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* Views expressed are those of the authors and do not necessarily reflect official positions of De Nederlandsche Bank.

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Animal spirits and household spending in Europe and the US*

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Abstract

We investigate whether consumer confidence has an independent effect on household spending. First, we control for a common set of factors that drive both consumer confidence and household spending. Next, we interpret the non-systematic residuals in the country consumer confidence equations as a proxy for animal spirits, "a spontaneous urge to action rather than inaction" in Keynes' words, and subsequently include this proxy in the spending equations as an additional explanatory variable. Our results suggest that animal spirits exist and may have a considerable impact on spending growth in Europe and the US.

Keywords: animal spirits, private consumption.
JEL classifications: E21, E71.

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1. Introduction

It has been shown that consumer confidence is strongly associated with future economic activity (see, for instance, Carroll et al., 1994). We investigate whether this merely reflects that changes in consumer confidence mirror information that can also be inferred from other economic indicators, or that they contain meaningful independent information about the economy. In other words, we investigate whether "animal spirits" exist.

There are two contrasting views about the role of consumer confidence in macroeconomics: the "animal spirits view" vs. the "news view" (Barsky and Sims, 2012). The first implies independent fluctuations in beliefs, which in turn have causal effects on economic activity (Blanchard, 1993). The second view suggests that the correlation between shocks to consumer confidence and subsequent economic activity arises because confidence measures contain information about the current and future states of the economy, which is also reflected in other macroeconomic variables (ECB, 2015). In this view, the value added of confidence measures lies in their timeliness in providing information about future consumption growth, as these are usually available several months earlier than data on key determinants of consumption (e.g. disposable income). There is no consensus in the literature. On the one hand, Akerlof and Shiller (2009) argue that the traditional economic theory fails to offer a true understanding of important economic events as it ignores animal spirits. According to them, the root causes of the Great Depression as well as the Great Recession can be found in these "mental" movements.[1] Similarly, in search of the drivers of the 1990/91 recession in the US, Blanchard (1993) suggests that the cause of the recession was a powerful, long-lasting negative consumption shock associated with an exogenous shift in pessimism that had a causal effect on overall aggregate demand. In a later paper, Blanchard et al. (2013) estimate a structural model and find that animal spirits ("noise shocks") play an important role in determining short-run consumption dynamics. Dées and Zimic (2016) find that noise shocks explain almost half of

[1] They quote Keynes (1935): "Our basis of knowledge for estimating the yield ten years hence of a railway, a copper mine, a textile factory, the goodwill of a patent medicine, an Atlantic liner, a building in the City of London amounts to little and sometimes to nothing…If people are so uncertain, how are decisions made? They can only be taken as a result of animal spirits. They are the result of a spontaneous urge to action".

business cycle fluctuations in the short term. On the other hand, the findings of Barsky and Sims (2012) provide support to the "news view" and suggest that consumer confidence aggregates information from many sources but does not drive consumption on its own. Likewise, the findings of Ludvigson (2004) suggest only a modest role for animal spirits in driving consumption.

In this paper, we address the question whether consumer confidence has an independent effect on household spending. We do this by first estimating a regression equation to explain consumer confidence with the same set of explanatory variables that we later use to explain household spending. We then use the estimated non-systematic residuals from the consumer confidence equation as an additional explanatory variable when estimating household spending equation, and interpret them as a sign of animal spirits behavior. Most of the related empirical literature focuses on the US. Besides the US, our sample includes the euro area, the UK, Sweden and Norway. Our findings suggest that animal spirits matter for household spending in both Europe and the US.

2. Data and methodology

The data we use come from the following sources. Consumer confidence data for the EU countries come from the European Commission, for the US from the University of Michigan Survey of Consumers, and for Norway from Kantar TNS. Household spending (private final consumption expenditure), house prices, labour income, the unemployment rate, personal consumption deflator, and consumer price index have been taken from the OECD. The VIX index comes from the Chicago Board Options Exchange, and short-term interest rate have been retrieved from both the OECD and the IMF. Finally, stock prices come from Refinitiv. Household spending, house prices and labour income are deflated by the personal consumption deflator, and the short-term interest rate is deflated by consumer price index. Our sample includes the US, the euro area, the UK, Sweden and Norway.[2] Data are quarterly and the sample period is from 1995q1 to 2018q3.

There are several ways to test empirically whether the quarterly change in consumer confidence (Δcc) and the quarterly growth rate of real household

[2] The euro area, the UK and Sweden together cover 91% of EU's GDP.

spending (*g(cons)*) are driven by the same fundamental news shock (Δx), or whether innovations to consumer confidence represent independent fluctuations in beliefs that have a causal effect on consumption. A Granger causality test rejects the hypothesis that causality *does not* run from changes in consumer confidence to changes in real private consumption (Table 1, column 2). The hypothesis that causality *does not* run from changes in real private consumption to changes in consumer confidence cannot be rejected (Table 1, column 3). This is a first rough signal that confidence shocks may be affecting consumer spending.

Table 1. Direction Granger causality $\Delta cc \leftrightarrow g(cons)$ (1995:q1-2018:q3)

Country	p-value	
	$\Delta cc \nrightarrow g(cons)$	$g(cons) \nrightarrow \Delta cc$
US	0.03	0.09
EA	0.00	0.96
SE	0.00	0.33
UK	0.00	0.36
NO	0.04	0.49

Note: Granger causality test with 2 lags

Next, we explore in greater detail the role consumer confidence plays in the dynamics of household spending in the short run. The starting point of our investigation is the 'news' interpretation of consumer confidence. In this approach, changes in consumer confidence and household spending are determined by the same set of economic variables. First, we estimate the change in consumer confidence (see Eq. 1 below). The residual (and its lags) from this estimation is then added as an additional explanatory variable into the equation of household spending (see Eq. 2 below). If the residual appears to have a statistically significant effect in explaining household spending with the expected sign, we interpret this as a sign of animal spirits behavior .

The set of economic variables explaining both household spending and consumer confidence is built upon Kharroubi and Kohlscheen (2017).[3] It is composed of real

[3] In addition to Kharroubi and Kohlscheen (2017), we add the unemployment rate and stock prices to the analysis, in line with DNB's macroeconomic policy model of the Netherlands, DELFI (2018).

house prices (*hp*), real labour income (*I*)[4], the unemployment rate (*un*), the real short term interest rate (*r*), real stock prices (*stk*), and a financial market volatility index (*vix*) that serves as a proxy for financial market uncertainty. The estimated equations are as follows:

$$\Delta cc_t = \delta_0 + \delta_1 \Delta cc_{t-1} + \delta_2 cc_{t-2} + \delta_3 g(cons_{t-1}) + \gamma_1 g(hp_{t-1}) + \gamma_2 g(l_t) + \gamma_3 \Delta un_t + \gamma_4 \Delta r_t + \gamma_5 g(stk_t) + \gamma_6 \mathrm{g}(vix_t) + v_t \quad (1)$$

$$g(cons_t) = \alpha_0 + \alpha_1 g(cons_{t-1}) + \alpha_2 g(cons_{t-2}) + \beta_1 g(hp_{t-1}) + \beta_2 \mathrm{g}(l_t) + \beta_3 \Delta un_t + \beta_4 \Delta r_t + \beta_5 g(stk_t) + \beta_6 \mathrm{g}(vix_t) + \sum_{i=0}^{2} \mu_i \frac{v_{t-i}}{\sigma v_{t-i}} + e_t \quad (2)$$

Δ represents first differences, g denotes quarterly growth rates and subscript t denotes time in quarters. v_t and e_t are the residual terms in Eq. 1 and Eq. 2, respectively. We include the normalized residual $\frac{v_t}{\sigma v_t}$ (v_t divided by its standard deviation) so that a proper comparison across countries can be made. The equations are estimated for each country separately and not as a panel. As we use quarterly data, changes in house prices enter with a first lag; the information on house price changes is available to households with a certain lag (see also Catte et al., 2004). If v_t is statistical noise, μ is expected to be statistically insignificant. If, on the other hand, μ is statistically significant and has the expected positive sign, we interpret this as a sign of animal spirit footprints, as mentioned above.

3. Main findings

Tables 2a and 2b summarize the OLS-estimation outcomes for changes in consumer confidence (Eq. 1) and tables 3a and 3b for growth in real household spending (Eq. 2). To a varying degree, changes in consumer confidence can be explained by the explanatory variables. R^2 ranges from 0.20 for the UK to 0.51 for the euro area. All coefficients that are statistically significant have the expected signs. The estimated negative coefficient for the lagged value of the level of cc indicates that consumer confidence, *ceteris paribus*, has a tendency to return to a neutral balance of positive and negative opinions on the economy. Moreover, past changes in household spending do not significantly affect consumer confidence.

[4] We use labour income due to data availability, as labour income allows us to cover a longer time period.

This is in line with the outcomes of the aforementioned Granger causality tests. The Portmanteau autocorrelation test indicates that the country residuals in the confidence equations show no autocorrelation up to 8 quarterly lags. From a statistical point of view, the residuals in Eq. 1 can therefore be considered as noise.

Table 2a. OLS-estimation results for Eq. 1 (*y*=consumer confidence)

$\Delta cc_t = \delta_0 + \delta_1 \Delta cc_{t-1} + \delta_2\, cc_{t-2} + \delta_3 g(cons_{t-1}) + \gamma_1 g(hp_{t-1}) + \gamma_2 g(l_t) + \gamma_3 \Delta un_t + \gamma_4 \Delta r_t + \gamma_5 g(stk_t) + \gamma_6 g(vix_t) + v_t$

Δcc_t	δ_1	δ_2	δ_3	γ_1	γ_2	γ_3	γ_4	γ_5	γ_6	R^2
US	-0.10	-0.10	2.00	0.81	2.55	-2.88	1.86	0.10	-0.10	0.37
	(-1.0)	(-3.0)	(1.1)	(1.3)	(3.0)	(-1.0)	(2.0)	(0.9)	(-2.3)	
EA	0.26	-0.17	-0.29	0.23	0.93	-2.01	-0.07	0.05	-0.00	0.51
	(2.8)	(-3.8)	(-0.6)	(1.0)	(2.2)	(-2.3)	(-0.2)	(3.5)	(-0.4)	
SE	0.18	-0.24	-0.16	0.08	0.42	-0.79	0.50	0.01	-0.02	0.34
	(1.7)	(-4.8)	(-0.5)	(0.5)	(2.0)	(-1.2)	(1.4)	(0.6)	(-1.9)	
UK	0.06	-0.16	-0.30	0.27	0.50	-1.67	-0.21	0.13	0.02	0.20
	(0.5)	(-3.0)	(-0.6)	(1.4)	(1.9)	(-1.0)	(-0.3)	(2.8)	(1.2)	
NO	-0.33	-0.27	-0.35	0.44	0.32	-13.1	-0.98	0.22	-0.17	0.27
	(3.3)	(-3.2)	(-0.2)	(0.5)	(0.2)	(-1.9)	(-0.7)	(1.4)	(-2.0)	
Adj. Q-stat system residual Portmanteau test for autocorrelation up to 8 lags: 212.7 (p-value=0.26)										

Note: t-statistics between parentheses

Table 2b. OLS-estimation results Eq. 1 excluding $g(cons_{t-1})$

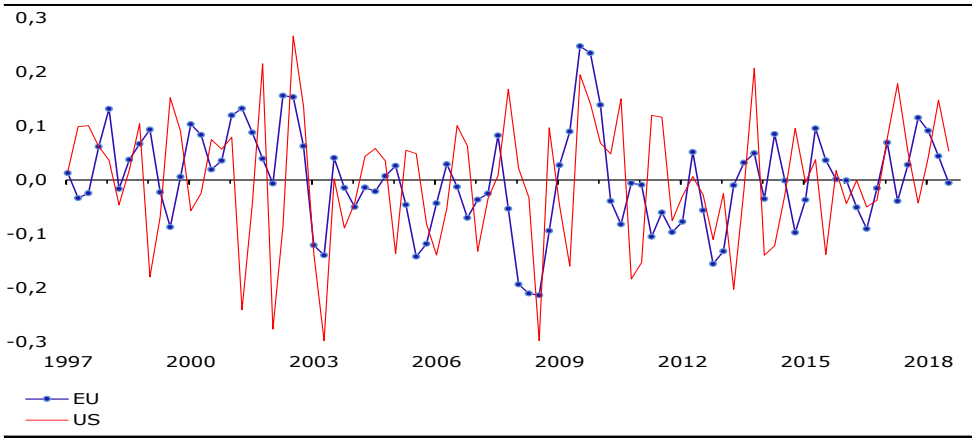
$\Delta cc_t = \delta_0 + \delta_1 \Delta cc_{t-1} + \delta_2\, cc_{t-2} + \gamma_1 g(hp_{t-1}) + \gamma_2 g(l_t) + \gamma_3 \Delta un_t + \gamma_4 \Delta r_t + \gamma_5 g(stk_t) + \gamma_6 g(vix_t) + v_t$

Δcc_t	δ_1	δ_2	δ_3	γ_1	γ_2	γ_3	γ_4	γ_5	γ_6	R^2
US	-0.10	-0.08	0	0.91	2.79	-3.70	1.75	0.10	-0.10	0.37
	(-1.0)	(-2.8)	(-)	(1.4)	(3.4)	(-1.3)	(1.9)	(1.0)	(-2.4)	
EA	0.25	-0.18	0	0.20	0.95	-1.96	-0.08	0.05	-0.00	0.52
	(2.8)	(-4.5)	(-)	(0.9)	(2.3)	(-2.2)	(-0.2)	(3.5)	(-0.5)	
SE	0.17	-0.24	0	0.06	0.39	-0.73	0.49	0.01	-0.02	0.35
	(1.7)	(-4.8)	(-)	(0.4)	(2.0)	(-1.1)	(1.4)	(0.6)	(-2.0)	
UK	0.06	-0.17	0	0.25	0.48	-1.45	-0.21	0.12	0.02	0.21
	(0.5)	(-3.3)	(-)	(1.3)	(1.9)	(-0.9)	(-0.3)	(2.7)	(1.2)	
NO	-0.34	-0.27	0	0.36	0.35	-13.1	-0.95	0.22	-0.17	0.28
	(3.3)	(-3.3)	(-)	(0.4)	(0.3)	(-1.9)	(-0.6)	(1.4)	(-2.0)	
Adj. Q-stat system residual Portmanteau test for autocorrelation up to 8 lags: 211.7 (p-value=0.27)										

Note: t-statistics between parentheses

The baseline results of an OLS regression for real household spending growth excluding the animal spirits proxy are summarized in Table 3a. Table 3b provides the outcomes including $\frac{v_t}{\sigma v_t}$. We include both the contemporaneous animal spirits proxy, as well as its one and two quarter lags. It turns out that lags of order three or higher play no significant role. In all countries except for Norway, the coefficients of our proxy for animal spirits are significant and have the expected positive sign. The highest significance is for one period lagged proxy, $\frac{v_{t-1}}{\sigma v}_{t-1}$. Thus, we can argue that the residuals of consumer confidence equations are not merely statistical noise, but contain relevant independent information on spending behavior that is not already captured by the other determinants. This hints at the existence of animal spirits behavior. Figure 1 offers a graphical impression of the contribution of animal spirits to the quarterly growth of household spending in the US and the EU as a whole. The impact ranges from -0.3/-0.2 percentage points to almost 0.3 percentage points for these countries, respectively.

Figure 1. Estimated contribution of animal spirits to household spending growth
Percentage points; contribution to quarterly growth rates



Note that the inclusion of the animal spirits proxy raises the explanatory power of Eq. 2. R^2 from 0.45 to 0.49 for the US and from 0.51 to 0.56 for the euro area. The strongest improvement of R^2 is for Sweden (10 percentage points) and the smallest is for Norway. Interestingly, the hypothesis that the animal spirit parameters are the same across countries cannot be rejected (as indicated by the Wald-test).

Table 3a. Baseline OLS-estimation results Eq.2 (*y*=household spending)

$g(cons_t) = \alpha_0 + \alpha_1\, g(cons_{t-1}) + \alpha_2 g(cons_{t-2}) + \beta_1 g(hp_{t-1}) + \beta_2 \mathrm{g}(l_t) +$
$\beta_3 \Delta un_t + \beta_4 \Delta r_t + \beta_5 g(stk_t) + \beta_6 \mathrm{g}(vix_t) + \varepsilon_t$

$g(cons_t)$	α_1	α_2	β_1	β_2	β_3	β_4	β_5	β_6	R^2
US	0.08	0.26	0.10	0.11	-0.07	-0.02	0.01	-0.00	0.45
	(0.7)	(2.6)	(2.8)	(2.3)	(-0.4)	(-0.4)	(1.6)	(-0.3)	
EA	-0.01	0.28	0.09	0.32	-0.25	-0.02	0.01	0.00	0.51
	(1.0)	(2.7)	(1.6)	(3.1)	(-1.3)	(-0.3)	(2.3)	(1.3)	
SE	-0.36	-0.09	0.20	0.22	-0.29	0.09	0.002	-0.00	0.30
	(-3.1)	(-0.9)	(4.2)	(3.0)	(-1.2)	(0.7)	(2.5)	(-0.5)	
UK	-0.22	0.18	0.09	0.22	-0.93	0.04	0.00	0.00	0.42
	(-2.0)	(1.9)	(2.3)	(4.1)	(-2.7)	(0.3)	(0.2)	(0.7)	
NO	-0.30	-0.12	0.16	0.14	0.08	-0.01	0.034	0.01	0.24
	(-2.9)	(-1.3)	(2.7)	(1.7)	(0.2)	(-0.1)	(3.3)	(1.0)	
Adj Q-stat system residual Portmanteau test for autocorrelation up to 8 lags: 215.8 (p-value=0.21)									

Note: t-statistics between parentheses

Table 3b. OLS-estimation results Eq.2 growth real consumption incl. animal spirits

$g(cons_t) = \alpha_0 + \alpha_1\, g(cons_{t-1}) + \alpha_2 g(cons_{t-2}) + \beta_1 g(hp_{t-1}) + \beta_2 \mathrm{g}(l_t) + \beta_3 \Delta un_t +$
$\beta_4 \Delta r_t + \beta_5 g(stk_t) + \beta_6 \mathrm{g}(vix_t) + \sum_{i=0}^{2} \mu_i \frac{v_{t-i}}{\sigma v}_{t-i} + \varepsilon_t$

$g(cons_t)$	α_1	α_2	β_1	β_2	β_3	β_4	β_5	β_6	μ_0	μ_1	μ_2	R^2
US	0.09	0.25	0.10	0.11	-0.05	-0.01	0.01	-0.00	-0.03	0.10	0.06	0.49
	(0.8)	(2.6)	(2.9)	(2.2)	(-0.3)	(-0.2)	(1.3)	(-0.9)	(-0.7)	(2.5)	(1.6)	
EA	-0.05	0.30	0.09	0.29	-0.24	-0.06	0.01	0.00	0.03	0.07	0.05	0.56
	(-0.5)	(3.0)	(1.8)	(2.9)	(-1.3)	(-0.8)	(2.4)	(1.6)	(1.1)	(2.4)	(1.6)	
SE	-0.46	-0.13	0.17	0.26	-0.44	0.06	0.02	-0.00	0.08	0.20	0.16	0.40
	(-4.1)	(-0.9)	(4.2)	(3.0)	(-1.2)	(0.7)	(2.5)	(-0.5)	(1.3)	(3.2)	(2.4)	
UK	-0.18	0.21	0.07	0.21	-0.87	0.02	0.00	0.00	0.03	0.15	-0.02	0.45
	(-1.7)	(2.2)	(1.9)	(3.9)	(-2.5)	(0.1)	(0.3)	(0.5)	(0.6)	(2.5)	(-0.4)	
NO	-0.31	-0.11	0.15	0.14	0.03	-0.02	0.03	0.00	0.00	0.16	0.08	0.24
	(-2.9)	(-1.1)	(2.5)	(1.7)	(0.1)	(-0.2)	(2.9)	(0.6)	(0.0)	(1.7)	(0.9)	
Adj Q-stat system residual Portmanteau test for autocorrelation up to 8 lags: 200.8 (p-value=0.47)												

Note: t-statistics between parentheses

Robustness tests suggest that our findings are not coincidental. For instance, the results continue to hold when we leave out the crisis years (2008 and 2009), as a comparison of columns 1 and 2 in Table 4 reveals. Inevitably, our results may also be driven by one or more omitted variables, which is particularly difficult to rule out convincingly when employing aggregate data. However, given the broad set of

economic variables we employ and the non-systematic nature of the residuals in the confidence equations (μi), we feel confident that our findings are robust. Adding additional variables such as oil price changes and exchange rate changes to equations 1 and 2 does not alter our results (see Table 4, column 3 and 4).

Table 4. Robustness tests
(*i* denotes lags; *i*=0,1,2)

		(1) 1995q4-2018q3	(2) Excl. 2008q1-2009q4	(3) Incl. changes in oil price	(4) Incl. changes in oil price & exchange rate
US	μ_0	-0.03	-0.06	-0.06	-0.06*
	μ_1	0.10**	0.11***	0.08**	0.08**
	μ_2	0.06*	-0.02	0.08**	0.08**
EA	μ_0	0.03	0.03	0.03	0,03
	μ_1	0.07**	0.06**	0.07**	0.07**
	μ_2	0.05*	0.02	0.05*	0.06**
SE	μ_0	0.08	0.09	0.07	0,08
	μ_1	0.20***	0.19***	0.19***	0.18***
	μ_2	0.16**	0.11	0.15*	0.15**
UK	μ_0	0.03	0.12**	0.03	0,03
	μ_1	0.15***	0.17***	0.14**	0.13**
	μ_2	-0.02	-0.05	-0.05	-0.05
NO	μ_0	0.00	-0.02	-0.07	-0.07
	μ_1	0.16*	0.15*	0.12	0.11
	μ_2	0.08	0.05	0.05	0.05

***, **, * = 99%, 95% resp. 90% confidence level

4. Conclusion

We investigated in this paper whether consumer confidence has an independent effect on household spending. Our results suggest that animal spirits exist and may have a considerable impact on spending growth, both in Europe and the US. In other words, although animal spirits may not affect household spending substantially, as some suggest, they are also not negligible. It is therefore worthwhile to take the consumer confidence channel into account in macro-economic modelling and short-term forecasting.

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