Cross-Country Monetary Policy Transmission

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Abstract

Why are mortgage and deposit rates in the euro area dispersed despite the eurozone operating within a monetary union? I analyze the cross-country monetary policy transmission on mortgage and deposit rates via the bank market power channel. Europe provides an interesting study of heterogeneous countries within a monetary union where the central bank has implemented a broad range of monetary policies. My results show that, when the policy rate increases by 100 basis points (bps), banks with high market power charge a 49 bps lower deposit rate and a 20 bps higher mortgage rate relative to banks with low market power. The amount of deposits do not change. Lower deposit rates decrease bank funding, which makes mortgage rates more expensive. Banks with high market power appear to be less resilient to monetary contractions, as they are more constrained by lower profitability margins. As a consequence, monetary policy decisions are transmitted to mortgage and deposit rates mainly through banks with low market power. In periods of financial stress, monetary policy is ineffective in countries with highly concentrated banking sectors. Lastly, monetary policy shocks have negligible effect on mortgage and deposit rates during zero lower bound periods.

JEL Codes: E44, E52, G21

Keywords: Monetary policy transmission, market power

1 Introduction

Lending conditions matter for central banks to understand the effectiveness of monetary policy transmission on aggregate demand. From the early 2000s to the end of 2007, monetary policy transmission in the euro area was relatively homogeneous across countries, while it has been heterogeneous across countries during the financial and sovereign debt crises. For example, The Danmarks Nationalbank, the Swedish Riksbank, and the Swiss National Bank have entered negative interest rate territory. The European central bank (ECB) has been involved with credit easing and quantitative easing measures to secure the lowest rate on new loans and for banks to maintain the same level of lending to households and businesses as in the previous year. Altavilla et al. (2019) and Claessens et al. (2018) have studied monetary policy transmission to firm borrowing rates through sovereign debt exposure and bank profitability margin channels. However, there has not been analysis on cross-country monetary policy transmission via the bank market power channel.

In this paper, I explain cross-country monetary policy transmission on mortgage and deposit rates through the bank market power channel. I focus on mortgages because monetary policy stimulates the economy by reducing mortgage payments, which could increase household spending. I focus on deposits as it determines banks' funding to make loans. When pricing frictions are present, changes in monetary policy alter banks' lending margins. The compression of lending margins is more pronounced for banks with high market power. Thus, when financial frictions matter, monetary policy influences not only how much the banking system lends, but also how it is funded. Lower funding increases the mortgage rate for newly issued loans.

My empirical analysis focuses on cross-country monetary policy transmission in the euro area from 2000 to 2020. The euro area provides an interesting case study as

the countries have heterogeneous bank market structure within a monetary union. It is an ideal setting to check whether bank market power plays any role during the monetary policy transmission. I condition on bank and macro characteristics and control for cross-country and time-series heterogeneity. The cross-country and time-series panel provides a strong way to isolate the effect of low interest rate transmission through bank market power. Then I use local projection to see impulse response functions of a monetary policy shock on mortgage and deposit rates. I also compare monetary policy transmission over pre-zero lower bound (pre-ZLB) and ZLB periods.

I find that in response to a contractionary monetary policy shock, banks with high market power charge a 49 bps lower deposit rate relative to banks with low market power. The number of loans and deposits do not change. Reduction in the deposit rate lowers bank funding, which contributes to a higher mortgage rate for banks with high market power. Banks with high market power increase the mortgage rate by 20.7 bps more relative to banks with low market power. The effectiveness of monetary policy on mortgage and deposit rates is dampened by market power. Ineffective transmission of policy rate changes makes it harder for a central bank to regulate the dynamics of aggregate demand. Thus, lending conditions are crucial to determine the effectiveness of monetary policy. Lastly, monetary policy shocks have negligible effect on mortgage and deposit rates during ZLB. Monetary policy transmits less during ZLB relative to pre-ZLB periods.

Related Literature The focus of the paper is the transmission of monetary policy through the bank market power channel. Altavilla et al. (2019) study the dispersion of monetary policy transmission through the sovereign risk exposure channel. Following a monetary expansion, poorly capitalized and highly exposed banks reduced their lending rates considerably less than banks with higher net worth or lower sovereign

risk exposure. They find that, over the period 2007-2014, there has been a significant fall in the median transmission of a policy rate change relative to the pre-2007 period, where capital adequacy and exposure to sovereign risk account for the decline in transmission dispersion.

In the US, the transmission to lending rates has been found to be stronger for small (Kashyap and Stein, 1995), illiquid (Stein (1995), Kashyap and Stein (2000)), and poorly capitalized banks (Peek and Rosengren (1995), Kishan and Opiela (2000), Van den Heuvel et al. (2002)). Larger, better capitalized, and more liquid banks are more resilient to monetary contractions as they can more easily substitute sources of external financing, absorb expected future losses, and divert liquidity to satisfy increases in loan demand. In this paper, I find that the transmission to mortgage and deposit rates are stronger for banks with less market power.

Peersman (2011) studies macroeconomic effects and pass-through of monetary policy in the euro area, and finds that a 25 bps decline in the policy rate is comparable to a 10% increase in the monetary base in terms of the magnitude of their impact on economic activity. Yet, bank interest rate spreads increase significantly after an expansionary interest rate innovation, whereas spreads decline persistently after a rise in the size of the Eurosystem's balance sheet. Boeckx et al. (2017) use a monthly bank-level dataset to analyze the effectiveness and transmission of credit support policies during Europe's banking and sovereign debt crisis. They find that banks that were more constrained in terms of external funding benefitted the most from these policies. I focus on the effectiveness of conventional and unconventional cross-country monetary policy transmission.

My work also connects to the literature on spillover effects. Kim (2001) examines the mechanism by which US monetary policy shocks are transmitted internationally in the flexible exchange regime, finding that expansionary US monetary policy

stimulates output in G-6 countries. Canova (2005) finds substantial effects from US monetary policy shocks on Latin American economies, in particular those that peg their exchange rate against the dollar, where the transmission operates via the financial channel through interest rate responses. Georgiadis (2016) finds that spillover effects from US monetary policy on output are stronger in countries which are less financially developed and have less flexible exchange rates and labor markets. Aizenman et al. (2016) find that financial spillovers from monetary policy in the US and other core countries are larger in economies with less flexible exchange rates and with higher financial openness. I study the spillover effects of US monetary policy shocks to mortgage and deposit rates in European countries.

My analysis contributes to the literature of low interest rates by looking at cross-country transmission in the euro area on mortgage and deposit rates. While research on cross-country monetary policy transmission focuses on bank profitability, I focus on bank market power. Claessens et al. (2018) analyze low cross-country interest rates on banks' net interest margins. Borio et al. (2017) study how monetary policy affects bank profitability across Europe, Japan, and the United States. They find that monetary policy is less effective in stimulating bank lending growth when interest rates are very low.

Recently, imperfect monetary policy transmission has been explained by bank market power. Drechsler et al. (2017) show that market power allows banks to keep deposit rates stable, but an increase in the policy rate transmits less to deposit rates. Banks lose deposit funding because deposits become less attractive as a store of value. There is a literature that evaluates the effect of low interest rates on the aggregate economy. Heider et al. (2018) examines empirically how negative policy rates transmit to the real economy. Eggertsson et al. (2019) presents New Keynesian macroeconomic models to evaluate the impact of negative policy rates. I explain

cross-country monetary policy transmission via the bank market power channel.

Outline The remainder of this paper is structured as follows. Section 2 introduces the data and demonstrates the cross-country differences in mortgage and deposit rates. Section 3 describes the empirical specification, and Section 4 discusses the effects on mortgage and deposit rates. Section 5 concludes.

2 Data

My main data source is the ECB Statistical Data Warehouse. I use the period 2000 to 2020 for 25 European countries[1]. I further obtain macroeconomic variables from Eurostat, monetary variables from the ECB BSI statistics, and monetary policy shocks, including the euro area shadow rate, from Wu and Xia (2017), and US monetary policy shock from Swanson (2021).

The main variables of interest are deposit and mortgage rates and ECB deposit facility rates (DFR). The DFR is the rate banks earn on their overnight deposits with the Eurosystem. While the ECB sets the rate on marginal lending facility and the rate on main refinancing operations, the DFR is the relevant rate during this period because of the ample liquidity provided by the central bank. The introduction of the ECB's expanded asset and credit purchase program increased the volume of excess liquidity in the system. A bank that has excess liquidity can either deposit it with the ECB or lend it to another bank in the system, where the interbank interest rate moves towards the DFR. Thus, the interest rate at which banks are able to deposit their excess liquidity has become the relevant variable in determining bank costs.

[1]The countries in my sample are: Austria, Belgium, Bulgaria, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithunia, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovekia, Slovenia, Sweden, and Spain.

Summary statistics of my sample of countries are displayed in Table 1. Countries' Herfindahl-Hirschman Index (HHI) is on average 0.11 and at maximum 0.14. A lower HHI indicates that the banking market is competitive, while a higher value indicates a concentrated market. Banks have an average ROA of 0.33. Government bonds are represented as a percentage of GDP, and the average among countries in my sample is 3.8%. The sovereign stress indicator (SSI) measures stress in sovereign debt markets in the Euro Area. It integrates measures of credit risk, volatility, and liquidity at short-term and long-term bond maturities into a broad measure of sovereign market stress. Higher values indicate a greater degree of stress. Inflation rates in these countries are 1.25% with a deposit rate of 0.24% and a mortgage rate of 2.65%.

Table 1: Summary Statistics

Variable	Mean	Std. Dev.	Min	Max	P25	P50	P75
HHI	.11	.07	.02	.36	.07	.1	.14
Government debt	3.82	3.33	0	16.4	1.3	2.6	6.3
ROA	.33	.8	-10.9	2.97	.16	.35	.6
Deposit rate	.24	.32	0	2.07	.04	.11	.33
Mortgage rate	2.65	1.02	.88	5.73	1.9	2.45	3.24
ECB Policy rates	.56	.5	.25	1.75	.25	.27	.75
SSI	.17	.19	.008	.987	.048	.087	0.206
Inflation	1.25	1.25	-1.6	5.7	.35	1.2	2.2
Unemployment rate	8.77	4.83	2.4	27.5	5.7	7.25	10.4
Population (000s)	18,231	23,188	420	83,084	3,517	9,198	18,380

Notes: Data on mortgage and deposit rates come from Eurosystem policy and exchange rates, return on assets (ROA) come from the European Bank Authority, HHI in bank assets are from Banking Structural Financial Indicators, and government bond measured as a percentage of GDP is from Government Finance Statistics. Inflation and the sovereign stress indicator come from Statistical Data Warehouse, while GDP growth comes from national accounts. Data on policy rates are from Eurosystem policy and exchange rates and unemployment rates are from Eurostat.

Table 2 shows similarities across countries with different mortgage types. On average, countries with fixed-rate mortgages (FRMs) have higher mortgage and deposit rates than countries with adjustable-rate mortgages (ARMs). Countries with FRMs have higher population and government debt, whereas countries with ARMs have higher inflation and unemployment rates.

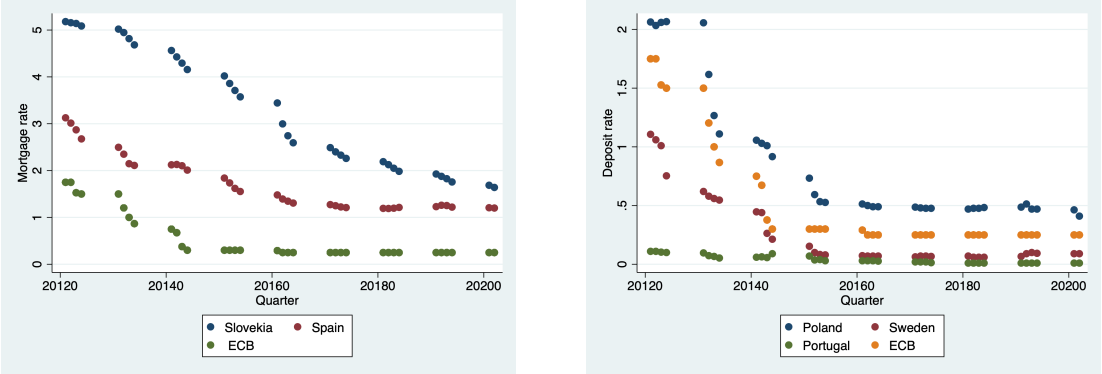
Table 2: Summary Statistics by Mortgage Type

Variable	Mean	Std. Dev.	Min	Max	P25	P50	P75
Adjustable-Rate Mortgages							
HHI	.1	.08	.02	.39	.04	.08	.12
Government debt	4.61	3.09	.06	12.19	2.13	3.66	6.88
ROA	.17	.77	-10.93	1.94	.08	.29	.5
Deposit rate	.57	.61	.01	7.38	.11	.38	.89
Mortgage rate	3.15	1.4	.88	7.55	1.98	3.06	4.18
Sovereign Stress Indicator	.2	.23	.01	.99	.05	.09	.25
Inflation	1.95	1.52	-1.4	15.3	1	1.9	2.9
Unemployment rate	9.96	4.85	1.9	27.5	6.3	8.8	11.9
Population (000s)	21,961.35	19,638.26	409.51	60,789.1	8,388.53	10,522.3	38,517
Fixed-Rate Mortgages							
HHI	.1	.07	.01	.27	.05	.11	.17
Government debt	4.71	4.43	0	17.39	.88	2.97	8.6
ROA	.3	.38	-1.81	2.13	.12	.27	.41
Deposit rate	.66	.72	0	3.67	.09	.41	1.06
Mortgage rate	3.74	1.15	1.6	5.94	2.67	3.99	4.62
Sovereign Stress Indicator	.14	.14	.01	.81	.05	.08	.17
Inflation	1.87	1.54	-1.6	12	1	1.8	2.3
Unemployment rate	7.25	2.68	3	19.6	5.2	7.3	8.5
Population (000s)	31,986.38	30,759.31	2,792.55	83,084	7,177.99	16,225	65,330

Notes: Fixed-Rate Mortgages: Belgium, Bulgaria, Denmark, France, Germany, Lithuania, Netherlands. Adjustable-Rate Mortgages: Austria, Greece, Finland, Italy, Latvia, Luxembourg, Poland, Portugal, Slovenia, Spain, Sweden.

2.1 Cross-country Analysis

Figure 1 illustrates the variation in mortgage and deposit rates across countries. Scatterplots for all European countries in our sample are shown in the Appendix. Slovakia has the highest mortgage rate among the European countries. On average, Sweden and Denmark offer the lowest mortgage rates while Germany and Slovakia offer the highest rate. Sweden and Denmark have higher bank market concentration and have higher ROA. Portugal and Sweden have lower deposit rates than the policy rate ECB while Poland has a higher deposit rate than the policy rate.



(a) Mortgage rates

(b) Deposit rates

Figure 1: Cross-sectional deposit and mortgage rates

Notes: ECB is the policy rate. Mortgage rates are always higher and deposit rates are generally lower than the policy rate. However, Poland's deposit rate is higher than the ECB rate.

The following summary statistics show the mean and standard deviation of mortgage and deposit rates in low- vs high-concentration markets. On average, banks in highly concentrated banking industries charge lower mortgage and deposit rates, with higher variation in mortgage rates and lower variation in deposit rates.

Table 3: Summary Statistics

Variable	Low Market Concentration	High Market Concentration
Mortgage rate	2.77	2.59
	(0.86)	(1.08)
Deposit rate	.36	.15
	(0.402)	(0.195)

Figure 3 illustrates the dispersion in cross-country bank market concentration. Finland has higher market concentration. Market concentration is rising for Cyprus, whereas it stays constant for Austria.

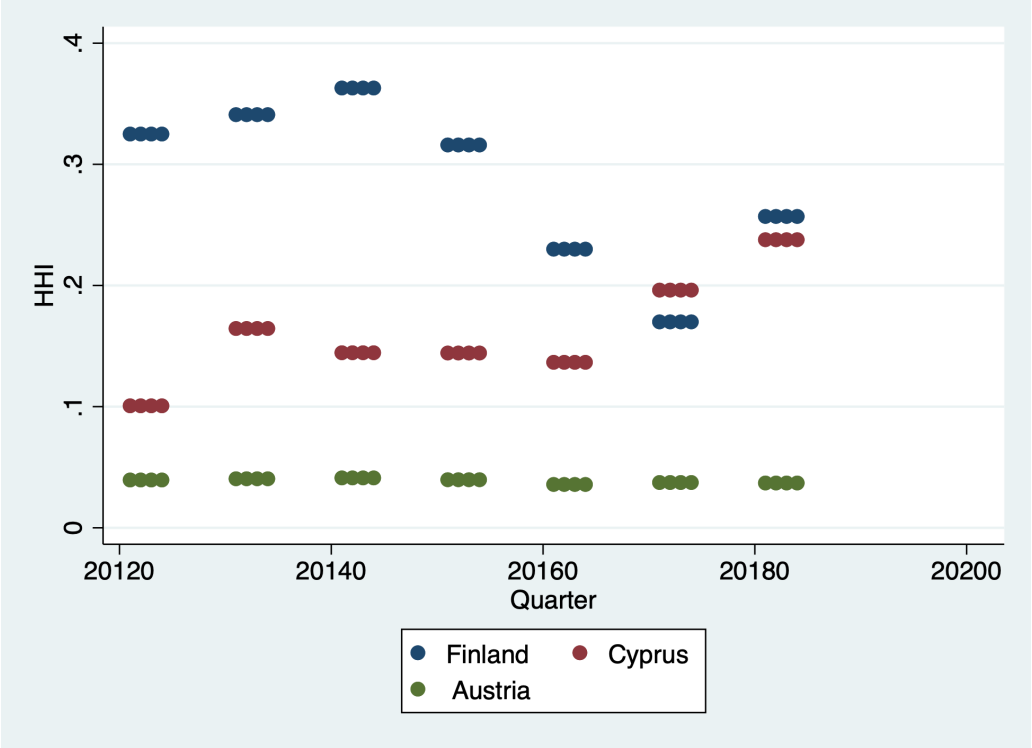


Figure 2: Herfindahl-Hirchsman Index–Bank market power

3 Empirical Strategy

In this section, I discuss three empirical strategies to study cross-country monetary policy transmission. First, I use OLS regression to understand how cross-country monetary policy transmits to mortgage and deposit rates. Second, I use local projection to see how impulse responses work under monetary policy shock.

3.1 Cross-Country Monetary Policy Transmission

Countries have different bank market power because Europe has variation in government support for big banks. Government support to financially stressed countries can distort bank competition in various ways. First, the government support may give an advantage to banks in financially stressed countries over banks in non-financially stressed countries. The expansion of banks in financially stressed countries could affect the competition. Second, it could prevent potential entry by foreign banks into the domestic market. In this paper, I ask if market concentration plays any role on the variation in deposit and mortgage rates.

$$y_{ct} = \alpha_c + \alpha_t + \beta_1 HHI_{ct} + \beta_2 \Delta i_t + \beta_3 HHI_{ct} \times \Delta i_t + \gamma X_{ct} + \epsilon_{ct} \tag{1}$$

where y_{ct} is either deposit or mortgage rates, HHI_{ct} is the Herfindahl-Hirschman Index in total bank assets, and Δi_t is the change in percentage points compared to the previous ECB deposit facility rate. Throughout all regressions, I control for quarter t and country c fixed effects and cluster at the country level. X_{ct} includes bank and macro controls. The fixed effects α_c ensure that all country-specific influences are accounted for, provided they are invariant over time. Year fixed effects, α_t, are included to reflect time-varying factors common to all countries.

β_1 captures how banks in a concentrated market charge deposit or mortgage rates, while β_2 tells us how policy rate changes affect deposit and mortgage rates. The main variable of interest is β_3, which tells us how banks in a concentrated market react to policy rate changes on deposit and mortgage rates.

Second, I sort banks by their market concentration.

$$y_{ct} = \alpha_c + \alpha_t + \beta_1 dHHI_{ct} + \beta_2 \Delta i_t + \beta_3 dHHI_{ct} \times \Delta i_t + \epsilon_{ct}, \tag{2}$$

where $dHHI_{ct}$ equals one when a country is above the 50th (75th) percentile of concentrated markets. β_1 captures whether banks with higher market power charge higher mortgage or deposit rates and β_3 shows how banks with higher market power respond to monetary policy changes.

3.2 Impulse Responses

I estimate whether the pass-through of monetary shocks to mortgage and deposit rates depend on the level of interest rates. I use Jorda (2005)'s local projection method and estimate the following regression equations at horizons $h = 0, ..., 4$ years:

$$y_{c,t+h} - y_{c,t-1} = \alpha_{ch} + \theta_{ch} i_t + \beta x_{ct} + \epsilon_{c,t+h}. \tag{3}$$

Dependent variables y_c are the mortgage and deposit rates, α_{ch} are country fixed effects for each horizon regression, i_t is monetary shock from Wu and Xia (2016), and x_{ct} includes country-specific and bank controls. I control for macroeconomic variables including GDP growth, inflation rate, sovereign stress indicator, population, and unemployment rate for each country. For bank controls, I take into account the return on asset (ROA) and HHIfor credit institutions' total assets and the holding of government bonds on commercial bank balance sheets.

Let θ_{ch} represent the estimate of the impulse response functions (IRFs) at horizon h. I can estimate a simple regression for each horizon h rather than impose the dynamic structure from a VAR. Jorda projection imposes fewer restrictions, but the IRFs are often estimated less precisely. Control variables do not need to be the same in every set of regressions. By construction, the error terms are moving average, so I use HAC standard errors.

Second, to see the interaction of monetary policy shock and bank market power, I implement:

$$y_{c,t+h} - y_{c,t-1} = \alpha_{ch} + \theta_{ch} i_t + \beta_1 x_{ct} + \beta_{2h} HHI_{ct} + \gamma_{ch} i_t \times HHI_{ct} + \epsilon_{c,t+h} \quad (4)$$

where $\gamma_{ch} i_t \times HHI_{ct}$ is interpreted as an additional effect of market concentration on $y_{c,t+h} - y_{c,t-1}$ (on top of the policy effect), if the policy effect simultaneously increases by 100 bps.

4 Results

In this section, I document three new facts about cross-country monetary policy transmission. First, when the policy rate increases by 100 bps, banks in concentrated markets raise their deposit rates by 37 bps and increase the mortgage rate by 14 bps. Second, an increase of 8.4 bps in monetary policy increases the mortgage rate by 0.01 bps and deposit rate by 0.003 bps after one year. Lastly, a monetary policy shock has negligible effect on mortgage and deposit rates during ZLB, as policy transmission has become less effective during ZLB relative to pre-ZLB periods.

4.1 Cross-Country Monetary Policy Transmission

Column (1) in Table 4 shows that a 100 bps increase in the policy rate increases deposit rates by 49 bps on average. Regression results are statistically significant throughout different specifications. Market concentration is not statistically significant except for in column (4) when time fixed effects are included. Banks in highly concentrated markets charge deposit rates that are 37 bps higher. The interaction term between monetary policy and market concentration is negative, which tells us that banks in highly concentrated markets lower the deposit rate when the policy rate increases. This is in line with Drechsler et al. (2017), which finds that banks transmit the policy rate less towards deposit rates and thus lose deposit funding. In the overall effect, banks with higher market power reduce deposit rates by 77 bps in response to a contractionary monetary policy shock. However, the amount of deposits do not change, which lowers banks' funding.

Table 4: Deposit Market

	(1)	(2)	(3)	(4)	(5)	(6)
			Deposit Rates			log(deposit)
	Benchmark	Bank Controls	Country Controls	Time FE	Time and Country FE	
Δi_t	0.497***	0.496***	0.527***	0.539***	0.457***	3.623
	(0.0377)	(0.0419)	(0.0397)	(0.0555)	(0.115)	(4.916)
HHI	0.0188	0.0137	0.262	0.377*	0.986	1.394
	(0.229)	(0.203)	(0.249)	(0.225)	(1.007)	(5.976)
$\Delta i_t \times$HHI	-1.273***	-1.270***	-1.279***	-1.379***	-1.677**	-10.43
	(0.281)	(0.315)	(0.279)	(0.313)	(0.793)	(17.89)
ROA		-0.00113		-0.00132	-0.000730	0.00133
		(0.000803)		(0.000827)	(0.00199)	(0.00819)
Log(population)			0.0150**	0.0143**	0.588	3.621
			(0.00762)	(0.00698)	(1.045)	(2.305)
Employment rate			-0.00390	-0.00644***	0.0263	-0.0146
			(0.00249)	(0.00248)	(0.0235)	(0.0445)
Inflation			-0.0191**	0.000295	0.0567*	0.153**
			(0.00940)	(0.0124)	(0.0318)	(0.0559)
R^2	0.361	0.372	0.369	0.416	0.762	0.993
N	667	522	667	522	522	440

Table 5 shows the response of mortgage rates to a contractionary monetary policy shock. One standard deviation increase in the policy rate raises mortgage rates by 6.7 bps, while high market power banks further increase mortgage rates by 20.7 bps. This result indicates that banks with higher market power decrease deposit rates, which lowers their funding, and thus they charge higher mortgage rates relative to banks with lower market power.

Table 5: Mortgage Market

	(1)	(2)	(3)	(4)	(5)	(6)
			Mortgage Rates			log(loan)
	Benchmark	Bank Controls	Country Controls	Time FE	Time and Country FE	
Δi_t	0.00895	0.0128	0.0124	0.0667***	0.0572**	-0.0590
	(0.00841)	(0.0103)	(0.00848)	(0.0166)	(0.0239)	(0.243)
HHI	-0.0466	-0.0295	-0.0315	-0.0576	-0.405*	-7.448
	(0.0660)	(0.0717)	(0.0737)	(0.0764)	(0.231)	(6.214)
$\Delta i_t \times$ HHI	0.105*	0.0915	0.116**	0.140**	0.0788	1.440
	(0.0583)	(0.0704)	(0.0572)	(0.0648)	(0.0540)	(1.427)
ROA		0.0000204		-0.000529	-0.00110**	0.0132
		(0.000388)		(0.000371)	(0.000524)	(0.0152)
Log(population)			-0.00516	-0.00473	-0.865**	-6.590
			(0.00332)	(0.00335)	(0.355)	(9.359)
Employment rate			-0.00327***	-0.00187	-0.0104	-0.181
			(0.00117)	(0.00133)	(0.00665)	(0.165)
Inflation			0.0139***	0.0299***	0.00817	0.111
			(0.00474)	(0.00684)	(0.0143)	(0.0767)
R^2	0.058	0.053	0.107	0.256	0.547	0.939
N	415	358	415	358	358	360

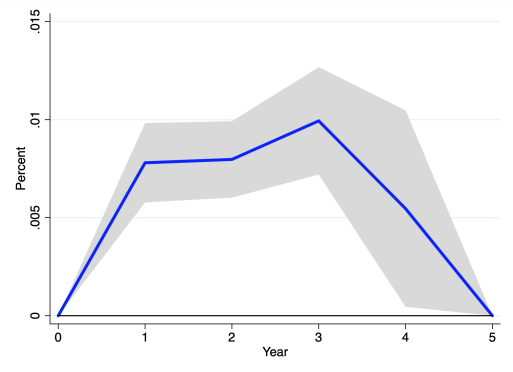
In Table 6, I group banks into high vs low market power. Columns (1) and (2) in Table 6 show mortgage rates and columns (3) and (4) show deposit rates. I try setting market concentration thresholds at the 50th and 75th percentiles. The interaction term of the policy rate and a dummy indicator for market power is not statistically significant on mortgage rate. However, it is statistically significant on deposit rates. Banks in highly concentrated markets charge a 34 bps lower deposit rate relative to their low-concentration counterparts.

Table 6: High vs Low Market Power

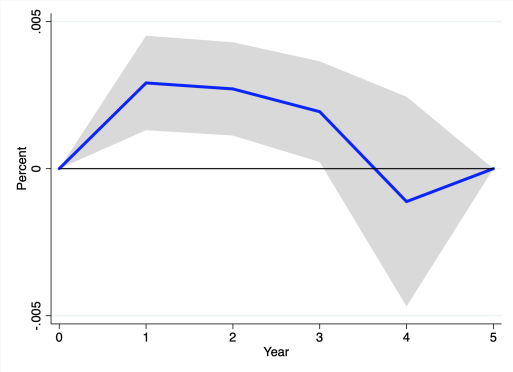
	(1)	(2)	(3)	(4)
	Mortgage rate	Mortgage rate	Deposit rate	Deposit rate
Δi_t	1.136***	1.274***	0.448***	0.349***
	(0.220)	(0.261)	(0.108)	(0.0912)
HHI50	0.0109		0.0516	
	(0.114)		(0.0341)	
$\Delta i_t \times$HHI50	0.0981		-0.343***	
	(0.185)		(0.120)	
HHI75		0.159		0.0494
		(0.139)		(0.0435)
$\Delta i_t \times$HHI75		-0.00667		-0.240**
		(0.138)		(0.110)
Log(population)	4.208	4.933*	0.353	-0.0336
	(2.490)	(2.654)	(0.733)	(0.781)
Employment rate	-0.0615	-0.0637	0.0216	0.0202
	(0.0524)	(0.0505)	(0.0179)	(0.0205)
Inflation	0.0412	0.0432	0.0291	0.0314
	(0.0728)	(0.0735)	(0.0216)	(0.0251)
ROA	-0.00386	-0.00446	-0.00220	-0.000610
	(0.00374)	(0.00403)	(0.00206)	(0.00212)
R^2	0.918	0.919	0.787	0.747
N	510	510	594	594

4.2 Impulse Responses

As can be seen in Figure 3, a monetary policy shock has a significant positive impact on mortgage and deposit rates. An increase of 8.4 bps in monetary policy increases mortgage rates by 0.01 bps and deposit rates by 0.003 bps after one year.



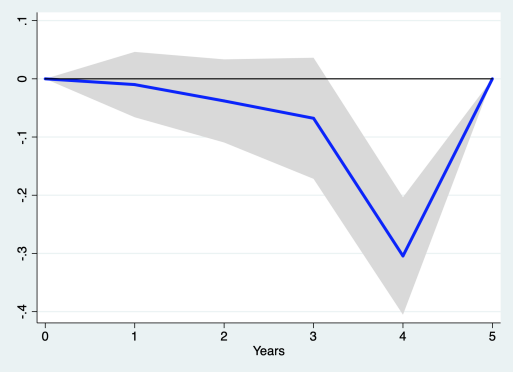
(a) Mortgage rate



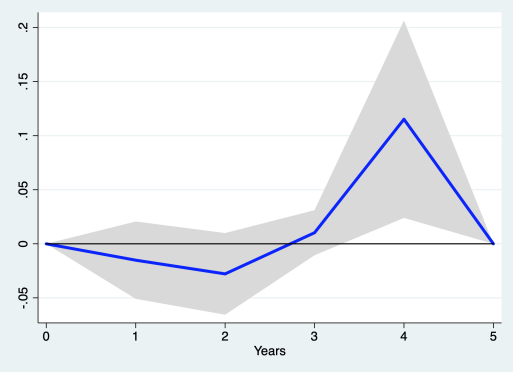
(b) Deposit rate

Figure 3: Response to Monetary Policy Shock

High market power banks charge less in order to mitigate the effect of monetary tightening on mortgage demand. Banks with higher market power respond positively to monetary tightening at the four year mark.



(a) Mortgage rate

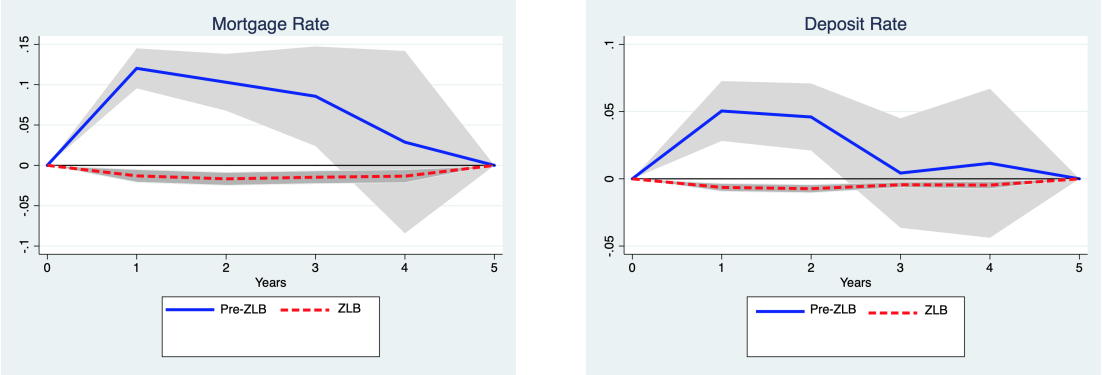


(b) Deposit rate

Figure 4: Response to Monetary Policy Shock x Market Power

4.3 Are the effects of unconventional policy actions different compared to conventional policy rate changes?

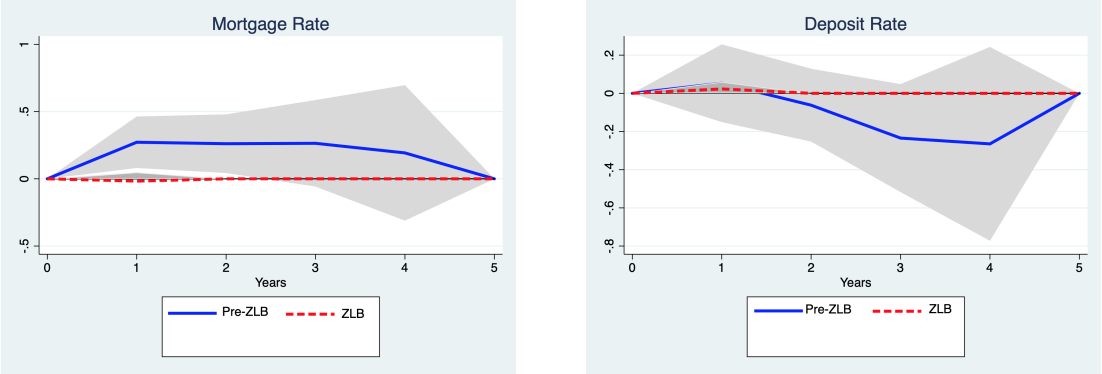
Figure 5 shows that monetary policy has a greater impact on the pre-ZLB period than during the ZLB period. During the ZLB period, monetary policy has a negligible negative effect on mortgage and deposit rates. The result on mortgage rates is similar when I interact market power with monetary policy shock. Banks with high market power charge lower deposit rates during contractionary monetary policy pre-ZLB but do not respond during the ZLB period.



(a) Mortgage rates

(b) Deposit rates

Figure 5: Response to Monetary Policy Shock



(a) Mortgage rates

(b) Deposit rates

Figure 6: Response to Monetary Policy Shock x Market Power

5 Conclusion

Monetary policies since 2014 have challenged banks when setting deposit and mortgage rates. While prior research has carefully studied policy transmission to deposit rates in low interest rate environments, I propose a novel mechanism – bank market power– by analyzing cross-country monetary policy transmission. I focus on the euro area as it provides bank and country heterogeneity within a monetary union. In this paper, I empirically document that banks with high market power decrease deposit rates which reduces their funding. Thus, banks make mortgage loans at a more expensive rate relative to banks with low market power. Monetary policy thereby becomes less effective during ZLB periods relative to pre-ZLB periods.

Banks with high market power are more prone to lower profitability margins and leave less room to tackle the transmission of monetary policy on mortgage rates. Thus, countries with high bank market power experience greater decreases in their deposit rates and greater increases in their mortgage rates than in countries with

lower bank market power. A monetary policy shock would decrease funding costs for banks, hamper a component of their profitability, and make the banking system vulnerable.

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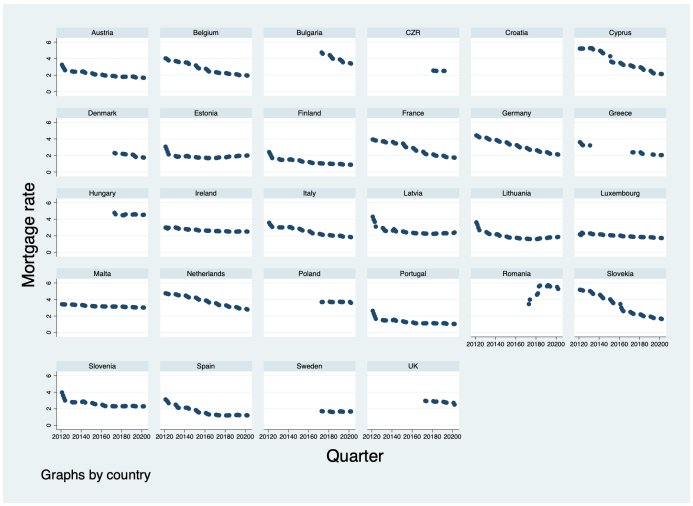
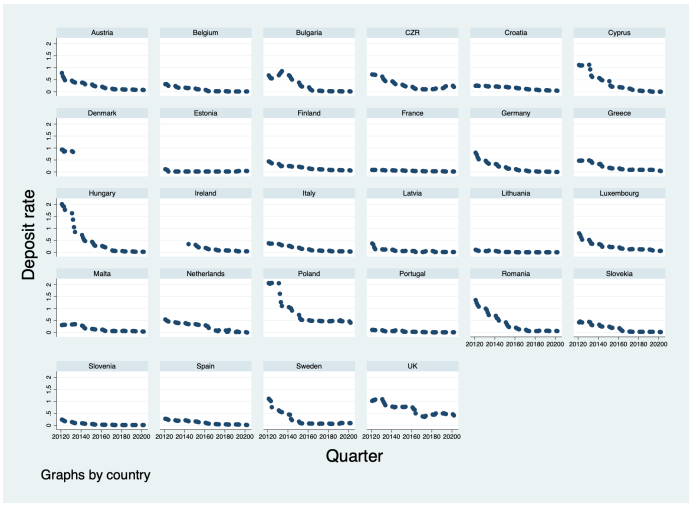
A Appendix



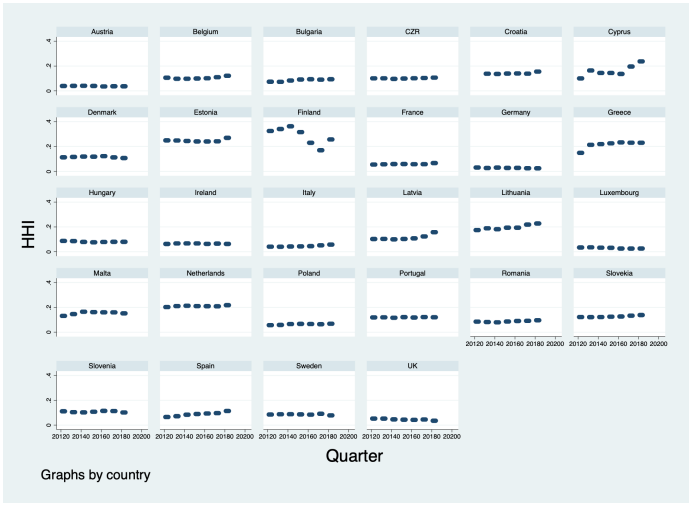
(a) Mortgage rate



(b) Deposit rate

Figure 7: Mortgage and deposit rates

(a) Return on assets



(b) HHI

Figure 8: Return on assets and HHI