



# Uncertainty shocks, central bank characteristics and business cycles



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## ABSTRACT

This paper investigates the conjecture that central bank independence and transparency moderate the negative effect of uncertainty shocks on real output. To test this conjecture, the real GDP growth rate is regressed on the interaction terms between measures of central bank characteristics and the proxy for macroeconomic uncertainty, i.e. stock market volatility. To address potential endogeneity concerns, stock market volatility is instrumented in a Two Stage Least Squares model by plausibly exogenous natural disaster, terrorist attack, political coup and revolution shocks. The estimation results provide strong evidence that central bank independence reduces the adverse effect of uncertainty shocks. There is also evidence for the moderating impact of transparency. However, due to the limited availability of transparency data, the result is less conclusive.

## 1. Introduction

This paper investigates the conjecture that an independent and transparent central bank mitigates the adverse impact of uncertainty shocks on real output. This conjecture is motivated by the insight that when exogenous uncertainty shocks hit the economy, the questions over the policy response of the central bank create uncertainty and further contract the output. Central bank independence and transparency, on the other hand, help reduce the contraction by reducing the uncertainty over the policy response. The estimation results provide strong support for the moderating impact of central bank independence. The evidence on the impact of central bank transparency also suggests a moderating impact on the adverse effects of uncertainty shocks, but the data is limited and consequently the result is less conclusive.

The two characteristics of central banks that I focus on are transparency and independence. Central bank transparency refers to the degree to which a central bank shares information about its procedures for decision-making, policy decisions and objectives, the implementation of policies and the economic variables relevant for the state of the economy. When an uncertainty shock hits the economy, the transparency of the central bank works to reduce policy uncertainty, undercuts precautionary incentives and mitigates the negative consequences of uncertainty shocks.

Independence, on the other hand, broadly refers to the degree of autonomy a central bank has in choosing and implementing its policies. Under uncertainty shocks, central bank independence matters, because it restricts political interference and the additional ambiguity it introduces to policy-making. Consequently, it increases the credibility of the central bank's policies and goals in the eyes of the public and reduces the destabilizing effects of uncertainty shocks on output.

This paper tests the two conjectures summarized above using the Instrumental Variables method. The dependent variable in the analysis is quarterly real GDP growth. The independent variable of interest is uncertainty (as measured by stock market volatility)

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interacted with central bank independence in the first set of regressions and central bank transparency in the second set. The conjecture that central bank independence and transparency mitigate the negative impact of uncertainty shocks implies that the coefficient of these interaction terms should be positive and significant.

The main concern with the empirical analysis is endogeneity. In the regression, the level and volatility shocks to the economy are proxied by shocks to the stock market return and volatility. The causality between these two variables and real output, however, is arguably two-way. To address this issue, I adopt the identification strategy employed in [Baker and Bloom \(2013\)](#). In particular, in the Two Stage Least Squares estimation, stock market return and volatility are instrumented by natural disasters, terrorist attacks, political coups and revolutions, while also controlling for country and year fixed effects and a number of economic, political and financial variables and their interactions with volatility.

The results of the empirical analysis are consistent with the conjectured impact for central bank independence. Using the index first constructed by [Cukierman et al. \(1992\)](#) and updated by [Bodea and Hicks \(2015\)](#), the analysis of 43 countries between the years 1972–2009 finds strong support for the mitigating impact of central bank independence on the adverse effects of uncertainty. This finding is robust after controlling for country and time fixed effects, political regime, inflation targeting regime, financial development level, population, real GDP, real GDP per capita and the interaction of these variables with volatility. Likewise, accounting for the possible endogeneity of central bank independence does not alter the results.

The evidence on transparency is mixed. In some specifications, the results suggest that transparency reduces the adverse impact of uncertainty and in others its impact is insignificant. This ambiguous result may partly be a consequence of the data limitations, as the dataset from [Dincer and Eichengreen \(2014\)](#) used in the analysis is restricted to the years between 1998 and 2009 and transparency is an attribute that is inherently more difficult to measure compared to other variables included in the analysis. In this respect, reaching a more conclusive result might require revisiting the question of the impact of transparency with more comprehensive data or alternative proxies.

The study relates to two different strands of the literature. The first investigates the impact of central bank characteristics on economic outcomes. The studies on the impact of central bank independence on real output find a relationship only for subsets of countries. [Cukierman et al. \(1993\)](#), [Grilli et al. \(1991\)](#) and [Alesina and Summers \(1993\)](#) find no overall relationship, but [Cukierman et al. \(1993\)](#) find a positive relationship for developing and [Neyapti \(2001\)](#) for former socialist countries. The literature on the relationship between central bank characteristics and inflation is more extensive and has stronger results. [Cukierman et al. \(1992\)](#), [Alesina and Summers \(1993\)](#), [Neyapti \(2001\)](#), [Crowe and Meade \(2008\)](#) and [Bodea and Hicks \(2015\)](#) find that independence of central banks reduces the inflation rate. [Dincer and Eichengreen \(2014\)](#) argue that higher central bank transparency reduces the surprise component of monetary policy and fluctuations in asset prices and improves the central bank's commitment capacity. The paper also finds that both independence and transparency of the central bank reduce the volatility of the inflation rate. In a similar vein, [Van der Cruijssen and Demertzis \(2005\)](#) and [Demertzis and Hallett \(2007\)](#) show that higher transparency of central banks decreases variations in the inflation rate. The second strand of literature focuses on the impact of uncertainty shocks on the real sector. On the theoretical front [Basu and Bundick \(2012\)](#), [Fern & ndez-Villaverde et al. \(2011\)](#), [Gilchrist et al. \(2014\)](#), [Christiano et al. \(2013\)](#), [Arellano et al. \(2010\)](#) and [Bloom et al. \(2012\)](#) and on the empirical front [Alexopoulos and Cohen \(2009\)](#), [Bloom \(2009\)](#), [Baker and Bloom \(2013\)](#), [Baker et al. \(2013\)](#) and [Caldara et al. \(2014\)](#) show that an increase in uncertainty induces real downturns.

This study extends the existing literature in a number of ways. While the main focus in the literature on central bank characteristics has been their impact on price stability, the current study investigates the consequences for output. Second, it does not focus on the impact of central bank characteristics per se, but rather on how central bank characteristics moderate the impact of uncertainty shocks. Moreover, in investigating this moderating impact, it adopts a credible instrumentation strategy in order to establish causality.

The rest of the article proceeds as follows. Section 2 discusses the existing literature on the consequences of central bank characteristics, with a focus on theoretical studies. Section 3 presents the empirical model and describes the data. Section 4 discusses the results and the last section concludes.

## 2. Theoretical review

There is a growing number of studies on the macroeconomic implications of uncertainty and instability and how they interact with institutions and policies.<sup>1</sup> In this study the focus is on the interaction between uncertainty shocks and central bank characteristics. Below, I review the relevant literature and relate it to the conjecture that central bank independence and transparency moderate the negative impact of uncertainty shocks on output.

The literature identifies a number of channels through which uncertainty shocks depress economic activity. One strand in the literature focuses on the demand side effects of macro level uncertainty shocks. For example, [Basu and Bundick \(2012\)](#), and [Fern & ndez-Villaverde et al. \(2011\)](#) argue that an increase in uncertainty induces risk-averse agents to make precautionary cuts in consumption and investment demand and consequently reduces output. A second strand focuses on the effects of micro level uncertainty on firms in an economy with financial frictions. In this vein, building on [Bernanke et al. \(1999\)](#) framework, [Gilchrist et al. \(2014\)](#), [Christiano et al. \(2013\)](#), and [Arellano et al. \(2010\)](#) suggest that when the volatility of the cross-sectional distribution of the idiosyncratic productivity of firms increases, entrepreneurs' default risk and cost of borrowing increase, which in turn depresses investment and real output. As a third channel, [Bloom et al. \(2012\)](#) suggest that uncertainty increases the return on inaction, causing firms to choose to wait. Consequently, productive firms pause expanding, unproductive firms pause contracting, and investment and output fall.

<sup>1</sup> See [Lee et al. \(2016\)](#), [Yang and Liu \(2016\)](#), [Maimbo and Melecky \(2016\)](#) and [Yang and Hamori \(2016\)](#).

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