# Economic Uncertainties and their Impact on Activity in Greece compared with Ireland and Portugal

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**ECONOMIC UNCERTAINTIES AND THEIR IMPACT ON ACTIVITY IN GREECE COMPARED WITH IRELAND AND PORTUGAL**

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## ABSTRACT/RÉSUMÉ

### Economic Uncertainties and their Impact on Activity in Greece compared with Ireland and Portugal

Uncertainty faced by households and firms affects economic activity. The rise in uncertainty since the beginning of the sovereign debt crisis in Greece could be one factor that has contributed to the steep and long-lasting recession. This paper presents a brief empirical analysis quantifying this phenomenon and compares it with developments in Ireland and Portugal. Overall, this analysis shows that the uncertainty impact on growth has been relatively small in Greece between 2008 and 2013, although stronger than in Ireland or Portugal. This quantification appears to be robust to various specification changes of the vector auto regressive models developed for this exercise.

This working paper relates to the *2013 Economic Survey of Greece* (www.oecd.org/eco/surveys/economic-survey-greece.htm)

*JEL classification:* E25, E65

*Keywords:* Greece, Ireland, Portugal, uncertainty, confidence, activity, GDP, private consumption, investment, vector auto regressive model, simulations

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### Les incertitudes économiques et leur impact sur l'activité en Grèce comparés avec l'Irlande et le Portugal

Les incertitudes auxquelles sont confrontés les ménages et les entreprises affectent l'activité économique. La montée des incertitudes depuis le début de la crise de la dette souveraine en Grèce semble avoir été l'un des facteurs qui a contribué à la récession forte et prolongée du pays. Cet article présent une brève analyse empirique qui quantifie ce phénomène et le compare avec les développements enregistrés en Irlande et au Portugal. Au total, cette analyse montre que l'impact de l'incertitude sur la croissance a été relativement modeste en Grèce entre 2008 et 20013, bien que plus fort qu'en Irlande et au Portugal. Cette quantification apparaît robuste aux divers changements de spécifications du modèle vectoriel autorégressif développé pour cet exercice.

Ce Document de travail se rapporte à *l'Étude économique de l'OCDE de la Grèce, 2013 (www.oecd.org/eco/etudes/grece.htm)*

*Classification :* E25, E65

*Mots-clés :* Grèce, Irlande, Portugal, incertitude, confiance, activité, PIB, consommation privée, investissement, modèle vectoriel autorégressif, simulations

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# Economic uncertainties and their impact on activity in Greece compared with Ireland and Portugal

*By Jan-David Schneider and Claude Giorno[1]*

1. Uncertainty faced by households and firms affects economic activity. The rise in uncertainty since the beginning of the sovereign debt crisis in Greece could be one factor that has dragged down growth significantly. This paper presents a brief empirical analysis quantifying this phenomenon and compares it with developments in Ireland and Portugal.

2. To carry out this work, the analysis first seeks to identify the main source of the uncertainty shocks that have affected Greece, Ireland and Portugal over recent years. Identifying the various sources of uncertainty is important because policy makers' room for manoeuvre to reduce uncertainty is not the same if it results from international rather than country-specific shocks. The second part of this work provides an estimation of the quantitative impact of confidence and uncertainty developments on the three countries since the beginning of the crisis. To this end, a vector auto regressive model (VAR) was estimated following the approach often used for this type of analysis (Haddow *et al.*, 2013; Baker *et al.*, 2013; EC, 2012).

**Uncertainty and confidence developments in Greece, Ireland and Portugal**

3. Confidence and uncertainty shocks are distinguished as two components of wider macroeconomic shocks in the literature (Bloom, 2009). Confidence shocks relate to the mean of economic agents' expectations, while the uncertainty component affects the volatility of expectations (Bloom, 2009). For example, following a financial crisis, companies may believe the economy is likely to grow at a slower rate (confidence shock) than before, but they may also think a greater number of outcomes is possible (uncertainty shock). These variables are not directly observable and, in practice, it is not easy to separate confidence from uncertainty shocks. The rise in uncertainty during crises is indeed often (inversely) correlated with confidence developments. In the case of Greece for instance, firms and households have both revised down their central expectation of economic prospects as the result of the crisis, while perceiving higher risks occurring around this more pessimistic outlook.

4. As mentioned in the 2013 *OECD Survey* on Greece (OECD, 2013), Greece experienced particularly steep declines in confidence between mid-2010 and mid-2012. Consumer morale and expectations for the performance of the economy reached their lowest levels since the surveys were first conducted, although the situation has improved somewhat recently (Figure 1). The decline in confidence

has also been more severe than in other programme countries since 2010, as also shown by stock market developments.

Figure 1. **Confidence indicators**
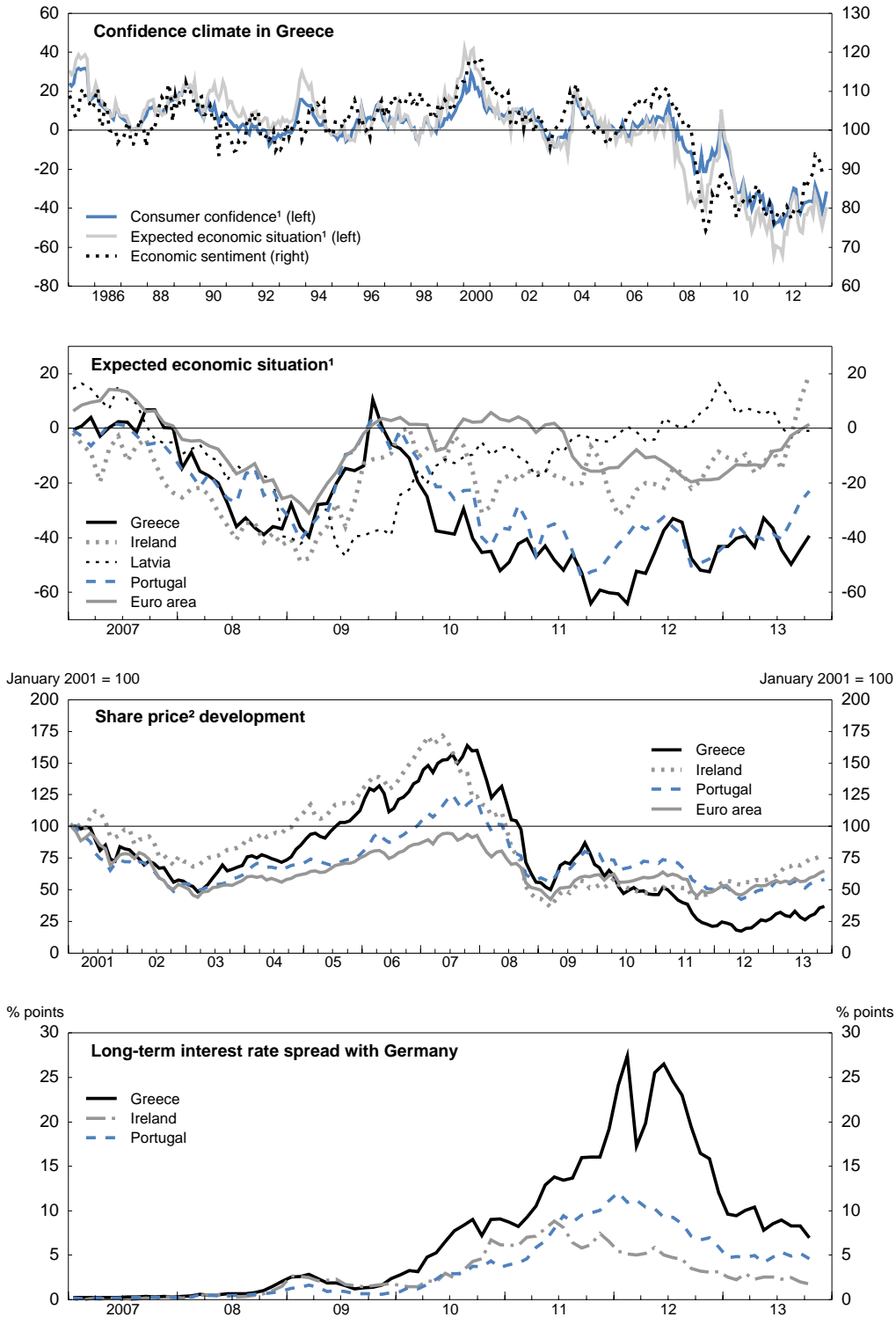


1. The series are normalised and averaged 0 over the period January 1985 (June 1986 for Portugal and May 2001 for Latvia) to the latest observation.
2. Athex composite index for Greece, Overall ISEQ for Ireland, PSI-20 for Portugal andEuro STOXX 50 for the Euro area.

5.　　　The adverse confidence shock has been associated with a substantial and sustained rise of uncertainty. This increase is illustrated by the sharp widening of long-term interest rate spreads with Germany, which culminated in mid-2012. The volatility in stock market returns was also more pronounced in Greece than in Ireland and Portugal (Figure 2). This latter indicator, which is often used in the empirical analysis of uncertainty (EC, 2012), is calculated here by constructing a 30-day-rolling standard deviation of stock index returns. These indicators have been standardised by using the average value of standard deviations between 2001 and 2007 to account for the differences in average volatility between stock markets in different countries.

Figure 2. **Uncertainty indicators based on financial market developments**[1]
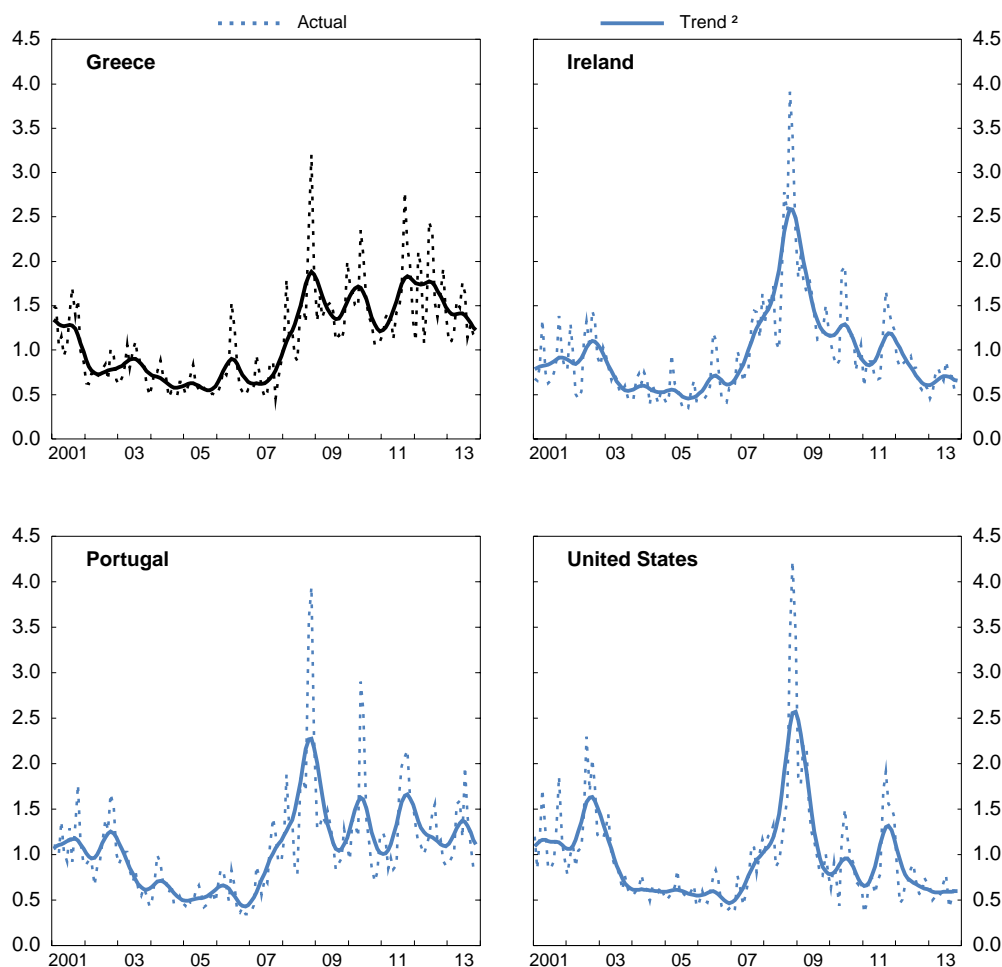


1.　Stock market volatility measured by a rolling-window 30-day standard deviation of stock index returns, which is then normalised by the average value of the standard deviation between 2001 and 2007.
2.　The trend has been estimated by smoothing the normalised series using a Hodrick-Prescott filter.
*Source:* Datastream and OECD calculations.

6.　　　Using these indicators of stock market volatility, an OLS regression was performed to identify possible sources of these uncertainties. This analysis revealed a statistical relationship between each country's uncertainty indicator and two explanatory variables: the global level of uncertainty, proxied by the stock market volatility index for the United States (Figure 2), and the economic cycle in each country, measured by their output gap. The volatility of stock market returns is indeed significantly linked to the variable representing global risks (Table 1). This is also the case for the measure of the economic cycle for Greece and Ireland, but not for Portugal. The periods of cyclical downturns (resp. expansions) often

coincide with rising (resp. declining) uncertainty, implying a generally negative correlation with output gaps, although the direction of the causality between these variables is not clear (IMF, 2012).

Table 1. **Sources of uncertainty: estimation results**[1]

| Dependent variable | **Greece** Volatility of Athex composite stock exchange index returns | **Ireland** Volatility of ISEQ stock exchange index returns | **Portugal** Volatility of PSI 20 stock exchange index returns |
|---|---|---|---|
| Estimation period | OLS 1993 Q1 - 2013 Q1 | OLS 1993 Q1 - 2013 Q1 | OLS 1993 Q1 - 2013 Q1 |
| Constant | 0.84*** | 0.18** | 0.23*** |
| Volatility of US Dow Jones index returns | 0.71*** | 1.01*** | 0.76*** |
| Output gap | -0.05*** | -0.01*** | -0.01 |
| Adj $R^2$ | 0.44 | 0.71 | 0.63 |
| SEE | 0.58 | 0.33 | 0.29 |

1. Three stars, two stars and one star indicate statistical significance at 1%, 5% and 10% level respectively.
*Source:* OECD calculation.

7. Using these equations, it has been possible to quantify the contributions of the various sources of uncertainty against their overall trends in Greece, Ireland and Portugal. This decomposition also includes the portion of the uncertainties that is unexplained by cyclical effects and global risks (*i.e.* the residuals of the estimated equations). Assuming that this latter effect can be interpreted as a proxy for the country-specific factors that have affected uncertainty, the main results of this decomposition can be summarised as follows (Figure 3):

- The effect of contagion from global uncertainties has been weaker in Greece and Portugal than in Ireland. In the case of Greece, this may reflect the good health of the Greek banking sector before the onset of the sovereign debt crisis, and its low exposure to toxic assets (OECD, 2011). However, in this respect, Portugal was in a similar situation as Greece.

- By contrast, the effect of the economic cycle on uncertainty has played a more important role in Greece than in the other countries. This effect reduced the level of uncertainty prior to the crisis, but increased it after 2009. The quantitative impact of the cycle on the trend of uncertainties, which was initially modest, has gradually increased.

- The country-specific factors that have increased uncertainty have been more prominent in Greece than in Ireland and Portugal since 2009. On average, these country-specific shocks have been the main source of rising uncertainty in Greece over the last three years, together with abrupt disruptions of the climate of confidence between mid-2009 and mid-2010, at the end of 2011 and in mid-2012, for which it is possible to identify the causes. In fact, those disruptions coincided with the discovery of irregularities in the Greek public accounts, the negotiation of the first and second economic adjustment programmes, and the dual general elections that led to the formation of a coalition government.

Figure 3. **Sources and evolution of uncertainty**[1]
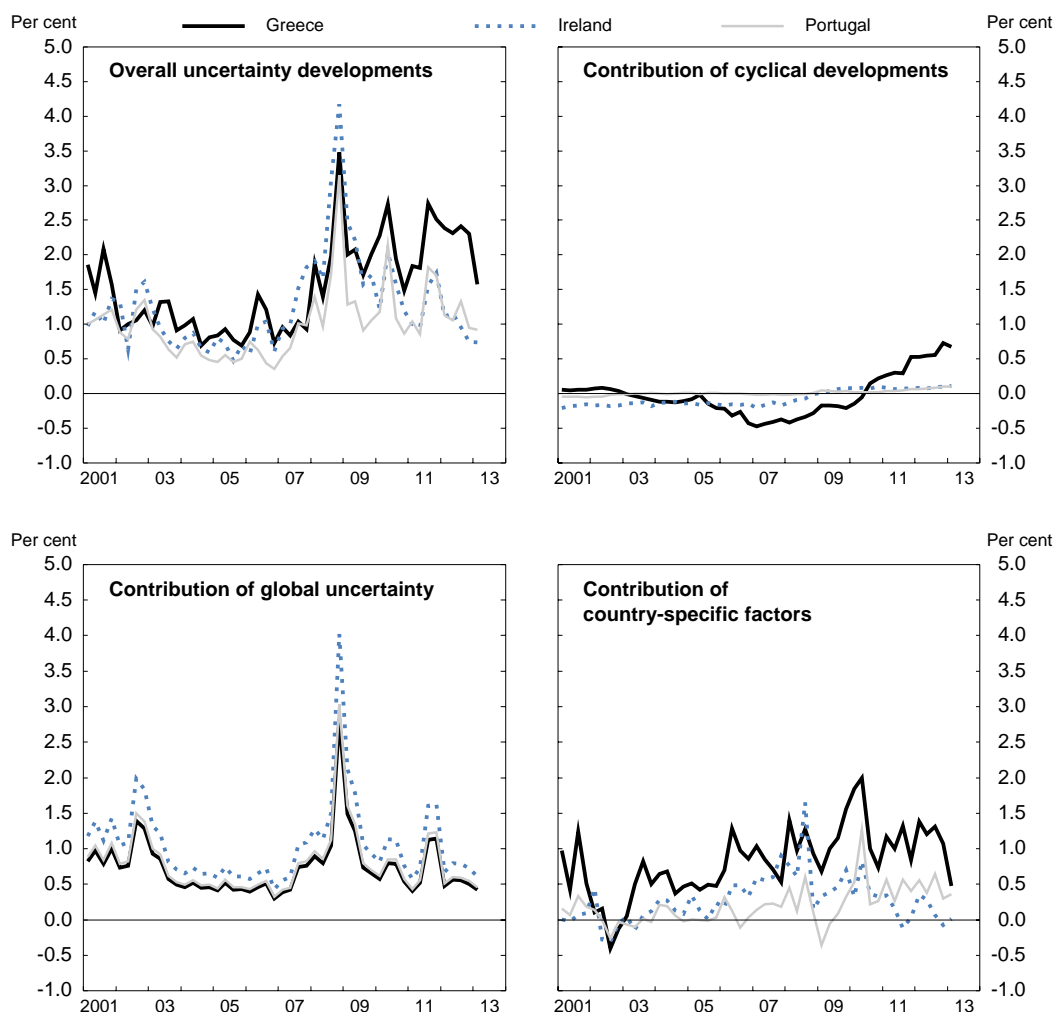


1. Analysis based on the Athex composite index for Greece, overall ISEQ for Ireland and PSI-20 for Portugal.
Source: Datastream and OECD calculations.

**The VAR models used for the analysis**

8.        Theoretical analyses identify several links between uncertainty and economic growth. For instance, rising uncertainty discourages investment and purchases of durable goods because households and businesses tend to delay these costly outlays, which are difficult to reverse, until the economic situation becomes clearer (Haddow *et al*., 2013; IMF, 2012). Beyond these demand effects, activity is also affected by the adverse impact of uncertainty on the supply side via the credit channel. Uncertainties reduce the expected return on projects financed by borrowing, making it more difficult for banks to evaluate collateral. This pushes creditors to increase interest rate risk premiums and to limit their  loan supply. A decline in bank deposits spurred by uncertainty, as experienced by Greece until mid-2012, also tends to reinforce the cautious lending behaviour of banks.

9.        However, the direction of the causality between uncertainty and growth is neither straightforward, nor unambiguous. As mentioned above, recessions raise uncertainties. The strong increase in uncertainty in Greece may thus have reflected its deep downturn, which was more pronounced than in Portugal and Ireland (Figure 4).

Figure 4. **Real GDP development**
Index 2008 Q1 = 100
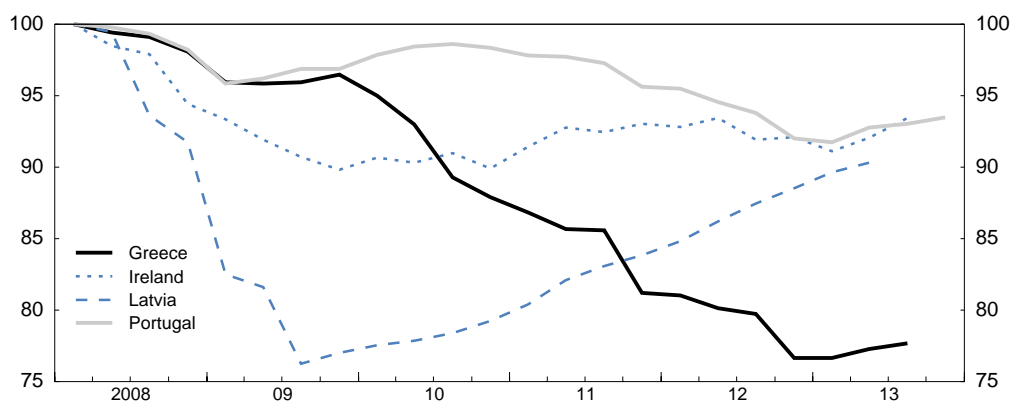
10.      Given this caveat, a VAR model has been estimated, as in other similar studies, to quantify the link between uncertainty and activity. This approach consists in estimating a system of equations where every variable is dependent on its own past and the past values of every variable of the system. It provides a convenient statistical tool that allows the analysis of interdependencies between a set of variables, conditional on the other variables of the model. In particular, this approach can be used for simulating an exogenous shock to the uncertainty measure and its effect on activity, without fully specifying the underlying structural model.

11.      Similarly to the approach adopted by Baker *et al*. (2013), the baseline model estimated for this exercise is a Cholesky ordered VAR model, which is a popular method often used in VAR analysis, with five key variables in the following order:[2] the various uncertainty measures, the share price returns, interest rates, employment and GDP. A linear time trend has also been included as an exogenous variable. The model was estimated in first difference form (with the exception of the uncertainty indices) to avoid unit root problems which were detected with augmented Dickey-Fuller tests, using quarterly data over the 1993Q1-2013Q1 period.

12.      Different specifications of the model were tested. As far as the uncertainty measures are concerned, several sets of indicators were used. A broad distinction was made between including the overall uncertainty index measured by the volatility of share price returns and a decomposition of this indicator distinguishing the country-specific and international component of uncertainty obtained from the analysis above. The uncertainty component derived from each country's cyclical development was, however, omitted from the VAR estimations due to strong collinearity with the GDP variables. Additional variables were also added to the baseline model, including total investment, private consumption and consumer confidence. This allows assessing the possible differentiated impact of uncertainties on the various demand components and the interaction effects of confidence with uncertainty on activity.

13.      The procedure applied for choosing the appropriate models was to compare the results of the Granger-Causality Tests (GCT) and the VAR Granger Causality/ Block Exogeneity Wald Tests (EGCT),

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2.      The reason for Cholesky ordering is the need for a decomposition of the original VAR into a set of uncorrelated components (an orthogonalisation method). This ensures that shocks to the simulation are only applied to the selected variable and that no cross-effects to other variables occur. The reasoning behind this method is that the first variable should be the only one with a potential immediate impact on all other variables. The second variable then has an impact on the remaining ones and so forth.

controlling for weak evidence of auto-correlation and heteroskedasticity. This led to the preferred model specifications including three lags. Table 2 provides the results of the EGCTs for a selection of model specifications. In all three countries there seems to be strong Granger-Causality from uncertainty and confidence towards output, investment and consumption growth but not vice versa. Furthermore, there is evidence of Granger-Causality from uncertainty towards confidence, which is in line with most of the literature (Haddow *et al.,* 2013). The results of these tests were little affected by the inclusion of the confidence effect in the model specifications for Greece and Portugal, but the links become stronger for Ireland.

14.        One apparently puzzling result of these tests was the highly significant Granger-causality running from country-specific to international uncertainty in Ireland. The Irish domestic uncertainty seems indeed unlikely to have caused the rise in global uncertainty measured by the increased volatility in the US stock market. However, one can argue that the Ireland problems were playing the role of an advanced indicator of the global financial crisis which took place later on. The turbulences in the Irish financial market also provided an indication of the looming problems associated with the Irish economic boom, which also took place in some other countries.

Table 2. **VAR Granger Causality/ Block Exogeneity Wald Tests for uncertainty, confidence and growth[1]**

(models with 3 lags)

**Model 1**

Greece

| From \ To | Uncertainty | GDP growth |
|---|---|---|
| Uncertainty | - | *** |
| GDP growth | - | - |

Ireland

| From \ To | Uncertainty | GDP growth |
|---|---|---|
| Uncertainty | - | - |
| GDP growth | - | - |

Portugal

| From \ To | Uncertainty | GDP growth |
|---|---|---|
| Uncertainty | - | - |
| GDP growth | - | - |

**Model 2**

Greece

| From \ To | Uncertainty | Confidence | GDP growth |
|---|---|---|---|
| Uncertainty | - | * | ** |
| Confidence | - | - | - |
| GDP growth | - | - | - |

Ireland

| From \ To | Uncertainty | Confidence | GDP growth |
|---|---|---|---|
| Uncertainty | - | - | * |
| Confidence | - | - | ** |
| GDP growth | - | - | - |

Portugal

| From \ To | Uncertainty | Confidence | GDP growth |
|---|---|---|---|
| Uncertainty | - | - | - |
| Confidence | - | - | - |
| GDP growth | - | - | - |

**Model 3**

Greece

| From \ To | International uncertainty | Country specific uncertainty | Confidence | GDP growth |
|---|---|---|---|---|
| International uncertainty | - | *** | * | *** |
| Country specific uncertainty | - | - | ** | *** |
| Confidence | - | - | - | - |
| GDP growth | - | - | - | - |

Ireland

| From \ To | International uncertainty | Country specific uncertainty | Confidence | GDP growth |
|---|---|---|---|---|
| International uncertainty | - | - | - | * |
| Country specific uncertainty | ** | - | - | ** |
| Confidence | - | - | - | ** |
| GDP growth | - | - | - | - |

Portugal

| From \ To | International uncertainty | Country specific uncertainty | Confidence | GDP growth |
|---|---|---|---|---|
| International uncertainty | - | - | - | ** |
| Country specific uncertainty | - | - | - | - |
| Confidence | - | - | - | - |
| GDP growth | - | * | - | - |

1. Three stars, two stars and one star indicate statistical significance at 1%, 5% and 10% level respectively.

*Source*: OECD calculation.

## Main results of the VAR analysis

15.    Figure 5 presents the key results of the empirical work. Panel A shows for each country the impulse response function of GDP growth from a shock to overall uncertainty. The shock was set equal to the uncertainty measure's mean change between 1993:Q1 to 2007:Q4 and 2008:Q1 to 2013:Q1 using the baseline model (model 1 of Table 2). This exercise simulates the impact of the increased uncertainty during the crisis. As shown by this chart, the initial output response to the increase in uncertainty is of broadly similar size in Greece and Ireland, but smaller in Portugal. The impact of the shock is more persistent in Greece than in the other countries.

Figure 5.  **Simulated effects of uncertainty shocks on activity**
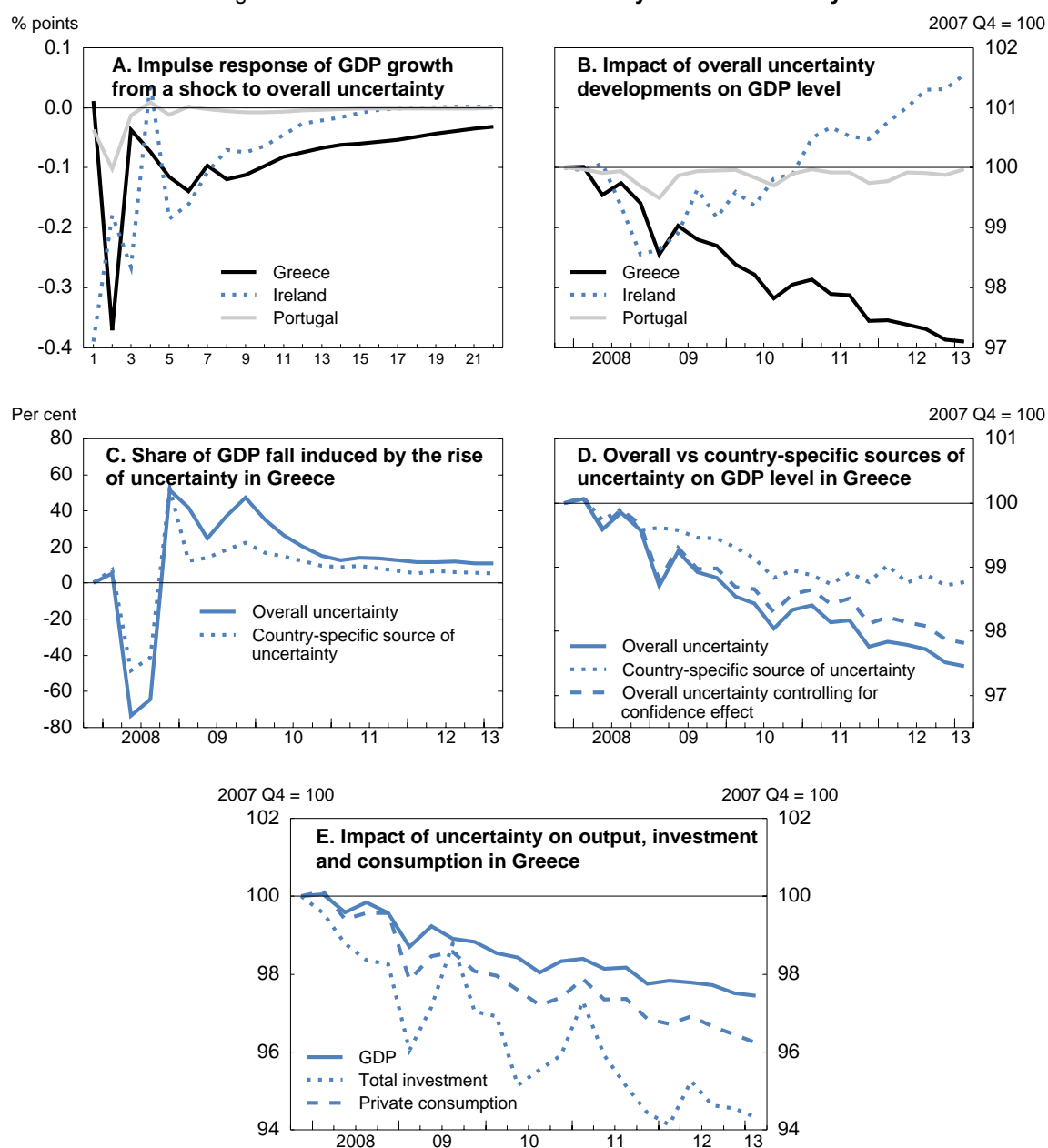


*Source:* OECD calculations.

16.      Panels B to E present the estimated impact of the overall uncertainty developments on real GDP experienced by each of the three countries since the beginning of the crisis. In this case, the quarterly change of the uncertainty measure, which actually occurred in each country between 2008Q1 and 2013Q1, is simulated as a shock to the VAR system to assess the effect of the changing uncertainty climate over this period. The graph plots the simulated reduction of the respective macroeconomic aggregate due to the uncertainty shocks, using the estimated VAR models. The main results of these simulations can be summarised as follows:

   •   The rise in uncertainty had a stronger negative cumulative impact on GDP in Greece than in Ireland and Portugal (Panel B). In the case of Ireland, uncertainty faded quickly and a positive cumulative effect on output as from the end of 2010 can be observed. It had virtually no effect on Portugal.

   •   In the case of Greece, controlling for other factors, the rise in uncertainty since the beginning of the crisis may have induced a cumulative fall of GDP by around 2½ per cent between end-2007 and early-2013, *i.e.* only around 10% of the total Greek GDP cumulative contraction recorded over this period. The overall share of uncertainty effects on the decrease in output since the beginning of the crisis is thus estimated to be relatively limited (Panel C).

   •   The estimated impact of the uncertainty effect on GDP is only marginally reduced if a confidence effect is explicitly taken into account in the model in addition to the uncertainty variables (Panel D). Moreover, only about half of the estimated contraction due to the rise in overall uncertainty can be attributed to Greek specific factors (Panel C).

   •   Finally, although consumption and investment seem to have been more affected by uncertainty than GDP (Panel E), these effects are actually of similar size when they are measured in proportion to the actual fall recorded for each of these variables.

17.      Overall, the uncertainty impact on growth seems to have been relatively small although stronger than in Ireland or Portugal. While this quantification appears to be robust to various changes in specifications of the models tested, one cannot exclude that this impact may be underestimated, in particular because of the nature of the statistical tools used for this exercise. Using an alternative approach to estimate the uncertainty impact on growth across countries, a recent IMF study concludes that recessions accompanied by strong uncertainty shocks are more severe and last longer, with a cumulative average decline in activity that is twice as strong as for other recessions (IMF, 2012).

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