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by

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GLOBALISATION AND INFLATION IN OECD COUNTRIES*

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ABSTRACT

During the last two decades, the world has experienced a remarkable process of disinflation, with average inflation rates in industrialized countries falling by 10 percentage points and an even sharper decline of the mean rate of inflation in developing countries. Parallel to the decline in inflation rates, a tremendous increase in economic integration – often referred to as globalisation – has been taking place. In this article, we analyse the effects of globalisation on inflation in OECD countries. We theoretically outline different channels through which globalisation may have influenced inflation dynamics and give an overview on the existing empirical evidence on this issue. In the empirical analysis we show that globalisation has contributed to the disinflation process in OECD countries since the 1980s. Inflation rates became much less prone to domestic parameters, especially the domestic output gap. Global factors such as the output gap of the main trading partners became more important in determining national inflation rates. Furthermore, economic freedom and the degree of globalisation are positively related to the disinflation process. Central bank independence seems to have contributed to the decline in inflation rates among OECD countries process, but the effect is rather modest. Though the inertia of inflation can still be observed, the persistence of inflation has considerably declined since the early 1990s.

Keywords: inflation, globalisation, openness, panel analysis

JEL classification: E30, E31, E58, F41

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I. INTRODUCTION

During the last two decades, the world has experienced a remarkable process of disinflation, with average inflation rates in industrialized countries falling by 10 percentage points and an even sharper decline of the mean rate of inflation in developing countries. Some authors call the disinflation process “an unsung benefit of globalisation” (Rogoff 2003) or even speak of the “death of inflation” (Bootle 1996). Furthermore, not only has the level of inflation rates declined, but inflation has also become less volatile and less vulnerable to certain economic shocks. This more or less global development is a good sign for economic stability and development all over the place. Above all, global disinflation should have contributed to the welfare of poor people – in poor and rich nations – since inflation hits the poor most badly and is the cruellest and most regressive tax (Rogoff 2003).

Parallel to the decline in inflation rates, a tremendous increase in economic integration – often referred to as globalisation – has been taking place. The question is if the comovement of globalisation and disinflation is just coincidence or if there is a causal relation between the both.

In this paper we analyze if the inflation process in OECD countries has changed due to economic integration. For this purpose, we first discuss theoretical considerations of how globalisation may influence inflation. Our main hypothesis is that the process of globalisation contributed to lower inflation rates in OECD countries. We will test this hypothesis empirically using a panel approach.

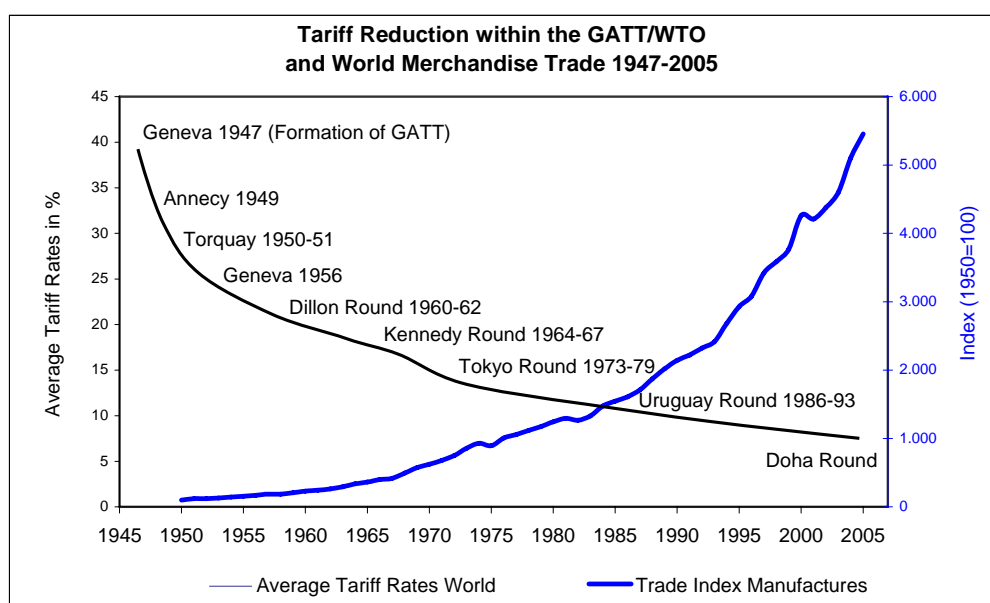
The paper is organised as follows. In chapter II we will outline the globalisation-inflation-nexus in OECD countries, especially the channels through which globalisation may influence inflation. In section III we give an overview on the existing empirical literature on the relationship between globalisation and inflation. Section IV contains our empirical analysis. In section V we conclude our findings and give some remarks.

II. THE GLOBALISATION-INFLATION-NEXUS IN OECD COUNTRIES

(1) GLOBALISATION – A SHORT NOTE

The integration of economic, political, and cultural systems has been one of the major global trends at the end of the 20th century. Advances in information technology and transportation have dramatically expanded economic, political and cultural interaction between actors all over the place. This process, called globalisation, is indeed not a new phenomenon, but its scale and pace has considerably increased since the 1980s driven by the internet revolution and major progress in transportation and logistics, namely containerized cargo and roll-on-roll-off cargo ships. These developments have led to dramatically falling transportation and communication costs and brought the world's markets and cultures closer together than ever.

Figure 1: Tariff Reduction and World Trade in Manufactures



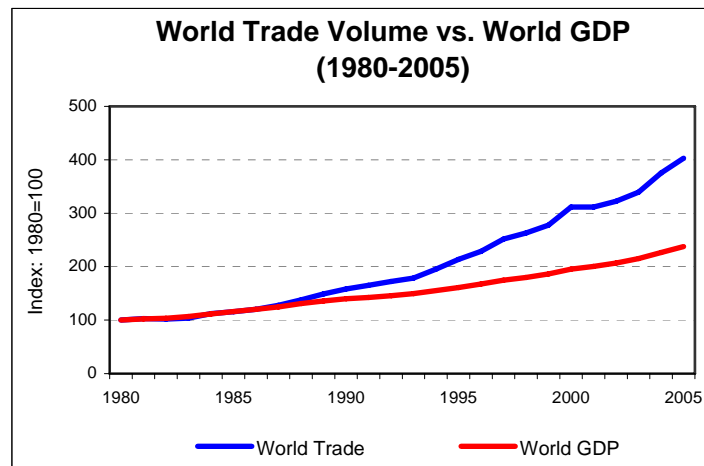
Sources: WTO; IDB; World Bank; IMF Global Monitoring Tariff; Senti, R. (2000).

Globalisation is also characterized by institutional and political reforms in many countries, just to mention gradual trade liberalisation and international coordination of policies. The reduction of tariffs and other barriers to trade within the GATT/WTO framework, bilateral trade agreements and – very much indeed – European integration and the fall of the iron curtain have been additional drivers of the massive growth in world trade, especially in manufactures, after World War II (see Figure 1).¹

¹ Not least because of massive protectionism, trade in agriculture still significantly lags behind trade in other goods.

The growth in worldwide trade has picked up speed in the 1980s and has by far exceeded output growth in the last 20 years. While the world's gross domestic product (GDP) increased by 150 percent from 1980 to 2005, the volume of worldwide trade more than quadruplicated in that period (see Figure 2).

Figure 2: World Merchandise Trade vs. World GDP (1980-2005)



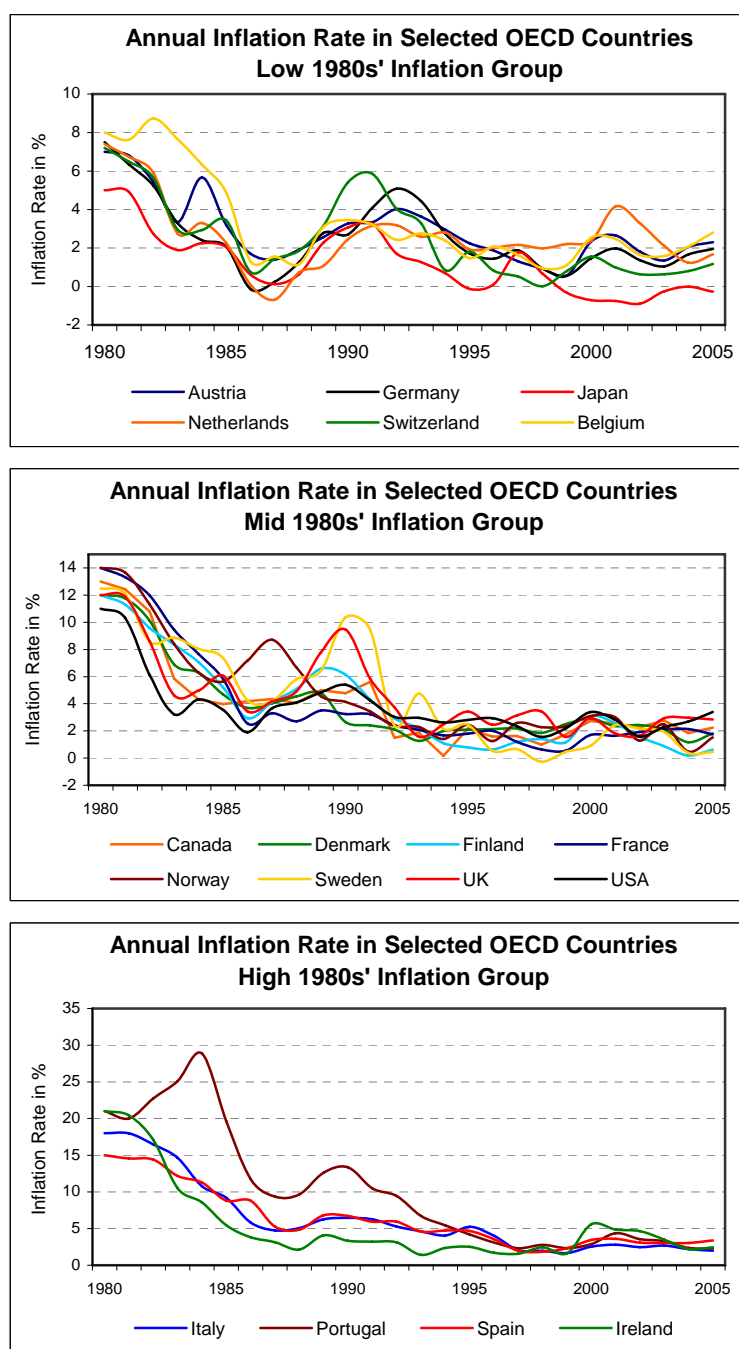
Source: Own estimates on the basis of data provided by the IMF.

The process of globalisation has even further accelerated in the late 1990s due to the integration of major developing countries into the world's markets. The impressive growth of the economies in China and India has already attracted much attention and has had a huge impact on international markets, already. However, it is fair to say that globalisation has just started and will most probably become much stronger in scale and scope.

(2) INFLATION IN OECD COUNTRIES

Inflation rates in OECD countries have dropped considerably since the 1980s, coming from an average of more than 12 percent in 1980 down to about 2 percent in the late 1990s. The following charts distinguish between OECD countries that showed comparably low inflation rates in the 1980s and those that had medium or relatively high inflation rates at that time.

Despite the sharp increase in energy and raw material prices at the beginning of the 21st century, inflation rates in OECD countries remained at very moderate levels (see Figure 6 in the appendix).

Figure 3: Inflation Rates in Selected OECD Countries (1980-2005)

Source: OECD

In addition, the volatility of inflation has also dropped considerably which had a stabilising effect on inflation expectations.² In the United States inflation volatility has fallen by two thirds since the mid-1980s and similar trends have been observed in other OECD countries (Blanchard and Simon 2001). Even developing countries, which continue to experience higher and more volatile inflation than the industrial countries, have seen inflation volatility fall since the early 1990s. The decline in inflation volatility

² This is even more obvious in emerging-market economies.

comes at a time of increasing international trade (Bowdler and Malik 2005). The reduction of inflation volatility is another positive side effect of economic integration since empirical evidence suggests that high inflation volatility is associated with lower mean growth and has a negative effect on the productivity of investment (Al-Marhubi 1998, Byrne and Davis 2004).

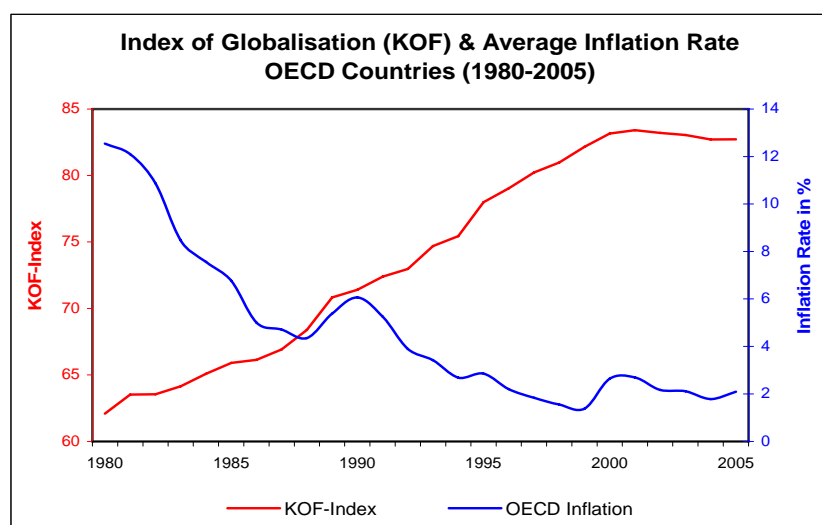
(3) THE EFFECTS OF GLOBALISATION ON INFLATION

In view of the striking comovement of globalisation and disinflation, one could suppose a strong interdependence between these two trends. Figure 4 shows this comovement for the observed OECD countries using the simple average of inflation rates in these countries and the KOF-Index³ as measures for inflation and globalisation, respectively. The KOF-Index of Globalization covers the economic, social and political dimensions of globalisation using proxies for globalisation such as trade flows, foreign direct investments (FDI) and portfolio investments, barriers to trade, transfers, tourism and migration, telecommunication data, data on cultural proximity, and memberships in international organisations (see Table 6 in the appendix).

We calculated an average globalisation for our sample of OECD countries. The index ranges from one to hundred with higher values indicating a higher level of globalisation. Our sample includes Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, UK, and the USA.⁴ As can be seen in Figure 4, globalisation within our sample of 22 OECD countries, measured by the KOF index, has increased remarkably, especially since the mid 1980s. Interestingly, the globalisation process has stagnated since the beginning of the 21st century. This stagnation is due to a higher level of perceived barriers to trade, just to mention some current trade conflicts between some major OECD countries and China and the renaissance of protectionist measures. Some exaggerated security measures after September 11th 2001 also rather retard the process of international integration.

³ The KOF-Index of Globalisation is calculated and published by the Konjunkturforschungsstelle of the Swiss Institute for Business Cycle Research at the ETH Zurich. For further details see Dreher 2006.

⁴ We omit some OECD countries mainly because of incomplete data.

Figure 4: Globalisation and Inflation in OECD countries (1980-2005)

Source: Konjunkturforschungsstelle of the Swiss Institute for Business Cycle Research at the ETH Zurich and OECD.

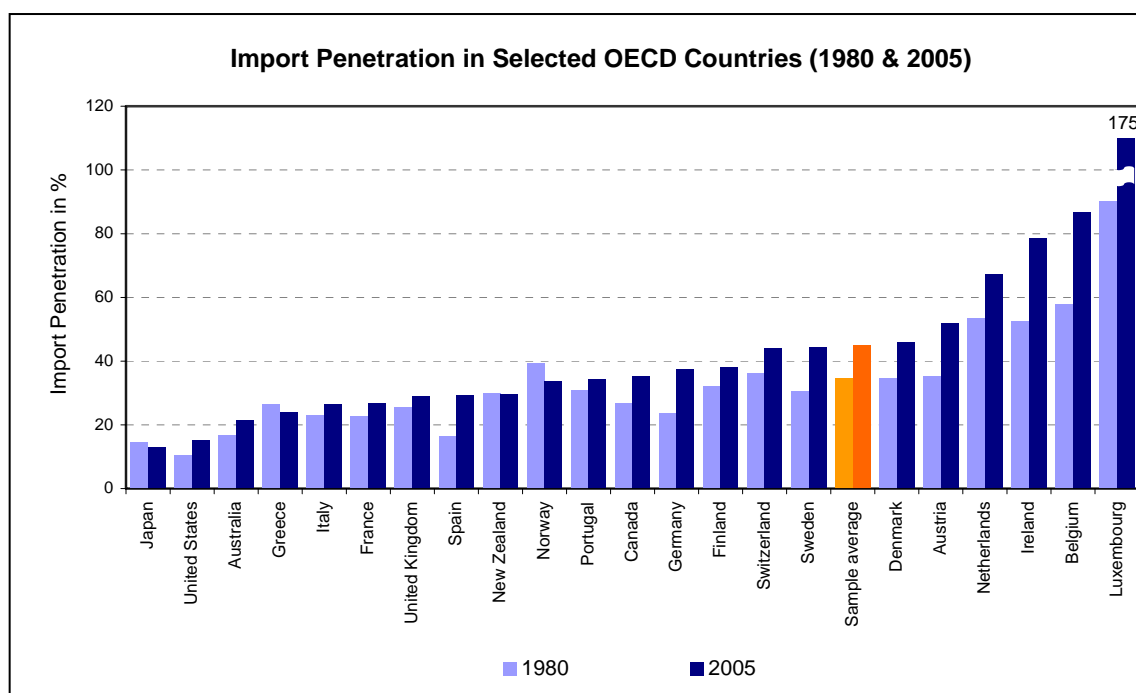
The question is if the comovement of globalisation and disinflation is just a coincidence or if there is a causal relationship. Furthermore, globalisation may not just have an effect on inflation rates but may even affect the process of inflation as a whole. There are various channels through which globalisation may influence inflation which we will discuss briefly in the following passages.

(i) import price effect

First and most obvious to many consumers, globalisation has an effect on consumer prices due to imports of cheap manufactured goods. The integration of low-income countries into the world economy and the enhanced division of labour has led to a better exploitation of comparative advantages and economies of scale and scope all over the place. Increased international trade has led to a higher import penetration in many OECD countries.⁵

Import prices directly influence domestic inflation and determine domestic prices. Every downward pressure on import prices contributes to lower domestic inflation in the particular sector. As import prices fall, consumer prices will fall directly in proportion to the share of imports in the actual consumption basket. Changes in import prices will also affect consumer price inflation because imports are used as inputs (Gamber and Hung 2001).

⁵ Import penetration ratios show the extent to which the demand for goods and/or services is being met by foreign producers.

Figure 5: Import Penetration of Good and Services in Selected OECD Countries

Source: OECD

Furthermore, domestically produced goods may be substituted by imported goods so that the share of imports in the national consumption will increase. Consequently, the disinflation process in the last 20 years has been most obvious in tradables. Clark (2004) shows that the US, the UK, Canada, and Australia experienced a fall in goods inflation relative to services. However, due to further innovations in information technologies, more and more services have become internationally tradable. This development has already led to a partial closing of the gap between goods and services inflation in some countries.⁶

Most recently, the emergence on China and India as new giant players on world markets has on the one hand put pressure on the prices of many manufactured goods, such as textiles and clothing and certain electronic devices. On the other hand, India's and especially China's hunger for natural resources has contributed to a massive increase in oil and other commodity prices. However, higher commodity prices have not seriously pushed average inflation in OECD countries (see again Figure 6 in the appendix).

Overall, increased import penetration is supposed to have dampened inflation worldwide, not only directly, but also indirectly, because there is not only the pure price effect of imports on domestic consumer prices but also a competition effect.

⁶ This is even more striking if one takes into account that the ever increasing demand for services relative to goods should theoretically raise the relative price of services.

(ii) global competition effect

Higher import penetration comes along with enhanced competition in OECD countries. Enhanced competition limits monopoly power of domestic producers because they cannot raise their prices when domestic demand increases or cost pressures appear because doing so would lead to a loss in market shares to international competitors. Technically speaking, economic integration increases the price sensitivity of consumers and therefore raises the price elasticity of demand. This forces producers and retailers in open economies to reduce mark-ups (Taylor 2000). The size of this effect is of course related to the intensity of foreign competition (Pain, Koske and Sollie 2006). The more open an economy the higher the competitive pressure on domestic producers and retailers. That is why globalisation may have reduced the cyclical sensitivity of profit margins since companies cannot raise their prices in cases of excess domestic demand that could be satisfied by imports. International competition also forces producers to raise their productivity in order to reduce costs. As a consequence, globalisation reinforces the efforts to increase labour productivity and technological progress.⁷ Growing productivity and declines in relative costs will only lead to a decline in prices if firms pass the lower costs on their customers in form of lower prices (Melick and Galati 2006). Enhanced competition due to globalisation is very likely to force firms to pass productivity gains through, at least partially. The erosion of firms' pricing power and the incentives to enhance productivity and reduce costs contribute to the disinflation effect of globalisation (Chen, Imbs and Scott 2004). An indirect channel goes from enhanced competition to the incentives of monetary authorities to inflate (see paragraph iv).

(iii) labour market effect

The integration of huge developing and newly industrialized countries into the world economy has led to an increase in labour supply and – alongside the global competition effect and the capital market effect – puts pressure on wages in OECD countries in certain sectors. This is no more only the case in traditional manufacturing sectors such as textiles and clothing but has reached many other industries and even services. Recent trends of outsourcing and off-shoring have further reduced the negotiating power of labour unions in OECD countries. Furthermore and closely connected to the import

⁷ Not least, the global competition effect could even result in better quality and diversification of the products available to consumers worldwide. However, productivity growth does not explain global disinflation since the mid 1980s. Interestingly, in some European OECD countries inflation was falling while the trend productivity growth was declining, though still positive (Rogoff 2003).

price effect, if globalisation delivers increasing purchasing power and growth in real wages by providing cheap imports, nominal wages need not to rise as fast (Frankel 2006) which actually reduces the incentive of workers unions to insist on raising wages. Overall, these developments result in reduced wage pressure in industrialized nations. As a consequence, the non-accelerating inflation rate on unemployment (NAIRU) may have fallen due to economic integration which would have contributed to the disinflation process in OECD countries.

(iv) policy incentives and reforms due to globalisation

Globalisation not only enhanced the competition between countries (and currencies) to attract capital but also served as a vehicle of international benchmarking of institutional quality and policy outcomes. Together with a deeper understanding of the process and the costs of inflation, this has pushed reforms and the evolution of institutions. One important issue in this context is central bank governance that has experienced major improvements since the end of the Bretton Woods system. Central bank independence has been strengthened in many countries and – explicit or implicit – inflation targeting and sound monetary policy has spread all over the world. Central banks certainly became more committed to the primary goal of price stability and have responded much more aggressively to inflation risks than before. It seems that the problem of time-inconsistent monetary policies (see Kydland and Prescott 1977 and Barro and Gordon 1983), almost disappeared in OECD countries. One reason for this could be that the incentives of politicians and discretionary margins of national institutions have changed due to globalisation. Since price rigidities have declined due to international competition, globalisation has limited the effects of an unexpected increase in money supply on real output and employment. That is why independent monetary policy makers and even politicians do not have a great incentive to create surprise inflation in order to generate a short-term output growth and reduce unemployment any more. Another indirect channel goes from competition to the incentives of monetary authorities to inflate. Theoretically, imperfect competition among firms or even a monopoly situation causes output to fall below the optimal level, which might enhance the incentive for monetary authorities to increase money supply in order to inflate (Cavalaars 2003). Furthermore, economic integration is likely to increase the costs of inflation because more open economies tend to suffer more from a depreciation of real exchange rates (Wagner 2000). In addition, in open economies inflation volatility will be relatively costly if international trade induces stronger competition because this stronger competition will increase the elasticity of the demand curve for tradables. A

higher volatility of inflation rates would then cause larger fluctuations in revenues, which could eventually result in welfare losses. This gives incentives to the government to reduce inflation volatility (Bowdler and Malik 2005).

Investors may interpret unsound monetary and fiscal policies as a country specific risk and rather abstain from investments in countries that show a poor performance in these fields of policy. The increased competition among national states to attract foreign direct investments may have even further strengthened the commitment to follow prudential monetary and fiscal policy.⁸ Governments have a strong incentive to commit themselves to an anti-inflationary policy because investors prefer a reliable and stable business environment. Furthermore, since currency fluctuations are more costly in open economies, economic integration forced countries to exhibit a more stability oriented monetary policy. Razin and Binyamini (2007) demonstrate how an endogenously determined monetary policy, which is guided by the welfare criterion of the representative household, becomes more aggressive with regard to inflation fluctuations but more benign with respect to output-gap fluctuations, when the economy opens up to migration, trade in goods, and capital flows. This is the reason why monetary authorities in more open economies have adopted more restrictive monetary policies which resulted in less inflation volatility and persistence.

As a fortunate side effect, enhanced central bank independence, better and more reliable monetary policy and improved measures have led to falling inflation expectations (Hodgetts 2006), creating a virtuous cycle.

It is not only central bank independence and monetary policy that have been improved during the last 20 years. Most OECD countries have also improved their fiscal policy showing a much greater fiscal discipline since the 1990s than in the two decades before. Deregulation and liberalisation resulted in sharp price reduction in some sectors, especially telecommunication. It is fair to say that the structural reforms within the framework of the Single European Market are on the one hand a reaction on the competitive pressures of globalisation and on the other hand accelerating the process of globalisation (Erixon, Freytag and Pehnelt 2007). Overall, globalisation has most definitely put disciplining pressures on institutions resulting and contributed or even initiated global disinflation.

⁸ Freytag and Renaud (2007) observe both active and pathological learning of policy makers who eventually introduce reforms and establish central bank independence.

(v) Other channels through which globalisation may influence inflation

Exchange rate fluctuations can affect national inflation. A depreciation of the national currency in comparison to the currencies of the main trading partners can have a direct effect on CPI inflation if the companies pass this devaluation through into prices. A currency depreciation could also affect inflation indirectly through to increasing prices for imported factors such as oil or other raw materials. Due to increased worldwide competition multinational companies and importers may have changed their pass-through behaviour and absorb exchange rate fluctuations by letting margins change, rather than to risk losing market shares by moving prices. Therefore, the effect of exchange rate fluctuations on inflation may have declined due to globalisation.

The liberalisation of capital markets has led to a better access to capital, widened portfolio choice possibilities, and improved the opportunities to diversify risks. This development reduced capital costs and contributed to the massive growth of foreign direct investments (FDI) worldwide. FDI growth itself has further propelled globalisation. Overall this process is supposed to have improved the allocation of capital. The increasing mobility of capital puts “disciplining” pressure on costs of more immobile factors and should therefore ease inflationary pressures.⁹

Inflation is also related to inflation expectations. Because of greater central bank independence and a stricter commitment to price stability, the higher fiscal discipline and the disciplining pressures stemming from globalisation, inflation expectations may have lowered and become less responsive to lagged inflation and even inflationary shocks. This may have further stabilized inflation expectations and therefore contributed to lower and more stable inflation rates in OECD countries.

III. THE EMPIRICAL EVIDENCE SO FAR

The empirical evidence on the relationship between openness to trade and inflation is mixed. The vast majority of empirical studies find a negative openness-inflation-relationship but some of them show that this relationship fairly varies across countries and that the results are sensitive to the period and the countries included in the sample.

⁹ However, the perception of the consequences of FDI and globalisation for individuals has not always been positive. Economic integration, though an overwhelming driver of economic growth and welfare, sometimes increases worker insecurity. FDI by multinational enterprises are likely to increase firms' elasticity of demand for labour. More elastic labour demand, in turn, diminishes the bargaining power of unions and individual workers. This tends to make workers feel less secure. Empirical evidence supports that FDI activity is positively correlated with individual perceptions of economic insecurity (Scheve and Slaughter 2004)

The estimates for OECD countries seem to be weaker and of less significance than the estimates for developing countries (Pain, Koske and Sollie 2006). Typically, these studies do not find strong support for the disinflation effect of openness in OECD countries (Bleaney 1999, Temple 2002, Wu and Lin 2007). Romer (1993, 1998), in his heavily discussed studies, finds a quite strong negative openness-inflation correlation. Terra (1998) points out that the negative link between openness and inflation found by Romer (1993) is largely driven by the response of the severely indebted countries to the debt crisis of the 1980s. Gruben and Mcleod (2004) and Lane (1997), using different methods and samples, find a quite strong and robust negative openness-inflation correlation. According to Gruben and Mcleod (2004), countries most open to trade have experienced the greatest reduction in their inflation rates during the 1990s, the trade openness-inflation relationship has strengthened during the 1990s and this relationship is more robust than earlier research suggested. Furthermore, openness has been found to reduce inflation volatility. Brahmabhatt and Dadush (1996) report that during the period 1984-93 inflation volatility in countries that were slow to integrate was twice that in countries that achieved rapid integration. Bowdler and Malik (2005) show that countries that have opened up to trade more rapidly than the global average have experienced larger reductions in inflation volatility, independently of the exchange rate regime. Aisen and Veiga (2006), analysing a panel of more than 100 countries in the period from 1975 to 1999, find that lower economic freedom along with higher degrees of political instability generate more volatile inflation rates. Overall the evidence on the impact of openness on inflation indicates that greater openness is related to lower levels of inflation and lower inflation volatility, although this link cannot be found in all countries at all times and depends on other factors.¹⁰ This, in sum, supports the existence of the import price effect. In a study by Pain, Koske and Sollie (2006), import prices are found to have become a significantly more important influence on domestic consumer prices in OECD countries since the mid 1990s, coinciding with the growing participation of some non-OECD countries in international trade.

Several studies have shown that economic rents and quasi-rents in OECD countries have significantly fallen, not least because of deregulation and international integration (Blanchard and Giavazzi 2003; Blanchard and Philippon 2003; Chen, Imbs and Scott 2004). According to IMF (2006), changes in relative producer prices in certain sectors are negatively related to the sector's exposure to globalisation, which further supports the hypothesis of a the productivity enhancing and disciplining effect of globalisation.

¹⁰ Cukierman and Lippi (1999) and Daniels, Nourzad and VanHoose (2005) show that a greater economic openness is associated with lower inflation and that increased openness tends to have a greater inflation-restraining impact in countries in which wage bargaining is less centralized.

Glatzer, Gnan and Valderama (2006) find that globalisation had an effect on dampening relative producer prices for a sample of medium-sized and large manufacturing firms in Austria. Their estimations suggest that gains in labour productivity are among the main drivers of dampening inflation, though the globalisation effect on inflation in Austria has been rather modest. Duca and VanHoose (2000) show that increased goods market competition lowered inflation, flattened the slope of the Phillips curve and even slightly lowered the NAIRU. Cavelaars (2003) also shows that a higher degree of product market competition leads to a permanently lower inflation rate. Both product market institutions and actual competitive behaviour by firms are important in explaining inflation differentials across OECD countries. Pain, Koske and Sollie (2006) suggest that competition from lower-priced imports has placed pressure on domestic producers in import-competing industries in OECD countries to lower the mark-ups of prices over domestic costs. These findings strengthen the presumption of the global competition effect.¹¹

A lot of attention has been drawn on the question how globalisation may affect the slope of the Phillips curve.¹² Some authors suggest that the short-run trade-off between inflation and economic activity, also known as the Phillips curve has flattened in major developed countries in the last couple of decades (Debelle and Wilkinson 2002; Temple 2002; Benati 2005; Bean 2006; IMF 2006).¹³ The rationale behind this is that inflation became less sensitive to domestic economic conditions. Therefore the short-term relationship between domestic economic parameters such as the unemployment rate and the domestic output gap has weakened. Another argument is that domestic producers cannot increase their prices in the case of raising domestic demand because of competitive pressure from outside. These infrequent price adjustments result in a flatter Phillips curve. Others find mixed or inconclusive evidence or even claim that the Phillips curves have become steeper due to globalisation (Romer 1993; Rogoff 2003b; Bowdler 2004). The argument goes as follows. If economy that is closely connected to foreign markets tries to raise the output by a monetary expansion it bears the costs of deteriorating terms of trade and exchange rate fluctuations. Higher costs of inflation and

¹¹ Dwyer and Leong (2001) find slight changes in the pass-through relationship between changes in productivity, import prices and wages and inflation in Australia in the 1990s and conclude that the inflation process as such might have changed.

¹² The discussion on the relationship between the unemployment rate and the change of the nominal wage rate was introduced by Phillips (1958) and is known as the original Phillips curve trade-off. Soon after Lipsey (1960) had provided the theoretical foundation of this empirical trade-off, Samuelson and Solow (1960) introduced the inflation rate instead of the change in the nominal wages into the model. To give a broader, more universal definition, the Phillips curve describes the relationship between the relative inflation and domestic demand and/or supply parameters.

¹³ For an overview on the literature on the implications of globalisation on the Phillips curve see Melick and Galati (2006).

less friction in price-setting result in a steeper Phillips curve. Interestingly, both strands of theoretical and empirical literature suggest that globalisation has led to lower inflation rates. The advocates of the new view that claims flatter Phillips curves argue that at a given output inflation rates are lower. The proponents of the argument that the Phillips curve has become steeper claim that the incentive to increase money supply has declined due to globalisation and that central banks rather fight shy of monetary expansion. This may, not least, result in lower inflation expectations. Consequently, some authors suggest that inflation expectations have become less responsive to past inflation, the domestic output gap or inflationary shocks (Basdevant 2003).¹⁴ Ahmed, Levin and Wilson (2004) show that monetary policy has changed the structure of the economy in such a way as to stabilize inflation over the past two decades.

Economic theory tells us that exchange rate fluctuations should be able to compensate foreign price shocks and that inflation should not spread across countries (Edwards 1989). However, various studies have shown that exchange rates are rather sticky and that the adjustment mechanism is not functioning very well (Reinhart and Rogoff 2004). Furthermore, common global factors seem to be important drivers of national business cycles in some OECD countries (Stock and Watson 2003). Overall, empirical evidence strongly supports the hypothesis that national inflation is to some extent determined on an international level, at least in major industrialised countries. It is therefore no surprise that inflation rates in OECD countries have moved pretty much together over the last decades and that this co-movement accounted for a substantial part of the variability of country specific inflation (Ciccarelli and Mojon 2005). Campa and Goldberg (2005) find that pass-through of exchange rates into import prices is lower for countries with low average inflation and low exchange rate variability. Though there is evidence that pass-through rates have been declining over time in some countries, this pattern of pass-through decline has not been a common or robust feature of all OECD countries.

There are just a few studies that have examined the development of the impact of domestic supply, demand parameters and foreign output gaps on inflation. The empirical findings of these studies are somehow mixed. Whereas a study by the IMF (2006) finds that the impact of domestic output gap on inflation has declined in major industrialised economies, Tootell (1998) finds no significant effect of capacity utilization in the main trading partners of the U.S. and U.S. inflation between 1973 and

¹⁴ Roberts (1998) show that inflation expectations are neither perfectly rational nor as unsophisticated as simple autoregressive models would suggest. Deviations of expectations from clear cut rationality play an important role in explaining why attempts by central banks to reduce inflation have historically required costs in terms of reduced output and employment.

1996. Gamber and Hung (2001) using a Phillips curve model for the United States over the period 1976-1999 find that a trade-weighted average of capacity utilization for U.S. trading partners significantly affects U.S. inflation. Gnan and Valderama (2006) suggest that globalisation has weakened the link between the domestic output gap and inflation in the Euro area. Borio and Filardo (2006) confirm that the importance of the domestic output gap in determining inflation rates has declined whereas the importance of foreign output gaps has increased. McCarthy (1999) finds that external factors have a sizable disinflationary effect in all of the countries, in particular the United States and the United Kingdom. To the contrary, Ball (2006) finds the effect of the foreign output gap on domestic inflation in the US to be smaller and less significant than the effect of the domestic output gap.

Empirical evidence suggest that countries with more independent central banks experienced lower inflation rates without economic costs such as lower growth rates (Cukierman 1992, 1998; Eijffinger and De Haan 1996). This advantageous situation is sometimes referred to as a “free lunch” created by central bank independence (Grilli, Masciandaro and Tabellini 1991).¹⁵ Although, the empirical literature on the relationship between the causality between central bank independence and inflation is not always conclusive¹⁶, the vast majority of studies confirm the negative relationship between inflation and CBI.¹⁷

Overall, the empirical evidence on the relationship between globalisation and inflation provides support that globalisation has contributed to the disinflation process.

¹⁵ This seems to be true also in transitions economies. A study by Loungani and Sheets (1997) suggests that increased central bank independence in twelve transition economies is correlated with lower inflation rates and that this CBI-inflation correlation is not well explained by initial economic conditions and persists after controlling for fiscal performance and the overall quality of economic reforms. Cukierman, Miller and Neyapti (2002) show that CBI is unrelated to inflation during the early stages of liberalization, but that for sufficiently high and sustained levels of liberalization legal CBI and inflation are significantly and negatively related. Once the process of liberalization has gathered sufficient momentum, legal independence seems to become effective in reducing inflation.

¹⁶ Campillo and Miron (1996) stress methodological problems of empirical studies on the CBI-inflation relationship. They suggest that institutional arrangements like central bank independence or exchange rate mechanisms are relatively unimportant determinants of inflation performance, while economic fundamentals such as openness and optimal tax considerations are important determinants. Brumm (1997) argues that the findings of Campillo and Miron (1996) should not be accepted uncritically and presents results of analysis of covariance structures that find a strong negative relationship between inflation and CBI. For other studies that question the significance of the CBI-inflation relationship see Sturm and de Haan (2001) and Bouwman, Jong-A-Pin and de Haan (2005). Overall, the results suggest that institutional arrangements - central bank independence or exchange rate mechanisms - are relatively unimportant determinants of inflation performance, while economic fundamentals - openness and optimal tax considerations - are relatively important determinants.

¹⁷ For a most recent study see Freytag and Schneider (2007). Temple (1998) shows that the findings of recent studies of central bank independence and inflation are very sensitive to outliers, but that evidence still reinforces the existing case for bank independence in high income economies.

IV. HYPOTHESES

Globalisation may have influenced inflation rates and patterns through various channels, namely the import price effect, the global competition effect, the labour market effect, the capital market effect, the effects on institutions and reforms, just to mention the most important. The theoretical considerations as well as the trends suggest that globalisation contributed to the disinflation in OECD countries and that inflation in industrialized countries has become less sensitive to fluctuations in (domestic) short-term shocks (Rogoff 2003b).

If there is something like a globalisation effect on inflation in OECD countries, one should find that the impact of country specific characteristics on national inflation rates has decreased over time and that inflation rates have been more and more influenced by global trends rather than domestic determinants. The underlying argumentation goes as follows. A higher import penetration makes a country's inflation rate less prone to domestic cycles and shocks. Globalisation may therefore act as a stabilizer in open economies. It seems reasonable to suggest that globalisation has made inflation less sensitive to domestic parameters such as aggregate demand and the domestic output gap and that global conditions such as the output gap of main trading partners and developments on the world's oil and commodity markets are more important for inflation rates today.

Hypothesis H1a: The effect of domestic output gap on inflation rates in OECD countries has declined since the 1980s.

Hypothesis H1b: The effect of the output gap of OECD countries' main trading partners on national inflation has increased in the last 25 years.

Since globalisation limits the negotiating power of labour unions in OECD countries, changes on the labour market are supposed to have a weaker impact on wages and therefore on inflation than they used to have. The labour market effect makes inflation less prone to the national unemployment rate and might even lowered the NAIRU.

Hypothesis H2: The relationship between the national unemployment rate and inflation in OECD countries has weakened.

If there is a significant effect of globalisation on inflation rates, disinflation should be positively correlated with a country's level of globalisation. Early globalisers should

have gained first from the disinflation effect of disinflation. The same holds for economic freedom. Higher economic freedom is related to a greater openness of the economy and is likely to reinforce the disinflation effects of globalisation. Furthermore, high economic freedom exerts pressure on governments and central bankers to commit sound monetary and fiscal policies (Freytag and Schneider 2007).

Hypothesis H3a: A high degree of globalisation is associated with lower (relative) inflation.

Hypothesis H3b: Economic freedom contributes to the disinflation effect.

Basically, inflation – at least in the longer run – must be ultimately backed by money supply and is therefore a monetary phenomenon. That is why monetary policy and central bank governance play a crucial role in determining inflation. We suppose that there is a negative relationship between the degree of central bank independence and inflation rates in OECD countries and that improvements in the institutional setting and monetary commitment contributed to the disinflation process.

Hypothesis H4a: OECD countries with a higher degree of central bank independence have shown lower inflation rates.

Hypothesis H4b: The introduction of inflation targeting contributed to disinflation in OECD countries.

V. EMPIRICAL RESULTS

In order to analyze the relationship between globalisation and inflation in the 22 OECD¹⁸ countries within the period 1980 to 2005, traditional and extended Phillips curve approaches are used.

We start with a simple inflation model

$$\pi_{t,i} = c + \phi\pi_{t-1,i} + \beta\text{GAP}_{t-1,i}^{\text{dom}} + \lambda^j X_{t-1,i}^j + \varepsilon$$

with $\pi_{t,i}$ being the annual inflation rate in country i in year t based on the consumer price index (CPI) including all items.¹⁹ The autoregressive term $\pi_{t-1,i}$ takes into account

¹⁸ Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, UK, and the US.

the persistence of inflation rates (“inflation inertia”). GAP^{dom} is defined as the difference between a country’s actual and potential gross domestic product (GDP). X is a vector of different control variables, such as the change in the unemployment rate ($\Delta UNEMPLOY$), or the change of the nominal effective exchange rate ($\Delta NEER$).²⁰ All independent variables (annual data) are lagged, since changes in economic conditions usually do not affect inflation rates immediately. We use panel techniques with fixed effects because of possible unobserved heterogeneity between the 22 countries.

In the regressions documented in Table 1 we split the period into five sub-periods covering 5 years each. As expected, the autoregressive term is highly significant in most of the periods. The inflation rate in year t highly depends on the inflation rate in the year $t-1$. Interestingly, the coefficient as well as the significance of this autoregressive term lost weight at the beginning of the 21st century which could be interpreted as a sign for a further declining persistence of inflation.

Table 1: The effect of output gaps on CPI inflation – simple model (1981-2000)²¹

	1981-1985	1986-1990	1991-1995	1996-2000	2001-2005
π_{t-1}	0.513*** (6.19)	0.375*** (5.48)	0.449*** (4.69)	0.561*** (6.30)	0.193** (2.07)
GAP^{dom}	0.738*** (5.36)	0.384*** (3.92)	0.121* (1.75)	0.003 (0.04)	0.106* (1.96)
$\Delta UNEMPLOY$	-0.001 (0.07)	-0.011 (0.80)	-0.026*** (3.53)	-0.014 (1.38)	-0.009* (1.75)
$\Delta NEER$	-0.073 (1.46)	-0.058* (1.73)	-0.011 (0.36)	-0.003 (0.15)	-0.041*** (3.22)
Adj. R^2	0.875	0.828	0.842	0.671	0.760
N	95	95	110	110	110

Dependent variable is the annual inflation rate (based on the CPI for all items). All explanatory variables are lagged. Absolute t-values in parentheses. Constant not reported.

* significant at the 10% level

** significant at the 5% level

*** significant at the 1% level.

The domestic output gap played a significant role in determining inflation rates in the 1980s. This relationship seems to have changed over the last 20 years. Although, the coefficient of the domestic output gap shows the expected sign in all sub-periods, the impact has declined considerably since the early 1980s. In the late 1980s, the coefficient of the domestic output gap is substantially smaller than in the first sub-period, already.

¹⁹ The CPI covers the changes in the prices of expenditures by households.

²⁰ We also used changes in the value added tax (VAT) and the trade-to-GDP ratio as independent variables. We do not report all of the results because some control variables turn out to be highly insignificant in the regressions.

²¹ For the first and second sub-period the sample size is reduced due to missing data for the domestic output gap.

It further loses weight in the third sub-period and even becomes insignificant in the late 1990s. This and the fact that the explanatory power of the model is lower for the last 10 years than for the 1980s indicates that the effect of the domestic output gap on inflation has declined since the early 1980s. Hypothesis H1a cannot be rejected.

The development of the relationship between the change in the national unemployment rate and the inflation rate shows an interesting pattern.²² Whereas a change in unemployment has no significant effect on the inflation rate in the 1980s, the effect seems to be quite relevant in the early 1990s. In the late 1990s, the relationship becomes insignificant again, though keeping the same sign. In the last sub-period, the coefficient reaches weak significance, indicating that the relationship between the change in unemployment and inflation has somehow recovered at the beginning of the 21st century.²³ These results suggest that an increasing unemployment rate has been associated with a lower inflation rate in the following year. However, the picture remains somehow unclear, not least because the causality between unemployment and inflation is far from clear cut. What can be concluded is that the impact of the national unemployment rate on inflation has not declined during last 25 years. We do not find support for hypothesis H2.

We also tested the possible effect of a change in the exchange rate on inflation. A nominal depreciation of a country's currency in comparison to major currencies is supposed to increase inflation because imports become more expensive.²⁴ Table 1 does not provide a conclusive answer to the question whether or not exchange rate fluctuations determine inflation. Although the coefficients show the expected sign, the significance does not reach satisfying levels, except in the last sub-period. Alternative model specifications produce very similar results. Overall, there seems to be a rather weak relationship between exchange rate fluctuations and inflation in OECD countries.

Summarizing the first evidence drawn from the simple model, there seems to be support for the hypothesis that the effect of the domestic output gap on inflation has declined during the last 25 years. However, the national unemployment has played a significant role in determining inflation in the early 1990s and seems to have been relevant in recent years, too. The relationship between exchange rate fluctuations and inflation rates

²² There is no significant correlation between the domestic output gap or the change in the output gap and the change in the unemployment rate.

²³ Regressions using the deviation of the actual unemployment from the trend unemployment approximated by the HP-filter instead of the change in the unemployment rate as the explanatory variable confirm this pattern. Our data indicate something like an additional structural break in the inflation dynamics at the beginning of the new millennium.

²⁴ Furthermore and perhaps even more important, high inflation expectations may set a currency under pressure and eventually lead to depreciation.

seems to be rather negligible. Obviously, domestic factors such as the output gap cannot satisfyingly explain the variance of inflation rates among OECD countries in the 1990s.

In order to analyze if other, rather global factors influenced the inflation rates in OECD countries, we distinguish between a country's domestic output gap and the country specific foreign output gap. GAP^{dom} is the same measure of the capacity utilization used in the panel regression of Table 1. GAP^{for} is the trade weighted output gap of at least the five main trading partners of the country under observation.²⁵ If the five main trading partners account for less than 50 percent of a country's trade, more than five trading partners are included that together account for at least 50 percent of the country's trade volume.²⁶ One would expect the two measures of capacity utilisation being closely connected because of the co-movement of business cycles in OECD countries. A high correlation between GAP^{dom} and GAP^{for} would cause the problem of multicollinearity once both variables are used simultaneously in regressions. But this is not the case. Although the two measures show a very similar pattern in some countries, such as Austria (0.75) and Belgium (0.85), it is rather low in others such as France (0.35), Ireland (0.17), Japan (0.12), the UK (0.32), and New Zealand (0.32), and even negative in the case of Australia.²⁷ That is why the correlation of GAP^{dom} and GAP^{for} over the full sample is surprisingly low (0.28). Therefore, both variables could be used simultaneously in panel regressions, which we do in some models. In order to test the hypotheses of changing inflation dynamics, we use the deviation of the actual annual inflation rate from the trend inflation ($\hat{\pi}_t$) as dependent variable. A country's trend inflation ($\hat{\pi}_{HP}$) is approximated by the Hodrick-Prescott filter of the annual inflation (all items) between 1980 and 2005. The domestic output gap and the foreign output gap are used separately as well as simultaneously as explanatory variables. We further introduce an interaction term that is defined as the product of the foreign output gap and the import penetration ($GAP^{for} * IPEN$).²⁸ Again, an autoregressive term is introduced to take into account inflation persistence beyond the approximated trend. Most of our analysis indicates that there is some sort of structural temporary break in the inflation dynamics at the beginning of the new millennium. Although inflation persistence seems to be further weakened in recent years, which is basically in line with the trend of the last 25 years, the extraordinary dotcom-boom and stock market boom that culminated in

²⁵ Tootell (1998) used a similar approach to test the impact of foreign economic slack on U.S. inflation. Most recently, Borio and Filardo (2007) used a similar design with alternative measures of foreign economic slack to test the impact of global factors on inflation.

²⁶ This is, among others, the case for Greece, Italy, the Netherlands, and Portugal where up to 8 countries are included in the calculation of the foreign output gap.

²⁷ For further details see Figure 7 in the appendix.

²⁸ The model can be formulated as follows: $\hat{\pi}_{t,i} = \pi_{t,i} - \pi_{HP,t,i} = c + \phi \hat{\pi}_{t-1,i} + \beta GAP_{t-1,i} + \varepsilon$.

2000, the incident on September 11th 2001 and the economic setback in the subsequent years may have temporarily influenced inflation dynamics worldwide. This seems to be the case for the years 2000, 2001, 2002, and 2003. Since we cannot control for the various factors that might have influenced inflation dynamics in OECD countries at that time, we split the sample into two sub-periods covering only the 1980s and the 1990s, respectively.²⁹

Table 2: The effect of output gaps on relative CPI inflation – extended model (1981-2000)

	I		II		III	
	1981-1990	1991-2000	1981-1990	1991-2000	1981-1990	1991-2000
$\hat{\pi}_{t-1}$	0.664*** (15.69)	0.306*** (4.85)	0.701*** (19.83)	0.370*** (5.83)	0.701*** (19.86)	0.434*** (7.07)
GAP ^{dom}	0.237*** (3.55)	0.132*** (3.99)				
GAP ^{for}	0.195 (1.64)	0.266*** (2.95)	0.206 (1.17)	0.420*** (4.97)		
GAP ^{for} *IPEN					0.007 (1.31)	0.007*** (3.82)
Adj. R ²	0.586	0.340	0.705	0.354	0.706	0.322
N	193	220	220	220	220	220

Dependent variable is the difference between the actual annual inflation rate (based on the CPI for all items) and the trend inflation. All explanatory variables are lagged. Absolute t-values in parentheses. Constant not reported.

* significant at the 10% level

** significant at the 5% level

*** significant at the 1% level.

The regressions documented in Table 2 give strong support for the hypothesis that the effect of the foreign output gap has increased. Whereas the measures for the foreign output gap are insignificant in the first sub-period, the coefficients of the measures for imported disinflation become highly significant in the 1990s. The lagged inflation is highly significant in both periods but the coefficient loses weight in the 1990s, indicating that inflation persistence has declined since the 1980s. As a consequence, the explanatory power of the model in the second sub-period falls way behind the one in the first sub-period. This somehow limits the findings from above. Although the foreign output gap is highly significant in the 1990s, it does not add much explanatory power to the model. This might be due to the fact that the relationship between the foreign output gap and inflation primarily picture the direct effect of imported (dis)inflation. However, the impact of capacity utilization in OECD countries' main trading partners on inflation has increased since the 1980s. Hypothesis H1b cannot be rejected.

²⁹ The results of panel regressions for overlapping periods (e.g. 1986-1995 and 1991-2005) are in line with the results presented above.

Since neither domestic nor foreign output gap can explain the variance of inflation in the 1990s, we introduce two measures of globalisation into the model. The first variable is the index Economic Freedom of the World (ECONFREE) published by the Fraser Institute.³⁰ The index includes measures for the size of government, the legal structure and security of property rights, access to sound money, freedom to trade internationally, and regulation of credit, labour, and business.³¹ Another measure for the level of globalisation is the KOF Index of Globalization (KOF) provided by the Swiss Institute for Business Cycle Research on an annual basis. This index is a broad measure of globalisation (see again Table 6 in the appendix). In order to control for other possible links, we also test for the effect of the change in the national unemployment rate and the measure for exchange rate fluctuations.³²

As can be seen in Table 3, the pattern of the changing coefficients of the output gap measures remains stable. The results of this extended model also confirm the significant relationship between the change of the national unemployment rate and the inflation in the 1990s. Hypothesis H2 has to be rejected. In the first sub-period (1981-1990), the two measures of globalisation are insignificant (and even show the “wrong” sign). There seems to be no link between the degree of economic freedom or globalisation and inflation among OECD countries in the 1980s. In the second sub-period, this has changed. The coefficients of both proxies for the level of globalisation are negative and highly significant in the 1990s. A higher degree of globalisation is associated with lower relative inflation rates. Apparently, the heavy and fast globalisers among OECD countries experienced the disinflation process since the mid 1980s to a larger extent. Panel regressions for the period 1986-1995 confirm these findings for ECONFREE.³³ These results give support for the hypotheses that a high level of economic freedom contributed to the disinflation process and that the degree of globalisation has been

³⁰ In the 1980s and the 1990s the index is calculated on a 5-years-basis and therefore not continuously time-varying; another reason why we choose 10-years-periods. For further information see Gwartney and Lawson (2006).

³¹ The Index of Economic Freedom of the World contains an area (area 3) that measures the access to sound money. One of the four components of this area is the recent inflation rate, which could cause the problem of endogeneity in regression analysis. We therefore corrected the aggregated index by omitting area 3. We used both, the complete and the corrected form of the index. The regression results are by all means independent of the version used as explanatory variable since the correlation between the complete index including area 3 and the corrected index without area 3 exceeds 0.97.

³² Since the latter is not significant at all in the periods under observation, we do not show the results in Table 3. The fact that the introduction of exchange rate fluctuations into the model does not affect the results for the 1980s and 1990s confirms earlier results that find a significant effect of exchange rate fluctuations only in the sub-period 2001-2005 (see again Table 1).

³³ Interestingly, the coefficients for the components 4b and 5b of the Index of Economic Freedom of the World that measure regulatory trade barriers and labour market regulations, respectively, show the right sign, to be sure, but are insignificant in most of our regressions for the period 1986-1995 and are only weakly significant for the period 1991-2000. The KOF index is at best weakly significant for the period 1986-1995.

associated with lower (relative) inflation rates, at least in the 1990s. The fact that the coefficient for the autoregressive term is considerably lower in the period 1991-2000 indicates that inflation persistence has declined.

Table 3: The effect of globalisation on CPI inflation – extended model (1981-2000)

	I		II		III	
	1981-1990	1991-2000	1981-1990	1991-2000	1981-1990	1991-2000
$\hat{\pi}_{t-1}$	0.671*** (15.45)	0.343*** (5.67)	0.713*** (18.93)	0.382*** (6.43)	0.701*** (19.85)	0.268*** (4.17)
GAP^{dom}	0.252*** (3.79)	0.149*** (5.07)				
GAP^{for}			0.212 (1.13)	0.280*** (3.50)	0.150 (0.82)	0.342*** (4.16)
$\Delta UNEMPLOY$	-0.012 (1.17)	-0.009*** (3.15)	0.006 (0.406)	-0.019*** (4.99)		
$ECONFREE$	0.195 (0.18)	-0.938*** (5.27)	1.476 (0.88)	-0.987*** (5.45)		
KOF					0.089 (1.12)	-0.091*** (4.62)
Adj. R^2	0.580	0.459	0.703	0.465	0.705	0.414
N	193	220	220	220	220	220

Dependent variable is the difference between the actual annual inflation rate (based on the CPI all items) and the trend inflation. All explanatory variables are lagged. Absolute t-values in parentheses. Constant not reported.

* significant at the 10% level

** significant at the 5% level

*** significant at the 1% level.

In order to analyze the indirect effect of globalisation on inflation dynamics, we use an alternative measure for (relative) inflation, namely the deviation of the actual GDP deflator from the trend inflation approximated by the HP filter of the GDP deflator. The GDP deflator is a broader measure of inflation because it covers not only household expenditures. The index is not based on a fixed market basket of goods and services. The basket is allowed to change with consumption and investment patterns. Therefore, new expenditure patterns are allowed to show up in the deflator as people respond to changing prices. Furthermore, the GDP deflator does not include imports directly but reflects the prices of all domestically produced goods and services in the economy. That is why this broader inflation measure reflects indirect effects of globalisation on inflation rather than the direct import price effect.

The model can be formulated as follows:

$$\hat{\pi}GDPdeflator_{t,i} = c + \phi\hat{\pi}GDPdeflator_{t-1,i} + \beta GAP_{t-1,i}^{for} + \lambda^j X_{t-1,i}^j + \varepsilon$$

The degree of economic freedom and globalisation is approximated by the Fraser-Index (ECONFREE) and the KOF index, respectively. We split the sample into different, overlapping sub-periods covering the whole period between 1980 and 2005. The results strongly support the previous findings. Firstly, the persistence of inflation seems to have weakened since the early 1980s as the declining coefficient of the autoregressive term suggests. Secondly, the foreign output gap has become more important in determining inflation in OECD countries, especially during the 1990s. However, our findings suggest that at the beginning of the 21st century the impact of foreign output gaps on inflation has somehow weakened. Thirdly, while unemployment rates did not affect inflation in the early 1980s to a significant extent, the change of the national unemployment rate became more influential for inflation in OECD in the 1990s. Fourthly, economic freedom and the degree of globalisation obviously have contributed to disinflation in OECD countries in the 1990s.

Table 4: The effect of globalisation on inflation – extended model (1981-2005)

	I		II			
	1981-1990	1991-2000	1981-1990	1986-1995	1991-2000	1991-2005
$\hat{\pi}\text{GDPdeflator}_{t-1}$	0.718*** (14.07)	0.445*** (6.96)	0.677*** (12.36)	0.441*** (7.42)	0.364*** (5.42)	0.421*** (8.62)
GAP^{for}	0.176 (1.48)	0.432*** (3.02)	0.222* (1.83)	0.286** (2.37)	0.341** (2.40)	0.216** (2.18)
$\Delta\text{UNEMPLOY}$	-0.005 (0.54)	-0.018*** (2.79)	-0.007 (0.74)	-0.023*** (3.57)	-0.022*** (3.39)	-0.014** (2.35)
ECONFREE	0.911 (0.88)	-1.044*** (3.11)				
KOF			-0.076 (1.34)	-0.107*** (2.74)	-0.165*** (4.47)	-0.081*** (3.43)
Adj. R ²	0.828	0.673	0.829	0.766	0.689	0.538
N	220	220	220	220	220	330

Dependent variable is the difference between the actual annual inflation rate measured by the GDP deflator and the trend inflation approximated by the HP-filter of the GDP deflator. All explanatory variables are lagged. Constant not reported. Absolute t-values in parentheses.

* significant at the 10% level

** significant at the 5% level

*** significant at the 1% level.

Panel regressions for the whole period 1980-2005 confirm the globalisation effect. As the result of regression I in Table 5 shows, a great part of the variance of inflation rates in OECD countries between 1980 and 2005 can be explained by the foreign output gap (GAP^{for}) and the degree of globalisation (KOF). The coefficients have the expected sign and are highly significant. As expected, including lagged inflation into the regressions (II-VI) adds much explanatory power to the model. However, the impact of the foreign

output gap and the level of globalisation are very robust. Using the Fraser-Index (ECONFREE) as independent variable produces basically the same results. However, ECONFREE does not reach the same significance levels as the KOF index.³⁴

Table 5: Factors that determined inflation rates between 1980 and 2005

	I	II	III	IV	V	VI
π_{t-1}		0.768*** (31.83)	0.750*** (31.27)	0.709*** (28.71)	0.766*** (32.13)	0.750*** (31.03)
GAP^{dom}				0.130*** (5.62)		
GAP^{for}	0.465*** (5.08)	0.254*** (4.71)	0.269*** (5.34)	0.178*** (3.42)	0.209*** (4.08)	0.210*** (4.13)
KOF	-0.348*** (23.99)	-0.054*** (4.31)	-0.032** (2.19)	-0.028** (1.99)	-0.039*** (2.72)	-0.042*** (2.92)
CBI			-1.452** (2.34)	-1.287** (2.12)	-0.890 (1.42)	-0.844 (1.37)
$\Delta UNEMPLOY$					-0.016*** (4.42)	-0.016*** (4.58)
$\Delta NEER$						-0.037*** (3.14)
Adj. R ²	0.649	0.880	0.881	0.853	0.879	0.881
N	550	550	540	513	540	540

Dependent variable is the annual inflation rate (based on the CPI for all items). All explanatory variables are lagged. Absolute t-values in parentheses. Constant not reported.

* significant at the 10% level

** significant at the 5% level

*** significant at the 1% level.

In order to test the hypothesis that decent central bank governance contributed to the disinflation process, we introduce a measure for central bank independence (CBI) into the model. The CBI is based on the index developed by Freytag (2001), that emphasises monetary commitment more explicitly than other indexes of central bank independence. Since this index is only available until 1999, we use additional information and measures such as the index developed by Cukierman (1992)³⁵ to derive an index for central bank independence.³⁶ The coefficient of the index for central bank independence (CBI) shows the expected sign but does not reach satisfactory levels of significance in every regression (see regressions III-VI in table 5). Although the robustness of the CBI is rather weak, it can be concluded that a higher degree of central bank independence seems to be at least weakly associated with lower inflation rates. Testing for the impact of the introduction of explicit inflation targeting does not provide conclusive results.

³⁴ By the way, the correlation between the two measures is 0.585.

³⁵ See also Cukierman et al. (1992).

³⁶ The values of this index do not change every year but rather every 5-10 years. That is why the index is not appropriate for the previous regressions analyzing 5-10 years sub-periods.

Although the coefficients of a dummy for inflation targeting show the expected sign, they miss acceptable levels of significance in most of our regressions.³⁷ To summarize, the hypotheses that enhanced central bank governance and a tighter commitment to price stability contributed to the disinflation process in OECD countries during the last 25 years cannot be rejected, but we do not find strong support for these hypotheses (H4a and H4b) either.

The results derived from regression V and VI confirm the finding that the changing national unemployment rates seem to affect inflation in the expected direction. Although we did not control for possible indirect effects of globalisation on labour markets in OECD countries, it has to be concluded that we do not find support for a strong labour market effect of globalisation. Exchange rate fluctuation seem to have the expected impact on inflation rates but – as has been shown earlier in this paper – this impact is rather weak.

VI. CONCLUSION

Overall, the theoretical consideration and the empirical results suggest that globalisation contributed to the disinflation process in OECD countries since the 1980s. The results are somehow mixed with respect to the relationship between domestic economic conditions and inflation. On the one hand, inflation rates became much less prone to the domestic output gap during the last 25 years. On the other hand, we do not find support for the hypothesis that the effect of changes in the national unemployment rate on domestic inflation has weakened. However, economic conditions in main trading partners surely became more important in determining inflation rates in OECD countries. Furthermore, economic freedom and the degree of globalisation are positively related to the disinflation process. Although central bank independence seems to have contributed to the process, the effect is rather modest. The effect of exchange rate fluctuations has been found to be very modest, varied over time and has, surprisingly, been most significant in the period 2001-2005. Though the inertia of inflation can still be observed, the persistence of inflation has considerably declined since the early 1990s.

³⁷ Results not reported. Panel regressions with a sub-sample of countries that introduced an explicit inflation targeting basically show a significant and negative effect of the introduction of inflation targeting on inflation.

Overall, the disinflation process in OECD countries since the 1980s seems to be closely connected to the tremendous economic integration in that time. Furthermore, it seems fair to say that in countries that are characterized by higher levels of globalisation, institutional reforms have been accomplished and thus have mitigated inflationary shocks and economic setbacks. However, it has to be taken into account that globalisation is not the only and maybe not even the primary influence on average inflation rates, since inflation rates were also low in the 1950s and early 1960s, while globalisation was much lower than today. Most probably, further research is necessary to draw a more detailed picture on the globalisation-inflation-nexus.

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REFERENCES

- Al-Marhubi, F. (1998): Cross-country Evidence on the Link between Inflation Volatility and Growth. *Applied Economics*, Vol. 30(10), pp.1317-1326.
- Ahmed, S.; Levin, A.; Wilson, B.A. (2004): Recent US Macroeconomic Stability: Good Policies, Good Practices, or Good Luck? *The Review of Economics and Statistics*, Vol. 86(3), pp. 824–832.
- Aisen, A.; Veiga, F.J. (2006): Political Instability and Inflation Volatility. IMF Working Paper WP/06/212.
- Badesavant, O. (2003): Learning processes and rational expectations: An analysis using a small macroeconomic model for new Zealand, Reserve Bank of New Zealand Discussion Paper No. 2003/05.
- Ball, L. (2006): Has Globalization Changed Inflation? NBER Working Paper No. 12687, November 2006.
- Barro, R., Gordon, D. (1983): A positive theory of monetary policy in a natural rate model. *Journal of Political Economy*, Vol. 91(4), pp. 589-610.
- Bean, C. (2006): Comments on Ken Rogoff: “Impact of Globalization on Monetary Policy” at the Federal Reserve Bank of Kansas City, 30th Annual Economic Symposium, Jackson Hole, Wyoming, 26 August 2006.
- Benati, L. (2005): The inflation targeting framework from an historical perspective, Bank of England Quarterly Bulletin, Summer 2005, pp. 160-168.

- Blanchard, O.J.; Simon, J.A. (2001): The Long and Large Decline in U.S. Output Volatility. MIT Dept. of Economics Working Paper No. 01-29.
- Blanchard, O.; Giavazzi, F. (2003): Macroeconomic Effects of Regulation and Deregulation in Goods and Labor Markets, *The Quarterly Journal of Economics*, Vol. 118(3), pp. 879-907.
- Blanchard, O.; Philippon, T. (2003): The Decline of Rents and the Rise and Fall of European Unemployment, mimeo MIT, April 2003.
- Bleaney, M. (1999): The Disappearing Openness-Inflation Relationship: A Cross-Country Analysis of Inflation Rates, IMF Working Paper No. 99/161.
- Borio, C.E.V.; Filardo, A. (2007): Globalisation and inflation: New cross-country evidence on the global determinants of domestic inflation, BIS Working Paper No. 227, May 2007, Bank for International Settlements.
- Bootle, R. (1996): *The Death of Inflation: Surviving and Thriving in the Zero Era*, London.
- Bouwman, K.; Jong-A-Pin, R.; de Haan, J. (2005): On the relationship between central bank independence and inflation: some more bad news. *Journal Applied Financial Economics Letters*, Vol. 1(6), pp. 381-385.
- Bowdler, C. (2004): Openness and the output-inflation tradeoff, Money Macro and Finance (MMF) Research Group Conference 2003.
- Bowdler, C.; Malik, A. (2005): Openness and inflation volatility: Cross-country evidence. *Economics Papers 2005-W14*, Economics Group, Nuffield College, University of Oxford.
- Brahmbhatt, M; Dadush, U. (1996): Disparities in Global Integration. *Finance and Development*, September 1996, pp.47-50.
- Brumm, H.J. (2000): Inflation and Central Bank Independence: Conventional Wisdom Redux. *Journal of Money, Credit and Banking*, Vol. 32(4), pp. 807-19.
- Byrne, J.P.; Davis, E.P (2004): Permanent and temporary inflation uncertainty and investment in the United States. *Economics Letters*, Vol. 85(2), pp. 271-277.
- Campa, J.M.; Goldberg, L.S. (2005): Exchange Rate Pass-Through into Import Prices. *The Review of Economics and Statistics*, Vol. 87(4), pp. 679–690.
- Campillo, M.; Miron, J.A. (1996): Why Does Inflation Differ Across Countries? NBER Working Papers 5540.
- Cavelaars, P. (2003): Does Competition Enhancement Have Permanent Inflation Effects? *Kyklos*, Vol. 56(1), pp. 69-94.

- Chen, N.; Imbs, J.; Scott, A. (2004): Competition, Globalization, and the Decline in Inflation, CEPR Discussion Paper No. 4695.
- Ciccarelli, M.; Mojon, B. (2005): Global Inflation, ECB Working Paper Series, No. 537, October 2005.
- Clark, T.E. (2004): An evaluation of the decline in goods inflation, Economic Review, Federal Reserve Bank of Kansas City, 2nd quarter 2004, pp. 19-51.
- Cukiermann, A. (1992): Central Bank Strategy, Credibility and Independence: Theory and Evidence, Cambridge.
- Cukiermann, A. (1998): The Economics of Central Banking, in: Wolf, H.C. (ed.), Contemporary Economic Issues: Proceedings of the Eleventh World Congress of the International Economic Association, Vol. 5, pp. 37-82.
- Cukierman, A.; Lippi, F. (1999): Central Bank Independence, Centralization of Wage Bargaining, Inflation and Unemployment: Theory and Evidence, European Economic Review, Vol. 43(7), pp. 1395-1434.
- Cukierman, A.; Miller, G.P.; Neyapti, B. (2002): Central bank reform, liberalization and inflation in transition economies-an international perspective. Journal of Monetary Economics, Vol. 49(2), pp. 237-264.
- Cukierman, A.; Webb, S.B.; Neyapti, B. (1992): Measuring the Independence of Central Banks and Its Effect on Policy Outcomes, The World Bank Economic Review, Vol. 6(3), pp. 353-398.
- Daniels, J.P.; Nourzad, F.; VanHoose, D.D. (2005): Openness, Central Wage Bargaining, and Inflation, Baylor University Working Paper No. 2005-059-ECO.
- Debelle, G.; Wilkinson, J. (2002): Inflation targeting and the inflation process: some lessons from an Australian economy, Reserve Bank of Australia Discussion Paper No. 2002-01.
- Dreher, A. (2006): Does Globalization Affect Growth? Empirical Evidence from a new Index, Applied Economics, Vol. 38(10), pp. 1091-1110.
- Duca, J.V.; VanHoose, D.D. (2000): Has Greater Competition Restrained U.S. Inflation? Southern Economic Journal, Vol. 66(3), pp. 729-741.
- Dwyer, J.; Leong, K. (2001): Changes in the Determinants of Inflation in Australia. RBA Research Discussion Papers 2001-02, Reserve Bank of Australia, May 2001.
- Edwards, S. (1989): Real Exchange Rates, Devaluation, and Adjustment: Exchange Rate Policy in Developing Countries. Cambridge, Mass.

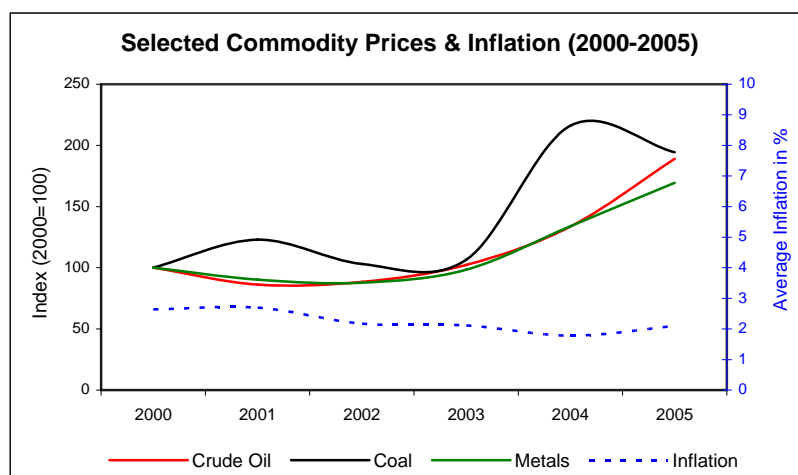
- Eijffinger, S.C.W.; De Haan, J. (1996): The Political Economy of Central Bank Independence, Princeton Studies in International Economics 19, International Economics Section, Department of Economics Princeton University.
- Erixon, F.; Freytag, A.; Pehnelt, G. (2007): The Rome Treaty at 50. ECIPE Policy Brief No. 4, 2007.
- Frankel, J. (2006): What Do Economists Mean by Globalisation? Implications for Inflation and Monetary Policy, Written for Academic Consultants Meeting, Board of Governors of the Federal Reserve System, October 2006.
- Freytag, A. (2001): Does Central Bank Independence Reflect Monetary Commitment Properly – Methodical Considerations, BNL Quarterly Review, No. 217, June 2001, pp. 181-208.
- Freytag, A.; Renaud, S. (2007): From short-term to long-term orientation – political economy of the policy reform process. Journal of Evolutionary Economics, Vol. 17, pp. 433-449.
- Freytag, A.; Schneider, F. (2007): Monetary Commitment, Institutional Constraints and Inflation: Empirical Evidence for OECD Countries since the 1970s. CESifo Working Paper No. 2001, May 2007.
- Gamber, E.N.; Hung, J.H. (2001): Has the Rise in Globalization Reduced U.S. Inflation in the 1990s? Economic Inquiry, Vol. 39(1), pp. 58-73.
- Glatzer, E.; Gnan, E.M.; Valderama, T. (2006): Globalization, Import Prices and Producer Prices in Austria, Monetary Policy and the Economy, Q3/06.
- Gnan, E.M.; Valderama, T. (2006): Globalization, Inflation and Monetary Policy, Monetary Policy and the Economy, Q4/06.
- Grilli, V.; Masciandaro, D.; Tabellini, G. (1991): Political and Monetary Institutions and Public Financial Policies in the Industrial Countries, Economic Policy, Vol. 6(13), pp. 341-392.
- Gruben W.C.; Mcleod D. (2004): The openness-inflation puzzle revisited, Applied Economics Letters, Vol. 11(8), pp. 465-468.
- Gwartney, J.; Lawson, R. (2006). Economic Freedom of the World: 2006 Annual Report. Vancouver: The Fraser Institute. Data retrieved from freetheworld.com.
- Hodgetts, B. (2006): Changes in the inflation process in New Zealand, Reserve Bank of New Zealand Bulletin, Vol. 69(1), pp. 18-30.
- IMF (2006): How has globalisation affected inflation?, IMF World Economic Outlook, September 2006, Chapter 5.

- Kydland, F., Prescott, E. (1977): Rules rather than discretion: The inconsistency of optimal plans. *Journal of Political Economy*, Vol. 85(3), pp. 473-491.
- Lane, P.R. (1997): Inflation in Open Economies, *Journal of International Economics*, Vol. 42(3-4), pp. 327-347.
- Lipsey, R. (1960): The Relation between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom, 1862-1957: A further Analysis. *Economica*, Vol. 27(105), pp. 1-32.
- Loungani, P.; Sheets, N. (1997): Central Bank Independence, Inflation and Growth in Transition Economies. *Journal of Money, Credit & Banking*, Vol. 29(3), pp. 381-399.
- McCarthy, J. (2000): Pass-Through of Exchange Rates and Import Prices to Domestic Inflation in Some Industrialized Economies. BIS Working Papers No. 79, November 1999.
- Melick, M.; Galati, G. (2006): The evolving inflation process: an overview, BIS Working Paper No. 196, February 2006.
- Pain, N.; Koske, I.; Sollie, M. (2006): Globalisation and Inflation in the OECD Economies, OECD Economics Department Working Papers 524.
- Phillips, A.W. (1958): The relationship between unemployment and the rate of change of money wages in the United Kingdom 1861-1957, *Economica*, Vol. 25(100), pp. 283-99.
- Razin, A.; Binyamini, A. (2007): Flattening of the Short-run Trade-off between Inflation and Domestic Activity: The Analytics of the Effects of Globalization, Kiel Working Paper No. 1363, Kiel Institute for World Economics, June 2007.
- Reinhart, C.; Rogoff, K.S. (2004): The Modern History of Exchange Rate Arrangements: A Reinterpretation, *The Quarterly Journal of Economics*, Vol. 119(1), pp 1-48.
- Roberts, J.M. (1998): Inflation expectations and the transmission of monetary policy, Finance and Economics Discussion Series 1998-43, Board of Governors of the Federal Reserve System (U.S.).
- Rogoff, K.S. (2003a): Disinflation: An Unsung Benefit of Globalization? *Finance & Development*, December 2003, pp. 54-55.
- Rogoff, K.S. (2003b): Globalization and Global Disinflation, Federal Reserve Bank of Kansas City, Economic Review, Fourth Quarter 2003.
- Romer, D. (1993): Openness and Inflation: Theory and Evidence, *Quarterly Journal of Economics*, Vol. 108(4), pp. 869-903.

- Romer, D. (1998): A New Assessment of Openness and Inflation: Reply, *Quarterly Journal of Economics*, Vol. 113(2), pp. 649-652.
- Samuelson, P.A.; Solow, R.M. (1960): Analytical Aspects of Anti-Inflation Policy, *American Economic Review*, Vol. 50(2), pp.177–194.
- Scheve, K.; Slaughter, M.J. (2004): Economic Insecurity and the Globalization of Production, *American Journal of Political Science*, Vol. 48(4), pp. 662-674.
- Senti, R. (2000). *WTO: System und Funktionsweise der Welthandelsordnung*. Zürich: Schulthess, Jur. Medien.
- Stock, J.H.; Watson, M.W. (2002): Has the Business Cycle Changed and Why?, NBER Working Paper No. 9127.
- Sturm, J.-E.; de Haan, J. (2001): Inflation in developing countries: does Central Bank independence matter? CCSO Working Papers 200101, University of Groningen, CCSO Centre for Economic Research.
- Taylor, J.B. (2000): Low inflation, pass-through, and the pricing power of firms. *European Economic Review*, Vol. 44(7), pp. 1389-1408.
- Temple, J. (1998): Central bank independence and inflation: good news and bad news. *Economics Letters*, Vol. 61(2), pp. 215-219.
- Temple, J. (2002): Openness, Inflation, and the Phillips Curve: A Puzzle, *Journal of Money, Credit, and Banking*, Vol. 34(2) pp. 450-468.
- Terra, C.T. (1998): Openness and Inflation: A New Assessment, *The Quarterly Journal of Economics*, Vol. 113(2), pp. 641-648.
- Tootell, G. (1998): Globalisation and US inflation, *New England Economic Review*, July/August 1998, pp. 21-33.
- Wagner, H. (2000): Globalization and Inflation, in: H. Wagner (ed.), *Globalization and Unemployment*, Berlin: Springer, 2000, pp. 343-388.
- Wu, C.-S.; Lin, J.-L. (2007): The Relationship between Openness and Inflation in NIEs and the G7, mimeo The Institute of Economics, National Cheng Chi University, March 2007.

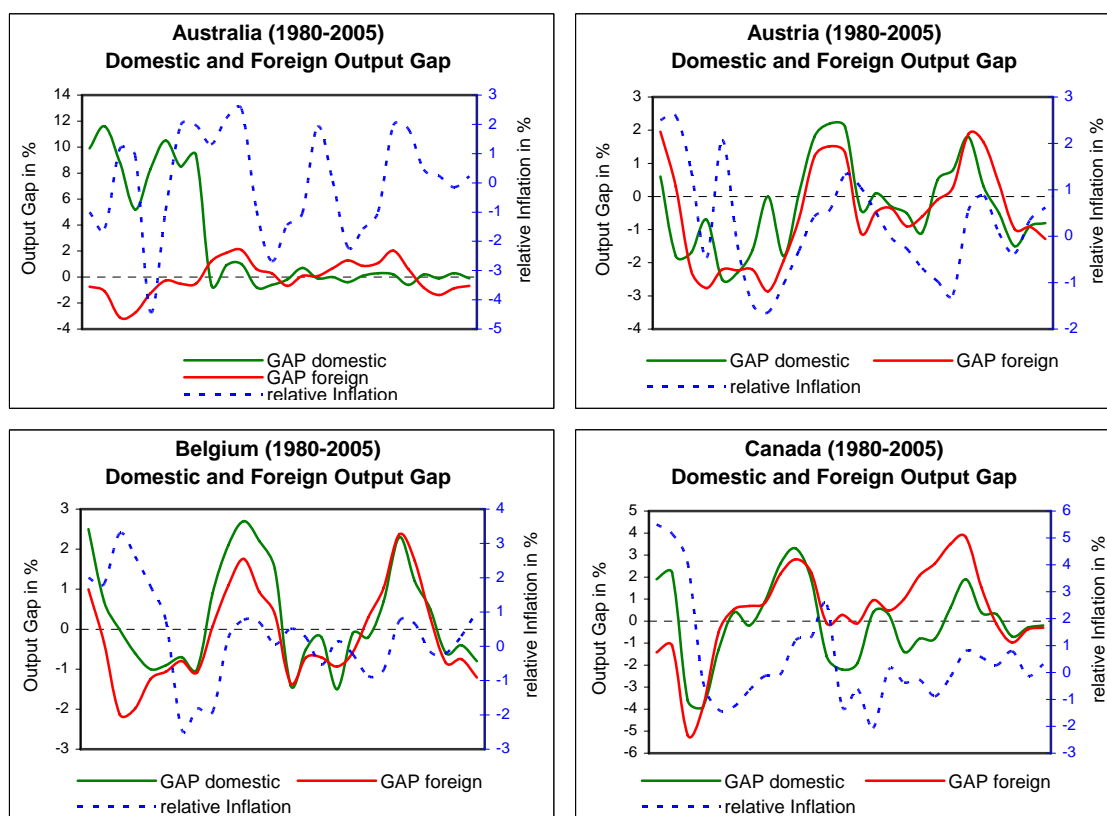
APPENDIX

Figure 6: Selected Commodity Prices and Inflation in OECD Countries (2000-2005)



Sources: IMF, OECD.

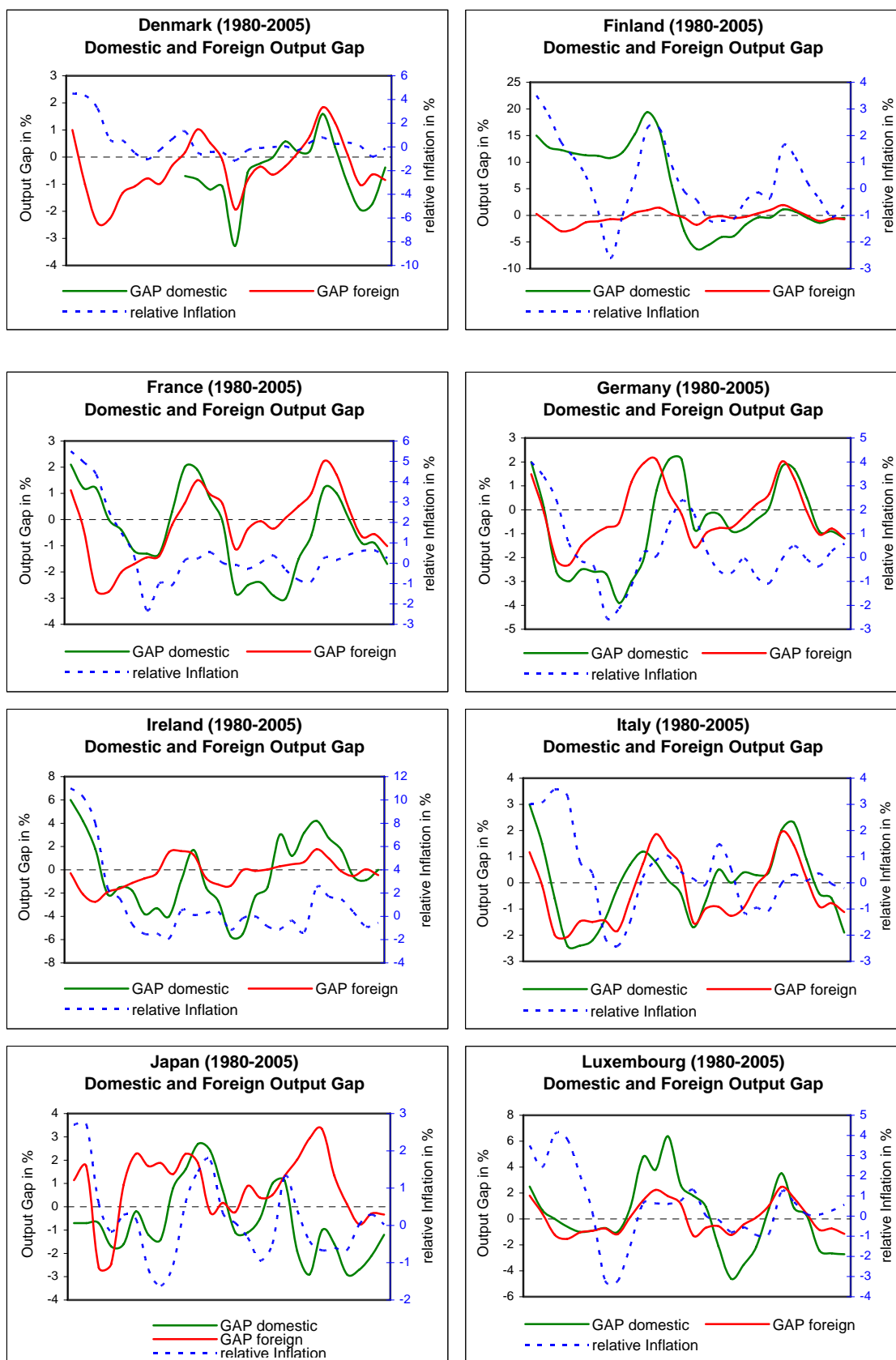
Figure 7: Output gaps and relative inflation in OECD countries (1980-2005)³⁸



t.b.c.

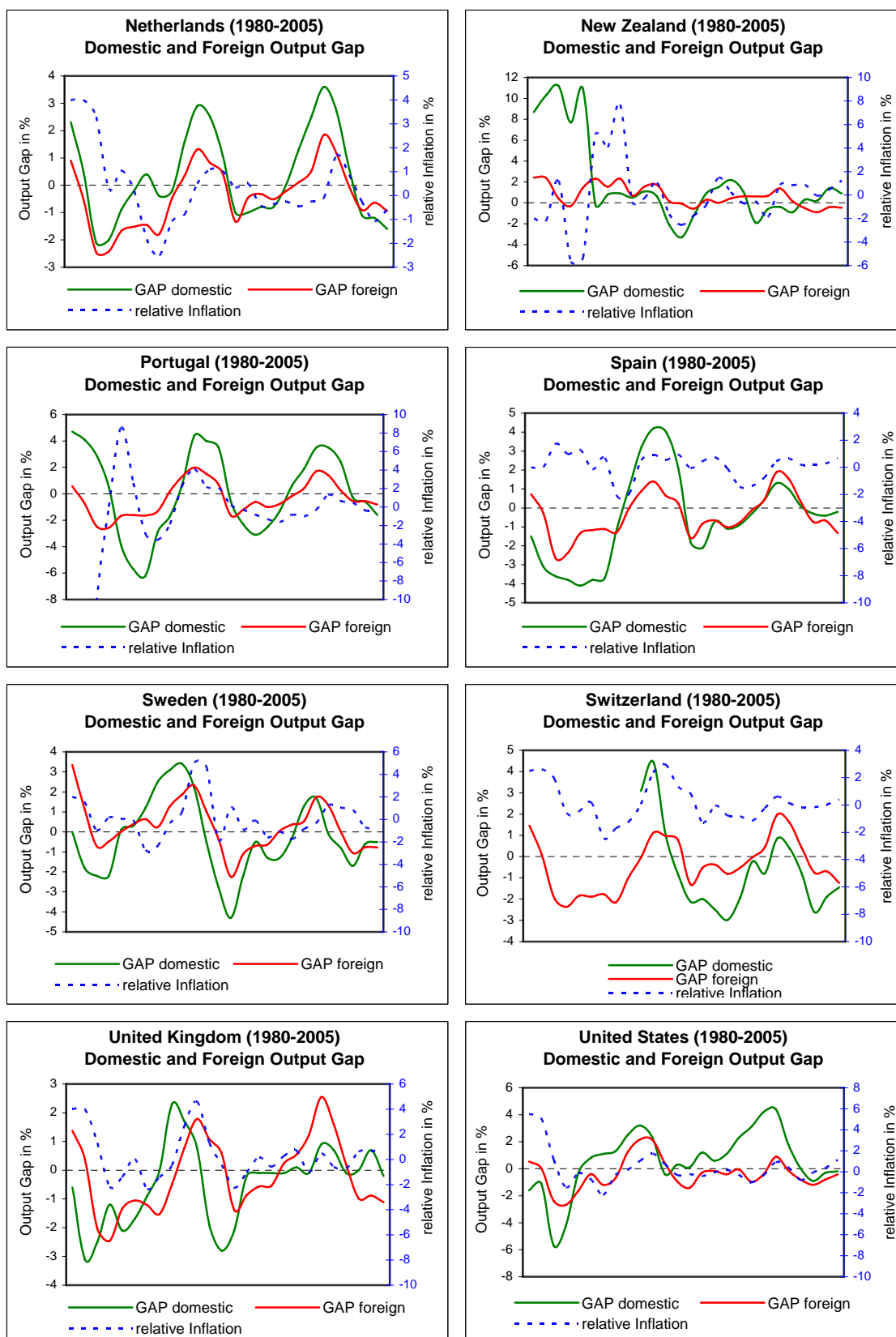
³⁸ Relative inflation (right hand axis) is the deviation of the actual annual inflation rate (CPI all items) and the trend inflation.

Figure 7 continued



t.b.c.

Figure 7 continued



Source: Own calculations on the basis of data provided by the OECD.

Table 6: KOF Index of Globalization

Indices and Variables	Weights
A. Economic Globalization	36%
i) Actual Flows	50%
Trade (percent of GDP)	16%
Foreign Direct Investment, flows (percent of GDP)	21%
Foreign Direct Investment, stocks (percent of GDP)	23%
Portfolio Investment (percent of GDP)	19%
Income Payments to Foreign Nationals (percent of GDP)	22%
ii) Restrictions	50%
Hidden Import Barriers	24%
Mean Tariff Rate	28%
Taxes on International Trade (percent of current revenue)	28%
Capital Account Restrictions	20%
B. Social Globalization	38%
i) Data on Personal Contact	29%
Outgoing Telephone Traffic	14%
Transfers (percent of GDP)	8%
International Tourism	27%
Foreign Population (percent of total population)	25%
International letters (per capita)	27%
ii) Data on Information Flows	35%
Internet Hosts (per 1000 people)	20%
Internet Users (per 1000 people)	24%
Cable Television (per 1000 people)	20%
Trade in Newspapers (percent of GDP)	14%
Radios (per 1000 people)	23%
iii) Data on Cultural Proximity	37%
Number of McDonald's Restaurants (per capita)	40%
Number of Ikea (per capita)	40%
Trade in books (percent of GDP)	20%
C. Political Globalization	26%
i) Embassies in Country	35%
ii) Membership in International Organizations	36%
iii) Participation in U.N. Security Council Missions	29%