



THE IMPACT OF FINANCIAL STABILITY REPORT'S WARNINGS ON THE LOAN TO VALUE RATIO

Andrés Alegría Rodrigo Alfaro Felipe Córdova
Central Bank of Chile

* The views are those of the authors and do not necessarily represent those of the Central Bank of Chile.



Motivation

- In its Financial Stability Report (FSR) of June 2012, the Central Bank of Chile issued a warning about potential risks associated with the dynamics of the housing market
- A second and stronger warning was included in the next FSR (December 2012)
- This paper measures the impact these warnings had on the Chilean mortgage market



FSR First Half 2012 (June 18, 2012)

Aggregate housing prices move in tandem with the economy's level of interest rates and income. At **some districts** in the central and eastern area of the Santiago Metropolitan Region prices **are outgrowing their historic trends**, possibly due to constraints in the land available. It is important to keep in mind that the materialization of the risk scenario described in this Report **could lead to a breakdown in current price trends**. The potential implications of this are price adjustments influencing the profits of executed projects and, additionally, the collaterals backing mortgage loans”.



FSR Second Half 2012 (December 18, 2012)

The Report highlights that aggregate housing prices indices have maintained their pace of expansion, in line with the dynamism of the economy, and that in many districts prices are rising above historic trends. These increases occur in a context of high growth in housing demand and a significant expansion of activity in this sector. [...] This, together with somewhat less stringent lending standards for mortgage credit. These developments could lead to financial vulnerabilities in the real estate and construction industry, or in those households searching for a home.



How do we do this?

- Aggregated data
 - Graphical analysis
- Administrative data
 - Distribution of LTV
 - Probit
 - Quantile Regression



Why focusing on the real estate market?

- The burst of the housing bubble in several economies, followed by the deleveraging of highly indebted households, lead to deep macroeconomic adjustments
- Housing is the main asset of the average household; therefore changes in property values affect their total wealth considerably
- A significant amount of home purchases are financed with mortgage loans, generating an exposure of banks to this sector



Outline

- Background
- Aggregated data
- Administrative data:
 - Distribution of LTV
 - Probit model
 - Quantile regression model
- Final remarks



Background



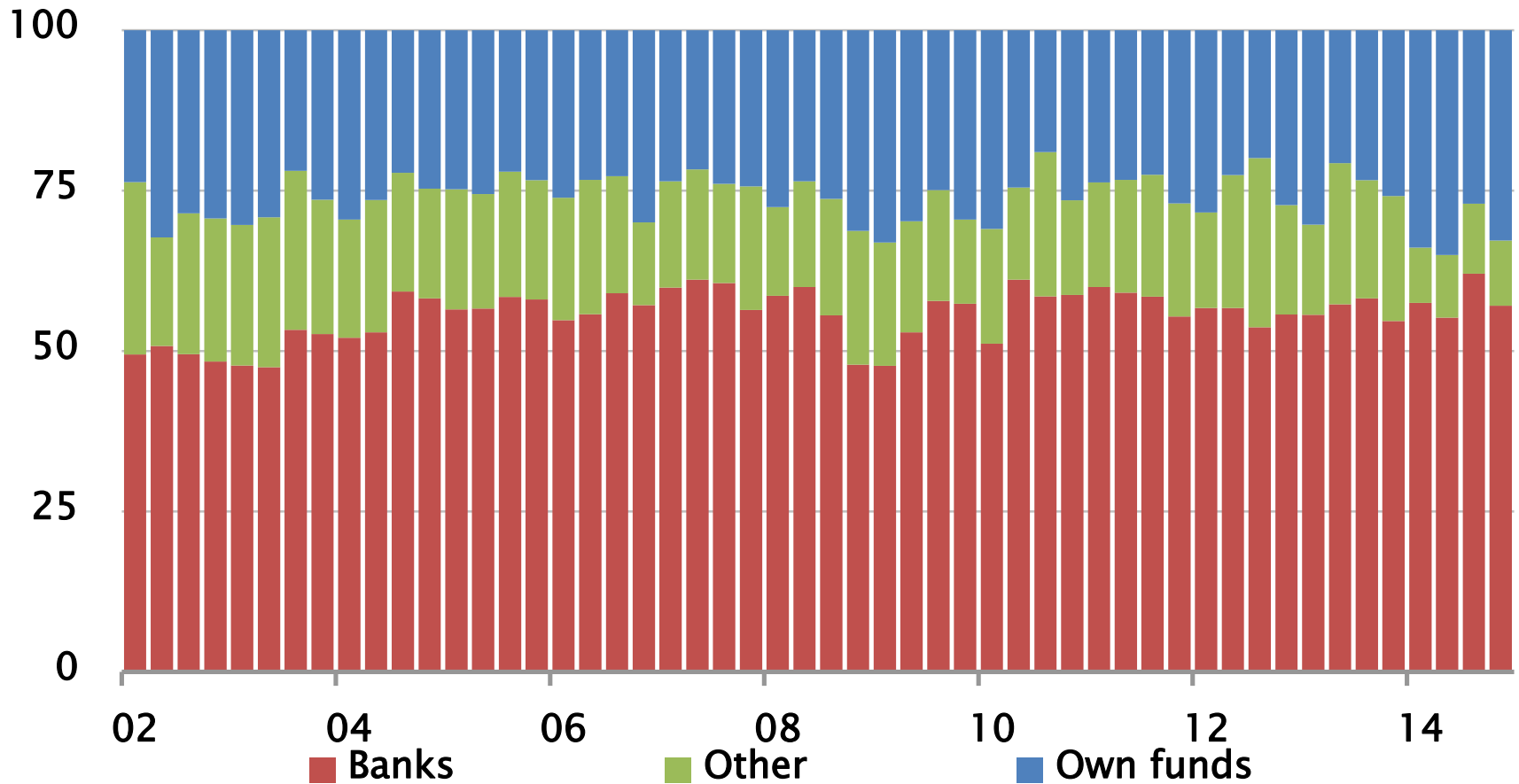
Background

- Since 1976, banks are allowed to offer inflation-indexed mortgage-backed bonds denominated in Unidades de Fomento (UF). UF is adjusted to the previous month inflation on a daily basis
- Regulatory and market structure changes in early 2000s shifted the financial instrument composition. Non-endorsable mortgage loans are currently predominant. These mortgages are mainly financed with emissions of long-term senior and subordinated corporate bonds
- Most mortgages have a fixed real interest rate. In 2015 over 98% of new mortgage loans had a fixed interest rate



Banking sector concentrates most of the housing market funding

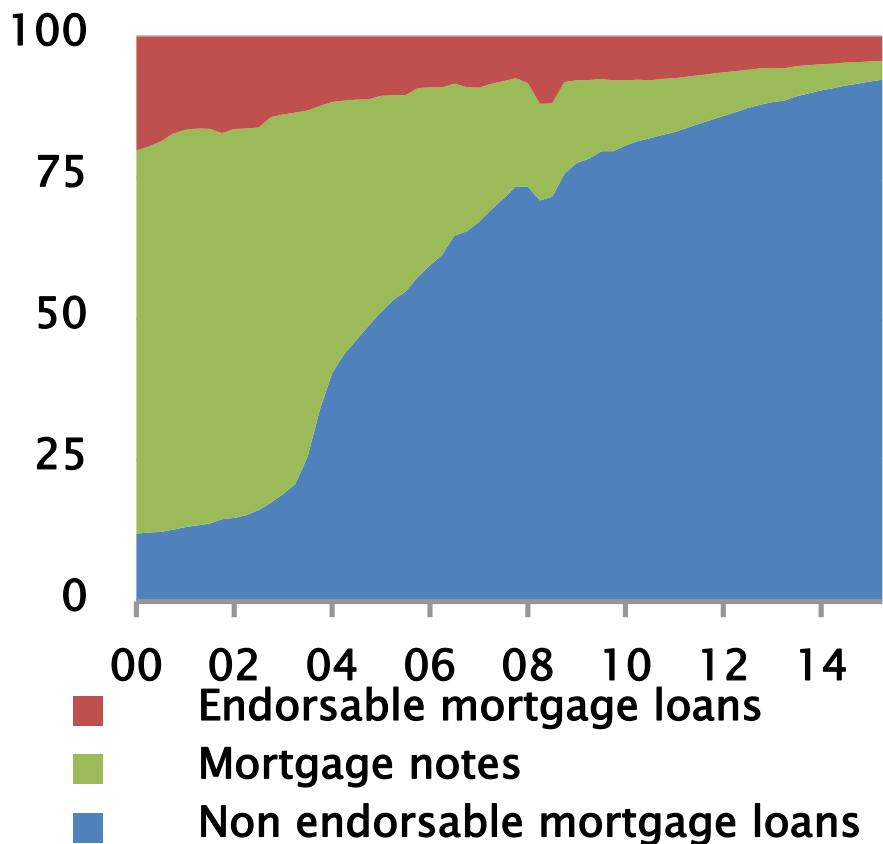
Housing market funding (percent)



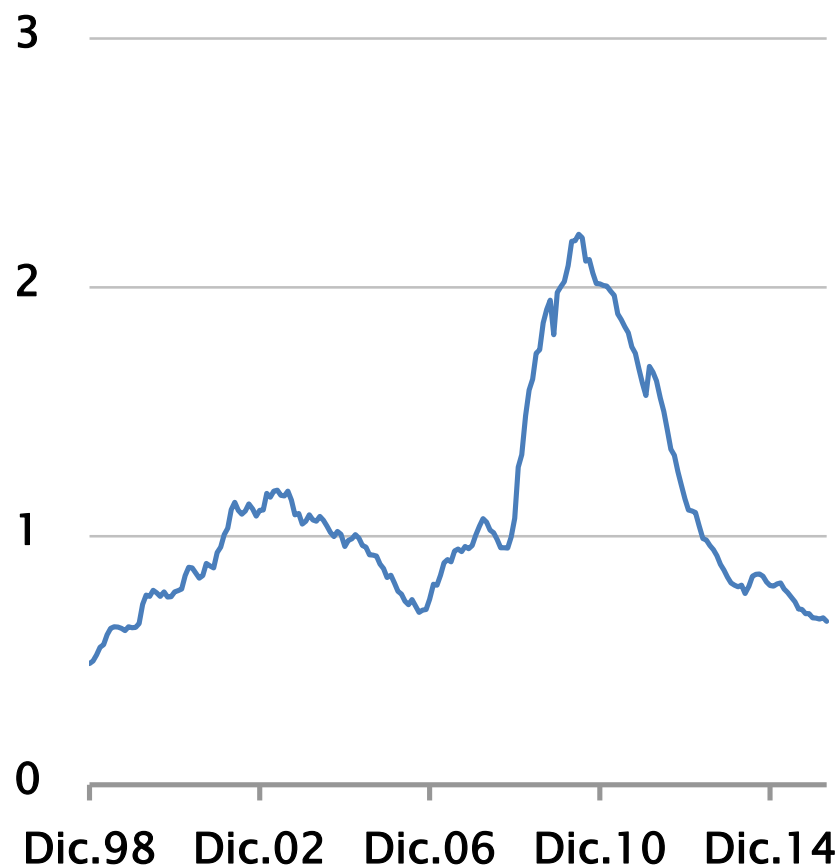


Market and regulatory changes propitiated a shift towards a more flexible financial instrument that sets no limit on LTV ratio. The share of unpaid installments has diminished after increasing during the financial crisis

Housing debt w/banks by instrument
(percent)



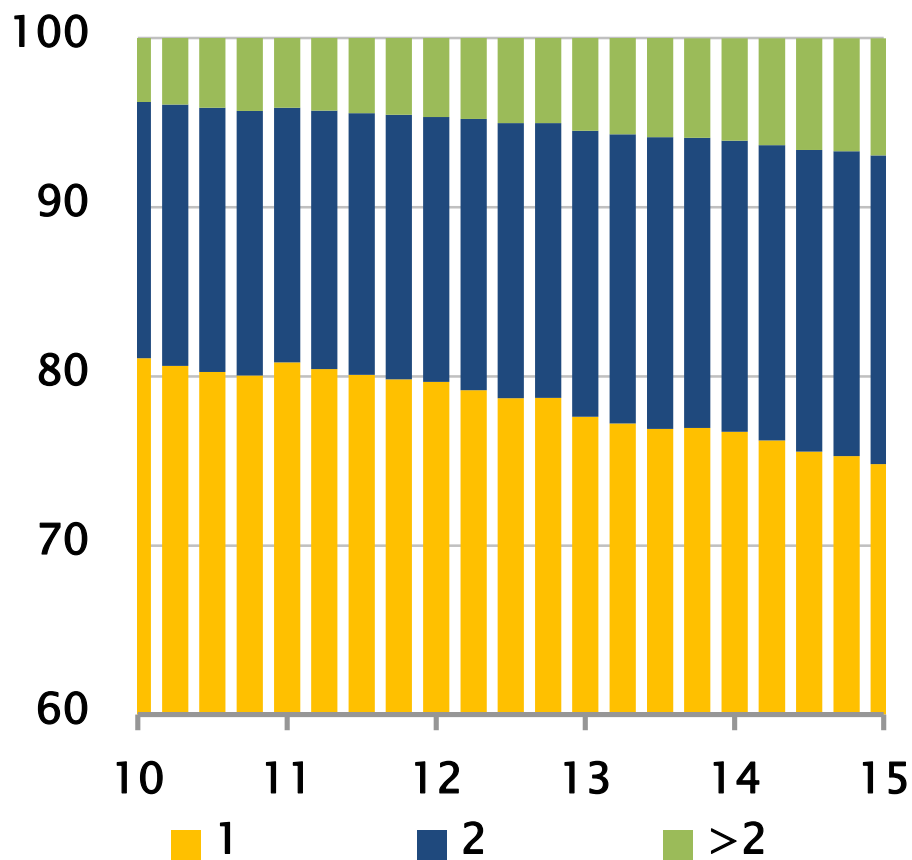
Unpaid installment ratio
(percent)



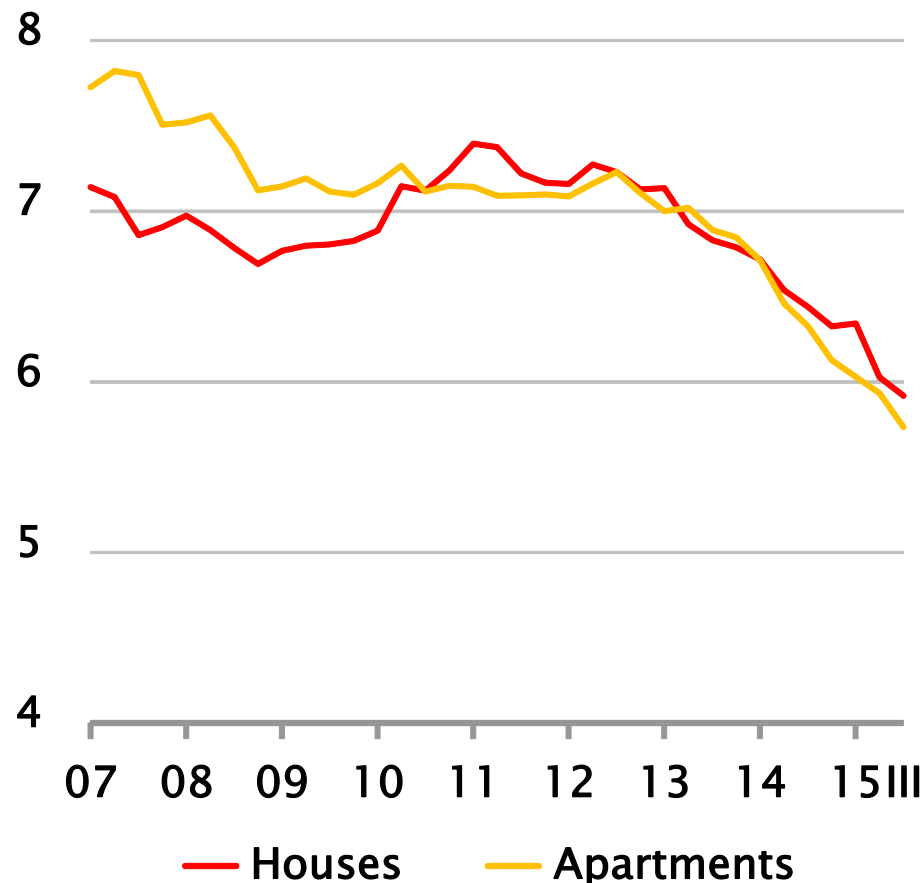


The mortgage loan market is mostly made out of first time buyers. The share of debtors with more than one loan started to increase as the rental rate of return remained at high levels

Number of mortgage loans per debtor
(percent of loans)



Housing rental return
(annual percent)



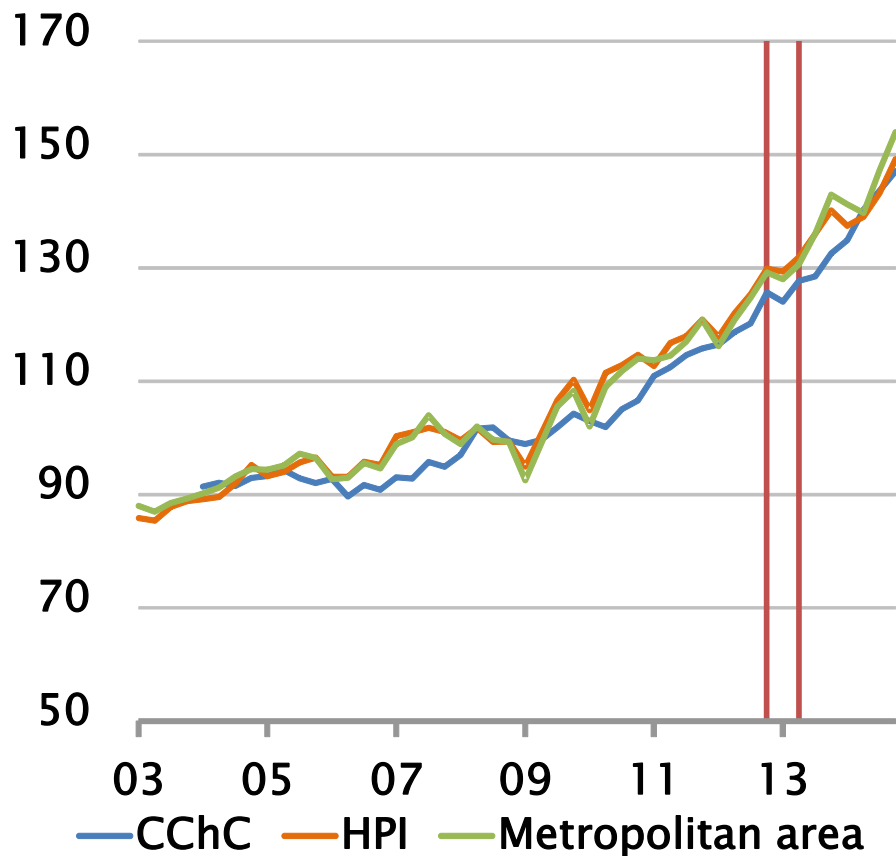


Aggregated data

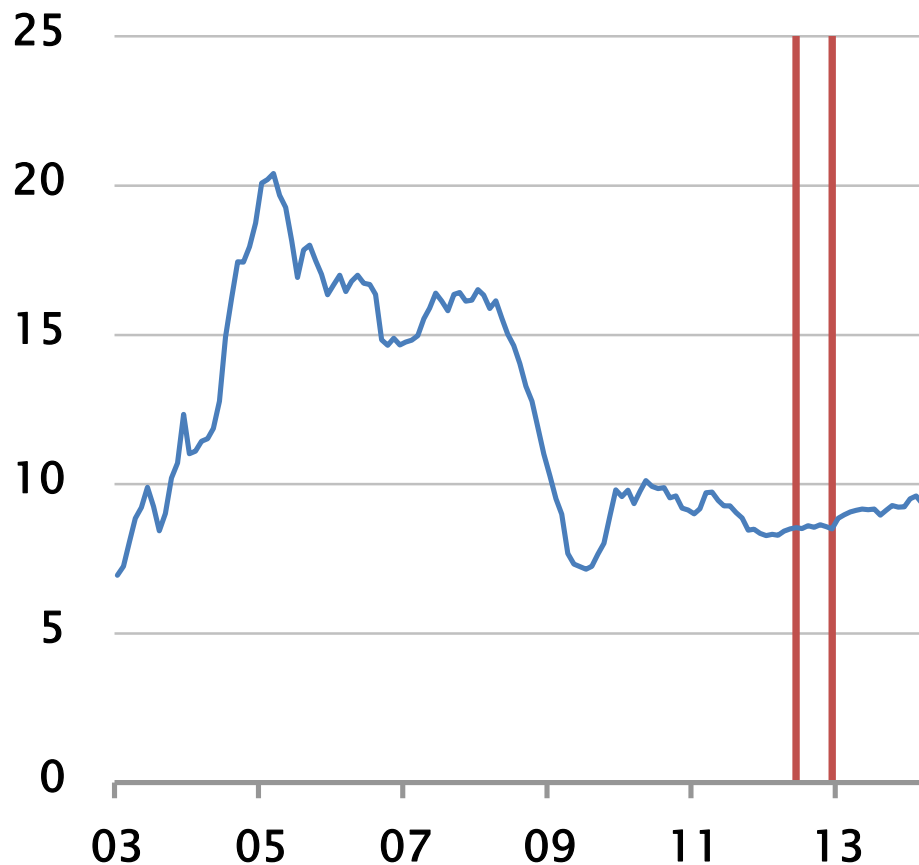


Aggregate house prices and mortgage loan growth showed no evident changes after the warnings were issued

Housing price index (2008 = 100)



Mortgage loans (real annual growth)





Summary I

- Aggregate figures show no impact of FSR warnings. This is consistent with the fact that warnings were not referring to a bubble scenario
- Instead, warnings called for prudence of banks when granting loans. This translated into tighter lending standards
- In the following exercises, based on micro-data, we study the effect these warnings had on the Loan to Value ratio



Administrative Data



Data description

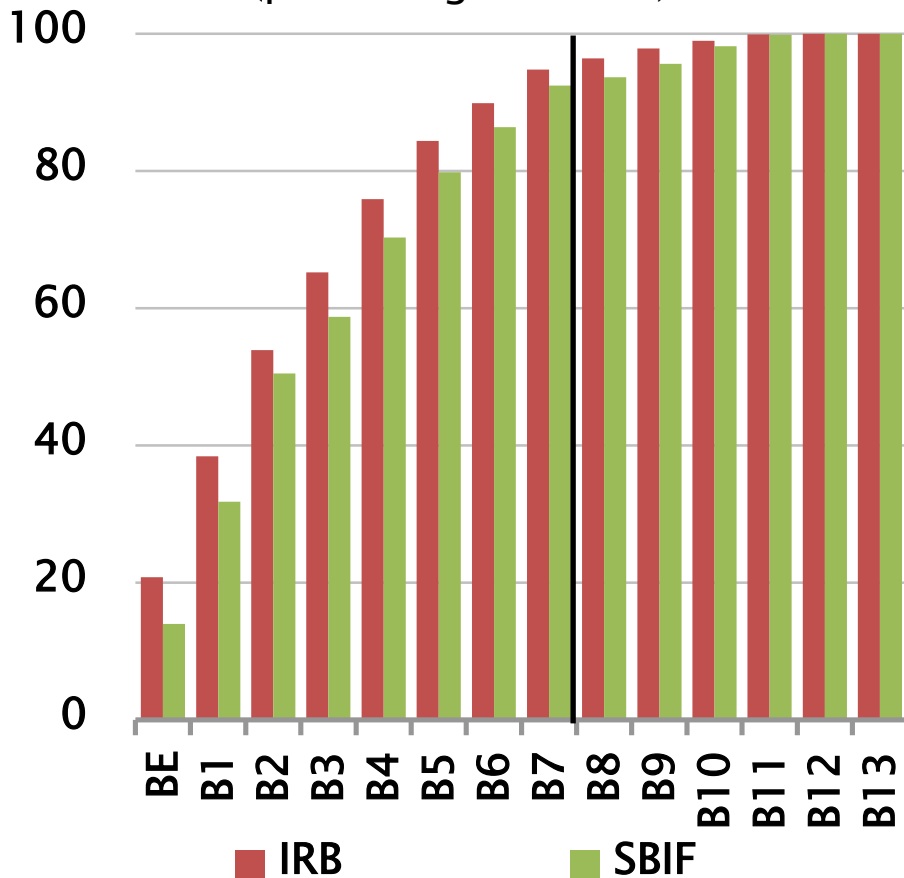
Tax Authority Database (IRB)

- Sample of housing transactions with bank financing
- Daily data 2004Q1–2014Q3
- Details of property (house/apartment, area), LTV, bank name, and tax–income bracket of buyer

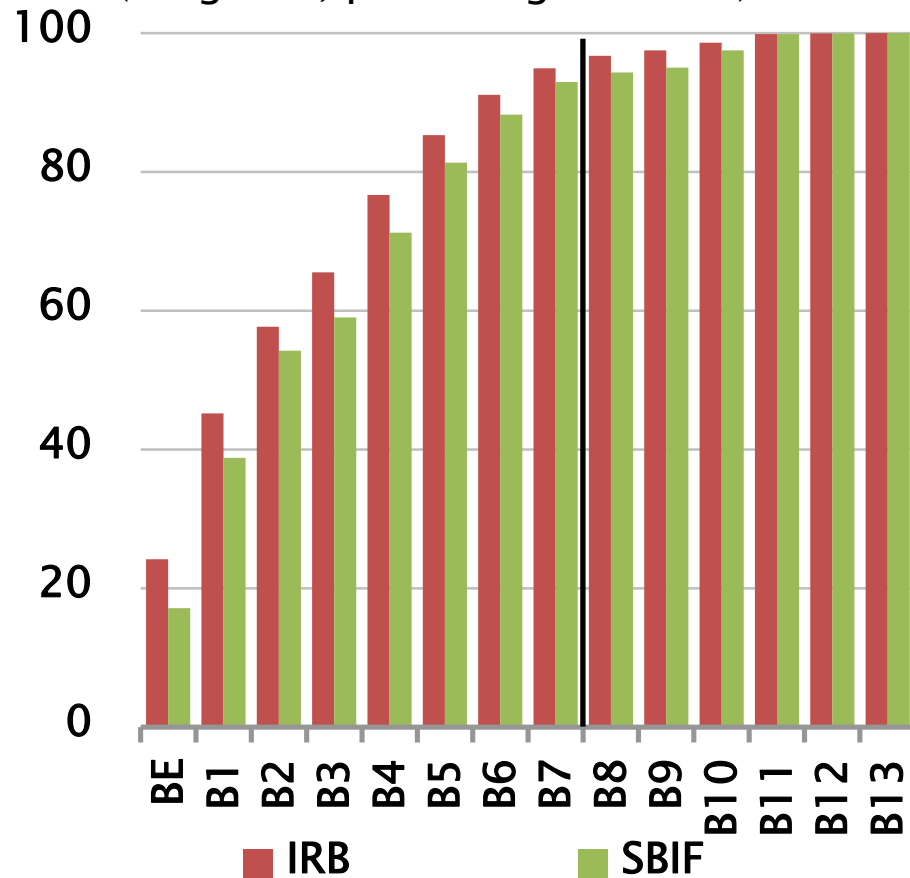


Using different sources of information, we verify that about half of the banks accumulate more than 90% of the market operations. Therefore, we will focus on this subset of institutions for the remainder of our exercises

Number of Operations by Bank
June 2012–September 2014
(percentage of total)



Number of Operations by Bank
June 2012–September 2014
(weighted, percentage of total)



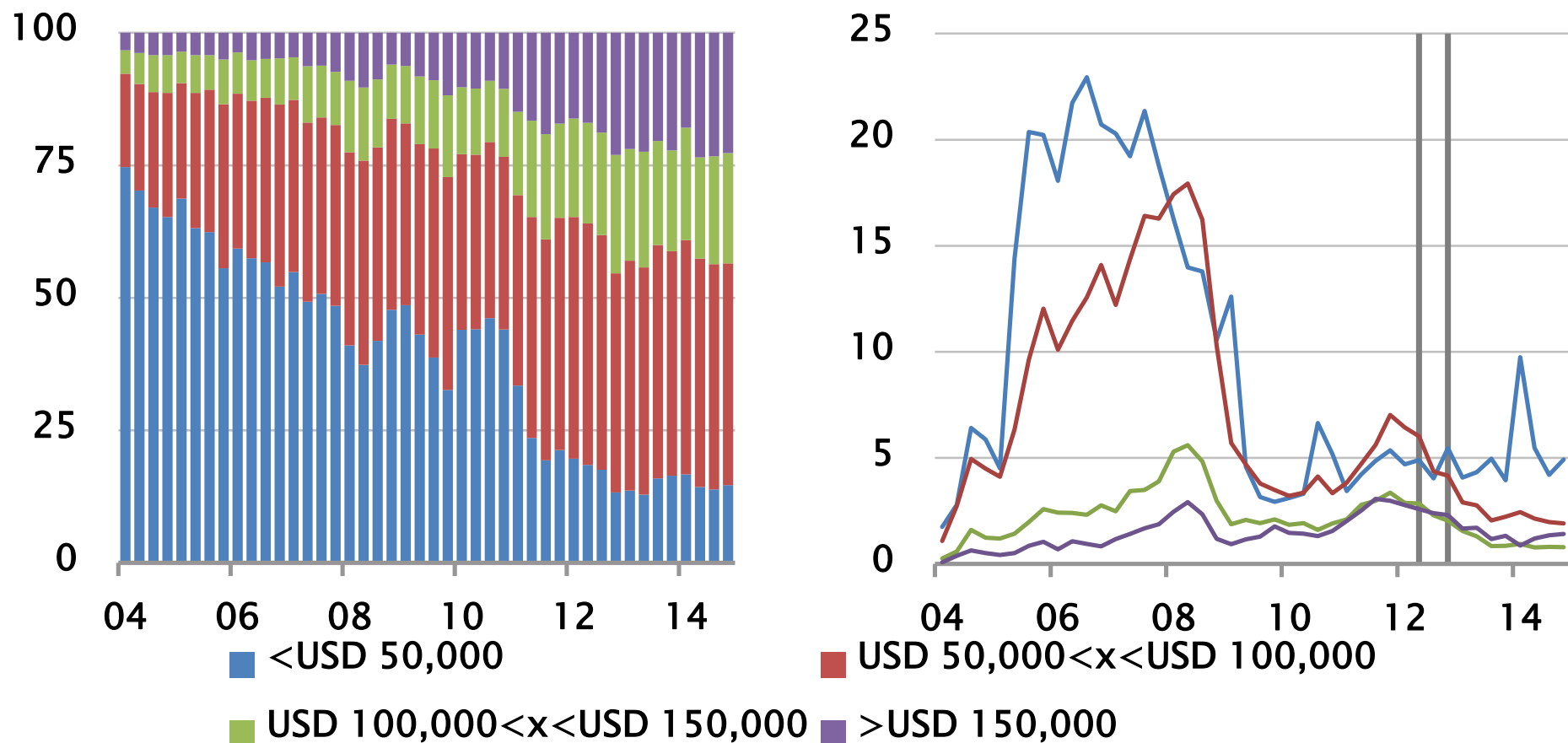


First Exercise: Distribution of LTV



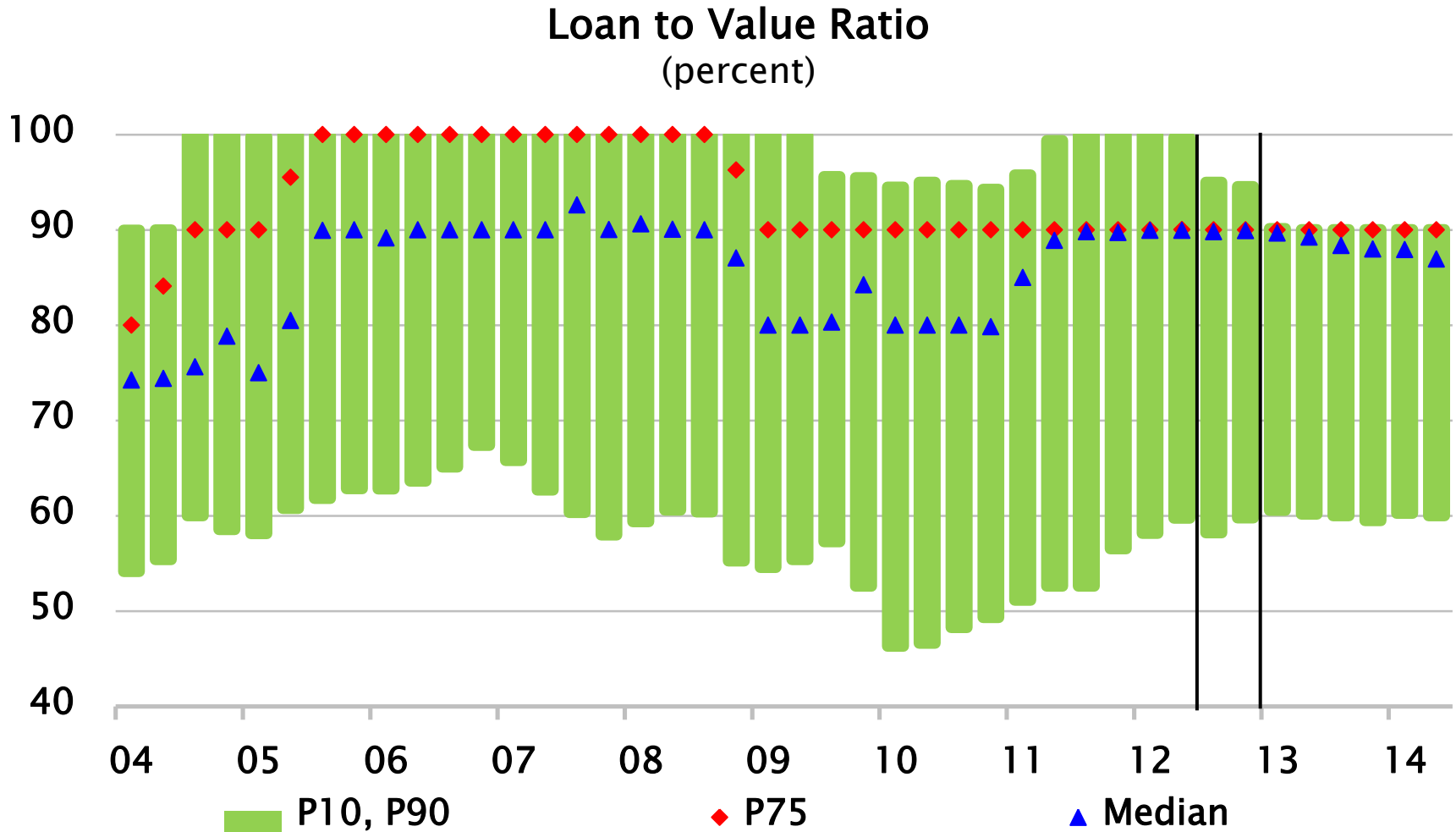
The concentration of mortgage loans has shifted towards houses of higher value. Also, the share of mortgage loans granted with full funding decreased after the financial crisis

Mortgage loans granted by banks
(percentage of transactions)



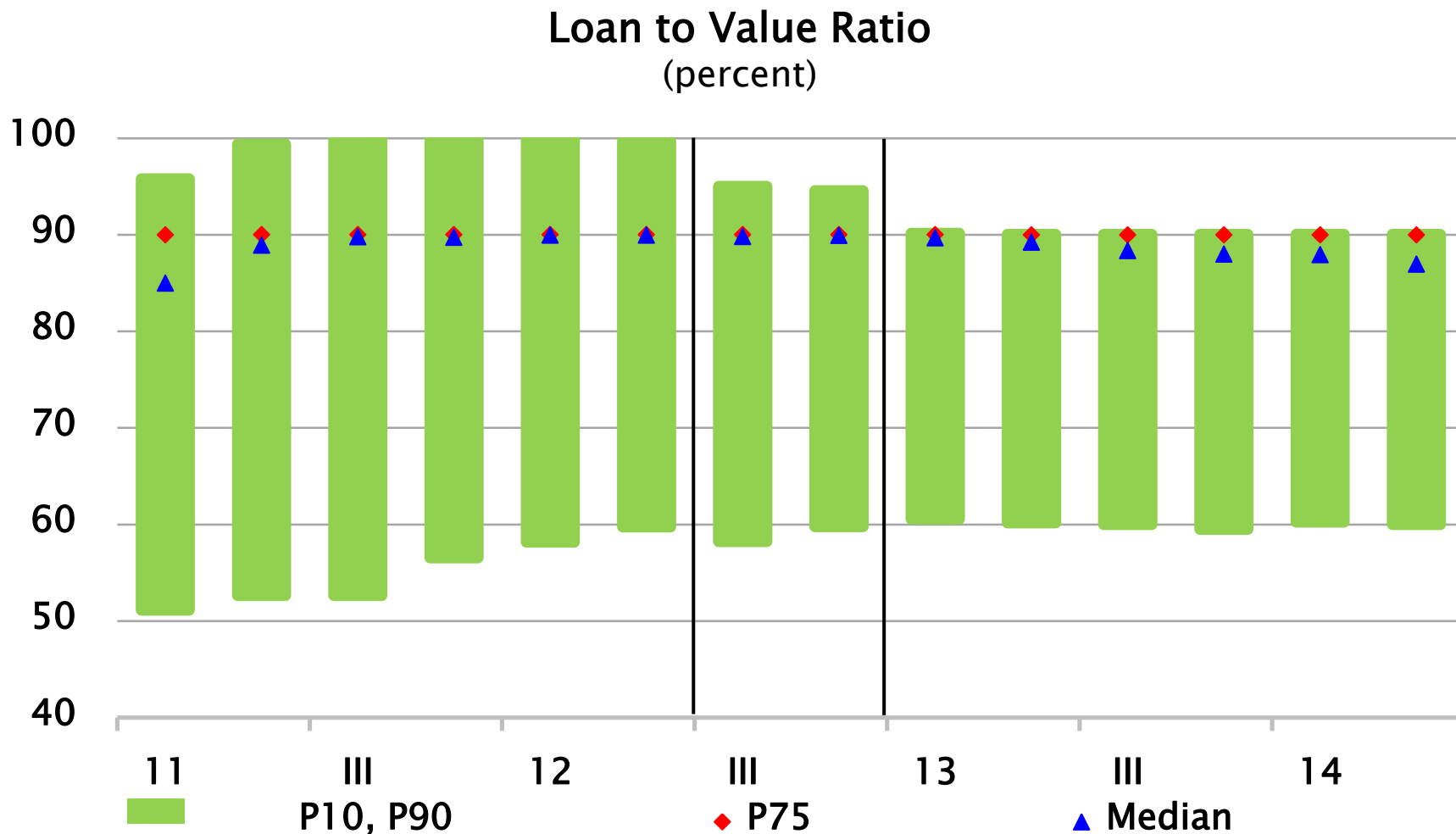


About 25% of the loans were granted with LTV of 100% before the subprime crisis (2005–2008). The first warning (June 2012) affected p90





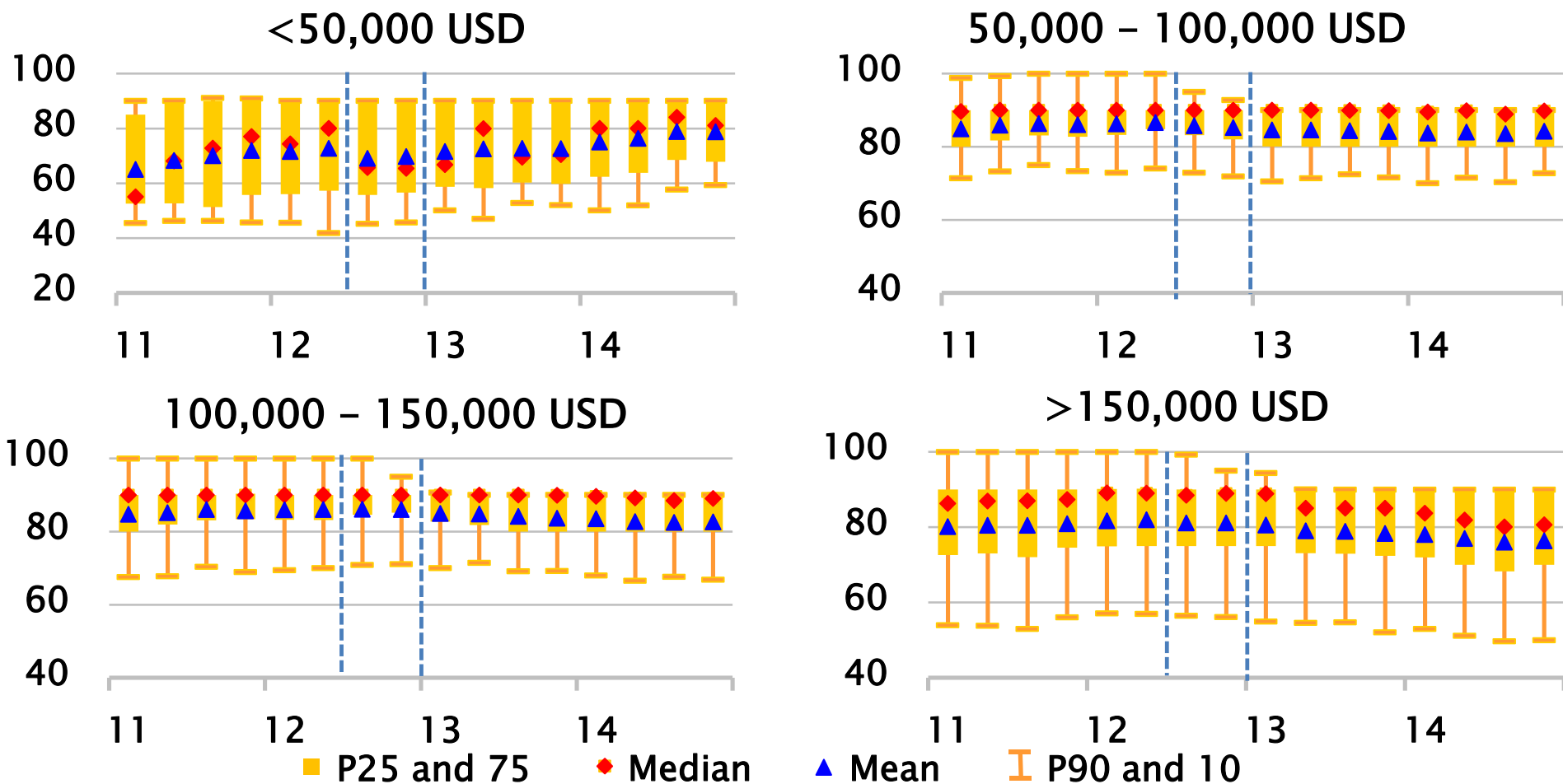
Zooming into 2011–14 allows us to partially isolate the message from the effect of the financial crisis. Focusing on the changes to p90





The timing and size of the response to the warnings was not homogeneous across banks and loan amounts. We study the average effect

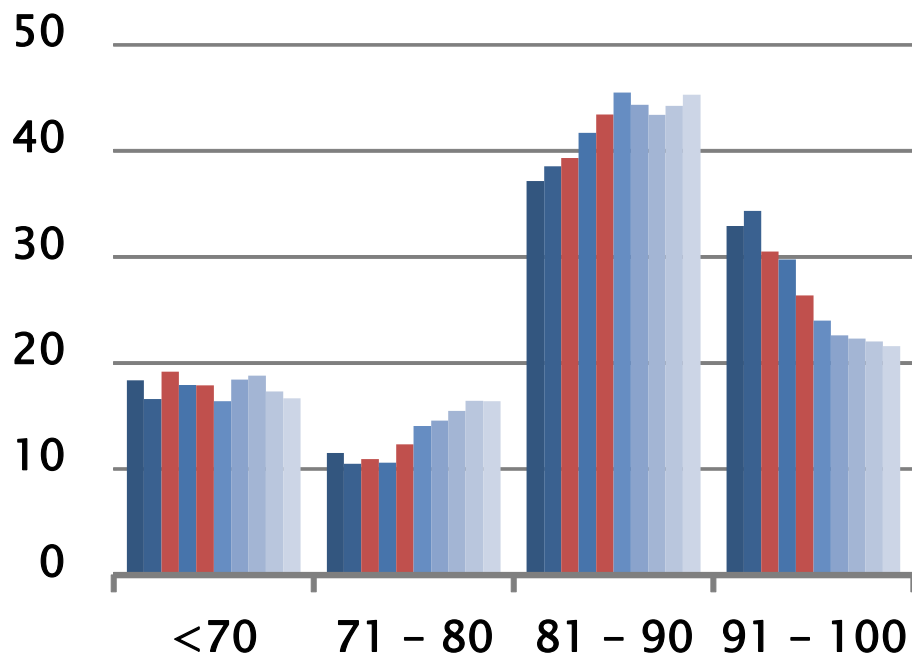
Loan To Value Distribution by House Price (percent)



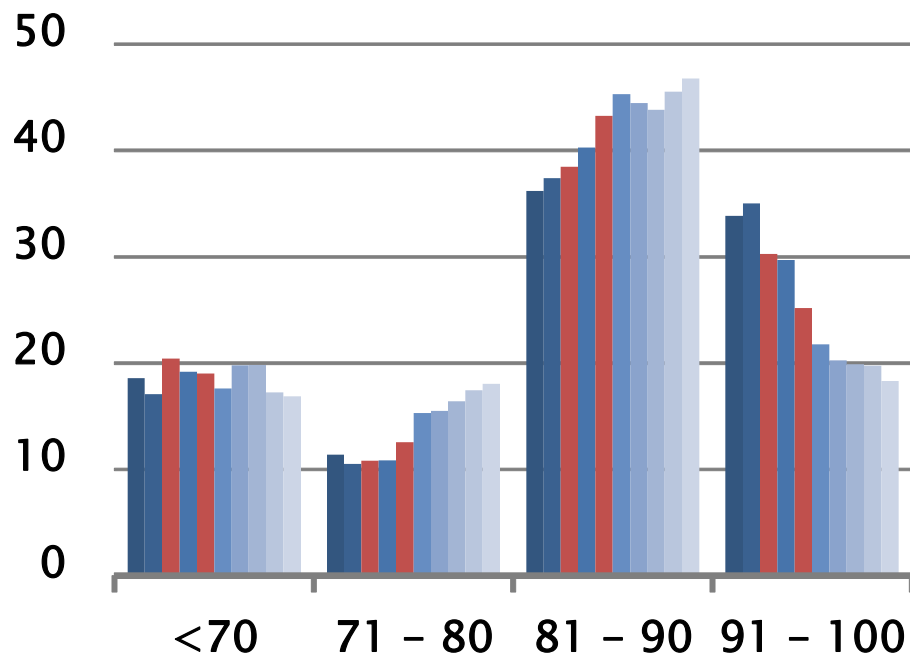


After the first warning, the high LTV bracket (>90) was reduced, this was somehow compensated by an increase in the low bracket (<70). One quarter later, the share of loans in the 81–90% interval began to increase. A similar pattern was observed after the second warning

Distribution of LTV ratio, full sample
(porcentaje)



Distribution of LTV ratio without BE
(porcentaje)



12Q1 12Q2 12Q3 - 1st W. 12Q4 13Q1 - 2nd W.
13Q2 13Q3 13Q4 14Q1 14Q2



Summary III

- Before the subprime crisis, a large fraction of loans (25%) were being granted with an LTV of 100%
- After 2009 there was a reduction in the granting of fully funded loans. However, after a couple of years, about 10% of loans granted by private banks had an LTV of 100%
- The warnings issued in the FSRs generated the last adjustment in the LTV distribution.



Second Exercise: Probit



Probit model setup

- **Data:** transaction level for subset of banks (over 270K observations) from 2010:Q1 to 2014:Q3.
- **Dependent variable:** Equal to 1 when the LTV ratio associated to a transaction is higher than a given threshold, and 0 otherwise.
 - We construct two dependent variables for two LTV thresholds, namely LTV90 and LTV80 for 90 and 80% thresholds, respectively.
- **Independent variables:** two dummy variables, one for each FSR warning.
 - The first one was issued in 2012Q3, and the second in 2013Q1.
 - Each of these dummy variables is equal to 1 after the respective warning is issued, and 0 before this period.



Joint effect of both warnings was negative on the probability of banks granting a loan with an LTV over 90%. The second warning had a larger impact, effect increases when removing the state-owned bank

Probit – (LTV90) (*)

	Full Sample			Without BE		
	(1)	(2)	(3)	(1)	(2)	(3)
2012q3	-0.07***	0.04***	0.06***	-0.22***	-0.06***	-0.04***
2013q1		-0.16***	-0.16***		-0.21***	-0.22***
Constant	-0.25***	-0.25***	-0.04***	-0.19***	-0.19***	0.02***
Bank FE	-	-	Yes	-	-	Yes
N	198,299	198,299	198,299	157,985	157,985	157,985



Total effect is smaller over the probability of a loan being granted with an LTV over 80%. Warnings were more effective on the far right side of the distribution.

Probit – (LTV80) (*)

	Full Sample			Without BE		
	(1)	(2)	(3)	(1)	(2)	(3)
2012q3	0.05***	0.09***	0.11***	-0.12***	-0.08***	-0.06***
2013q1		-0.05***	-0.06***		-0.05***	-0.07***
Constant	0.50***	0.50***	0.62***	0.62***	0.62***	0.69***
Bank FE	-	-	Yes	-	-	Yes
N	198,299	198,299	198,299	157,985	157,985	157,985



Probit summary

- The warnings significantly reduced the probability of a loan being granted with a high LTV
- The second message was more effective than the first one
- Effect is larger on the probability of granting new loans with an LTV over 90%
- When excluding the state-owned bank, the impact of the warnings increases. This might be due to the different mandate under which the latter institution operates



Third Exercise: Quantile Regression



Quantile regression setup

- **Data:** transaction level for subset of banks (over 270K observations) from 2010:Q1 to 2014:Q3.
- **Dependent variable:** LTV.
- **Independent variables:** bank fixed effects, debtors income and house price per m²
- **Econometric tool:** Quantile regression. Relevant provided that the impact is more prominent in p90.



FSR warnings were effective reducing the LTV of loans granted with ratios above 90%. The impact of the second warning was significantly larger than the first one

Quantile Regression (p90) (*)

	Full Sample			Without BE		
	(1)	(2)	(3)	(4)	(5)	(6)
2012q3	-9.87***	-4.95***	-0.63***	-9.48***	-3.89***	-1.08***
2013q1		-4.95***	-1.36***		-6.06***	-4.99***
Constant	99.95***	99.95***	100.00***	100.00***	100.00***	100.00***
Banks FE	-	-	Yes	-	-	Yes
N	198,299	198,299	198,299	157,985	157,985	157,985



The magnitude of the effect is smaller than previously obtained for the 90th percentile

Quantile Regression (p75) (*)

	Full Sample			Without BE		
	(1)	(2)	(3)	(4)	(5)	(6)
2012q3	-0.02***	-0.01***	-0.00	-0.04***	-0.02***	-0.01
2013q1		-0.02***	-0.01		-0.02***	-0.02
Constant	90.02***	90.02***	90.97***	90.04***	90.04***	90.97***
Banks FE	-	-	Yes	-	-	Yes
N	198,299	198,299	198,299	157,985	157,985	157,985



Results for the median LTV indicate the first warning had a positive effect over the granting of mortgage loans, but still negative when aggregating the impact of both warnings

Quantile Regression (p50) (*)

	Full Sample			Without BE		
	(1)	(2)	(3)	(4)	(5)	(6)
2012q3	-0.27***	0.38***	0.02	-1.27***	-0.14	-0.01
2013q1		-1.00***	-0.13		-1.80***	-1.15***
Constant	89.54***	89.54***	89.99***	89.95***	89.95***	90.00***
Banks FE	-	-	Yes	-	-	Yes
N	198,299	198,299	198,299	157,985	157,985	157,985



Quantile regression summary

- Overall, the QR results largely coincide with those of the Probit estimation
- FSR warnings were effective reducing the LTV of loans granted with ratios above 90%. The size of the effect is reduced when estimating in lower percentiles above the median
- The second message had a larger effect than the first one on the LTV distribution
- Removing the state-owned bank increases the magnitude of the impacts



Final Remarks

- The Central Bank of Chile issued two warnings about the mortgage market evolution in 2012. Aggregate results suggest these messages had no effect
- Looking at the LTV distribution we observe there was a statistically significant change among the upper percentiles after the warnings
- Our results indicate that the second message had a larger impact. When excluding the state-owned bank, the impact of the warnings increases
- These results are robust to the inclusion of a set of controls that capture existing heterogeneity among banks



THE IMPACT OF FINANCIAL STABILITY REPORT'S WARNINGS ON THE LOAN TO VALUE RATIO

Andrés Alegría Rodrigo Alfaro Felipe Córdova
Central Bank of Chile

* The views are those of the authors and do not necessarily represent those of the Central Bank of Chile.



Non-endorsable mortgage loans have no limit on LTV or DTI, unlike the other available instruments

	Mortgage note	Endorsable mortgage loan	Non-endorsable mortgage loan
Term	>1 year	1 to 30 years	–
LTV	Up to 75%	Up to 80%	–
DTI	Up to 25% for loans ≤ 3000 UF	–	–
Securitization	Not allowed	Allowed	Allowed



Banking sector concentrates most of the housing market funding

Housing debt (percentage of total housing debt)

	Banks			Totals	
	Non endorsable mortgage loans	Endorsable mortgage loans	Mortgage notes	Banks	Non Banks
2005	43.8	9.0	32.7	85.5	14.5
2006	51.2	7.7	27.1	86.0	14.0
2007	57.4	7.7	20.3	85.5	14.5
2008	62.7	7.0	15.6	85.4	14.6
2009	67.1	6.7	12.7	86.4	13.6
2010	71.1	6.8	10.2	88.0	12.0
2011	73.9	6.6	8.5	88.9	11.1
2012	76.9	5.7	6.9	89.5	10.5
2013	79.2	5.0	5.4	89.6	10.4
2014	81.5	4.4	4.2	90.1	9.9
2015	83.6	4.0	3.2	90.9	9.1