4. DOES ECONOMIC POLICIES UNCERTAINTY AFFECT ECONOMIC ACTIVITY? EVIDENCES FROM THE UNITED STATES OF AMERICA

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Abstract

The last global financial and real turmoil highlighted the importance of stable and effective economic policies. Using a recently developed measure of economic policy uncertainty, we estimate - for the United States of America, from 1973 to 2014 - the uncertainty impact upon economic activity volatility, as captured by a Nonlinear ARCH model.

We learned that inflation volatility exerts the largest overall impact, followed by personal consumption expenditure volatility, while the commercial and industrial loans produce a small (although significant) effect. We found evidences of a U-shaped impact of policy uncertainty upon volatility. However, the net effect is direct: an increase in uncertainty leads to an overall increase in economic volatility. We conclude that a stable and predictable economic policy is critical for the economic growth.

Keywords: uncertainty, volatility, NARCH/ GARCH

JEL Classification: O11, C33

1. Introduction

The recent financial and real turmoil acutely highlighted the importance of stable, predictable and effective economic policies. A growing body of literature is currently dealing with the potential effects induced by exogenous economic policy uncertainty on economic growth.

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For example, Baker *et al*. (2013) emphasises that policy uncertainty is crucial in explaining the recent compression of United States of America's (US) economy. Bloom *et al*. (2012) documents that microeconomic uncertainty is robustly countercyclical. It argues that increased uncertainty initially alters the relative impact of government policies, making them less effective, while subsequently they become more effective.

Abdiweli (2001) studied the volatility of economic policies, as a significant indicator of stability. His results showed that almost all policy uncertainty variables are significantly and negatively correlated with economic growth. However, the author found that economic policies' instability has no significant impact upon the accumulation of capital. Alexopoulos and Cohen (2009) demonstrated that uncertainty shocks generate short sharp recessions and recoveries. They have used traditional measures, such as stock market volatility index, as well as new measures of uncertainty, such as the number of New York Times' articles on uncertainty and economic activity and concluded that output, employment, productivity, consumption and investment decreased, as a response to an unanticipated uncertainty rise. The two authors also found that widespread changes in the level of uncertainty, captured by their newspaper index, explain between 10 and 25 percent of the short-run variation in these variables.

Bloom (2009) found uncertainty spikes after major political, military, economic and terrorist events, such as JFK's assassination, Cuban Missile crisis, the 1973 oil crisis and the 2001 Twin Towers terrorist attack.

Bloom created a model with a time-varying second moment, solved numerically and estimated using Örm level data. The author discovered that, in the medium run, increased volatility due to shocks induced an overshoot in output, employment and productivity. So, second moment shocks generated short sharp recessions and recoveries. His model also estimated labor and capital convex and non-convex adjustment costs.

Caggiano *et al*. (2013) investigated the effects of uncertainty shocks on unemployment dynamics in the US recessions in the last 70 years. Authors have used a non-linear (Smooth – Transition) VARs, which proved to have a much higher relevance in predicting uncertainty shocks than the linear VARs. The results of their study confirmed the significance of the trade-off between *correctness* and *timeliness* of policy makers' decisions.

Bachmann *et al*. (2012) employed survey expectation data from Germany and United States to build empirical proxies for time-varying business-level uncertainty. They used confidential micro-data from the German IFO Business Climate Survey, which allowed them building uncertainty measures based on both *ex-ante* disagreement and on *ex-post* forecast errors. The authors also analyzed US data, measuring uncertainty with forecast disagreement from the Business Outlook Survey, administered by Philadelphia Federal Reserve Bank. As opposed to the German situation, they learned that unexpected increases in forecast dispersion generated significant and persistent reductions in production and employment.

On the other hand, Bloom *et al*. (2007) proved that, with partial irreversibility, a higher uncertainty decreases investments' responsiveness to demand shocks. The authors concluded that uncertainty increases real option values, which makes companies even more prudent when investing or disinvesting. Moreover, they have found that companies' responsiveness to a given policy stimulus is considerably weaker during high uncertainty periods.

Baker *et al*. (2015) created a new index of economic policy uncertainty (or EPU) based on newspaper coverage frequency. Using several types of evidence, including readings of 12,000 newspaper articles, the authors have shown that EPU proxies for movements in policy-related economic uncertainty. The authors found their U.S. index spiked near tight presidential elections, Gulf Wars I and II, the 9/11 attacks, the failure of the Lehman Brothers, the 2011 debt-ceiling dispute and other major battles over fiscal policy. With company-level data, the authors found that policy uncertainty raised stock price volatility and reduced investment and employment in policy-sensitive sectors such as defense, healthcare, and infrastructure construction.

Sum (2013) found that economic uncertainty is closely followed and analyzed by businesses, policy makers and academic scholars, as world economies have become more interconnected than ever. His study examined the relation between economic policy uncertainty in the United States and in Europe. His results showed a long-run equilibrium relationship (cointegration) between economic policy uncertainty in the United States and in Europe.

Fatima and Waheed (2014) have investigated the effects of economic uncertainty upon Pakistan's growth performance, using a GARCH method for designing economic uncertainty variables related to macroeconomic policies. Their study concluded that economic uncertainty reduced current investments and economic growth and it also affects future investment decisions and economic growth.

Balcilar *et al*. (2016) employed nonparametric causality-in-quantiles test to analyse predictability of returns and volatility of sixteen U.S. dollar-based exchange rates. Their results indicated that, for seven exchange rates, economic policies uncertainty differentials had a causal impact on exchange rate returns variance, though not on the returns themselves.

Several transmission channels can be considered for the impact of policies uncertainty on economic growth. At micro level, the uncertainty related to business prospects may increase the cost of capital and managerial risk-aversion (Panousi and Papanikolaou, 2012). It might lead to a distortion in the optimal investment and financing policies chosen by the manager (Glover and Levine, 2014) and, generally, it can worsen the moral hazard issues faced by companies. At macro level, the policy uncertainty might distort the market allocation mechanisms, possibly generating consumption, investment or saving decisions, driving the economy far from its steady-state dynamics.

We intend to contribute to this literature by testing, for the U.S. case, the existence of a potential non-linear impact of uncertainty on economic activity, via a recently developed uncertainty index (Baker *et al*., 2013, 2014).

2. Methodology

To describe the linkages between policy uncertainty and economic volatility, we imply the following model:

$$\sigma_t^2 = \varphi_0 + \varphi_1 uncertainty_t + \varphi_2 uncertainty_t^2 + \varphi_3 (\sigma_t^2)^{cons} + \varphi_4 (\sigma_t^2)^{loans} + \varphi_5 (\sigma_t^2)^{\pi} + crisis_t \quad (1)$$

where:

σ_t^2 – the volatility of economic output;

uncertainty – a measure of exogenous policy uncertainty.

We include several controls: corresponding volatilities for the households' consumption expenditures $(\sigma_t^2)^{cons}$; commercial and industrial loans $(\sigma_t^2)^{loans}$; inflation, $(\sigma_t^2)^{\pi}$. They aim to reveal some major determinants of the endogenous induced volatility, such as consumption-driven growth, financial intermediation and financial stability. In addition, we include seven dummy variables designed to capture some significant economic instability episodes: the 1973 oil crisis, the early 1980's US and Japan's recession, the 1987 financial instability ('Black Monday' crisis), the early 1990's recession, the 1997 Asian financial crisis, the early 2000's 'Dot com' crisis, and the 2007-2010 financial and real economic turmoil.

We have designed this framework to reflect the expected non-linear impact of the exogenous policy uncertainty on economic activity. We argue that an initial short-run uncertainty increase will have a detrimental impact on business environment and contribute to economic agents' decisional uncertainty. However, once a certain threshold is reached, should uncertainty expand in the long-run, a 'decoupling' of individual decisions from the public policies (perceived as ineffective) will emerge, along with a loss of public policies 'signalling capability'.

We estimate the implied volatilities for each variable y, $\sigma_{y,t}^2$ using a Nonlinear ARCH model (NARCH/ GARCH). This is a recursive model (with potential short and long-run memory):

$$y_t = \alpha_0 + \gamma_1\sigma_{y,t-1}^2 + \rho_1\left(y_{t-1} - \gamma_1\sigma_{y,t-2}^2\right) + \sum_{i=1}^{3}\theta_i\,\varepsilon_{y,t-i} + \varepsilon_{y,t}, \varepsilon_{y,t}\quad GED(s)$$

$$\sigma_{y,t}^2 = \upsilon_0 + \delta_1\left(\varepsilon_{y,t-1} - k_1\right)^2 + \delta_2\left(\varepsilon_{y,t-1} - k\right)^2 + \beta\sigma_{y,t-1}^2 \qquad (2)$$

For the mean equation, this includes a constant, an ARMA (1;3) term, $\rho_1\left(y_{t-1} - \gamma_1\sigma_{y,t-2}^2\right) + \sum_{i=1}^{3}\theta_i\,\varepsilon_{y,t-i}$, as well as an ARCH-in-mean term $(\gamma_1\sigma_{y,t-1}^2)$. The error term, ε_t, supposedly follows a general error distribution (GED) process (a parametric family of symmetric distributions). The conditional variance equation includes a *narch* term, $\delta_1\left(\varepsilon_{y,t-1} - k_1\right)^2$, allowing the minimum conditional variance to occur at a value of lagged innovations other than zero. It also includes a *narchk* term, a variation of *narch* with *k* held constant for all involved lags. This model allows identifying the impact of different 'good/bad news' (positive and negative information shocks) on volatility (see, for details, Bollerslev, 2010).

To capture the policy-related uncertainty, we involve the Economic Policy Uncertainty index proposed by Baker *et al.* (2013, 2014). This is built over three main dimensions: (1) the frequency of newspaper references to economic policy uncertainty; (2) the number of federal tax code provisions set to expire; and (3) the extent of forecasters' disagreement over future inflation and government acquisitions.

As Stock and Watson (2012:110) point out: "The construction of measures of uncertainty is relatively new, and finding exogenous variation in uncertainty is challenging". One critical issue for the existence of such exogenous uncertainty measure concerns the causality direction for the link between policy uncertainty and economic activity: "policy is forward looking, so this may simply reflect policymakers acting more aggressively when they foresee an economic slowdown" (Baker *et al*., 2013:2). Still, several arguments may support the existence of an exogenous component of policy uncertainty. Firstly, economic activity displays a certain inertia, namely some of the current investments originate from previous periods; the local and international markets rely upon former settled contracts; savings are based on a multi-period framework and so on. Secondly, real assets markets are not necessarily information-efficient, as heterogeneous agents collect and utilize imperfect information (costly, incomplete and only partially relevant) involving different algorithms for its use and interpretation. Even if a 'bounded rationality' framework for the economic agents' decisions is considered, the amplitude and frequency of moral hazard issues can be critical to the impact of economic policies on economic activity. To check for potential causality issues, we involve a two-steps approach to instrumental Generalized Method of Moments (GMM).

Finally, one can argue that policy uncertainty impact on economic dynamics is a regime-shift process. Hence, the distinct behaviors of economic agents may be expected under 'low' and 'high' volatility regimes. The quantile regression approach can reflect such distinctive behavior. This approach provides several advantages, such as generating robust estimates, particularly for the misspecification errors related to heteroskedasticity, non-normality and other error terms misspecification (Knight, 2008).

3. Results and Comments

Our analysis covers the time span between March 1973 and February 2014. As a proxy for the economic output, we use the (logarithm) Industrial Production Index (2007 Index value = 100). The economic data originate from the Federal Reserve Bank of St. Louis (2015) database. The Baker *et al*. (2013, 2014) Economic Policy Uncertainty index data are provided by: *http://www.policyuncertainty.com/.* To eliminate some business cycle effects and mitigate the potential endogeneity problems, we have estimated all the variables as three-month averages.

Table 1 below reports estimates of implied volatility for dependent and explanatory variables.

The results point towards the existence of non-linear patterns occuring in the dynamics of variables volatility. Firstly, the *narch* term is statistically significant at 1% for all explanatory variables and at 10% for estimates of Industrial Production Index. Secondly, the *narchk* term displays statistical significance for the dependent, as well as for personal consumption expenditures (at 10% and 5%, respectively). Thirdly, there appears to be some *ARCH-in-mean* effects, especially for the dependent and inflation volatility. Finally, the Generalized Error Distribution (GED) parameter is significant at 1% for all estimates. Hence, such a model is able to capture at least some non-linear evolutions at the level of involved variables.

Table 1

Nonlinear ARCH Models for Implied Volatilities Estimates

Component	(logarithm) Industrial Production Index	Personal consumption expenditures	Commercial and industrial loans	CPI
Constant in mean equation	41.665*** (1.377)	100.945*** (0.073)	100.555*** (0.133)	0.316*** (0.049)
ARCH-in-mean term	13.055** (5.334)	-0.164 (0.122)	0.073 (0.154)	-2.651*** (0.887)
AR(1)	1.005*** (0.001)	1.002*** (0.001)	0.908*** (0.023)	1.003*** (0.004)
MA: first lag	1.301*** (0.401)	-1.261*** (0.048)	-0.394*** (0.059)	-0.618*** (0.053)
MA: second lag	0.061 (0.046)	0.278*** (0.073)	-0.127** (0.051)	-0.249*** (0.051)
MA: third lag	0.059 (0.044)	0.001 (0.047)	0.104** (0.043)	0.043 (0.041)
ARCH				
narch term: one lag	0.007* (0.004)	0.200*** (0.052)	0.318*** (0.097)	0.303*** (0.082)
narchk term	7.322* (3.950)	0.188** (0.093)	-0.077 (0.105)	0.007 (0.016)
GARCH term: one lag	0.862*** (0.047)	0.698*** (0.070)	0.204 (0.155)	0.517*** (0.073)
Constant	-0.326* (0.186)	0.019** (0.009)	0.165*** (0.046)	0.002*** (0.001)
(Natural logarithm) GED parameter	0.320*** (0.073)	0.233*** (0.084)	0.322*** (0.096)	0.139* (0.092)
Wald χ^2	829815.58 (p=0.000)	$1.53*10^6$ (p=0.000)	2411.39 (p=0.000)	83359.16 (p=0.000)
Log likelihood	-249.441	-301.003	-399.363	477.6714
Number of observations	494	494	494	494

***/**/* -1%, 5%, 10% significance levels.

Figure 1 shows the evolutions of output volatility and uncertainty index. Both reflect the major economic instability periods (with large peaks especially for the 2007-2010 time span).

Figure 1. NARCH/ GARCH Estimates of Industrial Production Index Volatility and (Logarithm) Economic Policy Uncertainty Index (Three-month Averages)

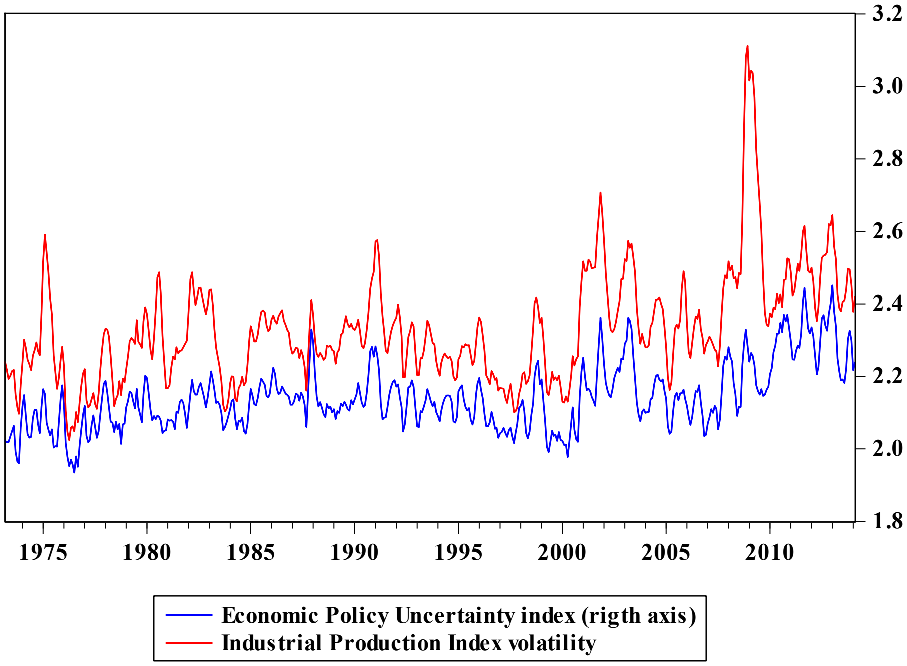


Table 2 provides a more detailed analysis. A Generalized Linear Model (GLM), as a flexible generalization of ordinary linear regression, is involved as a baseline estimate. The corresponding coefficients are reported in Column 1 of Table 1. It appears that exogenous uncertainty exerts a *U-shaped* impact on output volatility, both being statistically significant at 1%. The 'net' effect is a direct one: overall, a higher uncertainty surrounding economic policies leads to a more volatile economic activity. The amplitude of this effect clearly dominates the considered controls' volatility impact. Interestingly, commercial and industrial loans volatility seems to exert the lowest, yet significant impact at 1%. These estimates are all statistically significant at 1% (5%) and, as expected, they positively contribute to increased output volatility. Similarly, it is interesting to note that, in this framework, only the Japanese asset price bubble, the 'Black Monday' crisis (1987), the Asian financial crisis and the recent subprime mortgage crisis seem to have a significant impact on economic output volatility. This is not surprising, when considering United States financial markets' role (as well as of other developed and developing markets) in attracting savings, sharing information among investors, providing mechanisms for the allocation of resources and a support-network for risk management (King and Levine, 1993; Rajan and Zingales, 1998; Levine, 2003; Wong and Zhou, 2011; Ductor and Grechyna, 2015). Meanwhile, these results might reflect the importance of trade and portfolio investments with Japan and the ASEAN countries for the United States economy.

Column 2 of Table 2 displays the instrumental GMM method, which appears to preserve the *U-shaped* effect of economic policies' uncertainty and its statistical significance in a robust manner. However, it looks like the estimated amplitude of this effect is substantially lower than the GLM regression-derived one. This may reveal a certain amount of endogeneity in the relationship between uncertainty and output volatility. Also, crisis episodes, such as the early 1970's oil shock or the 'dot-com bubble', are gaining statistic significance in this framework, suggesting their potential effects are actually covered by the 'reverse causality' mechanisms between economic outcome and policy uncertainty. The value of Sargan/Hansen test and J test supports the quality of choosed instruments.

The quantile regression approach (Columns 3 to 5 of Table 2) provides further insights. The shift from low to high quantiles volatility does not substantially disturb the volatility-uncertainty relationship, which remains significant at 1% accros all quantiles.

Table 2

Economic Uncertainty and Industrial Production Volatility (March 1973 - February 2014)

	Genera-lized linear models	Instrumental variables (GMM) regression	Bootstraps Quantile regression (20th quantile)	Bootstraps Quantile regression (50th quantile)	Bootstraps Quantile regression (80th quantile)
	(1)	(2)	(3)	(4)	(5)
Uncertainty Index	31.370*** (5.967)	0.215*** (0.034)	4.611*** (1.275)	4.711*** (1.228)	5.360*** (1.033)
Uncertainty Index squares	-6.949*** (1.367)	-0.077*** (0.016)	-1.001*** (0.298)	-1.032*** (0.278)	-1.175*** (0.235)
Personal consum-ption expenditures' volatility	0.513*** (0.087)	0.159*** (0.020)	0.026 (0.024)	0.101*** (0.032)	0.175*** (0.035)
Commercial and industrial loans' volatility	0.178** (0.090)	0.013** (0.006)	0.099*** (0.022)	0.075*** (0.027)	0.057* (0.029)
CPI volatility	10.813*** (1.803)	3.221*** (0.275)	3.602*** (0.677)	3.451*** (0.622)	3.412*** (0.930)
Dummy for 1973 oil crisis	-0.118 (0.116)	-0.190*** (0.013)	-0.191** (0.080)	-0.026 (0.081)	-0.013 (0.029)
Dummy for early 1980s recession (1981-1982)	0.039 (0.072)	-0.007 (0.008)	0.017 (0.020)	0.019 (0.015)	-0.007 (0.015)
Dummy for Japanese asset price bubble and 'Black Monday' crisis (1987)	-0.789*** (0.107)	-0.153*** (0.017)	-0.09*** (0.031)	-0.122*** (0.024)	-0.133*** (0.024)
Dummy for early 1990s recession (1991-1992)	0.044 (0.070)	0.014** (0.007)	0.017* (0.009)	0.010 (0.011)	0.005 (0.012)

	Generalized linear models	Instrumental variables (GMM) regression	Bootstraps Quantile regression (20th quantile)	Bootstraps Quantile regression (50th quantile)	Bootstraps Quantile regression (80th quantile)
Dummy for 1997 Asian financial crisis	-0.359*** (0.099)	-0.066*** (0.007)	-0.016 (0.033)	-0.017 (0.011)	-0.029** (0.012)
Dummy for 'dot-com bubble' (2000)	0.141 (0.098)	-0.013** (0.007)	-0.004 (0.020)	0.024 (0.030)	0.034 (0.024)
Dummy for 'subprime mortgage crisis' (2007-2010)	0.199*** (0.054)	0.092*** (0.009)	0.010 (0.021)	0.028 (0.017)	0.140*** (0.047)
Constant	-37.289*** (6.508)		-5.212*** (1.363)	-5.254*** (1.357)	-5.962*** (1.137)
(Pseudo) R^2			0.185	0.258	0.423
Scale parameter	0.107				
(1/df) Deviance	0.113				
(1/df) Pearson	0.107				
Log likelihood	352.223				
Hansen's J		1.788 (p=0.938)			

****/**/* -1%, 5%, 10% significance levels.*

Notes: Dependent variable - (logarithm) Industrial Production Index (2007 Index =100; Monthly, Seasonally Adjusted, INDPRO). For GLM models: Family (distribution of dependent variable): Gamma; Link function: log. For GMM estimates: Two-step estimators; GMM weight matrix: HAC Bartlett with 487 lags. Lagged values of explanatories used as instruments. For quantile regressions: significance is determined by the 95% confidence interval based on 100 bootstrap iterations.

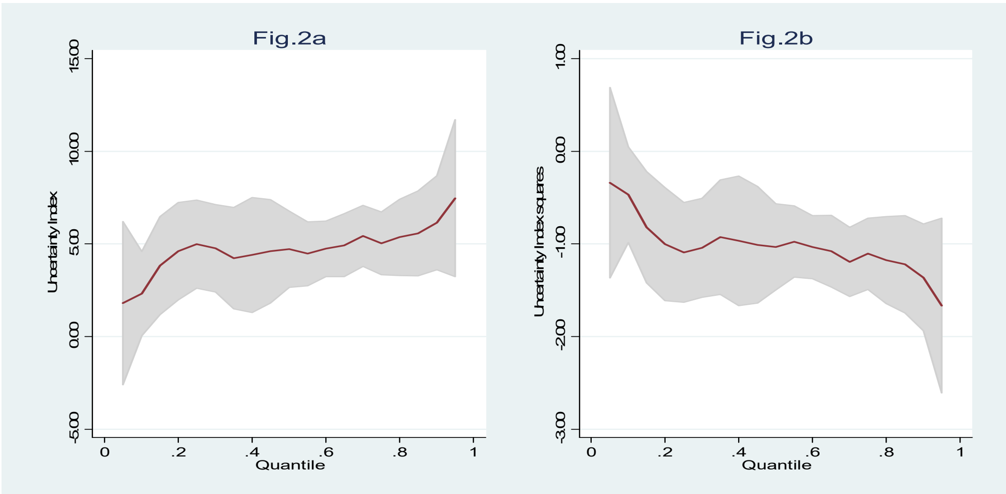
Nevertheless, such a shift disturbs the transmission channels for household consumption and volatilities of loans, while economic policy uncertainty, as well as inflation volatility surpasses the explanatory power of all the other variables for all quantiles. Simultaneously, the movement toward higher volatility quantiles tends to reduce the corresponding threshold: in a global uncertainty context, the partial 'decoupling' of economic dynamics from the highly uncertain economic policy seems to occur sooner. For instance, Gulen and Ion (2015) estimate that approximately two thirds of the 32% drop in corporate investments in the United States during the 2007-2009 crisis can be associated to policy-related uncertainty. One possible explanation could be that an increase in the uncertainty concerning timing and nature of public policy changes might significantly increase uncertainty about the future profitability of companies and, thus, might lower the investment rates (especially for the reversible investment projects).

To assess robustness of quantile regressions, Figure 2 shows estimated parameters of the Uncertainty Index (levels and squares) for different quantiles at 95 percent credible intervals. Both levels and squares preserve their signs accros quantiles. However, it can be noticed that amplitude of direct impact of uncertainty on output volatility tends to increase when shifting from lower to higher quantiles, while reverse effects are also becoming more important with such a shift. The amplitude of the 'net' effects induced by an increase in policy uncertainty suggests that such effects are overall more important for the areas in which output evolution follows a higher volatility regime.

At the same time, as Figure 3 shows, from among the other explanatory variables, inflation volatility has the greatest stability across quantiles, while the relative explanatory importance of volatility of personal consumption expenditures tends to increase for higher quantiles. Several reasons can be identified to explain such results. For instance, one can argue that an improvement in the quality of Federal Reserves' monetary policy can explain the lower volatilities of both output and inflation. Nevertheless, as Kahn *et al*. (2002:184) note: "It is easy to see that both inflation and output have been less volatile in the most recent two decades than in the turbulent 1970s. When viewed in comparison with the 1950s and 1960s, however, the stability of the recent period is considerably more striking for output growth than it is for inflation". Perhaps other explanations, such as the technological progress and the changes in the prices of durable goods, are more relevant. Still, one key result here is that growth is not affected by the inflation level, yet it is significantly affected by inflation volatility. This result is in the line with other findings from the literature (such as Emara, 2012).

Figure 2

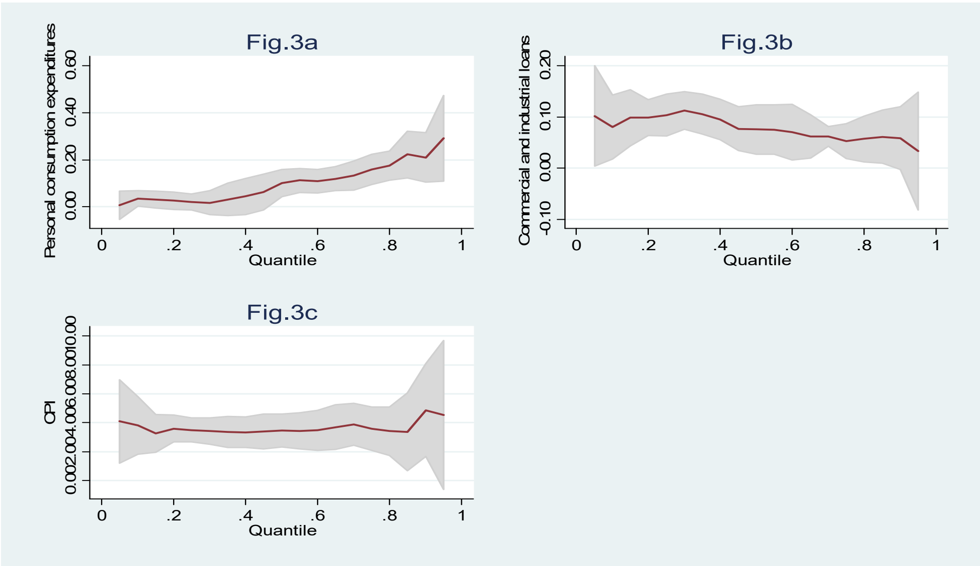
Estimated Parameters for Bootstraps Quantile Regression: Levels (2a) and Squares of Uncertainty Index (2b)



Note: The grey areas represent the 95% confidence intervals.

Figure 3

Estimated Parameters for Bootstraps Quantile Regression: Estimates of Volatilities for Personal Consumption Expenditures (3a), Commercial and Industrial Loans (3b) and CP-based Inflation (3c)



Note: The grey areas represent the 95% confidence intervals.

In addition, to have a broader view of these results, one should note that the dynamics of output volatility is only partially explained by 'structural changes' over the last three decades. For instance, as Grimm and Sliker (2009:2) found, "declines in the volatility of states, regions, industries, or industry groups do not account for much of the decline in the volatility of GDP growth. In fact, when disaggregating by regions and industry groups, less than one-eighth of the decline in the variance of GDP growth is due to declines in variances of the regions and industry groups". Thus, we argue that the determinants of output volatility are rather located on the supply side: the expansion of demand for goods and services, supported by the development of financial intermediation services, appears to substantially amplify this volatility.

The novelty of these findings is supported by several considerations. Firstly, beside the factors Baker *et al*. (2015) mentioned for policy uncertainty increase (the increasing scale of government activity, political polarization and institutional dynamics) our results suggest there might also be a certain endogenous component of policy uncertainty, as regards the economic activity uncertainty. The concerns related to economic perspective might fuel a rise in policy uncertainty. Secondly, these results are pointing toward a potential non-linear impact of policy uncertainty upon output evolutionary path, which, to our knowledge, is largely neglected by the current literature. A possible argument for the existence of these non-linearities can be related to a 'decoupling' effect: if uncertainty related to public policies is high, the economic subjects adopt their short-run consumption, investment and savings decisions in an autonomous way as regards these policies. Thirdly, these results might connect the policy uncertainty-output volatility nexus to the financial (in) stability and growth stream of literature. For instance, Barro (2013) provides evidences on a sample of around 100 countries from 1960 to 1990, supporting the causation from higher long-term inflation to reduced growth and investment. Such connection might explain the remarkable stability of the impact of inflation volatility across different output volatility regimes. Fourthly, differences between quantile regressions suggest the impact of the considered explanatory variables is a non-uniform one across different output volatility regimes. Thus, consumption volatility becomes significant only for higher output volatility levels, while there is a relative decline in the explanatory power of financial intermediation processes for such levels. Fifthly, transmission channels for different crisis episodes appear to be far from a uniform impact on the real sector activity. While some episodes are associated with an increase in output volatility, others seem to exercise little or no impact on this volatility. Since we do not directly address the issue of the nature of these channels (nor the potential for these crises to contribute to an increase in policy uncertainty), a more detailed analysis is required at this point.

Overall, the emerging picture is quite complex: while policy uncertainty clearly looks like a major explanatory factor of output volatility, the uncertainty related to other real and financial variables does substantially contribute to this as well. Of course, our approach accounts only for the *direct* impact of policy uncertainty on output volatility. Nevertheless, there are no *ex ante* reasons to exclude the existence of a supplementary *indirect* impact of policy uncertainty that might be exercised on output via the volatility of some key macroeconomic variables (including consumption, loans or inflation). Thus, the cumulated importance of the policy uncertainty might be greater than suggested by such results.

4. Conclusions

We have tested, based on long-run US data, the existence of a non-linear impact induced by a measure of exogenous policy uncertainty on economic output volatility. We find the index proposed by Baker *et al*. (2013, 2014) to be *U-shaped* connected with industrial production volatility, as estimated by NARCH/GARCH model. This connection is robust in respect to different estimation methods and to the inclusion of different control variables. Of these controls, inflation volatility exerts the largest overall impact, followed by personal consumption expenditures volatility, while commercial and industrial loans apply a small (although significant) effect. This result is in accordance with our expectations. Since inflation is a key macroeconomic measure, it is included in a lot of private and public forecasts and it influences in its turn a whole set of micro and macroeconomic measures, as well as private and public spending and investment decisions. Private companies' investment decisions in particular are quite sensitive to inflation volatility, since their outcome can vary significantly according to companies' ability to compensate its effects (to increase their selling prices at the same pace with inflation).

Personal consumption expenditures volatility is also important for private as well as for public spending and investment decisions. Private companies, in particular, are very attentive to the evolution of personal consumption expenditures, since it influences their current and future selling and investment strategies. At the same time, this measure is important for the execution of public budgets, as well as for the future macroeconomic and budgetary forecasts.

We conclude that a stable and predictable economic policy is critical to economic growth.

Several further research questions can be raised in regard to the potential indirect impact of policy uncertainty translated through other variables; the endogeneity of public policies in respect to growth or the different effects of endogenous and exogenous shocks related to crisis episodes.

We also believe that basic financial education should be promoted and become a prerequisite at least for politicians, public employees and public managers. Even for the general public (as proposed by Greenspan in 2005), personal financial education would generate important benefits at societal level and contribute to a more predictable economic and financial evolution.

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