

BEYOND THE LTV RATIO: MACROPRUDENTIAL LESSONS FROM SPAIN

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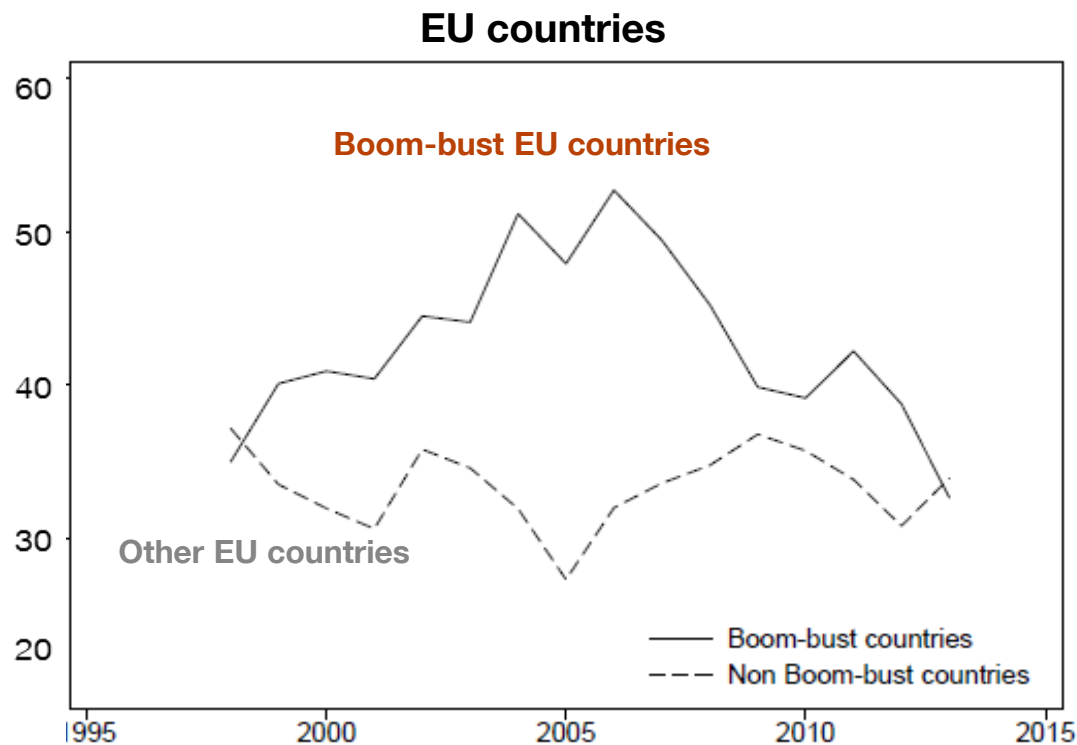
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JOINT ECB & BANCA D'ITALIA MPPG RESEARCH WORKSHOP "MACROPRUDENTIAL
POLICY: EFFECTIVENESS, INTERACTIONS AND SPILLOVERS"



- Implementation of borrower-based measures since the crisis to ensure sound lending standards over the cycle (Rünstler and Vlekke, 2017)

Share (%) of new mortgages with LTV>90%



Source: Kelly et al. (2019)

- LTV ratio in Spain: Lending standards did not deteriorate in this country?

Share (%) of new mortgages with LTV>90%



Source: Colegio de Registradores

➤ **Our paper**

- Large dataset of mortgages in Spain, at loan-level
- Empirical exercise: estimate the PD of mortgages given their terms *at origination*

➤ **Two main findings**

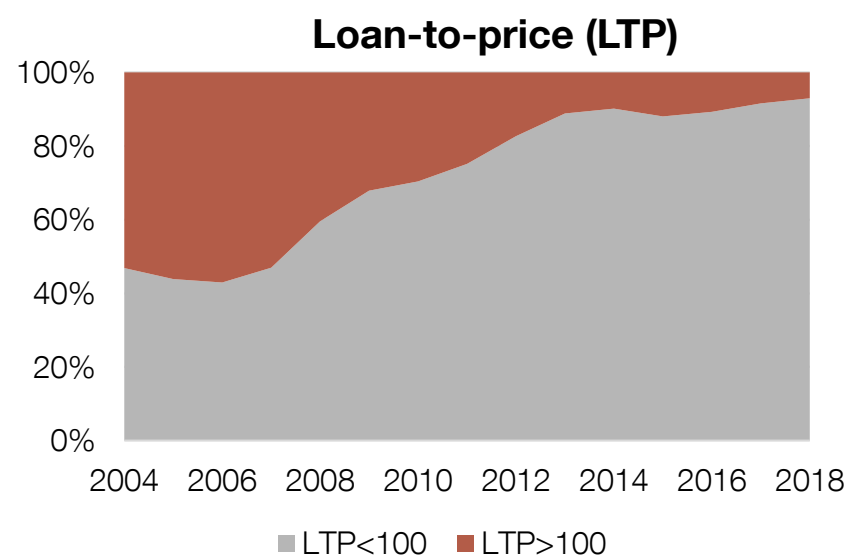
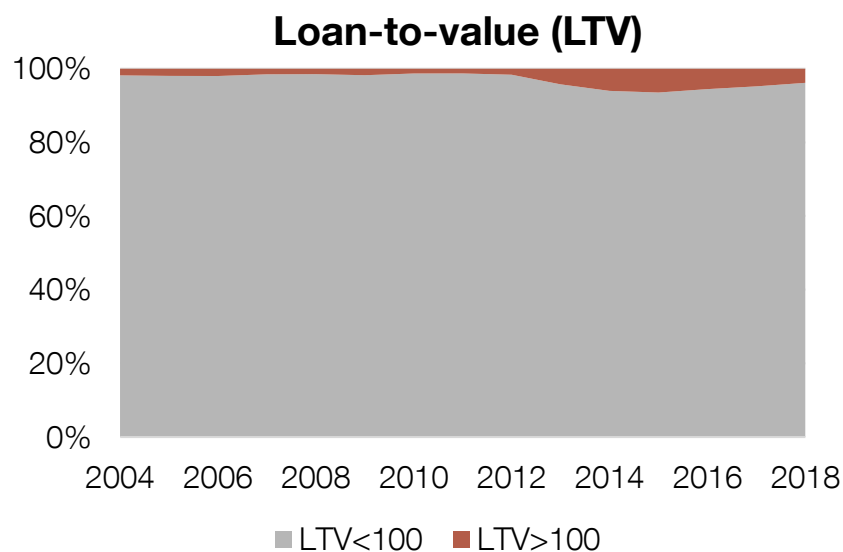
- LTV distorted by *optimistic* appraisals, impairing risk identification
 - Alternative leverage metrics/other indicators are better predictors of the PD of mortgages
- Non-linearities in the relationship lending standards-risk
 - No 1:1 relationship and pockets of risk when considering the joint distribution of indicators
 - Dynamic, not static relationship

- **Main dataset: Colegio de Registradores (Spanish land registries)**
 - A rich set of characteristics of dwellings (location, prices) and mortgages (principal amount, appraisals).
 - Full coverage of the mortgage market since 2004 (ca. 6 million operations), and at loan-level...
 - ...but 1) info on borrowers' characteristics (e.g. income) is absent; 2) some limitations regarding the dataset of defaults (before 2013)

- **Secondary dataset: European DataWarehouse (ED)**
 - Data on the collateral pool of MBS issued by Spanish banks
 - Large sample (ca. 2 million), solves for previous data gaps (borrowers' info) and default coverage issues
 - The riskiness of these loans does not seem materially different from that of other loans (securitized vs. non-securitized credit)

$$LTV \text{ ratio} = \frac{\text{Principal amount of the mortgage}}{\text{Appraisal value of the property}}$$

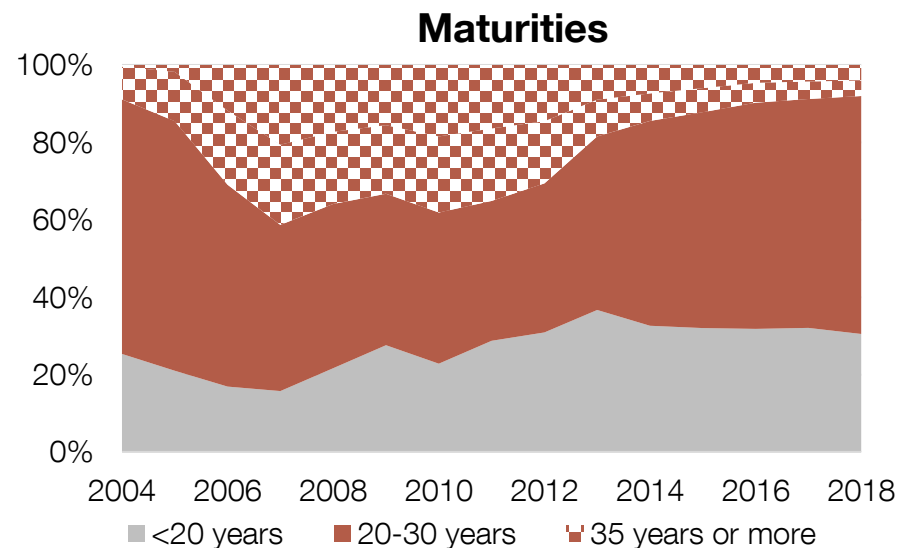
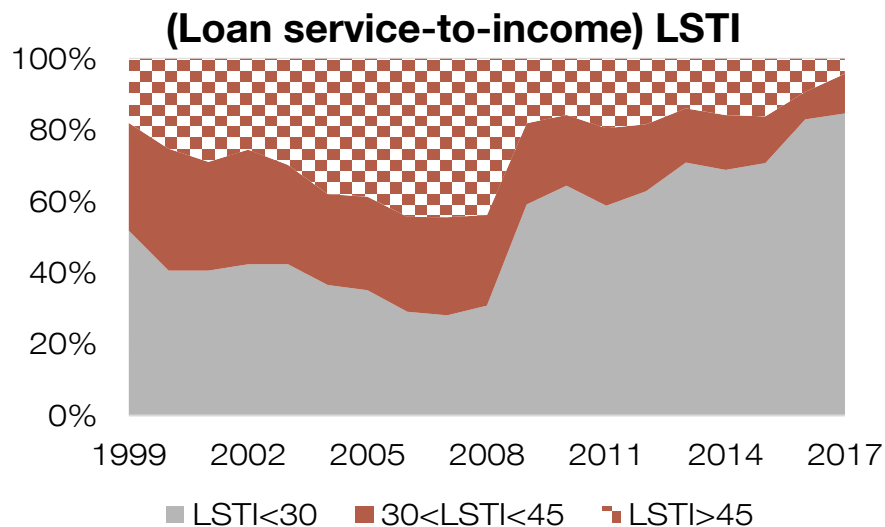
$$LTP \text{ ratio} = \frac{\text{Principal amount of the mortgage}}{\text{Price of the property (properties registers' records)}}$$



- 50% mortgages with **LTP** > 100% in 2007 (close to 0% if **LTV** is used)
- **LTP** better for monitoring, it may explain better loans failures?

Source: Colegio de Registradores

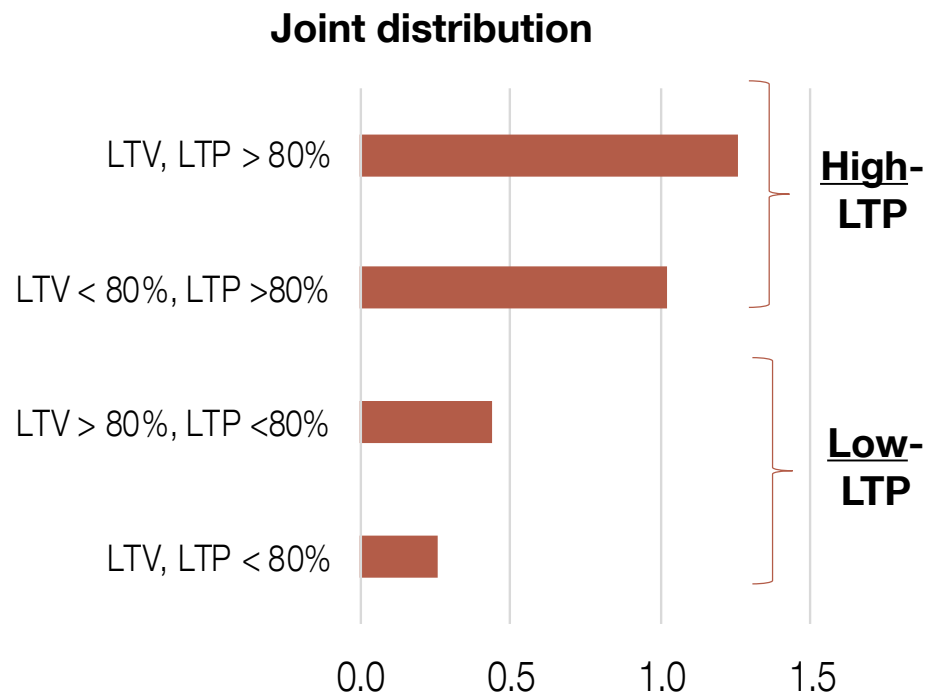
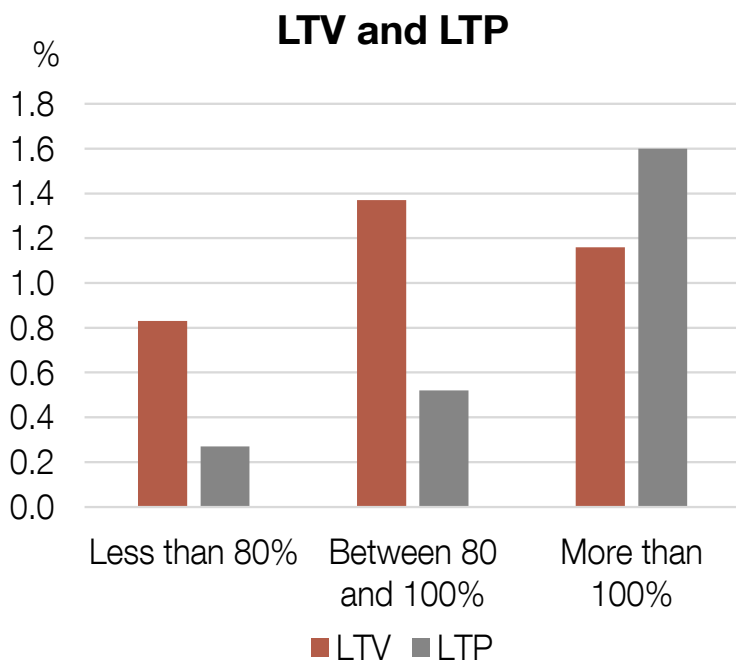
$$LSTI \text{ ratio} = \frac{\text{Debt service during the first year of the mortgage}}{\text{Annual income of the primary borrower}}$$



- The LSTI appears more volatile/sensitive to shifts in the RE cycle
- The share of mortgages with terms over 35 years increased importantly ahead of the crisis (to alleviate debt service payments?)

Source: European DataWarehouse (left-hand side) and Colegio de Registradores (right-hand side)

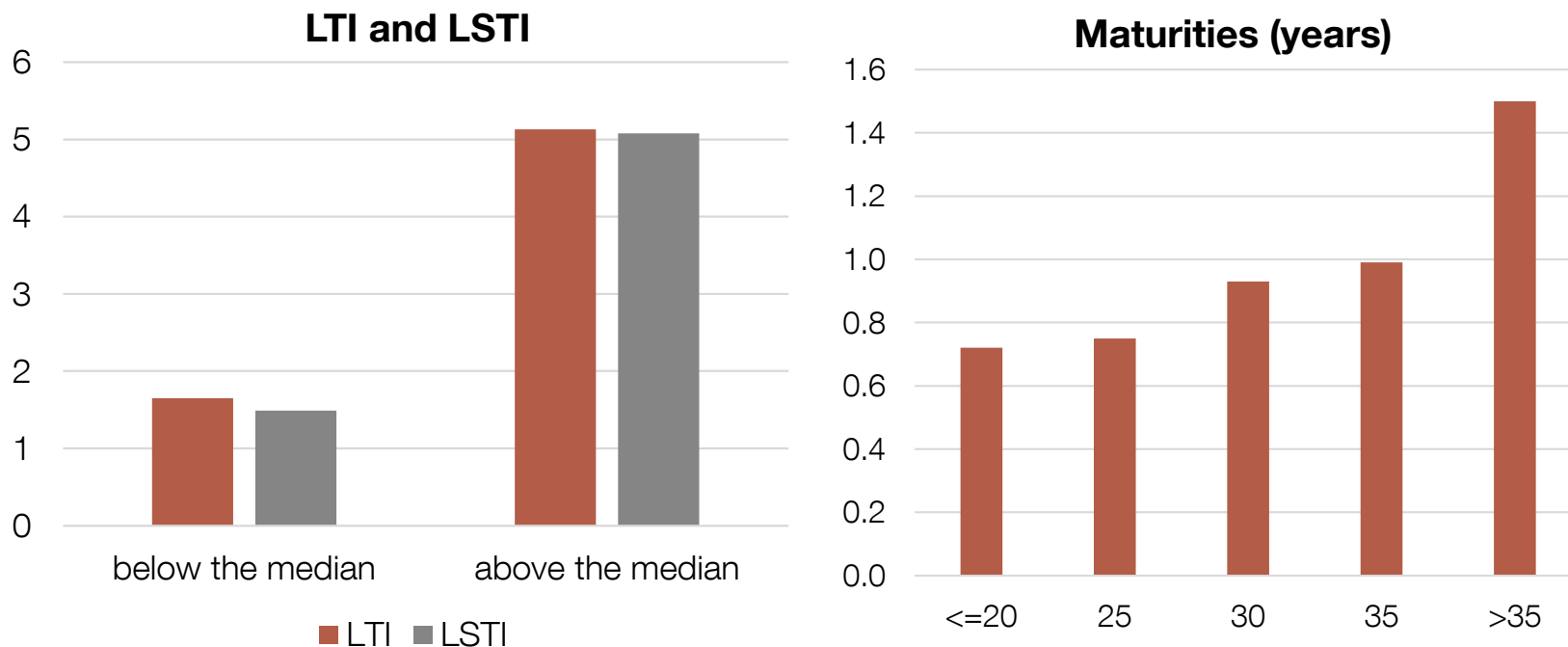
Default frequency of mortgages (%)



- Default frequencies augment for loans with high-LTV and high-LTP values, but the increase is more evident for the LTP
- **PD high if LTP is high, low if LTP is low, no matter LTV values!**

Source: Colegio de Registradores (LTV, LTP and maturities) and European DataWarehouse (LSTI)

Default frequency of mortgages (%)



- Larger LTI, LSTI and longer maturities increase (unconditionally) risk
- Jump in default frequencies for maturities > 35 years

Source: Colegio de Registradores (maturities) and European DataWarehouse (LTI, LSTI)

- We estimate a battery of conditional logit models
- Two different databases, we run separate regressions for each

Probability of default = f [lending standards (LTV, LTP, LSTI, maturities) , controls]

VARIABLES	COLEGIO DE REGISTRADORES	EUROPEAN DATAWAREHOUSE
Dummy for problematic mortgages (dependent variable)	Issuance of certificates of foreclosure	Defaults (+ foreclosures)
Lending standards at origination	LTV Maturity LTP	LTV Maturity LSTI
Mortgage/borrower/collateral characteristics (<i>Z</i>)	Second-hand Subsidised-housing	Employment status Variable rate Remortgage Second-house Non-RRE
Fixed effects (<i>FE</i>)	Region Year of origination	Region Year of origination Bank

Colegio de Registradores (land registries)

	Model 3	Model 4	Model 5
LTV	0.8254***	1.9581***	1.7872***
Maturity	0.0176***	0.0599***	0.0473***
LTP	1.1096***	4.1987***	3.6942***
LTV ²		-0.0001***	-0.0001***
Maturity ²		-0.0008***	-0.0009***
LTP ²		-0.0001***	-0.0001***
LTV x LTP			0.0001*
LTP x Maturity			0.0002***
Second-hand	0.2641***	0.2582***	0.2563***
Subsidised-housing	0.1693***	0.1792***	0.1781***
Region effects	Y	Y	Y
Origination year effects	Y	Y	Y
McFadden R ²	0.088	0.092	0.093
Observations	1,255,649	1,255,649	1,255,649

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1 Strong link between lending standards and the PD (LTV vs LTP)

2 Presence of non-linearities: quadratic (-) and interaction terms (+)

European DataWarehouse (securitized credit)

	Model 6	Model 7	Model 8
LSTI	0.0032***	0.003***	0.002***
LTV	1.56***	1.90***	1.60***
Maturity	0.0271***	0.073***	0.027***
LSTI^2		-0.0000	-0.0000
LTV^2		-0.00002***	-0.0001***
Maturity^2		-0.0008***	-0.0011***
LSTI*Maturity			-0.0000
LSTI*LTV			0.0001***
LTV*Maturity			0.0003***
status: civil servant	-0.861***	-0.861***	-0.861***
status: unemployed	0.653***	0.658***	0.664***
status: self-employed	0.459***	0.461***	0.466***
(...)			
Region effects	Y	Y	Y
O. year effects	Y	Y	Y
Bank effects	Y	Y	Y
McFadden R2	0.160	0.160	0.160
Observations	1,674,398	1,674,398	1,674,398

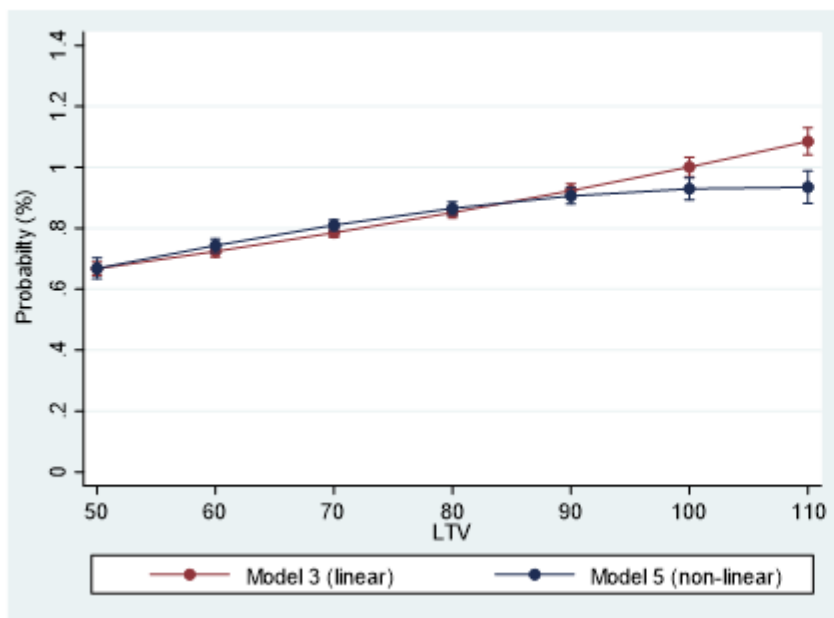
Leverage and repayment capacity are important drivers of the PD

Again, presence of non-linearities

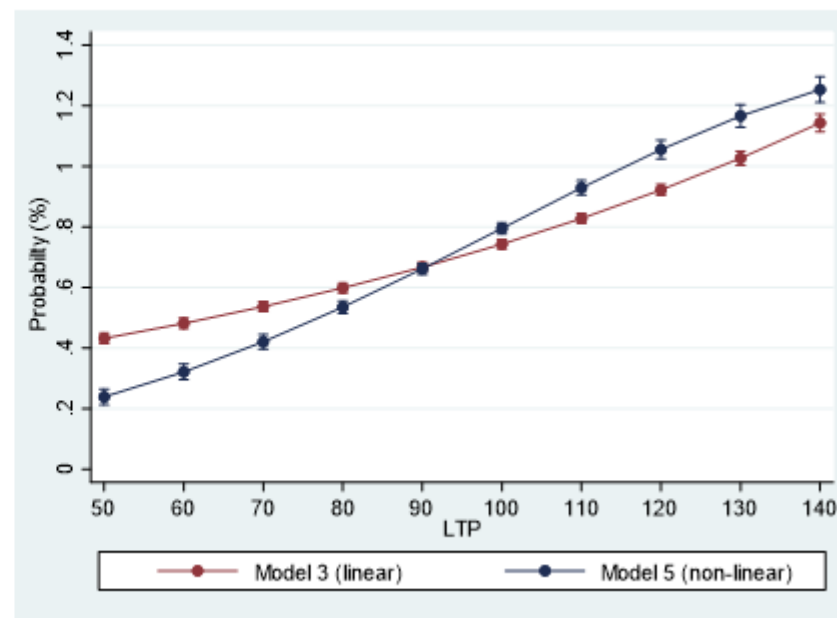
Expected *signs* for job status: more stable jobs are *safer* in terms of risk

LTV vs LTP

LTV



LTP

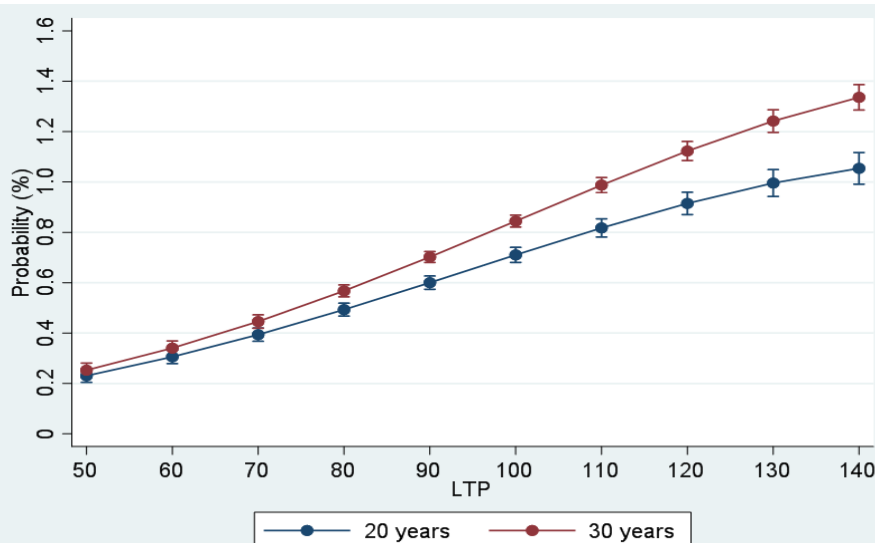


- **LTV**. Non-linearities are important: The PD does not grow for $LTV > 90\%$
- **LTP**. Much more dispersion in the PD for low vs. high LTP values

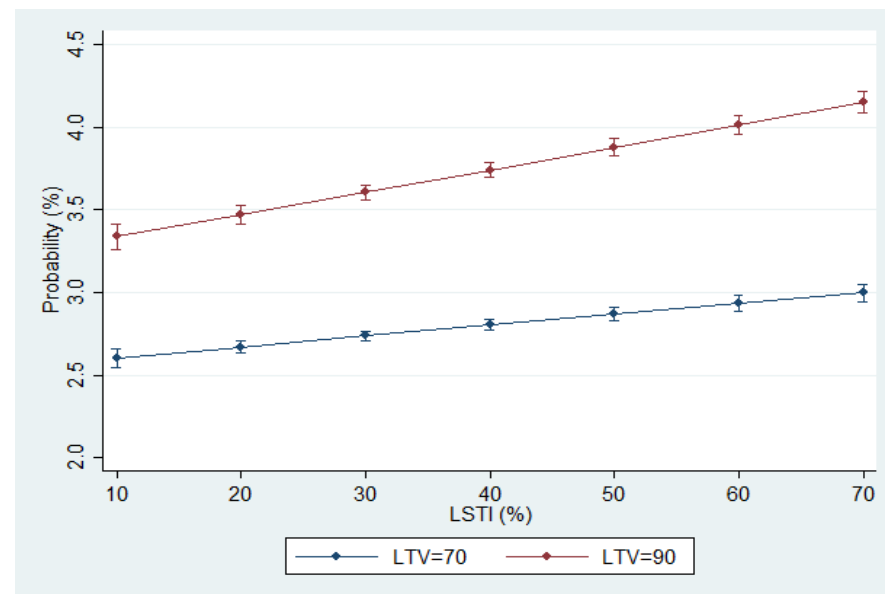
Source: own elaboration

Interactions

LTP x Maturities



LSTI x LTV



- **LTP x Maturities.** Higher PD but only for highly leveraged borrowers
- **LSTI x LTV.** Stronger impact on the PD in all segments of the distribution

Source: own elaboration

- **Other non-linearities**
 - ✓ Dummies identifying segments of problematic loans
- **The effects of the crisis**
 - ✓ Panel data specification with time fixed effects
- **Differential effects between boom and bust periods**
 - ✓ Repayment capacity indicators (LSTI, LTI) more important during busts/recovery periods; leverage metrics during booms
- **Addressing potential selection biases: the “LTP-sample”**
 - ✓ Bootstrapping exercises
- **Alternative definitions of problematic loans**
 - ✓ CdR: foreclosures instead of certificates of foreclosure
 - ✓ ED: loans in arrears, only foreclosures
- **Other model specifications** (Linear Probability Models and Probit models)

- **Spain was not different to other markets** with exuberant conditions in the housing sector
 - ✓ Lending standards did deteriorate
 - ✓ “Appraisal bias” → use the right leverage metric (LTP)
 - ✓ **Spain is different? Distortion in appraisals could be present in other jurisdictions (De Nederlandsche Bank, 2019)**

- **Non-linearities**
 - ✓ PD might increase only marginally for some indicators
 - ✓ More intense effects found for the joint distribution of lending standards
 - ✓ **Policy implications: LTV caps ineffective if set at high levels; pockets of risk better addressed if joint setting of BBM**
 - ✓ **Costs of BBM? More research is needed on this front**

THANKS FOR YOU ATTENTION

