How Does Monetary Policy Affect Income and Wealth Inequality? Evidence from Quantitative Easing in the Euro Area

Online Appendix

February 22, 2023

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Abstract

This paper evaluates the impact of quantitative easing on income and wealth of individual euro area households. We first estimate the aggregate effects of a QE shock, identified by means of external instruments, in a multi-country VAR model with unemployment, wages, interest rates, house prices and stock prices. We then distribute the aggregate effects across households using a reduced-form simulation on micro data, which captures the portfolio composition, the income composition and the earnings heterogeneity channels of transmission. The earnings heterogeneity channel is important: QE compresses the income distribution since many households with lower incomes become employed. In contrast, monetary policy has only negligible effects on the Gini coefficient for wealth: while high-wealth households benefit from higher stock prices, middle-wealth households benefit from higher house prices.

Keywords Monetary Policy, Household Heterogeneity, Inequality, Income, Wealth, Quantitative Easing, Great Recession

JEL codes D14, D31, E44, E52, E58

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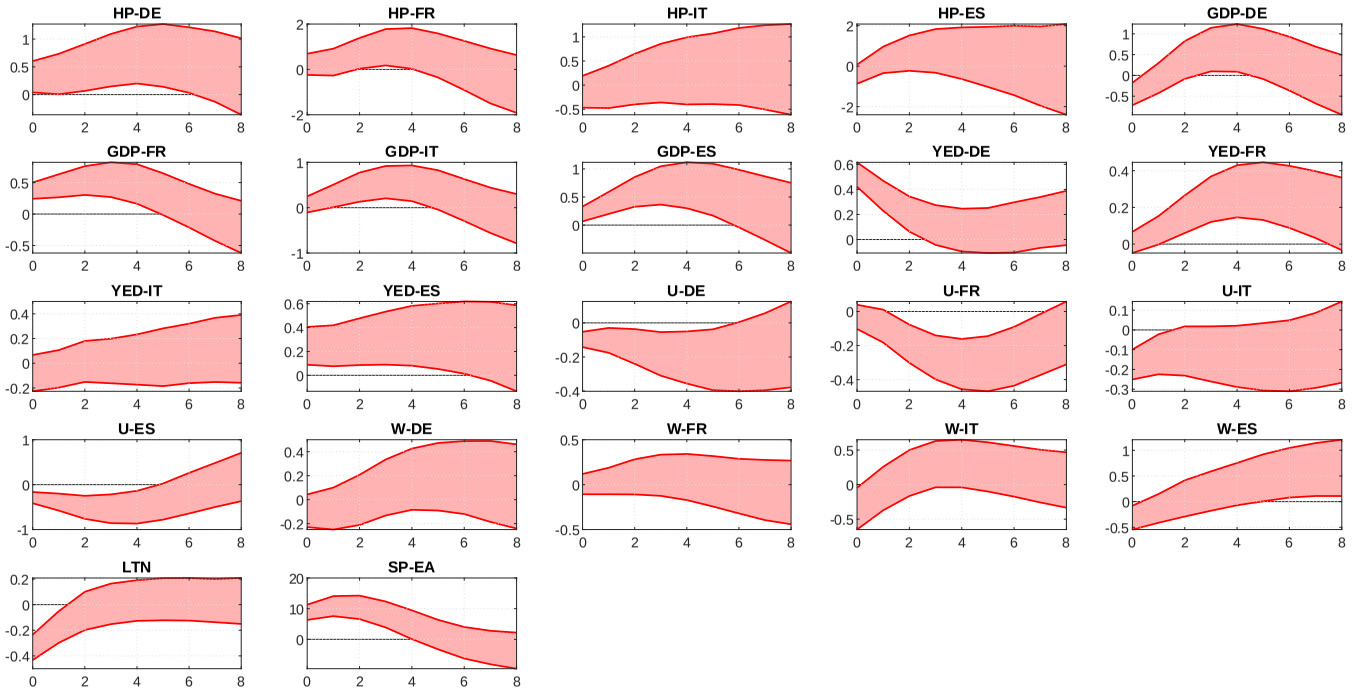
First version: February 2018; this version: February 2023. This paper uses data from the Household Finance and Consumption Survey. We thank Marco Felici and Thibault Cézanne for excellent research assistance and Klaus Adam, Alena Bicakova, Lídia Brun, Vítor Constâncio, Maarten Dossche, Michael Ehrmann, Nicola Fuchs-Schündeln, Jordi Galí, Bertrand Garbinti, Dimitris Georgarakos, Domenico Giannone, Marek Jarociński, Bartosz Maćkowiak, Alberto Martin, Klaus Masuch, Pierre Monnin, Giorgio Primiceri, Moreno Roma, Alfonso Rosolia, Anna Samarina, Oreste Tristani, Mika Tujula, Panagiota Tzamourani, Gianluca Violante, Bernhard Winkler, Christian Wolf and Jonathan Wright, and seminar audiences at ECB, HFCN, Barcelona GSE Summer Forum and 2018 IAAE Annual Conference for useful comments and discussions. The views presented in this paper are those of the authors, and do not necessarily reflect those of the European Central Bank.

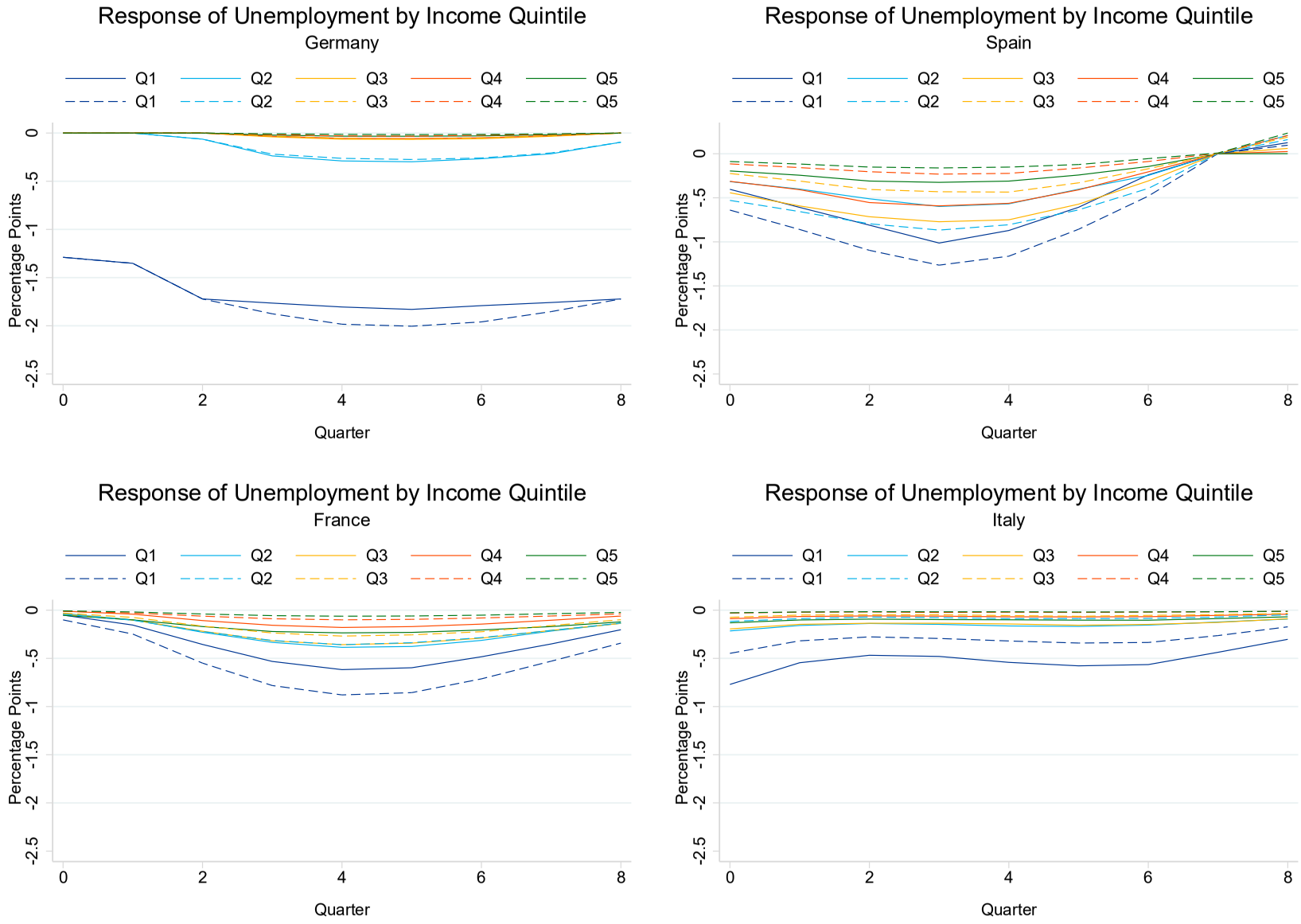
Appendix C: Additional Figures and Tables—For Online Publication

Figure C.1 Impulse Responses to QE Shock



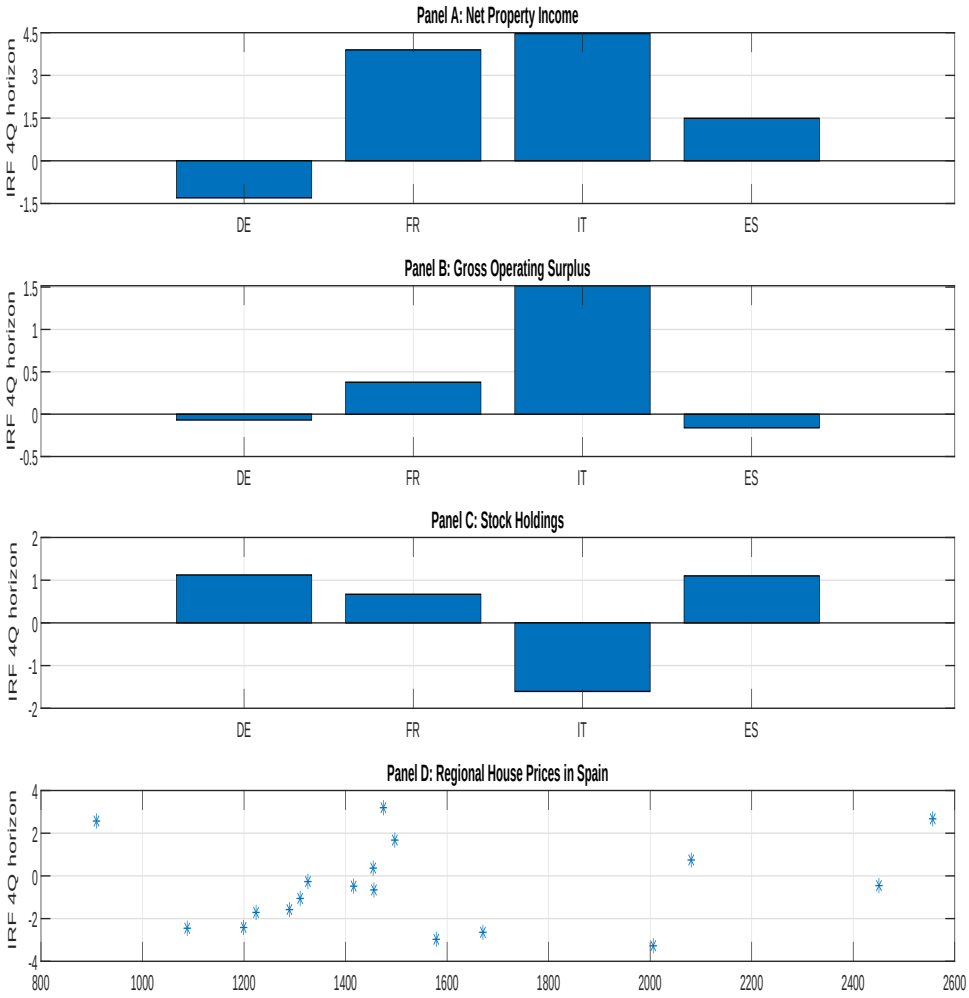
Note: The figure shows the impulse response of all the variables in the model to the QE shock (30 bp drop in the term spread). The red shaded area reflects the 16th–84th percentile range. HP: house prices; GDP: real gross domestic product; YED: GDP deflator; U: unemployment rate; W: compensation per employee, wage; LTN: nominal long-term interest rate; SP: stock prices. EA: euro area; DE: Germany; FR: France; IT: Italy; ES: Spain.

Figure C.2 Impulse Responses of Unemployment—Baseline IRFs (Solid) vs IRFs Generated Under Uniform Probability of Getting Employed (Dashed)



Source: Household Finance and Consumption Survey
Note: The charts show impulse responses of unemployment by income quintile.

Figure C.3 Robustness exercises



Note: The figure reports the median of the impulse responses (four quarters after the shock) of the additional variables used in the robustness checks. The responses are estimated by means of the local linear projection method of Jordà (2005) applied to the median QE shock estimated in the VAR. Units: percentage point deviation from pre-shock levels. Panel D shows a scatter plot of impulse responses of regional house prices across provinces in Spain across house prices per square meter (in EUR). DE: Germany; FR: France; IT: Italy; ES: Spain.

Probit and Heckman estimates

Table 1 Probit Estimation Results—Germany

Variable	**Coefficient**	**(Std. Err.)**
gender	-0.047	(0.060)
college	0.962**	(0.100)
highschool	0.539**	(0.087)
age2	-0.052	(0.098)
age3	0.034	(0.088)
age456	-0.170ý	(0.091)
single	-0.348**	(0.072)
children	0.104	(0.076)
Intercept	1.136**	(0.111)
N	4868	
Log-likelihood	-1020.965	
$\chi^2_{(8)}$	172.886	

Significance levels : ý : 10% ∗ : 5% ∗∗ : 1%

Table 2 Probit Estimation Results—Spain

Variable	**Coefficient**	**(Std. Err.)**
gender	0.178**	(0.035)
college	0.695**	(0.040)
highschool	0.335**	(0.048)
age2	0.264**	(0.055)
age3	0.259**	(0.053)
age456	0.415**	(0.055)
single	-0.400**	(0.045)
children	0.068	(0.045)
Intercept	0.211**	(0.061)
N	6815	
Log-likelihood	-3320.85	
$\chi^2_{(8)}$	619.444	

Significance levels : ý : 10% ∗ : 5% ∗∗ : 1%

Table 3 Probit Estimation Results—France

Variable	**Coefficient**	**(Std. Err.)**
gender	0.006	(0.030)
college	0.809**	(0.041)
highschool	0.401**	(0.039)
age2	0.394**	(0.043)
age3	0.552**	(0.042)
age456	0.504**	(0.047)
single	-0.368**	(0.034)
children	0.110**	(0.035)
Intercept	0.509**	(0.053)

N	13408
Log-likelihood	-4291.914
$\chi^2_{(8)}$	1026.339

Significance levels : ý : 10% ∗ : 5% ∗∗ : 1%

Table 4 Probit Estimation Results—Italy

Variable	**Coefficient**	**(Std. Err.)**
gender	0.106**	(0.035)
college	0.805**	(0.054)
highschool	0.501**	(0.038)
age2	0.591**	(0.049)
age3	0.857**	(0.050)
age456	0.931**	(0.056)
single	-0.395**	(0.046)
children	0.145**	(0.046)
Intercept	-0.002	(0.061)

N	7979
Log-likelihood	-3552.257
$\chi^2_{(8)}$	1210.823

Significance levels : ý : 10% ∗ : 5% ∗∗ : 1%

Table 5 Heckman Estimation Results—Germany

Variable	Coefficient	(Std. Err.)
Equation 1 : log_laborincome		
gender	0.591**	(0.028)
college	1.021**	(0.125)
highschool	0.579**	(0.099)
age2	0.428**	(0.046)
age3	0.500**	(0.044)
age456	0.459**	(0.041)
Intercept	8.912**	(0.155)
Equation 2 : job		
gender	-0.031	(0.061)
college	1.016**	(0.102)
highschool	0.588**	(0.089)
age2	-0.030	(0.099)
age3	0.064	(0.089)
age456	-0.150	(0.092)
single	-0.348**	(0.072)
children	0.099	(0.077)
Intercept	1.038**	(0.115)
Equation 3 : /mills		
lambda	-0.778*	(0.377)
N	4650	
Log-likelihood	.	
$\chi^2_{(6)}$	760.647	

Significance levels : ý : 10% * : 5% ** : 1%

Table 6 Heckman Estimation Results—Spain

Variable	Coefficient	(Std. Err.)
Equation 1 : log_laborincome		
gender	0.323**	(0.028)
college	0.604**	(0.052)
highschool	0.233**	(0.044)
age2	0.190**	(0.057)
age3	0.426**	(0.057)
age456	0.568**	(0.062)
Intercept	9.300**	(0.127)

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... table 6 continued

Variable	Coefficient	(Std. Err.)
Equation 2 : job		
gender	0.187**	(0.036)
college	0.712**	(0.041)
highschool	0.341**	(0.049)
age2	0.360**	(0.056)
age3	0.364**	(0.055)
age456	0.518**	(0.057)
single	-0.428**	(0.046)
children	0.086ý	(0.046)
Intercept	0.060	(0.063)
Equation 3 : /mills		
lambda	-0.859**	(0.138)
N	6365	
Log-likelihood	.	
$\chi^2_{(6)}$	278.775	

Significance levels : ý : 10% * : 5% ** : 1%

Table 7 Heckman Estimation Results—France

Variable	Coefficient	(Std. Err.)
Equation 1 : log_laborincome		
gender	0.414**	(0.017)
college	0.593**	(0.043)
highschool	0.094**	(0.033)
age2	0.248**	(0.035)
age3	0.361**	(0.038)
age456	0.465**	(0.037)
Intercept	9.454**	(0.076)
Equation 2 : job		
gender	-0.001	(0.031)
college	0.866**	(0.042)
highschool	0.442**	(0.040)
age2	0.447**	(0.044)
age3	0.613**	(0.042)
age456	0.563**	(0.048)
single	-0.380**	(0.034)
children	0.142**	(0.036)
Intercept	0.385**	(0.055)

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... table 7 continued

Variable	Coefficient	(Std. Err.)
Equation 3 : /mills		
lambda	-0.808**	(0.119)
N	12753	
Log-likelihood	.	
$\chi^2_{(6)}$	1124.399	

Significance levels : ý : 10% ∗ : 5% ∗∗ : 1%

Table 8 Heckman Estimation Results—Italy

Variable	Coefficient	(Std. Err.)
Equation 1 : log_laborincome		
gender	0.376**	(0.017)
college	0.580**	(0.036)
highschool	0.265**	(0.026)
age2	0.263**	(0.045)
age3	0.446**	(0.052)
age456	0.468**	(0.054)
Intercept	9.179**	(0.086)
Equation 2 : job		
gender	0.105**	(0.035)
college	0.806**	(0.054)
highschool	0.502**	(0.038)
age2	0.591**	(0.049)
age3	0.856**	(0.050)
age456	0.931**	(0.057)
single	-0.394**	(0.046)
children	0.146**	(0.046)
Intercept	-0.004	(0.061)
Equation 3 : /mills		
lambda	-0.273**	(0.095)
N	7964	
Log-likelihood	.	
$\chi^2_{(6)}$	634.546	

Significance levels : ý : 10% ∗ : 5% ∗∗ : 1%

Table C.1 Estimates of the Effects of Nonstandard Monetary Policy Using Event Studies

Authors	Country	Type of Event	Typical Impact on 10-Year Rate (p.p.)	Notes
Altavilla et al. (2016)	DE, ES, FR, IT	OMT	0.2 to 1	
Altavilla et al. (2015)	EA, DE, ES, FR, IT	APP	0.3 to 0.5	
Andrade et al. (2016)	EA	APP	0.45	
Joyce and Tong (2012)	UK	APF1	1	
Christensen and Rudebusch (2012)	UK, US	APF1	0.43 to 0.89	
Lam (2011)	JP	CME+	0.24 to 0.27	
Fukunaga et al. (2015)	JP	QQE	0.33 to 0.47	
Gagnon et al. (2011)	US	LSAP1	0.55 to 1.05	
Krishnamurthy and Vissing-Jorgensen (2013)	US	LSAP1, LSAP2, MEP	0.07 to 1.07	
Bauer and Rudebusch (2014)	US	LSAP1	0.89	
Krishnamurthy and Vissing-Jorgensen (2011)	US	LSAP1, LSAP2	0.3 to 1.07	
Cahill et al. (2013)	US	LSAP1, LSAP2, MEP	0.089 to 0.131	for $100bn purchases

Notes: See also Andrade et al. (2016), Appendix B for other studies and details. Abbreviations: OMT—Outright Monetary Transactions (Announcement), APP—Asset Purchases Programmes, APF—Asset Purchase Facility, CME—Comprehensive Monetary Easing, QQE—Quantitative and Qualitative Monetary Easing, LSAP—Large Scale Asset Purchase Program, MEP—Maturity Extension Program.

Table C.2 Estimates of the Effects of Nonstandard Monetary Policy Using VARs

Authors	Method (Country)	Type of Event	Effect on Real Economy and Inflation
Altavilla et al. (2016)	VAR (DE, ES, FR, IT)	OMT	Real GDP: 0.34%–2.01%, HICP: 0.28%–1.21%
Baumeister and Benati (2013)	TVP VAR (US, UK)	LSAP	Inflation: trough of −1% to −4% GDP gr: trough −10% to −12%, UR: peak 10.6%
Kapetanios et al. (2012)	TVP VAR (UK)	BoE LSAP	Real GDP: peak effect of 1.42%
Weale and Wieladek (2016)	Bayesian VAR (US, UK)	LSAP	Real GDP: 0.25%–0.58%, CPI: 0.32%–0.62%
Gambacorta et al. (2014)	Panel VAR (EA, non-EA countries)	Various	GDP: −0.25% to 0.25%, CPI: −0.12% to 0.10%
Darracq-Paries and De Santis (2015)	Panel VAR (EA countries)	3-year LTROs	GDP: peak of 0.8%, GDP Defl: peak of 0.35%
Babecka Kucharcukova et al. (2016)	VAR (EA, non-EA countries)	Spillovers from ECB QE	IP: −0.2% to 0.2%, HICP: −0.1% to 0.06%
Bluwstein and Canova (2016)	Bayesian SVAR (EA, EU countries)	Spillovers from ECB QE	IP: −0.1% to 0%, CPI: 0%–0.5%
Hachula et al. (forthcoming)	SVAR (EA, EA countries)	LTROs	GDP: 0.1%–0.65%, CPI: 0%–0.45% UR: −0.21%–0.07%
Behrendt (2017)	SVAR (EA)	ECB QE	IP −0.0032%–0.0023%, HICP −0.0006%–0.0005%
Boeckx et al. (2017)	SVAR (EA, EA countries)	3Y LTRO, CBPP1	GDP: −0.35%–0.6%, HICP: −0.1%–0.3%

Notes: See also Andrade et al. (2016), Appendix B for other studies and details. Abbreviations: OMT—Outright Monetary Transactions, LSAP—Large Scale Asset Purchase Program, LTROs—long-term refinancing operations, CBPP1—Covered Bond Purchases Program.

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