed. For the United States, some have found little evidence that foreign capacity utilisation has a significant impact on domestic inflation (Corrado and Matthey, 1997; Tootell, 1998), but others have come to the opposite conclusion (Gamber and Hung, 2001). More recent multi-country studies also yielded mixed results. For example, while the studies by Borio and Filardo (2006) and Vega and Winkelried (2004) suggest that measures of foreign economic slack play an important role in explaining inflation dynamics in OECD countries, Ihrig *et al.* (2007) find insignificant or incorrectly signed coefficients on foreign output gaps in Phillips curve equations for a set of eleven industrial countries.

Borio and Filardo (2006) test whether the gap between headline and core inflation is related to measures of the global output gap. Using a sample of 16 OECD economies it is found that the global output gap is significant, with its inclusion reducing the significance of the domestic output gap.<sup>24</sup> Moreover, a rolling regression exercise suggests that the importance of global measures of economic slack has risen over time.<sup>25</sup> To some extent these findings are not surprising. The gap between headline and underlying inflation includes energy and food prices, where global conditions on commodity prices have an important influence on domestic pricing. As discussed above, estimates of the global output gap have a significant positive relationship with commodity price inflation.

A related approach to the possible link between global economic conditions and national inflation rates is pursued by Ciccarelli and Mojon (2005). This study uses a dynamic factor approach to obtain a measure of global inflation from the national inflation rates of 22 economies. This measure is then found to be an attractor of national inflation rates suggesting that national inflation rates are indeed sensitive to economic conditions in other countries. This leaves open the issue of what is driving global inflation.<sup>26</sup>

A possible corollary to the finding that inflation has become more sensitive to global conditions over time is that it may have become less sensitive to domestic conditions. The latter appears to be a common finding from many empirical studies for individual OECD

economies (Melick and Galati, 2006), although it is not a universal one. For the United States, Dexter *et al.* (2005) demonstrate that the breakdown in the relationship between domestic capacity utilisation and domestic inflation found in other empirical studies disappears once controls are included for the effects of international trade. Ihrig *et al.* (2007) find evidence of a decline in the sensitivity of inflation to movements in the domestic output gap, but do not find significant evidence that this is due to globalisation.

### ***Changes in exchange-rate pass-through to domestic prices***

A number of recent studies have sought to test the proposition by Taylor (2000) that global competition should reduce the extent to which exporting firms are able to pass through exchange rate movements into the domestic currency prices charged to importers. This has been found to have considerable empirical support (see, for example, Olivei, 2002, Gagnon and Ihrig, 2004 and Marazzi *et al.*, 2005). The latter study estimates that exchange rate pass-through to United States import prices has declined from above one-half during the 1980s to around one-fifth during the last decade. This decline is found to be due to both a shift of imports away from commodities to manufacturing goods which tend to have lower pass-through rates (Campa and Goldberg, 2003; Pain *et al.*, 2005) and to a general decline in the exchange rate pass-through across all product categories (Olivei, 2002). Gust *et al.* (2006) demonstrate in a dynamic general equilibrium model that this observed decline in the exchange rate pass-through stems mainly from the increasing trade integration of the United States. For Japan, a decline in exchange rate pass-through is found to be spread across products, rather than being due to a shift in the composition of imports (Otani *et al.*, 2003). For the euro area, Campa *et al.* (2005) find that a structural break in the exchange rate pass-through into import prices is evident only in a small number of manufacturing industries. Overall, these results provide indirect evidence that the competitive impact of enhanced openness may matter and that it might vary across economies.

### ***Changes in inflation persistence***

An important issue for monetary policy is whether past inflation has a significant role in determining present inflation (*i.e.* whether inflation is persistent) or whether expectations of future inflation are more important.<sup>27</sup> A higher degree of inflation persistence implies that stabilising inflation following economic “shocks” may require higher temporary costs to output. This has led to a series of studies testing whether the persistence of domestic inflation has changed over time. Again, the findings differ by country, by period considered and by the estimation technique used (Melick and Galati, 2006).<sup>28</sup>

Altissimo *et al.* (2006) find that inflation persistence in the euro area has declined substantially since the 1970s once changes in the mean of inflation are allowed for and that the breaks in the mean coincide with shifts in the monetary policy regime. The link between changes in inflation persistence and changes in monetary credibility is confirmed by IMF (2006a) for a set of eight OECD countries. According to these estimates, strengthened monetary credibility reduced inflation persistence (as measured by the coefficient on lagged inflation) from 0.7 in the early 1980 to 0.6 in 2004.

### ***Testing for the impact of globalisation***

The empirical analysis in the present study differs from the above studies in several respects. First, the above studies examine the relationship between globalisation and inflation within an extended Philips-curve framework. Such a framework does not allow

for a potential effect of measures of globalisation on price levels. The present study attempts to overcome this by estimating an error correction model for consumer prices, relating prices to import prices, unit labour costs and the domestic output gap.<sup>29</sup> It thus accounts explicitly for a possible price level effect from globalisation, as reflected in the level of import prices. Secondly, the present study takes a broader view than many others by examining a range of possible effects from globalisation for a large set of OECD countries. Finally, the econometric analysis is complemented by a scenario analysis which quantifies some of the possible impacts of globalisation on domestic inflation, with import price inflation split into commodity and non-commodity components. This provides a richer analysis of underlying inflation dynamics than previous studies.

The empirical work examines the impact of globalisation as reflected in the price of imported goods and services. This is done using an error-correction model for the private consumption deflator in 21 OECD economies over the period 1980-2005,<sup>30</sup> with consumer prices being related to import prices, unit labour costs and the domestic output gap:

$$\begin{aligned} \Delta \ln P_{i,t} = & (\alpha_{0i} + \varphi_{0i}D) + (\alpha_{1i} + \varphi_{1i}D)(\ln P_{i,t-1} - (\alpha_{2i} + \varphi_{2i}D)M_{i,t-1}^{SH} \ln P_{i,t-1} - (1 - (\alpha_{2i} + \varphi_{2i}D)M_{i,t-1}^{SH})\ln C_{i,t-1}) \\ & + \sum_{j=1}^4 (\beta_{ji} + \phi_{ji}D)\Delta \ln P_{i,t-j} + \sum_{j=0}^4 (\gamma_{ji} + \lambda_{ji}D)\Delta \ln P_{i,t-j}^M + \sum_{j=0}^4 (\delta_{ji} + \kappa_{ji}D)\Delta \ln C_{i,t-j} \\ & + (\alpha_{3i} + \varphi_{3i}D)GAP_{i,t-1} + \varepsilon_{it}. \end{aligned} \quad [1]$$

The subscript  $i$  denotes the country and the subscript  $t$  the time period. The variables are defined as follows:  $P$  represents domestic prices measured by the private consumption expenditure deflator,<sup>31</sup>  $P^M$  represents import prices measured by the deflator of imports of goods and services,  $C$  represents domestic costs, proxied by unit labour costs of the total economy,  $GAP$  is the domestic output gap, and  $\varepsilon$  is an error term. The equations also include seasonal dummies as well as time dummies to account for changes in indirect taxes and similar events. Static homogeneity is imposed on all equations so that the mark-up of prices over costs is independent of the price level. Dynamic homogeneity is not directly imposed on the system. A test of this restriction is carried out after estimating the system and found to be strongly rejected by the data.

Initial parameter stability tests revealed evidence of a significant structural break in the parameters in the consumer price equations in the mid-1990s. To overcome this, two modifications were found to be necessary. The first was to interact the long-run import price coefficient with the share of imports in domestic demand, denoted  $M^{SH}$  in [1].<sup>32</sup> This implies that the long-run coefficient on import prices rises over time in most countries in the sample, in line with increases in import penetration, with an equivalent decline in the long-run coefficient on domestic unit labour costs. But even with this modification, there continued to be evidence of parameter instability in the mid-1990s. The second modification was thus to allow for separate parameter estimates before and after 1995 by introducing a dummy variable  $D$  that is equal to unity from 1995 onwards. This overcomes the parameter instability when there is only a single set of parameters for the whole estimation period.<sup>33</sup>

The set of equations is estimated jointly using the seemingly unrelated regression procedure (SUR), first proposed by Zellner (1962). Cross-country restrictions are imposed as the data permit.<sup>34</sup> In the empirical model the long-run coefficient on the import price term will reflect not only the direct weight of imports in private consumption, but also the wider influence of import competition on the prices set by actual and potential competitors. The unit labour costs term will reflect indirect effects from globalisation via wages and productivity.<sup>35</sup>

### **Summary of empirical results**

The empirical analysis highlights a number of important ways in which the behaviour of consumer prices appears to have changed over the past decade. Of these, the most notable is the extent to which import prices have become a more important determinant of consumer prices over time in all OECD countries, implying that foreign economic conditions have become a more important influence on domestic inflation. At the same time, domestic inflation is found to have become less sensitive to temporary changes in the domestic output gap. Other notable changes include evidence that inflation persistence has declined in most OECD countries and that the speed of adjustment towards the “desired” price level has slowed over the past decade.

During the first part of the sample period, from 1980 to 1994, the data support the formation of two country groups for the interaction term between import prices and import penetration. The long-run coefficients on the two interaction terms are very different, having values of 2.1 and 0.4 respectively (Table 1).<sup>36</sup> In the second part of the sample period, from 1995-2005, the long-run coefficient on the interaction term is found to rise to a common value of 2.6 for both groups of countries (Table 2).<sup>37</sup> This suggests that during the more recent period domestic producers have increasingly taken greater account of foreign competitors when setting their prices, so that import prices have a larger influence on domestic prices than their share in domestic demand would suggest.<sup>38</sup> The results also imply that the sensitivity of consumer prices to import prices will differ considerably across countries, reflecting differences in import penetration.<sup>39</sup>

The domestic output gap is found to have a significant impact on consumer price inflation in all of the countries in the sample, with the size of the initial impact being smaller in the more recent period. On average across countries, a rise in the domestic output gap by 2 percentage points for four consecutive quarters raises inflation in the following two years by 0.1 percentage point per annum less in the second part of the sample (1995-2005) than in the first part (1980-94). This is similar to, but slightly smaller than, the finding reported in IMF (2006a).

The model employed in the analysis automatically incorporates an indirect effect from foreign economic conditions, as mediated through import prices.<sup>40</sup> Augmenting the model with an additional world output gap variable and testing the joint significance of the coefficients on this term for all countries suggests that the world output gap does not have a significant additional direct influence on domestic inflation in either of the two sub-periods. Hence the indirect effect through import prices seems to be the only channel through which foreign economic conditions affect consumer price inflation.<sup>41, 42</sup> This implies that the importance of foreign economic conditions for domestic inflation will vary across countries, reflecting the different forces that influence international trade prices for each country (Pain *et al.*, 2005), as well as differences in import penetration. The coefficients on the domestic output gap are not affected by the inclusion of the foreign output gap; they remain significant with magnitudes that are close to the base specification.

There is also no strong evidence that the short-run reaction of domestic producers to import price changes varies with the type of import goods. When augmenting the equation with current and lagged changes of commodity import prices, these additional terms were found to be significant for only a small number of countries,<sup>43</sup> suggesting that, in general, changes in commodity import prices have the same impact on consumer price inflation as do changes in non-commodity import prices.

Table 2. Regression results, 1995-2005

	$\alpha_0$	$\alpha_1$	$\alpha_2$	$\beta_1$	$\beta_2$	$\beta_3$	$\beta_4$	$\gamma_0$	$\gamma_1$	$\gamma_2$	$\gamma_3$	$\gamma_4$	$\delta_0$	$\delta_1$	$\delta_2$	$\delta_3$	$\delta_4$	$\alpha_3$
AUS	0.047 [0.381]	-0.020 [0.000]	2.608 [0.000]		0.084 [0.000]	0.263 [0.000]		0.061 [0.000]	0.012 [0.011]	-0.022 [0.009]			0.059 [0.000]		0.033 [0.000]			0.00029 [0.000]
AUT	0.096 [0.012]	-0.020 [0.000]	2.608 [0.000]	0.118 [0.000]		0.263 [0.000]		0.020 [0.000]	0.116 [0.000]		0.060 [0.000]	-0.105 [0.000]	0.016 [0.103]	0.027 [0.019]				0.00029 [0.000]
BEL	0.029 [0.465]	-0.020 [0.000]	2.608 [0.000]	0.363 [0.000]	-0.257 [0.000]	0.099 [0.000]		0.182 [0.000]	-0.141 [0.000]	0.131 [0.000]	-0.046 [0.012]	0.022 [0.000]	0.193 [0.000]	-0.130 [0.000]				0.00011 [0.002]
CAN	0.094 [0.060]	-0.020 [0.000]	2.608 [0.000]	0.118 [0.000]		0.099 [0.000]		0.020 [0.000]					0.193 [0.000]		0.077 [0.000]	0.116 [0.000]		0.00008 [0.001]
DNK	0.224 [0.002]	-0.020 [0.000]	2.608 [0.000]	0.118 [0.000]	0.084 [0.000]	0.099 [0.000]		0.182 [0.000]					0.016 [0.103]	0.072 [0.000]				0.00008 [0.001]
FIN	0.069 [0.291]	-0.020 [0.000]	2.608 [0.000]		0.084 [0.000]	0.099 [0.000]		0.020 [0.000]		0.021 [0.016]		0.022 [0.000]	0.016 [0.103]	0.027 [0.019]	0.077 [0.000]		0.116 [0.000]	0.00011 [0.002]
FRA	0.062 [0.058]	-0.020 [0.000]	2.608 [0.000]	0.314 [0.000]		0.099 [0.000]		0.084 [0.000]	-0.033 [0.000]	0.028 [0.000]			0.016 [0.103]	0.072 [0.000]				0.00008 [0.001]
DEU	0.162 [0.001]	-0.020 [0.000]	2.608 [0.000]	0.118 [0.000]		0.099 [0.000]		0.104 [0.000]	-0.033 [0.000]		0.060 [0.000]		0.104 [0.000]		0.033 [0.000]			0.00011 [0.001]
GRC	0.102 [0.267]	-0.020 [0.000]	2.608 [0.000]		0.084 [0.000]	0.099 [0.000]	0.635 [0.000]	0.020 [0.000]		0.028 [0.000]		0.022 [0.000]			0.033 [0.000]	0.116 [0.000]		0.00029 [0.000]
IRL	-0.079 [0.134]	-0.020 [0.000]	2.608 [0.000]	0.118 [0.000]	0.084 [0.000]	0.099 [0.000]	0.212 [0.000]	0.084 [0.000]		0.131 [0.000]	-0.046 [0.012]	0.111 [0.000]	0.059 [0.000]	0.093 [0.000]				0.00048 [0.000]
ITA	0.017 [0.742]	-0.020 [0.000]	2.608 [0.000]	0.483 [0.000]		0.099 [0.000]		0.061 [0.000]	0.012 [0.011]				0.016 [0.103]	0.027 [0.019]	0.033 [0.000]			0.00011 [0.002]
JPN	-0.064 [0.121]	-0.020 [0.000]	2.608 [0.000]		0.084 [0.000]	0.099 [0.000]	0.212 [0.000]	0.020 [0.000]	0.012 [0.011]				0.104 [0.000]	0.027 [0.019]				0.00011 [0.002]
KOR	0.437 [0.001]	-0.020 [0.000]	2.608 [0.000]			0.099 [0.000]		0.061 [0.000]							0.033 [0.000]	0.116 [0.000]		0.00011 [0.002]
NLD	0.200 [0.012]	-0.020 [0.000]	2.608 [0.000]	-0.213 [0.000]	0.084 [0.000]	0.099 [0.000]	0.212 [0.000]	0.084 [0.000]	0.037 [0.001]	0.028 [0.000]	0.021 [0.016]	0.022 [0.000]	0.193 [0.000]	0.072 [0.000]	0.077 [0.000]			0.00029 [0.000]
NOR	0.075 [0.480]	-0.020 [0.000]	2.608 [0.000]		-0.257 [0.000]	0.099 [0.000]		0.020 [0.000]	0.037 [0.001]			0.016 [0.103]			0.077 [0.000]	0.235 [0.000]		0.00008 [0.001]
PRT	0.211 [0.001]	-0.020 [0.000]	2.608 [0.000]	0.314 [0.000]	0.084 [0.000]	0.099 [0.000]		0.104 [0.000]	-0.033 [0.000]			0.022 [0.000]	0.104 [0.000]	-0.130 [0.000]				0.00008 [0.001]
ESP	0.191 [0.030]	-0.020 [0.000]	2.608 [0.000]			0.099 [0.000]		0.037 [0.001]	0.037 [0.001]	0.028 [0.000]	0.021 [0.016]		0.016 [0.103]	0.180 [0.001]	0.033 [0.000]	0.116 [0.000]		0.00008 [0.001]
SWE	-0.055 [0.532]	-0.020 [0.000]	2.608 [0.000]	0.118 [0.000]		0.099 [0.000]	0.212 [0.000]	0.104 [0.000]				0.022 [0.000]	0.059 [0.000]	0.072 [0.000]	0.033 [0.000]			0.00008 [0.001]
CHE	0.065 [0.082]	-0.020 [0.000]	2.608 [0.000]	0.314 [0.000]	0.084 [0.000]	0.099 [0.000]		0.061 [0.000]					0.059 [0.000]	0.027 [0.000]	0.033 [0.000]			0.00011 [0.002]
GBR	0.072 [0.178]	-0.020 [0.000]	2.608 [0.000]			0.099 [0.000]		0.020 [0.000]		0.028 [0.000]		0.022 [0.000]	0.193 [0.000]	0.072 [0.000]	0.077 [0.000]	-0.145 [0.000]	0.116 [0.000]	0.00008 [0.001]
USA	0.147 [0.000]	-0.020 [0.000]	2.608 [0.000]	0.118 [0.000]		0.099 [0.000]	0.212 [0.000]	0.104 [0.000]					0.016 [0.103]					0.00011 [0.002]

Note: The numbers in parentheses are the p-values of exclusion restrictions on the coefficients.

The empirical results also indicate that the inflation process has become less persistent in the majority of the countries over the past decade, although in a small number of countries (Finland, Greece, Ireland, and Italy) past inflation appears to have become a more important determinant of current inflation.<sup>44</sup> Given that the model employed in the analysis is equivalent to one in which current inflation is related to past inflation and a fixed level of inflation expectations,<sup>45</sup> the change in inflation persistence might be related to a change in the relationship between inflation and inflation expectations.<sup>46</sup>

The error correction coefficients, though small in magnitude, are all highly significant in both sub-samples.<sup>47</sup> For the majority of the countries, the error correction coefficients become smaller in the second part of the sample period, implying that the speed of adjustment towards the “desired” price level has slowed. A possible explanation is the more direct focus of monetary policy on inflation objectives over the past decade, with the associated possibility of some degree of price level drift (Svensson, 1999).

### Quantifying the overall impact of globalisation

On the basis of the preceding results a series of scenario analyses were carried out to obtain illustrative estimates of the possible direct impact of globalisation on consumer price inflation over the past ten years. These incorporate the main findings from the scenario analyses for commodity prices and the estimated “mechanical” impact on import prices as a result of the higher shares of trade with lower-cost producers discussed in the previous sections. Two alternative starting points for these scenarios are considered, the first quarter of 1995 and the first quarter of 2000.

A baseline scenario was obtained by forecasting consumer price inflation employing the coefficient estimates obtained for the period 1995-2005 and actual values of all exogenous variables. The forecast is dynamic in the sense that projected values of consumer prices are employed for the right-hand-side variables rather than the actual values of the lagged dependent variables. The average annual consumer price inflation rates in the baseline scenario are generally very close to actual annual inflation rates (see Table 3).

Then, various scenarios are undertaken by modifying the series on import price inflation, with import price inflation separated into its commodity and non-commodity parts. This requires assumptions about the rate of commodity and non-commodity import price inflation if globalisation had not taken place.<sup>48</sup> To take account of the uncertainty that surrounds the impact of globalisation on import prices, the scenario analysis derives a range of estimates employing different assumptions about the change in commodity and non-commodity import price inflation.

For commodity import prices, the scenario analysis uses the results discussed above, which derive an alternative path for each commodity price under the assumption of slower rates of growth in non-OECD trade and GDP since 2000. These changes are then combined using information on the composition of commodity imports to generate an alternative profile for the price of imported commodities in each OECD economy in the sample.<sup>49</sup> Two alternative profiles are constructed, one for each of the separate oil price estimates.

For the growth rate of non-commodity import prices, the scenario analysis assumes that in the absence of the rising level of imports from low-cost producers, price inflation would have exceeded the actual growth rate by 1 or 2 percentage points per annum, respectively. This reflects the range of estimates discussed earlier.

**Table 3. Average annual consumer price inflation, scenario analysis 1995Q1-2005Q4**

	Average annual inflation (in per cent)		Scenario, difference from baseline (in percentage points)	
	Actual	Baseline	1% point	2% points
Australia	2.0	2.0	0.2	0.4
Austria	1.5	1.5	0.3	0.5
Belgium	1.8	1.8	0.3	0.6
Canada	1.6	1.6	0.1	0.3
Denmark	1.9	1.8	0.3	0.6
Finland	1.7	1.7	0.2	0.3
France	1.2	1.2	0.2	0.4
Germany	1.1	1.1	0.2	0.4
Greece	4.8	4.7	0.3	0.6
Ireland	2.8	2.8	0.5	0.9
Italy	3.0	3.0	0.2	0.5
Japan	-0.5	-0.5	0.1	0.2
Korea	4.6	4.6	0.2	0.4
Netherlands	2.2	2.2	0.3	0.6
Norway	2.0	2.1	0.2	0.4
Portugal	2.9	2.9	0.3	0.5
Spain	3.2	3.1	0.2	0.4
Sweden	1.5	1.6	0.3	0.6
Switzerland	0.8	0.8	0.2	0.4
United Kingdom	2.2	2.2	0.2	0.4
United States	2.0	2.0	0.2	0.4
Euro area	2.0	2.0	0.2	0.5
OECD	1.7	1.7	0.2	0.4

Note: The scenario assumes that import price inflation (total goods and services) was 1 and 2 percentage points per annum above baseline, respectively.

Tables 3 and 4 compare the different scenarios by reporting differences from the baseline in average annual rates of inflation. For the simulation period from 1995 to 2005, only the results of the modification of non-commodity import price inflation are reported in Table 3. This provides a longer-term perspective on the influence of globalisation in the absence of any impact on commodity prices. If the prices of non-commodity imports had risen by 1 percentage point (2 percentage points) more per annum since 1995, inflation would, on average, have been 0.2 percentage point (0.4 percentage point) per annum higher in the OECD economies.<sup>50</sup> Starting the simulation in 2000 reduces the difference in OECD inflation from the baseline to 0.1 and 0.2 percentage point per annum, respectively.<sup>51</sup>

The impact of the changes in commodity import prices over the period 2000-05 is reported in Table 4 and summarised in Figure 10. In the scenario with a 20% decline in oil prices, OECD inflation is found to be reduced by 0.08 percentage point per annum on average from 2000 onwards. In the scenario with a 40% decline in oil prices, OECD inflation is reduced by 0.15 percentage point per annum. The impact differs considerably across countries, with the smallest changes found for Norway, Canada and the United Kingdom, and the highest found for Korea.<sup>52</sup>

The final column in Table 3 shows the combined effect on consumer inflation from higher non-commodity import price inflation and lower commodity import price inflation (see also Figure 10). The analysis suggests that consumer price inflation could have been up to 0.3 percentage point higher per annum in the euro area had the estimated effect of

Table 4. **Average annual consumer price inflation, scenario analysis  
2000Q1-2005Q4**

	Average annual inflation (actual, in %)	Difference from baseline (in percentage points)					Net effect
		Non-commodity component		Commodity component			
		1% point	2% points	40% oil 10% metals	20% oil 10% metals		
Australia	2.4	0.1	0.3	0.0	-0.1	0.0 – 0.2	
Austria	1.8	0.2	0.4	-0.1	-0.1	0.1 – 0.3	
Belgium	2.3	0.2	0.4	-0.1	-0.2	0.0 – 0.3	
Canada	1.8	0.1	0.2	0.0	0.0	0.0 – 0.1	
Denmark	2.1	0.2	0.5	0.0	-0.1	0.2 – 0.4	
Finland	1.9	0.1	0.2	-0.1	-0.1	0.0 – 0.2	
France	1.5	0.2	0.3	-0.1	-0.1	0.0 – 0.3	
Germany	1.4	0.2	0.3	-0.1	-0.1	0.0 – 0.2	
Greece	3.4	0.2	0.4	-0.1	-0.2	0.0 – 0.3	
Ireland	2.5	0.4	0.8	0.0	-0.1	0.3 – 0.7	
Italy	2.8	0.2	0.4	-0.1	-0.2	0.0 – 0.3	
Japan	-1.0	0.1	0.1	-0.1	-0.1	0.0 – 0.1	
Korea	3.6	0.1	0.3	-0.1	-0.3	-0.1 – 0.1	
Netherlands	2.7	0.2	0.4	-0.1	-0.2	0.0 – 0.3	
Norway	1.9	0.1	0.2	0.0	0.0	0.1 – 0.2	
Portugal	3.0	0.2	0.4	-0.1	-0.2	0.0 – 0.3	
Spain	3.3	0.1	0.3	-0.1	-0.1	0.0 – 0.2	
Sweden	1.5	0.2	0.5	-0.1	-0.2	0.1 – 0.4	
Switzerland	1.0	0.1	0.3	0.0	-0.1	0.1 – 0.3	
United Kingdom	1.7	0.1	0.2	0.0	-0.1	0.1 – 0.2	
United States	2.2	0.2	0.3	-0.1	-0.2	0.0 – 0.2	
Euro area	2.1	0.2	0.3	-0.1	-0.1	0.0 – 0.3	
OECD	1.8	0.1	0.3	-0.1	-0.1	0.0 – 0.2	

Note: The lower (upper) bound of the total impact is calculated assuming that the prices of non-commodity import price inflation was 1 percentage point (2 percentage points) per annum above baseline and that commodity import prices reflect the 20% (40%) oil price estimate. In both cases the metals price effect is 10%.

globalisation not occurred. For the United States, the estimated impact ranges from -0.04 to 0.21 percentage point per annum, suggesting that US inflation might even have been lower in the absence of globalisation.<sup>53</sup> For Japan, the net effect is very small, ranging from -0.04 to 0.06 percentage point per annum. The uncertainty surrounding the estimates for most countries tends to be quite large as indicated by the difference between the lower and the upper bound which amounts to over 0.2 percentage point on average.

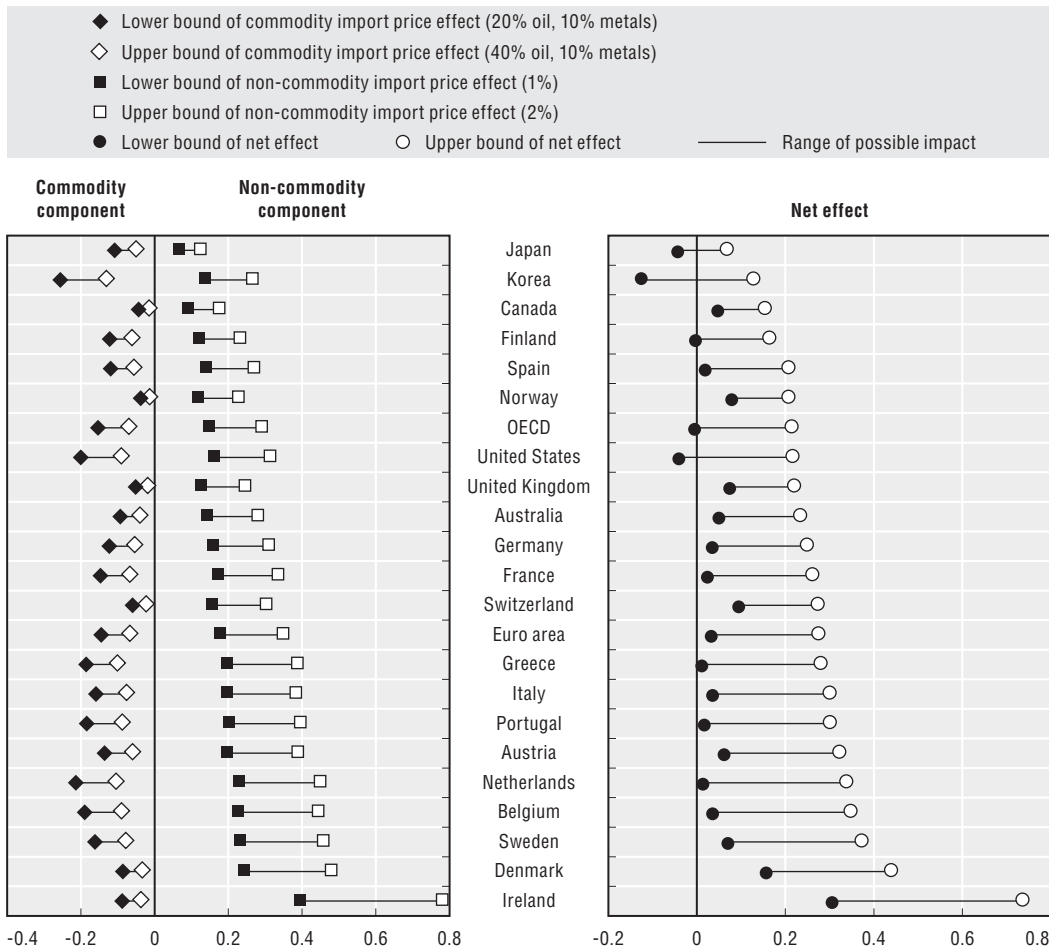
## Concluding remarks

The decline in consumer price inflation observed over the past 25 years in all OECD economies has coincided with a marked increase in the level of trade between the OECD and non-OECD economies. Against this background, this study has investigated the contribution of the increasing trade integration of non-OECD economies on the decline in OECD inflation. In doing so, the study has extended the existing literature on this topic in several important respects: a wider allowance is made for possible price level effects from globalisation, a larger number of countries are included in the analysis and separate impacts of commodity and non-commodity import prices are considered.



Figure 10. **The impact on consumer price inflation from removing globalisation effects 2000-05**

Average percentage point difference per annum



Note: See note to Table 4.

The main globalisation-related findings from the new econometric analyses of consumer and commodity prices in this paper are as follows:

- Import prices are found to have become a significantly more important influence on domestic consumer prices since the mid-1990s, coinciding with the growing participation of non-OECD countries in international goods and services trade.
- The impact of import prices on domestic prices in all countries over the past decade is estimated to be significantly larger than the weight of imported goods and services in domestic demand, suggesting that competition from lower-priced imports has placed pressure on domestic producers in import-competing industries to lower the mark-ups of prices over domestic costs.
- The cyclical sensitivity of inflation to domestic economic conditions has declined. At the same time, domestic inflation has become more sensitive to foreign economic conditions, working through import prices. However, there is no evidence of a robust significant impact from global output gaps in addition to that embodied in import prices.

- Strong GDP growth in the non-OECD economies since 2000 is found to be an important factor underlying the growth of real oil prices and real metals prices since 2002. A scenario analysis in which the non-OECD economies are assumed to grow at the same (lower) rate as the OECD economies since 2000 is found to be associated with a decline in real oil prices from baseline by 20-40% by the fourth quarter of 2005, and a decline in real metals prices of just over 10% from their baseline. This removes some, but not all of the strong growth in these commodity prices after 2002.

The econometric findings are also used to quantify the overall impact of particular aspects of globalisation on consumer price inflation in OECD countries over the period from 2000 to 2005. Two facets of globalisation are considered – the growth in commodity prices estimated to have resulted from strong output growth in the non-OECD economies, and a decline in the average rate of non-commodity import price inflation that is estimated to have resulted from higher levels of trade with non-OECD economies. Both of these estimates are uncertain and so a range of possible outcomes is considered in the quantification exercise.

On balance, if such changes had not occurred, it is likely that inflation would have been higher in all the OECD economies considered, all else being equal, consistent with the view that globalisation has had a disinflationary effect. For most countries globalisation is estimated to have been associated with a decline in the rate of consumer price inflation of between 0 to ¼ percentage point per annum since 2000. The impact was found to be a little larger in many European economies than elsewhere.

Even at the peak of the possible range of net effects the estimated impact on annual consumer price inflation appears to be modest, and no greater than the potential change in annual inflation that could result from a change in indirect taxes or administered prices. However, these calculations take the behaviour of domestic costs as given. To the extent that aspects of globalisation may be helping to restrain the cost of capital or labour costs (Rodrick, 1999; Dumont *et al.*, 2006; IMF, 2007), and also because of the potential feedback of changes in price inflation to wages, it is possible that the implicit net disinflationary impact of globalisation on price inflation is understated in this paper. The same holds for inflation expectations, if globalisation has led to a decline in inflation expectations or helped expectations to become better anchored.

Globalisation-related developments generate considerable challenges to monetary policy makers, even if they are continuing to place some downward pressure on inflation in almost all economies. Identifying the extent and persistence of structural change in the economy is difficult and could result in policy mistakes. To the extent that globalisation is changing the price level of imported non-commodity goods and services, the econometric analysis implies that in the long term there will be an effect only on the domestic price level rather than on domestic inflation. However, the adjustment to this new steady state is likely to be a lengthy process that will persist over several years to come, especially if the prices of traded services also begin to decline significantly relative to the prices of non-traded services.<sup>54</sup>

As regards non-oil commodities, increased supply should eventually lead to a reversal of currently high real metals prices, at least if past behaviour is a guide to the future. As regards oil, continued strong growth in the non-OECD economies can be expected to help keep prices high in real terms. At the margin, however, the effects of this may be attenuated in the longer-term as the non-OECD economies begin to attain less energy-intensive stages of development.

The uncertainty about the relative strengths of the various influences on inflation suggests that policymakers should examine developments in headline inflation as well as core inflation (Bean, 2006). The latter is usually regarded as a better signal of ongoing inflationary pressures, but the former will reflect both influences from globalisation.<sup>55</sup> If the favourable external conditions for low inflation begin to wane going forward, higher nominal interest rates may be required to keep inflation low.

## Notes

1. Using disaggregated EU import price data (classified at the 8-digit level) Kaplinsky (2005) demonstrates that the proportion of sectors in which import prices fell between 1988 and 2001 is the higher the lower the per capita income of the country of origin.
2. The rise relative to domestic output or consumer prices is less marked, with trade prices having declined in real terms (Pain *et al.*, 2005).
3. The price series for metals and the agricultural commodities are composite indicators produced by the Hamburg Institute for World Economics (HWWA). The oil price series is the price of Brent crude.
4. Kamin *et al.* (2006) find little evidence that the rising share of Chinese goods in the United States has had a marked impact on producer price inflation.
5. To this extent, domestically generated inflation may end up being higher than otherwise. In this sense, the impact of higher trade with low-cost producers is inflationary (Rogoff, 2006).
6. World export prices are a weighted average of the export prices of those countries that export to the United Kingdom in US dollars.
7. Related findings for Norway, Sweden and New Zealand are reported by Melick and Galati (2006) and Hodgetts (2006).
8. Thus implicitly, the findings in OECD (2006) can be regarded as consistent with a view that trade with China and the other Dynamic Asian economies will have been lowered import price inflation in the United States and the euro zone by at least 1% per annum.
9. The group of “low-cost” producers considered in ECB (2006) includes the new member states and candidate countries of the EU, the CIS, Latin America, Africa and all Asian countries other than Japan.
10. Business services prices are measured using the deflator for imports of “other private services” in the United States national accounts.
11. Insofar as certain commodity-intensive activities have moved from other countries (including OECD countries) to China, the growth of Chinese demand for commodities may give an exaggerated impression of the net impact on demand for commodities of the emergence of China. For this reason, total non-OECD output measures are used in the empirical work, rather than just measures for China.
12. Although China and other emerging markets also make a significant contribution to global demand for other agricultural commodities (IMF, 2006b), the speed of response in supply can act to offset the impact of demand pressures on prices. Observed prices may also rise rapidly for reasons unconnected to demand pressures, such as weather-related supply fluctuations.
13. The weightings on individual commodities within these broad price indices will reflect global demand, rather than country-specific factors. In some cases important commodities for particular countries may not be included in the aggregate price measures at all.
14. A broader set of control variables were also considered initially for other possible macroeconomic influences, such as the US effective exchange rate and real short-term interest rate (Adams and Ichino, 1995; Hua, 1998).
15. The output gap is measured as the ratio of actual GDP to potential GDP.
16. The global output gap used in estimation is a GDP weighted average of separately estimated output gaps for the OECD and the non-OECD economies. The OECD output gap is calculated using a production function approach to assess potential output. The non-OECD output gap was derived using a measure of potential output derived from a Hodrick-Prescott filter.

17. Significant econometric results for oil prices could be obtained only when using a sample beginning in the mid-1980s. The findings were inconclusive when the estimation period was lengthened by including the acceleration in oil prices in the 1970s. One possible explanation for this is that supply-side factors were the dominant influence on prices in these earlier periods.
18. By the fourth quarter of 2005, world GDP in constant prices is around 10% below its actual value as a result of allowing non-OECD GDP to grow at the rate of OECD GDP from 2000 onwards.
19. To this extent, the results reported above may suggest a slight underestimation of the effects on real commodity prices.
20. See, for instance, the different findings for each of six OECD economies in Debelle and Wilkinson (2002).
21. For 2004, the estimation results imply an inflation-output elasticity of 0.2 compared with a value of 0.3 for 1960 and 1983.
22. Openness is also found to be associated with an increase in productivity of 11%, consistent with the hypothesis that the least productive domestic firms are forced to exit from the market as a result of additional import competition.
23. In addition to this direct effect, the study detects a small indirect effect of globalisation on producer prices that works through increased productivity growth.
24. This result is robust to the inclusion of three control variables (import prices, oil prices, and domestic unit labour costs).
25. The rolling regression results use pooled estimates across countries. As noted by Borio and Filardo (2006), the pre-conditions for obtaining unbiased parameters are not fulfilled in the data set used and these results should therefore be interpreted with care.
26. There are some preliminary results in the paper which suggest that the constructed measure of global inflation is significantly correlated with measures of global real and monetary conditions.
27. It is possible that future expectations are based, at least in part, on past inflation.
28. For example, Rudd and Whelan (2005) and O'Reilly and Whelan (2005) find little evidence that inflation persistence in the United States and in the euro area has changed over time, whereas Cogley and Sargent (2001), Clark (2003), Levin and Piger (2004) and Altissimo *et al.* (2006) all suggest that inflation persistence is markedly lower in recent years. Debelle and Wilkinson (2002) find that inflation persistence has declined in Australia and New Zealand, but has risen in the United Kingdom and the United States. Cecchetti and Debelle (2006) report only weak evidence of a decline in inflation persistence in recent years, even after allowing for a break in the mean of inflation.
29. In this respect, the present study is very similar to that of Ihrig and Marquez (2004), who use an error correction model to examine the contribution of productivity advancements and labour market slack to low inflation in OECD countries. However, in contrast to the present study, Ihrig and Marquez (2004) look entirely on domestic factors as drivers of the decline in inflation and do not address the extent to which globalisation lies behind the decline.
30. The countries included in the analysis are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Korea, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom, and the United States. All data are taken from the OECD Economic Outlook database if not otherwise specified.
31. The private consumption deflator provides a broader measure of inflation than many national consumer or retail price series, and is in principle more directly comparable across countries because it comes from the system of national accounts.
32. A similar approach has been adopted in a number of related studies (see, for instance, Gamber and Hung, 2001 and IMF, 2006a). The import content of consumption is calculated as  $M_{i,t}^{SH} = (M_{i,t} - \eta_i X_{i,t}) / (M_{i,t} + Y_{i,t} - X_{i,t})$ , where  $M$  denotes total imports,  $X$  denotes total exports,  $Y$  denotes domestic output and  $\eta$  is the share of imports used in the production of export goods. Estimates of  $\eta_i$  are taken from Pain *et al.* (2005, Table 7).
33. This was done by interacting the coefficients with dummy variables that are equal to unity from 1995 onwards. For simplicity, only the results of the final specification are summarised in the main part of the paper. A discussion of the results of the intermediate specifications can be found in Appendix 1 of Pain *et al.* (2006).
34. Imposing a single set of parameters common to all countries, as in other studies (IMF, 2006a, Borio and Filardo, 2006), was strongly rejected by the data.

35. Specification [1] has two important implications for the behaviour of the mark-up over marginal costs. First, the mark-up behaves pro-cyclically, increasing during an economic upturn and falling during an economic downturn. This proposition is in line with the empirical evidence provided by Haskel *et al.* (1995) and Ghosal (2000). Second, the reaction of the mark-up to changes in the import content of consumption depends on the ratio between import prices and unit labour costs:  $\partial \ln(P_i/C_i) / \partial M_i^{SH} = \alpha_{2i} \ln(P_i^M/C_{it})$ . If import prices are initially higher (lower) than unit labour costs, the mark-up increases (decreases) with a rise in the import content of consumption.
36. A coefficient of unity would indicate that the weight on import prices was exactly as might be expected given the share of imports in domestic demand.
37. For the G7 economies, the size of the coefficient on the interaction term implies that domestic costs have a bigger influence on domestic consumer prices than do import prices. Not surprisingly, for most of the smaller economies in the sample domestic costs have a smaller weight than import prices, implying that domestic prices in these countries are to a large extent driven by world market prices in the long-run. The size of the coefficient also implies that the direct (long-run) impact of a change in world oil prices is very similar to the present shares of energy in total private consumption expenditure in OECD economies.
38. This interpretation rests on the assumption that import prices are weakly exogenous to the system. Testing for weak exogeneity of import prices is not feasible in the current setting as it would require including a full set of import price equations in the system being estimated. If import prices were not exogenous, the rise in the coefficient could also reflect an increase in pricing to market by importers. However, it is possible to establish that the current change term in import prices is exogenous to the system, as shown by a Wu-Hausman test (the respective *p*-value is 0.11). The tests entails regressing the current change in import prices on a set of explanatory variables that are clearly exogenous to the system and then testing whether the residuals from this regression have any explanatory power in addition to the variables already included in the system.
39. Earlier attempts at imposing a common long-run coefficient on import prices in each country were rejected by the data, confirming that there are significant differences across countries in the influence of import prices.
40. Import prices of OECD economies depend on world export prices which, in turn, reflect capacity constraints and other cyclical conditions in the exporting economy (Pain *et al.*, 2005).
41. The coefficient on the world output gap is allowed to differ across countries in both sub-periods.
42. This finding differs from Borio and Filardo (2006) who demonstrate that measures of global economic slack have a significant influence on the inflation process even after controlling for the indirect impact via import prices. However, the results of the two studies are not directly comparable as Borio and Filardo (2006) use the gap between headline and core inflation as the dependent variable. In contrast, Ihrig *et al.* (2007) also find insignificant or wrongly signed coefficients on the foreign output gap term in Phillips-curve equations.
43. These are Canada and Germany in the first half of the sample and Canada, France and Ireland in the second half.
44. These mixed results are consistent with previous research, demonstrating that inflation persistence has risen in some countries but declined in others (Melick and Galati, 2006).
45. This can be seen by transforming a simplified version of equation [1] as follows:  

$$\Delta \ln P_t = \alpha + \beta \Delta \ln P_{t-1} = \beta \Delta \ln P_{t-1} + (1 - \beta) \Delta \ln P^e + \xi$$
, where  $\xi = \alpha - (1 - \beta) \Delta \ln P^e$ .
46. For this reason, the finding that the sum of the coefficients on the lagged inflation terms is below unity need not imply a long-run trade-off exists between the level of inflation and the output gap. Inflation expectations, as reflected in the constants, in the estimated equations, also need to be taken into account.
47. Ihrig and Marquez (2004), who estimate a similar model on a country-by-country basis, obtain error-correction parameters that are in many cases not significantly different from zero or even positive.
48. To simplify the analyses, exchange rates are assumed to remain unaffected by globalisation so that they follow their true time paths throughout the simulation exercise.
49. The weights of individual commodities in total imports are calculated as described in Pain *et al.* (2005).
50. Ireland is an exception, with average annual inflation rates some 0.5 and 0.9 percentage point higher than in the baseline. This reflects both the comparatively high level of import penetration in Ireland and the faster speed at which changes in import prices are reflected in domestic prices.

51. The calculations do not account for differences in the regional composition of imports. For example, the disinflationary impact may be underestimated for Japan given the comparatively higher share of imports from China in total Japanese imports.
52. This stems from the comparatively high share of oil in Korea's imports.
53. This requires that globalisation has had a large impact on commodity import prices, but a small impact on non-commodity import prices.
54. The disinflationary impacts might be weakened by real exchange rate appreciations in non-OECD economies.
55. Since headline inflation may be rather volatile, short-run changes in headline inflation may not always be very informative. Nonetheless, persistent movements in headline inflation over the medium to long run may contain useful information for monetary policy makers and are taken into account by many central banks when assessing future inflationary pressures.

## Bibliography

- Adams, F.G. and Y. Ichino (1995), "Commodity Prices and Inflation: A Forward-looking Price Model", *Journal of Policy Modeling*, Vol. 17, pp. 397-426.
- Altissimo, F., M. Ehrmann and F. Smets (2006), "Inflation Persistence and Price-setting Behavior in the euro Area – A Summary of the IPN Evidence", *ECB Occasional Paper*, No. 46.
- Bean, C. (2006), "Comments on 'The Impact of Globalisation on Monetary Policy'", presented at the Federal Reserve Bank of Kansas City 30th Annual Economic Symposium, Jackson Hole, Wyoming.
- Borio, C. and A. Filardo (2006), "Globalisation and Inflation: New Cross-country Evidence on the Global Determinants of Domestic Inflation", mimeo, Bank for International Settlements.
- Campa, J.M., L.S. Goldberg and J.M. González-Mínguez (2005), "Exchange Rate Pass-through to Import Prices in the euro Area", *Federal Reserve Bank of New York Staff Report*, No. 219.
- Campa, J.M. and L.S. Goldberg (2003), "Exchange Rate Pass-through into Import Prices: A Macro or Micro Phenomenon?", *NBER Working Paper*, No. 8934.
- CBO (2006), *China's Growing Demand for Oil and its Impact on US Petroleum Markets*, Congressional Budget Office Paper, Congress of the United States.
- Cecchetti, S.G. and G. Debelle (2006), "Has the Inflation Process Changed?", *Economic Policy*, Vol. 21, pp. 311-352.
- Chen, N., J. Imbs and A. Scott (2004), "Competition, Globalization and the Decline of Inflation", *Centre for Economic Policy Research Discussion Paper*, No. 4695.
- Ciccarelli, M. and B. Mojon (2005), "Global Inflation", *Banco Central de Chile Working Paper*, No. 357.
- Clark, T. (2003), "Disaggregated Evidence on the Persistence of Consumer Price Inflation", *Federal Reserve Bank of Kansas City Working Paper*, No. 03-11.
- Cogley, T. and T. Sargent (2001), "Evolving Post-World War II Inflation Dynamics", *NBER Macroeconomics Annual*, Vol. 16, pp. 331-373.
- Corrado, C. and J. Matthey (1997), "Capacity Utilization", *Journal of Economic Perspectives*, Vol. 11, pp. 151-67.
- Debelle, G. and J. Wilkinson (2002), "Inflation Targeting and the Inflation Process: Some Lessons from an Open Economy", *Reserve Bank of Australia Research Discussion Paper*, No. 2002-01.
- Dexter, A.S., M.D. Levi and B.R. Nault (2005), "International Trade and the Connection between Excess Demand and Inflation", *Review of International Economics*, Vol. 13, pp. 699-708.
- Dumont, M., G. Rayp and P. Willeme (2006), "Does Internationalisation Affect Union Bargaining Power? An Empirical Study for Five EU Countries", *Oxford Economic Papers*, Vol. 58, pp. 77-102.
- ECB (2006), "Effects of the Rising Trade Integration of Low-cost Countries on euro Area Import Prices", *European Central Bank Monthly Bulletin*, August, pp. 56-57.
- Feyzioglu, T. and L. Willard (2006), "Does Inflation in China Affect the United States and Japan?", *IMF Working Paper*, No. 06/36.
- Gagnon, J. and J. Ihrig (2004), "Monetary Policy and Exchange Rate Pass-through", *International Journal of Finance and Economics*, Vol. 9, pp. 315-338.

- Gamber, E.N. and J.H. Hung (2001), "Has the Rise in Globalisation Reduced US Inflation in the 1990s?", *Economic Inquiry*, Vol. 39, pp. 58-73.
- Ghosal, V. (2000), "Product Market Competition and the Industry Price-cost Markup Fluctuations: The Role of Energy Price and Monetary Changes", *International Journal of Industrial Organization*, Vol. 18, pp. 415-444.
- Gust, C.J., S. Leduc and R.J. Vigfusson (2006), "Trade Integration, Competition, and the Decline in Exchange-rate Pass-through", Board of Governors of the Federal Reserve System, *International Financial Discussion Paper*, No. 864.
- Haskel, J., C. Martin and I. Small (1995), "Price, Marginal Cost and the Business Cycle", *Oxford Bulletin of Economics and Statistics*, Vol. 57, pp. 25-41.
- Hodgetts, B. (2006), "Changes in the Inflation Process in New Zealand", *Reserve Bank of New Zealand Bulletin*, Vol. 69/1, pp. 18-30.
- Hua, P. (1998), "On Primary Commodity Prices: The Impact of Macroeconomic/Monetary Shocks", *Journal of Policy Modeling*, Vol. 20, pp. 767-790.
- IEA (2006), *Oil Market Report – Annual Statistical Supplement for 2005 and User's Guide*, International Energy Agency, Paris.
- Ihrig, J. and J. Marquez (2004), "An Empirical Analysis of Inflation in OECD Countries", *International Finance*, Vol. 7, pp. 61-84.
- Ihrig, J., Kamin, S.B., Lindner, D. and J. Marquez (2007), "Some Simple Tests of the Globalization and Inflation Hypothesis", Board of the Governors of the Federal Reserve System, *International Finance Discussion Paper*, No. 891.
- IMF (2006a), "How has Globalization Affected Inflation?", *IMF World Economic Outlook*, April, Chapter 3.
- IMF (2006b), "The Boom in Non-fuel Commodity Prices: Can it Last?", *IMF World Economic Outlook*, September, Chapter 5.
- IMF (2007), "The Globalization of Labor", *World Economic Outlook*, April, pp. 161-192.
- Kamin, S., M. Marazzi and J.W. Schindler (2006), "The Impact of Chinese Exports on Global Import Prices", *Review of International Economics*, Vol. 14, pp. 179-201.
- Kaplinsky, R. (2005), "China, Globalisation and Neo-liberal Dogma", paper prepared for 50th Anniversary Conference, Queen Elizabeth House, Oxford, 4-6 July.
- Kohn, D.L. (2006), "The Effects of Globalisation on Inflation and their Implications for Monetary Policy", presented at the Federal Reserve Bank of Boston's 51st Economic Conference, Chatham, Massachusetts.
- Levin, A. and J. Piger (2004), "Is Inflation Persistence Intrinsic in Industrial Economies?", *ECB Working Paper*, No. 343.
- Marazzi, M., N. Sheets and R. Vigfusson (2005), "Exchange Rate Pass-through to US Import Prices: Some New Evidence", Board of Governors of the Federal Reserve System, *International Financial Discussion Paper*, No. 833.
- Markandya, A., S. Pedroso-Galinato and D. Streimikiene (2006), "Energy Intensity in Transition Economies: Is there Convergence towards the EU Average?", *Energy Economics*, Vol. 28, pp. 121-145.
- Melick, W. and G. Galati (2006), "The Evolving Inflation Process: An Overview", *Bank for International Settlements Working Paper*, No. 196.
- Nickell, S. (2005), "Why has Inflation Been so Low since 1999?", *Bank of England Quarterly Bulletin*, Spring, pp. 92-107.
- OECD (2005), *Economic Survey of China*, OECD, Paris.
- OECD (2006), *OECD Economic Outlook*, Vol. 2006/1, OECD, Paris.
- Olivei, G.P. (2002), "Exchange Rates and the Prices of Manufacturing Products Imported into the United States", *New England Economic Review*, first quarter, pp. 3-18.
- O'Reilly, G. and K. Whelan (2005), "Has euro-area Inflation Persistence Changed Over Time?", *Review of Economics and Statistics*, Vol. 87, pp. 709-720.
- Otani, A., S. Shiratsuka and S. Toyochiro (2003), *The Decline in the Exchange Rate Pass-through: Evidence from Japanese Import Prices*, Bank of Japan, Institute for Monetary and Economic Studies.

- Pain, N., I. Koske and M. Sollie (2006), "Globalisation and Inflation in the OECD Economies", *OECD Economics Department Working Paper*, No. 524.
- Pain, N., A. Mourougane, F. Sédillot and L. Le Foulér (2005), "The New International Trade Model", *OECD Economics Department Working Paper*, No. 440.
- Pain, N., M. Molnar and D. Taglioni (2007), "Globalisation and Employment in the OECD", *OECD Economic Studies*, this issue.
- Rae, D. and D. Turner (2001), "A Small Global Forecasting Model", *OECD Economics Department Working Papers*, No. 286.
- Rodrik, D. (1999), "Globalization and Labor, or: If Globalization is a Bowl of Cherries, Why are there so Many Glum Faces around the Table?", in R.E. Baldwin et al. (eds.), *Market Integration, Regionalism and the Global Economy*, Cambridge University Press, for CEPR New York.
- Rogoff, K. (2006), "The Impact of Globalisation on Monetary Policy", presented at the Federal Reserve Bank of Kansas City 30th Annual Economic Symposium, Jackson Hole, Wyoming.
- Rudd, J. and K. Whelan (2005), "Modelling Inflation Dynamics: A Critical Review of Recent Research", Board of Governors of the Federal Reserve System, Finance and Economics Discussion Series No. 2005-66.
- Svensson, L.O. (1999), "Price Level Targeting vs. Inflation Targeting: A Free Lunch?", *Journal of Money, Credit and Banking*, Vol. 31, pp. 277-295.
- Taylor, J. (2000), "Low Inflation, Pass-through, and the Pricing Power of Firms", *European Economic Review*, Vol. 44, pp. 1389-1408.
- Temple, J. (2002), "Openness and Inflation: A New Assessment", *Quarterly Journal of Economics*, Vol. CXIII, pp. 641-648.
- Tootell, G.M.B. (1998), "Globalisation and US Inflation", Federal Reserve Bank of Boston, *New England Economic Review* (July/August), pp. 21-33.
- Vega, M. and D. Winkelried (2004), "How Does Global Disinflation Drag Inflation in Small Open Economies?", *Central Bank of Peru Working Paper*, No. 2005-01.
- Wu, C.S. and J.L. Lin (2006), "The Relationship between Openness and Inflation in Asian 4 and G7", presented at the NBER 17th Annual East Asian Seminar on Economics, Kohala Coast, Hawaii.
- Zellner, A. (1962), "An Efficient Method of Estimating Seemingly Unrelated Regressions and Tests for Aggregation Bias", *Journal of the American Statistical Association*, Vol. 57, pp. 348-368.