Resilience in the UK and other OECD economies: Treasury Economic Working Paper No.2

March 2008

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Resilience in the UK and other OECD economies

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Abstract

All economies need continually to respond to shocks that arise, for example, from technological progress or from changes in the relative growth rates of demand for individual goods and services. Resilience describes the ability of an economy to maintain levels of employment and keep actual output close to its potential level in the face of such shocks. This paper presents two measures of resilience exhibited by 14 OECD economies over the past 25 years. These show that there has been a general improvement in resilience across the countries in the study, and a marked improvement in the United Kingdom. Regression analysis indicates that this has been associated both with improved macroeconomic policy, proxied by lower long-term interest rates, and by less stringent labour and product market legislation, as measured by the OECD.

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The opinions expressed in this paper are those of the author and do not necessarily reflect those of HM Treasury.

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Introduction

Macroeconomic stability and resilience to shocks

1.1 Macroeconomic stability, characterised by sustainable rates of output growth and low inflation, allows businesses, individuals and the Government to plan more effectively for the long term, improving the quality and quantity of investment in physical and human capital, and helping to raise productivity.

1.2 Robust macroeconomic policy frameworks and flexible product, labour and capital markets are important elements in creating a resilient and stable economy[1]. Resilience can be defined as the capacity of an economy to maintain levels of employment and to keep actual output close to its potential level in response to shocks that affect both the demand-side and the supply-side of the economy.

Macroeconomic stability in the United Kingdom

1.3 From the 1970s to the early 1990s, the UK economy displayed low levels of resilience and was characterised by high levels of macroeconomic instability. For example, during the 1970s, 1980s and early 1990s, the UK suffered repeated episodes of high inflation, reaching more than 25 per cent in 1975, 20 per cent in 1980 and almost 10 per cent in 1990. As a result, the UK suffered from relatively poor economic outcomes including weaker GDP growth and higher short and long-term interest rates than other G7 countries. Over the past decade the economy has experienced much more stable inflation and output growth. CPI inflation has averaged around 1¾ per cent during the past decade, just a little below the current 2 per cent target. The UK economy has avoided any quarters of negative output growth over this period.

1.4 This paper considers evidence that the economic resilience of the UK and OECD economies has improved in recent years, and the relationship between this improved resilience and policy reforms affecting product and labour markets. It provides additional evidence to the debate as to how much of the improvement in macroeconomic stability seen in recent years is due to 'good luck' (i.e. shocks hitting the economy have been less severe) or to 'good policy' (i.e. reforms have left the UK economy better able to deal with the shocks that have occurred).

The importance of resilience

1.5 Resilience is important because all economies are subject to continual change and adjustment. For example, technological change and globalisation lead to permanent structural changes in the composition of output, employment or trade. In the short-term, economies may be buffeted by unexpected shocks, such as the recent financial market turbulence. A resilient economy deals with such change and adjustment efficiently by minimising the movement of output and employment away from trend levels.

Structural change

1.6 The process of economic growth entails adjustments in the structure of employment and production. Technological advances allow improvements in the range and quality of goods and services that can be produced. Increased global economic integration provides new opportunities for trade. These can be best exploited by increasing the production of those goods and services that domestic producers can produce more efficiently than their foreign counterparts and trading the surplus domestic production for the goods and services that can be produced more cheaply elsewhere.

[1] In his memoirs, Alan Greenspan highlights resilience as an important determinant of economic performance, noting that "I was gradually coming to believe that the US economy's greatest strength was its resiliency - its ability to absorb disruptions and recover, often in ways and at a pace you'd never be able to predict, much less dictate." (Greenspan, 2007).

1.7 Changes in the capacity of the economy to supply individual goods and services and changes in the relative growth rates of demand for individual goods and services combine to alter the efficient allocation of labour and capital across activities and across locations. In order to maintain high levels of growth and employment, an economy needs to be able to respond by ensuring that its resources, both human and physical, can be redeployed away from activities where they no longer earn a viable income into activities where they do.

"Creative destruction"

1.8 This process of continuing change was famously described by Joseph Schumpeter as one of "creative destruction"[2]. Schumpeter's phrase succinctly captures the two-edged nature of the phenomenon. On the plus side, it is the route by which advances in technology and integration with global markets are translated into increases in living standards. On the negative side, it entails a disruption to existing patterns of production and employment. The most favourable outcomes will occur when the ability to move resources into new activities (the creative side of the equation) offsets the redundancy rate in existing activities.

Resilience and adjustment to shocks

1.9 Resilience enables an economy to maintain levels of employment and to keep actual output close to its potential level, in the face of shocks that affect both the demand-side and the supply-side of the economy. Supply shocks include technological progress, the entry of new producers to the market, and changes in the price and availability of inputs used in production, such as oil, other natural resources, labour and capital. Demand shocks include changes in consumer preferences and changes in monetary and fiscal policy. Households respond to such shocks by adjusting the balance of their labour supply, consumption and saving. Firms respond by adjusting production, employment, investment and prices.

1.10 History shows that resilience has varied considerably. There have been prolonged episodes of strong growth and high employment, both in the United Kingdom and in other countries. Equally, there have been episodes where unemployment has been high and growth has been weak. In the 1930s, unemployment was persistently high, while in the 1950s and 1960s it was persistently low. In the 1970s and early 1980s, there were strong fluctuations in output, but over the past twenty years aggregate output has been much more stable, despite considerable changes in the structure of employment and output across different activities.

The effects of policy

1.11 An important question is the extent to which economic policies can affect an economy's resilience. Economic policy in the United Kingdom has recognised the importance of ensuring macroeconomic stability and of microeconomic policies that support flexible and timely adjustment to economic shocks[3]. The macroeconomic framework introduced in 1997 promotes macroeconomic stability (Box 1.1). This allows businesses, individuals and the Government to plan more effectively for the long-term, and reduces the risk of abrupt changes in the levels of spending, output and employment.

[2] Schumpeter (1942)

[3] Balls and O'Donnell (2002), Balls, Grice and O'Donnell (2004), Gurney (2007)

Box 1.1: The Government's macroeconomic policy framework

The Government's macroeconomic framework is based on the principles of transparency, accountability and responsibility. The frameworks set clear objectives for monetary and fiscal policy, and embody the principle of 'constrained discretion', by which policymakers are afforded short-term flexibility in order to meet credible long-term goals.

The monetary policy framework gives full operational independence to the Monetary Policy Committee (MPC) to meet the Government's symmetrical inflation target, presently 2 per cent for the 12-month rate of increase in the Consumer Prices Index (CPI). Subject to that, the remit also gives the Bank an objective to support the economic policy of Her Majesty's Government, including its objectives for growth and employment.

Openness, transparency and accountability are enhanced through the publication of MPC members' voting records, prompt publication of the minutes of monthly MPC meetings, and publication of the Bank's quarterly Inflation Report. The open letter system is an integral part of the monetary policy framework, allowing the MPC to respond in a flexible and transparent way in the event of economic shocks causing deviations of inflation from its target rate by more than 1 percentage point.

The Code for fiscal stability sets out a clear framework and set of obligations constraining how Government conducts fiscal policy. It specifies the key principles for the formulation and implementation of fiscal policy as well as the reporting requirements, including independent audit, incumbent on the Government. The Code requires the Government to state clearly its fiscal policy objectives and the rules through which policy will be operated, increasing the transparency and accountability of fiscal decision-making.

The institutional framework, along with the Government's own fiscal policy objectives and rules, allows for action in the face of economic shocks while maintaining confidence in the Government's commitment to long-term stability.

1.12 Microeconomic policies support the flexible and efficient operation of labour, product and capital markets. The operation of these markets determines the speed of adjustment within the wider economy, in particular by ensuring that labour and capital are employed in those activities where they add most value. Previous Treasury publications have highlighted the importance of policies that promote flexibility in creating an economy that can successfully deal with shocks[4]. Policies in labour and product markets have been designed to remove barriers to entry, increase competition, sharpen work incentives and facilitate the acquisition of skills (Box 1.2).

[4] HM Treasury (2003), HM Treasury (2004)

Box 1.2: The Government's programme of microeconomic reform

Shocks affecting the economy imply that existing structures of prices, production, employment and spending need to adjust to maintain the balance between supply and demand in labour, product and capital markets. Flexible markets allow the economy to adjust with minimal disruption to output and employment. The Government's programme of microeconomic reform has therefore aimed to bolster market flexibility. Reforms to improve the functioning of labour, product and capital markets are also important elements in the Government's programme to raise productivity growth[5].

Competitive product markets, with low barriers to entry, allow the most productive, and therefore most profitable, firms to increase market share; the least productive lose market share or exit the market altogether. The UK's competition regime generally scores strongly in international comparisons – KPMG's latest peer review ranked the UK third overall.

A well-functioning labour market is able to adjust to changing economic conditions in a way that keeps unemployment and inflation low, and ensures continued growth in real incomes. The Government's labour market policies aim to extend employment opportunity to all and improve incentives to work. They also aim to provide support and help back to the labour market when people find themselves out of work in the transitional periods as the economy adjusts to a shock.

Efficient capital markets match the resources of savers to the needs of borrowers. They increase the supply of capital to businesses and government to finance investment. Capital markets also enable savers to construct portfolios with risk and return characteristics that are best suited to their individual requirements. Financial markets allow firms and individuals to manage their exposure to risk through insurance and other products. They help to increase resilience by allowing firms and households to smooth their response to temporary changes in their income over time, thereby reducing the initial magnitude of the shock. The Government aims to ensure that financial sector regulation is effective, proportionate, and risk-based, protecting investors and consumers appropriately and ensuring market integrity while encouraging innovation to expand the range of available products and services.

1.13 Disruptive adjustments generate social and economic pressures. One response to such pressures is to attempt to underpin the existing order, by subsidies or regulations that protect incumbent firms and workers. But if the underlying cause results from a permanent change to supply or demand that means that the previous structure of employment is no longer viable, then such protection implies a reduction in aggregate incomes. In addition, it is likely to prove less costly to allow an industry to adjust gradually rather than to delay the adjustment process, given that a delay is likely to imply a sharper adjustment at a later date.

Macroeconomic and microeconomic policies

1.14 The combined effect of the decisions made by all the firms and households within the economy means that resilience observed at the macroeconomic level does not simply reflect macroeconomic shocks per se, but also the ability of firms and households to adjust to shocks that may originate at a more local level. For example, if workers who become redundant are unable to find new employment then overall purchasing power is lower than it would otherwise be. Hence poor adjustment at the local level can have spillover effects on the wider economy.

[5] HM Treasury (2007b)

1.15 Analysis undertaken by the OECD has consistently emphasised that strong economic performance requires both sound macroeconomic policies and microeconomic policies that enable an economy to adjust flexibly to changes in the economic environment. Both elements have been highlighted in their analysis of cross-country differences in labour market performance and of economic growth[6].

This paper

1.16 This Treasury Economic Working Paper derives two measures of the resilience exhibited by 14 OECD economies over the past 25 years. The first measure enables resilience to be decomposed into two components: the initial impact of the shock and its subsequent persistence. The second one tracks movements in resilience over time.

1.17 The first measure cumulates the predicted deviation of output from trend following a typical shock. The predicted deviations of output and trend and the size of the typical shocks are derived from regressions of the output gap on its own previous values for each country. These regressions are estimated over two sub-periods (1982-1993 and 1994-2005). Estimating over two periods provides estimates both of how the size of the typical shock and its subsequent persistence have changed between the two periods.

1.18 The second measure of resilience is derived from the standard deviation of the residuals from a similar regression, estimated over the whole sample period (1982-2005). The standard deviations are calculated over rolling six–year windows to give a measure of resilience that evolves over time. This measure is regressed on a number of measures of the stringency of labour and product market regulation that have been developed by the OECD, in order to assess the effect that such policies have on resilience.

Previous literature

1.19 The analysis in this Treasury Economic Working Paper builds on previous work by Duval, Elmeskov and Vogel (2007) in an OECD Working Paper. It uses an alternative methodology to derive specific measures of resilience, and to test the robustness of their results. It also includes a proximate measure of macroeconomic stability as one of its policy indicators. Whereas the OECD study considered resilience only in response to common shocks (that is those having a contemporaneous effect on all OECD countries), the current study analyses the responses to all shocks affecting each economy. Hence it includes shocks that have a country-specific element as well as those that have effects across all countries. The two measures of resilience used in this paper are closely related to the criteria for resilience assessed by the OECD authors.

1.20 Several other papers have highlighted the general reduction in macroeconomic volatility and there has been a lively debate as to whether this can be attributed to "good policy" or "good luck". Notable contributions include McConnell and Perez-Quiros (2000), Blanchard and Simon (2001), Stock and Watson (2003), Benati (2007) and Benati and Surico (2007). Blanchard and Gali (2008) investigate the improved resilience to oil price shocks in the past decade in comparison with the 1970s.

1.21 The "good policy or good luck" debate has been fuelled by disagreements about how to interpret the reduction in the observed magnitude of shocks to output and inflation. Some authors have interpreted this as a reduction in the size of the underlying shocks affecting the economy, and hence as "good luck". Other authors have argued that observed shocks include the responses of firms and households to underlying shocks. With this view, improved policy should be expected to lead to a reduction in the magnitude of observed shocks. Firms are less likely to make abrupt changes in their

[6] OECD(1994), OECD (2003), OECD(2006)

output and pricing decisions when the Government's commitment to maintain macroeconomic stability is credible. And policies that promote flexible adjustment will increase the proportion of an underlying shock to output that can be absorbed within the observation period, and hence reduce the size of observed shocks.

1.22 These two views are both consistent with the well-documented reduction in the magnitude of observed shocks. This makes it difficult to adjudicate between the two explanations. However, other evidence suggests that improved resilience may not simply be "good luck". The Bank of England have stated that the past decade "does not seem [to have been] especially tranquil"[7]. They note that the international economy has had to absorb shocks that have included the integration of China, India and East European countries into the global economy, the dot-com boom and bust, the 9/11 attacks, war in the Middle East, and a more than three-fold increase in oil prices in recent years. Other shocks affecting the United Kingdom have included a sharp increase in the value of sterling between 1996 and 1998, the tripling of house prices between 1997 and 2006, and a substantial increase in net inward migration.

Main findings

1.23 The analysis in this Working Paper follows the work undertaken by Duval, Elmeskov and Vogel in investigating whether improved resilience has been associated with less restrictive labour and product market conditions, as measured by the OECD.

The main findings are:

- The United Kingdom has exhibited a marked improvement in its resilience between the 1982-93 and 1994-2005 periods: in the latter period it was the most resilient of the economies studied;
- There has been a general improvement in resilience across the countries studied;
- Improved resilience in most countries, including the United Kingdom, reflects both a tendency for the observed shocks to be smaller than in the past and a tendency for shocks to be less persistent than before; and
- The reduction in the overall volatility of shocks to output has been associated with both improved credibility of macro-economic policy, as proxied by lower long-term interest rates, and by less stringent labour and product legislation, as measured by the OECD. The results in this paper suggest that reforms to strengthen product market competition have been most influential.

Caveats

1.24 These results suggest that improved macroeconomic stability and reforms in labour and product markets may have contributed to greater resilience in OECD economies over the past decade. However, while suggestive, this evidence is not conclusive. In particular, the measures of resilience and of labour and product market regulation are imperfect. The measures of resilience used in this paper are a function of the observed shocks to output. These are a combination of fundamental shocks and the capacity of the economy to absorb such shocks within the observation period. Ideally, these two elements would be separated, but this is difficult to do. Future research on this topic could address this issue. In addition, it is difficult to measure the stringency of labour and product market regulation with much precision.

[7] Bank of England (2007)

1.25 These considerations imply that further work is needed to test the robustness of these results, as more observations become available, and with respect to alternative measures of resilience and of the policy stance. Such work is part of a continuing research programme investigating the link between economic policies and both microeconomic and macroeconomic performance. Nonetheless, the results in this paper accord well with theoretical insights that restrictive labour and product market regulation may impair an economy's capacity to adjust to shocks, thereby reducing its resilience.

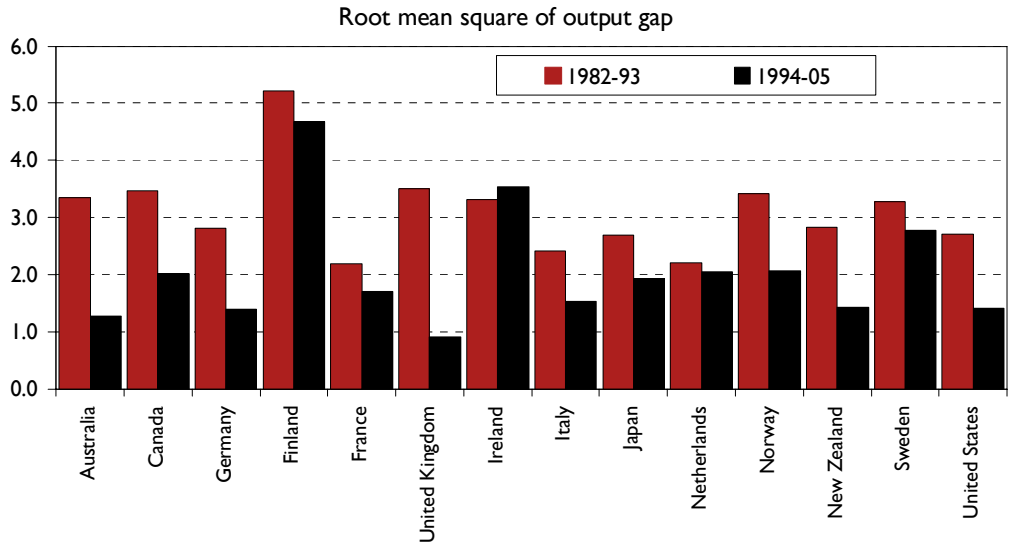
1.26 Past performance is not necessarily a good guide to future outcomes. Both the nature and the severity of future shocks may differ significantly from those experienced in the recent past[8]. But one certainty is that the economy will continue to need to adjust to future changes in the economic environment. The evidence presented in this paper suggests that labour and product market regulations affect the economy's adjustment capacity and its resilience to such shocks. This underlines the importance of policy settings that support rather than hinder the economy's adjustment capacity.

[8] King (2003). HM Treasury (2007a) discusses the risks associated with the financial market turbulence in the second half of 2007.

2 A MEASURE OF MACROECONOMIC RESILIENCE

2.1 It is widely recognised that OECD economies have proved to be more resilient to shocks in recent years, than was previously the case. One measure of this is the decline in the magnitude of the output gap (Chart 2.1). This has fallen in all countries, with the exception of Ireland. The United Kingdom experienced the second highest average absolute level of the output gap during 1982-93 among the fourteen OECD countries shown, but the lowest average absolute level over the 1994-2005 period[1].

Chart 2.1: Average size of output gap, 1982-93 and 1994-2005



Note: Output gap is measured on quarterly basis. OECD Secretariat estimates are used for all countries, including the United Kingdom.

Source: OECD Economic Outlook

2.2 This study follows Duval, Elmeskov and Vogel (2007) in trying to assess the extent to which greater resilience can be attributed to economic policy reforms, and in particular to reforms in labour and product markets. Duval and his co-authors analyse resilience in 20 OECD countries over the period 1982-2003. The features of their approach include:

- the use of annual data;
- estimation using panel data;
- a non-linear specification in the regression equation which they use to account for common shocks across countries; and

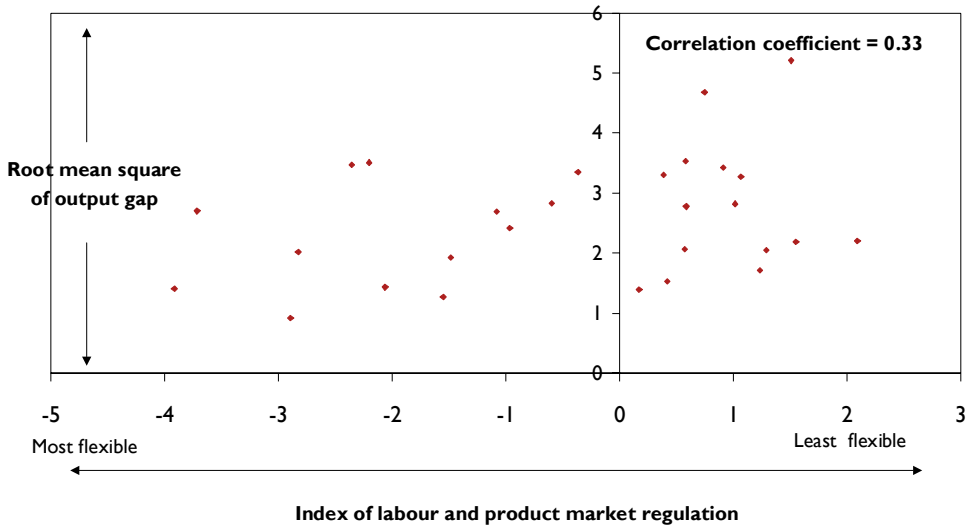
[1] These two subperiods split the overall sample into half. I have not tested whether this represents an optimal break point. Optimal break points are likely to differ across countries. One extension of this analysis could be to assess the robustness of the results to alternative break points.

- a non-linear specification to analyse the effects of structural policy indicators on both the size of the common shock and the coefficients on past output gaps, which determines the persistence of shocks in subsequent periods.

2.3 The empirical results in their paper suggest that greater levels of financial market flexibility (proxied by the level of household mortgage debt) and more flexible labour and product markets reduce the persistence of shocks. However, the authors conclude that stronger labour and product market regulation can damp the initial impact of common shocks.

2.4 Duval et al. also conclude that economies with more flexible labour and product markets may exhibit greater output gap volatility. This finding is difficult to reconcile with Chart 2.2, which shows that countries with more flexible policies have tended to have smaller output gaps, on average. One explanation for the apparently perverse finding is that it relates to the volatility associated with common shocks, rather than all shocks. However, in studying resilience, it is unclear why the focus should be on common shocks alone: countries that have a relatively high exposure to country-specific shocks may still vary in their capacity to respond to such shocks.

Chart 2.2: Regulation and the average size of the output gap, 1982-93 and 1994-2005



Source: OECD

THIS STUDY

2.5 This study complements the analysis undertaken by the OECD. It uses an alternative methodology to derive specific measures of resilience, and to test the robustness of their results. It also includes a proximate measure of macroeconomic stability as one of its policy indicators. In particular:

1. This study uses quarterly rather than annual output gap data for the reasons outlined below. One consequence is that the analysis has had to be restricted to 14 countries rather than the 20 considered by Duval et al[2].

   - The decline in output gap magnitudes shown in chart 2.1 suggests that the degree of resilience has increased in all countries except Ireland between the two sub-periods shown. However, if annual data is used to analyse these two periods then there are only 12 observations per country, leaving few degrees of freedom for econometric analysis; and

   - Data at an annual frequency limits the analysis of the evolution of shocks through time. Part of any shock will already have been absorbed within the observation period. Quarterly data may help to highlight differences in resilience that are masked by the use of annual observations.

2. Unlike Duval et al, this study does not attempt to separate shocks into common and idiosyncratic shocks. It is not clear that this distinction is helpful in terms of assessing resilience. Further work could explore this point in more detail.

3. This study takes a two-stage approach to assessing the relation between resilience and structural indicators, first deriving a measure of resilience and then assessing how it is related to the structural policy indicators. By contrast, Duval et al include the structural policy indicators as explanatory variables in their regressions for the output gap.

2.6 As noted above, the use of quarterly output gap data allows 14 countries to be included in the analysis. These comprise the G7 (United States, Japan, Germany, United Kingdom, France, Italy and Canada) plus Australia, Finland, Ireland, the Netherlands, Norway, New Zealand and Sweden.

2.7 For each country the following univariate time-series regression is estimated for each of the two sub-periods, 1982-1993 and 1994-2005:

$$Gap_t = \alpha_0 + \alpha_1 Gap_{t-1} + \alpha_2 Gap_{t-2} + u_t$$

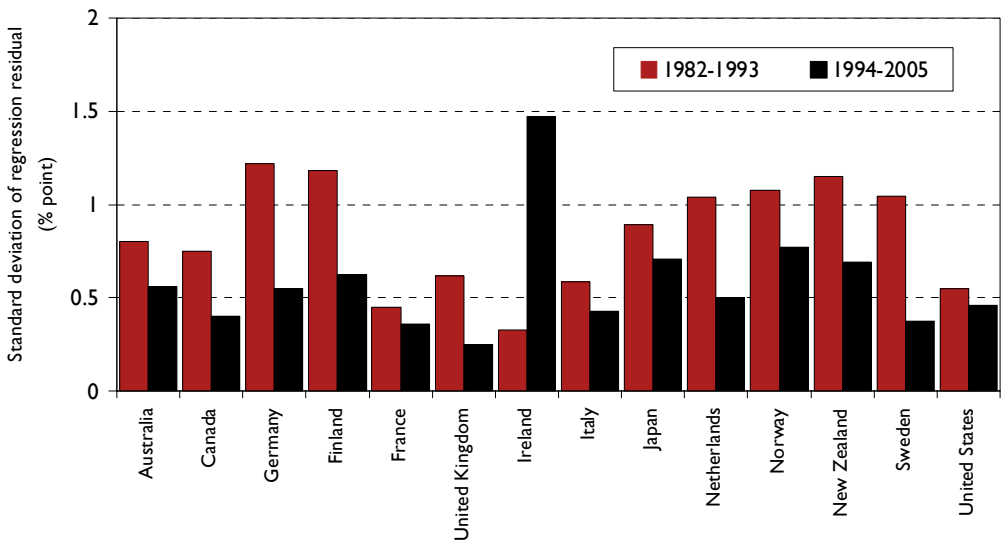
where Gap_t is the output gap in quarter t, and u_t is the regression residual.

2.8 These regressions give estimates of the size of the shocks affecting the economy in each period. In addition, the regression coefficients give estimates of the persistence of the shock in subsequent periods. The estimated equations can be solved forward to trace the responses of the economy to a typical shock to the output gap. These impulse response functions are used to derive measures of resilience. The methodology used is similar to that employed by Blanchard and Simon (2001).

[2] The OECD do not have quarterly output gap data for Austria, Belgium, Denmark, Portugal, Spain and Switzerland.

2.9 The regression results are reported in Table 2.1, and some important features are illustrated in Charts 2.3 to 2.6. With the exception of Ireland, all countries have experienced a decline in the average size of the shock to the output gap in recent years (Chart 2.3). This feature has been highlighted in a number of previous studies, and has been termed the "great moderation" or "great stability"[3]. There is a continuing lively debate as to whether it is the consequence of improved policies or simply "good luck". Regardless of the cause, smaller shocks will, other things equal, act to reduce the variance of the output gap, and hence give the appearance of improved resilience.

Chart 2.3: Average shock to the output gap, 1982-93 and 1994-2005



Source: OECD, HM Treasury calculations

[3] Stock and Watson (2003), Bernanke (2004), Benati (2007), Benati and Surico (2007)

Table 2.1: Regression results

Country	Estimation period	Coefficient on lagged output gap	Coefficient on second lag of output gap	Constant	Regression standard error	Explanatory power of regression (R-squared statistic)
Australia	1982-1993	1.38	-0.53	-0.40	0.80	0.87
Australia	1994-2005	0.73	0.10	0.00	0.56	0.80
Canada	1982-1993	1.49	-0.56	-0.11	0.75	0.94
Canada	1994-2005	1.49	-0.54	0.00	0.40	0.96
Germany	1994-2005	1.00	-0.09	-0.05	0.55	0.83
Finland	1994-2005	0.93	0.01	0.07	0.62	0.98
France	1982-1993	1.29	-0.34	-0.07	0.45	0.94
France	1994-2005	1.20	-0.27	-0.10	0.36	0.89
United Kingdom	1982-1993	1.31	-0.35	-0.02	0.62	0.96
United Kingdom	1994-2005	1.17	-0.30	-0.02	0.25	0.91
Ireland	1982-1993	1.81	-0.89	-0.19	0.33	0.98
Ireland	1994-2005	0.45	0.45	0.27	1.47	0.83
Italy	1982-1993	1.26	-0.34	-0.17	0.59	0.90
Italy	1994-2005	1.30	-0.39	-0.02	0.43	0.92
Japan	1982-1993	0.86	0.09	0.00	0.89	0.90
Japan	1994-2005	1.09	-0.19	-0.09	0.71	0.84
Netherlands	1982-1993	0.75	0.16	-0.08	1.04	0.77
Netherlands	1994-2005	1.12	-0.16	-0.01	0.50	0.94
Norway	1982-1993	0.76	0.18	-0.20	1.07	0.87
Norway	1994-2005	0.53	0.36	0.21	0.77	0.83
New Zealand	1982-1993	1.07	-0.18	-0.15	1.15	0.83
New Zealand	1994-2005	0.90	-0.08	0.15	0.69	0.73
Sweden	1982-1993	0.81	0.17	-0.10	1.04	0.88
Sweden	1994-2005	1.31	-0.37	-0.01	0.38	0.97
United States	1982-1993	1.50	-0.57	-0.04	0.55	0.95
United States	1994-2005	1.06	-0.15	-0.03	0.46	0.87

Results for Finland and Germany not shown in the 1982-93 period, as these are affected by the effects of the collapse of the Soviet Union and the unification of Germany.

Source: HM Treasury calculations

2.10 The regression results allow the calculation of "impulse response functions", which trace out the persistence of a shock in subsequent periods. These are shown in Chart 2.4a for the 1982-93 period and Chart 2.4b for the 1994-2005 period for the 7 largest economies, and Charts 2.5a and 2.5b for the other 7 countries. The shocks applied are equivalent to the standard deviation of the estimated residual to the output gap equation for each country in each sub-period. Features from these charts include:

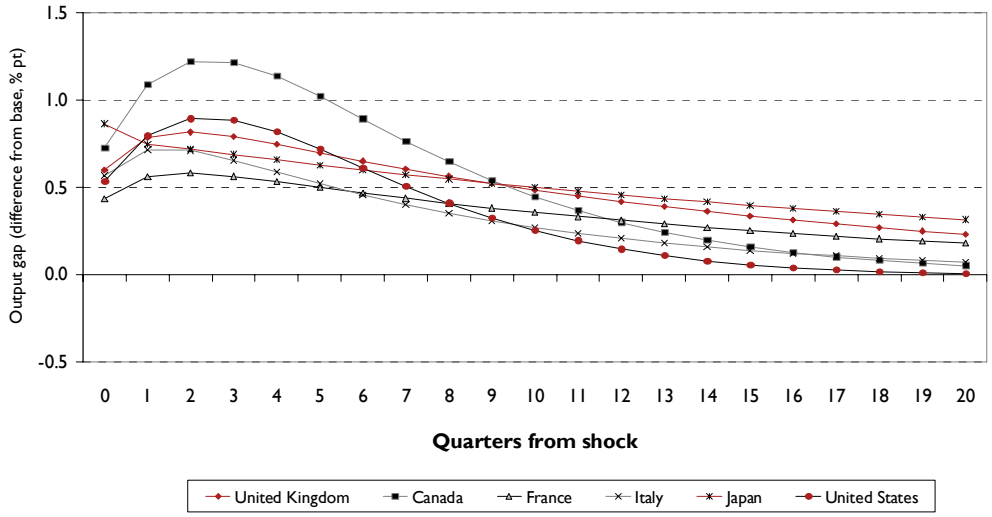
- As noted in the discussion of chart 2.3, the size of the "typical" shock was higher for most countries in the earlier period;
- The results imply that shocks have dissipated more rapidly in the more recent period in 8 out of 12 countries[4], including the United Kingdom. The yardstick for this is the ratio of the effect of the shock in period t+8 to the initial size of the shock for each country in each period. The four countries in which shocks appear to have become more persistent are Australia, Canada, the Netherlands and Sweden;
- In the earlier period, the persistence of shocks was lowest in Australia, where the effect had essentially dissipated after 8 periods. Ireland had the highest persistence. The United Kingdom ranked fourth highest; and
- In the more recent period, the persistence of shocks has been lowest in New Zealand and Australia (even though it has increased in Australia compared with the earlier period). The estimated persistence has been highest in Canada. The United Kingdom ranked the third lowest during this period.

2.11 Chart 2.6 depicts a summary measure of resilience that takes account of both the initial size of a typical shock and its subsequent persistence. The measure is the cumulated deviation of output from trend over the twenty quarters following a typical shock, or in other words the sum of the absolute values of the impulse responses at each time horizon depicted in Charts 2.4 and 2.5. The following features are worth noting:

- With the exception of Ireland, all countries showed improved resilience in the period after 1993. This is consistent with the observed variance in output gaps depicted in chart 2.1;
- In the earlier period, the most resilient economies were Australia, Italy and the United States. The United Kingdom ranked 8th out of twelve countries;
- In the more recent period, the most resilient economies have been the United Kingdom , Australia and New Zealand; and
- The general improvement in resilience is underlined by the fact that 9 of the 14 countries proved more resilient in the second period than the best performer in the earlier period.

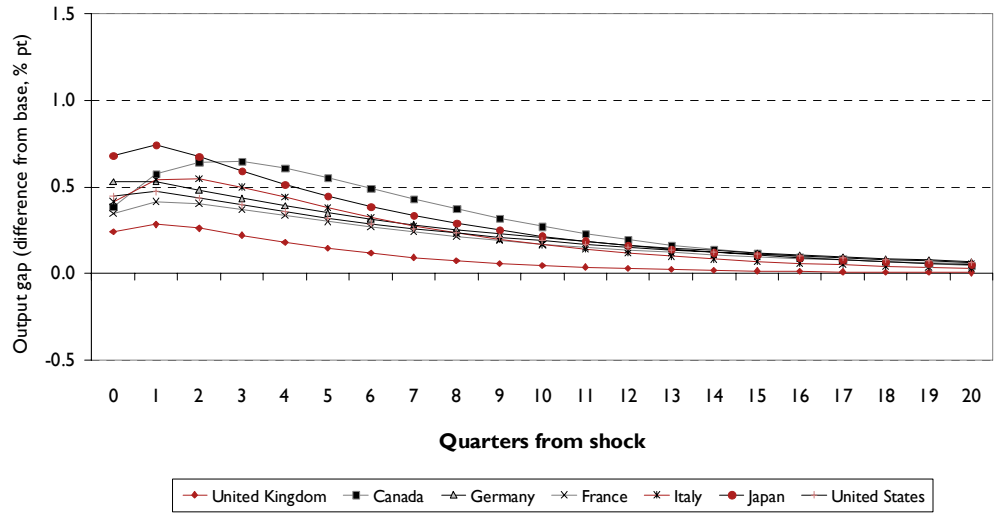
[4] Note that Germany and Finland have been excluded from this comparison, as the 1982-93 period spans German reunification, and by the collapse of the Soviet Union, which had large effects on Finland's economy.

Chart 2.4a: Output gap evolution following a typical shock, estimated over 1982-1993



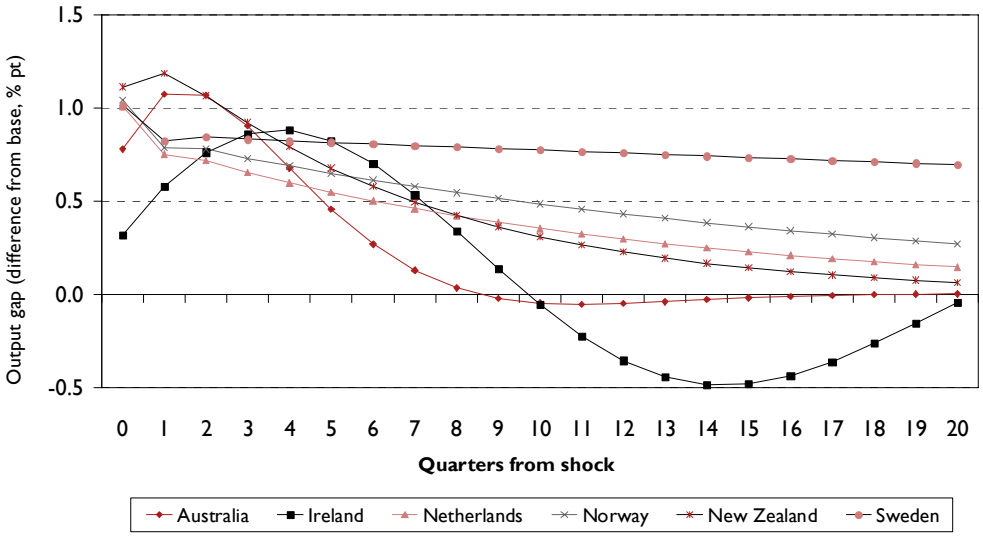
Source: HM Treasury calculations

Chart 2.4b: Output gap evolution following a typical shock, estimated over 1994-2005



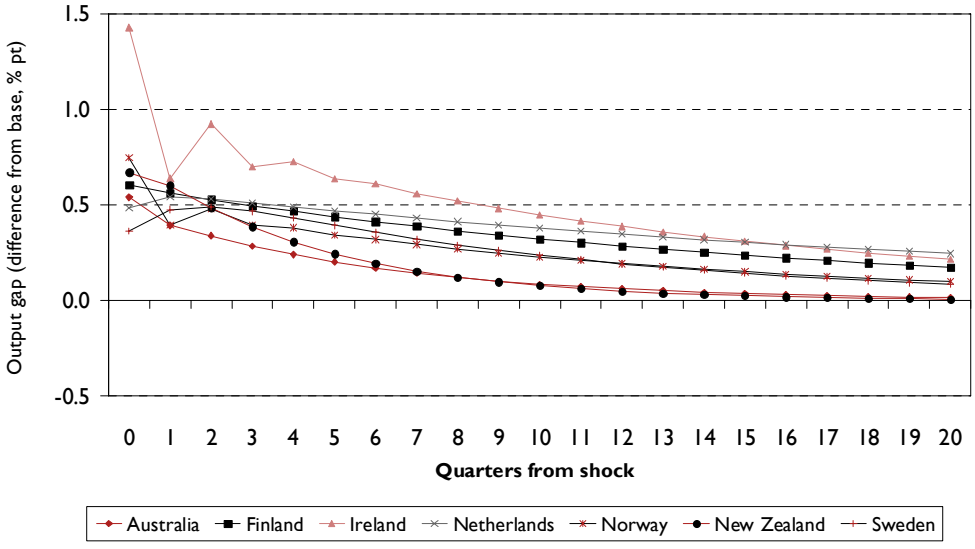
Source: HM Treasury calculations

Chart 2.5a: Output gap evolution following a typical shock, estimated over 1982-1993



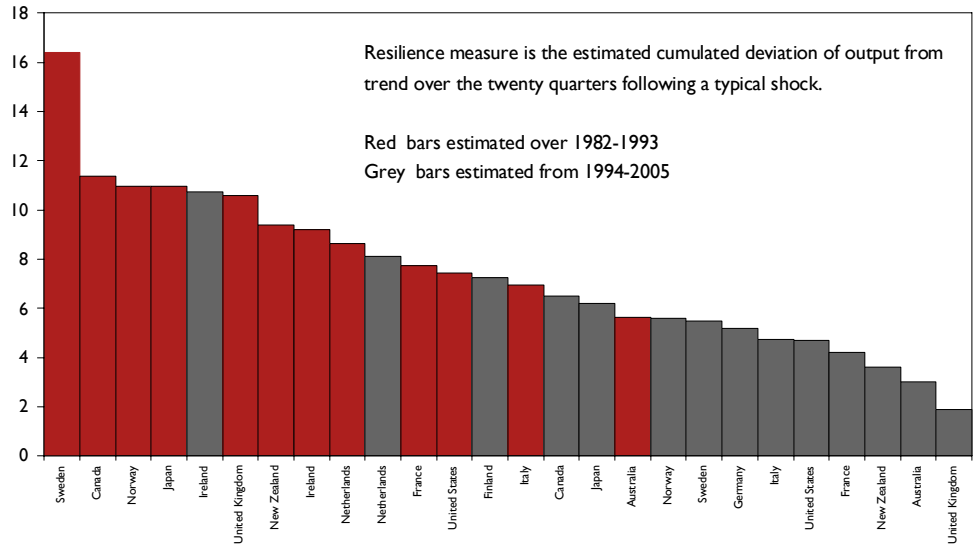
Source: HM Treasury calculations

Chart 2.5b: Output gap evolution following a typical shock, estimated over 1994-2005



Source: HM Treasury calculations

Chart 2.6: Summary measure of resilience



The typical shock for each country is equal to the estimated root mean squared error of shocks to its output during the estimation period.
Results for Finland and Germany not shown in the 1982-93 period, as these are affected by the effects of the collapse of the Soviet Union and the unification of Germany.
Source: HM Treasury calculations

2.12 This resilience measure can be decomposed into two elements that separate out the effect of a change in the size of the initial shock and a change in the persistence of shocks as follows:

Resilience = Size of initial shock * ratio of cumulated deviations in output to the size of the initial shock

The overall measure is closely related to the second of three resilience criteria assessed by Duval et al. Their criteria are:

1. the time needed for output to get back to potential in the aftermath of a 1 percentage point negative common shock (affecting all countries) to the output gap;
2. the cumulative output loss from the initial period and the period in which the output gap closes; and
3. the volatility of output gaps in response to common shocks across countries.

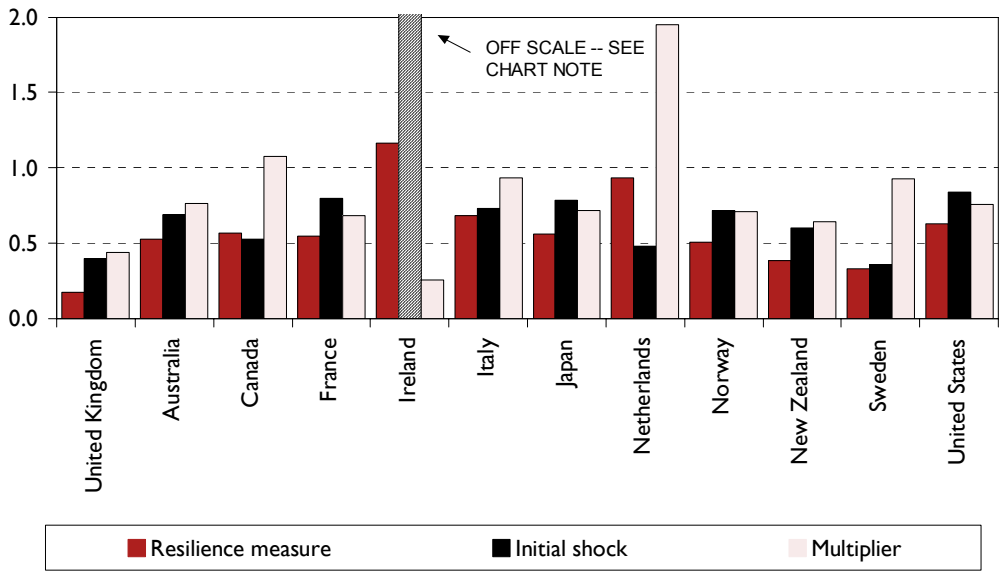
An important difference is that Duval et al. restrict their analysis of resilience to common shocks, affecting all countries, ignoring the impact of idiosyncratic (country-specific) shocks. However, it is not clear why resilience should be assessed only in relation to common shocks. The Duval et al. measure will tend to overstate the level of resilience, particularly in countries where the effects of common shocks are small relative to country-specific ones.

2.13 Chart 2.7 shows the ratio of the overall index and its two component parts for each country. This decomposition reveals that both components played a role in reducing the overall resilience in 9 countries. The exceptions are:

- Ireland, where the standard deviation of shocks rose by more than four-fold, but where the multiplier component fell by almost a quarter; and
- Canada and the Netherlands, where the multiplier component rose somewhat, but the effect of this was more than offset by a decline in the size of the initial shock.

2.14 The effect of changes in the two components for the United Kingdom is illustrated in Chart 2.8. This compares the effects of the typical initial shock experienced during the 1982-93 period under the alternative assumptions that the propagation of the shocks are as implied by the regression coefficients estimated over the 1982-93 and 1994-2005 periods respectively. The chart highlights the role that reduced persistence has played in the more recent period in eliminating the output gap more rapidly than before.

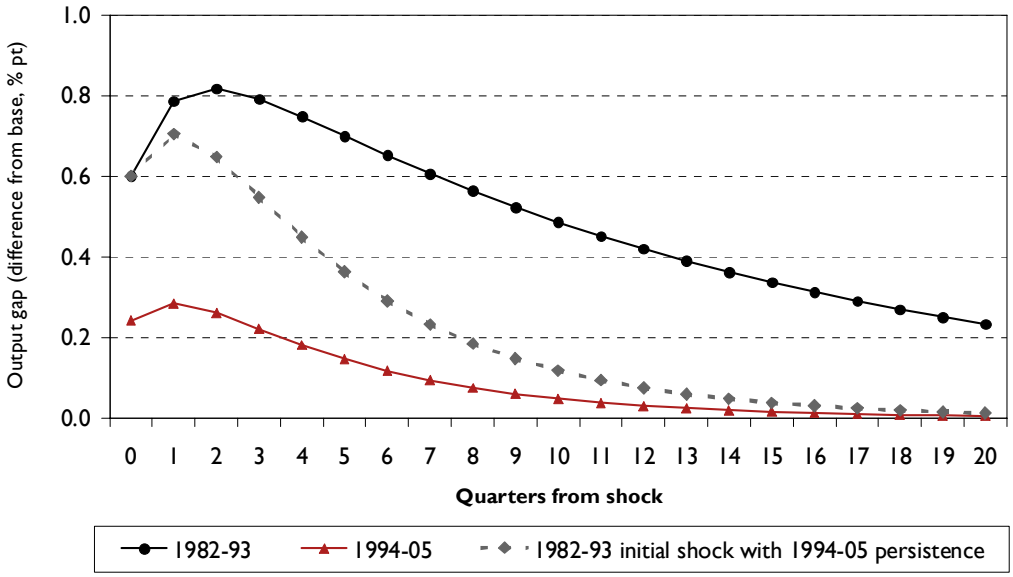
Chart 2.7: Ratio of resilience measure and its component parts,1994-2005 values as ratio of 1982-1993 values



Note: the ratio for Ireland's initial shock is 4.5

Source: HM Treasury calculations

Chart 2.8: Output gap evolution in the UK following typical shocks



Note: Top line uses the coefficients and regression standard error obtained from the regressions estimated over 1982-93;
Bottom line uses coefficients and regression standard error from 1994-05 regressions;
Middle line uses 1982-93 regression standard error with 1994-05 regression coefficients.
Source: HM Treasury calculations

3 STRUCTURAL POLICY AND RESILIENCE

RESILIENCE AND STRUCTURAL POLICY INDICATORS

3.1 The previous chapter confirmed that an important component in improved resilience has been the reduction in observed shocks to output. This section investigates the extent to which this has been associated with improved macroeconomic policy or better structural policy. This is done using a second, related, measure of resilience that provides a time series for the changes in resilience attributable to lower observed shocks to output. This second resilience measure is regressed on a number of indicators of the stringency of labour and product market regulation that have been developed by the OECD, and on the long-term interest rate in order to assess its relationship with structural policy reforms and a proxy indicator of macroeconomic stability.

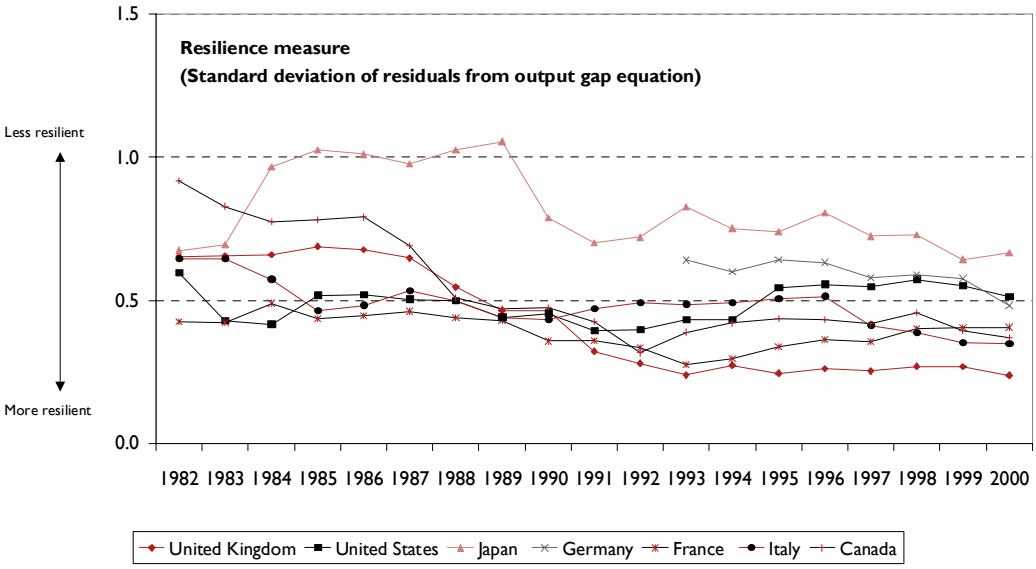
3.2 The resilience measure used in this chapter is the standard deviation of the residuals from the regression of output gap on its first two lagged values, as in the previous chapter. However, in this case the regression is estimated over a single period, 1982Q1-2005Q4. The resilience measure is then calculated as the standard deviation of the residuals over a 6 year rolling window. This measure is related to the third of the resilience criteria used by Duval et al. They consider the volatility of output gaps in response to common shocks across countries, deriving this analytically from their regression equation.

3.3 Charts 3.1a and 3.1b show my second measure of resilience for the G7 and the other economies, respectively. Points to note include:

- All countries except Ireland showed greater resilience between 2000-2005 (the observation for 2000 in the charts) than between 1982-87. The general improvement in resilience is shown more clearly by the downward trends in the median value across countries (chart 3.2);
- Between 1982-87, France exhibited the greatest resilience, and New Zealand the least. The United Kingdom was the fourth most resilient over this period; and
- Between 2000-05, the United Kingdom exhibited the greatest resilience and Ireland the least[1].

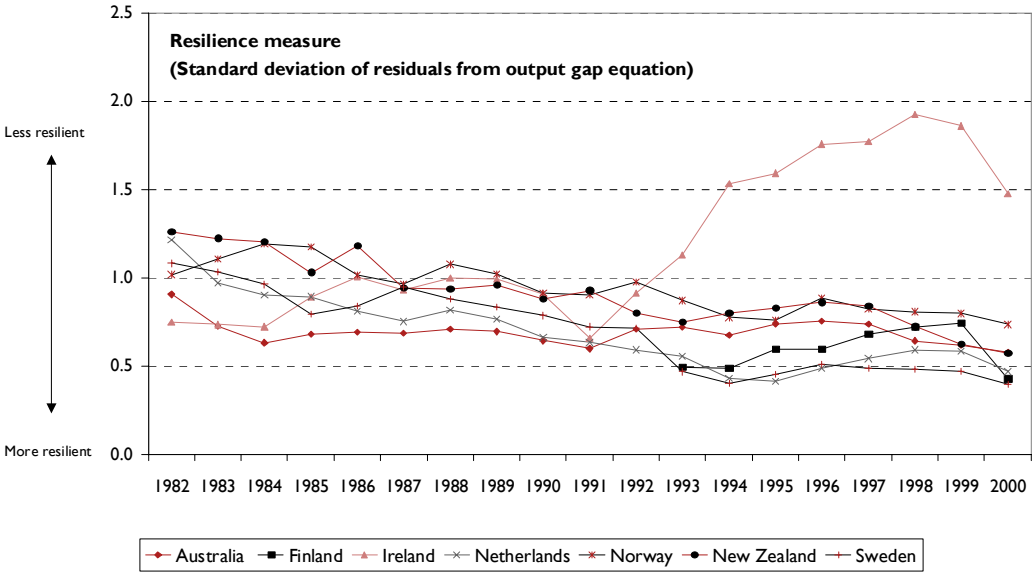
[1] The deterioration in this measure of resilience for Ireland is striking, and may reflect poor measurement of the Irish output gap.

Chart 3.1a: Resilience in G7 economies



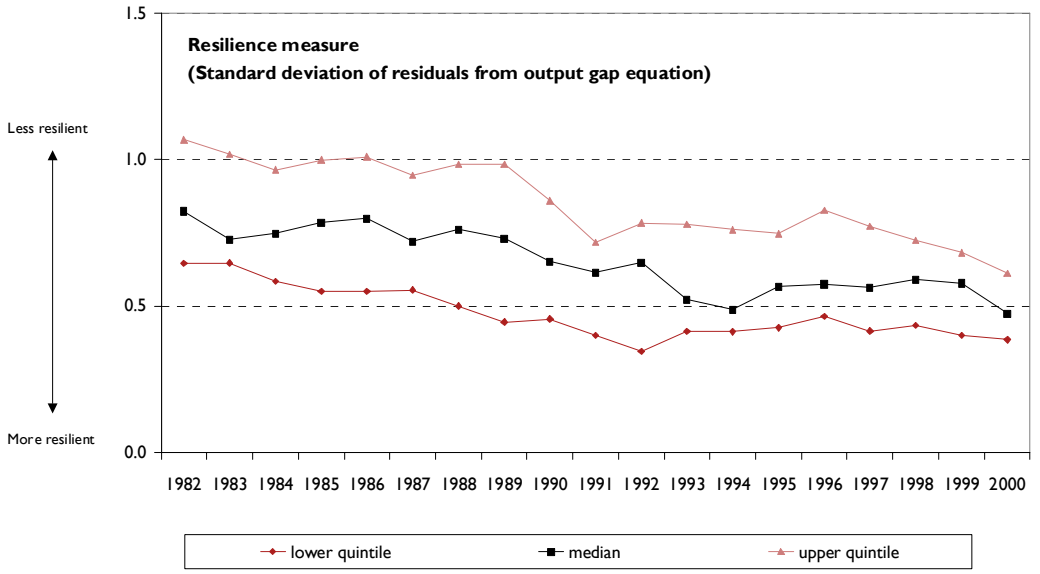
Source: HM Treasury calculations

Chart 3.1b: Resilience in non G7 economies



Source: HM Treasury calculations

Chart 3.2: Improved resilience over time



Source: HM Treasury calculations

3.4 The results obtained by Duval et al. suggest that economies with less restrictive labour and product market regulations tend to be more resilient. Chart 3.3 plots the resilience measure that has just been described against their synthetic measure of labour and product market regulation, which is explained in Box 3.1[2]. The chart shows:

- a tendency for less stringent regulation to be associated with greater resilience ; and
- a shift down in the trend lines between 1982-91 and 1992-2000. This implies an improvement in resilience over and above that associated with less stringent regulation.

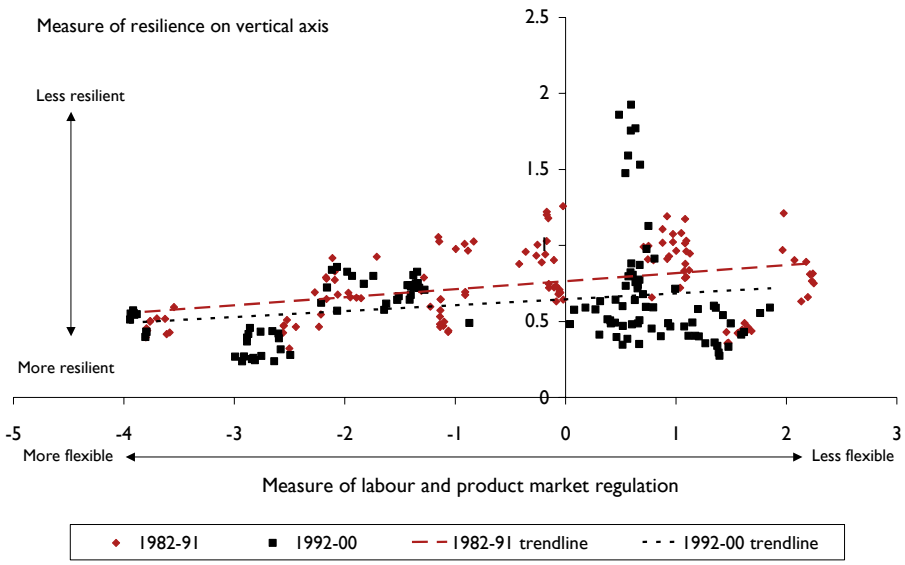
Box 3.1 Index of labour and product market regulation

Chart 3.3 uses the synthetic measure of labour and product market regulation derived by Duval et al. The synthetic indicator is a weighted average of a set of policy indicators, where the weights are given by the factor loadings for the first principal component of the set of indicators:

Labour and product market regulation = 0.42 * replacement rate + 0.45 * employment protection legislation + 0.48 * collective bargaining coverage – 0.51 * low corporatism + 0.37 * product market regulation.

[2] The data on labour product market regulation was provided by Romain Duval.

Chart 3.3: Resilience and labour and product market regulation



Source: OECD, HM Treasury calculations

3.5 Table 3.1 reports regression results from regressing this resilience measure on the long-term interest rate and the following policy indicators used in the Duval et al study:

- Their synthetic labour and product market indicator (shown in Chart 3.3);
- Indicator of employment protection legislation;
- Indicator of product market regulation; and
- The average replacement rate.

3.6 The regressions in Table 3.1 are panel regressions, which allow both the cross-country and the time series variation in the data to influence the coefficients on the explanatory variables. Systematic differences across countries are accounted for by the inclusion of fixed country effects.

Table 3.1: Regression results for volatility of shocks to output

Independent variable	Coefficients on independent variables				
Long-term interest rate	0.015				
Product market competition		0.098			
Employment protection legislation			0.219		
Replacement rate				-0.00315	
Labour and product market regulation					0.157
Constant	0.550	0.311	0.283	0.765	0.761

All regressions are estimated with country fixed effects over the period 1982-2000. Observations prior to 1993 are excluded for Germany and Finland.
For 1982 the dependent variable measures the standard deviation of estimated shocks to output during 1982-87.
The independent variables are all significant at the 1% level, with the exception of the replacement rate, which is not significant at the 10% level.
Source: HM Treasury calculations

3.7 The results in Table 3.1 show that:

- Countries with high long-term interest rates tend to have higher levels of volatility in subsequent years. Long-term interest rates are an indicator of the private sector's confidence in long-term macroeconomic stability, as they incorporate market expectations of future inflation. Hence this result is consistent with the view that improved macroeconomic stability may have bolstered resilience;
- More stringent product market regulation and employment protection legislation also tend to be associated with higher levels of volatility. This is consistent with the view that barriers to competition in labour and product markets can impair an economy's adjustment capacity, resulting in reduced resilience;
- Similarly, the synthetic measure of labour and product market regulation derived by the OECD suggests that more regulated economies tend to be less resilient; and
- By contrast, the replacement rate does not appear to be associated with the level of resilience, since the coefficient on this variable is not statistically significant.

3.8 Table 3.2 reports regressions that analyse the effect of including both the long-term interest rate and one of the structural policy variables as explanatory variables.

- The coefficient on the long-term interest rate becomes statistically insignificant if the synthetic indicator of labour and product market regulation is included, and wrongly signed if the measure of product market

regulation is included. These results suggest that there is strong correlation between the long-term interest rate and these indicators. This makes it difficult to separate out the respective effects of an improved macro-economic environment and better structural policy. Nonetheless the regressions suggest that better structural policy may be a more dominant influence on overall resilience.

Table 3.2: Regression results for volatility of shocks to output

Independent variable	Coefficients on independent variables			
Long-term interest rate	-0.024	0.010	0.015	0.007
Product market competition	0.159			
Employment protection legislation		0.178		
Replacement rate			0.000	
Labour and product market regulation				0.142
Constant	0.291	0.267	0.546	0.693

All regressions are estimated with country fixed effects over the period 1982-2000.
For 1982 the dependent variable measures the standard deviation of estimated shocks to output during 1982-87.
The coefficient on the long-term interest rate is significant at the 5% level in all regressions except when the synthetic indicator of labour and product market regulation is included, when it is insignificant at the 10% level.
The coefficients on the other variables are all significant at the 1% level, with the exception of the replacement rate which is insignificant at the 10% level.
Source: HM Treasury calculations

3.9 As already noted, these regressions include so-called "fixed effects" for each country. These capture systematic differences in the resilience of countries that are invariant across time, and that cannot be explained by the variables included in the regression. Table 3.3 summarises how these fixed effects vary in the 9 regressions shown in Tables 3.1 and 3.2:

- France, Italy and the Netherlands appear to be generally more resilient than the regressions would otherwise suggest. This may indicate that their economies have some institutional or structural features that are not well captured by the measures used in this analysis;
- By contrast Ireland, New Zealand and Norway appear generally less resilient than the regressions would otherwise suggest; and
- The country fixed effects may also pick up systematic measurement problems with respect to measurement of the output gap. In the case of Ireland, the measured output gap has displayed strong volatility in recent years, some of which may reflect measurement errors.

Table 3.3: Country fixed effects

	Median	Minimum	Maximum
Australia	0.05	-0.02	0.19
Canada	0.00	-0.17	0.18
Germany	-0.09	-0.31	-0.03
Finland	-0.04	-0.28	0.01
France	-0.48	-0.60	-0.26
United Kingdom	-0.11	-0.28	0.05
Ireland	0.49	0.34	0.71
Italy	-0.25	-0.55	-0.21
Japan	0.13	0.04	0.26
Netherlands	-0.12	-0.36	0.09
Norway	0.22	0.03	0.29
New Zealand	0.31	0.20	0.42
Sweden	0.00	-0.25	0.07
United States	0.05	-0.23	0.32

Source: HM Treasury calculations

3.10 The robustness of these results has been tested by adding year dummies to the regressions reported in Table 3.1. The year dummies account for fluctuations in resilience that are common to all countries in any one year. With the inclusion of year dummies (Table 3.4):

- the coefficient on the long-term interest rate becomes negative, since the year dummies account for the improvement in resilience over time. This could be interpreted as implying that improvements in macroeconomic stability do not have a particularly robust association with improved resilience. However, the strong correlation between long-term interest rates and the year dummies may mean that the effect of improved macroeconomic stability is largely captured by the year dummies themselves; and
- By contrast the effects from product market competition, employment protection legislation and the synthetic indicator of labour and product market regulation all remain both statistically significant and with the expected sign, suggesting that the association between these indicators and resilience is more robust.

Table 3.4: Regression results for volatility of shocks to output: with inclusion of year specific effects

Independent variable	Coefficients on independent variables				
Long-term interest rate	-0.023				
Product market competition		0.223			
Employment protection legislation			0.176		
Replacement rate				0.002	
Labour and product market regulation					0.120
Constant	0.700	0.044	0.278	0.521	0.670
Year fixed effects:					
1982	0.468	-0.297	0.225	0.278	0.205
1983	0.376	-0.338	0.170	0.222	0.151
1984	0.374	-0.323	0.172	0.223	0.152
1985	0.357	-0.326	0.170	0.211	0.140
1986	0.328	-0.299	0.179	0.219	0.150
1987	0.293	-0.307	0.143	0.182	0.106
1988	0.273	-0.269	0.135	0.174	0.105
1989	0.246	-0.279	0.104	0.144	0.079
1990	0.198	-0.318	0.033	0.077	0.016
1991	0.117	-0.335	-0.021	0.023	-0.010
1992	0.108	-0.285	-0.010	0.033	0.003
1993	0.071	-0.250	-0.001	0.029	-0.009
1994	0.084	-0.211	0.000	0.030	-0.002
1995	0.112	-0.147	0.028	0.055	0.031
1996	0.137	-0.054	0.075	0.104	0.085
1997	0.092	-0.049	0.067	0.082	0.067
1998	0.077	-0.004	0.087	0.093	0.082
1999	0.050	0.028	0.068	0.063	0.061

See notes to table 2.
In this table the coefficients on the policy indicator variables are significant at the 2% level, with the exception of the replacement rate, which is not significant at the 10% level.
Source: HM Treasury calculations

4 Conclusions

4.1 This study derives two measures of the resilience exhibited by 14 OECD economies over the past 25 years. The first measure enables resilience to be decomposed into two components: the initial impact of the shock and its subsequent persistence. The second one tracks movements in resilience over time. The study assesses the relation between resilience and macroeconomic policy, and between resilience and indicators of labour and product market legislation.

Main findings

4.2 The main findings of this Working Paper are:

- The United Kingdom has exhibited a marked improvement in its resilience between the 1982-93 and 1994-2005 periods: in the latter period it was the most resilient of the economies studied;
- There has been a general improvement in resilience across the countries studied;
- Improved resilience in most countries, including the United Kingdom, reflects both a tendency for the observed shocks to be smaller than in the past and a tendency for shocks to be less persistent than before; and
- The reduction in the overall volatility of shocks to output has been associated with both improved credibility of macro-economic policy, as proxied by lower long-term interest rates, and by less stringent labour and product legislation, as measured by the OECD. The results in this paper suggest that reforms to strengthen product market competition have been most influential.

Caveats

4.3 These results suggest that improved macroeconomic stability and reforms in labour and product markets may have contributed to greater resilience in OECD economies over the past decade. However, while suggestive, this evidence is not conclusive. In particular, the measures of resilience and of labour and product market regulation are imperfect. The measures of resilience used in this paper are a function of the observed shocks to output. These are a combination of fundamental shocks and the capacity of the economy to absorb such shocks within the observation period. Ideally, these two elements would be separated, but this is difficult to do. Future research on this topic could address this issue. In addition, it is difficult to measure the stringency of labour and product market regulation with much precision.

4.4 These considerations imply that further work is needed to test the robustness of these results, as more observations become available, and with respect to alternative measures of resilience and of the policy stance. Such work is part of a continuing research programme investigating the link between economic policies and both microeconomic and macroeconomic performance. Nonetheless, the results in this paper accord well with theoretical insights that restrictive labour and product market regulation may impair an economy's capacity to adjust to shocks, thereby reducing its resilience.

4.5 Past performance is not necessarily a good guide to future outcomes. Both the nature and the severity of future shocks may differ significantly from those experienced in the recent past[1]. But one certainty is that the economy will continue to need to adjust to future changes in the economic environment. The evidence presented in this paper suggests that labour and product market regulations affect the economy's adjustment capacity and its resilience to such shocks. This underlines the importance of policy settings that support rather than hinder the economy's adjustment capacity.

[1] King (2003). HM Treasury (2007a) discusses the risks associated with the financial market turbulence in the second half of 2007.

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