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Confidence and economic activity in Europe

Alessandro Saccal*

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Abstract

This work supplies additional empirical evidence of responses in real economic activity to shocks in confidence. A structural vector autoregression (SVAR) featuring confidence, real consumption and real output is constructed with respect to the Euro area and eight European nations. Results are mixed: responses exhibit reversibility and irreversibility, suggesting the formulation of a theoretical mechanism capable of formalising such a variety. The potential causes behind confidence in the same nations are moreover evaluated through a panel data regression. Results indicate aversion towards output, inflation, unemployment, monetary independence and financial openness, but favour population, exchange rate rigidity and the accumulation of sovereign debt.

JEL classification numbers: C32; C33; E37.

Keywords: confidence; economic activity; Europe.

1. INTRODUCTION

Market efficiency versus state intervention is the historic dispute amid economics, but explicit research on the role of confidence therein is relatively scarce. Notwithstanding, two views emerge, the Keynesian and the Pigovian view: the first conjectures confidence as pure sentiment¹ waves, while the second admits it as a proxy for news shocks to economic fundamentals (and noise shocks).

The Keynesian view is perhaps best exemplified by [Angeletos *et alii* \[2\]](#), wherein higher order beliefs are regarded as potentially expansionary and effective transmitters of pure sentiment shocks; other prominent references are [Angeletos and La'O \[3\]](#) and [Lorenzoni \[9\]](#). The Pigovian view, having gained ampler attention, is instead fittingly typified by [Barsky and Sims \[4\]](#) (as well as by [Cochrane \[8\]](#) and [Beaudry and Portier \[5\]](#)). In their work the signal extraction problem of news and noise shocks faced by agents is resolved as follows: because news and noise processes are not theoretically observable² confidence is devised as their theoretical and empirical proxy, so that empirical structural impulse response functions (SIRFs, i.e. orthogonalised) in real consumption and real output upon changes in confidence reveal the nature of the underlying shocks, as [Sims \[10\]](#) had indicated; such was applied to the USA.

In this work the same empirical exercise is carried out with respect to the ensuing sample: Euro area (EA); France; Germany; Greece; Ireland; Italy; Portugal; Spain; United kingdom (UK). Other than wishing to depict Europe's corresponding situation, the present scope involves the amplification of the germane SIRFs spectrum in order to expand upon the empirical basis for the two views. Be that as it may, this work chooses to ascribe neither news nor noise shocks to ones in empirical confidence, thereby accounting for [Chahrour and Jurado \[7\]](#)'s remark by which news and noise proxies are equivalent representations of economic fundamentals and beliefs³ (i.e. news and noise processes). Lastly, a panel data regression

*sacal.alessandro@gmail.com. Disclaimer: the author has no declaration of interest related to this research; all views and errors in this research are the author's. Note: a former version of this article titled "Confidence and economic activity in Western Europe" and all preventient versions by a title yet possibly different are hereby supplanted. ©Copyright 2021 Alessandro Saccal

¹Pure sentiment (i.e. demand, noise) is in contrast to sentiment, which is a typical confidence statistic.

²Such is the reason for which [Blanchard *et alii* \[6\]](#) might not empirically recover news and noise shocks, as also stressed by [Sims \[10\]](#).

³[Sims \[10\]](#) had implicitly conveyed so and [Barsky and Sims \[4\]](#) had implicitly applied it by choosing confidence as the equivalent representation of the underlying news and noise processes, as seen above.

with respect to the same nations is run to the end of probing for possible confidence constituents, thereby providing a better sense of its characterisation (even in reverse causality).

2. SVAR, IRFs AND FEVDs

Consider the following trivariate vector autoregression (VAR) of order 4:

$$x_t = \Pi_1 x_{t-1} + \dots + \Pi_4 x_{t-4} + w_t, \quad (1)$$

for $x_t = [s_t, c_t, y_t]^\top$, depicting economic sentiment (i.e. confidence), real consumption and real output, respectively, and w_t as a white noise. Real consumption is placed ahead of real output in light of its ampler informational content (i.e. the permanent income hypothesis whereby consumption is a sufficient statistic for future output; see [Cochrane \[8\]](#)). Upon parameters estimation and a short run restriction it is transformed into a structural VAR(1):

$$z_t = \Gamma z_{t-1} + \varepsilon_t,$$

for $z_t = [x_t, x_{t-1}, x_{t-2}, x_{t-3}, x_{t-4}]^\top$ and $\varepsilon_t = D\eta_t$, wherein D is a (5×5) lower triangular matrix, $E_t [\varepsilon_t \varepsilon_t^\top] = DD^\top$ and $E_t [\eta_t \eta_t^\top] = I$. Causality gives rise to a structural vector moving average (SVMA) of infinite order:

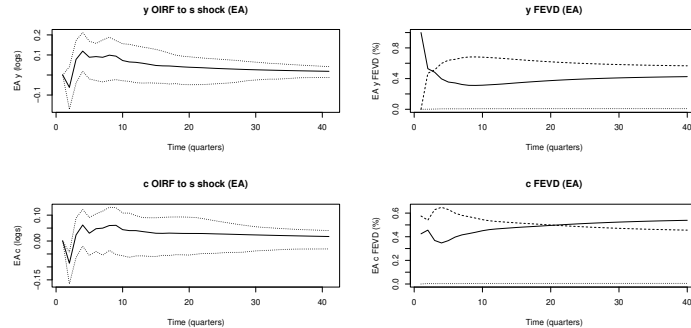
$$z_t = \sum_{j=0}^{\infty} \Gamma^j D \eta_{t-j}, \quad (2)$$

for SIRFs $\sum_{j=0}^{\infty} \Gamma^j D$ and forecast error variance decompositions (FEVDs) $Var(e_{t+h}) = Var\left(\sum_{j=0}^{h-1} \Gamma^j D\right)$.

The trivariate VAR(4) in question features an estimation in log-levels across all three variables because data therein are renowned to be generally co-integration robust. In order to describe the response of either real economic activity variable to a single impulse in economic sentiment one considers partial derivatives of real consumption and real output with respect to a short run restricted shock in economic sentiment (i.e. SIRFs), at a horizon of forty lags: $\frac{\partial z_t}{\partial \eta_{t-j}} = \Gamma^j D, \forall j = 0, 1, \dots$

The quarterly data (1996-2021) on the economic sentiment indicator were supplied by the [European commission directorate general for economic and financial affairs](#). Quarterly and nominal consumption expenditure and gross domestic product (GDP), seasonally and calendar adjusted and in millions of Euros, and the consumer price index (CPI) instead belong to the [Eurostat](#) accounts. Real consumption and real output are computed by dividing their nominal counterparts by the CPI. The construction of the economic sentiment indicator is located at page 21 of “The joint harmonised EU programme of business and consumer surveys” user guide.

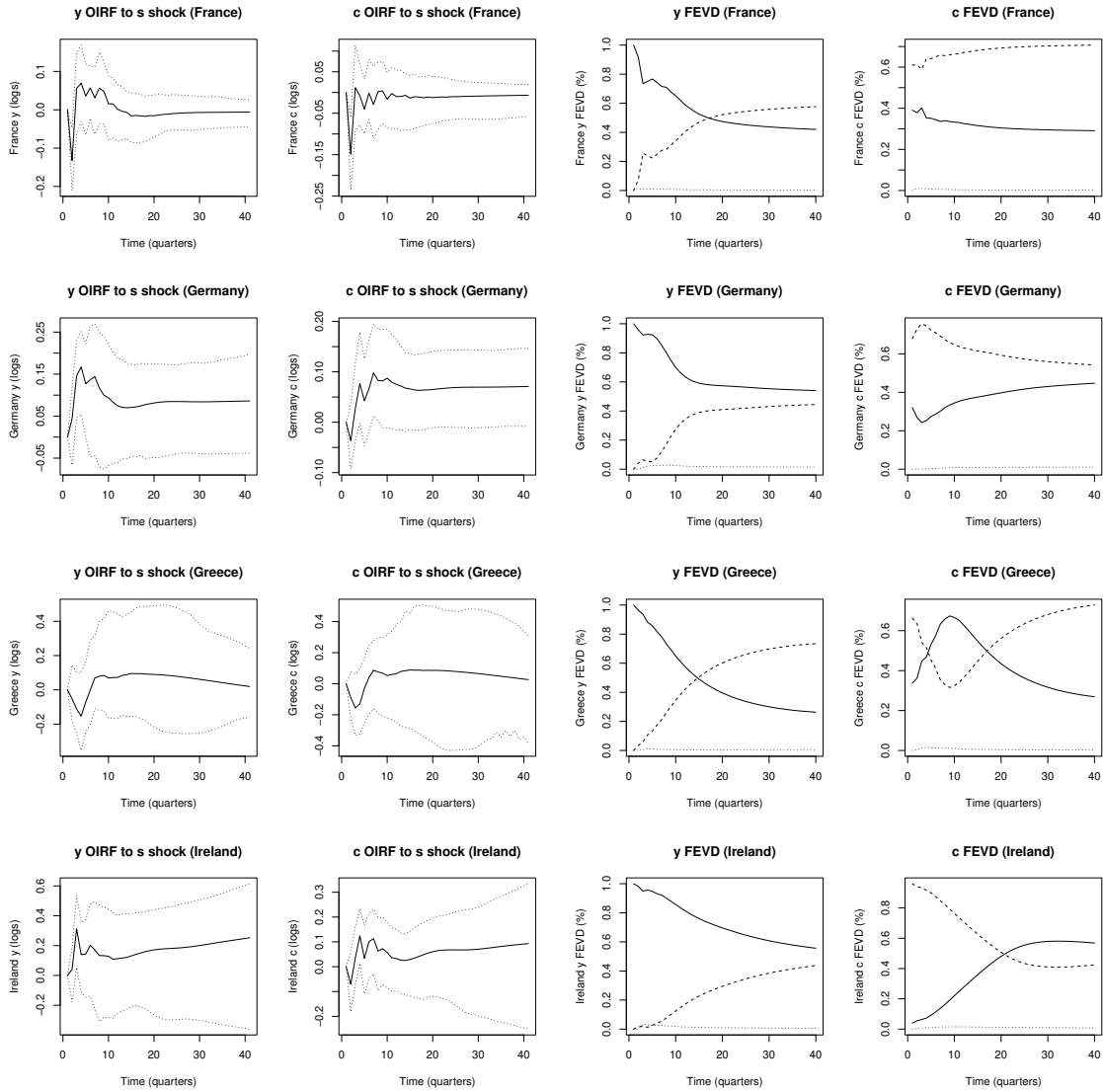
Figure 1: EA SIRFs and FEVDs



Note: The first column depicts EA SIRFs and confidence intervals (i.e. solid and dotted lines) of real output and real consumption to a shock in economic sentiment at a ten year horizon. The second column depicts EA FEVDs of real output and real consumption, wherein solid, dashed and dotted lines respectively graph the contributions of real output, real consumption and economic sentiment.

Following an immediate plunge, EA SIRFs display increasing short run reactions. As of the fifteenth quarter or so a new steady state is approached. EA responses exhibit a pattern of delayed irreversibility. The economic sentiment shock hardly accounts for real economic activity variations. The real consumption shock ultimately explains about fifty percent of the respective changes in real output and itself. The real output shock ultimately explains about forty and fifty percent of the respective changes in real consumption and itself.

Figure 2: French, German, Greek and Irish SIRFs and FEVDs



Note: The first and second columns depict French, German, Greek and Irish SIRFs and confidence intervals (i.e. solid and dotted lines) of real output and real consumption to a shock in economic sentiment at a ten year horizon. The third and fourth columns depict French, German, Greek and Irish FEVDs of real output and real consumption, wherein solid, dashed and dotted lines respectively graph the contributions of real output, real consumption and economic sentiment.

French SIRFs exhibit an immediate plunge and an oscillating and only partly successful return to the steady state therefrom, as of the fifteenth quarter *circa*. Both real output and real consumption increase the most around the fifth quarter, but the latter's oscillation is about the new steady state, whereas the former's follows a regressing expansion. French responses globally display a pattern of immediate irreversibility. The economic sentiment shock again hardly accounts for real economic activity variations. The real consumption shock ultimately explains about fifty and seventy percent of the respective changes

in real output and itself. The real output shock ultimately explains about thirty and forty percent of the respective changes in real consumption and itself.

German SIRFs globally display an immediate rise and are ultimately non-reverting. Real consumption increases the most around the tenth quarter and real output around the fifth, both approaching the new steady state around the twentieth. German responses globally exhibit a pattern of immediate irreversibility. The economic sentiment shock does not likewise account for real economic variations. The real consumption shock ultimately explains about forty and sixty percent of the respective changes in real output and itself. The real output shock ultimately explains about forty and sixty percent of the respective changes in real consumption and itself.

Greek SIRFs exhibit an immediate plunge, lasting until the tenth quarter *circa*, as of which the new steady state is softly approached. Greek responses display a pattern of delayed irreversibility. The economic sentiment shock similarly accounts for little variation in real economic activity. The real consumption shock ultimately explains sixty or so percent of the respective changes in real output and itself, though plunging to less than forty percent as regards the latter, around the tenth quarter. The real output shock ultimately explains thirty or so percent of the respective changes in real consumption and itself, though peaking to more than sixty percent as regards the former, around the tenth quarter.

Irish SIRFs globally display an immediate rise and are ultimately non-reverting, as German ones. Both real consumption and real output increase the most around the fifth quarter, approaching the new steady state around the twentieth. Irish responses globally exhibit a pattern of immediate irreversibility. The economic sentiment shock once again accounts for little variation in real economic activity. The real consumption shock ultimately explains forty or so percent of the respective changes in real output and itself, as of the twentieth quarter. The real output shock ultimately explains sixty or so percent of the respective changes in real consumption and itself, as of the twentieth quarter.

Italian SIRFs exhibit an immediate rise and a gradual, though slightly oscillating, return to the steady state, as of the fifteenth quarter *circa*. Both real output and real consumption increase the most around the fifth quarter. Italian responses display a pattern of delayed reversibility. The economic sentiment shock barely accounts for real economic activity variations afresh. The real consumption shock ultimately explains about thirty and seventy-five percent of the respective changes in real output and itself. The real output shock ultimately explains about sixty and twenty-five percent of the respective changes in itself and real consumption.

Portuguese SIRFs globally display an immediate rise and a gradual convergence towards the new steady state, as of the twentieth quarter *circa*. Both real output and real consumption increase the most around the fifth quarter. Portuguese responses globally exhibit a pattern of immediate irreversibility. The economic sentiment shock likewise accounts for little variation in real economic activity. The real consumption shock ultimately explains sixty or so percent of the respective changes in real output and itself. The real output shock ultimately explains forty or so percent of the respective changes in real consumption and itself.

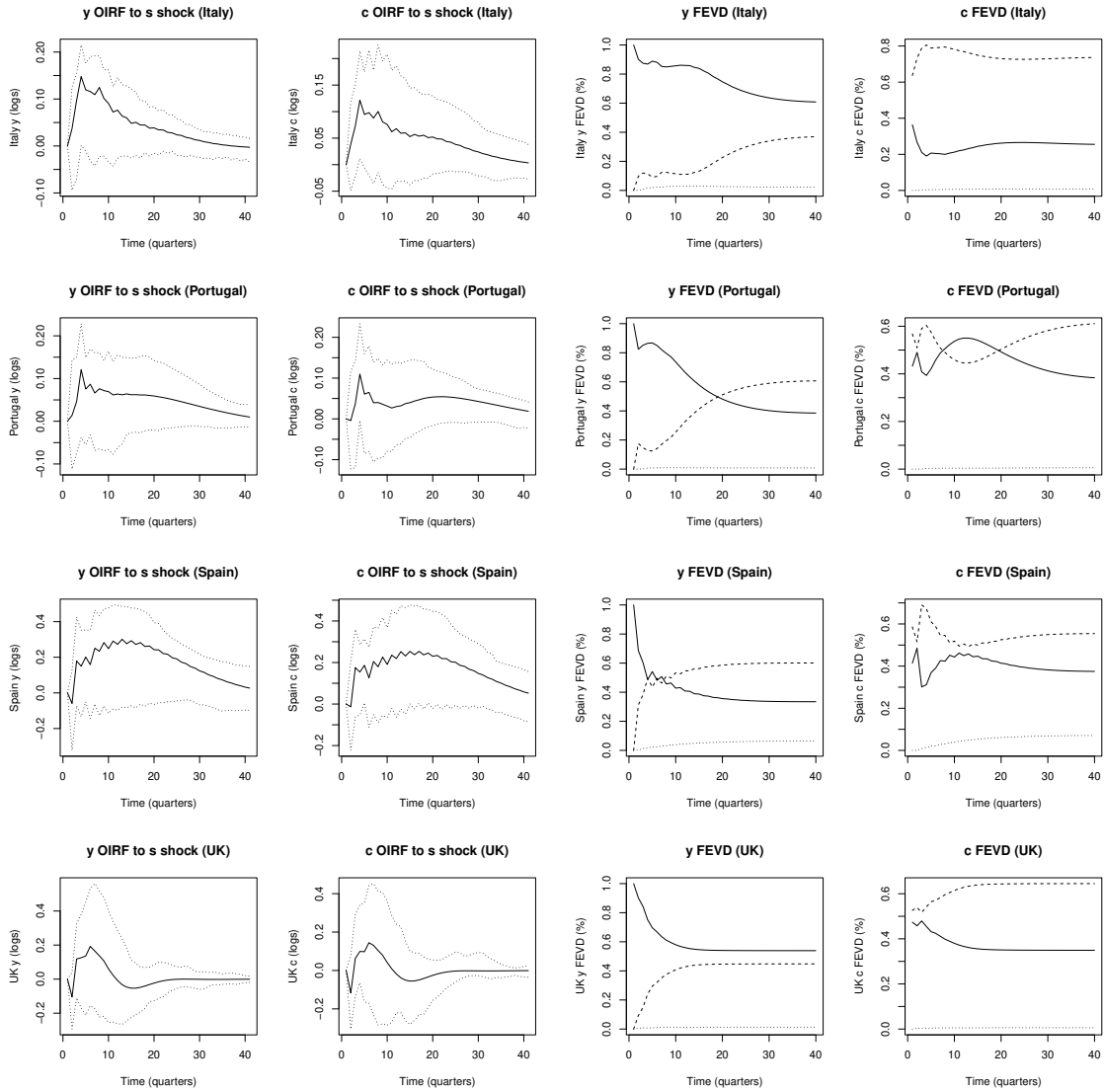
Spanish SIRFs globally exhibit an immediate rise and a gradual, though slightly oscillating, convergence towards the new steady state. Both real output and real consumption increase the most around the fifteenth quarter. Spanish responses globally display a pattern of immediate irreversibility. The economic sentiment shock does not again account for much variation in real economic activity. The real consumption shock ultimately explains about sixty and fifty-five percent of the respective changes in real output and itself. The real output shock ultimately explains forty or so percent of the respective changes in real consumption and itself.

British SIRFs globally display an immediate rise and a gradual, though slightly recessionary (around the fifteenth quarter), return to the steady state. British responses globally exhibit a pattern of delayed reversibility. The economic sentiment shock barely accounts for real economic activity variations afresh. The real consumption shock ultimately explains about forty and sixty percent of the respective changes in real output and itself. The real output shock ultimately explains about forty and sixty percent of the respective changes in real consumption and itself.

The resulting patterns are summarily those of immediate irreversibility (i.e. France, Germany, Ireland, Portugal, Spain), delayed irreversibility (i.e. EA, Greece) and delayed reversibility (i.e. Italy, UK). Immediate irreversibility signals a news shock to economic fundamentals driven by sustained effort and enthusiasm on the part of firms and households, respectively, before its fulfilment. Delayed irreversibility

suggests the same shock absent the said enthusiasm and effort. Delayed reversibility suggests a noise shock driven by firm effort and household enthusiasm. A structural framework which may give form to such a theorisation is therefore sought (within a dynamic stochastic general equilibrium model, ideally). The meagre, if not absent, contribution of the economic sentiment shock to the variations in real consumption and real output on the other hand importantly demarcates a tangential role for confidence in Europe's growth and business cycle.

Figure 3: Italian, Portuguese, Spanish and British SIRFs and FEVDs



Note: The first and second columns depict Italian, Portuguese, Spanish and British SIRFs and confidence intervals (i.e. solid and dotted lines) of real output and real consumption to a shock in economic sentiment at a ten year horizon. The third and fourth columns depict Italian, Portuguese, Spanish and British FEVDs of real output and real consumption, wherein solid, dashed and dotted lines respectively graph the contributions of real output, real consumption and economic sentiment.

3. PANEL DATA REGRESSION

The influence exerted by internal stability, public finance, population and the macroeconomic trilemma upon the economic sentiment indicator is now assessed by means of a European panel, ranging from 1980 to 2020, composed of the same eight nations: France; Germany; Greece; Ireland; Italy; Portugal; Spain; UK.

For group $i = \text{France}, \dots, \text{UK}$ and time $t = 1980, \dots, 2020$ one considers the following longitudinal matrix regression:

$$Y = X\beta + U, \quad (3)$$

wherein explained variable Y , explanatory variable X , gradient β and error U are of respective dimensions $(n_{it} \times 1)$, $(n_{it} \times n_x)$, $(n_x \times 1)$ and $(n_{it} \times 1)$. Specifically, the explained variable is the regressand column $Y = [s_{it_\alpha}, \dots, s_{it_\omega}]^\top$ over joint periods of group and time $it = it_\alpha, \dots, it_\omega$, spanning France 1980 to UK 2020. The explanatory variable is the regressors matrix $X = [1 \ y_{it_\alpha} \ \pi_{it_\alpha} \ u_{it_\alpha} \ d/y_{it_\alpha} \ P_{it_\alpha} \ er_{it_\alpha} \ mi_{it_\alpha} \ fo_{it_\alpha}, \dots, 1 \ y_{it_\omega}, \ \pi_{it_\omega} \ u_{it_\omega} \ d/y_{it_\omega} \ P_{it_\omega} \ er_{it_\omega} \ mi_{it_\omega} \ fo_{it_\omega}]^\top$ over the same joint periods of group and time it . The gradient is the column vector of coefficients $\beta = [\alpha, \dots, \beta_{fo}]^\top$. The error is the column vector of error terms $U = [u_{it_\alpha}, \dots, u_{it_\omega}]^\top$ over the same joint periods of group and time it .

Real GDP y is the quotient of nominal GDP, measured in billions of American Dollars, divided by the CPI. Inflation rate π is measured as the annual percentage change in the CPI. Unemployment rate u is measured as an annual percentage of the total labour force. Debt to GDP ratio d/y is measured as an annual percentage of GDP. Population P is measured in millions of persons. Exchange rate rigidity er , monetary independence mi and financial openness fo are dummy variables, taking values of one whenever respectively verified and zero otherwise. Quantitative data were taken from the [International monetary fund \(IMF\)](#) accounts. Qualitative data were supplied by [Aizenman *et alii* \[1\]](#)'s [Trilemma indexes](#).

The generalised least squares (GLS) estimator is homoskedastic and autocorrelation robust and it is thus adopted to gauge the statistical significance of gradient β 's row entries. Specifically, whenever $\text{Var}(U|X) = \sigma^2\Omega$, for $\sigma^2 \in (0, \infty)$, $\Omega = \Gamma^\top^{-1}\Gamma^{-1}$ and a lower triangular Γ matrix,

$$\hat{\beta}_{GLS} = (X^\top X^*)^{-1} X^\top Y^* \quad (4)$$

is a GLS estimator, for $Y^* = \Gamma Y$, $X^* = \Gamma X$ and $U^* = \Gamma U$ such that $\text{Var}(U^*|X^*) = \sigma^2\Gamma\Omega\Gamma^\top$. In addition, whenever $\Omega = I_n$ the GLS estimator equals the ordinary least squares (OLS) one: $\hat{\beta}_{GLS} = \hat{\beta}_{OLS}$. The t-statistic, practically equals the estimator divided by its standard error, which is the sample standard deviation divided by the square root of the observations: $t = \frac{\hat{\beta}}{se(\hat{\beta})}$, wherein $se(\hat{\beta}) = \frac{s}{\sqrt{n}}$. The p-value is the probability of observing values greater than the t-statistic in modulus under the null hypothesis of no statistical significance: $p = Pr(> |t| | H_0 : \hat{\beta} = 0)$; low p-values (i.e. typically lower than 0.1) are therefore indicative of statistical significance.

Table 1: European panel data GLS regression results

Coefficient	Estimate (Standard error)	p-value
α	108.227574 (0.642279)	$< 2.2 \times 10^{-16}$
β_y	-0.159200 (0.069863)	0.02268
β_π	-0.145115 (0.024643)	3.895×10^{-9}
β_u	-0.505573 (0.029940)	$< 2.2 \times 10^{-16}$
$\beta_{d/y}$	0.020799 (0.004596)	6.027×10^{-6}
β_P	0.043338 (0.025563)	0.09001
β_{er}	0.779649 (0.118970)	5.627×10^{-11}
β_{mi}	-1.441483 (0.188244)	1.895×10^{-14}
β_{fo}	-3.690123 (0.193960)	$< 2.2 \times 10^{-16}$

Note: Coefficient estimates, standard errors and p-values of a GLS regression for France, Germany, Greece, Ireland, Italy, Portugal, Spain and the UK from 1980 to 2020. The regressand is the economic sentiment indicator and the regressors are real output, inflation, unemployment, the debt to GDP ratio, population, exchange rate rigidity, monetary independence and financial openness.

All coefficients are statistically significant: six are so at the null significance level, one at 0.05 and another

at 0.1, being those of real GDP and population, respectively. Standard errors are moreover commensurate with coefficients estimates, in turn mostly in line with economic theory.

A unit rise in real GDP, inflation, unemployment, monetary independence or financial openness gives rise to a unit fall in economic sentiment. While the negative sign of the inflation and unemployment coefficients may signal aversion towards internal instability, that of the coefficients proper to real GDP and monetary independence is counterintuitive. The negative sign of the financial openness coefficient was instead debatably expectable, for aversion towards the instability of financial markets and the attendant repercussions upon the business cycle is renowned amongst most of the sample (i.e. Greece, Italy, perhaps Portugal, Spain and even France). The unemployment coefficient's magnitude also exceeds that of real GDP and inflation about thrice, that of monetary independence exceeds the former almost thrice in turn and financial openness' coefficient magnitude exceeds that of monetary independence by two times and a half.

A unit rise in the debt to GDP ratio, in population and exchange rate rigidity by contrast gives rise to a unit rise in economic sentiment. While the positive sign of the population coefficient might be expected, ultimately empowering growth, that of the coefficient proper to the debt to GDP ratio is counterintuitive. The positive sign of the exchange rate rigidity coefficient signals a preference for exchange rate fixation or regulation, for most sampled nations favour the single currency in spite of the havoc (many argue) it wreaked. The said coefficient's magnitude is furthermore twentyfold that of population, in turn twofold that of the debt to GDP ratio.

4. CONCLUSION

This work has supplied additional empirical evidence of responses in real economic activity to shocks in confidence. By having computed short run restricted IRFs and FEVDs with respect to the EA and eight European nations one has found outcomes spanning immediate and delayed irreversibility and delayed reversibility, invoking a structural framework able to theorise them. A panel data regression with respect to the same eight nations has finally shown aversion towards output, inflation, unemployment, monetary independence and financial openness and a preference for population, exchange rate rigidity and the accumulation of sovereign debt.

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