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**Has the Financial Crisis eroded Citizens'
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Panel Data Evidence for the Euro Area,
1999-2011**

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HAS THE FINANCIAL CRISIS ERODED CITIZENS' TRUST IN THE EUROPEAN CENTRAL BANK? PANEL DATA EVIDENCE FOR THE EURO AREA, 1999-2011

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Abstract

In the aftermath of the financial crisis trust in the European Central Bank (ECB) has reached an historical low. Taking panel data and using a fixed effects DFGLS estimation for a 12-country sample over the time period 1999 to 2011 with a total of 312 observations, this paper detects a structural break in citizens' trust in the ECB. The paper confirms that during the pre-crisis period, citizens' trust in the ECB was driven by economic growth. In crisis time, however, trust in the ECB is both driven by inflation and unemployment.

Keywords: Financial Crisis, Trust, European Central Bank

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1. *Introduction*

The bankruptcy of Lehman Brothers in September, 2008 triggered a crisis of trust (Sapienza and Zingales, 2009; Guiso, 2010) and of confidence (Tonkiss, 2009) crisis and has acted as the starting point of a financial and economic crisis for most advanced economies worldwide, including advanced economies in the euro area (EEAG, 2010). The breeding ground of the financial crisis was mostly created by a lack of regulation within the institutional framework of the financial system in the US as well as in Europe (Acharya, 2009; De Grauwe, 2009; Stiglitz, 2009; Financial Crisis Inquiry Commission, 2011). Since central banks are commonly identified to be the major guardians of the financial system (Healy, 2001, p. 22), the financial crisis will most likely have eroded citizens' trust in central banks. Indeed it has been shown that citizens' trust in national central banks (Gros and Roth, 2009) and in the ECB (Roth, 2009 a, b; Gros and Roth, 2010) has reached an historical low in the period since September 2008 onwards. Based upon these findings it now seems worthwhile to analyze the precise channels that have caused this loss of citizens' trust in central banks.

In this respect the following paper will focus on the euro area and citizens' trust in the ECB. The paper will be structured in the following manner. It will first embed the concept of citizens' trust in the ECB within the overall concept of systemic trust and will elaborate what might be the consequences of an enduring loss of citizens' trust in the ECB. In a next step the paper will try to identify those factors that most likely led to the loss of citizens' trust in the ECB. Based upon these theoretical assumptions, the paper will elaborate upon the operationalization of trust, its model specification and the measurement of the data. A description of the trend in citizens' trust will be followed by a discussion about methodological issues, a presentation of the econometric results and a discussion of our results in the context of previous empirical results. The conclusions will summarize the main findings and suggest ways in which citizens' trust might be restored in the ECB.

2. *Theoretical links*

2.1. *The consequences of an enduring loss of citizens' trust in the ECB*

Trust can be conceptualized into three forms: thick, interpersonal and systemic or institutional trust (Khodyakov, 2007; Roth, 2009c). As this paper will analyze citizens' trust in the ECB, it will take the concept of systemic trust as its starting point. A prominent and for our paper suitable elaboration of systemic trust is given within the sociological discipline by Luhmann (2000) and Giddens (1996). Both authors stress the importance of systemic trust in today's

modern complex societies (Luhmann, 2000, p. 26; Giddens, 1996, p. 165). For Luhmann systemic trust is necessary to reduce the complexity of modern societies in order to stabilize its very foundations (Luhmann, 2000, p. 72). Giddens characterizes systemic trust as necessary to secure the functioning of modern societies, and warns that decreasing levels of systemic trust have in some cases the potential to break apart institutional arrangements (Giddens, 1996, p. 166). Concerning the latter argument, political scientists such as Kaltenthaler et al (2010) focus on trust in (policy-making) institutions. Alongside Kosfeld et al. (2005, p. 673), Kaltenthaler et al. (2010, p.1262) argue that a certain level of citizens' trust in a policy-making institution is crucial for the legitimacy of that institution.

How do these arguments apply to the concept of trust in the ECB and what are the consequences of an enduring loss of citizens' trust in the ECB? As the ECB is a (policy-making) institution, it can be argued that a certain level of citizens' trust in the ECB seems to be crucial to maintain its legitimacy. In addition, as the ECB is an *independent* institution which is not democratically elected (as highlighted in Article 130 TFEU of the Treaty of Lisbon (2009)) the "legitimacy" argument applies to an even greater extent to the ECB than to other policy-making institutions. In this respect a high level of citizens' trust in the ECB can be characterized as a proxy for a high approval rating among citizens which ultimately secures the independence of the ECB. Following from the above argumentation, it seems apparent that a loss of trust will make the ECB vulnerable to political influence, as citizens will most likely pressure politicians to minimize the ECB's independence (Kaltenthaler et al., 2010, p. 1261). This reasoning is shared by the ECB policy-makers. Via publicly available communications (ECB, 2010), an interview with the president Wim Duisenberg (Wenkel, 2008) and other expert interviews (Kaltenthaler et al., 2010, p. 1267), ECB policy-makers confirm that they depend on citizens' trust in the ECB to resist pressures from politicians and secure their independence. As we have argued that a loss of trust in the ECB will endanger the ECB's independence we still have to clarify why this granted independence is important for the ECB. Concerning the importance of the independence of central banks, a detailed literature survey by Eijffinger and De Haan, evaluating the pre-existing theoretical and empirical literature, comes to the conclusion that the independence of central banks will be associated with lower inflation rates and will thus entail less costs to long-term economic growth (Eijffinger and De Haan, 1996, p. 54).

2.2. *Possible factors informing citizens' trust in the ECB*

Although citizens' perceptions might influence citizens' systemic trust (Banducci et al., 2009, p. 572) this paper solely focuses on the impact of the "classical" three macro economic variables:

i) inflation, ii) growth of GDP per capita and iii) unemployment when trying to identify those factors that led to a loss of citizens' trust in the ECB. This undertaking seems to be reasonable for three reasons. First, it is soundly rooted in economic theory when considering the literature on popularity functions (Nannestad and Paldam, 1994), the pre-existing literature on trust in the ECB (Fischer and Hahn, 2008) and the most recent economic literature linking institutional trust to business cycles (Stevenson and Wolfers, 2011). Second, it seems to be quite adequate when trying to determine trust in the ECB in the aftermath of the economic crisis, as the real economic deterioration will most likely have influenced citizens' trust in the ECB. Third, in contrast to citizens' perceptions (itself being a subjective variable), these three real economic variables can be clearly identified and, if desired, be influenced by the responsible policy-makers. Since the literature on trust in the ECB however, is still underdeveloped, we will nevertheless shortly elaborate theoretically why we have opted for an inclusion of these three macro economic variables into our baseline model. First, concerning inflation, according to Article 127 (TFEU), paragraph 1 in the Treaty of Lisbon (2009) the ECB's primary policy goal is to guarantee price stability (and keep inflation below but close to 2%). It thus seems reasonable to assume that citizens hold the ECB responsible for increasing inflation rates. Therefore an increase in inflation should theoretically have a negative effect on trust in the ECB. Second, concerning growth of GDP per capita and unemployment, according to Article 127 (TFEU), paragraph 2, a secondary policy aim of the ECB is to promote the general economic policies laid down in Article 3 (TFEU) such as "balanced economic growth" and "full employment". It thus seems reasonable to assume that citizens hold the ECB responsible for decreasing growth rates and increasing unemployment. However, in addition to its legal obligations, concerning the financial and economic crisis in particular, the ECB might have been held responsible for the deterioration of the two real economic variables, namely growth of GDP per capita and unemployment, in the aftermath of September 15, 2008 for two reasons. First, following the arguments by Roubini (2006) and Seyfried (2010), citizens might have wondered whether the ECB should not have intervened in response to the housing property bubbles in Spain and Ireland to prevent the financial and economic crisis. Second, following an argumentation by De Grauwe and Gros (2009), De Grauwe (2009, pp. 207-221) and Eichengreen et al. (2011), citizens might have wondered whether the ECB should not have intervened against the increasing leverage of the European financial sector to guarantee a balance between financial and price stability. Overall, therefore an increase in unemployment and a decrease in growth should have a negative effect on trust in the ECB.

3. *Data and measurement*

3.1. *Operationalisation*

Trust in the ECB was measured by asking citizens to respond to the following question: “For each of the following European bodies, please tell me if you tend to trust it or not to trust it.” The respondents were then presented a range of European institutions, one of which was the ECB. Next to the answers “Tend to trust it” and “Tend not to trust it”, a third category “Don’t know (DK)” was also available to respondents. As the DK answers range from 0% in Greece in EB 71 to 44.6% in Portugal in EB 51 with a mean value of 21.3% and the DK answers fluctuate significantly over time the best measure of trust seemed to be “net trust”, which is obtained by subtracting the percentage of those who trust from those who do not trust the institution (see also Gärtner 1997, p. 504). The net trust value then varied from -48 percent in Greece in spring 2011 to 69.9 percent in the Netherlands in the spring of 2008 (as can be seen in Table B1 in the Appendix).

3.2. *Model specification*

Our model specification includes the classical macro-economic variables as specified in the popularity function and pre-existing literature (Nannestad and Paldam, 1994; Fischer and Hahn, 2008). In the baseline model with an unbalanced panel, net trust in the ECB is therefore estimated as a function of inflation, growth of GDP per capita, unemployment and important control variables:

$$ECB\ Trust_{i,t} = f(Inflation_{i,t}, Growth_{i,t}, Unemployment_{i,t}, Z_{i,t}) \quad (1)$$

where i represents each country and t represents each time period; $ECB\ Trust_{i,t}$ is the net trust amount for country i during period t ; $Inflation_{i,t}$, $Growth_{i,t}$, $Unemployment_{i,t}$ and $Z_{i,t}$ are respectively inflation, growth of GDP per capita, unemployment and important control variables such as public expenditure, the debt level of GDP and the USD/EUR exchange rate for country i during period t .

3.3. *Measurement of data*

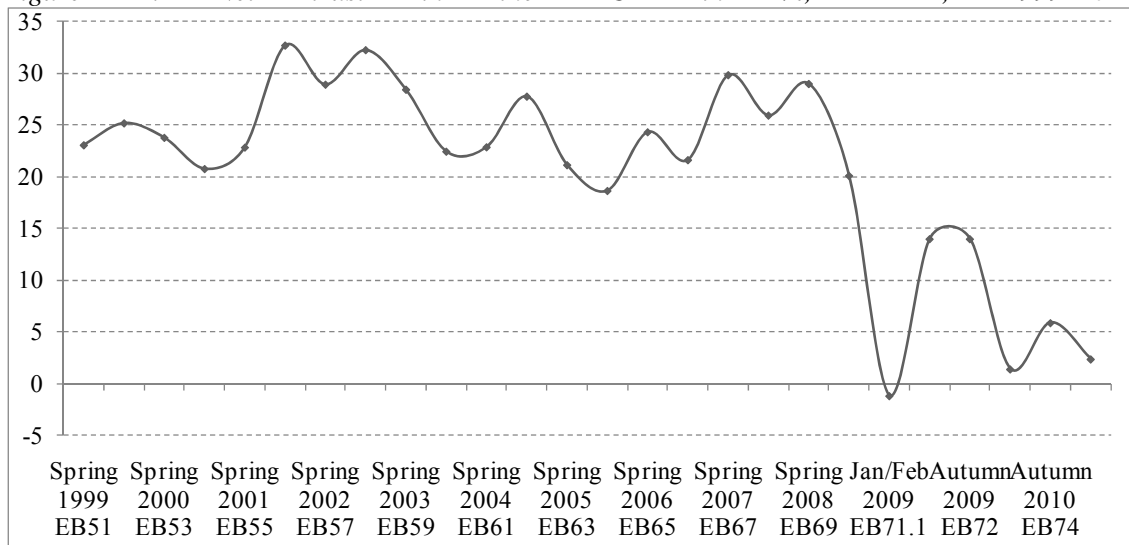
The data on trust in the ECB are based upon the bi-annual Eurobarometer survey. The first available observation dates from spring 1999, the year the ECB was established, in Standard Eurobarometer 51. From there onwards Standard Eurobarometer data up to Eurobarometer 75

(May 2011) are taken. To precisely measure the effect of the financial crisis on net trust in the ECB, the observation from Special Eurobarometer 71.1 in January–February 2009 is also taken into consideration. The data for GDP, inflation rates, population, and unemployment were taken from Eurostat. The analysis is based on time series data from the 11 euro area countries Germany, France, Italy, Spain, the Netherlands, Belgium, Austria, Portugal, Ireland and Luxembourg from spring 1999 onwards and for Greece from spring 2001 onwards.¹ For a detailed overview of the research design and the data construction, please see Appendix A.

4. Descriptive statistics

Figure 1 shows the time trend in net levels of trust in the ECB for the 12 member states of the euro area as measured by the semi-annual Eurobarometer surveys.

Figure 1. Net trust in the ECB in %, EA-12, 1999–2011



Sources: Standard Eurobarometers 51-75 and Special Eurobarometer 71.1. Aggregated data are based upon approximately 300,000 individual responses.

It is immediately apparent that trust in the ECB dramatically decreased in the direct aftermath of the financial crisis² with a considerable recovery nine months later. Yet, the loss of trust in the ECB does not seem to stem from an overreaction to the immediate impact of the crisis, because

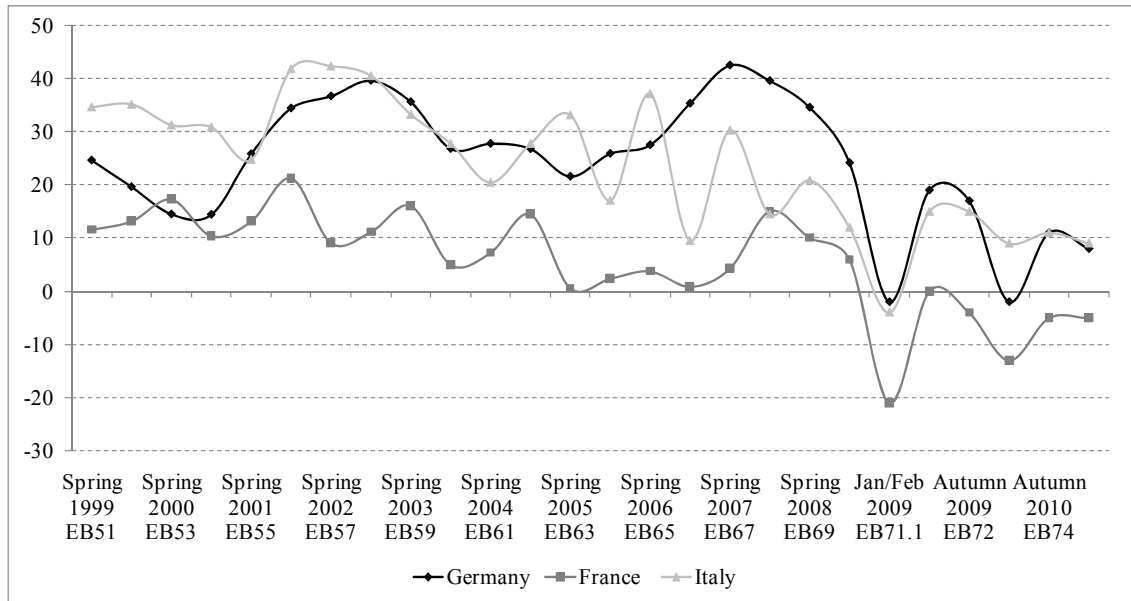
¹ The five countries Slovakia, Slovenia, Malta, Cyprus and Estonia were not analyzed as their accession occurred only recently and thus time trend data would not have been available.

² One should note here that not only the ECB has faced such a stark loss in trust, but also the other two central banks, the US Federal Reserve and the Bank of England, faced severe decreases in trust (see Gros and Roth, 2009). Still, compared with the ECB, loss of trust in the Bank of England and the Federal Reserve was less pronounced.

in the October–November 2008 poll, close to the peak of the crisis, the confidence level in the ECB was still within its historical range (albeit at the lower bound). But by January–February 2009, confidence in the ECB reached an all-time low, recording an unprecedented fall. For the first time since the start of European monetary union, more European citizens distrusted the ECB than trusted it at that point. The drop between autumn 2008 and January–February 2009 was equivalent to over seven times the standard deviation observed over the previous period. Similarly startling is the relatively strong recovery of citizens' trust nine months later in July, back to a net trust level of approximately 15%. Then after coming to a halt at that level in autumn 2009, in May 2010 the trust levels plummeted again to 1%, near the threshold of 0%, recovering slightly in autumn 2010 to 6% and decreasing in May 2011 again to 2%.

As depicted in Figure 2, in the three largest euro area economies – Germany, France and Italy, which account for about two-thirds of the population – the decrease in citizens' trust was particularly severe. In January–February 2009, in these three larger countries more people distrusted the ECB than trusted it. Meanwhile, there are also interesting differences among the three largest economies. It is apparent that trust in the ECB was always at its lowest in France, but it was still usually in positive territory. Between October–November 2008 and January–February 2009, however, it fell from 6% to -21%. The level of trust in the ECB used to be highest in Italy (close to +40% at the start of the European monetary union), but even there it turned negative, as was the case in Germany in January–February 2009. Although there was a recovery in June 2009, with net trust rising in Germany back to 20 percentage points, the data also indicate that despite the recovery, half of French citizens still mistrusted the ECB at that point. Starting with a net trust value of 30% in spring 2007, net trust levels fell below 0% in January–February 2009 and then bounced back to a net trust level of around 17% in June 2009. In May 2010 the decrease in citizens' trust was moderate in Italy and relatively moderate in France, reaching a level of -13%. In contrast, a stark decline can be observed in the case of Germany, with a net trust fall of 19 percentage points. This might be related to the well-known 'inflation-averseness' of German citizens (Eschweiler and Bordo, 1994) and the ECB's 'unorthodox' policy change to buy Greek government bonds in the secondary markets in May 2010, which might lead to higher inflation (Belke, 2010a and 2010b).

Figure 2. Net trust in the ECB in Germany, France and Italy in %, 1999–2011



Sources: Standard Eurobarometers 51-75 and Special Eurobarometer 71.1. Aggregated data are based on approximately 78, 000 individual responses.

5. Econometric analysis

There are basically four econometric issues that deserve discussion at this point. The first and most important issue is the endogeneity of the explanatory variables, which causes feedback effects between trust and the right-hand side variables. The second issue is whether and how to deal with omitted variables and whether time fixed effects should be included to absorb unexpected shocks. The third issue is about structural breaks or whether inflation, growth and unemployment influence trust in the ECB in the same way under normal economic conditions as they do in times of crisis. The fourth and last problem refers to the robustness of results when variables are added to the regression or when the sampling period changes. We start with a discussion of the endogeneity and the autocorrelation issue in subsections 1 and 2, and present the final results in subsection 3 (Table 1). We will discuss our empirical results in the light of the previous given empirical results in subsection 4 and explore the robustness of our results in subsection 5.

5.1. The issue of endogeneity of the explanatory variables

When running regressions one must be aware of the possibility that the left-hand side and the right-hand side variables would influence each other. More specifically, the right-hand side variables (inflation, growth and unemployment) might be endogenous (affected by a common

event) or stand in a bi-directional relationship with trust (a low level of trust might lead to a self-fulfilling prophecy and might speed up and worsen an existing downturn). Therefore, we estimate the model for the pre-crisis and the crisis periods by means of dynamic ordinary least squares (DOLS), a method that controls for endogeneity of the regressors. DOLS is also known as the leads and lags approach proposed by Stock and Watson (1993) and described by Wooldridge (2009). It can be shown that by decomposing the error term and inserting the leads and lags of the right-hand side variables in first differences, the explanatory variables become (super-) exogenous and the regression results thus become unbiased. The baseline regression, which does not control for endogeneity and which reflects a situation whereby all adjustments have come to an end, reads as follows:

$$ECB\ Trust_{i,t} = \alpha_i + \beta\ Inflation_{i,t} + \gamma\ Growth_{i,t} + \mu\ Unemployment_{i,t} + \psi\ Z_{i,t} + w_{i,t}, \quad (2)$$

with w_{it} being the iid-N error term with the properties of the classical linear regression model.

Controlling for endogeneity requires the decomposition of the error term into the endogenous changes of the right-hand side variables, which are correlated with w_{it} .³ This leads to the following equation⁴ in which all explanatory variables from the baseline model can be considered exogenous:

$$\begin{aligned} ECBTrust_{it} = & \alpha_i + \beta_1 Inflation_{it} + \chi_1 Growth_{it} + \delta_1 Unemployment_{it} + \phi_1 Z_{i,t} + \\ & \sum_{p=-1}^{p=+1} \beta_{2p} \Delta Inflation_{it} + \sum_{p=-1}^{p=+1} \chi_{2p} \Delta Growth_{it} + \sum_{p=-1}^{p=+1} \delta_{2p} \Delta Unemployment_{it} \\ & + \sum_{p=-1}^{p=+1} \phi_2 \Delta Z_{it} + v_{i,t} \end{aligned} \quad (3)$$

with α_i representing country fixed effects and Δ indicating that the variables are in first differences; the error term v_{it} fulfils the requirements of the classical linear regression model (if it is free from autocorrelation).

Inflation, growth and unemployment become exogenous and the coefficients β_1 , χ_1 , δ_1 and ϕ_1 follow a t-distribution. This property allows us to draw statistical inferences on the impact of

³ Usually the leads and lags of the variables in first differences are inserted as well (a classical DOLS procedure). We apply a simple, reduced DOLS, which contains only the unlagged and unled first differences. This was necessary since in the crisis period we only have a limited number of observations.

⁴ We started with one forward lead and one backward lag in the first differences, but ended up running a simplified DOLS with an unlagged first difference when multicollinearity was present.

inflation, growth and unemployment on trust. β_2 , χ_2 , δ_2 and ϕ_2 are coefficients that belong to the endogenous part of the explanatory variables and do not follow a t-distribution. Nevertheless, this does not affect our inferences about the role played by inflation, growth and unemployment, since we are not interested in the influence of these “differenced variables” on trust in the ECB.

Yet the application of DOLS is not so standard and a prerequisite for using the DOLS approach is that the variables entering the model are non-stationary (in our case all series are integrated of order 1, i.e. they are $I(1)$ – see Table B2 in the Appendix) and that the series are in a long-run relationship (they are cointegrated, see Table B3 in the Appendix). It is worth noting that many of the panel studies that would fulfil these prerequisites and have a sufficiently long time span do not apply the DOLS approach even though it allows the endogeneity problem to be tackled.

To our knowledge, the working papers that try to explain trust in the ECB with a sole set of macro-economic variables (Fischer and Hahn, 2008; Wälti, 2011) do not utilise FE-DOLS but run standard FE models instead. To build a more sophisticated model they insert time fixed effects (time dummies). However, we have shown in a pre-study that this does not improve the specification of the model, as indicated by the Durbin-Watson statistic.

5.2. *Dealing with omitted variables and unexpected events/shocks*

Having found cointegration (see Table B3 in the Appendix), we can be sure that omitted variables (which are lumped together in the error term) do *not* systematically influence our long-run relationship between trust in the ECB and macroeconomic variables. The error term is stationary [$I(0)$], a characteristic of cointegration.

Nonetheless, the error term might still contain some unexpected events/shocks.⁵ In the traditional panel data literature, it has become very common to work with fixed time dummies. They are intended to proxy these unquantifiable events, which are assumed to be identical for all countries in the sample but change over time. For instance, Fischer and Hahn (2008) use time dummies in related work on trust in the ECB to capture the euro cash changeover, EU enlargements and the state of the world economy. In contrast to traditional panel data studies, we do not favour the use of time dummies in general and in particular not in this piece of research. We have reason to believe that cross-sections are usually very differently affected by the same “general” event and that this event lasts for a while.⁶ With respect to the 12 EU

⁵ Our finding from the cointegration test tells us that these shocks are only of a temporary nature.

⁶ We can observe swings in the error term (positive autocorrelation).

economies under investigation, e.g. the EU enlargement strongly affects the neighbouring countries in Central Europe and less so the countries farther afield. Moreover, the state of the world economy affects especially those countries having commercial and investment banks with considerable international exposure or a strong dependency on exports, and tight financial markets do more harm to countries with a housing bubble, such as Spain, Ireland and the UK. By plugging in time dummies, one would mimic the same exposure to an unspecified risk in all 12 EU countries under investigation. We therefore find it more appealing to control for unknown swings in the error term that are country-specific and change over time (v_{it}) through an FGLS procedure that involves a transformation of all variables (including the error term) of the above equation. It is realistic to assume that the incidences of v_{it} are somehow related to past values of the disturbance term, i.e. unexpected shocks are omitted over the entire sample period. Correcting for swings in the error term leads to the following equation:

$$\begin{aligned}
ECBTrust_{it}^* &= \alpha_i^* + \beta_1 Inflation_{it}^* + \chi_1 Growth_{it}^* + \delta_1 Unemployment_{it}^* + \phi_1 Z_{i,t}^* + \\
&\sum_{p=-1}^{p=+1} \beta_{2p} \Delta Inflation_{it}^* + \sum_{p=-1}^{p=0+1} \chi_{2p} \Delta Growth_{it}^* + \sum_{p=-1}^{p=+1} \delta_{2p} \Delta Unemployment_{it}^* + \\
&\sum_{p=-1}^{p=+1} \phi_{2p} \Delta Z_{it}^* + u_{i,t}
\end{aligned} \tag{4}$$

with α_i^* being the country fixed effect and Δ indicating that the variables are in first differences; * indicating that the variables have been transformed (purged from autoregressive processes) and that the error term u_{it} fulfils the requirements of the classical linear regression model (it is free from autocorrelation).

$$ECBTrust_{it}^* = ECBTrust_{it} - \rho_1 ECBTrust_{it-1}$$

$$Inflation_{it}^* = Inflation_{it} - \rho_1 Inflation_{it-1},$$

$$Growth_{it}^* = Growth_{it} - \rho_1 Growth_{it},$$

$$Unemployment_{it}^* = Unemployment_{it} - \rho_1 Unemployment_{it-1},$$

$$Z_{it}^* = Z_{it} - \rho_1 Z_{it-1} \text{ and } u_{it} = v_{it} - \rho_1 v_{it-1} \tag{5}$$

The differences of the explanatory variables are transformed in exactly the same way as the variables in levels. Note that the new error terms u_{it} are free of autocorrelation and that swings in the error term are eradicated by transforming the variables. Since the coefficient ρ_1 is usually unknown (as in our case), it has been estimated by means of, e.g. the Cochrane-Orcutt method, an FGLS procedure. In addition, we use country-specific fixed effects, α_i^* , in our analysis.

The general panel data literature, in contrast, can be criticised for two shortcomings: first, standard FE models do not control for endogeneity. The minority of authors who do control for endogeneity use instruments⁷ for the “suspect” explanatory variable. This method is much more restrictive than our approach, which removes the endogenous part from *all* explanatory variables. Second, the majority of the standard FE models do not control for autocorrelation through an FGLS procedure. Instead, robust standard errors are used or the problem is ignored. Proceeding like this, the resulting estimators will be biased and inconsistent (Banerjee et al., 2010). We control for autocorrelation using the FGLS procedure and run the dynamic feasible generalised least squares (DFGLS) or dynamic generalised least squares (DGLS) estimation. Last but not least, we can be sure *not* to have an “omitted variable problem” given that we run regressions with cointegrated series.

5.3. *The issue of structural breaks and derivation of the final estimation equations*

So far we have tackled the problems of endogeneity and autocorrelation. By applying the FE-DFGLS method we are able to study the link between inflation, growth, unemployment and trust over the period 1999 to 2011. But can we be sure that the model is valid throughout this period, given that the euro countries experienced a severe financial crisis in 2008? In other words, was there a structural break in 2008?

To check for the existence of a structural break in autumn 2008 when the financial crisis hit Europe, we start with a common regression line for the entire observation period (1999 to 2011; see Table 1, column 3) by assuming that the relationship will stay the same over the full sample period (an absence of structural breaks) and separate regression lines for the sub-periods (Table 1, columns 1-2) and study whether the sum of squared residuals of the restricted model (full

⁷ Very often the instruments chosen are not strongly correlated with the “suspect” variable to be replaced. The weak instrument problem occurs.

period) differs significantly from the sum of squared residuals of the unrestricted model (crisis and pre-crisis period).

The hypothesis that trust in the ECB varies with the economic situation is confirmed by a structural break test (a pre-crisis sample from 1999 to spring 2008 versus the crisis samples from autumn 2008 to spring 2011). The Chow test yields a highly significant result, thus pointing to a structural break between the pre-crisis and crisis periods (see Table B4 in the Appendix).⁸ Therefore we must run two separate regressions, one for the pre-crisis period and the other for the crisis period.

Table 1 contains the results for the spring 1999-spring 2011 period and for the pre-crisis and crisis sub-periods. As theoretically expected, column 3 (full sample period) shows that an increase in per capita GDP growth has a positive impact on trust in the ECB and that increases in inflation and unemployment have a negative impact on trust in the ECB. The impact of growth, however, is fully driven by the pre-crisis period (column 1) and the effect of inflation and unemployment is exclusively driven by the crisis-period (column 2).

⁸ We have tested whether the impact of growth differs before and after the crisis (structural break) with a Chow test (Chow, 1960). Our test statistic, which is chi-square distributed, of 17.82 rejects the null hypothesis indicating that there is a significant structural break. Growth affects trust much more positively after the crisis.

Table 1. Determinants of net trust in the ECB – Accounting for endogeneity, autocorrelation and structural change (FE-DFGLS estimation)/EU-12 sample^a

	(1)	(2)	(3)
	ECB trust	ECB trust	ECB trust
	Spring 1999– Spring 2008	Autumn 2008– Spring 2011	Spring 1999– Spring 2011
	Pre-Crisis	Crisis	Full sample
	FE-DFGLS	FE-DFGLS	FE-DFGLS
<i>Inflation</i>	0.15 (0.93)	-2.20*** (-3.02)	-0.65*** (-3.64)
<i>Growth</i>	2.16** (2.21)	-0.58 (-0.75)	1.40** (2.09)
<i>Unemployment</i>	0.13 (0.15)	-3.98*** (-5.23)	-1.99*** (-3.30)
Country fixed effects	Yes	Yes	Yes
Time effects	No	No	No
Simplified DOLS	Yes	Yes	Yes
Elimination of autocorrelation by DFGLS	Yes	Yes	Yes
Durbin-Watson statistic	2.21	2.33	2.35
Observations	200	84	284
Number of countries	12	12	12
R-squared	0.76	0.90	0.79
Adjusted R-squared	0.73	0.88	0.77

^a FE-DFGLS: we utilise a fixed-effects model that we estimate by means of the DOLS- approach and control for autocorrelation of the disturbances, which renders DFGLS estimates.

*** p<0.01, ** p<0.05, * p<0.11

Note: T-values are in parentheses.

Source: Own calculations.

5.4. How do our results compare to previous findings?

Besides a cross-sectional empirical study (Kaltenthaler et al., 2010), working papers that utilize micro-based panel analyses (Ehrmann et al., 2010; Farfaque et al., 2011; Bursian and Furth, 2011) and a working paper that uses a macro-economic analysis focusing on the impact of sovereign bond yields and banking sector distress on citizens' trust in the ECB (Wälti, 2011), the above-mentioned working paper by Fischer and Hahn (2008) has arrived at interesting results that are worth discussing in the light of our empirical results. Concerning the macro-economic variable growth of GDP per capita, we confirm the results of Fischer and Hahn (2008)

who show that national income has a strong impact on trust (at the 1% level). Concerning inflation our results contradict the results of Fischer and Hahn who find that higher inflation rates reduce trust (at the 10% level) during normal economic conditions (from 1999-2004). Our result suggests that only in times of economic crisis will inflation significantly impact negatively on trust. Concerning unemployment our empirical results add new evidence to the results of Fischer and Hahn (2008), who find that unemployment does not have a significant impact on trust in the ECB. Our empirical results show that in times of economic crisis unemployment will significantly negatively impact on citizens' trust in the ECB. The differences in the results between our empirical study and the one from Fischer and Hahn (2008) will be due to i) the fact that the latter uses a different research design (using annual data in contrast to bi-annual), ii) uses less observations (72 in contrast to 312) due to the utilization of a shorter time frame (from 1999-2004), iii) the fact that endogeneity was not sufficiently tackled by the authors and iv) the fact that time fixed effects were incorporated.

5.5. *Robustness of the results*

Another issue that remains to be addressed is whether the model misses important variables, whether it contains superfluous variables and whether the model specification reflects the data points.

As the decline of trust in the ECB might be interpreted as part of a general crisis of trust in European economic institutions, it becomes debatable whether other trust variables, such as citizens' trust in the European Commission and the European Parliament should be included in the model specification. We excluded these variables for two reasons that come immediately to mind: First, as trust in the European Commission and the European Parliament is equally determined by inflation, growth and unemployment (Roth et al., 2011), it is econometrically incorrect to include these trust variables in the regression, because doing so would lead not only to double counting but also to endogeneity. Second, the Durbin-Watson statistic (being around 2) did not give us reason to worry about omitted variables.

However, on a more general ground, we can be confident that *no* important variables were excluded from the regression equation and also that no superfluous variables have been included.⁹ This finding is supported by the cointegration framework utilised. Kao's cointegration test shows that the residuals are stationary and therefore have no systematic influence on trust in the ECB. As the residuals largely consists of omitted and/or unobservable

⁹ This is the reason why we have not included any of our control variables such as public expenditure, the debt level of GDP and the USD/EUR exchange rate into our regression equation.

and unquantifiable variables, this amounts to saying that omitted variables are not able to give an additional explanation to trust. The variables inflation, growth and unemployment, in contrast, do have a systematic influence on trust in the ECB and therefore, none of the included variables is superfluous.

We also checked the robustness of the results by changing the end of the first period and the beginning of the second period. The results remained robust. The year 2010, however, changed the results as the most important euro economies moved out of the crisis. This could be an indication of a *second* structural break in 2010. But a test of this assumption would require more observations (especially beyond 2010).

6. CONCLUSION

This article has examined the trends and determinants of net trust in the ECB, focusing on macroeconomic determinants as the main factors responsible for the dramatic loss of trust in the aftermath of the financial crisis. Four findings emerge.

First, taking panel data and using a fixed effects DFGLS estimation for a 12-country sample over the time period 1999 to 2011 with a total of 312 observations, this paper detects a structural break in citizens' trust in the ECB.

Second, the paper found that an increase in growth increases trust in the ECB under normal economic conditions (in the spring 1999–spring 2008 period).

Third, in times of economic crisis (autumn 2008–spring 2011), the rate of unemployment affects trust in the ECB in the expected way: a rise in unemployment reduces trust in the ECB.

Fourth, in times of economic crisis (autumn 2008–spring 2011), the impact of inflation is negative and significant when the crisis fully hit the 12 euro economies under investigation.

We therefore conclude that European citizens seem to hold the ECB responsible for the overall employment situation in times of crisis, expect sufficient growth rates under normal conditions and become concerned about inflation at times of crisis when public debt started to dramatically rise in basically all 12 euro area economies.

Our empirical findings confirm that in order to increase citizens' trust the ECB would have to calibrate its primary policy goal to guarantee price stability with its secondary policy goal to promote economic growth and employment. In order to promote economic growth and employment, the ECB should in the future guarantee an effective balance between financial and price stability.

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APPENDIX

A. Research design and Data Construction

The research design taken varies significantly in comparison to the working paper by Fischer and Hahn (2008). In their working paper Fischer and Hahn (2008) work with averaged yearly Eurobarometer data from 1999–2004, focusing on the 12 countries from the euro area. Applying this kind of research design enabled the authors to work with 72 observations for their empirical analysis. The authors' decision to use yearly data does unfortunately exclude a range of information and does not make use of the bi-annual data from the Standard Eurobarometer surveys (their paper matches an average of two bi-annual Eurobarometer observations with yearly data from the national accounts). And by only using data up to 2004, the authors miss important observations in their analysis, here in particular observations concerning the deterioration of trust in the ECB from 2008 onwards.

In contrast to the working paper of Fischer and Hahn (2008), our analysis matches bi-annual Eurobarometer data with quarterly and monthly data from Eurostat. The data were constructed taking the following research design:

- Trust Data was taken from the various Eurobarometer waves. The raw data are available on CD-ROM from Gesis ZA Data Service for Standard Eurobarometers 51-62 (Gesis, 2005a and 2005b) and were received on request from Gesis ZA Data Service for Standard Eurobarometers 63-69 (<http://www.gesis.org/en/services/data/survey-data/eurobarometer-data-service/data-access/>). Data for the Standard Eurobarometer 70 were taken from Eurobarometer (2008). Data for the Special Eurobarometer 71.1 were taken from Eurobarometer (2009a). Data from Eurobarometer 71 were taken from Eurobarometer (2009b). Data from Eurobarometer 72 were taken from Eurobarometer (2009c). Data from Eurobarometer 73 were taken from Eurobarometer (2010a). Data from Eurobarometer 74 were taken from Eurobarometer (2010b). Data from Eurobarometer 75 were taken from Eurobarometer (2011).
- Data on population and on GDP were taken from Eurostat's quarterly data. GDP data were chain-linked with 2000 as the reference year.¹⁰ The Eurobarometer fieldwork normally takes

¹⁰ Chain-linking is a methodology for calculating GDP values at constant prices. In particular, the previous year is used as a base year instead of a single fixed year, which is moved every five years. The year 2000 is used as a reference year, for which the deflators are expressed as equal to 100.

place around April–May and October–November.¹¹ We constructed semester GDP per capita growth using GDP per capita data on the four quarters preceding the Eurobarometers. More precisely, the two quarters directly preceding the Eurobarometer were compared with the third and fourth quarters before the Eurobarometer, e.g. GDP per capita growth for the May 1999 Eurobarometer was calculated by comparing the GDP per capita for October 1998–March 1999 (the fourth quarter of 1998 plus the first quarter of 1999) with the GDP per capita for April–September 1998 (the second plus third quarters of 1998). As in 2009, we had three observations for net trust; Standard Eurobarometer 71, conducted in June 2009, was exceptionally matched with the first and second quarters of GDP per capita in 2009. Data on GDP were missing for Greece for the first four semesters. A graphical overview of the data construction is given in Figure B1.

- Data on inflation rates were based on Eurostat’s monthly indicators for the harmonised index of consumer prices. Semester data were constructed by averaging monthly data from April to September and from October to the end of March. The April–September data were then matched with the Standard Eurobarometers from autumn, and the October–end of March data were then matched with the Standard Eurobarometers from spring. As discussed above, Standard Eurobarometer 71, conducted in June 2009, was exceptionally matched with the first and second quarters of inflation in 2009.
- Data on unemployment were obtained from Eurostat. Semester data for unemployment were constructed in a similar manner as for GDP and inflation. A graphical example of the data construction on unemployment is given in Figure B2.

¹¹ Although this fluctuates slightly we assumed that the Standard Eurobarometer in spring was polled in April–May and the one in autumn was polled in October–November. That this assumption is valid is underlined when analysing the exact dates of the fieldwork for the single Eurobarometers. The polling for the Standard Eurobarometers took place in the following months: 03-04/1999, 10-11/1999, 04-05/2000, 11-12/2000, 04-05/2001, 10-11/2001, 04-05/2002, 10-11/2002, 04-05/2003, 10-11/2003, 02-03/2004, 10-11/2004, 05-06/2005, 10-11/2005, 04-05/2006, 09-10/2006, 04-05/2007, 09-10/2007, 03-05/2008, 10-11/2008, 01-02/2009, 06-07/2009, 10-11/2009, 05/2010, 11/2010, 05/2011.

B. Figures and Tables

Figure B1. Research design for the construction of data on growth of GDP per capita

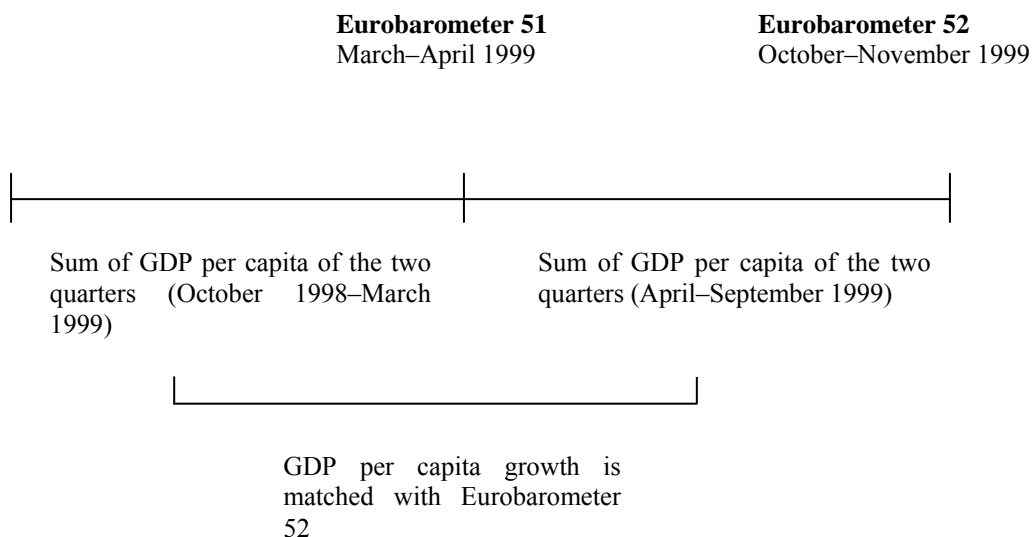


Figure B2. Research design for the construction of data on unemployment

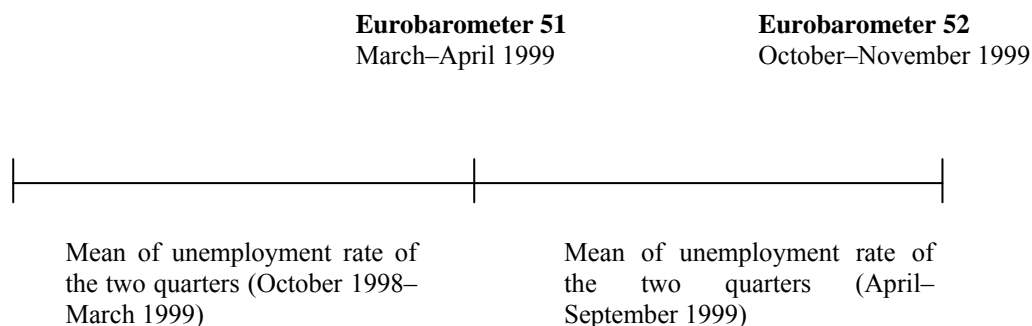


Table B1. Summary statistics

Variable	Year	Obs.	Mean	Standard deviation	Min.	Max.
Net trust in the ECB	1999–2011	312	26.8	17.4	-48.0	69.9
Inflation	1999–2011	312	99.2	8.5	78.9	119.6
Unemployment	1999–2011	312	7.6	3.1	1.9	20.6
Growth (semester)	1999–2011	308	0.6	1.6	-6.5	4.9

Source: Own calculations.

Table B2. EU-12 country sample, Augmented Dickey-Fuller (ADF) panel unit root tests

Variable	Total (balanced) observations	ADF-Fisher Chi-square	Probability
<i>Net trust in the ECB</i>	264	16.43	0.87
<i>GDP per capita growth</i>	236	26.12	0.37
<i>Unemployment rate</i>	252	22.67	0.54
<i>Inflation rate</i>	264	13.30	0.96

Note: H_0 = series has a unit root (individual unit root process).

Source: Own calculations.

Table B3. EU-12 country sample, Kao residual cointegration test

Cointegration between the following set of variables:	Included observations	ADF-t-statistic	Probability
Net_trust_ECB, GDP per capita growth, unemployment rate, inflation rate,	312	3.04	0.00

Note: H_0 = no cointegration

Source: Own calculations.

Table B4. Test on structural break (Chow-test)

Period	Sum squared residuals	of Type model	of Number of observations	of K+1 regressors	F-statistic
Spring 1999– Spring 2011	19003.66	Restricted	284	7	17.82
Spring 1999– Spring 2008	9646.40	Unrestricted	200		
Autumn 2008–Autumn 2011	3350.79	Unrestricted	84		

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