



# LUXEMBOURG

## FINANCIAL SECTOR ASSESSMENT PROGRAM

### TECHNICAL NOTE ON MACROPRUDENTIAL POLICY FRAMEWORK, TOOLS, AND CALIBRATION

June 2024

This Technical Note on Macprudential Policy Framework, Tools, and Calibration for the Luxembourg FSAP was prepared by a staff team of the International Monetary Fund as background documentation for the periodic consultation with the member country. It is based on the information available at the time it was completed on January 2024.

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FINANCIAL SECTOR ASSESSMENT PROGRAM

May 20, 2024

## TECHNICAL NOTE

MACROPRUDENTIAL POLICY FRAMEWORK, TOOLS, AND CALIBRATION

Prepared By  
**Monetary and Capital Markets  
Department**

This Technical Note was prepared by Tarak Jardak in the context of the Financial Sector Assessment Program in Luxembourg. It contains technical analysis and detailed information underpinning the FSAP's findings and recommendations. Further information on the FSAP can be found at <http://www.imf.org/external/np/fsap/fssa.aspx>

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## Glossary

AIFMD	Alternative Investment Fund Managers Directive
BBMs	Borrower-based measures
CBSO	Central Balance Sheet Office
Cob	Capital conservation buffer
CCR	Corporate Credit Register
CCyB	Countercyclical capital buffer
CdRS	Comité de Risque Systémique
CET1	Common equity tier 1
CRD	Capital Requirements Directive
CRE	Commercial real estate
CRR	Capital Requirement Regulation
DSTI	Debt service to income
CSSF	Commission de Surveillance du Secteur Financier
DTI	Debt to income
ECB	European Central Bank
ESRB	European Systemic Risk Board
EA	Euro Area
FSAP	Financial Sector Assessment Program
GDP	Gross Domestic Product
HFCS	Household Finance and Consumption Survey
ICR	Interest coverage ratio
IFRS	International Financial Reporting Standards
LCR	Liquidity coverage ratio
LR	Leverage ratio
LSI	Less significant institution
LTV	Loan-to-value
BCL	Banque Centrale du Luxembourg
MoF	Ministry of Finance
NFCs	Non-financial corporations
NPL	Non-performing loan
O-SII	Other systemically important institution
OECD	The Organization for Economic Cooperation and Development
RRE	Residential Real Estate
SSM	Single Supervisory Mechanism
SSyRB	Sectoral systemic risk buffer
SyRB	Systemic risk buffer

## EXECUTIVE SUMMARY

**Strong policy support and high financial buffers are helping the financial sector weather the consecutive shocks, but pre-pandemic vulnerabilities have continued to rise.** Ultra loose financial conditions, in part as a consequence of ECB's monetary policy, have contributed to increased households' indebtedness and stretched asset prices. Specifically, real estate prices had grown rapidly over 2018–22 with signs of overvaluation. Households' indebtedness continued to rise, although partly mitigated by high households' net wealth. These mounting real estate vulnerabilities prompted measures from the authorities, including on the macroprudential front, that bolstered the resilience of the banking sector but had mixed effects on the risk profile of new mortgages. The average LTV has dropped but the impact on DSTI and DTI has been more muted.

**More recently, following the tightening of monetary policy, GDP, credit, and house prices contracted.** The CSSF reacted to the higher interest environment by requiring banks to perform an interest rate sensitivity analysis of 200 basis points at loan origination, which helped reduce the share of variable rate new mortgages. The new government has announced new measures to stimulate housing demand and purchasing power. This, together with automatic wage indexation, could bolster resilience in the short term. However, it could impede price adjustment, feed moral hazard, and put the debt on an upward trend in coming years, with potentially unintended distributional and financial stability consequences.

**The authorities have made commendable progress in developing their operational framework in line with the 2017 FSAP recommendations.** The authorities have extended macroprudential tools to include borrower-based measures (BBMs). BCL and CSSF have continued to develop their systemic risk monitoring framework with a focus on real estate and non-bank financial institutions while making substantial progress in filling existing data gaps. More recently, following the ESRB recommendations on commercial real estate (CRE) vulnerabilities at the European level, the authorities stepped-up their monitoring with regular data collection, thematic surveys, and dialogue with the industry.

**However, the institutional framework remained unchanged leaving the previous FSAP's concerns about potential inaction bias unaddressed.** While the authorities activated some measures in response to mounting residential real estate and household vulnerabilities, these actions focused mostly on increasing banks' resilience, tended to come somewhat late in the cycle and were only partially sufficient. Three potential reasons may have contributed to that; first, rising affordability concerns seem to have increasingly weighed on policy decisions in the context of unanimous vote and a de facto veto power of the Ministry of Finance (MoF) in the systemic risk committee (CdRS). Second, a lengthy legislative process for the introduction of BBMs may have also constrained the ability to act in a timely manner. Finally, high uncertainty around the indicators, in part due to large revisions, and difficulty to assess the impact of macroprudential policy have likely increased the weight of judgement in policy decisions and contributed to limited or delayed action at the macro level.

**Against this background, the 2024 FSAP suggests multiple avenues to reduce the risk of inaction bias and enhance the effectiveness of macroprudential policy.** In particular,

- *the FSAP recommends upholding the primacy of the financial stability objective in CdRS decisions by reducing the role of the ministry of finance (MoF) in macroprudential decisions.* This could be achieved through different institutional changes such as revoking the unanimity requirement by lowering the threshold to three out of four votes for a CdRS decision to be passed. Alternatively, the MoF could be designated as a non-voting member. In line with the experiences in many other countries, the chairmanship of CdRS could be transferred to the central bank (BCL).
- *the macroprudential authorities should strengthen communication on macroprudential policy decisions, including in case of inaction, and enhance accessibility to the public.* Communication by the CdRS on macroprudential decisions and elements underpinning the decision should be systematic even if no action is taken, and accessibility to the general public enhanced.
- *the operational agility of the macroprudential authorities outside the CRR/CRD, including for BBMs should be strengthened.* The authorities are encouraged to regularly reassess whether they do not constrain their ability to act in a nimble and proportionate manner and review the law as needed. More generally, delays in the legislative process on introduction of tools outside the CRR/CRD should be to the extent possible avoided. If action is needed urgently, CSSF should use its semi-hard powers where legally feasible. When considering new tools, the laws should strike the right balance between defining the scope of action and preserving sufficient flexibility to act.
- *greater coordination with housing policies and other government policies that have financial stability implications, is highly encouraged.* The government should include financial stability implications in the design of its policies and consider establishing a consultation mechanism with the CdRS on measures that have financial stability implications.

**The BCL's and CSSF's efforts to strengthen their systemic risk monitoring system are commendable but some areas of improvements remain.** First, authorities should continue to improve the availability and the quality of data. While expediting plans to establish a household credit register, information on housing supply needs to improve. Second, the authorities need to improve the quality and coverage of corporate balance sheets, better identify special purpose entities, and analyze their role to better understand potential amplification mechanisms through linkages with investment funds. Finally, there could be a better mapping of objectives, indicators, and instruments behind policy decisions. While keeping a role of judgment, decisions not to act should be sufficiently motivated.

**In the short term, macroprudential policy should preserve resilience against real estate vulnerabilities through targeted capital-based measures, then address structural indebtedness early in the recovery cycle through borrower-based measures.** FSAP stress tests of households and corporate balance sheets suggest that despite overall robust initial conditions and the presence of automatic stabilizers, the high level of indebtedness of the private sector and high level of interest-rate risk will put pressure on their capacity to service the debt. Stock vulnerabilities stem, mainly from

from real estate exposures, which are concentrated in few banks. Against this background, the authorities should use the capital headroom to increase macroprudential requirements through targeted capital-based measures to real estate exposures, preferably sectoral systemic risk buffer (SSyRB). The latter allows for more precise targeting and would have limited effects on credit supply, especially given banks' record profitability and ample buffers. Subsequently, income-based measures should be introduced early in the recovery cycle—with preparations on calibrations and targeting starting immediately—to counter household indebtedness. FSAP analysis suggests introducing a stressed-DSTI around 45-50 percent, possibly tied to the current interest rate stress test required by CSSF for new mortgages. The authorities should also consider gradually reduce the maximum LTV limit of 100 percent.

**Table 1. Luxembourg: Recommendations on Macroprudential Policy Framework**

Recommendations		Agency	Time <sup>1</sup>
<b>A. Institutional Arrangements</b>			
1.	Reduce the role of the MoF in macroprudential policy decisions.	Government	MT
2.	Strengthen communication and accountability by systematically communicating on macroprudential decisions, including in case of inaction, and enhancing accessibility to the general public.	CdRS and its members	I
3.	Enhance coordination with housing and other government policies that have financial stability implications and consider establishing a consultation mechanism with the CdRS.	Government /CdRS	NT
<b>B. Systemic Risk Monitoring and Articulation with Policy Decisions</b>			
4.	Continue to improve the quality and availability of data, especially in housing supply and households and corporate sector balance sheet.	STATEC/BCL	MT
5.	Ensure a better mapping between objectives, indicators and instruments especially related to households' indebtedness and real estate vulnerabilities.	CdRS	NT
<b>C. Tools and Calibration</b>			
6.	Increase macroprudential capital requirements to preserve resilience against vulnerabilities in the real estate sector preferably through a sectoral systemic risk buffer.	CdRS	I
7.	Activate income-based macroprudential measures—such as stressed DSTI—early in the recovery cycle and consider gradually reducing the maximum-LTV ratio from 100 percent	CdRS	Early in the recovery cycle
<sup>1</sup> I = Immediate (within one year); NT = Near Term (within 1 to 3 years); MT=Medium Term (within 3 to 5 years).			



# INTRODUCTION<sup>1</sup>

**1. The 2017 FSAP provided a comprehensive assessment of the macroprudential policy framework.** The 2017 FSAP Technical Note on Macroprudential Policy Framework (IMF, 2017) offered a full assessment of the institutional arrangement against these three key principles, set out in the [Staff Guidance Note on Macroprudential Policy](#). While assessing the nascent macroprudential framework as broadly adequate, the previous FSAP acknowledged that it was too early to assess its effectiveness and provided recommendations to strengthen it. More specifically, it emphasized potential risks of inaction bias associated with the unanimous vote requirement in the systemic risk committee and called for greater flexibility and strengthened communication to enhance transparency and accountability. The authorities were also advised to strengthen monitoring of real estate and investment fund sector, including by closing data gaps, and extend the macroprudential toolkit to borrower-based limits.

**2. Setting the stage in the next section, the note first assesses risks and vulnerabilities in light of the monetary policy tightening and potential stagflation risks, which are also used to calibrate policy tools.** In addition to analyzing broad-based vulnerabilities, the following section focuses mainly on credit risk assessment using macro-micro simulations for both households and the corporate sector with an emphasis on risks linked to the property market. The assessment is followed with a discussion of the effectiveness of the measures that were undertaken, trade-offs and policy recommendations.

**3. The Note then follows up on previous FSAP recommendations and draws on how the macroprudential framework has been operationalized in recent years.** The third section discusses progress on the 2017 FSAP recommendations and provides a comprehensive approach to overcome potential inaction bias and enhance the effectiveness of macroprudential policy, going forward. The fourth section takes stock of improvements in the systemic risk monitoring framework and identifies areas of improvement. The final section discusses policy options while calibrating a borrower-based-measure based on the household stress tests.

**4. This technical note does not cover all macroprudential policy areas.** These include liquidity and funding risk for banks, systemic risks for non-bank financial institutions and insurance companies (except those related to commercial real estate) and interconnectedness, which are dealt with in the Technical Note on Stress Tests. Finally, the assessment does not cover discussions of the macroprudential dimensions of climate and cyber risks.

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<sup>1</sup> This technical note was prepared by Tarak Jardak (EUR) with support from Xun Li (EUR) and Sultan Orazbayev (ITD). The review was conducted during the period of January 9–23, 2024, and considers the legal and regulatory framework in place and the practices employed at the time. The stress test of households' balance sheets is based on joint work with BCL staff members Michael Ziegelmeyer and Gaston Giordana. The mission team would like to thank the Central Bank of Luxembourg, the Ministry of Finance, the CSSF and representatives from the banking sector for their excellent cooperation and fruitful discussions.

## BACKGROUND

**5. After weathering the consecutive shocks, the Luxembourgish banking system continues to exhibit ample overall capital and liquidity buffers.** Ultra loose financial conditions partly driven by ECB's monetary policy, strong fiscal support as well as loan guarantees and debt service moratoria, helped to contain corporate insolvencies and prevent household balance sheet stress during the pandemic. The financial stress in GBP LDI funds and United States and Swiss banks had only idiosyncratic effects. With a CET1 at 23 percent and a LCR above 150 percent, Luxembourg's banking system capital and liquidity remained well above minimum requirements. Profitability, one of the system weak points, has risen sharply recently, benefiting from higher interest rates. That said, asset quality has deteriorated (especially for some segments), albeit from low levels, and funding costs are rising.

**6. Since the previous FSAP, vulnerabilities in the residential real estate (RRE) sector have continued to rise in a low interest rate environment.** House prices have been growing rapidly, increasing by 78 percent over 2016–22. While the increase is partly driven by fundamentals, such as demographics and supply rigidity, most indicators were pointing to significantly stretched valuations. Households' debt to disposable income continued to increase at a steady pace, exceeding 180 percent of disposable income and became one of the highest in Europe. The rapid mortgage growth has been accompanied by a deterioration in the risk profile of mortgages, in particular income-based measures; for example, 60 percent of the new mortgages granted over 2018H2–2022H2 have a debt service-to-income (DSTI) higher than 40 percent and more than 50 percent have a DTI higher than 900 percent. In the meantime, the ESRB has issued a warning in 2016, followed by a recommendation in 2019 to encourage the authorities to act more forcefully to address medium term vulnerabilities in the real estate, mainly by activating borrower-based limits.

**7. Starting mid-2022, the rapid tightening of financial conditions contributed to a contraction in economic activity and a turning in the credit and house price cycles.** Real GDP has dropped by 1.1 percent and unemployment has risen by to 5.5 percent in December 2023. Credit growth turned negative, both for households and nonfinancial corporations (NFCs). New mortgages plummeted, reflecting a significant drop in demand and tighter lending standards. House prices initiated an orderly correction, declining year on year by about 14½ percent in 2023Q4, and the CRE market is in the midst of a downturn. The steep rise in interest rates is testing firms' and households' debt servicing capacity, especially those with variable rates, who are leveraged and have weak initial buffers. NPLs have been recently increasing for both households and corporates, albeit from low levels. A sharper tightening of financial conditions, a weaker economy and a disorderly correction in asset prices could amplify credit risk from households and corporates, albeit still manageable.

**8. The authorities have taken measures to contain mounting vulnerabilities in the RRE sector with mixed results.** In 2016, and following the opinion issued by the CdRS, the CSSF increased the minimum risk weights on residential real estate exposures for internal ratings-based

(IRB) banks to 15 percent.<sup>2</sup> In 2019, the CCyB has been gradually raised to 0.5 percent. Following the adoption of a legal framework for borrower-based limits in November 2019, a legally binding differentiated LTV<sup>3</sup> limit for mortgage loans has been implemented in 2021, along with some fiscal measures to reduce speculative demand (reduction of the accelerated depreciation rate, new special 20 percent tax—so called “prélèvement immobilier”—on all income derived by tax-opaque Luxembourg Funds from domestic real estate assets, announcement of a tax reform to lands and empty dwellings). In end-2022, with interest rates rising, the CSSF has required banks to perform sensitivity analysis including a debt servicing test buffer of 2 percentage points increase in rates at loan origination drawing on the EU Mortgage Credit Directive principles. These actions have bolstered banks’ resilience but had a mixed impact of mortgages risk profile. The average LTV has dropped, and the stress test requirement contributed to reduced share of variable loans, but the DSTI continued to increase (see also later sections).

**9. In response to the recent downturn, the government announced some measures to support purchasing power and housing demand.** The former government has decided several packages to deal with the cost-of-living shock and support affordability, which come on top the existing automatic stabilizers such as the automatic wage indexation and other social safety nets. In addition, the newly elected government has decided a retroactive adjustment of the personal income tax brackets (equivalent to 4 indexation tranches). In addition, it announced a package of measures to support housing demand, mainly in the form of purchase of new affordable residential projects and temporary tax incentives mostly directed to the buy-to-let segment (e.g., increase in the accelerate depreciation rate, increase in the cap of VAT payment deductions, tax credit on the registration tax for the acquisition of buy-to-let dwellings). This would be accompanied by more structural measures to support affordability as well as housing supply (public housing supply, reduced red tape).

## CREDIT, HOUSEHOLD, AND CORPORATE RISK

**10. To successfully contain systemic vulnerabilities, an appropriate set of suitably calibrated instruments needs to be deployed by the macroprudential authority.** Against this background, the following section assesses the risks and vulnerabilities following the tightening of monetary policy and potential stagflationary pressures. It also provides recommendations on the choice and calibration of tools.

### A. Assessment of Broad-Based Vulnerabilities

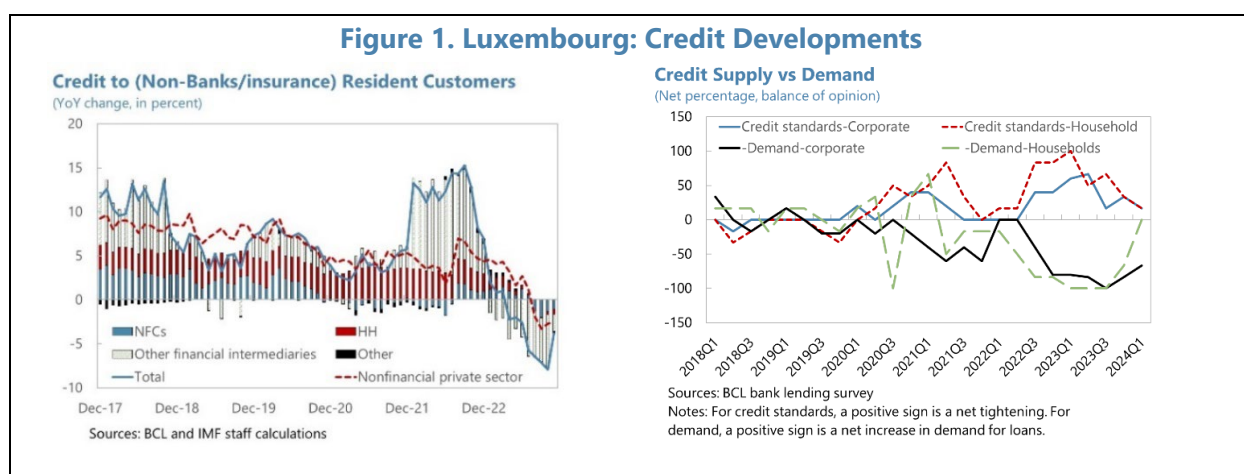
**11. After several years of sustained credit growth, the credit cycle has turned (Figure 1).** Credit to the nonfinancial private sector growth turned negative (-3 percent year on year in November 2023). Higher interest rates following the monetary policy tightening, coupled with an

<sup>2</sup> While not legally-binding, banks have in general complied with this requirement.

<sup>3</sup> Following the CdRS recommendation, and after consulting the BCL, the CSSF issued Regulation N°20-08 (December, 2020) introducing differentiated LTV limits for mortgage loans as follows: an 80% LTV limit is applied to all mortgages collateralized by RRE located in LU (no speed limit) including buy-to-let loans, with 2 exceptions; (1) for first-time buyers (FTBs), the LTV limit is set at 100 percent (no speed limit); (2) for non-FTBs acquiring their primary residence, the LTV limit is 90 percent (some flexibility is introduced as banks may provide up to 15 percent of their annual portfolio of new mortgage loans with an LTV ranging from 90 to 100 percent).

uncertain economic outlook, have contributed to a substantial decline in demand for loans. At the same time, banks have tightened their credit standards. Credit dynamics weakened significantly for households, as mortgages contracted due to lower demand for housing and a higher rejection rate by banks. For NFCs, growth in loans also turned negative as firms are postponing capital expenditures and relying on internal sources of funding. More recently, the latest data suggest the tightening cycle is close to the end and forward-looking indicators point to positive dynamics in coming quarters especially for households.

**12. The CdRS kept the CCyB unchanged to support resilience.** The CCyB has been increased twice before the COVID to 0.5 percent in response to the brisk activity in credit. It has been kept unchanged since then despite the negative credit to GDP gap. The CdRS motivated this decision by the uncertainty around the outlook and the need to bolster banks' loss absorptive capacity, de facto implementing a positive neutral CCyB.



## B. Assessment of Household and Housing Market Vulnerabilities

**13. House prices have been growing rapidly since mid-2010s amid signs of stretched valuations.** House prices have been historically buoyant in Luxembourg, driven by structural factors such as demographics, policies promoting homeownership and supply rigidity. The pace has nonetheless accelerated since the last FSAP with prices growing by 78 percent over 2016–22, a much faster pace than the income per capita. While in part driven by fundamentals, such as lower interest rates, and pandemic-related factors (e.g., supply bottlenecks), both statistical and model-based indicators pointed at significant overvaluation, especially since 2019, albeit with significant uncertainty around the estimates (Figure 2).

**14. In parallel, households' indebtedness has continued its upward trend.** Leverage indicators have been increasing steadily since early 2000s. With mortgages accelerating in recent years, these dynamics continued despite robust income growth and falling consumer loans. The household debt to disposable income ratio exceeded 180 percent in 2022 and became one of the highest in Europe. The debt service-to-income have been also on the rise even as interest rates dropped, partly because reduced maturity. While it has halved since the GFC, the share of outstanding mortgages with variable rate is at 40 percent.

**15. High household net worth on aggregate provides some cushion but has been recently falling.** The rapid increase in household debt has been accompanied by similar trends in assets. About 70 percent of households are homeowners, hence benefiting from rising real estate prices. Financial assets, which are more than twice the value of financial liabilities, have also been growing rapidly in the environment of low interest rates and have been further consolidated during the pandemic thanks to higher savings and buoyant financial markets. However, most of these assets are either illiquid or sensitive to market variation, and gains have reversed in 2022 and 2023. Importantly, these assets are unevenly distributed across households.

**16. The low interest environment encouraged a riskier lending behavior to households, prompting a policy response with mixed effects.** Over 2018–2020, the CSSF survey on mortgage lending conditions shows the loan-to-value (LTV), debt-to income (DTI) and maturities have been loosened across all income levels. In response, the CdRS has recommended introducing a legally binding differentiated LTV limit in November 2020, which has reduced the average LTV by 3 percentage points within a year. The LTV declined further in 2022–23 reflecting a tightening of lending standards by banks. However, the DTI and debt-service to income (DSTI) ratios have continued to increase. As of end-2022, about 60 percent of new mortgages have a DSTI higher than 40 percent and a DTI exceeding 900 percent, and about 45 percent have an LTV higher than 80 percent. To counter these trends, the CSSF required banks to assess households' creditworthiness through a 200 bp interest rate stress test, which contributed to reducing the appetite for variable rate mortgages.

**17. The recent spike in interest rates has reduced the lending and collateral stretch but is starting to put pressure on some households' debt servicing capacity.** The growth of credit to households slipped into negative territory as the drop in mortgages more than offset the rise in consumer credit. The steep increase in borrowing costs, coupled with deteriorating consumer confidence and housing market prospects, have reduced demand for mortgages. This, together with a substantial tightening of credit standards by banks, led to a sharp drop in new lending. As a result, and following several years of rapid growth, house prices have dropped by 14½ percent year-on-year in 2023Q4, although with some heterogeneity across market segments, contributing to reduced overvaluation. The adjustment appears nonetheless incomplete and price-at-risk estimates suggests further downward pressures, although lower supply and government support policies minimize such risk. Finally, despite automatic wage indexation, government support measures and excess savings accumulated during the pandemic, households' debt servicing capacity is decreasing with higher borrowing costs, especially for those with floating rates. Early signs of asset quality deterioration are emerging, albeit from low levels, with rising NPLs and renegotiations of loans (Figure 3).

### Household-Level Stress Tests and Debt-at-Risk

**18. Against this background, this subsection assesses households' balance sheet vulnerabilities to macrofinancial shocks using macro-micro simulations.<sup>4</sup>**

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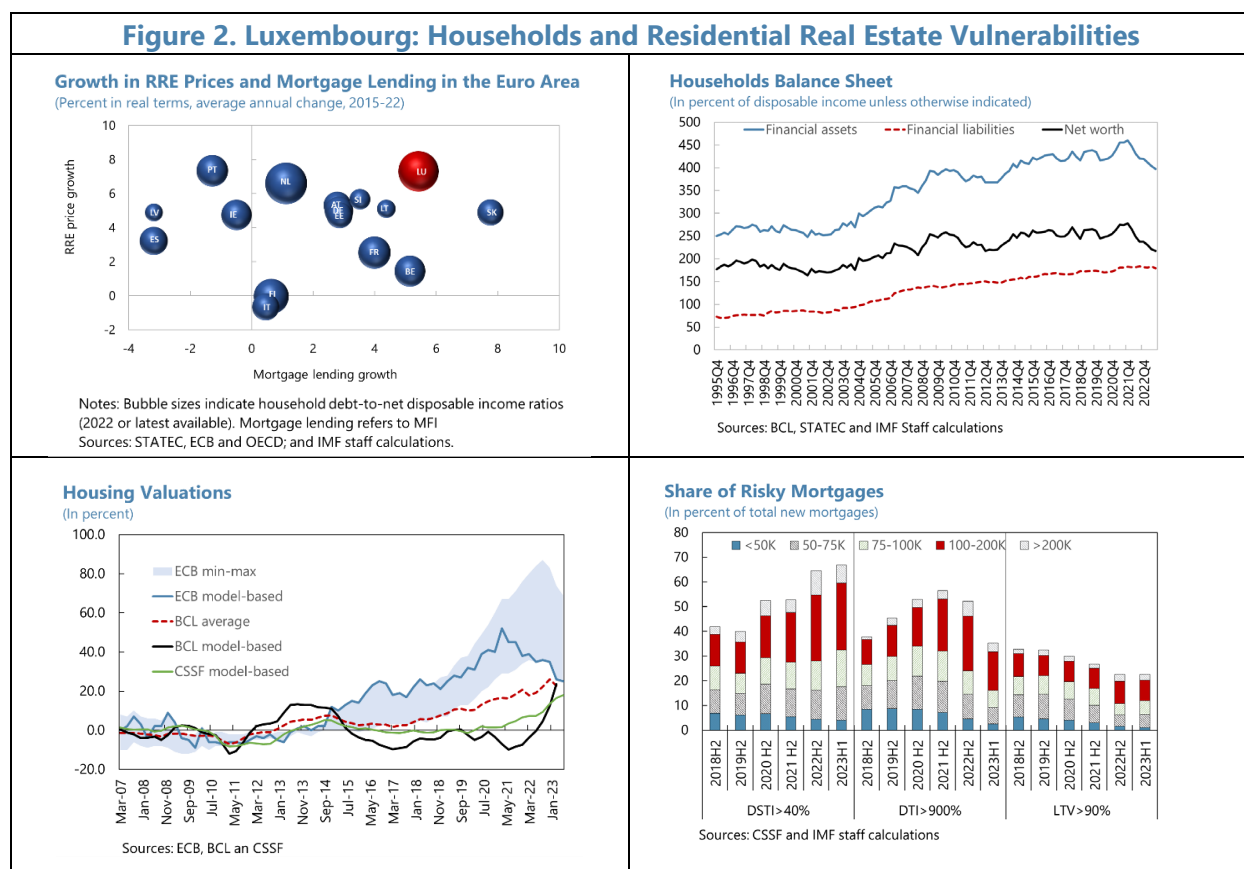
<sup>4</sup> This section presents the results from joint work with BCL staff members Michael Ziegelmeyer and Gaston Giordana.

The analysis uses household-level data from the fourth wave of the LU-HFCS survey (2021). Households are weighted depending on their characteristics to obtain representative results for the entire resident population. Following Ziegelmeyer and Giordana (2019), “financially vulnerable households” are defined based on a continuous measure of the probability of default considering the household financial margin (FM) and the availability of liquid financial assets to service their debt in case the financial margin is negative.<sup>5</sup>

Where the financial margin FM defined for household is equal to the net income (obtained by adjusting gross income for taxes and social security contributions) minus current debt service, the

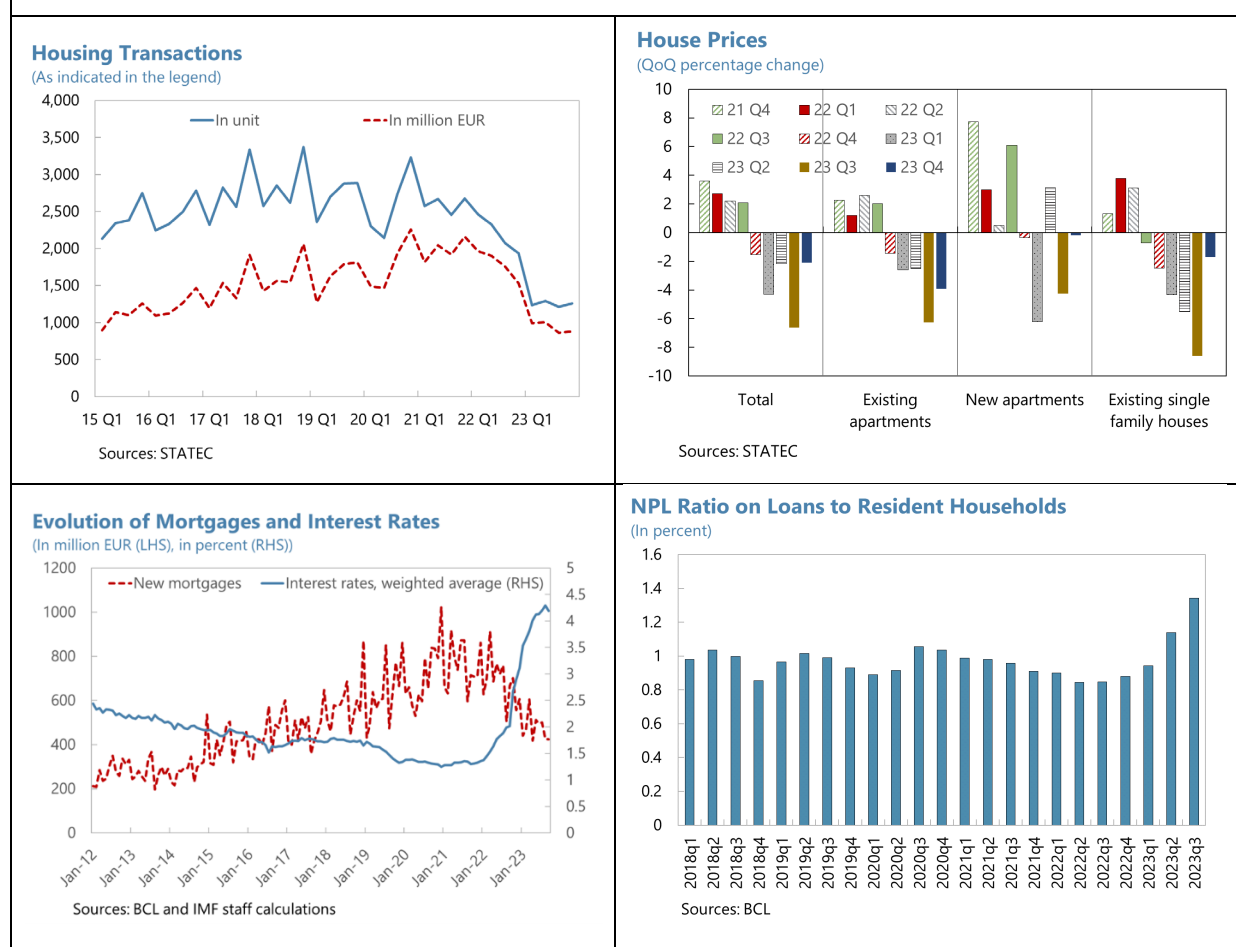
$$PD_i = \begin{cases} 0 & \text{if } FM_i \geq 0 \text{ or } |FM_i| \cdot M \leq LIQ_i \\ 1 - \frac{LIQ_i}{|FM_i| \cdot M} & \text{if } FM_i < 0 \text{ and } |FM_i| \cdot M > LIQ_i \end{cases}$$

rental charge for households that do not own their household main residence, and a measure of basic living costs. Holdings of liquid financial assets are denoted LIQ, and the number of months, M, of expenses set to 3 as in the original paper.



<sup>5</sup> The probability of default is more of a constructed, rather than a statistical, measure.



**Figure 3. Luxembourg: Impact of the Interest Rate Hike on Households and RRE Price****19. The analysis assumes the following shocks and assumptions at the micro-level:**

- Mortgages and interest rate shock.** The micro-simulations assume that the population of indebted households in 2022–2026 share the same demographic and socio-economic characteristics as the population of households observed in 2021. Average mortgage rates in the adverse scenario are set at the level projected for the EA's long-term interest rate plus a spread of 200 bp (100bps for the baseline).<sup>6</sup> The spread is distributed at the households' level using a uniform distribution along the quantiles of the creditworthiness measure (debt to income). Mortgages are adjusted for 40 percent (the current share of variable rate mortgages) and for another 25 percent per year corresponding to the current share of new mortgages (including adjustable-rate mortgage loans reaching a reset point). For other loans, the interest rate moves similarly to the euro area short-term rate.
- Unemployment shock/benefits.** We use a logistic model linking the household members' employment status to individual characteristics, such as individuals' age, level of education,

<sup>6</sup> The mortgage rates in the adverse scenario are as follows: 8.8 percent in 2024, 7.7 percent in 2025 and 5.4 percent in 2026.

gender, country of birth and households' characteristics such as size, homeownership status, households' wealth, etc. The model is used to generate a large number of stochastic draws for all individuals while shifting the intercept of the logistic regressions and setting a persistence parameter, to match the population-level unemployment rate path and persistence. The simulated unemployed income mimics unemployment benefits, and those individuals who were already unemployed (in the data) do not receive any new benefits. The latter group assumes long-term unemployment, where the individual loses their entitlement to benefits. If the resulting household income is below the Luxembourg minimum subsistence level, the household receives the Social Inclusion Income ("REVIS").

- **Income shock and fiscal support measures.** The compensation per employee is used to steer the disposable income path for employed household members. Automatic wage indexation is expected to hold but real labor income is assumed to drop moderately in the adverse scenario. The micro-simulations also consider the impact on households of fiscal measures included in the Energiedesch package, as well as the most important measures of three Solidarity packages, in particular the inflation adjustment of the tax brackets of the income tax (4 indexation tranches) in January 2024 and the increased caps for interest payment deductibility.
- **Consumption and savings.** Consumption is assumed to be constant in real terms, which implies that households with a lower propensity to consume would tend to accumulate savings and hence increase their capacity to service their debt. While a constant saving rate is a more valid assumption in the long term, in periods of uncertainty, one could assume that households increase precautionary savings.

## Stress Test Results

**20. Despite the supportive role of automatic stabilizers and discretionary government measures, household debt servicing capacity would continue to be affected by the recent increase in interest rates in coming years.** Under the baseline, the share of households with a DSTI higher than 40 percent would increase from 17 percent in 2023 to 38 percent in 2026. The average (indicative) probability of default (PD) would rise more moderately from 5 percent to 7.7 percent, as the automatic wage indexation (and other fiscal support measures) helps provide some cushion especially for households with lower propensity to consume. The deterioration in debt servicing capacity is amplified in the adverse scenario: the share of households at risk and debt at risk (debt with a positive indicator of default probability) increases to 14 and 30 percent, respectively. Here too, automatic stabilizers such as the unemployment benefits, other social safety nets, and interest deductibility play an important role in absorbing the unemployment/interest rate shocks (Figure 4).

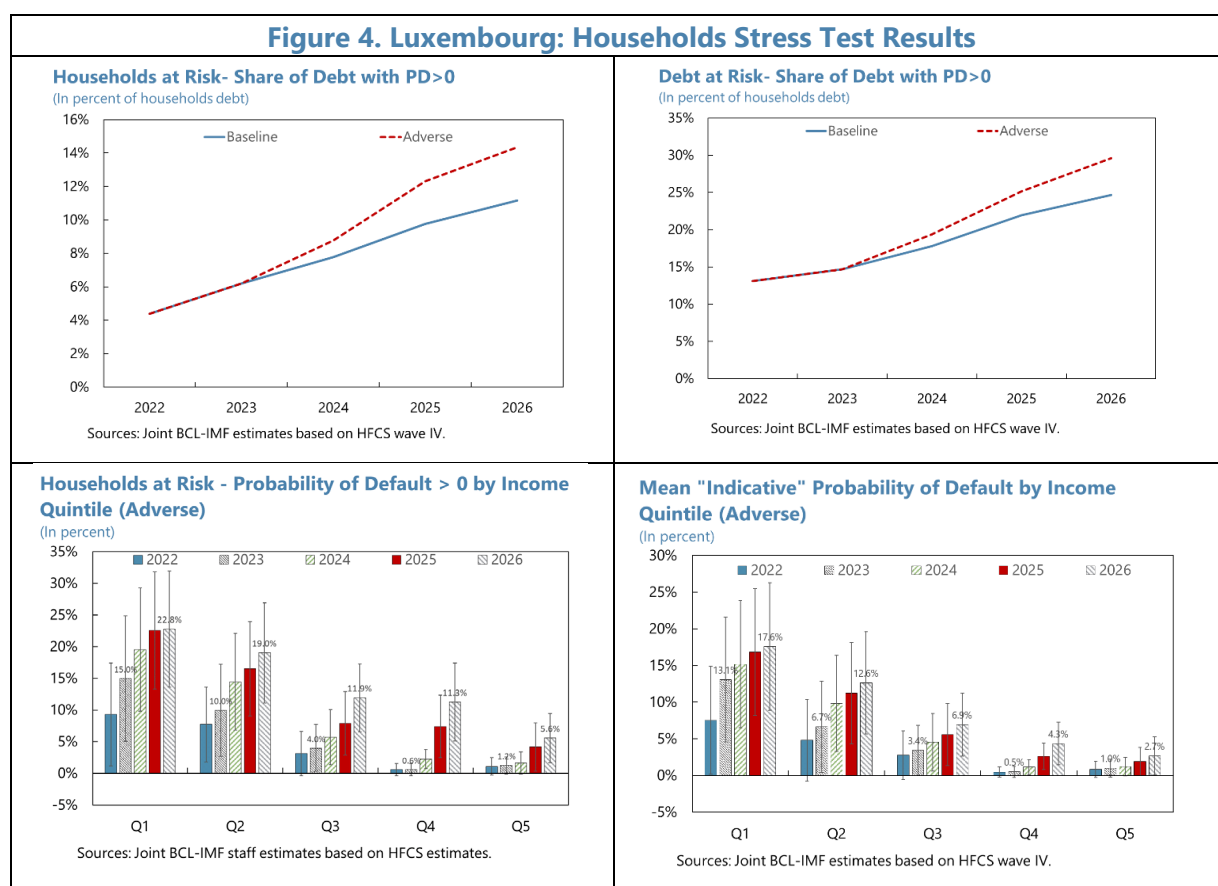
**21. While the lower income households are the most vulnerable, the more affluent households, especially in the adverse scenario, contribute significantly to debt at risk.** The "PD" and the share of households at risk are higher for the bottom quintiles, with one out of five households in this cohort having a positive "PD." However, our analysis reveals that more affluent households are relatively more affected in the adverse scenario (higher multiple "PD"). The share of households at risk in the fourth and fifth quintiles increases respectively to 11 and 6 percent and their contribution to the exposure at default is close to 50 percent. While this may be due in part to concentrated exposures on some risky borrowers, it also mirrors a higher credit risk on recent



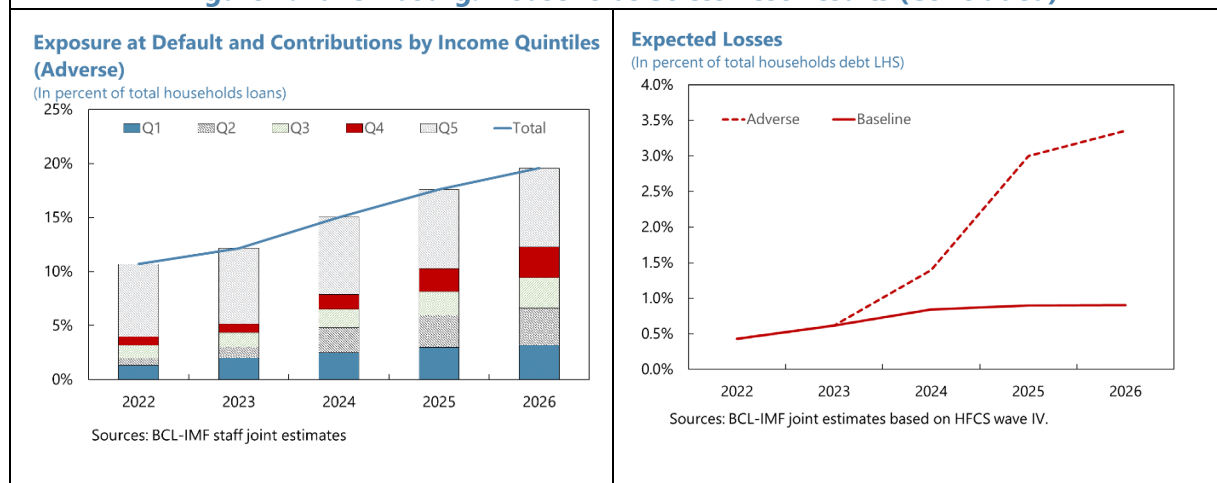
mortgages that were mostly dominated by the higher income cohorts.<sup>7</sup> That said, the high net wealth of these cohorts would reduce potential losses in case of default.

**22. Banks' potential unexpected losses in the adverse scenario could be material, albeit manageable.** While expected losses would remain contained in the baseline, a sharp correction in house prices combined with a 20 percent haircut linked to transaction costs could increase banks losses assuming they do not wait to sell their collateral. This risk is compounded with a significant concentration of loans to households (and mortgages) in few domestically oriented banks.

**23. Our results should be interpreted with caution.** First, the HFCS data sample is relatively small and granular analysis at the income quintile levels are subject to uncertainty. Second, the HFCS wave IV was conducted during the pandemic and some critical information for the analysis (such as the type of interest fixation) was not collected, requiring some simplifying assumptions. Third, behavioral responses are not considered. For example, banks could preemptively restructure loans to ease household payment burdens. Notwithstanding these caveats, our results suggest that high and rising households' indebtedness is a growing concern including for middle income and high-income households and that notwithstanding credit risk for banks, in case of shocks, they may need to cut their consumption especially where DSTI increases materially. Overvalued house prices could also expose banks to material, though manageable, losses.

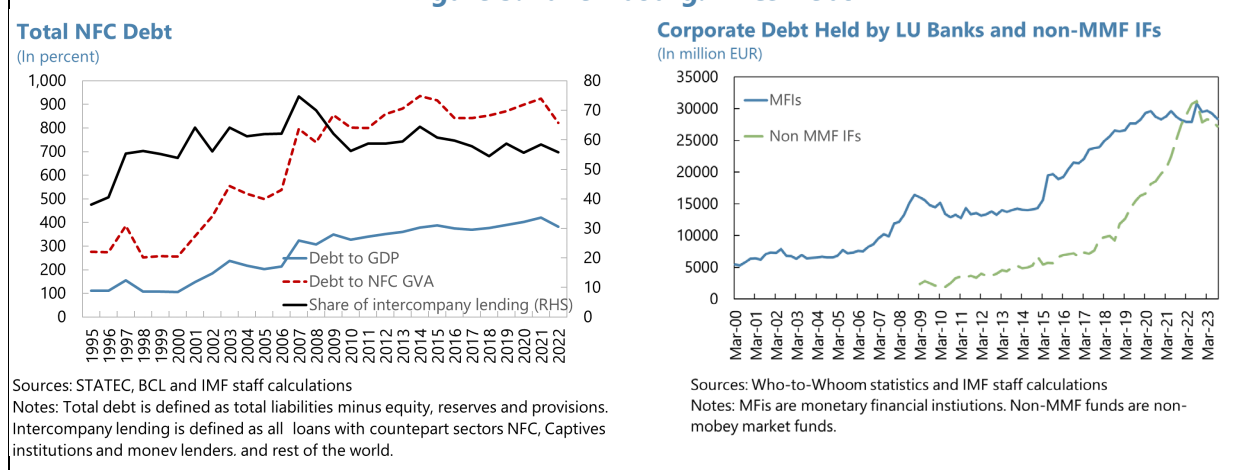


<sup>7</sup> Excluding concentrated risky exposures (that could be outliers), the contribution of the upper quintiles to the exposure at default is 31 percent.

**Figure 4. Luxembourg: Households Stress Test Results (Concluded)**

## C. Assessment of Nonfinancial Corporate (NFC) and CRE Vulnerabilities<sup>8</sup>

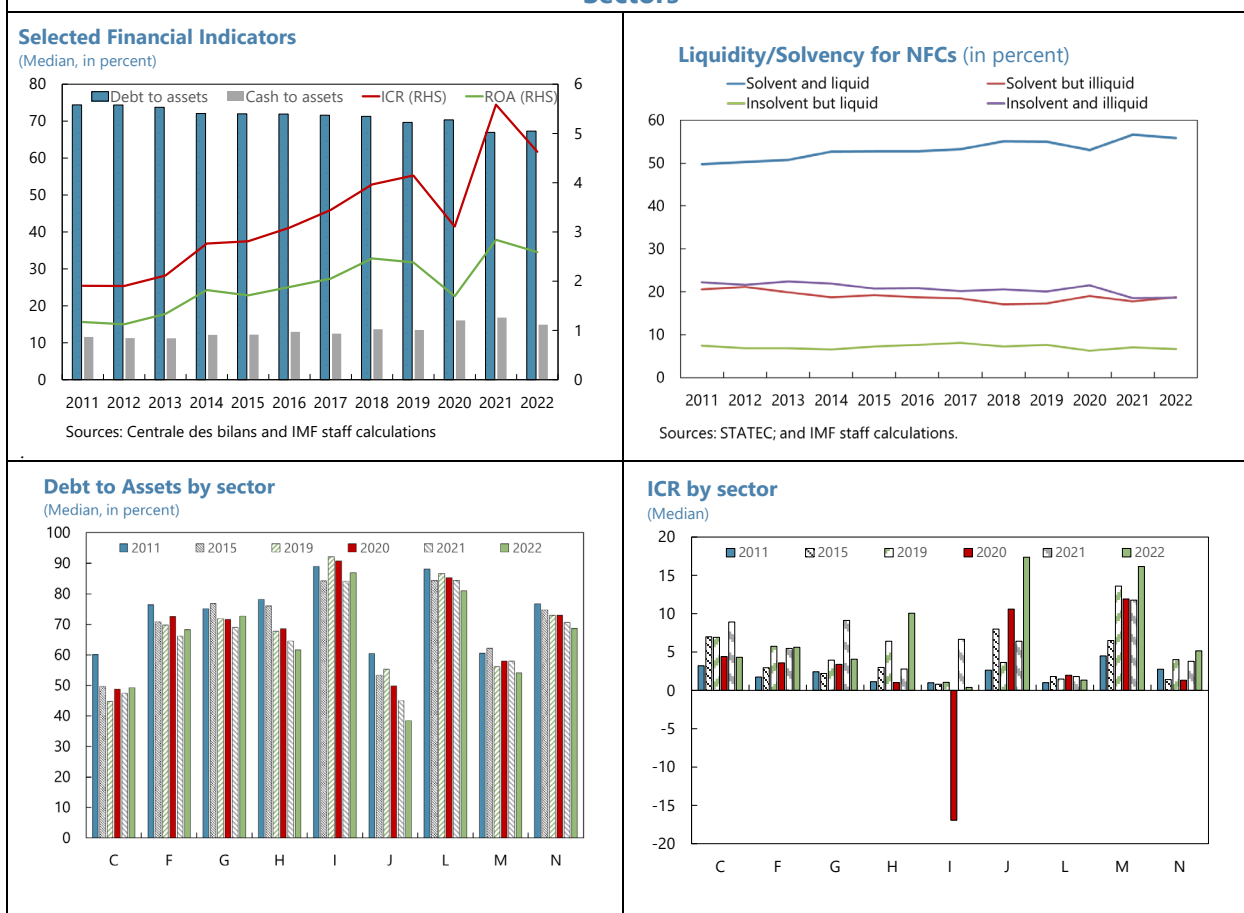
**24. Debt of nonfinancial corporates has risen moderately in recent years mainly driven by volatile inter-company lending, including debt contracted within the same group.** After growing rapidly, in the years 2000s, NFCs debt expanded at a slower pace since the GFC from 341 percent of GDP in 2011 to 382 percent of GDP in 2022 (see Figure 5). While this is about three times the euro area level, a significant portion of this debt (more than 55 percent) is intra-sectoral lending, debt owed to captive financial institutions, and credit by nonresidents, which are significant in Luxembourg due to the presence of special purpose entities and multinational companies. Focusing on debt vis-à-vis domestic financial institutions (excluding OFIs), the debt is much smaller, amounting to 57 billion (74 percent of GDP). Half of this loans granted by domestic banks. Since 2018, the debt owed to non-money market funds (non-MMF) has risen substantially. However, this might reflect in part securitization of bank loans to NFCs rather than direct market financing.

**Figure 5. Luxembourg: NFCs Debt**

<sup>8</sup> In this section, we will focus mostly on domestic NFCs.

**25. Luxembourgish NFCs entered the hiking cycle with a stronger financial position but there is significant heterogeneity across firms and sectors (Figure 6).** A long period of ultra-low interest rates and a strong post-pandemic recovery helped the median firm build resilience. The median debt to asset ratio has continuously dropped and higher profitability, together of lower interest rates enhanced the interest coverage ratio.<sup>9</sup> After a short-lived profit recession during the pandemic, gross profits rebounded, and firms were able to accumulate substantial cash buffers. These trends have somewhat softened in 2022 but the overall financial position remained much stronger than the pre-pandemic. That said, these positive trends mask the fragility of a significant share of firms (in our sample), with close to 40 percent of firms reporting an interest coverage ratio below 1 and one out of five firms facing both liquidity and solvency challenges. Also, there is significant heterogeneity across sectors, with companies in real estate activities standing out as having the weakest conditions both in term of high level of indebtedness and low liquidity buffers.<sup>10</sup>

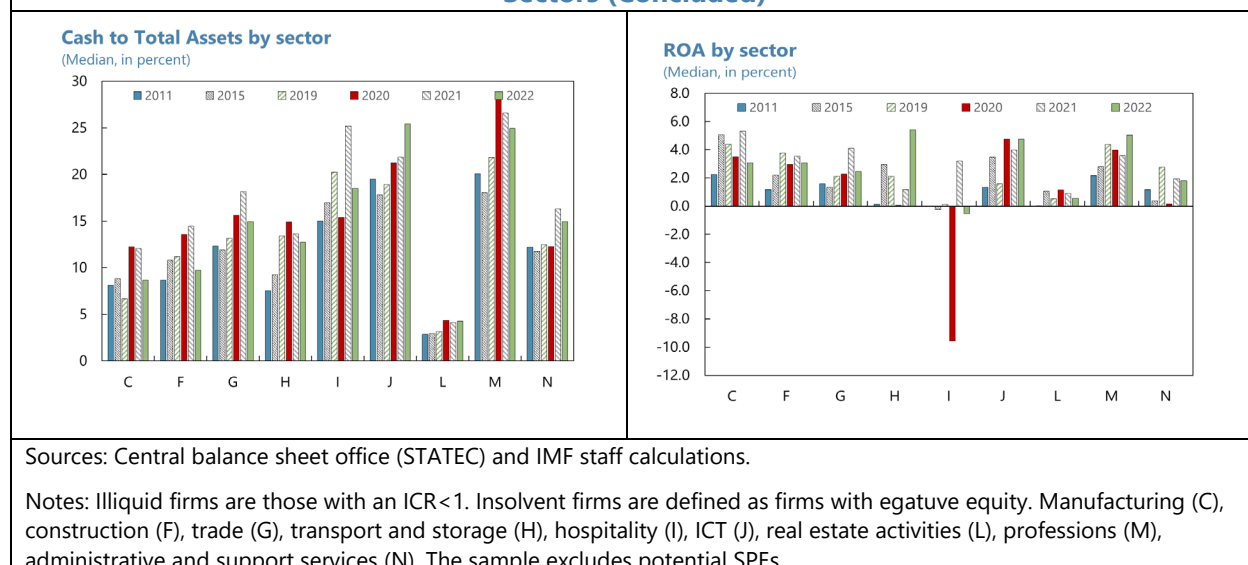
**Figure 6. Luxembourg: Corporate Financial Indicators and Heterogeneity Across Selected Sectors**



<sup>9</sup> The estimates are based on micro data from the central balance sheet office excluding potential special purpose entities (see more details below on the identification strategy).

<sup>10</sup> The hospitality sector is also fragile, with high debt and low ICR and more than 40 percent of firms with negative equity. However, the firms in the sector have accumulated significant cash buffers in recent years.

**Figure 6. Luxembourg: Corporate Financial Indicators and Heterogeneity Across Selected Sectors (Concluded)**



**26. With activity softening in some sectors and policy rate hikes passing through to borrowing costs, firms' liquidity is increasingly strained and asset quality is worsening.** Several sectors (e.g., manufacturing and construction), have recorded a negative growth or a slowdown in activity as the post-pandemic recovery faded and higher interest rates are started to bite demand. This, together with lower inflation and the rapid increase in labor costs due to several wage indexation tranches), is starting to take a toll on profitability. In parallel, as most of the debt is at variable rate, a large part of the monetary policy tightening has already increased the interest bill (although there is significant heterogeneity across firms) and risen reliance on cash buffers, which dropped 14 percent in September 2023. The credit quality of corporate exposures has deteriorated especially for SMEs and CRE collateralized loans. By sector, manufacturing, construction, and real estate activities have seen a sharp deterioration in the NPL ratio. Bankruptcies have remained broadly stable so far but have increased by close to 40 percent for construction and real estate activities, although from low levels (Figure 7). Although there is no evidence of high refinancing risk, banks credit standards have recently tightened, and the loans rejection rate increased. In order to mitigate the effect of the current slowdown in real estate activities, the government has set up dedicated support mechanisms to help construction firms overcoming temporary financial difficulties should the situation further deteriorate.

### Corporate Debt-at-Risk and Firm-at-Risk

**27. To assess firms' vulnerabilities in the coming years, we use the stress-testing methodology developed in Tressel and Ding (2021).** The empirical framework is based on firm-level panel data regressions of profitability (measured by the return on assets, ROA).<sup>11</sup> The independent variables include a large set of firm-level controls as well as macrofinancial variables. We use two strategies: in the first, we run a panel regression for all firms and industry fixed effects.

<sup>11</sup> In our analysis, the ROA is defined as the ratio of earning before interests (EBI) expenses to total assets, due to the lack of reporting of taxes and depreciation in the database.

We complement the former with sectoral level regressions to capture responses to specific sectoral shocks. In both cases, we use a selection process based on the root mean square error as well as the sign and significance of the estimated parameters.

$$Y_{i,s,t} = a * Y_{i,s,t-1} + \Delta * FirmCharacter_{i,s,t-1} + \Phi * MacroFinancial_t + d_s + v_{i,s,t}$$

Where  $Y_{i,s,t}$  is the ROA for firm  $i$ , in industry  $s$ , and year  $t$ .  $FirmCharacter_{i,s,t-1}$  is a set of firm level variables (size, leverage, tangibility).  $MacroFinancial_t$  is a set of macro variables: real GDP growth, short term interest rate, house price growth, inflation, oil price growth) for year  $t$ ,  $d_s$  is an industry fixed effect and  $v_{i,s,t}$  is a residual which is clustered at the year level.

The ROA is then projected dynamically, and the Earnings before Interest (EBI) is derived assuming total assets remain constant.

*Interest expenses (t) = Total debt (t-1) \* effective interest rate (t), where for each period, the effective interest rate changes mimic the evolution of the euro area short term rate plus an additional risk premium in the adverse scenario (170 basis point  $\pm$  50 bp depending on the firm level indebtedness).<sup>12</sup>*

*Cash Balance(t+1) = EBI (t+1) – Interest Expenses (t+1) + Cash Balance(t)*, where a projected negative value indicates that the firm would have a liquidity shortage and need to rely on external credit to meet its scheduled cash outflows.

*Debt(t+1) = Debt(t) - Cash Balance(t+1) if projected cash balance is negative.  
= Debt(t) otherwise.*

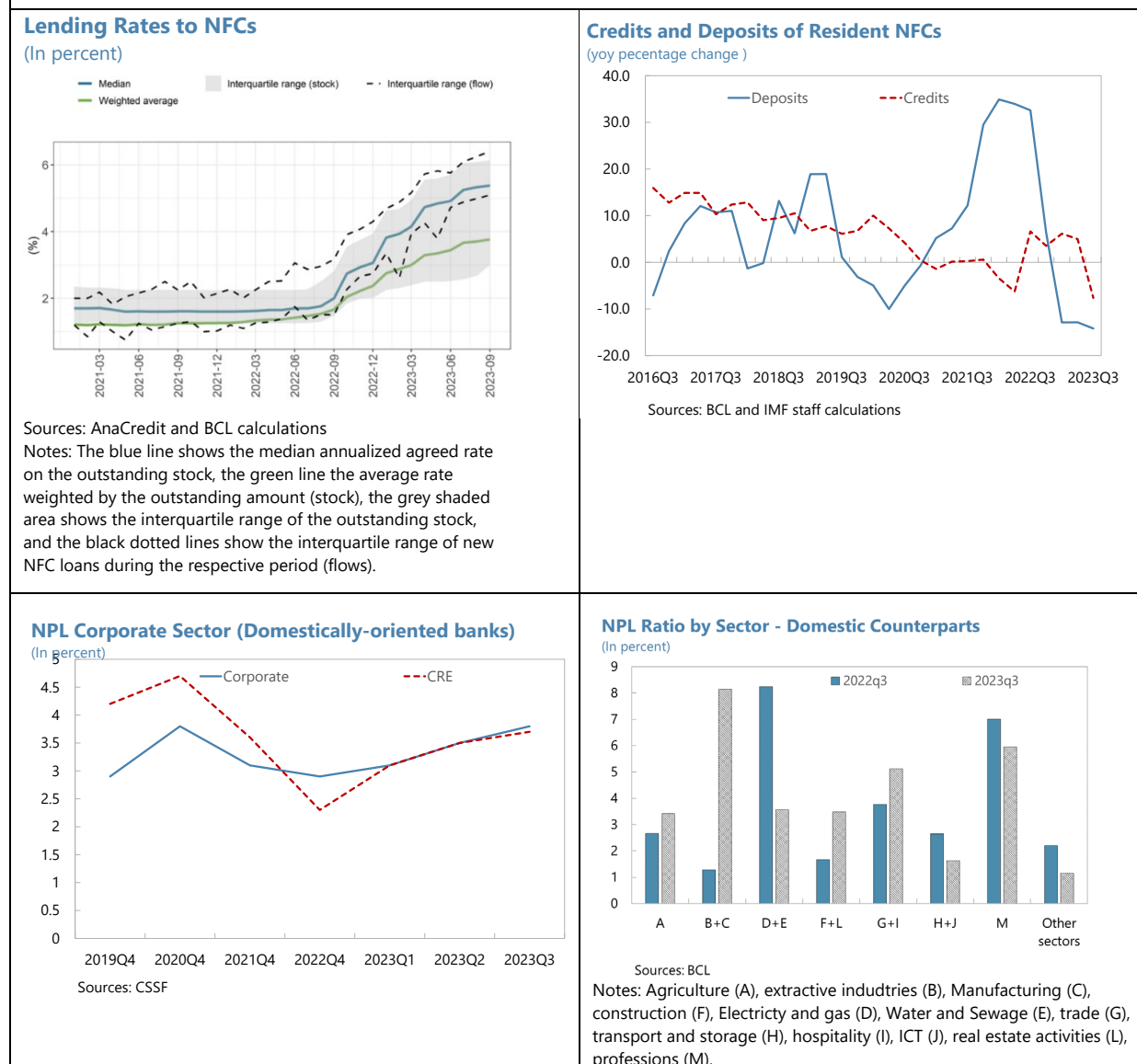
*Interest Coverage Ratio(t) = EBI(t)/Interest Expenses(t)*

*Equity(t+1) = Total assets (t+1) - Total debt (t+1) assuming that firms raise no new equity and pay no dividends during the years of the analysis.*

**28. Firms' financial vulnerabilities are assessed based on their liquidity and equity positions.** Liquidity needs are measured based on cash balances. In our framework, firms with negative cash balances will have to borrow or make other adjustments to avoid defaulting on their liabilities. Insolvency is measured based on firms' equity positions. A negative equity position suggests that a firm's liabilities are larger than its assets. The projected cash balances and equity positions are used to estimate the share of "firms at risk" (firms with cash balances or equity below zero) and "debt at risk" (the debt of firms at risk as a fraction of total non-financial corporate debt) at the country and industry levels.

**29. Firm level data are sourced from STATEC's central balance sheet office and cleaned from potential Special Purpose Entities (SPEs).** The dataset covers 10 industries at annual frequency over the period of 2011–2022. To identify SPEs, we use a range of criteria: NACE codes K and M701 (holdings) are excluded from the analysis, the share of financial assets to total assets does not exceed 90 percent and the share of debt owed to affiliated companies does not exceed 75 percent of total debt. We also use the minimum corporate income tax and net wealth tax for "SOPARFIs" to identify remaining SPEs. The sectoral sample coverage is good but large firms may be underrepresented.

<sup>12</sup> We assume that all NFC debt is at variable rate, which could be a conservative assumption.

**Figure 7. Luxembourg: Impact of the Higher Interest Rates on the Corporate Sector**

## Stress Test Results

**30. Liquidity risk increases significantly under the adverse scenario (Figure 8).** Under the baseline, the share of firms with negative cash balance increases to 35 percent compared to 20 percent during the pandemic. However, the associated debt at risk remains contained, which may suggest that mainly smaller firms are affected in the baseline. Under the adverse scenario, lower economic activity and higher borrowing costs exacerbate borrowing needs. The share of firms with liquidity shortfall exceeds 50 percent and the debt at risk doubles compared to the baseline to reach 40 percent. The impact on solvency is more moderate; the share of firms and the debt at risk would rise to 37 percent and 25 percent, respectively.

**31. While these levels appear high at first glance, they should be interpreted cautiously.**

First, our analysis does not consider natural hedges such as cuts in other expenses, which would reduce borrowing needs. Second, due to the lack of reporting, cash refers to currency and deposits and does not include account receivables and other cash equivalent items, which suggests that the results could be more conservative than in similar studies. Finally, as indicated previously, large firms that are in general more resilient may be underrepresented in our sample.

**32. Complementary analysis using sector specific shocks reveal a high sensitivity of real estate activities.** The construction sector (NACE F) and real estate activities (NACE L), which account for 62 percent of NFC loans granted by domestically oriented banks, would be more affected than the other sectors as a sharp house/real estate price would put their profit margins under pressure. However, with much weaker initial conditions—namely higher leverage and lower liquidity buffers—real estate activities are more severely exposed to liquidity and solvency risk, even under the baseline. This could be in part due to the fact that real estate developers create SPVs for each project, with high level leverage and the land as collateral. The parent company could eventually provide support to the SPV if needed but it also has more incentives to transfer the liquidity risk to the bank (or even let the SPV go bankrupt) if the situation worsens significantly. For the construction sector, the pressure on the debt servicing capacity is partially absorbed by high cash buffers accumulated in recent years.

**CRE Vulnerabilities**

**33. Higher interest rates have also exacerbated the post-pandemic downturn in the CRE market.** Following several years of rapid growth pre-pandemic, commercial real estate transactions have slowed along with the widespread adoption of remote work as well as e-shopping. More recently transactions came to halt, reflecting compressed yields and more attractive alternative investments. This has put pressure on prices especially in the office sector (-21 percent based on private sector estimates).<sup>13</sup> That said, the vacancy rate remains at historically low level and demand for climate-friendly buildings will support demand in the medium term (Figure 9).

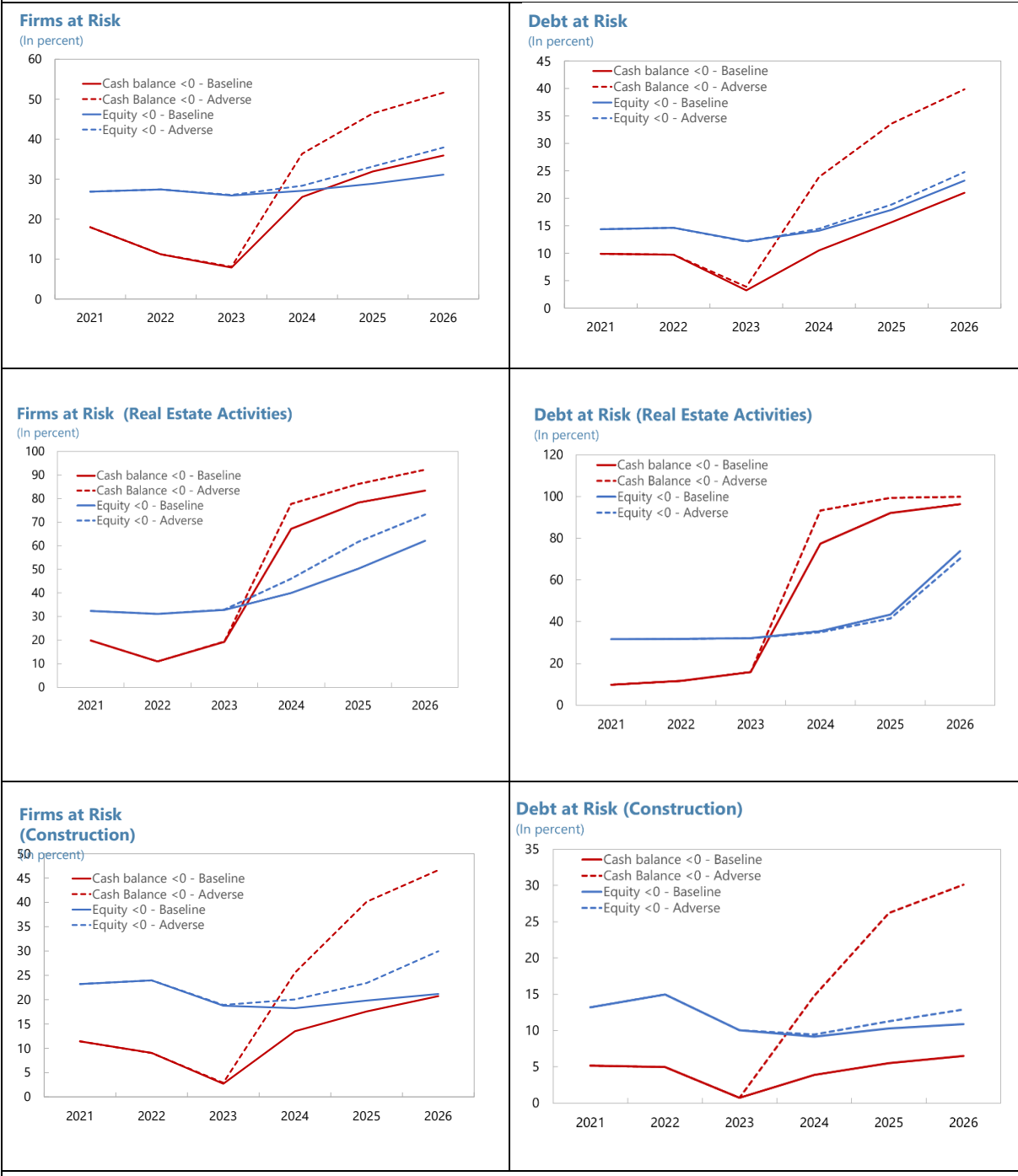
**34. CRE risks are moderate and manageable for Luxembourgish banks.** The share of CRE loans in the loan portfolio of Luxembourgish banks is relatively low compared to other countries (6-7 percent of total loans) but there is significant heterogeneity across banks.<sup>14</sup> The weighted average LTV ratio on the outstanding CRE loans averages 54 percent but the leverage on real estate developers at origination is higher (ranging from 65 to 80 percent). The coverage ratio is high at 94.5 percent (98 percent for domestically oriented banks), but this might not fully reflect the valuation effects of the recent drop in prices (Figure 10).

<sup>13</sup> These estimates have to be interpreted cautiously as the lack of transactions hampers price discovery.

<sup>14</sup> CRE loans either serve a CRE purpose, i.e., the acquisition of construction of a commercial property, or constitute borrowing for other purposes that is collateralized with CRE.



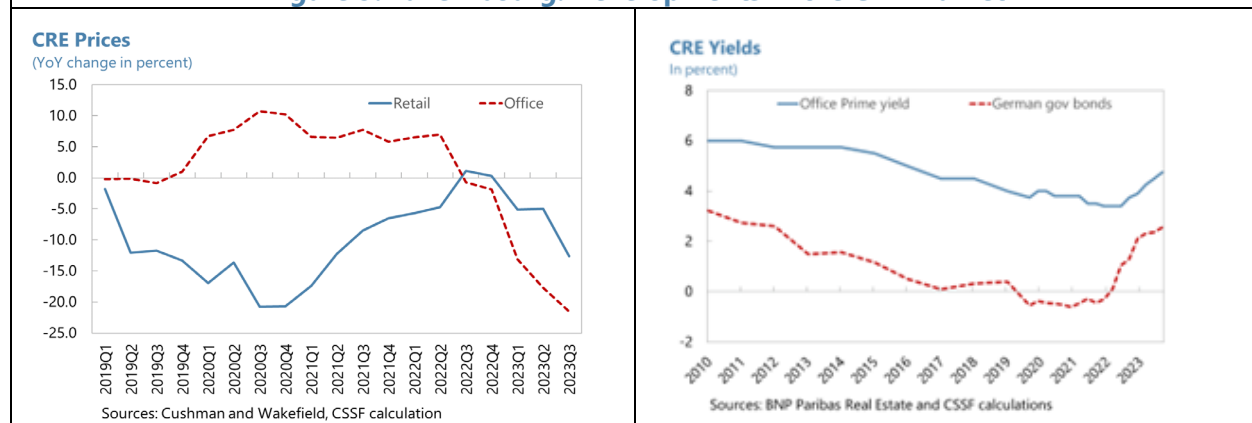
Figure 8. Luxembourg: Corporate Stress Test Results



Sources: Central balance sheet office (STATEC). And IMF staff estimates

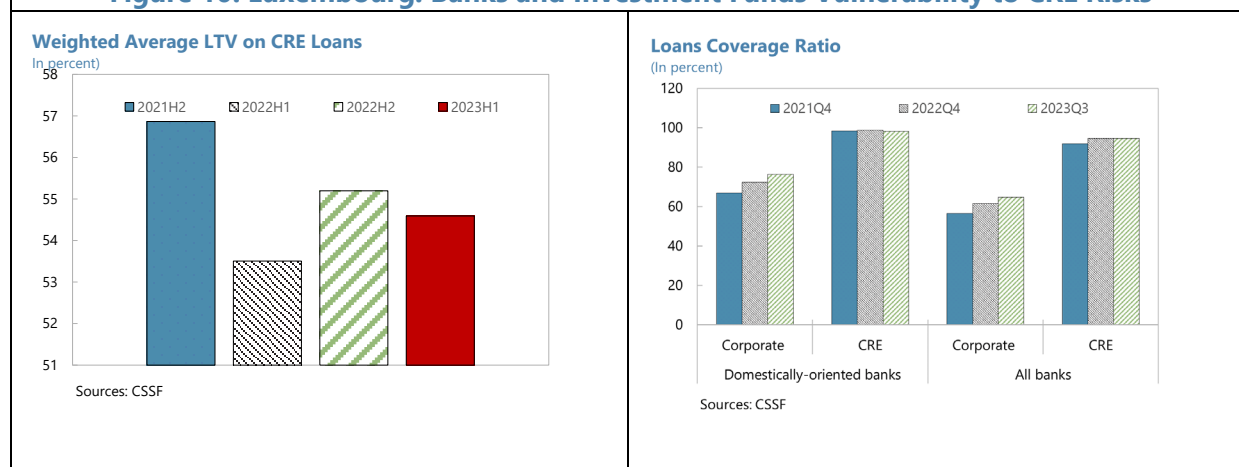


**Figure 9. Luxembourg: Developments in the CRE Market**



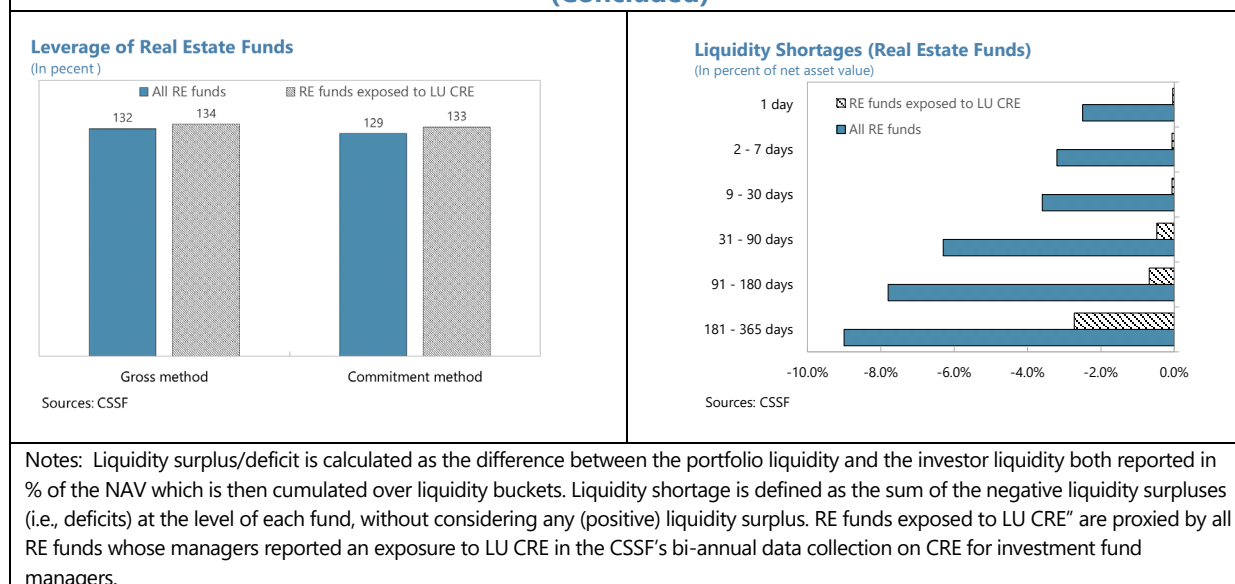
**35. CRE exposures of nonbank financial institutions exposure to the domestic market is limited, and risks appear manageable, although vigilance is needed.** Real estate funds’ assets have grown at a rapid pace with direct investments in recent years but have slowed down significantly in 2023H1. Direct investment reached EUR335 billion in 2023H1, of which 3.3 billion invested in Luxembourgish CRE market. Most of domestic investments are concentrated in the office market and prime locations. The real estate funds leverage is moderate (around 130 percent), and liquidity risks appear manageable especially for funds active in the domestic real estate market. Mitigating factors include the predominance of institutional investors and the fact that a large number of these funds are closed-ended redemption deferrals. According to ESMA, a subset of funds has a significant liquidity mismatch (1-year shortage of 9 percent). The calculation of the mismatch however does not incorporate redemption deferrals which are widely used as a liquidity management tool.<sup>15</sup> The insurance sector holds 2.2 billion in real estate assets (2.7 percent of total assets), of which 0.96 billion are invested in the Luxembourgish market.

**Figure 10. Luxembourg: Banks and Investment Funds Vulnerability to CRE Risks**



<sup>15</sup> For more details, see [ESMA60-1389274163-2572 TRV article - Assessing risks posed by leveraged AIFs in the EU \(europa.eu\)](https://www.esma.europa.eu/press-material/press-conferences/other-press-conferences/2023/08/assessing-risks-posed-by-leveraged-aifs-in-the-eu)

**Figure 10. Luxembourg: Banks and Investment Funds Vulnerability to CRE Risks (Concluded)**



## INSTITUTIONAL FRAMEWORK

**36. Robust institutional arrangements are essential for the effectiveness of macroprudential policy.** Following up on the previous FSAP recommendations, this section assesses the institutional arrangements based on three aspects: (i) the willingness to act, which makes sure the sufficient timely actions by dedicated institutions through a clear mandate and an accountability framework, including communication tools; (ii) the ability to act, which encompasses powers to obtain necessary information, activate regulatory constraints, and change regulatory perimeters when necessary; and (iii) effective cooperation in risk assessments and mitigation across domestic and international agencies.

### A. Willingness to Act

**37. The CdRS serves as the Luxembourg macroprudential authority, playing a central role in coordinating actions between its members to safeguard financial stability.** More specifically, it is tasked to identify, monitor, and assess risks to financial stability, and issue opinions, warnings, and recommendations of corrective actions to prevent and mitigate those risks. The CdRS is chaired by the Minister of Finance and includes the BCL (also acting as the secretariat), the CSSF and the CAA. Except for MoF, all CdRS members have a clear financial stability mandate. Decisions are taken based on a unanimous vote. The CdRS is accountable to the national parliament and is subject to a transparency framework. As required by the European legislation CRD IV, the CSSF has been entrusted as the national designated authority. When acting in such capacity, the CSSF takes decisions in relation to macroprudential measures after consulting with the BCL in order to find a common position and, where applicable, after requesting the opinion of the CdRS or taking the

latter's recommendations into account. Finally, while the responsibility lies primarily at the national level, addressing systemic risks is a shared competency with European authorities.<sup>16</sup>

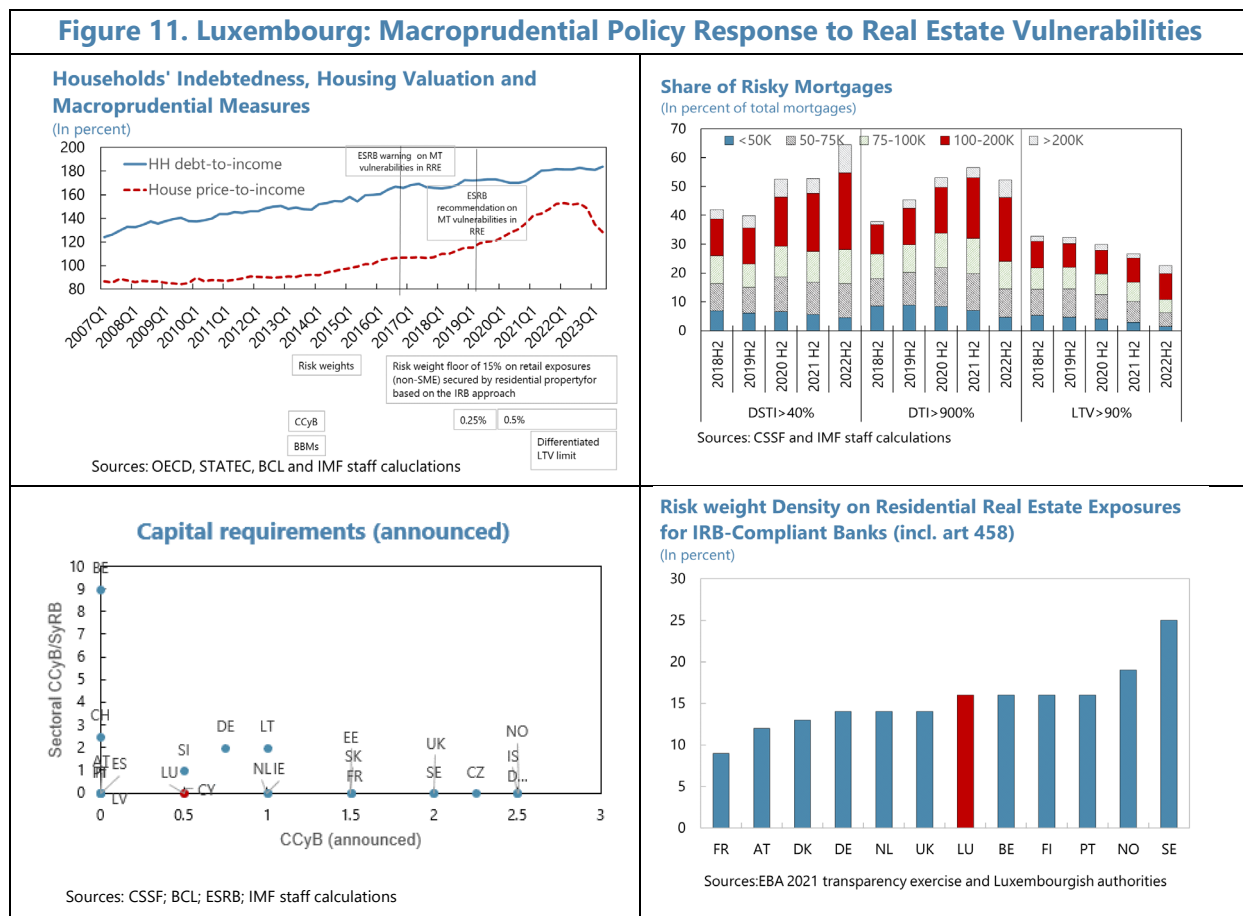
**38. While assessing the institutional framework as broadly appropriate, the 2017 FSAP proposed several recommendations to enhance its effectiveness.** In particular, it considered that the unanimous voting risks delaying the decisions or leading to inaction and suggested introducing greater flexibility by switching to a majority vote, enshrining in law the lead role of the Banque centrale du Luxembourg (BCL), and awarding it formal powers to issue recommendations. To strengthen transparency and accountability, the FSAP recommended to publish periodically analysis of systemic risks including the “notes de surveillance” and risk dashboards.

**39. The institutional framework has remained unchanged, leaving open concerns about potential inaction bias.** While the macroprudential authorities has taken several decisions to address vulnerabilities in the real estate, the measures focused mostly on strengthening resilience, tended to come somewhat late and were only partially sufficient to tackle rising households' indebtedness and risk-taking behavior by borrowers and banks. The legislation and implementation of borrower-based limits took more than four years. Although the legislative process and the uncertainty about the pandemic at a later stage partly explain this, it is worth noting that the authorities—through CSSF—could have acted on a comply or explain basis. The calibration of the LTV kept the maximum limit of LTV at 100 percent for first-time homebuyers in a context of significant overvaluation—the highest among peers—giving a high weight to affordability considerations (see Table 2).

**40. The ESRB and the IMF have called for tighter macroprudential measures in the past.** In its 2022 report on residential real estate vulnerabilities, the ESRB, similarly to the 2021–23 IMF Article IVs, assessed the measures undertaken by the authorities as partially appropriate and partially sufficient given the high risk, calling for complementing the LTV by income-based measures and to consider increasing the CCyB or implementing a sectoral capital-based measures.<sup>17</sup> The authorities have since then kept the CCyB unchanged at 0.5 percent since the pandemic (Figure 11).

<sup>16</sup> At the European level, Article 5(1) of the Single Supervisory Mechanism (SSM) Regulation requires macroprudential authorities in the euro area to inform the European Central Bank (ECB) prior to taking any decision to give it the possibility for review and objection. Article 5(2) allows the ECB to impose more stringent requirements on banks than national authorities for any macroprudential policy instruments falling under CRD/CRR, with the primary aim of preventing inaction bias. The ECB has the option to reject a macroprudential policy decision taken by a national authority yet needs to provide a written justification for doing so within five working days. The national authority has to take the ECB's view into account yet can still incorporate its decision as it deems appropriate. Moreover, The ESRB has the possibility to issue non-binding warnings and recommendations for the financial sector in its entirety, with a recommendation triggering a legal obligation by the concerned national authority to react by following a “comply or explain” approach. Furthermore, the ECB and the ESRB are compiling (non-public) macroprudential (ECB) and—less extensive—country risk assessment (ESRB) reports which review systemic financial sector risks and the macroeconomic policy stance in jurisdictions within their remit. Lastly, the ESRB also develops guidelines, recommendations, and opinions about the use of particular macroprudential policy instruments.

<sup>17</sup> [Vulnerabilities in the residential real estate sectors of the EEA countries \(europa.eu\)](https://www.eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32013R0649)

**Figure 11. Luxembourg: Macroprudential Policy Response to Real Estate Vulnerabilities**

**41. There are no systematic communications on systemic risks and macroprudential policy decisions for the general public.** The CdRS and its members have several periodic publications that discuss financial stability developments and macroprudential policy. In particular, the BCL financial stability report covers a wide range of analysis and indicators, complemented with ad hoc in-depth studies or research papers. The CdRS and the CSSF also have shorter assessments of risks and macroprudential policy in their respective annual reports. While containing useful summary of activities and developments, these publications are at low frequency, reducing their relevance for systemic risk assessment. Regarding macroprudential decisions, the CdRS issues systematically a justification about its quarterly decisions about the CCyB, the reciprocation of other countries' macroprudential measures, as well as its annual designations of G-/O-SIIs and the associated buffer requirements. Other communications are not systematic and are subject to agreement between the members. In general, communication remains highly technical and not easily accessible to the general public. This has at times led to a misperception of some policy decisions (e.g., the LTV-maximum limits were interpreted by the public as the actual LTV allowed by banks).

## Recommendations

**42. The authorities are encouraged to uphold the primacy of the financial stability objective in macroprudential decisions by reducing the role of the MoF.** Rising concerns about

housing affordability could make it politically more difficult to support introducing or tightening targeted real estate tools for financial stability reasons. In addition, while there is no evidence that it has materialized in the past, a potential conflict of interest could also arise from the fact that the government is a shareholder in the major players (banks) in the mortgage/real estate loans segment.<sup>18</sup> Against this background, the FSAP recommends reducing the role of the government in macroprudential decisions. This could be achieved through different institutional changes such as revoking the unanimity requirement by lowering the threshold to three out of four votes for a CdRS decision to be passed, in line with the [Key Aspects](#) Board paper (paras 86, and 87). Alternatively, the MoF could be designated as a non-voting member. In line with the experiences in many other countries, the chairmanship of CdRS could be transferred to the central bank (BCL).

**43. Accountability should be strengthened through systematic communication on the rationale for macroprudential policy decisions, including in the case of inaction.** The CdRS protocol on communicating on its decisions about CCyB and Global- and Other-Systemically Important Institutions (G-SII and O-SII) buffers should be extended to all macroprudential policy decisions. Even when no action is taken, the CdRS should communicate on the factors underpinning the decision. In this context, in line with best practices in OECD countries, the FSAP sees merit in publishing the records of the CdRS meetings soon after they take place, while excluding sensitive and confidential information.<sup>19</sup> Individual positions of the members do not have necessarily to be disclosed but a flavor of discussions and divergence in views could be given. Finally, as in the 2017 FSAP, the CdRS is recommended to regularly publish the risk assessment (note de surveillance) and risk dashboards. Such publications, together with a greater use of soft power (warnings), could enhance the understanding of risks and future policy directions.

**44. Adapting communication to a wider audience is key to ensure buy-in and understanding of macroprudential policy measures.** More specifically, the authorities should explain the role of macroprudential policy as well as its costs and benefits. To that end, the authorities could increase the use of on press conferences, events, and other tailored communication channels (e.g., social media platforms). Technical documents could be accompanied with non-technical summaries, chart packs, and heatmaps that would enhance readability and understanding of risk assessments.

**45. The macroprudential policy strategy should be updated periodically to align to evolving risks in line with its organic law.**<sup>20</sup> The macroprudential policy was developed and published in 2016 but has not been updated since then. As new vulnerabilities emerge, changes to the intermediate objectives and to the toolkit might be needed, requiring an update of the strategy.

<sup>18</sup> Banks fully or partially owned by the state account for more than two-thirds of RRE mortgages.

<sup>19</sup> Publication of records/minutes of macroprudential policy meetings is a common practice among several OECD countries. (e.g., Czech Republic, Belgium, Denmark, Finland, France, and Ireland, amongst others). The level of detail provided in these records varies. In some cases, there is a short summary of meeting discussion points (e.g., France, Poland); in others, a lengthier discussion of risks and policy directions is given (e.g., United Kingdom); minutes are published in only one instance (United States).

<sup>20</sup> [Loi du 1er avril 2015 portant création d'un com... - Legilux \(public.lu\)](#)

## B. Ability to Act

**46. The institutional arrangements provide broadly adequate powers to ensure CdRS's ability to act.** The CdRS is empowered to make opinions, recommendations, and warnings to its members institutions on tools entrusted to them by European or national legislations, assorted with a “comply or explain” mechanism. While not binding, the CdRS monitors the implementation of its recommendations and takes corrective actions if needed. The CdRS and its members also have overall adequate power to obtain information enabling it to fulfill its macroprudential mandate. The Organic Law gives the CdRS wide-ranging powers to request the information required to contain systemic financial sector risks. The law of December 4, 2019, has further strengthened the BCL access to aggregated information from public entities to conduct analysis for the CdRS. While no formal arrangements are in place to ensure it, the sharing of information has been relatively fluid, although not always systematic.

**47. The ability of the macroprudential authorities to add new tools poses some challenges.** The presence of the MoF in the CdRS should facilitate the adoption of new laws. Yet, recent experience with the introduction of BBMs in 2019 (Law of December 4, 2019) has revealed a lengthy (more than 2 years) and complex legislative process that potentially hampered the ability of the macroprudential authorities to act in a timely manner. In its 2019 financial stability review, the BCL raised concerns about these delays and found that “... it is very regrettable that the vote on the bill took a considerable delay preventing the authorities from having the tools essential to the effectiveness of a macroprudential supervision consistent with the rising nature of systemic risks specific to the residential real estate market in Luxembourg”. In addition, during the process, following the State Council (Conseil d'Etat), several amendments to the original draft law were introduced, to better define the scope of action in the use of BBMs. These include imposing corridors (floor and caps) to the BBMs and introducing a sequencing for their activation, which could limit the ability to act in an appropriate and proportionate manner.<sup>21</sup>

### Recommendations

**48. The operational agility of the macroprudential authorities' framework should be further enhanced.** In a context of rapidly evolving risks and vulnerabilities, the macroprudential authorities should be able to adapt rapidly their strategy and tools and act in a timely manner. This requires reducing unnecessary hurdles. The authorities could for example consider special (faster) procedures for macroprudential laws. In case of delays, the CSSF should use its semi-hard and soft

<sup>21</sup> The corridors are as follows: (1) 75 percent to 100 percent for the maximum limit for the ratio between the total credit obligations of a borrower and the total market value of a given property (LTV ratio); (2) 400 percent to 1200 percent for the maximum limit for the ratio of the total amount of a borrower's repayment obligations resulting from a loan secured by a mortgage on residential property and the borrower's total available annual income (LTI ratio); (3) 400 to 1200 percent for the maximum limit for the ratio between the borrower's total indebtedness and the borrower's total available annual income (DTI ratio); (4) 35 to 75% for the maximum limit for the ratio between the total annual mortgage charges and the borrower's total available annual income (DSTI ratio); and (5) 20 to 35 years for the maximum limit for the initial maturity of the loan (maturity limits). The law also imposes to make sure that all other tools within the CRR/CRD are not effective to address the identified systemic risk before activating the BBMs. For more details, see [Opinion on additional macroprudential tools for residential mortgages \(CON/2019/34\) \(europa.eu\)](https://www.europa.eu/press-communications/infobox.cfm?id=11300).



powers as needed. Moreover, when considering new tools, the laws should strike the right balance between defining the scope of action and preserving sufficient flexibility to act. In this context, regarding the BBMs law, while the corridors may be not too binding for now, the authorities are encouraged to regularly reassess whether they do not constrain their ability to act in a nimble and proportionate manner and review the law as needed where legally feasible.

## C. Effective Coordination and Cooperation

**49. Coordination within CdRS members and with other domestic and external stakeholders has been overall effective.** As stipulated by its organic law, the CdRS role is to coordinate between its various members to contribute to financial stability through the cross-fertilization of views and exchange of information. Preparatory technical meetings take place to coordinate and the “notes de surveillance” benefit from inputs from the different institutions. A working group has been recently formed to follow-up on the ESRB recommendation on CRE vulnerabilities. Even in the absence of a formal mechanism, the exchange of information has been fluid although not always systematic. In addition to regular meetings, exceptional CdRS meetings were called in periods of stress, allowing a rapid assessment of the risks and a coordinated response. At the European level, the ESRB collects and communicates policy decisions taken by national macroprudential authorities in its constituent countries and fosters the mutual recognition of macroprudential policy measures across its membership to reduce leakages. The BCL and CSSF have been participating regularly in international fora and contributing actively to the regulatory/policy debates and research.

### Recommendations

**50. Enhanced coordination between macroprudential policy and other policies (in particular housing policies) could be highly beneficial.** Housing policies, whether targeting demand or supply, can impact house prices and carry significant financial stability implications, both in the short and the medium terms. At the same time, macroprudential policy may affect housing affordability, especially in the short term. Improved coordination between macroprudential and housing policies could be particularly important to enhance the effectiveness of macroprudential measures while minimizing its potential costs. Financial stability considerations should be considered in the design/calibration of government policies (especially housing and fiscal policies). In this context, the authorities should consider establishing a consultation mechanism between the government and the CdRS.

## SYSTEMIC RISK MONITORING AND ARTICULATION OF POLICY DECISIONS

**51. Monitoring and evaluating systemic vulnerabilities in the financial sector are crucial for the appropriate and timely calibration of macroprudential policy.** This section reviews and assesses the existing framework of systemic risk monitoring in terms of (i) the availability of adequate data and indicators, (ii) the use of quantitative methods to detect and analyze systemic risks, and the articulation between systemic risk assessment and policy decisions.

## A. Data Issues

**52. The authorities have made a remarkable progress in filling the data gaps identified in the 2017 FSAP.** In particular,

- for *households and residential real estate*, harmonized data on the LTV and DSTI ratios as well as additional relevant indicators are collected on semi-annual basis (CSSF circular N°18/703 and N°20/737), following the ESRB's recommendation ESRB/2016/14. The data collection has been instrumental in assessing the risk profile of new loans, although more granularity (for example through a richer bucketing of risks) is encouraged. Also, the BCL uses triennial Household Finance and Consumption Survey (HFCS) to stress test households balance sheet.
- for *commercial real estate (CRE)*, the CSSF has issued circulars for regular data collection from banks and investment funds (box 1). STATEC is working closely with Eurostat to develop a price indicator for CRE, although these efforts are facing technical hurdles related to the lack of transactions and price discovery especially in periods of downturn. To date, as part of its follow-up of recommendations, the ESRB has assessed Luxembourg as fully compliant with respect to CRE.
- for *non-financial corporations*, the AnaCredit EU regulation, 2016/867 has been transposed in Luxembourg via the BCL circular 2017/240 titled "introduction of granular credit risk". The database offers granular information about individual bank loans, including credit terms and conditions, credit status, etc. However, the CSSF has faced so far challenges in accessing AnaCredit data.
- for *investment funds related data gaps*, since the last FSAP, a new dedicated EU reporting for MMFs was introduced and implemented in accordance with article 37 of the regulation 2017/1131 of 14 June 2017 on money market funds. In addition, article 4 of Regulation 2015/2365 of 25 November 2015 on transparency of securities financing transactions (SFTs) and of reuse and amending Regulation No 648/2012 introduced an EU-wide reporting on SFTs. Efforts were also undertaken since the last FSAP to improve data quality in the prudential reporting, including setting up and automating controls on the UCITS Risk Reporting as well as implementing locally the EU data quality engagement frameworks on the AIFMD and MMFR reporting as well as the EU data quality action plans on EMIR and SFTR data. Some data fields in the AIFMD reporting were changed from optional to mandatory in order to increase coverage, and the CSSF engaged with ESMA in order to provide guidance on the risk indicators in the AIFMD risk reporting which were not usable due to a lack of standardization.

**53. Ad hoc surveys and qualitative information from dialogues with market participants are also a valuable source of information.** In-depth discussions with the industry are conducted to better understand their practices and the potential impact of measures. Where needed, these are complemented with ad hoc surveys. For example, the CSSF launched a survey related to the Luxembourg real estate developers' portfolio. The domestic banks selected for this survey represented 92 percent of the total Luxembourg real estate developer's portfolio. The purpose of this thematic review was threefold: (i) to obtain an overview of the risks stemming from the slowdown of real estate development project prices and interest rates/construction costs increases,



(ii) to benchmark banks on their lending standards and practices at loan origination and their monitoring process, and (iii) to propose remedial actions based on the findings and risks identified in this review.

### Box 1. Efforts in Filling CRE Data Gaps

*The ESRB has issued two recommendations on closing real estate data gaps (ESRB/2016/14 & ESRB/2019/3), which were followed by the ESRB Recommendation on vulnerabilities in the commercial real estate sector in the EEA (ESRB/2022/9). The authorities have made substantial progress in filling the identified gaps despite some technical challenges in compiling price indicators. As a result, as part of its follow-up the ESRB has assessed LU as fully compliant with respect to commercial real estate.*

**In order to ensure the follow-up of these recommendations, the CdRS has established a working group on real estate data gaps (“Groupe de travail sur les données immobilières”) in 2019.** The CdRS working group, chaired by the BCL, is composed of representatives of the BCL, the CSSF, the CAA, the Ministry of Finance and STATEC and facilitates the coordination and development of a harmonized set of real estate indicators for banks, funds, and insurers (where applicable) as well as a set of physical CRE market indicators as recommended in ESRB/2016/14 and ESRB/2019/3.

**To close data gaps on CRE financing, and after coordination with the CdRS working group members, the CSSF has issued two regular data collections for banks and funds.**

- **For Banks**, in 2022, the CSSF has published the circular N° 22/803, launching a semi-annual data collection on bank loans aimed at acquiring a CRE property or secured by a CRE property. This data collection is addressed to banks active in this sector and was designed based on extensive discussions with the main banks and the industry representatives to have a better understanding of market practices. It has also been designed to meet the expectations of various stakeholders (ECB, ESRB, etc). The CSSF can collect data on CRE exposures with some granularity depending on the purpose of the CRE loans, the property type associated to these loans, the location of the CRE property. Data on LTV ratio (aggregate and by CRE purpose), interest coverage and debt service coverage ratios are also collected. Moreover, the same level of granularity as the one of the CRE loans applies to data collected on non-performing loans for acquiring CRE, and to the loan loss provisions on loans for acquiring CRE. Finally, all this set of indicators is collected not only on the stock of CRE loans, but also on the newly granted CRE loans.
- **For funds**, the CSSF introduced in September 2021 a data collection on commercial real estate for investment fund managers. This data collection takes the form of an online questionnaire, which benefitted from the collaboration with the funds industry’s professionals. This data collection gathers data on CRE direct and indirect domestic and foreign investment to follow-up on the CRE market and related trends. It also gathers data according to several dimension such as the location (prime, non-prime), the type (office, retail etc.) and the country where the building is located. This set of indicators is collected not only on the stock of CRE loans, but also on the newly granted CRE loans.

**Regarding physical indicators, the compilation of a CRE price index is ongoing work undertaken by STATEC.** As a member of the Eurostat Task Force on Commercial Real Estate Indicators, STATEC participates actively in the development of physical CRE market indicators and a corresponding European wide legal framework. Current practical challenges in construction of a commercial real estate price index

### Box 1. Efforts in Filling CRE Data Gaps (Concluded)

for Luxembourg include a very low number of transactions per year, the difficult price measurement in multi-use properties, the definition of “prime” and “non-prime” real estate. Therefore, STATEC, together with the national statistical institutes from other jurisdictions with small CRE markets, was in frequent exchange with Eurostat, in order to consider the challenges related to few market transactions in the new legal framework establishing the European wide data collection. STATEC expected that a new European regulatory framework for the collection of physical CRE market indicators would enter into force by end-2025, followed by a first data collection in the first quarter of 2026. In the meantime, STATEC has signed an agreement with one of the private actors to get aggregated data on commercial real estate data.

## Recommendations

### 54. Building on recent efforts, the authorities should continue to improve the quality, granularity, and availability of data, especially on housing supply as well as households and corporate balance sheets.

- STATEC and relevant data sources should continue to fill data gaps on housing supply. Data on completed buildings are available with a considerable lag (latest available is 2019) and estimates of stock of residential dwellings are only available at very low frequency through census data. Plans to collect data on vacant dwellings/rental stock should be expedited. The construction of a land price index and collection of associated transactions data by the “observatoire de l’habitat” is welcome, but higher frequency would be highly beneficial to detect potential speculative market movements.
- Micro data on households’ balance sheets should be improved. The authorities’ efforts to analyze the potential setting up of a credit register for households are welcome and implementation should be expedited with clearly defined timelines (cf., Technical Note on banking supervision). The BCL should also consider increasing the coverage of the HFCS (sample and response rate) and regularly adapting the questionnaire to emerging macroprudential questions.
- The data on the corporate sector liabilities are subject to large revisions. They are highly volatile partly because of large inter-company lending from special purpose entities and multinational companies. STATEC should aim at better isolating these entities both in national and financial accounts. There is also a need to improve the quality of the reporting on some balance sheet and P&L items in the central balance sheet office database (e.g., taxes, turnover, granular components of debt).

## B. Quantitative Methods

**55. The BCL and the CSSF have continued to develop a comprehensive systemic risk monitoring framework in line with the 2017 FSAP recommendations** The previous FSAP had assessed the operational capacity as broadly adequate. It recommended the authorities to strengthen monitoring of residential real estate, non-banks including interconnectedness between the investment fund industry and banks, as well as the corporate sector. The FSAP also called to

strengthen stress-testing capacity of investment funds and prepare a study on liquidity management tools.

**56. The authorities continued to strengthen their monitoring of the residential real estate market and households' vulnerabilities.** The BCL and CSSF risk assessment framework includes a comprehensive analysis of house price growth, overvaluation indicators (using both statistical and model-based indicators), as well as estimates of downside risk with house price-at-risk modeling. They also monitor mortgage credit developments (credit growth, credit-to-GDP gap, lending standards, pockets of risky lending), household debt, domestic bank exposures and mortgage risk-weights. The BCL has developed a stock-flow model to assess the gap between housing supply and demand. Both the BCL and the CSSF participate in SSM and ECB/ESRB working groups on residential real estate. The BCL also participates in the BIS CGFS Study Group on housing policies. The modelling of house prices should continue to be developed. Current models are in general partial equilibrium models that do not capture the interplay between the labor, housing, and credit markets, which in the case of Luxembourg, go beyond the domestic market. They also do not incorporate the impact of government and macroprudential policies (e.g., on the user cost of housing).

**57. Efforts to better assess corporate vulnerabilities are still at early stages and should be sustained.** The BCL developed econometric models to project the number of bankruptcies and NPLs by sector in Luxembourg.<sup>22</sup> It also developed a set of risk monitoring indicators specific to non-financial companies using both AnaCredit. Finally, following the recommendation of the European Systemic Risk Board issued on December 1, 2022, BCL and CSSF have stepped up the monitoring of banks and funds CRE exposures as well as lending standards and practices. The BCL has recently obtained access to nonpublic balance sheet data, which will help develop corporate balance sheet stress test and analysis.

**58. The BCL and CSSF have bolstered their stress testing capacities, including for NBFIs, to assess the resilience of the financial sector to adverse shocks.**

- On solvency, the BCL developed a top-down stress test using mixture VAR (MVAR) model and projecting the probability of default of banks' counterparts following different shocks as well as the impact on capital buffers.<sup>23</sup> CSSF relies on top-down stress tests to assess the loss-absorptive capacity of the banking sector and inform micro and macroprudential actions. It also conducts sensitivity analysis/stress-test based on real estate shocks.<sup>24</sup>

<sup>22</sup> See Boubacar Diallo and Lucas Hafemann (2022), [228812 BCL RSF 2022 04 chap4 ann 1.pdf](#), pp150-168.

<sup>23</sup> For more details, see P. Guarda, A. Rouabah et J. Theal (2013): A mixture vector autoregressive framework to capture extreme events in macroprudential stress tests, *Journal of Risk Model Validation* 7(4), pp. 21-51.

<sup>24</sup> The sensitivity analysis allows to observe the level of capital shortfall compared to the hurdle rate according to (i) default rate (ranging from 0 percent to 25 percent) and (ii) real estate price decline (ranging from 0 percent to 50 percent). It is performed on the 7 most important banks in the domestic RRE market. This sensitivity analysis is also performed for exposures towards real estate developers and constructions companies.

- On systemic liquidity risk and market risks, the BCL compiles several indicators of liquidity for investment funds. CSSF performs an annual assessment of maturity transformation between liabilities and intragroup assets at all banks. The CSSF and BCL monitor the sensitivity of banks' debt securities portfolios to changes in interest rates and credit spread on a quarterly basis, based on the modified duration of the debt securities held by banks and funds. In addition, the CSSF monitors on a semi-annual basis the sensitivities of debt securities portfolios of UCITS to changes in interest rates and credit spread, based on the univariate stress test reported in the UCITS Risk Reporting. The sensitivity of MMFs is monitored via the quarterly EU reporting including indicators like WAM and WAL as well as standardized stress test covering inter alia interest rate and credit risks. Finally, in line with FSAP recommendations, the CSSF developed a liquidity stress testing (LST) framework for investment funds, considering second round effects and extending asset classes, and published a working paper on the effectiveness of LMTs.
- Interconnectedness. The BCL has developed network analysis. The CSSF monitors potential contagion effects between Luxembourg banks through the simulation of its annual bank interconnectedness stress test. Based on the CSSF solvency stress test scenario and other scenarios (that are based on the identified main vulnerabilities), the impact on bank capital and banks' risk weighted assets is simulated. Second round effects via interbank exposure (based on the Large Exposure Reporting (LAREX)) and third round effects are also simulated. The CSSF conducts a bi-annual stress testing exercise focusing on interlinkages between banks domiciled in Luxembourg and investment funds (both in Luxembourg and abroad).<sup>25</sup> Notwithstanding, these commendable improvements, giving their increasing role in financial intermediation, the monitoring of other financial institutions and their contribution to the financing of the economy and potential contagion channels should be further strengthened.

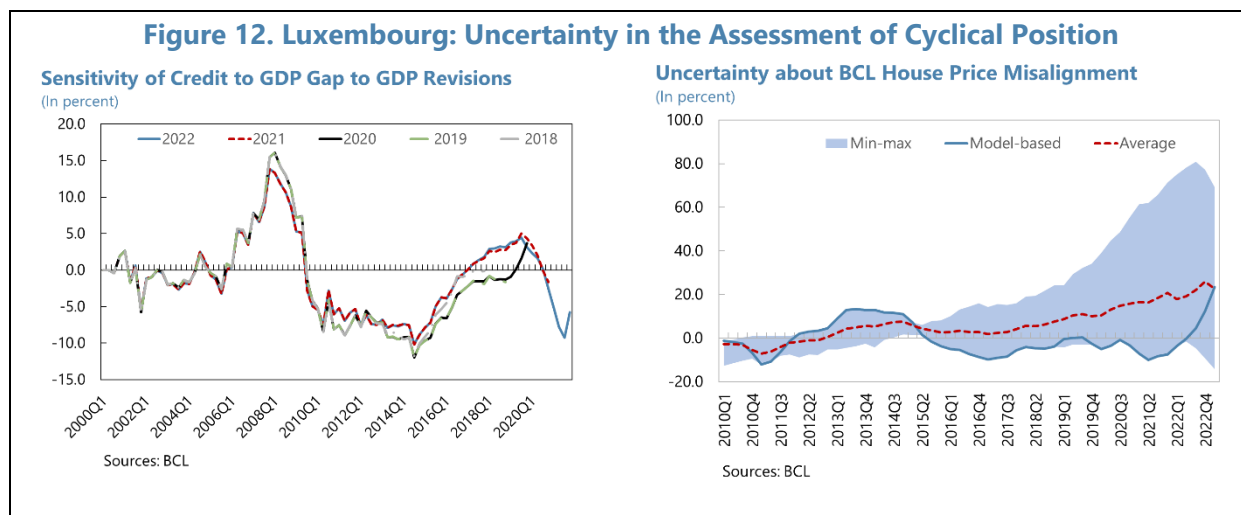
**59. The CdRS uses guided discretion to decide about macroprudential measures.** The CdRS reviews a broad set of indicators and models. These indicators are related to the intermediate objectives defined in the macroprudential policy strategy. For some instruments, such as the CCyB or OSII buffers, there are well defined thresholds for the associated indicators, that guide the decision while keeping space for judgment. For example, the activation of the CCyB in end-2018 has relied on a broader set of indicators. For others, the thresholds are defined internally by the members and the mapping between the objectives, the indicators and the instruments are less clear. When deciding about the activation/loosening/tightening of the measures, BCL and CSSF conduct cost-benefit analysis based on welfare-based models and counterfactual simulations.

**60. Despite BCL and CSSF significant efforts, the assessment of macroprudential policy stance and systemic risks remains challenging.** First, like in other countries, the lack of historical time series on asset quality, credit conditions and history of macroprudential policy makes it difficult to assess ex-ante the impact of macroprudential measures. This could lead to some fear of action

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<sup>25</sup> The CSSF adopts two approaches to calibrate outflow rates for funds' deposits at Luxembourg banks: (i) outflow rates vary between 40% and 100%, depending on the fund type, and (ii) deposit outflow rates depend on a redemption shock and liquid assets holdings of each fund. Deposit outflows are then compared to banks' counterbalancing capacity, including short-term intra-group placements.

especially if risks are not perceived as imminent. Second, many indicators and models developed by BCL and CSSF are subject to substantial uncertainty due data revisions, volatility, etc. For example, several measures of the macroprudential policy stance and the cyclical position such as growth/house price at risk models, credit to GDP gap and house price gap rely on GDP (or a measure of income) as a major variable, which is highly volatile and subject to large revisions (Figure 12). This adds to models' uncertainty and could significantly undermine the assessment of systemic risks, reduce confidence in the indicators/analysis, increase the weight of judgement in decisions and contribute to inaction bias. To mitigate these risks, the BCL is relying on average measures as well signal approach (AUROC) based on multiple indicators.



## Recommendations

**61. A better mapping of objectives, indicators and instruments should be considered.** The authorities should increase reliance on indicators less subject to revisions. In parallel, they should coordinate with STATEC to better identify and isolate potential sources of volatility in national and financial accounts. In addition, the authorities should set internal thresholds for household indebtedness and real estate related indicators that could have a structural and cyclical (adjustable) components and would trigger discussions about potential action. While keeping a role for judgment, decisions not to act if these thresholds are breached should be sufficiently motivated. In general, a gradual approach in the calibration of tools and the use of combined measures could reduce uncertainty about the impact of macroprudential policy and increase their effectiveness.

## POLICY TOOLS AND CALIBRATION

**62. In the short term, macroprudential policy should lock-in bank capital headroom using targeted capital-based measures.** FSAP analysis suggests that the increase in interest rates have reduced the lending and collateral stretch while increasing stock vulnerabilities for both households and corporate. It also found that although banks have high coverage ratios, a sharp correction real estate prices would expose few banks with high real estate exposures to more material unexpected

losses. While banks have enough capital buffers on aggregate, it is recommended to preserve resilience by increasing macroprudential capital requirements, preferably through sectoral systemic risk buffers on real estate exposures. Compared to the CCyB, the sectoral systemic risk buffer allows for more precise targeting of the stock vulnerability. High profitability and ample capital headroom would mitigate the impact on capital costs and reduce procyclical effects. In addition, while banks have in general high coverage ratios (collateral and provisions) on real estate related loans, the authorities should continue to closely monitor collateral valuation effects and refinancing/liquidity risks in the real estate sector, while maintaining sound lending practices to the sector.

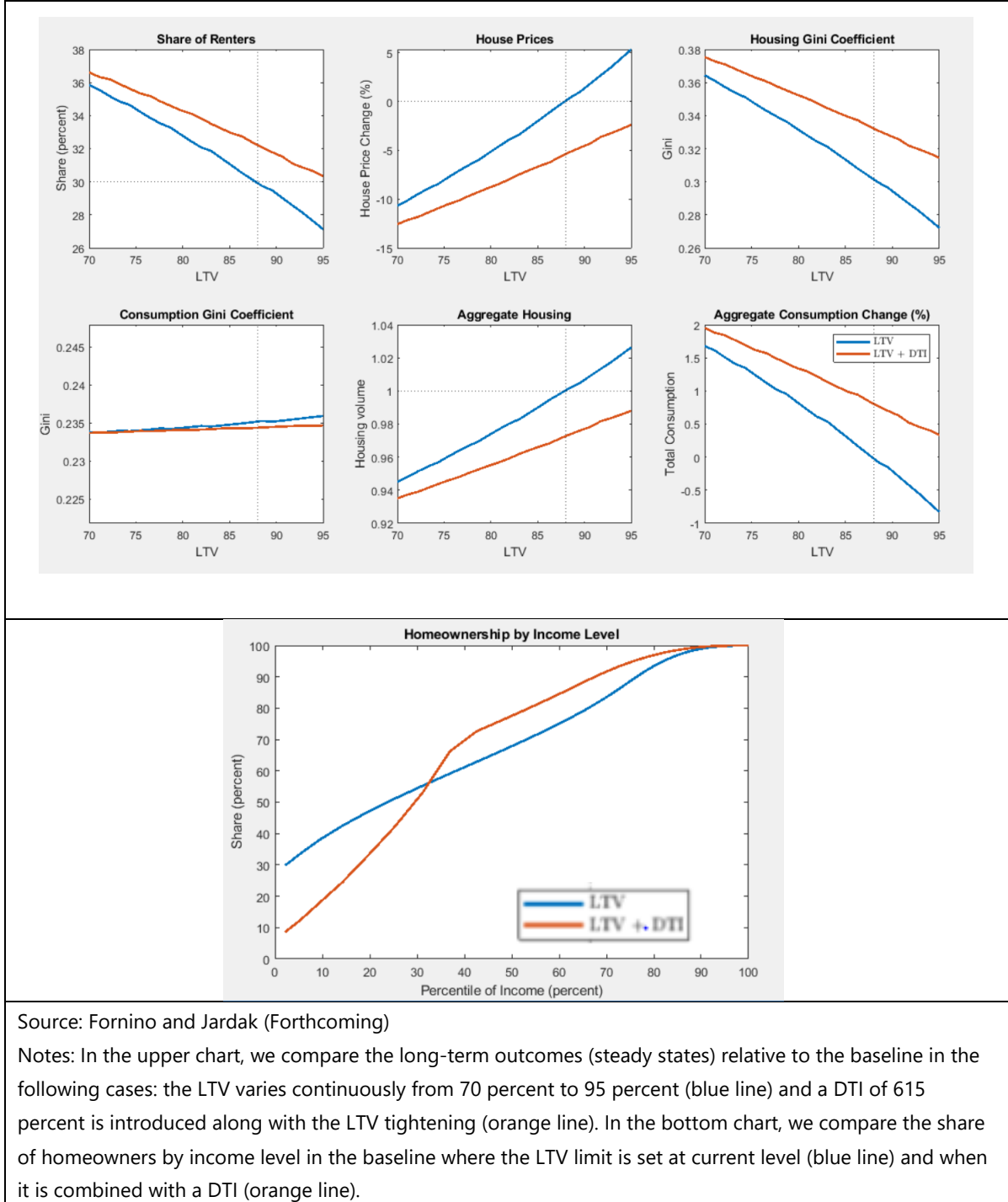
**63. Income-based measures should be introduced early in the recovery cycle to address rising households' indebtedness.** The introduction of the LTV and the stress test requirement of 200bp of borrowers' capacity to repay are welcome. However, they fell short of tackling the rising housing indebtedness. As suggested by the households' stress test, vulnerabilities are not restricted to lower income households, it is important to make sure that to avoid further build-up vulnerabilities on new flows through income-based measures. Jurča et al. (2020) and Giannoulakis et al. (2023) find a nonlinear complementarity between DSTI and LTV limits in reducing the probability of default, thereby lowering credit losses and preserving solvency ratios. The maximum loan-to-value limit of 100 percent is very high and should also be reduced gradually over time.

**64. FSAP Analysis shows several benefits and little costs in implementing-income based limits.** Extending Nakamura (2023), the FSAP has calibrated a continuous-time heterogeneous agent model for Luxembourg with a stochastic income stream and flexible housing supply.<sup>26</sup> The introduction of income-based limits is found to reduce house prices in the medium term in a context of supply rigidity, thereby reducing households indebtedness and preserving consumption in case of a shock. Although housing affordability (measures by house ownership) declines, our results suggest that for a large share of households, the benefits from lower house prices would outweigh the financial constraint impact. This would be consistent with the authorities' objective of avoiding the exclusion of more households from the housing market. The affordability cost for low-income could be compensated through social housing and other targeted policies.

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<sup>26</sup> We use a diffusion process with variance of steady state log-normal distribution calibrated to match observed after-tax Gini coefficient in Luxembourg.

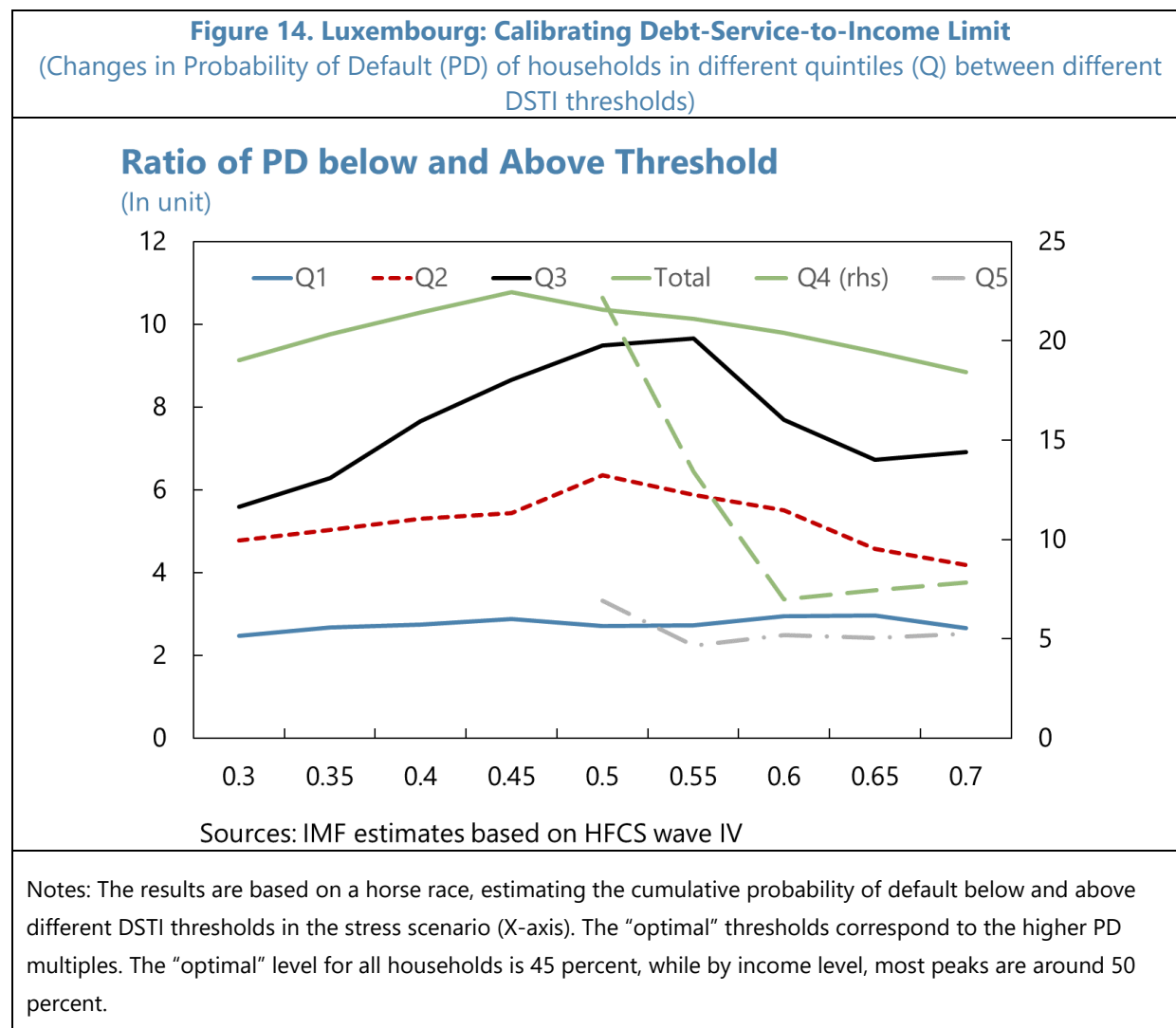
**Figure 13. Luxembourg: Impact of the Introduction of Income-Based Limits: Evidence from a Continuous Heterogenous Agent Model**



Source: Fornino and Jardak (Forthcoming)

Notes: In the upper chart, we compare the long-term outcomes (steady states) relative to the baseline in the following cases: the LTV varies continuously from 70 percent to 95 percent (blue line) and a DTI of 615 percent is introduced along with the LTV tightening (orange line). In the bottom chart, we compare the share of homeowners by income level in the baseline where the LTV limit is set at current level (blue line) and when it is combined with a DTI (orange line).

**65. The authorities should immediately start working on the calibration of income-based limits.** FSAP analysis suggests calibrating stressed-DSTI around 45-50 percent, possibly tied to the current interest rate stress test required by CSSF for mortgages.<sup>27</sup> The calibration of the stressed interest rate could be rule-based, as for instance in Canada or Estonia, where the stressed interest rate is defined as the maximum between a flat rate and the current mortgage rate augmented by a certain margin. Given uncertainty about the impact, the authorities could apply a gradual approach, implementing a speed limit that gives some flexibility for banks, and tightening it when the recovery firms up.



**66. Over the medium term, the CdRS should evaluate the benefits of a positive neutral CCyB and modify its CCyB framework accordingly if the introduction of such a buffer is deemed beneficial.** Recent years’ experience has shown that shocks could be asymmetric and that an unexpected sudden credit contraction could occur even when there are no signs of excessive

<sup>27</sup> Our results are similar to those of another IMF forthcoming work, using a different methodology to identify vulnerable households (Valderrama and others, 2023).



credit built-up. A positive neutral rate could address such concern and provide releasable buffers against unexpected macro-financial shocks that are unrelated to the credit cycle. By keeping the CCyB at 0.5 since 2019, the CdRS and the CSSF is de facto following the same logic.

**67. Support measures to housing demand and purchasing power should be carefully (re) considered.** Even if temporary, measures to support housing demand, especially untargeted tax incentives and buy-to-let, could support demand but risk impeding the orderly rebalancing of the housing market. Over time, they could lead to moral hazard and encourage risk-taking behavior by borrowers and lenders. Assistance to viable real estate developers could be envisaged under strict conditions and support in the completion of unfinished projects (e.g., in the form of guarantees under strict underwriting standards) could be also considered. In addition, in line with past year article IV recommendations, the authorities should consider frontloading public projects, with greater involvement of the private sector. Over the medium term, the authorities should consider redesigning help-to-buy policies, including by gradually phasing out interest payment deductibility, and expediting measures to unlock supply bottlenecks.

Table 2. Luxembourg: Use and Calibration of Borrower-Based Limits in Selected EU Countries

	Austria	Belgium	Canada	Cyprus	Czechia	Denmark	Estonia	Finland	France	Iceland	Ireland	Latvia
<b>Loan-to-value (LTV)</b>	90% (20% speed limit)	90% for BTL (with 10% allowed up to 90%); 90% for FTB (with 35% allowed up to 100% and 5% over 100%); 90% for SSB (with 20% allowed up to 100%)	95% for owner occupied with government guarantee up to 500,000; 80% for others	80% for FTB, 50% for construction of luxury properties, 70% for others	90% for those under age 36, 80% for others	95%; the share of loans with an interest rate fixation of less than 2 years with an LTV of 75% or above should not exceed 25%	90% if guaranteed by KredEx (15% speed limit); 85% for others (15% speed limit)	95% for FTB, 85% for others		85% for FTB, 80% for others	90% for FTB (15% speed limit); 70% for BTL (10% speed limit); 80% for others	95% for mortgages with state guarantee; 70% for BTL, 90% for others
<b>Debt service to income (DSTI) or stressed DSTI</b>	40% (10% speed limit)	50%	39% stressed GDS and 44% stressed TDS for loans with government guarantee	80%	50% for those under age 36, 45% for others		50% stressed DSTI		35%	40% stressed DSTI for FTB; 35% for others (5% speed limit)		40% (10% speed limit)
<b>Loan-to-income (LTI)</b>	-					LTI above 4 requires stress testing					3.5 for FTB (20% speed limit); 3.5 for SSBs (20% speed limit)	
	Lithuania	Luxembourg	Netherlands	New Zealand	Norway	Poland	Portugal	Slovakia	Slovenia	Sweden	Switzerland	United Kingdom
<b>Loan-to-value (LTV)</b>	70% for indebted SSB (with a current LTV of at least 50%), 85% for others	100% for FTB, 90% for owner occupied (15% speed limit), 80% for others	100%	65% for investment properties (5% speed limit); 80% for owner-occupied (15% speed limit)	60% for second homes in Oslo, 85% for others	90% for insured or overcollateralized mortgages, 80% for others	90% for own and permanent residence, 80% for others	80% (with 20% allowed up to 90%)	80% for FTB, 70% for others	85%	25% for investment properties, 90% for others	
<b>Debt service to income (DSTI) or stressed DSTI</b>	40% unstressed; 50% stressed DSTI; 5% allowed up to 60%)		13-36% depending on income and interest rate				50% (with 10% allowed up to 60%)	60% (with 5% allowed up to 70%)				
<b>Loan-to-income (LTI)</b>												4.5 times (15% speed limit)

Sources: ESRB macroprudential database (sept 2023), EBA transparency exercise 2021

Notes: FTB stands for first-time buyers, BTL is buy-to-let.

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