



PORTUGAL

SELECTED ISSUES

June 2023

This paper on Portugal was prepared by a staff team of the International Monetary Fund as background documentation for the periodic consultation with the member country of Portugal. It is based on the information available at the time it was completed on June 1, 2023.

Copies of this report are available to the public from

International Monetary Fund • Publication Services

PO Box 92780 • Washington, D.C. 20090

Telephone: (202) 623-7430 • Fax: (202) 623-7201

E-mail: publications@imf.org Web: <http://www.imf.org>

Price: \$18.00 per printed copy

International Monetary Fund
Washington, D.C.



PORTUGAL

SELECTED ISSUES

June 1, 2023

Approved By
Rupa Duttagupta

Prepared By Kamil Dybczak, Ippei Shibata, Volodymyr Tulin,
and Laura Valderrama, with research support from Paul
Tershakovec.

CONTENTS

INFLATION IN PORTUGAL, RECENT TRENDS, DRIVERS, AND RISKS	3
A. Stylized Facts	3
B. Drivers of Inflation - The Phillips Curve	5
C. Inflation Projections	8
D. Is There a Risk of a Wage-Inflation Spiral?	10
E. Conclusions	11
References	12
ANNEXES	
I. Components of HICP Inflation in Portugal and EA	13
II. Inflation Differential between Portugal and EA across Components	15
III. HICP Inflation Weights in Portugal and EA	17
OPTIMAL FISCAL PATH CONSIDERATIONS	19
ANNEX	
I. Model Details	22
References	24
LABOR MARKET AND DIGITALIZATION IN PORTUGAL	25
FIGURES	
1. Aggregate Labor Market Dynamics	25
2. Employment Impact During COVID-19 by Worker and Job Types	26
3. Digital Employment in Portugal	27

4. COVID-19 Impact on Digital Employment Share _____	28
5. Share of Skilled Workers _____	29
References _____	30

HOUSEHOLD VULNERABILITIES, FINANCIAL STABILITY, AND THE ROLE OF POLICIES IN

PORTUGAL _____ 31

A. Introduction _____	31
B. Stress Testing Household Balance Sheets _____	32
C. Impact on Bank Capital _____	35
D. The Effect of Policies _____	35
E. Concluding Remarks and Policy Implications _____	37

FIGURES

1. Vulnerability Indicators in the Residential Real Estate Market _____	39
2. Rising Interest Rates are Hurting Affordability _____	40
3. Tenure Status and Borrowers’ Vulnerability _____	41
4. Vulnerable Households Are at Default Risk _____	42
5. Simulation Results – Household Vulnerability by Income and Tenure _____	43
6. Simulation Results – The Effect of Policies _____	44
References _____	45

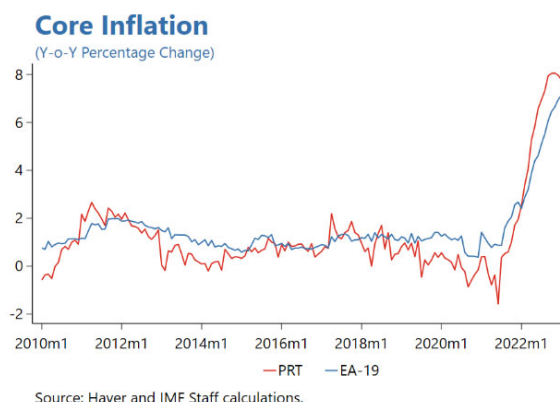
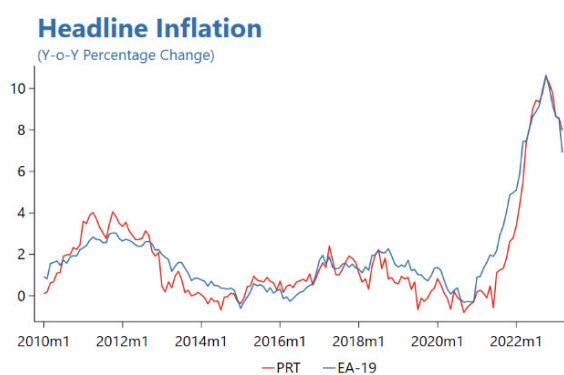
ANNEXES

I. Assessing House Price Overvaluation _____	46
II. Technical Aspects of the Model _____	47

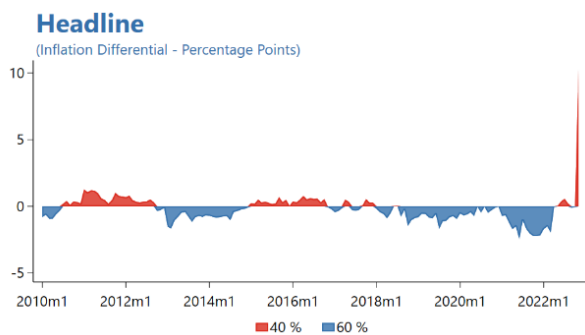
INFLATION IN PORTUGAL, RECENT TRENDS, DRIVERS, AND RISKS¹

A. Stylized Facts

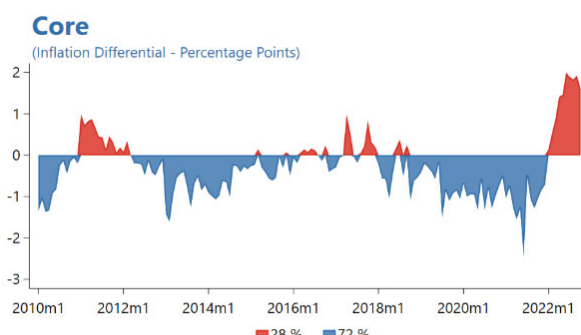
1. Before the recent energy crisis, inflation in Portugal was relatively low. For the most part of the last decade, headline and core inflation hovered below 2 percent. A disinflation trend was present in some of the components of the harmonized index of consumer prices (HICP, Annex I).²



2. While below average euro area (EA) levels, inflation has been strongly correlated with the rest of the EA. Since 2010, until the energy crisis, Portugal's headline and core inflation were below the EA level more than half the time, mostly driven by non-energy industrial goods such as clothing and footwear. These trends continued during the Covid pandemic, partly reflecting an almost 10 percent decline in tourism-related prices—e.g., transport, and hotels, cafés, and restaurants—and higher weight of these items in Portugal's HICP basket, resulting in Portugal's inflation falling further below the EA level (Annex II).



Note: Red area represents periods with inflation in Portugal exceeding inflation in EA.
Blue area represents periods with inflation in Portugal below inflation in EA.
Source: Haver and IMF Staff calculations.



Note: Red area represents periods with inflation in Portugal exceeding inflation in EA.
Blue area represents periods with inflation in Portugal below inflation in EA.
Source: Haver and IMF Staff calculations.

¹ Prepared by Kamil Dybczak and Ippei Shibata

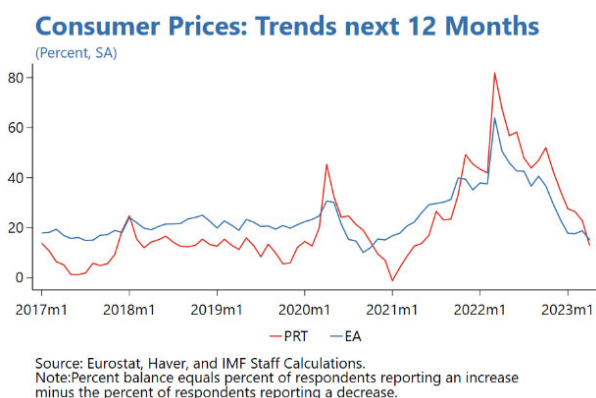
² We define core inflation as headline inflation excluding energy and unprocessed food prices.

3. However, the inflation differential with the EA cannot be fully explained by differences in weights of individual HICP items. The structure of Portugal's HICP basket is similar to those in other EA countries and the weights are broadly comparable across countries, despite some differences (Annex III). For example, the weight of food and non-alcoholic beverages in Portugal's HICP basket has been above the EA level since 2012 (at over 20 percent), while the weight of housing, water, electricity, and gas represents 10 percent in case of Portugal, it is 16 percent for the EA. Despite all these differences, assuming the average EA weights were imputed to Portugal, inflation in Portugal would be only about 0.2 pp above its actual level in 2021 and 2022.³

4. Inflation picked up slowly in 2022H1, reflecting delayed passthrough from international commodity prices to headline, but accelerated quickly in 2022H2. The passthrough from rising energy prices (between end 2021 to early 2022) to Portugal's prices was less pronounced than in average EA country (about 9 percent increase y/y in Portugal compared to about 47 percent for EA in March 2022). This mainly reflected policy measures, such as the reduction in network access tariffs and other policies (tax exemptions on fuel excises and VAT, and the Iberian price cap were announced in mid-2022 and came into effect in H2). Eventually, headline inflation accelerated and after peaking in October 2022 (10.6 percent y/y), it has been on a gradual downward path. In contrast, core inflation exceeded EA level in early 2022, and has hovered around 8 percent since September 2022, pointing to a stickier and more entrenched inflationary path.

5. Consumer price expectations have followed trends similar to those in headline inflation,⁴ picking up from early 2021, and eventually exceeding EA averages by end-2022. They started declining during 2022H2, keeping risks of second round effects from the initial commodity price shock well contained.

6. The rest of this note analyzes drivers of price dynamics through the lens of a Phillips curve estimation. The analysis provides a model-based forecast of headline and core inflation using assumptions from the January 2023 WEO and conducts sensitivity assessment, including the evaluation of risks of developing a sustained wage-price inflation spiral under current circumstances.



³ Based on calculations using main twelve HICP subgroups.

⁴ Inflation expectations are proxied by the difference between the share of households expecting prices to increase and households expecting prices to decrease over the next 12 months. Higher share of households expecting prices to increase indicates higher inflation expectations, and vice versa.

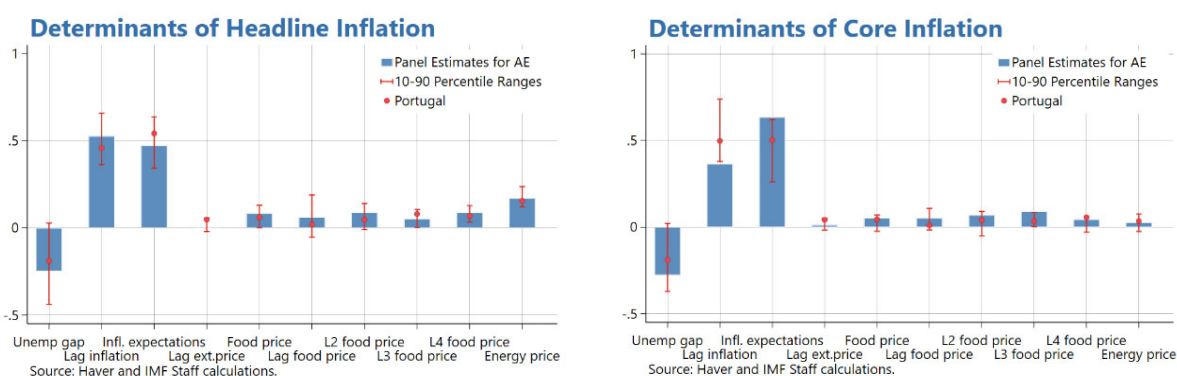
B. Drivers of Inflation - The Phillips Curve

7. We examine the drivers of the recent surge in inflation in Portugal and predict its likely path by estimating a standard Phillips curve equation which relates inflation to its past and future expected values, economic slack, and foreign price developments. After removing seasonality from the data, we estimated the following functional form:

$$\pi_t = \beta_1\pi_{t-1} + \beta_2\pi_t^e + \beta_3y_t + \beta_4Energy_t + \beta_5Food_t + \beta_6External_t + \varepsilon_t \quad (1)$$

where, π_t represents actual headline or core inflation in terms of q/q annualized growth rates. Expected inflation (π_t^e) and slack (y_t)—proxied by the unemployment gap⁵—represent domestic drivers of inflation. Energy ($Energy_t$) and food ($Food_t$) prices—expressed in domestic currency and weighed by the share in HICP basket—and other external price pressure ($External_t$)—proxied by a sum of weighted import producers' prices—represent mostly global price developments. Furthermore, equation (1) is expanded by lagged proxy of external price pressures and lagged food prices to allow for longer passthrough to domestic prices.⁶ The Phillips curve is estimated and examined over 2000: Q1 to 2022: Q4 for 27 advanced economies, including Portugal.⁷

8. Inflation in Portugal is determined by similar factors as in other AE countries. The relationship between slack and headline and core inflation is negative and significant for both Portugal and AE (and of similar magnitude). The role of both backward-Inflation and forward-looking expectations is also comparable to the AE countries, as is the passthrough of food prices and external price pressure (although the coefficients are smaller for both).



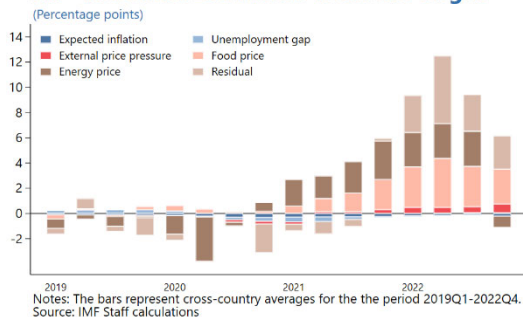
⁵ Unemployment gap estimates and forecast were provided by IMF country teams (January 2023 WEO). Other proxies of slack, including the output gap, were used as robustness checks, and did not materially change the thrust of the results.

⁶ The choice of the number of lags follows Baba et al (2023) reflecting the empirical regularities uncovered in the data.

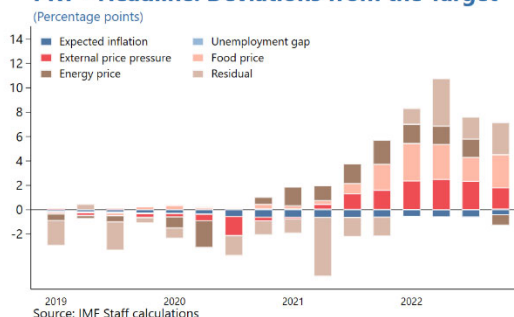
⁷ The analysis is conducted separately for both headline and core inflation for Portugal and a set of advanced European countries including: AUT, BEL, CHE, CYP, CZE, DEU, DNK, ESP, EST, FIN, FRA, GBR, GRC, IRL, ISL, ISR, ITA, LTU, LUX, LVA, MLT, NLD, NOR, PRT, SVK, SVN, and SWE.

9. While food and external price pressures contributed the most to Portugal’s inflation in 2022, a significant part of inflation cannot be explained by conventional inflation drivers. To account for the exceptional size of price changes in 2022, following Baba et al (2023), we quantify dynamic contributions of each driver of inflation from the Phillips curve. Explaining about ¾ of Portugal’s inflation, the model performs slightly better than in the case of the group of AE countries, in which case it explained at most 60 percent. The contribution of food and external prices pressures dominated inflation dynamics in Portugal in 2022, representing about 3.5 pp and 2.5 pp of headline inflation, respectively. While the contribution of food prices to overall inflation seems comparable in Portugal and other AEs, the contribution of external price pressures is significantly larger for Portugal, likely reflecting Portugal’s reliance on imported inputs as a small open economy. The contribution of energy prices in Portugal is estimated to be below the average of AE countries, reflecting domestic energy price policies and the lower weight of energy in Portugal’s HICP basket. The Phillips Curve accredits only a small impact to the unemployment gap on overall inflation in case of the AE and almost no impact for Portugal. Finally, despite inflation expectations started picking up since 2021, they remained anchored and have driven inflation in the opposite direction than the remaining factors since 2022H2.

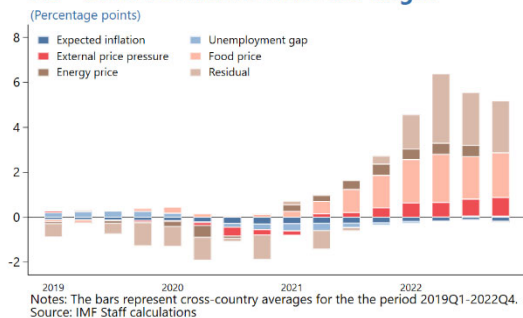
AE - Headline: Deviations from the Target



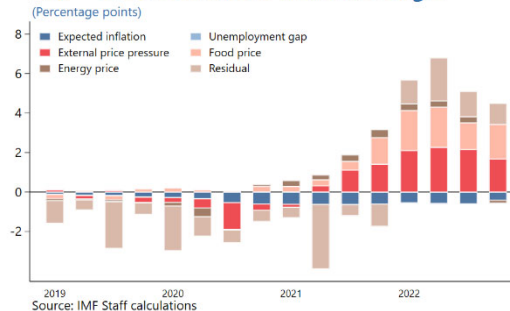
PRT - Headline: Deviations from the Target



AE - Core: Deviations from the Target

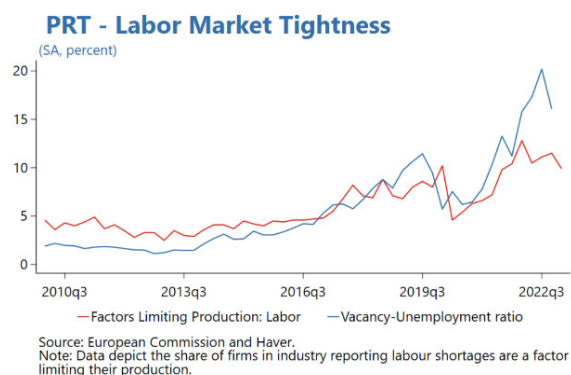


PRT - Core: Deviations from the Target



10. Several factors may account for the rise in unexplained inflation. The unexplained part of inflation increased in 2022, but more in AE countries than in Portugal. This could result from the inability of the model to capture possible non-linear impact of the exceptionally large commodity price changes and/or an alteration of the inflation process due to the pandemic and Russia’s war in Ukraine.⁸ In addition, the commonly used indicators used in our analysis may not fully capture inflation drivers or increase in spillovers between inflation components after the pandemic (see Quelhas and Serra (2023)). While these factors seemed to have affected all European countries in a similar way—as reflected in the consistently positive Phillips curve residuals in the last few quarters—country-specific factors could have also played a role:

- a. *Labor market tightness* – Despite the recent pick up, the unemployment rate in Portugal remains below pre-pandemic level and below the estimated equilibrium unemployment level, resulting in a negative unemployment gap. Moreover, labor market tightness in Portugal might have increased even more than indicated by the unemployment gap, which would be in line with a growing share of job vacancies per number of unemployed and growing share of firms reporting labor shortages as a factor limiting production.

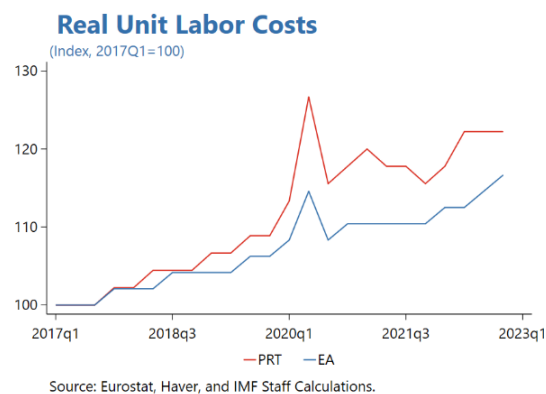
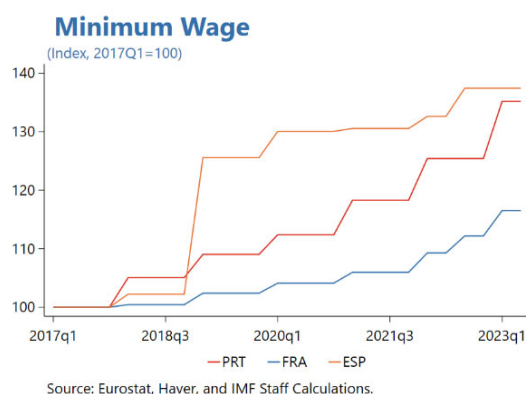
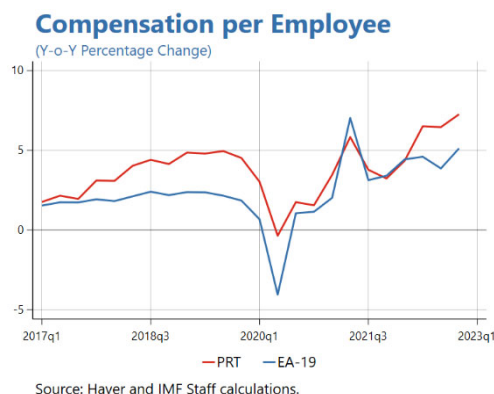


- b. *Administered prices* – To mitigate rising commodity prices and postpone passthrough to other prices, many European countries introduced specific tax and regulatory measures (such as price caps or freezes). Countries with a higher share of administered prices experienced slower changes in inflation in 2022, though often at sizable fiscal costs. In Portugal, it has been estimated that the Iberian cap protected Portuguese consumers by reducing electricity prices by about 16 percent (Schlecht et al (2022)).
- c. *Wage growth* – For most of the time since 2017, wages⁹ in Portugal have grown above the EA average, and typically above inflation and productivity levels. Wage growth receded during the pandemic, but less sharply than the EA. Conversely the post- energy crisis increase in nominal wages has outpaced EA average, in part reflecting developments in the minimum wage. Nonetheless, wage growth has been relatively contained so far, as nominal wages increased less than headline inflation (6.1 percent and 8.1 percent in 2022, respectively). As such, real wages rose in the first half of 2022 but fell in the second half of the year, as soaring inflation outpaced wage growth.

⁸ To test stability of estimated coefficients and explore possible structural shifts, Baba et al (2023) estimate Phillips curves on a rolling basis using panel data for 28 countries over 16 quarters. Their estimates point to possible shifts in the Phillips curve coefficients in the post-pandemic period, suggesting that inflation may have become more backward-looking.

⁹ Wages are approximated by the compensation of employees, which also includes non-wage costs besides wages.

- d. *Tourism* — a strong pickup in tourism-related prices (e.g. hotels and restaurants) in Portugal (13 percent vs 7 percent for EA average) contributed to higher inflation since the end of the pandemic.



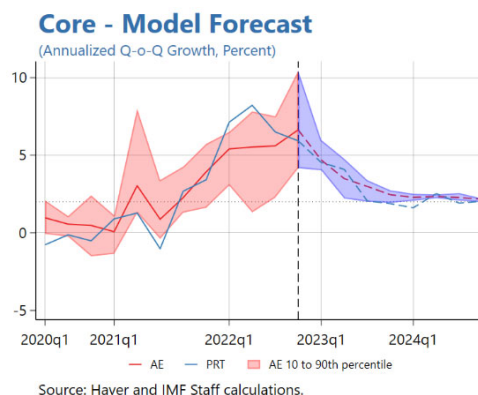
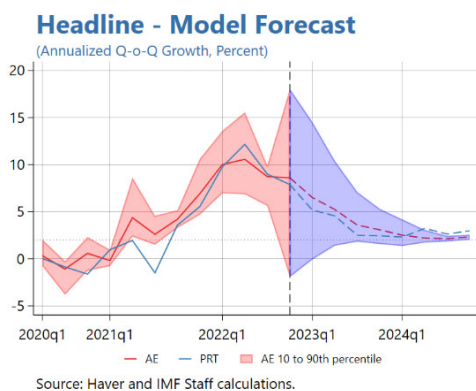
C. Inflation Projections

11. Inflation in Portugal and other AEs is projected to decline gradually in 2023 and 2024.

The empirical model based on the Phillips curve—drawing on the estimation from the previous section—would predict headline and core inflation in Portugal and the AE countries to decline to about 2 percent by the end of 2024, reflecting larger slack, lower energy prices and lower external price pressures. In the short run, falling commodity prices would mainly benefit headline inflation and impact core inflation only through the second-round effects with some lag. Staff’s baseline inflation forecast as of March 2023 also assumes both headline and core inflation to decline over the projection horizon, though in a more gradual manner—reaching the 2 percent target only after 2025—taking into account factors not reflected by the model, such as the minimum wage growth, and labor market tightness.¹⁰ Similarly, the inflation forecast by Banco de Portugal as of March 2023 assumes slower convergence of inflation towards its target than suggested by the empirical model, reaching 2 percent in the course of 2025.¹¹

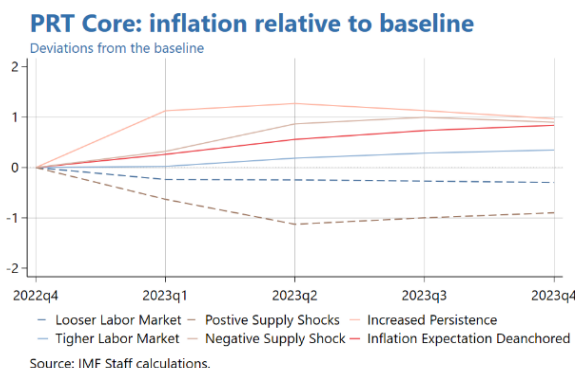
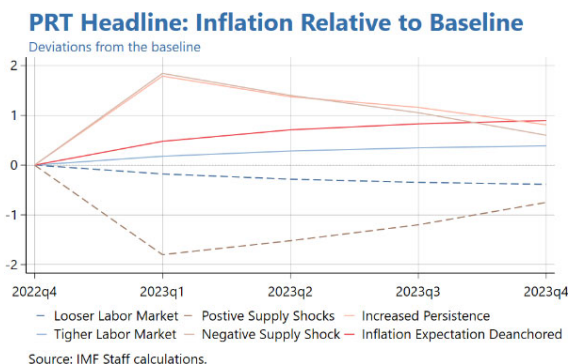
¹⁰ International Monetary Fund (2023) World Economic Outlook, March 2023.

¹¹ See Banco de Portugal (March 2023) “Projections for the Portuguese economy: 2023-25”



12. Despite the favorable outlook for commodity prices, the predicted inflation deceleration remains uncertain and could be slower than expected. Assuming the inflation forecast errors of 2022 will fade away over time, the model prediction could underestimate near-term inflation rates. In addition, persistent supply-side bottlenecks and elevated commodity prices together with continued inflation surprises may de-anchor inflation expectations or prompt workers to demand higher inflation-related wage compensation, which may potentially trigger wage-price feedback loops and make the overall inflation process more backward-looking and persistent. In addition, the decline in actual inflation rates could be slowed as measures initially dampening commodity price passthrough are gradually phased out. On the other hand, if global economy slows more than expected, it may translate into larger slack and further sliding commodity prices.

13. Simulations to analyze the effect of such potential risks suggest that inflation could increase further with shocks but would remain on a downward trend under most scenarios. Despite the uncertainties surrounding the model forecast, inflation is projected to continue a downward trend even under alternative scenarios. For instance, if the unemployment gap (slack) decreases/increases by 2 pp, headline and core inflation would increase/decrease by about 0.5 pp over next four quarters. Similarly, a temporary de-anchoring of inflation expectations (higher by 1 pp) would elevate headline and core temporarily by some 1 pp over the next 4 quarters. On the other hand, the impact of 20 percent higher/lower energy and food prices would increase inflation by 1 to 2 pp in case of headline and less than 1 percent in case of core inflation. The most challenging situation would be if the inflation formation process becomes more backward-looking. Increasing the coefficient on past inflation in the Phillips curve to 0.8 (level observed pre-1990), headline inflation would increase by about 2 pp and core by about 1 pp, but the effect would dampen over time as long as inflation expectations do not get impacted.

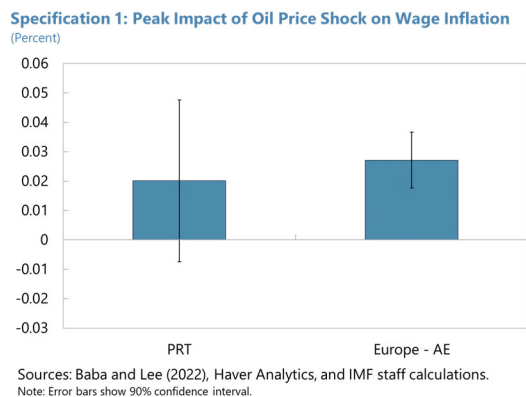


D. Is There a Risk of a Wage-Inflation Spiral?

14. Recent literature suggests that the risk of sustained wage-price spirals, while prevalent, is contained so far in advanced economies. Wage dynamics in advanced economies (AEs) appear to be mostly driven by labor market conditions and inflation expectations but not by the past inflation (Alvarez et al ,2022). In a historical analysis of 79 wage-price spiral episodes, the authors identify 29 episodes that are similar to the ongoing inflation episode. These episodes have the following characteristics: i) increasing year-on-year inflation, ii) positive nominal wage growth, iii) negative real wage growth, and iv) flat or falling unemployment. The authors find that these events did not tend to be followed by sustained wage-price spirals. In fact, inflation and nominal wage growth on average tended to stabilize in the quarters following the wage-price spiral, leaving real wage growth broadly unchanged. In another study, Baba and Lee (2022) estimate the passthrough of oil prices to nominal wages using a cross-country database of European countries since 1960s. The authors find that oil prices have typically not generated wage-price spirals. In response to a 10 percent oil price shock, wages tend to increase by 0.3 percent over three years and then stabilize. However, the passthrough of oil prices to wages is more than twice as high when underlying inflation already exceeds 4 percent, suggesting that there is a risk that the ongoing high inflation episode could increase the passthrough to wages more persistently.

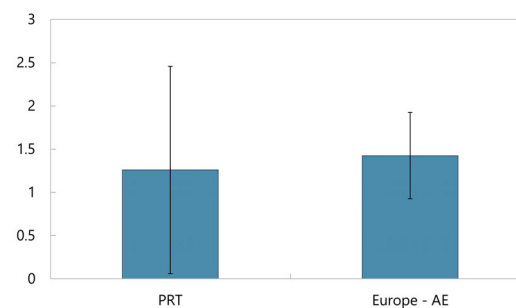
15. An empirical analysis of passthrough of inflation to wages suggests a relatively low risk of an extended wage-price spiral in Portugal.

Following Baba and Lee (2022), we estimate the passthrough from inflation to wage inflation for European advanced economies and Portugal between 2000 and 2019. We consider two specifications: in the first specification, we regress wage inflation on the past four quarters of oil price inflation while controlling for the past four quarters of wage inflation, quarterly changes in unemployment rates and nominal effective exchange rates. Oil price developments, which are globally determined, are assumed to be exogenous in the specification. In the second specification, we regress wage inflation on the past four quarters of inflation while using oil price inflation now as



an instrument for the past inflation, while keeping the rest of variables unchanged from the first specification. In the first specification, while statistically not significant, the estimated coefficients on the lagged inflation over the local projection horizon suggest that a 1 percent increase in oil price raises wage growth by 0.02 percentage points (peak value) in Portugal during the first year. For Advanced economies in Europe, the estimated coefficient is 0.03 percentage points during the first year. The impact of higher oil prices on wages dissipates fully over the year and at a somewhat faster pace in Portugal compared to other European Advanced economies. Considering that oil prices have risen by some 65 percent in 2021 and 40 percent in 2022, this would imply some 1.3 and 0.8 percentage point increase in the wage growth in 2021 and 2022 respectively, *ceteris paribus*. Based on the second specification, a 1 percentage point increase in inflation caused by the oil price shocks is associated with a peak wage growth of 1.2 percentage point for Portugal during the first year, and 1.4 percentage point increase for other advanced European economies during the same period. These findings provide a cautionary note on the overall assessment of a low risk of wage-price spiral in Portugal.¹²

Specificaiton 2: Peak Impact of Price Inflation on Wage Inflation (Percent)



Sources: Baba and Lee (2022), Haver Analytics, and IMF staff calculations.
Note: Error bars show 90% confidence interval

E. Conclusions

16. Overall, our analysis on inflation processes suggests that inflation in Portugal has likely peaked, but some upside risks should not be ignored. The analysis of inflation dynamics based on the estimated Phillips curve for Portugal suggests that beyond the predominant role of commodity prices, the recent surge in inflation has been driven by external price pressures but also to some extent by labor market tightness. Inflation is projected to ease in 2023 and 2024—driven by falling energy prices and in the context of anchored expectations. This downward path should be sustained under most alternative assumptions. However, inflation would increase if the inflationary process became backward looking or energy prices remained elevated for longer, or wage-inflation increases induced by pressures from energy prices become sustained. While these risks appear contained so far, the unprecedented nature of recent inflation dynamics and unusual forecast uncertainty points to the need for policies to remain focused on inflation reduction.

¹² The results of the econometric exercise do not consider institutional factors impacting wage formation in individual countries. For example, wages in Portugal are set under sectoral collective agreements, which are (in most cases) negotiated during the first half the year. This may explain the only moderate passthrough of inflation to wages observed in 2022, as many collective wage contracts had already been set before inflation started picking up in 2022H2. Conversely, collective wage contracts in 2023 may reflect not only inflation expectations for the rest of 2023 but also real wage losses observed in 2022.

References

Alvarez J., J. Bluedorn, N. Hansen, Y. Huang, E. Pugacheva, and A. Sollaci (2022), “Wage-price spirals: What is the historical evidence?” IMF Working Paper 22/221.

Ari A., N. Arregui, S. Black, O. Celasun, D. M. Iakova, A. Mineshima, V. Mylonas, I. W.H. Parry, I. Teodoru, and K. Zhunussova (2022) “Surging Energy Prices in Europe in the Aftermath of the War: How to Support the Vulnerable and Speed up the Transition Away from Fossil Fuels” IMF Working Paper 22/152.

Baba, C and J Lee (2022), “Second-round effects of oil price shocks—Implications for Europe’s inflation outlook”, IMF Working Paper 22/173.

Baba, C., R. A. Duval, T. Lan, and P. Topalova (2023), “The 2020-2022 Inflation Surge Across Europe: A Phillips-Curve-Based Dissection” IMF Working Paper 2023/030.

Banco de Portugal (2023), “Economic Bulletin”, March 2023.

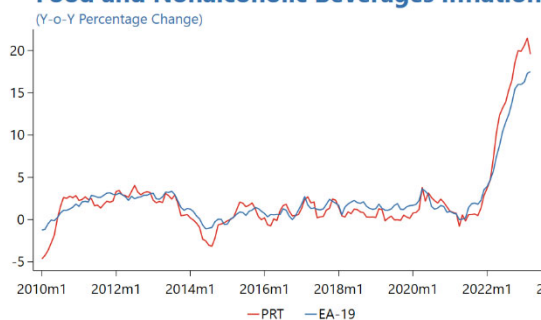
International Monetary Fund (2023) World Economic Outlook.

Quelhas, J and S Serra (2023), “The inflation process in Portugal: the role of price spillovers”, Banco de Portugal Economic Studies, Vol. IX, No. 2, pp. 29-48.

Schlecht I., J. Mühlenpfordt, L. Hirth, C. Maurer, and A. Eicke (2022), “The Iberian electricity market intervention does not work for Europe”, VoxEU.org, 29 August 2022.

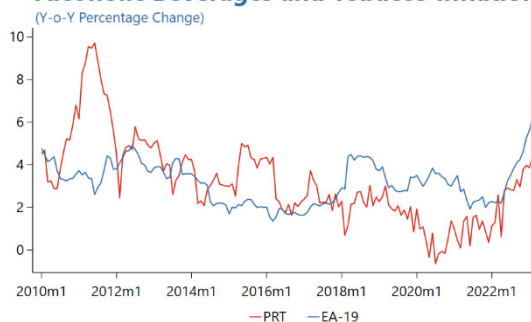
Annex I. Components of HICP Inflation in Portugal and EA

Food and Nonalcoholic Beverages Inflation



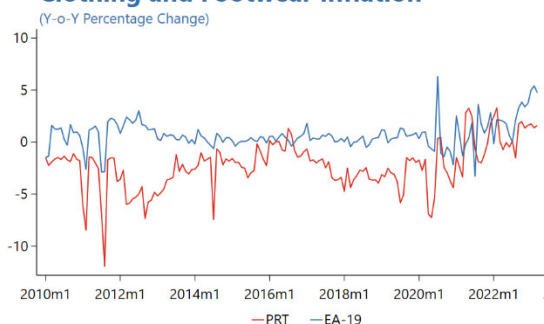
Source: Haver and IMF Staff calculations.

Alcoholic Beverages and Tobacco Inflation



Source: Haver and IMF Staff calculations.

Clothing and Footwear Inflation



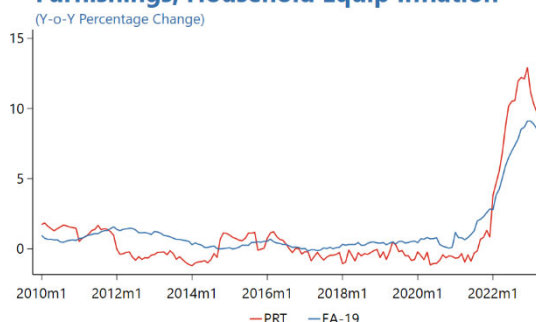
Source: Haver and IMF Staff calculations.

Housing/Water/Elect/Gas Inflation



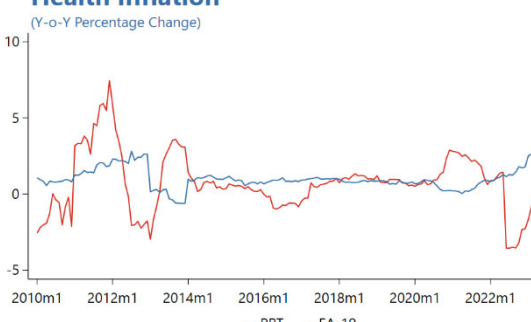
Source: Haver and IMF Staff calculations.

Furnishings, Household Equip Inflation



Source: Haver and IMF Staff calculations.

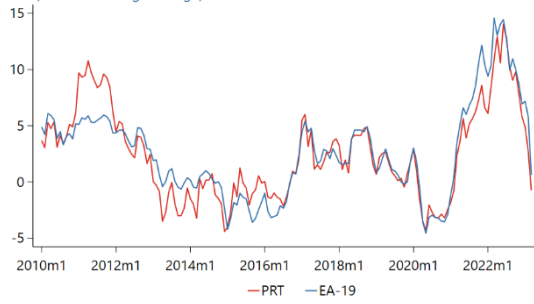
Health Inflation



Source: Haver and IMF Staff calculations.

Transport Inflation

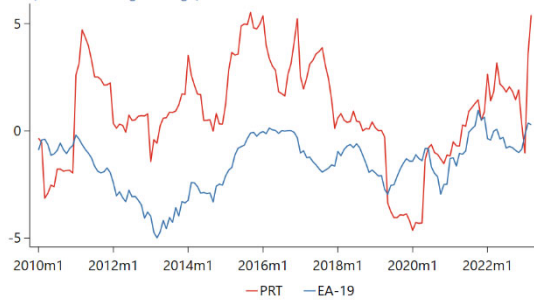
(Y-o-Y Percentage Change)



Source: Haver and IMF Staff calculations.

Communications Inflation

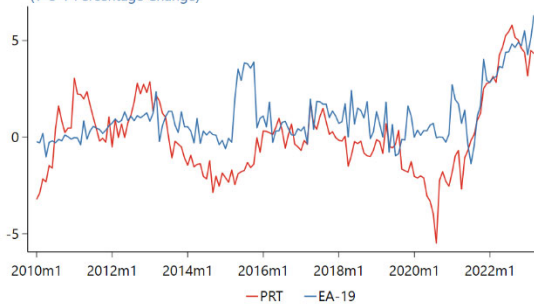
(Y-o-Y Percentage Change)



Source: Haver and IMF Staff calculations.

Recreation and Culture Inflation

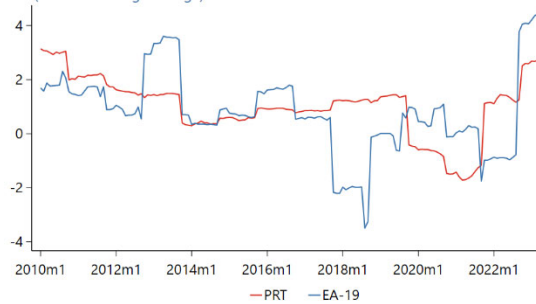
(Y-o-Y Percentage Change)



Source: Haver and IMF Staff calculations.

Education Inflation

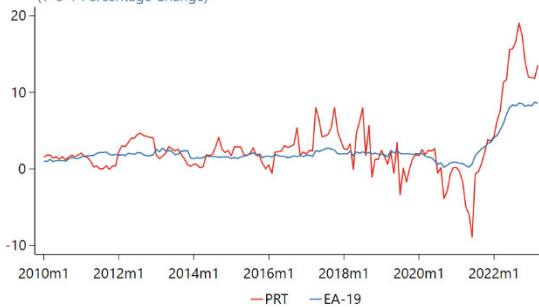
(Y-o-Y Percentage Change)



Source: Haver and IMF Staff calculations.

Hotels, Cafes and Restaurants Inflation

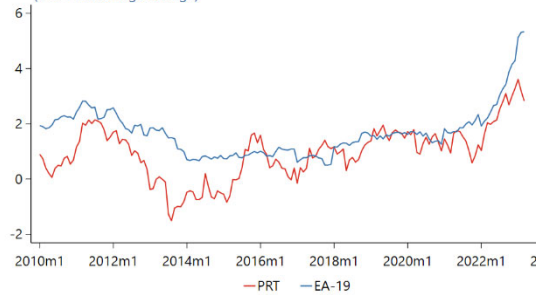
(Y-o-Y Percentage Change)



Source: Haver and IMF Staff calculations.

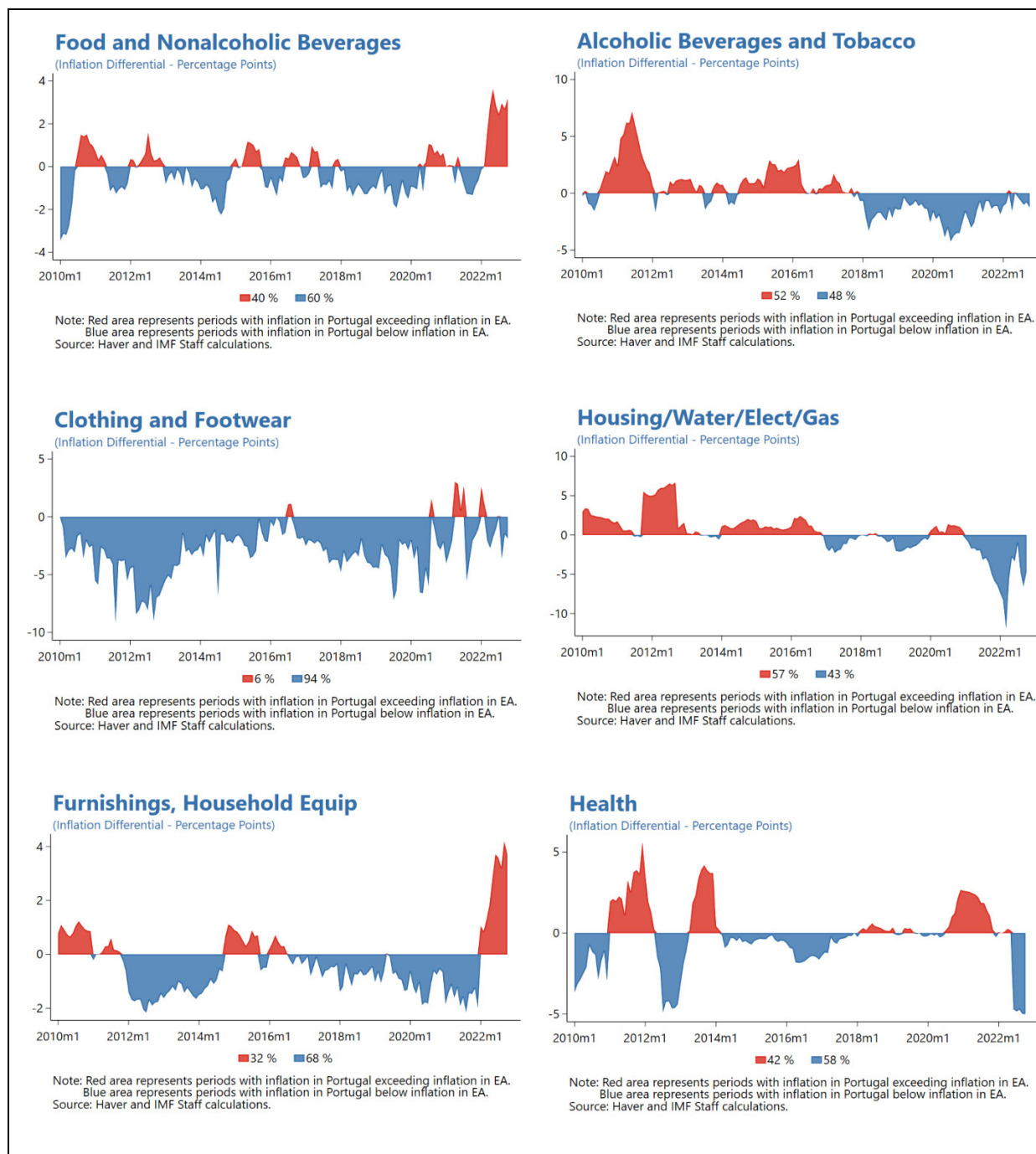
Miscellaneous Goods and Services Inflation

(Y-o-Y Percentage Change)



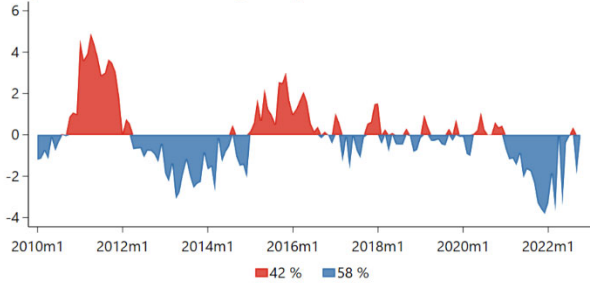
Source: Haver and IMF Staff calculations.

Annex II. Inflation Differential between Portugal and EA across Components



Transport

(Inflation Differential - Percentage Points)

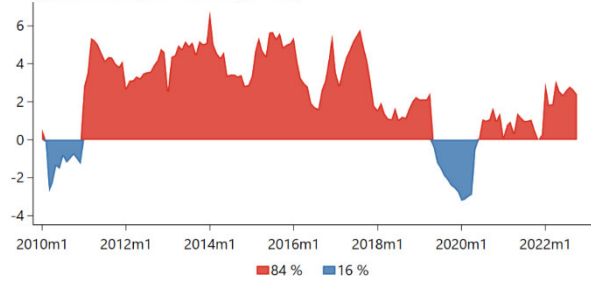


42 % 58 %

Note: Red area represents periods with inflation in Portugal exceeding inflation in EA.
Blue area represents periods with inflation in Portugal below inflation in EA.
Source: Haver and IMF Staff calculations.

Communications

(Inflation Differential - Percentage Points)

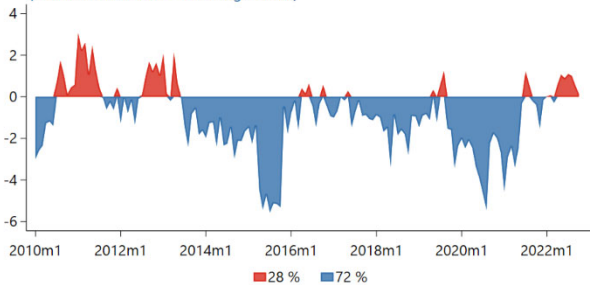


84 % 16 %

Note: Red area represents periods with inflation in Portugal exceeding inflation in EA.
Blue area represents periods with inflation in Portugal below inflation in EA.
Source: Haver and IMF Staff calculations.

Recreation and Culture

(Inflation Differential - Percentage Points)

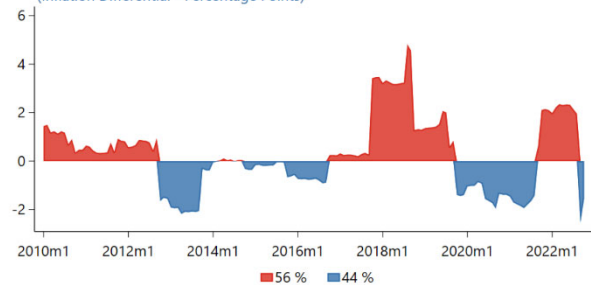


28 % 72 %

Note: Red area represents periods with inflation in Portugal exceeding inflation in EA.
Blue area represents periods with inflation in Portugal below inflation in EA.
Source: Haver and IMF Staff calculations.

Education

(Inflation Differential - Percentage Points)

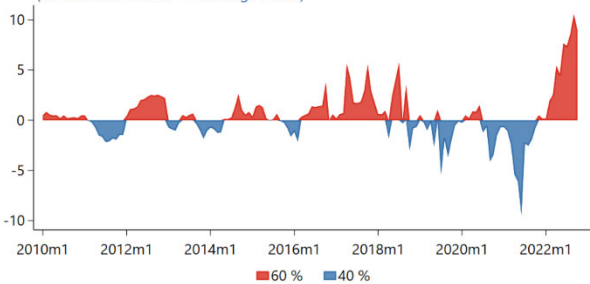


56 % 44 %

Note: Red area represents periods with inflation in Portugal exceeding inflation in EA.
Blue area represents periods with inflation in Portugal below inflation in EA.
Source: Haver and IMF Staff calculations.

Hotels, Cafes and Restaurants

(Inflation Differential - Percentage Points)

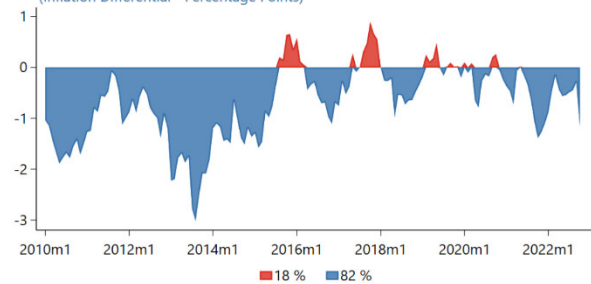


60 % 40 %

Note: Red area represents periods with inflation in Portugal exceeding inflation in EA.
Blue area represents periods with inflation in Portugal below inflation in EA.
Source: Haver and IMF Staff calculations.

Miscellaneous Goods and Services

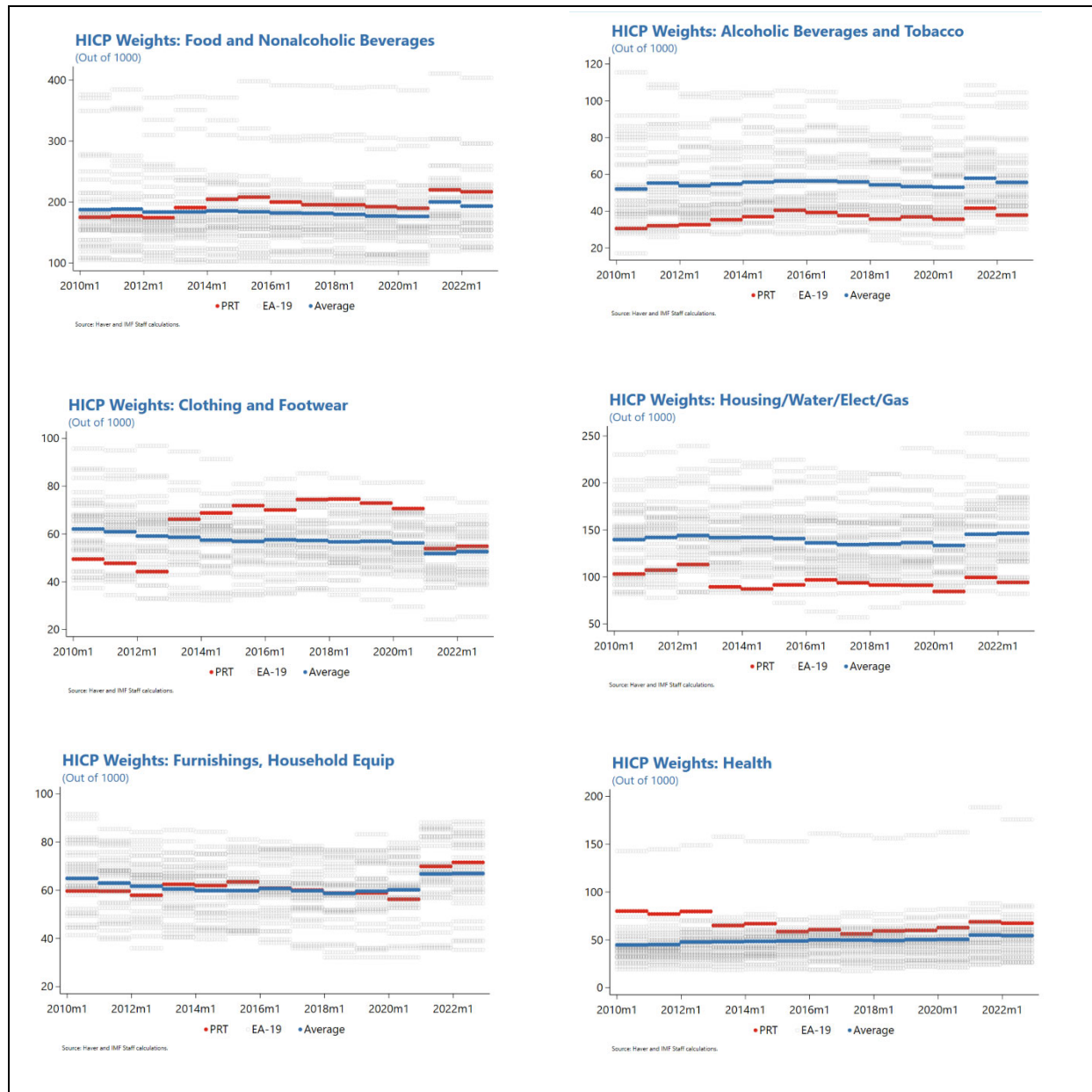
(Inflation Differential - Percentage Points)

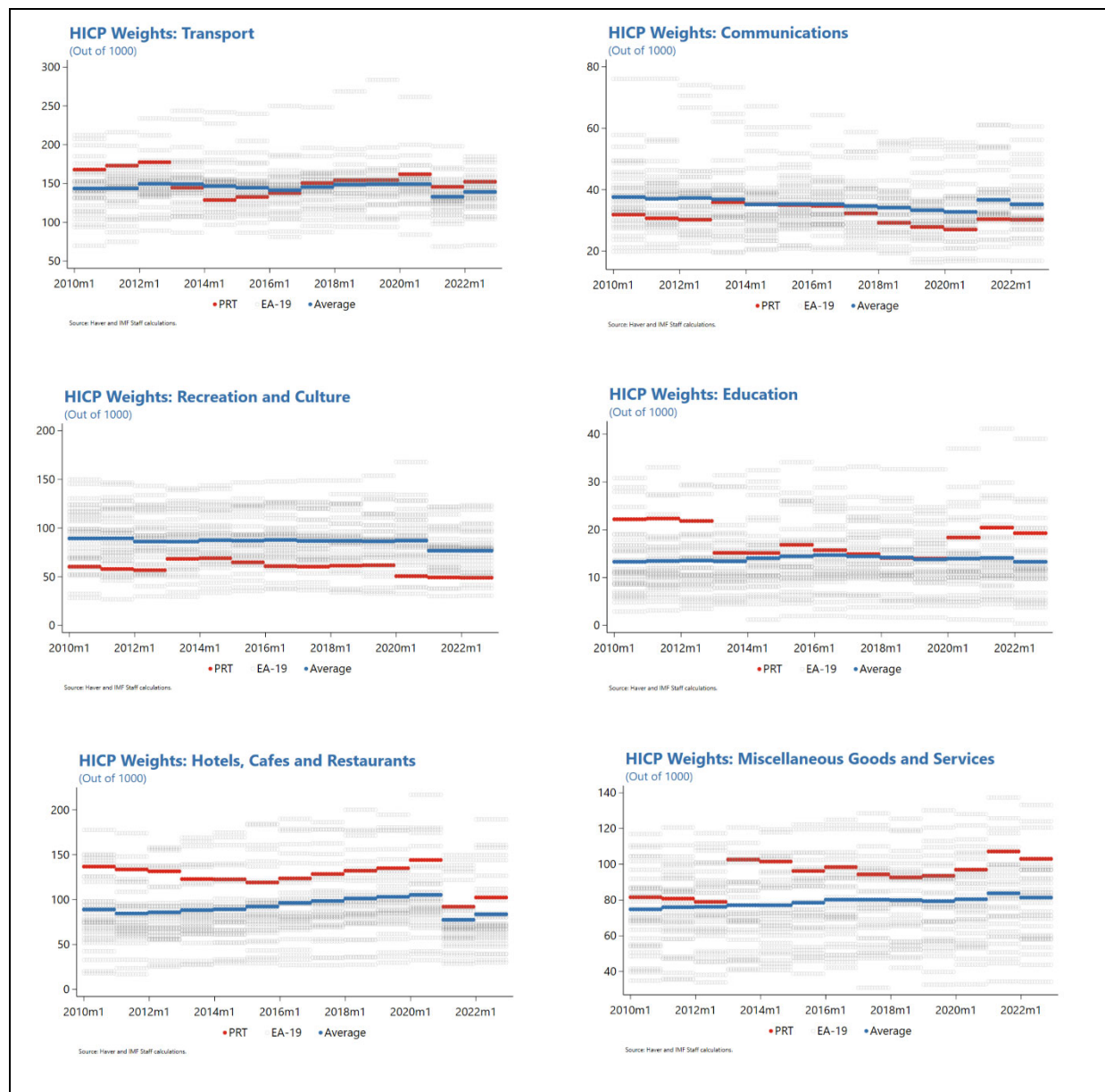


18 % 82 %

Note: Red area represents periods with inflation in Portugal exceeding inflation in EA.
Blue area represents periods with inflation in Portugal below inflation in EA.
Source: Haver and IMF Staff calculations.

Annex III. HICP Inflation Weights in Portugal and EA

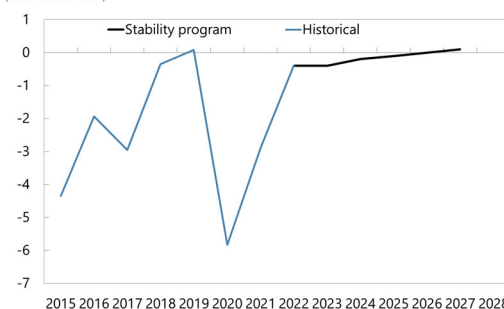




OPTIMAL FISCAL PATH CONSIDERATIONS¹

1. This note analyzes the considerations for Portugal’s fiscal policy and public debt to stay on a sustainable path under alternative economic conditions. Despite a nearly 20 percentage points of GDP spike in 2020 at the onset of Covid-19 shock, the public debt-to-GDP fell below its pre-pandemic level by end-2022. The authorities’ 2023 Stability Program forecasts the overall deficit to remain low and the public debt to stay on a downward track. However, the still-high debt ratio implies that a sustained effort will be needed for continued ambitious debt reduction over the medium term. This note uses an analytical model—the Buffer Stock model (see Fournier, 2019) to shed light on how the optimal medium-term path for structural consolidation may be affected under alternative scenarios.

Overall Balance: Stability Program Forecast
(Percent of GDP)

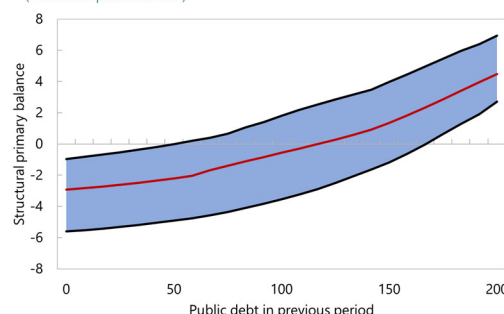


2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028

Sources: 2023 Portugal Stability Program Report

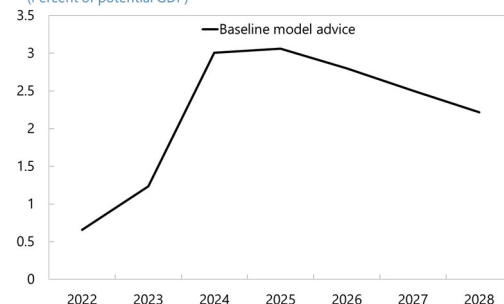
2. A structural stochastic model of the general government is used to help formulate an appropriate medium-term fiscal path.² The model presents an optimizing framework whereby the government aims to strike a balance between the objectives of economic stabilization and debt sustainability (see adjacent figure, top panel). The model features a forward-looking fiscal policy setting to smooth cyclical shocks and reduce scarring effects, subject to the initial public debt level, fiscal policy stabilization function, market’s risk appetite and the distribution of future shocks that may hit the economy (Annex I). When debt is low, the government’s best response to adverse economic shocks is to smooth the shocks with countercyclical fiscal policy. However, as the debt level increases, so do borrowing costs (interest rates). As debt gets close to its limit regarded by the model as the point where the government may lose market access³, the government’s optimal policy is to respond less to the negative shocks and instead preserve the fiscal room.

Fiscal Reaction Function to Debt
(Percent of potential GDP)



Source: IMF staff calculations.

Structural Primary Balance
(Percent of potential GDP)



Source: IMF staff calculations.

¹ Prepared by Ippei Shibata and Volodymyr Tulin.

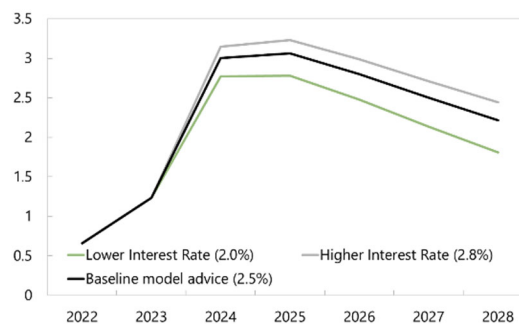
² The model, described in [Fournier \(2019\)](#) and [Fournier and Lieberknecht \(2020\)](#), has been featured in recent staff reports for Article IV consultations for France, Israel, Lithuania, Spain. See Annex of the papers for additional model details and calibrations.

³ There is positive probability of losing market access.

3. Relative to the baseline path, the model illustrates the sensitivity of the recommended fiscal consolidation to interest rate, potential growth, and the market sensitivity to debt. We start with the model’s baseline path, calibrated to the Portuguese economy under the 2023 Article IV Staff Report forecast. Under these assumptions, the model recommends an increase in the structural primary balance averaging at around 2.1 percentage points of potential GDP relative to 2022 during 2024-2028, implying the average level of 2.7 percent of potential GDP. The front-loaded fiscal consolidation path reflects the higher initial debt level. Also, the model recommends a more aggressive consolidation path under:

- Higher long-run interest rate:** A key parameter to pin down the steady-state of the model is the long-run real effective interest rate. The baseline parametrization assumes that the real effective interest rate will eventually converge to 2.5 percent, a level comparable to the average over the two decades since euro adoption. To assess how the model recommendation would vary under different interest rate scenarios, alternative calibrations for the long-term real interest rate were considered, ranging from 2.8 percent observed over 2002-19 to the low levels of about 2.0 percent observed over the same period but removing sovereign crisis and Covid-19 periods. Higher long-term rates than in the baseline would call for the optimal fiscal path to entail a faster fiscal adjustment to offset the higher debt-serving costs and debt level. Specifically, for a 30-basis point increase in long run real interest rates, the recommended additional annual increase in the structural primary balance (relative to the baseline) would be some 0.2 percentage points higher than the baseline. Conversely, if the long-run interest rate is lower, the recommended fiscal path entails a lower structural primary balance.

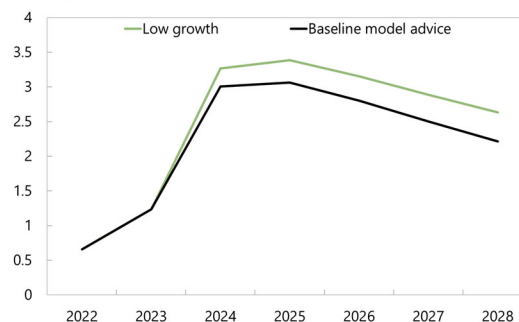
Structural Primary Balance: Long-run Interest Rate Sensitivity
(Percent of potential GDP)



Source: IMF staff calculations.

- Lower medium-term growth:** Lower medium-term growth would necessitate a significantly stronger adjustment to offset weaker debt dynamics. The baseline medium-term growth path assumes a boost to potential growth from the RRP investment and its structural reforms. An alternative scenario with a long-term potential growth rate of $\frac{3}{4}$ percent, which equals the average growth recorded during 2002-19, would necessitate an additional 0.3 p.p. average increase in structural primary balance starting in 2024 over the medium-

Structural Primary Balance: Potential Growth Sensitivity
(Percent of potential GDP)



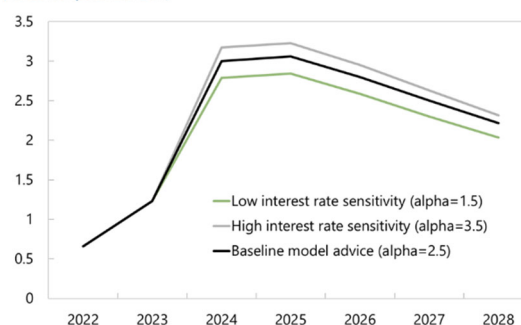
Source: IMF staff calculations.

term relative to the baseline model. Additional risks stem from possible fiscal cliff effects at the end of the NGEU period, which could reduce long term growth further.⁴

- **Market sensitivity to debt:** Among debt sensitivity parameters to measure the market’s risk appetite, interest rate sensitivity is important. Higher sensitivity of interest rate to the debt level necessitates stronger consolidation over the medium-term.

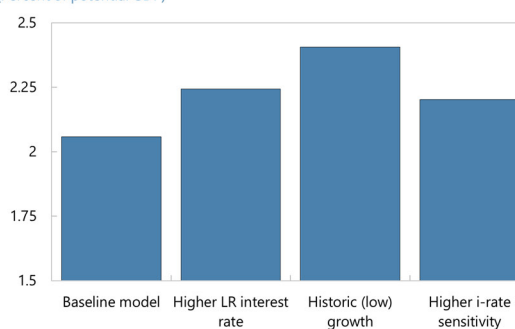
4. In conclusion, the buffer-stock model suggests that the appropriate fiscal consolidation path for Portugal will critically depend on medium-term output dynamics and market’s risk appetite. While debt is forecast to decline under the model’s baseline scenario, in line with staff’s baseline projections, the model calls for more ambitious consolidation. The recommended fiscal effort is higher under alternative adverse scenarios.

Structural Primary Balance: Interest Rate Sensitivity to Debt Level
(Percent of potential GDP)



Source: IMF staff calculations.

Recommended Structural Primary Balance, Average for 2024-28
(Percent of potential GDP)



Source: IMF staff calculations.

⁴ Over the last decade public investment has fallen from high levels to below EU peers. We do not explicitly consider a large fiscal impact from NGEU grants. Given the focus on balancing country-level fiscal sustainability and stabilization policy setting, the model abstracts from the composition of public finances, an implicit near-term stimulus impact of NGEU grants, or EU-level fiscal stabilization considerations. Hence our approach is based on the scenario analysis with different long-term assumptions regarding the growth potential.

Annex I. Model Details

Key Model Highlights

- **Two-way feedback between fiscal policy and output.** A tightening of the structural primary balance negatively affects output (fiscal multiplier), in which the multiplier is cycle dependent (larger during recessions). Output also impacts the fiscal outcome (automatic stabilizers).
- **Macro stabilizing role of fiscal policy is constrained by high debt.** Countercyclical fiscal policy dampens recessions and limits overheating during upswings. However, the interest rate rises with debt, and at high levels, the government risks losing market access. As a result, the feasible fiscal response to a negative output shock will be much smaller if access to credit markets is affected. Therefore, building fiscal buffers by lowering debt is appropriate to reduce the risk of rising sovereign yields and market cutoff.
- **Hysteresis.** Recessions create a persistent effect on potential output owing to loss of physical and human capital and lower investment during severe economic downturns.

Calibration

- **The welfare function** parameters are standard in the literature. The discount factor is on the conservative side. Interaction with GDP growth implies a cumulative discount factor of 0.975. With the weight on labor set to one, the instantaneous utility peaks when the output gap is null.
- **Fiscal parameters** are country specific. The average fiscal multiplier of 0.5. Automatic stabilizers is set to 0.4. With fiscal multiplier sensitivity (m_2) of 3, a negative output gap of five percent lowers the fiscal multiplier by 0.15. The adjustment cost parameter (χ) of 3, is a moderate value in terms of allowing a sizable adjustment should the previous primary balance was far from appropriate.
- **The risk premium** is the linear function of government debt (α) and implies an increase of 2.5 bps per 1 p.p. increase in debt to GDP ratio. The value is in line with literature (Henao-Arbelaez and Sobrinho, 2017), though above the Fournier' parameter value of 1.5. For the risk of losing market access, the values imply the 50 percent probability of losing market access at debt-to-GDP ratio of 150 percent, level at which fiscal stress has been more frequent over the last twenty years among the advanced countries.
- **Economic parameters** entail a combination of country-specific and literature-based calibration. Potential growth at 1.3 percent reflects a scenario of above-historic growth (2001-19

average 0.75%), and about ½ p.p. below the medium-term potential growth of 1.9 percent under the baseline WEO. Real interest rate of 2.5 percent is based on the 20-year average 10-year bond yield (4.25 percent) and inflation (1.75 percent). Population growth is based on UN population projection (15-20 years ahead). Shock parameters (size and persistence) are estimated using 20-year averages on the output gap and primary balances. Lastly, the hysteresis parameters are calibrated such that the long-run effect is in the middle of the range from the literature (Blanchard and Summers, 1987; DeLong and Summers, 2012; Ball, 2014) with long-term effects in the middle of the range of around 0-20 percent.

Parameter Calibrations	
Welfare function	
Discount factor, β	0.99
Risk aversion, σ	2
Labor elasticity, η	1/0.3
Weight of labor, ξ	1
Fiscal parameters	
Fiscal multiplier, m_1	0.5
Fiscal multiplier sensitivity to shocks, m_2	3
Automatic stabilizers (primary balance semi-elasticity to the gap)	0.4
Adjustment cost, χ	3
Interest rate and debt parameters	
Effect of debt level on the risk premium, α	2.5%
Effect of debt change on the risk premium, α_2	0.5%
Debt level at which the risk to lose market access is 50%, d	150%
Debt limit accuracy, d_1	3
Effect of debt change on the risk to lose market access, d_2	1
Effect of debt change on the risk to lose market access, d_3	0
Economy parameters	
Potential growth, long-term	1.3%
Population growth	-0.4%
Real interest rate	2.5%
Shock persistence	0.77
Shock size	0.032
Hysteresis	10%
Hysteresis threshold	-1%
Sources: Fiscal Buffer Stock Model in Fournier (2019) and Fournier and Lieberknecht (2020) and IMF staff calculations.	

References

Ball, L. 2014, "Long-Term Damages From The Great Recession In OECD Countries," *NBER Working Paper 20185*.

Blanchard, O., J. and L. H. Summers, 1987, "Hysteresis in Unemployment," *European Economic Review 31*: 288–295.

Delong, J. B. and L. H. Summers, 2012, "Fiscal Policy in a Depressed Economy," *Brookings Papers on Economic Activity*.

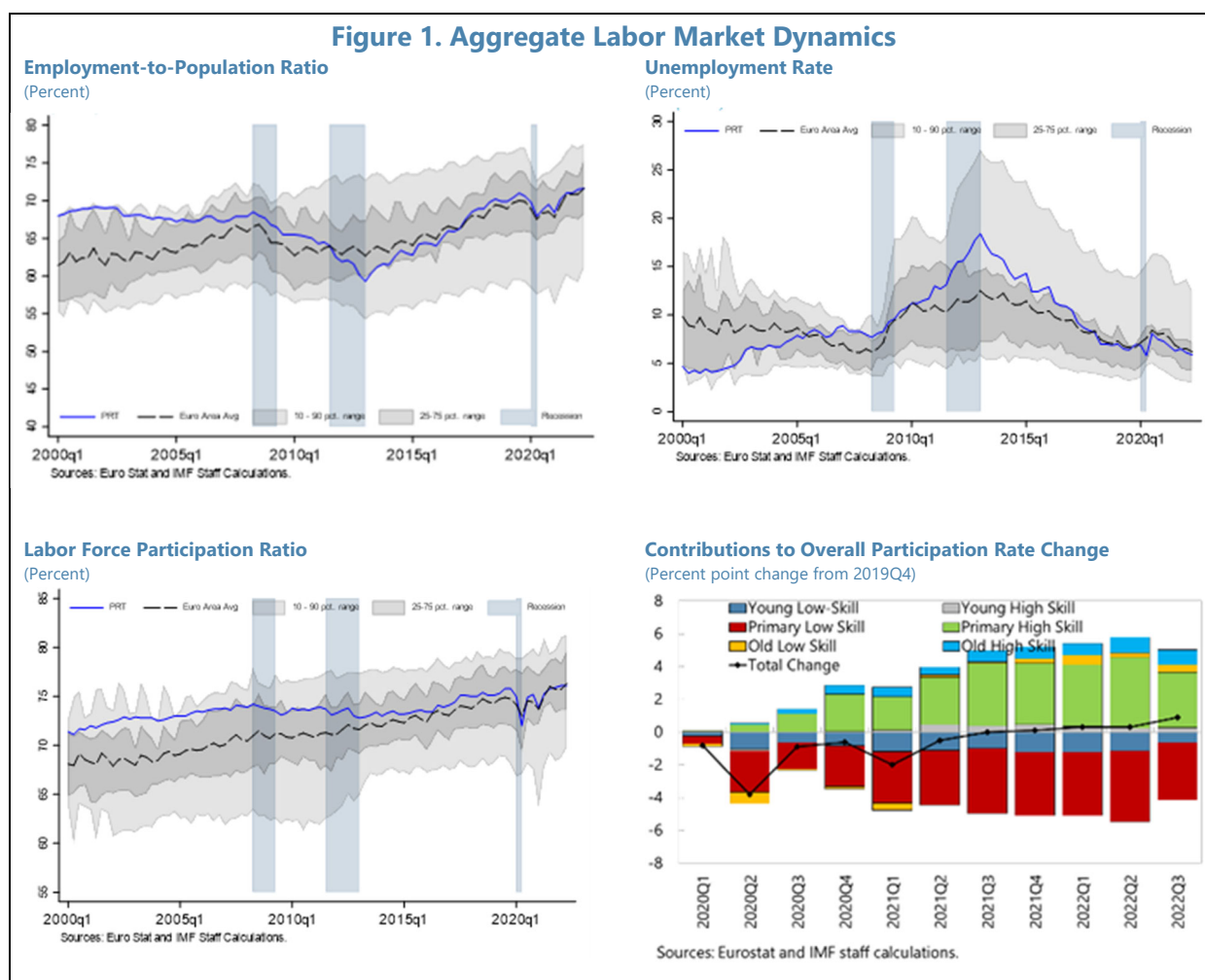
Fournier, Jean-Marc, 2019. "A Buffer-Stock Model for the Government: Balancing Stability and Sustainability" *IMF Working Paper 2019/159*.

Fournier Jean-Marc, and Philipp Lieberknecht 2020. "A Model-based Fiscal Taylor Rule and a Toolkit to Assess the Fiscal Stance" *IMF Working Paper 2020/33*.

Henao-Arbelaez, C. and N. Sobrinho, 2017, "Government Financial Assets and Debt Sustainability," *IMF Working Paper 17/173, International Monetary Fund, Washington, DC*.

LABOR MARKET AND DIGITALIZATION IN PORTUGAL¹

1. The Portuguese labor market was hit during Covid-19, but to a lesser degree than previous recessions. As shown in the Figure 1 top row panels, aggregate employment rate (unemployment rate) declined (increased) less during the Covid-19 recession than in previous recessions. This pattern is broadly in line with the median euro area (EA) country and smaller than the US, in large part due to job retention scheme extensively deployed in most European countries (Ando et al, 2022, Duval et al, 2022, Pizzinelli and Shibata 2023, and Shibata 2021). The labor force participation rate, however, dropped more sharply during Covid-19 than in the previous two recessions, in part reflecting the unique nature of health-related shocks, largely driven by low-skilled and young workers² (Figure 1, bottom row panels).



¹ Prepared by Ippei Shibata.

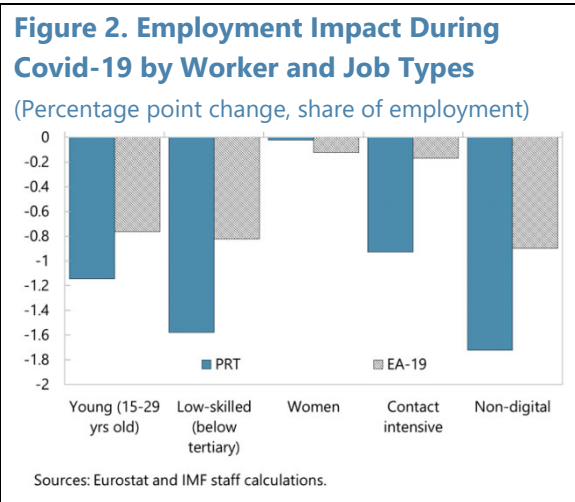
² Some of the decline in labor force participation could reflect statistical (measurement error) issues. Specifically, during Covid-19, individuals who should be classified as unemployed may have been reclassified as inactive (out of the labor force). Young is defined as those with age between 15-29 years old. Low-skilled workers are workers with below tertiary education.

2. The aggregate dynamics mask important distributional impacts of the Covid-19 recession on the labor market.

Young, and low-skilled employment in contact-intensive and non-digital jobs experienced a sharper decline compared to counterpart groups (Figure 2).³ The

adjoining figure plots the change in the employment share of different worker/job groups between 2020Q1 and 2020Q2 at the onset of the Covid-19 pandemic. The share of young workers (15-29 years old) employment in total employment (among 15-64 years old) experienced a decline of around 1.1 percentage points. Low-skilled workers (below tertiary education) employment also experienced a drop in their share in total employment of around 1.6 percentage points. Moreover, contact-

intensive employment (in sectors requiring workers to interact with customers in the production process, such as in hotels and restaurants) was greatly affected, experiencing a decline of around 1 percentage point in its share of total employment.⁴ Conversely, Portugal did not experience any significant differences in changes to male versus female employment levels, unlike some other advanced economies that saw female employment levels being disproportionately hit (Bluedorn et al, 2023).



3. Among the heterogenous labor market impacts in Portugal, non-digital employment, in particular, experienced the sharpest drop in its share of total employment, with around 1.7 percentage points decline in its share of total employment.

To investigate further, we follow Muro et al. (2017) to better understand the effect of Covid-19 on digital versus non-digital employment using O*NET.⁵ Specifically, we calculate distal scores—the weighted averages of scores on (i) knowledge and (ii) work activity related to computers—for each occupation and classify occupations above the median score as digital.⁶ Based on this method, ISCO08 occupations defined as digital are (i) managers, (ii) professionals, (iii) technicians and associate professionals, and (iv) clerical support workers, while those that are non-digital are (i) service and sales workers, (ii) skilled

³ Industries that are defined to be contact-intensive are (i) Construction, (ii) Trade, (iii) Transport, (iv) Accommodation and Food, (v) Education, (vi) Health, (vii) Arts (viii) Other Services Digital occupations are defined in more detail in the following paragraph.

⁴ Note that there is an overlap between young and low-skilled workers and contact-intensive employment, in particular for tourism related activities. Also, some sectors did not see a decline in employment (for example, health).

⁵ O*NET is online database developed by the United States Department of Labor and contains comprehensive information on required skills and job duties on hundreds of occupations. See <https://www.dol.gov/agencies/eta/onet> for more details.

⁶ Specifically, we calculate the weighted average of knowledge and work activity related to computers. See Soh et al (2022) for detail. The 50th percentile level is 53. These measures were mapped to ISCO08 codes to obtain digital scores for 9 categories of ISCO08 one-digit occupation codes.

agricultural, forestry and fishery workers, (iii) craft and related trade workers, (iv) plant and machine operators and assemblers, and (v) elementary occupations.⁷

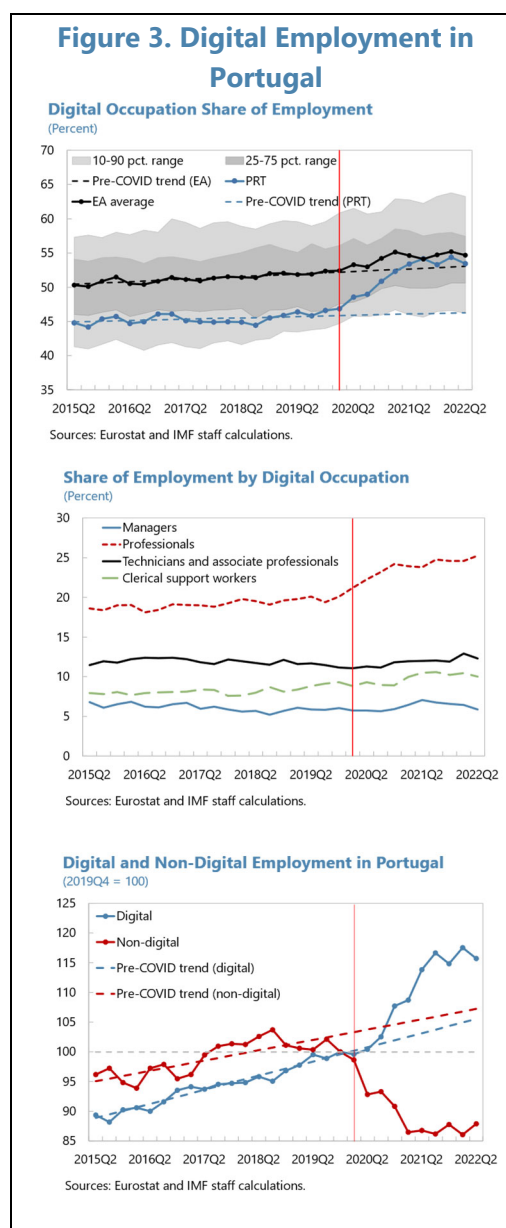
4. On the basis of this measure of digital employment, we find that the share of jobs in digital occupations experienced a sharper increase in Portugal during Covid-19 compared to the rest of EA, and at the cost of a falling share of non-digital jobs.

Figure 3, top panel plots the evolution of employment share of digital occupation for Portugal and EA countries. While the EA experienced a *small* increase in digital employment share during the Covid-19, Portugal experienced a much *sharper* increase in digital employment than in the Euro Area, driven by an increase in the share of the “professional” occupation (Figure 3, middle panel). Looking at levels for Portugal, digital employment actually increased during Covid-19, while non-digital employment declined (Figure 3, bottom panel).

5. We next investigate the causal impact of Covid-19 on the digital employment, using a regression approach for 29 European countries and the US economy. Following Soh et al. (2022), the following regression specification for the 29 European countries was implemented.⁸

$$Y_{m,q,t} - Y_{m,q,2019} = \alpha_0 + \alpha_1 [COVIDshock_m \times I_{q,t}] + \alpha_2 COVIDshock_m + \alpha_2 I_m + \beta controls_{m,q,t} + \epsilon_{m,q,t} - (1)$$

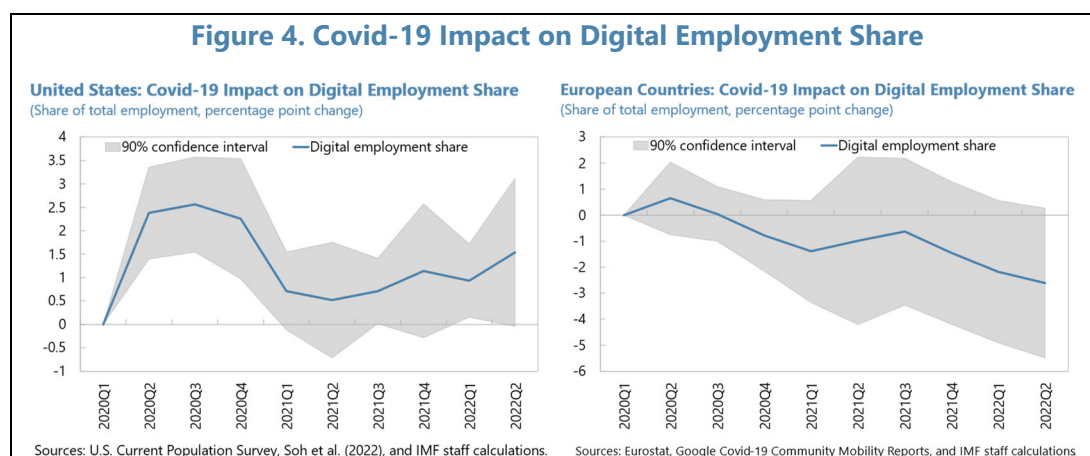
In this specification, Y refers to the share of digital employment, m refers to region (either country in case of Europe or state in case of U.S.), q refers to quarter, and t to year. $Y_{m,q,t} - Y_{m,q,2019}$ is the change in the share of digital employment in region m at quarter q , year t



⁷ Digital skills go beyond teleworkability of occupations to capture the underlying skills required to perform a job, instead of characterizing only on the basis of the job arrangement. While digital and teleworkable occupations are related, the mapping between the two is not one-to-one. See Soh et al (2022) and Florence et al (2023) for more detailed information on how digital occupations are defined and how digital occupations are related to teleworkable occupations.

⁸ We include the following 29 European countries beyond Euro Area to maximize the sample size (cross-country dimensions): Austria, Belgium, Bulgaria, Croatia, Czechia, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, and United Kingdom.

relative to the same quarter q in 2019. 2019 was chosen as the pre-Covid-19 base year. Taking the difference of the same quarter relative to 2019 addresses the potential seasonality in data. $I_{q,t}$ is dummy variable for the quarter q and year t which includes each post-recession period from 2020Q2 to 2022Q2. The variable $COVIDshock_m$ uses the largest drop in the average of Google mobility indicators in (i) retail and recreation areas and (ii) transit locations in 2020 relative to January 2020 for each country, while $COVIDshock_m$ uses a Bartik shock for the U.S. (see Soh et al. (2022) for details).⁹ The variable $controls_{m,q,t}$ includes pre-Covid level of digital employment share to account for the pre-Covid-19 heterogeneity in inclinations to increase digital employment for the regression for European countries.¹⁰



6. The results indicate a significant and temporary increase in digital employment for the U.S. during the pandemic. Figure 4 plot coefficients α_1 's in equation (1), which capture the impact of a unit increase in the Covid-shock on cumulative percentage point change in digital employment.¹¹ The U.S. results show a significant but temporary increase in the US economy digital employment (Figure 4, left panel). Further analysis in Soh et al. (2022) show that while both digital and non-digital employment declined in absolute levels in the United States, digital employment declined less, and the increase in digital employment share was driven by digital and cognitive occupations rather than digitalization of manual or routine jobs.

7. The results for European countries, which suggests that the increase in the share of digital employment is small and not statistically significant, are subject to some caution (Figure 4, right panel). First, the sample size is only 29 countries at the aggregate level, while the

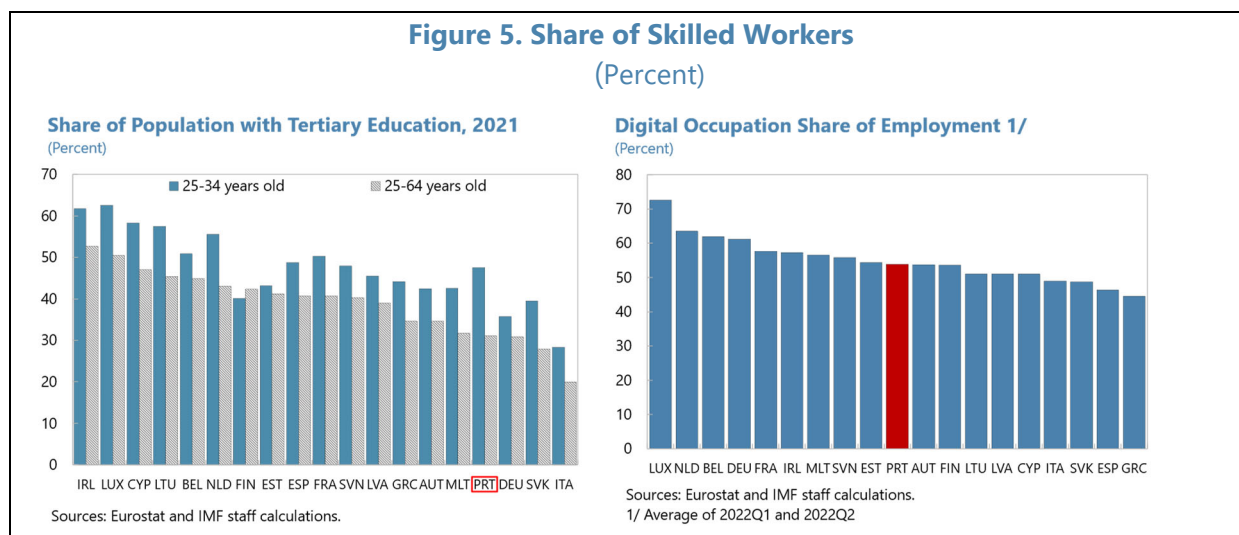
⁹ Note google mobility shock deliver similar results for the U.S. in similar estimates.

¹⁰ For the U.S. analysis, the vector $controls_{m,q,t}$ includes pre-Covid-19 levels of digital employment share to and (i) demographic controls such as share of population with bachelor's degree, share of population with age between 25-44 years old, race compositions, migration in-flows, (ii) GDP per capita in reach region, (iii) quit rates for Job Openings and Labor Turnover Survey (JOLTs) for the U.S. to address historically higher quite rates in some regions for robustness checks.

¹¹ For European countries, the measures calculate the impact from an one percent change in the google mobility shock. For the U.S., we normalize the variable $COVIDshock_m$ with the difference between the 10th and 90th percentiles of the Bartik shock's distribution across states. The interpretation is the differences in digital employment share between the hard-hit region (90th) and the less-hit region (10th).

U.S. analysis is done at state level. Second, most European countries deployed job retention schemes to mitigate the impact of Covid-19 shocks in the labor market, which most likely disproportionately saved jobs in more affected occupations and sectors including non-digital jobs. Therefore, the U.S. results could be capturing a cleaner Covid-19 impact on the change in the digital employment share (and shielding of digital employment) in the absence of policy measures to preserve employment. Indeed, stylized facts for Portugal suggests a sharp persistent rise in digital employment share in Portugal.

8. Our analysis points to an important role for policies to invest in digitalization and digital skills for a more resilient labor market in Portugal. Covid-19 did not impact the Portuguese labor market more adversely relative to previous recessions. The aggregate figures, however, mask distributional impacts of the pandemic. This analysis shows that young, and low-skilled workers in contact-intensive and non-digital jobs were more affected than their counterparts. Moreover, digital employment share experienced an increase in Portugal. While the share was already increasing over the past decade, the rise became steeper at the onset of Covid-19. Our regression analysis provides suggestive evidence that digital employment was shielded during the Covid-19. These findings reinforce the relevance of policies to invest in digital skills and higher education in Portugal to build a more resilient labor market for future shocks (Figure 5).



References

Ando, Sakai, Ravi Balakrishnan, Bertrand Gruss, Jean-Jacques Hallaert, La-Bhus Fah Jirasavetakul, Koralai Kirabaeva, Nir Klein, Ana Lariau, Lucy Qian Liu, Davide Malacrino, Haonan Qu, Alexandra Solovyeva. 2022. "European Labor Markets and the COVID-19 Pandemic: Fallout and the Path Ahead" IMF Departmental paper 2022/004.

Duval, Romain, Yi Ji, Longji Li, Myrto Oikonomou, Carlo Pizzinelli, Ippei Shibata, Alessandra Sozzi; Marina M. Tavares. 2022. "Labor Market Tightness in Advanced Economies" *IMF Staff Discussion Notes* 2022/01.

Florence, Jaumotte, Longji Li, Andrea Medici, Myrto Oikonomou, Carlo Pizzinelli, Ippei Shibata, Jiaming Soh, and Marina M. Tavares. 2023 "Digitalization During the COVID-19 Crisis: Implications for Productivity and Labor Markets in Advanced Economies" *IMF Staff Discussion Note* 2023/03.

John Bluedorn, Francesca Caselli, Niels-Jakob Hansen, Ippei Shibata, Marina M. Tavares. 2023. "Gender and employment in the COVID-19 recession: Cross-Country evidence on "She-Cessions", *Labour Economics*, Volume 81, 102308.

Muro, M., S. Liu, J. Whiton, and S. Kulkarni (2017). Digitalization and the American Workforce. Brookings Paper.

Pizzinelli, Carlo, and Ippei Shibata. 2023 "Has COVID-19 induced labor market mismatch? Evidence from the US and the UK." *Labour Economics*, Volume 81, 102329.

Shibata, Ippei 2021. "The Distributional Impact of Recessions: the Global Financial Crisis and the COVID-19 Pandemic Recession" *Journal of Economics and Business* Vol 115:105971

Soh, Jiaming, Myrto Oikonomou, Carlo Pizzinelli, Ippei Shibata, and Marina M. Tavares. 2022 "Did the COVID-19 Recession Increase the Demand for Digital Occupations in the United States? Evidence from Employment and Vacancies Data" *IMF Working Paper* 2022/195.

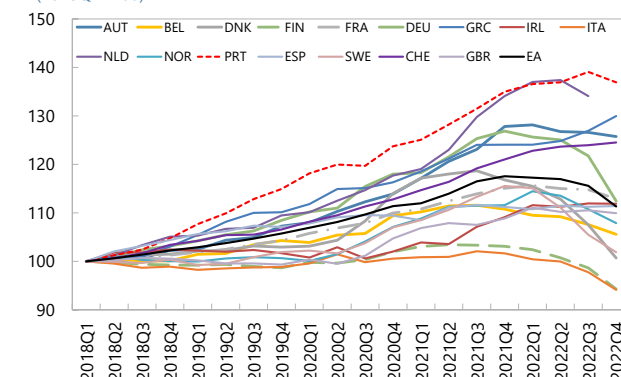
HOUSEHOLD VULNERABILITIES, FINANCIAL STABILITY, AND THE ROLE OF POLICIES IN PORTUGAL¹

A. Introduction

1. As elsewhere in Europe, financial stability risks related to higher interest rates and strong housing market dynamics have risen in Portugal:

- *House prices:* Since 2018Q1 real house prices have increased by 40 percent (the highest appreciation rate in Europe), driven by the rapid post-Covid-19 economic recovery, negative real interest rates, rising construction costs, and structural supply constraints. The real estate market started cooling down in 2022 somewhat amid soaring interest rates with real house price growth decelerating to around 2 percent y/y in 2022Q4 (versus 9.1 percent y/y one year earlier), though remaining at the high end of the house price growth distribution in Europe (Figure 1).

Evolution of Real House Prices in Europe
(2018Q1=100)



Sources: OECD; Haver; author's calculations. Note: The latest date for house prices in NLD is 2022Q3.

- *New home buyers:* In Portugal, mortgage rates on new issuances reached 3.2 percent at end 2022, representing a 240-bps increase from end-2021. As a result, the monthly bill of buyers purchasing property in the main cities in 2022 rose by almost half relative to 2021. If interest rates were to increase by a further 300 basis points, mortgage bills would double relative to 2021 (Figure 2).²

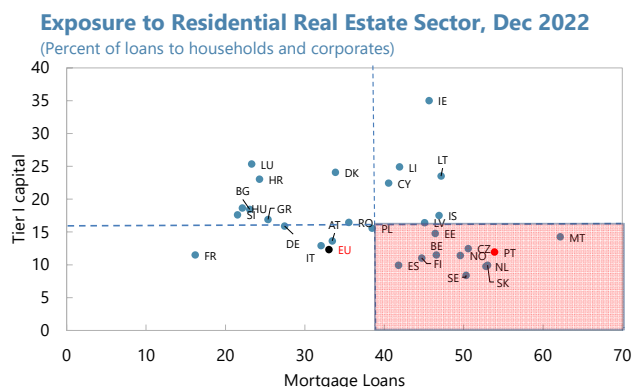
- *Existing mortgage borrowers* (Figure 3): As of 2022, the median household spends one third of its gross income on food and energy, while the bottom tercile of the income distribution spends 56 percent. In addition, 14 percent of households in the bottom tercile of the income distribution, 28 percent in the second tercile, and 25 percent in the top tercile have non-mortgage loans (such as consumer loans, credit lines, overdrafts, etc.).³ The estimated average debt service among households with debt payments is around 10.4 percent at end-2021.

¹ Prepared by Laura Valderrama. This paper draws on Valderrama et al (2023).

² To quantify the impact, we calculate the price of a 100m² dwelling as the average transaction price of new and existing homes in the most important cities in Portugal drawing on Statista. Then, we use information on the typical LTV ratio (Hypostat 2022) to back out the size of the average mortgage loan. Using data on average maturity, lending rate, and median income (using EU-SILC microdata), we compute the debt service to income ratio (DSTI) in 2021. We update the DSTI ratio using the mortgage rate on new originations as of December 2022 and simulate it under various interest rate scenarios.

³ The partition of the income distribution is based on total gross annual household income, equalized using the modified OECD equivalence scale.

2. Mortgage loans are still sizable in bank portfolios. Household loans collateralized by residential real estate (RRE) account for over half of total loans to the nonfinancial private sector, and amount to over 40 percent of 2022 GDP. Other non-collateralized household loans represent 10 percent of total loans or 6 percent of GDP. Portuguese banks' exposure to RRE combined with relatively weaker CET1 capital buffers (compared to EA) also induces higher risks to financial stability stemming from a sharp fall in house prices.



Source: EBA Risk Dashboard; and IMF staff calculations. The chart shows Tier 1 capital as a share of total loans, rather than risk-weighted assets (y-axis) and mortgage loans as a share of total loans (x-axis). The cut-off points of the dashed lines represent the average. The data is based on a sample of banks representing the largest EBA reporting institutions in each country.

3. Since the start of the cost-of-living crisis, the government is estimated to have spent about 1 percent of GDP on average during 2022-23 to shield households from rising food, energy, and housing costs. Most of the measures are in the form of income support to vulnerable households (e.g., low-income families). Other measures seek to provide VAT and excise tax relief. To protect vulnerable mortgage borrowers from higher interest rates, the government approved two sets of relief measures: (i) a measure to encourage banks to restructure loans for borrowers that could struggle to service their mortgage repayments (November 2022); and (ii) an interest rate subsidy to absorb part of the rise in interest rates for financially stretched borrowers (March 2023).

4. Against this backdrop, this paper examines the impact of RRE vulnerabilities, the cost-of-living crisis, and the tightening of financial conditions on households and banks in Portugal. It first assesses the ability of households to continue servicing their debt and maintain consumption under a range of scenarios. It then quantifies the impact on banks from the ensuing change in asset quality. Finally, it examines the effectiveness of policy measures to reduce household vulnerabilities and preserve financial stability.

B. Stress Testing Household Balance Sheets

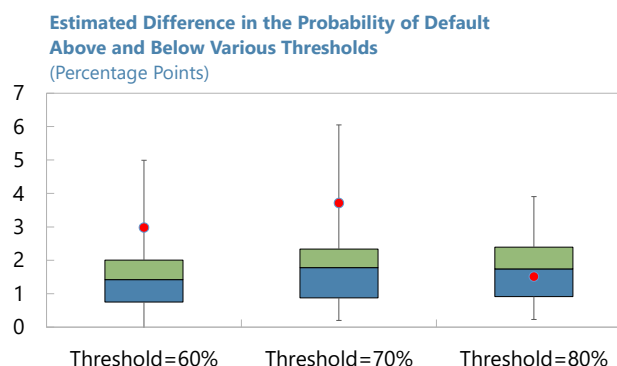
5. We assess affordability risk by quantifying the share of households that may be unable to service their debt. A household is identified as *financially vulnerable* (at a non-negligible risk of default) if debt service and basic living expenditures represent more than 70 percent of gross income.⁴ Basic living expenditures include essential consumption (food and utilities), and housing costs. We also show results using the more standard measure of financial vulnerability, i.e., when debt service exceeds 40 percent of gross income. Based on the proposed definition of vulnerability, *mortgage debt-at-risk* is defined as the amount of outstanding mortgages of households identified as financially vulnerable as a share of the total volume of mortgages outstanding. Similarly, *consumer debt-at-risk* is defined as the amount of outstanding non-mortgage debt held by

⁴ Country-level logit regressions identify 70 percent as the most significant threshold for a sharp increase in mortgage default risk across countries.

financially vulnerable households as a share of total consumer loans. The analysis relies on granular household level data, which allows identifying vulnerable households across the income distribution and tenure status and analyzing effectiveness of targeted policies. The data and the methodology are further described in Annex II.

6. Financially vulnerable households are estimated to be significantly more likely to be in arrears on their debt payments.

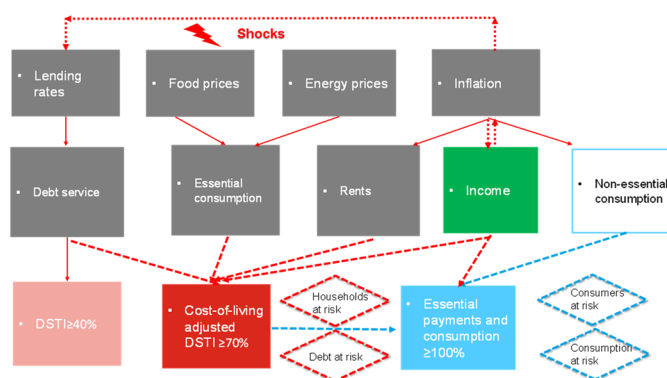
A logit regression controlling for macroeconomic drivers (e.g., unemployment rate, growth rate), and the household position in the income distribution suggests that the probability of being in arrears on their mortgage payments in Portugal increases by 70 percent (from 3.1 to 5.3 percent on average during the estimation period 2004-2020) when households are overburdened by basic expenditures and debt repayments.⁵ Based on country-level regressions, the average probability of being in arrears jumps from 4.5 to 6.8 percent for vulnerable households across EA (Figure 4). Similarly, the probability of being in arrears on other retail loans rises by 60 percent (from 3.6 to 5.8 percent) when households are overburdened in Portugal, relative to a surge from 7.3 to 10.3 percent in EA.



Source: EU-SILC microdata; IMF staff calculations. The box plots show the country distributions for the estimated difference in the probability of default of mortgage loans above and below various thresholds, based on country-level logit regressions controlling for household level income and macroeconomic factors.

7. To evaluate the risk that households cut consumption sharply, we consider an alternative definition of vulnerability.

A household is identified as *economically vulnerable* (at a risk of sharply cutting consumption) if the sum of debt service and total consumption exceed gross income. While consumers may cut back on spending to avoid breaching their budget constraints regardless of their level of indebtedness, this risk is higher for leveraged households to avoid default. *Consumption-at-risk* is defined as the consumption of households classified as economically vulnerable as a share of aggregate consumption. Figure illustrates the transmission of shocks.



While consumers may cut back on spending to avoid breaching their budget constraints regardless of their level of indebtedness, this risk is higher for leveraged households to avoid default. *Consumption-at-risk* is defined as the consumption of households classified as economically vulnerable as a share of aggregate consumption. Figure illustrates the transmission of shocks.

8. We simulate the paths of household income, housing cost, other basic expenses, and repayments of other loans using a range of scenarios over a 2-year horizon.

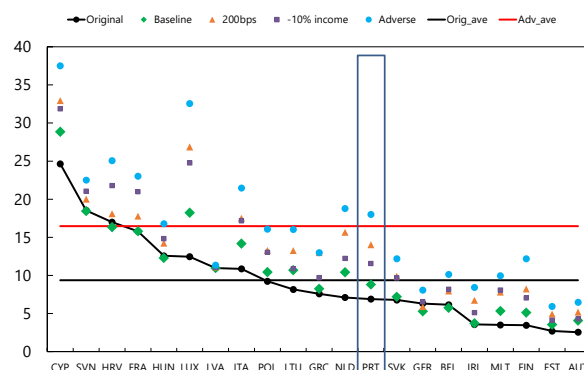
These scenarios are illustrative. The baseline scenario follows the IMF October 2022 WEO forecast. To assess the resilience of households to deteriorating macrofinancial conditions, we stress test households' finances against a set of adverse scenarios. For instance, the 'cost of living' scenario features the

⁵ In 2022, the share of households in arrears is 1.8 percent according to Bank of Portugal statistics.

materialization of both an interest rate shock (200 bps) and a food and energy price shock (20 percent) relative to the baseline. Annex II Table 2 shows the cumulative shocks by end-2023 for Portugal and EA. Some of these scenarios can be regarded as tail risk events.

9. Using the standard measure of financial vulnerability, the change in the share of vulnerable households would be moderate in all scenarios. The share of mortgage borrowers with a DSTI ratio (including all debt payments) exceeding 40 percent is estimated to rise to 8.8 percent under the baseline (and 14.0 percent in the ‘tightening’ scenario) in Portugal. This is in part because in the current inflationary environment, the rise in gross income absorbs most of the increase in interest payments. Because stressed households hold a good part of the outstanding debt, the share of *mortgage debt at risk* could double to reach a quarter of outstanding mortgage debt under the worst-case scenario.

Mortgage Borrowers at Risk (DSTI≥40%; all debt payments)
(Percent)



10. But once basic living expenditure is accounted for, a more significant share of households could be financially vulnerable. In the adverse scenario(s), almost half of households could struggle to afford basic expenditures in Portugal (twice as many as before the energy crisis), with sharper effects on low-income households. The share of financially vulnerable low-income families could increase to 78 percent under the baseline (from 60 percent) and reach around 90 percent under the ‘cost of living’ scenario. By contrast, only between 5 and 13 percent of high-income households would be financially vulnerable depending on the severity of the scenario. In the worst-case scenario⁶, one third of consumers could be economically vulnerable and be forced to cut back on consumption on non-essential goods to afford basic expenditures, accounting for over one fourth of consumption (Figure 5). The estimated reduction in aggregate consumption would range between 2 and 5 percent.⁷

⁶ The worst-case of scenario is characterized by an intensification of the cost-of-living crisis whereby interest rates increase by a further 200 bps relative to the baseline, and food and energy prices rise 20 percent above baseline projections.

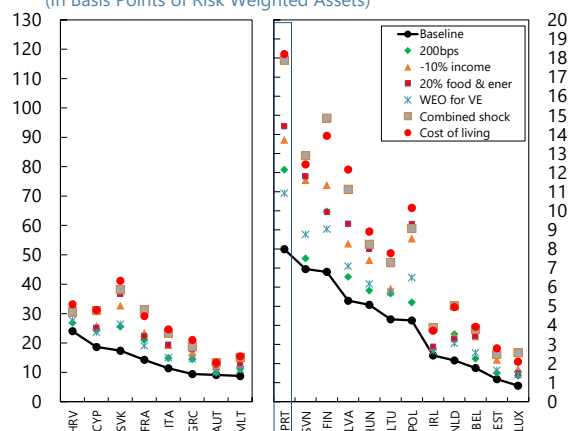
⁷ This is calculated by multiplying the share of stretched consumers (weighted by their contribution to total consumption) by their excess consumption over their budget constraint. This is a conservative assumption since consumers could draw down on their savings, rely on transfers, or use credit lines to keep their consumption habits. At the same time, some consumers may start adjusting their consumption levels well before they hit their budget constraint for precautionary motives.

C. Impact on Bank Capital

11. To quantify the impact of household financial stretch on banks' capital, we follow a four-step procedure. First, we estimate a range of scenarios to account for uncertainty around the outlook by end-2023. Second, we estimate the link between being financially vulnerable and the likelihood of default at the individual household level. In a third step, we simulate the increase in the share of financially vulnerable households to estimate the increase in probability of default. In a fourth step, we use data from EBA Risk Dashboard to project the impact of higher credit risk on banks' capital position. We use estimates of house price overvaluation in Portugal to compute bank impact under a house price correction.

CET1 Capital Depletion - No House Price Correction

(In Basis Points of Risk Weighted Assets)

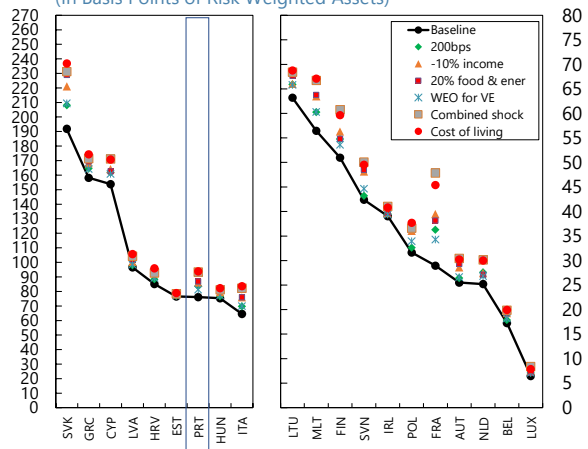


12. In the absence of a sharp house price correction, the impact of household stress on Portuguese banks is relatively contained.

Capital depletion would not exceed 20 basis points in Portugal (versus 15 basis points in the EA). However, an abrupt decline in house prices in Portugal (eliminating the 20 percent estimated overvaluation; see Annex I) combined with the increase in default rates projected in the analysis, could challenge some banks.⁸ On aggregate, it would shed up to 100 basis points of capital in Portugal (versus 85 basis points in the EA). While this is a severe scenario, the estimates don't consider that some households could see their credit quality deteriorate and require additional provisions even if their DSTI falls below the estimated threshold where the default rate jumps.

CET1 Capital Depletion - House Price Correction

(In Basis Points of Risk Weighted Assets)



D. The Effect of Policies

Policies to Mitigate the Impact of Soaring Food and Energy Prices in Portugal

⁸ It is assumed that the 20 percent estimated house price overvaluation is corrected by end 2023 (Annex I). This impacts the loss given default (LGD) of defaulted exposures which increases by 20 percent over the weighted average LGD on retail loans secured on real estate property reported by Portuguese IRB banks on non-defaulted exposures (i.e., 20.1 percent as of 2022Q4). The stressed LGD (i.e., 40 percent) is in line with estimates found in the literature (An and Cordell, 2019).

13. The sharp increase in food and energy prices, prompted the Portuguese government to put in place measures to shield households from the direct impact of rising prices. In 2022, the government reduced the tax burden on fuel, put a hold on the planned carbon tax increase, reduced the VAT rate on electricity, and provided exceptional income support to households, among fiscal policy responses. We conduct a cost-benefit analysis of specific policy measures⁹ that we label as ‘selected shock mitigation policies’.¹⁰ For simplicity, we assume that the reduction in the price of energy and the exceptional income support applies to all the households. We compute the estimated fiscal outlay (cost) of the ‘selected shock mitigation policies’ under the baseline and ‘cost of living’ scenario. Then, we calculate the share of households and mortgage debt at risk protected (from default) under each scenario (benefit).¹¹

14. The analysis suggests a moderate cost-effectiveness of the ‘selected shock mitigation policies’ in Portugal (Figure 6). Under baseline conditions, around 3.5 percent of households would be saved from distress at a cost of 0.6 percent of GDP. The financial stability impact would be smaller with a 1.7 percent reduction of risky debt. Under the ‘cost of living’ scenario, the share of households shielded from financial stretch would reach 3.8 percent at a cost of 0.7 percent of GDP. The reduction of the share of mortgage debt at risk is estimated at 2.5 percent.

15. We also quantify the cost effectiveness of three hypothetical interventions. We estimate the impact of three hypothetical policies which would shield consumers from the entire (100 percent) increase in food and energy prices during 2022-23, with different targeting schemes: (i) a *broad* policy whereby all households are shielded; (ii) a *partially targeted* policy according to which the poorest two thirds of households are shielded; and (iii) a *narrowly targeted* policy through which only the bottom tercile is shielded. Simulation results suggest that, in the baseline, a hypothetical *narrowly targeted* policy would save 7.9 percent of households (0.8 percent of mortgage debt at risk) at a cost of 0.8 percent GDP. Under the ‘cost of living’ scenario, a *narrowly targeted* policy would save 12 percent of distressed households (2.5 percent of risky debt) at an estimated cost of 1.5 percent of GDP.¹²

⁹ We include the following policy measures in the simulation: (i) a reduction of the price on gasoline and diesel and the temporary suspension of the carbon tax available at <https://ps.pt/wp-content/uploads/2022/04/OE2022.pdf>; (ii) a EUR 60 extraordinary support transfer for households in the context of the armed conflict in Ukraine available at <https://dre.pt/dre/en/detail/decree-law/30-d-2022-182213909>; (iii) a reduction of VAT on electricity from 13 to 6 percent (“Famílias Primeiro”) available at <https://www.portugal.gov.pt/pt/gc23/comunicacao/noticia?i=familias-primeiro-perguntas-e-respostas#1>; and (iv) a EUR 240 extraordinary transfer to households (“Famílias Primeiro”). A summary of policies is available at the Bruegel database of national fiscal policy responses to the energy crisis at <https://www.bruegel.org/dataset/national-policies-shield-consumers-rising-energy-prices>.

¹⁰ The simulation exercised does not include additional revenue and expenditure measures provided in the broader ‘Geopolitical shock mitigation measures’ fiscal package. For details see the Staff Report.

¹¹ In addition to Portugal, we quantify the estimated cost of the support programs announced by the government in Greece, Cyprus, and Croatia, taking into account the conditionality of the schemes. See Valderrama et al (2023) for details.

¹² The cost of the policy depends on the evolution of wholesale market prices during 2022-23, which in the analysis, are in line with the October 2022 WEO forecast. Under current projections for energy prices, the cost would be more contained.

Policies to Mitigate the Impact of Higher Rates on Mortgage Borrowers in Portugal

16. Considering the surge in interest rates, the government published the Decree-Law No. 80-A/2022 on November 25, 2022. The objective is early detection of debtors and exposures in distress. Under the Decree-Law, borrowers with first residence floating-rate loans of up to EUR 300,000 at acquisition are eligible to renegotiate their loans if the DSTI is 50 percent or higher, or if it exceeds 36 percent with an increase in DSTI of at least 5 percentage points in 2023. We conduct a cost-benefit analysis of this measure by assuming that banks restructure the loans of eligible borrowers by reducing their monthly installments through a reduction of interest payments (half of the increase by end-2023). Results suggest that around 0.5 to 3.2 percentage points of mortgage-debt-at-risk (and between 0.3 and 2.3 percent of mortgage borrowers) would be protected from distress depending on the scenario.¹³ Restructuring would be applied to 7-18 percent of outstanding mortgage debt. The benefit for banks (lower provisions) would be around 5 basis points of common equity Tier 1 (CET1), while the cost (lower NII) would reach between 10 and 20 basis points of CET1.

17. A law granting an interest subsidy to stressed borrowers came into force on March 23, 2023 (Decree-Law No. 20-B/2023).¹⁴ Support takes form of a temporary subsidy in 2023 for half of the increase in current and past benchmark rates at origination augmented by a 3-percentage point increase. The outstanding amount at origination should be lower than EUR 250,000, the family's income up to the 6th income bracket (EUR 38,632 annual income), and the DSTI greater than or equal to 35 percent.¹⁵ We re-run the simulations for eligible mortgage borrowers and find that that under the 'interest rate shock' or 'cost of living' scenario mortgage debt at risk would be lower by up to one percentage point under the policy. Debt relief, at an estimated subsidy of 0.46 percent on eligible debt (around 15 percent of outstanding mortgages) would cost around EUR 60 million (3 basis points of GDP). The benefit for banks (lower provisions) is estimated at 1 basis point of CET1. These are lower bound projections as the reference rate at the time when the loan was signed is biased upwards (and the amount of support downwards) as outstanding loans do not include mortgage originations granted after the 2017 (latest) Household Finance and Consumption Survey (HFCS).

E. Concluding Remarks and Policy Implications

18. Since the onset of the Covid-19 pandemic, house prices in Portugal have risen faster than fundamental factors can account for, pointing to overvaluation of around 20 percent. This implies an elevated risk of price correction. Given the materiality of the mortgage portfolio for

¹³ For this analysis, we use the standard metric of financial distress whereby debt service to income ratio exceeds 40 percent of household income.

¹⁴ At the time of drafting this note, a broader program to support the housing market "Mais Habitação" had been approved by the Council of Ministers in March 2023 and was in Parliament to be discussed in the following weeks.

¹⁵ In the simulations, the eligibility criteria follow the conditionality of the February 2023 proposal including an outstanding amount of less than EUR 20,000, and no conditionality on the maximum amount of financial assets (less than 62 times the social support index up to EUR 29,787).

Portuguese banks, an abrupt decline in house prices combined with an increase in default rates amid the cost-of-living crisis and soaring interest rates could become a challenge for some banks.

19. Using a cost-of-living measure of financial vulnerability, our simulations suggest that, under adverse conditions, almost half of all households could become financially stretched in Portugal. They represent over 40 percent of mortgage debt and 45 percent of consumer debt. The share of vulnerable low-income families could range between 78 and 90 percent, while only 5 to 13 percent of high-income households would struggle depending on the severity of the scenario. In the worst-case scenario, one third of consumers could be forced to cut back on consumption with an estimated reduction in aggregate consumption of 7 percent. Considering that banks have adequately provisioned existing risks, capital depletion would not exceed 100 basis points under a market price correction that would bring back house prices to fundamental values in Portugal.

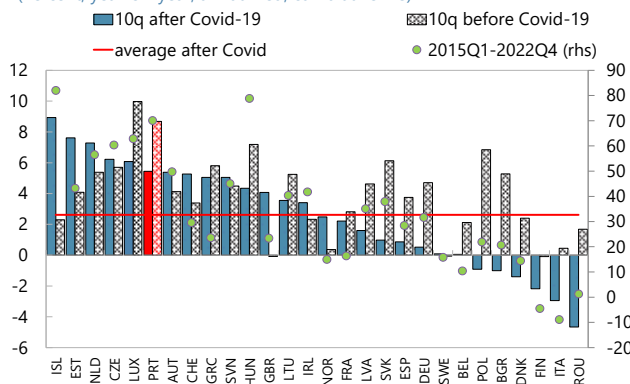
20. Government support measures could help maintain borrower repayment capacity. We measure the benefit of intervention by the share of household/debt that could be spared from financial distress. Results suggest that, under the baseline, the 'selected shock mitigation policies' in terms of VAT reductions and extraordinary income support could shield around 3.5 percent of households from financial distress (and 1.7 percent of mortgage debt at risk) at a cost of 0.6 percent of GDP. Targeting a similar budget envelope to the bottom tercile of the income distribution would be more cost effective to reduce the share of financially stretched households. A policy package that also includes the middle tercile would increase the financial stability support as these households are more likely to hold mortgage debt.

Figure 1. Vulnerability Indicators in the Residential Real Estate Market

Real house prices rose by 6 percent after Covid-19...

Real House Price Growth Before and After Covid-19

(Percent, year-on-year, annualized; cumulative rhs)

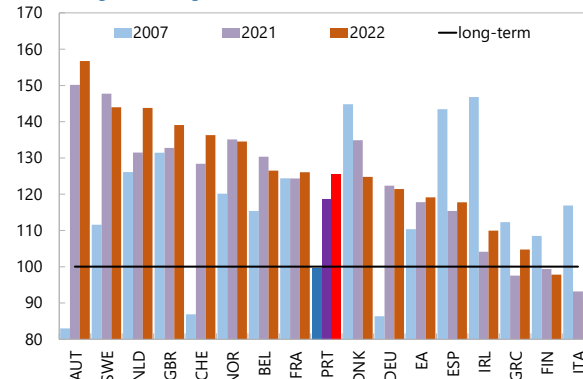


Sources: OECD, Haver, and IMF staff calculations. The dots show cumulative growth over the referenced period. Note: For EST and NLD, data is up to 2022Q3.

...with price-to-income ratios reaching levels above 25 percent their historical averages...

Price-to-Income in European Countries

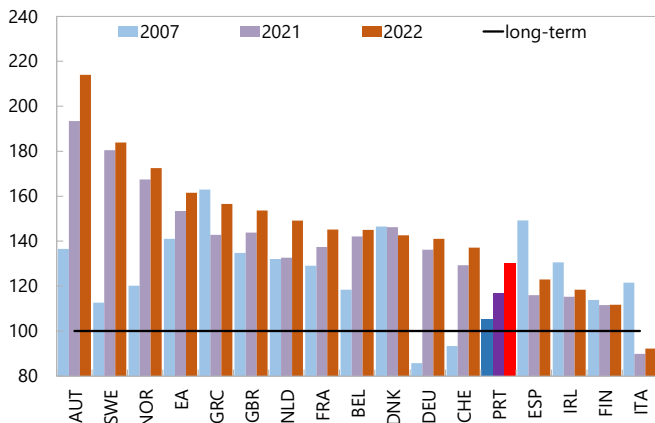
(Index, long-term average = 100)



...and price-to-rent ratios exceeding long-term values by 30 percent.

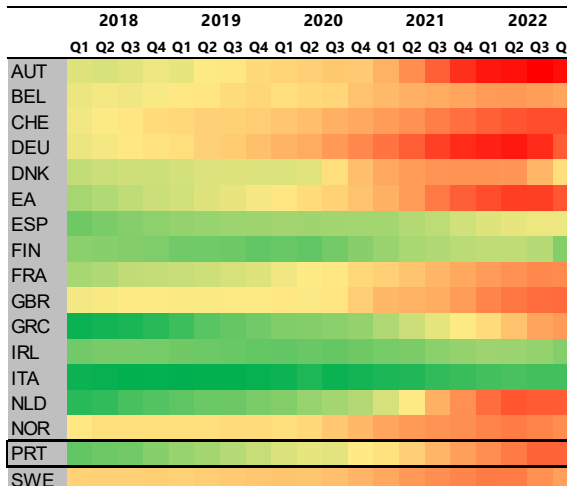
Price-to-Rent in European Countries

(Index, long-term average = 100)



This trend has intensified over the last five years.

Heatmap of Price-to-Rent in European Countries



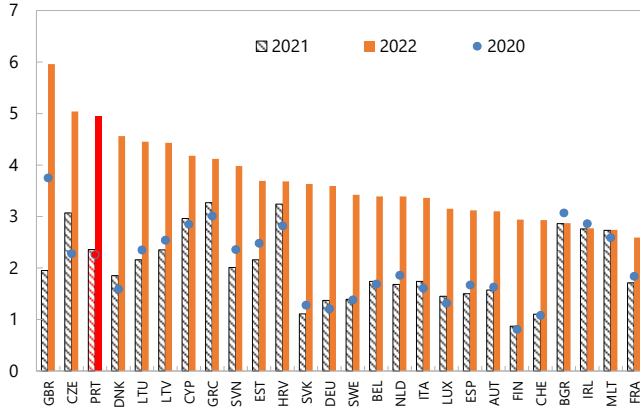
Sources: OECD, and IMF staff calculations. Note: The latest data is 2022Q4, except for Estonia, Netherlands (top left chart), and for Estonia, Netherlands, and Portugal data (remaining three charts) (2022Q3). In top left chart, ten quarters (10q) after Covid includes 2020Q2-2022Q4, while 10q before Covid covers 2017Q4-2020Q2. The dots show cumulative real house price growth over 2015Q2-2022Q4. In top right and bottom left charts, the long-term average is calculated for each country separately starting at least in 2000. In bottom right chart, the heatmap shows Z-scores, computed by subtracting the mean from the observation at time t and dividing the difference by the standard deviation. The mean and the standard deviation are computed over the available sample, starting in 1970Q1 through 2022Q4.

Figure 2. Rising Interest Rates are Hurting Affordability

Mortgage rates in Portugal raise by 260bps in 2022... ...pushing DSTI ratios by 50 percent.

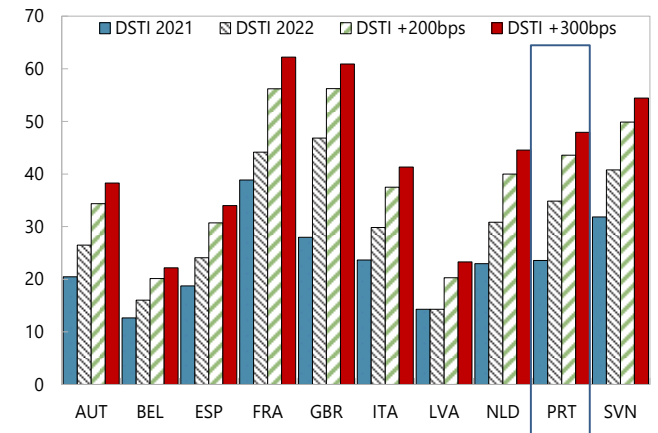
Interest Rates on New Mortgages

(Percent; APRC; end of period)



DSTI to Keep Buying Power in Main Cities at 2021 Levels

(Percent of Household Gross Income)



Sources: Statista, Hypostat, Haver Analytics, and IMF staff calculations. Note: DSTI denotes debt service to income ratio. To quantify the increase in DSTI due to higher mortgage rates, we calculate the price of a 100m2 dwelling as the average transaction price of new and existing homes in the most important cities drawing on Statista. Then, we use information on the typical LTV ratio (Hypostat 2022) to back out the size of the average mortgage loan. Using data on average maturity, lending rate, and median income (using EU-SILC microdata), we compute the debt service to income ratio (DSTI) in 2021. We update the DSTI ratio using the mortgage rate as of December 2022 and simulate it under various interest rate scenarios

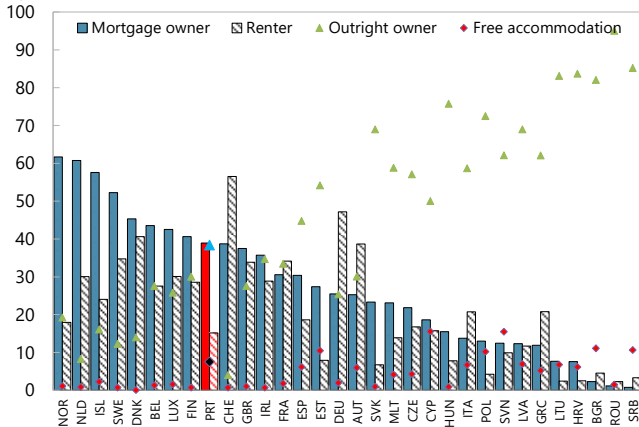
Figure 3. Tenure Status and Borrowers' Vulnerability

Around 40 percent of households in Portugal have mortgages...

...of which 90 percent have floating rate loans with median DTI ratio of 2...

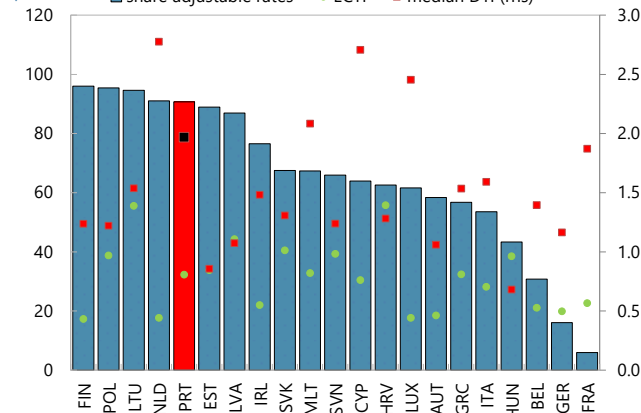
Tenure Status, 2020

(percent)



Adjustable Mortgage Rates, Essential Consumption, and Leverage

(percent)

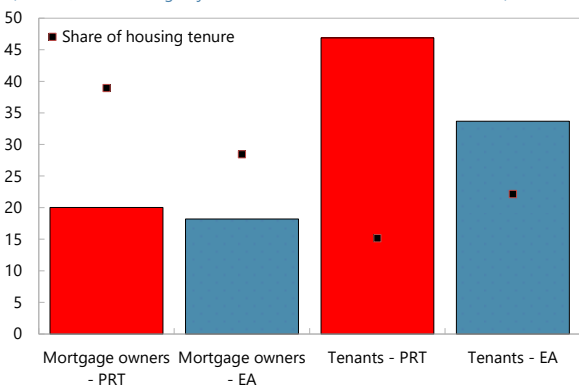


The share of vulnerable households is higher than in the EA, particularly for renters...

...even borrowers with a DSTI of 30 percent in 2018 would see debt service increase by over 5 pps in 2022...

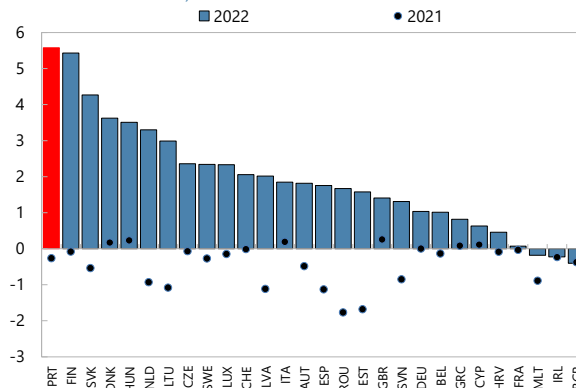
Share of Vulnerable Households by Tenure Status

(Percent, cost-of-living-adjusted debt-service-to-income ratio ≥ 70%)



Estimated change in DSTI ratio for outstanding borrower

(Indexed: DSTI=30 in 2018)



Sources: EU-SILC microdata; HFCS microdata; Hypostat; Haver Analytics; and IMF staff calculations. Note: In Panel 3, a vulnerable household consumes more than 70 percent of its gross income on essential payments (housing costs, food, utilities, and debt repayments). Panel 4 shows the increase in DSTI ratio of an outstanding borrower with a DSTI of 30 percent in 2018 in 2021 (dots) and 2022 (bars) as a result of shifts in benchmark curves.

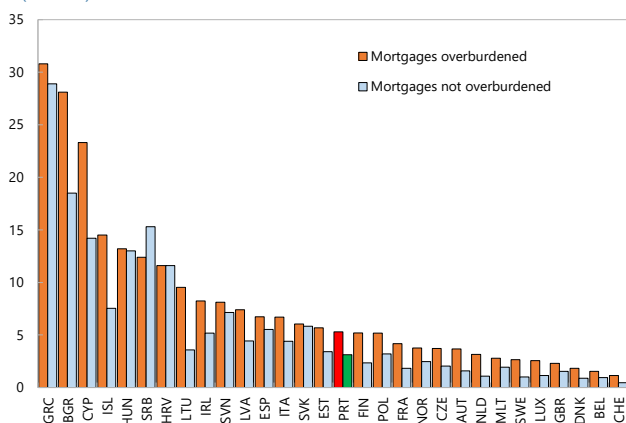
Figure 4. Vulnerable Households Are at Default Risk

When a household is overburdened, the probability of default on mortgage loans rises from 3.1 percent to 5.3 percent ...

...and on consumer loans from 3.6 percent to 5.8 percent.

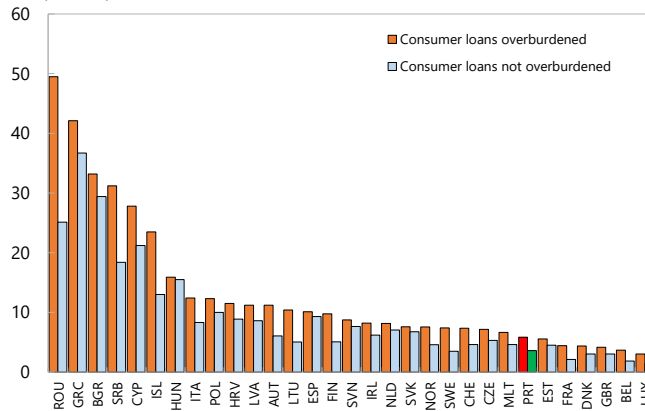
Probability of default on mortgage loans

(Percent)



Probability of default on consumer loans

(Percent)

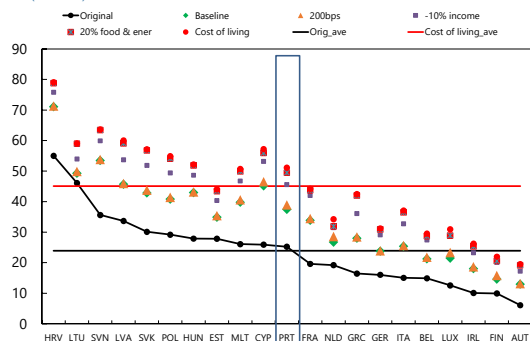


Sources: EU-SILC microdata; and IMF staff calculations. The figure plots the average predicted value of the probability of being in arrears (i.e., the household is unable to pay on time due to financial difficulties) on the mortgage loan for the main dwelling (left chart) or other hire purchase installments or loan payments (right chart) based on country level logit regressions controlling for macrofinancial variables (e.g., growth, unemployment) and the income quantile of the household, conditional on whether the household is overburdened or not. An overburdened household is defined as a household for which essential payments consume more than 70 percent of its gross income. Regressions are conducted at the household level over 2004-2020.

Figure 5. Simulation Results – Household Vulnerability by Income and Tenure

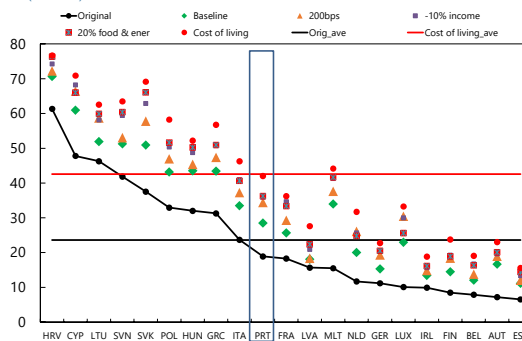
Households At Risk - Adjusted For Living Conditions

(Percent)



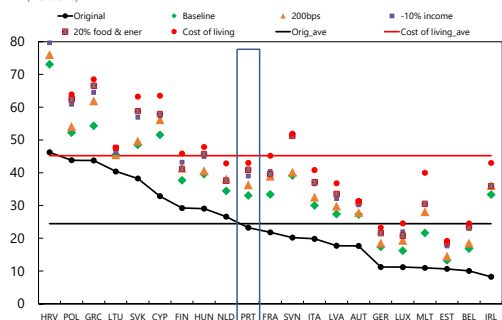
Mortgage Debt At Risk - Adjusted For Living Conditions

(Percent)



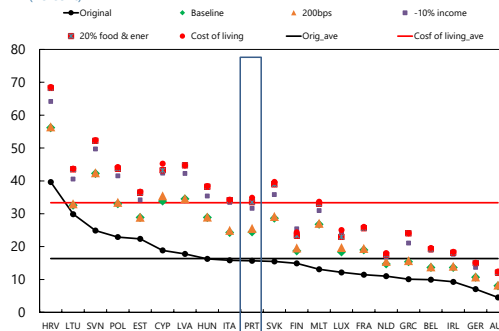
Consumer Debt At Risk - Adjusted For Living Conditions

(Percent)



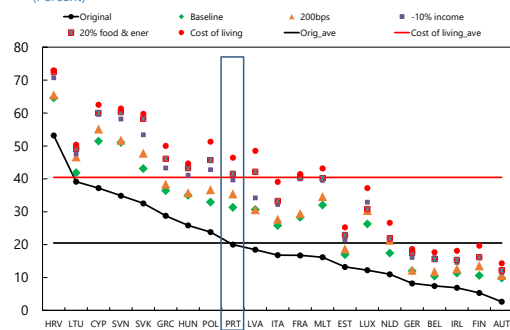
Consumers At Risk

(Percent)



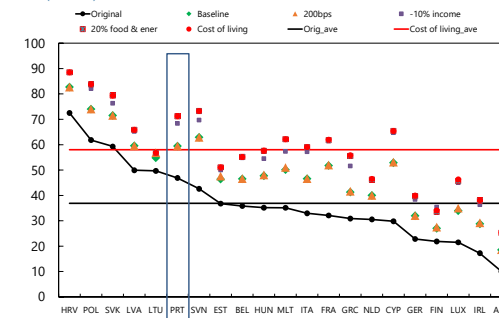
Mortgage Owners At Risk

(Percent)



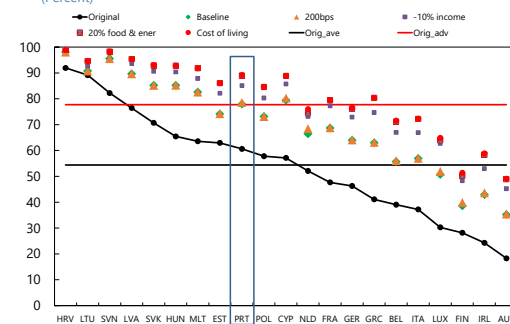
Renters At Risk

(Percent)



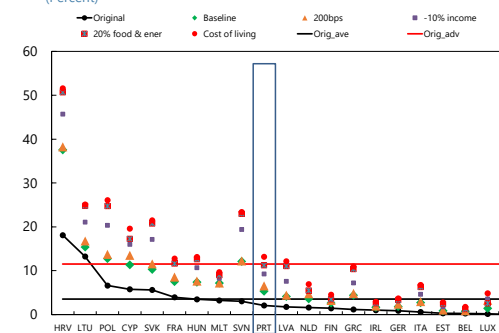
Low Income Households At Risk

(Percent)



High Income Households At Risk

(Percent)



Source: HFCS micro data; and IMF staff calculations. To simplify the charts, selected scenarios are shown.

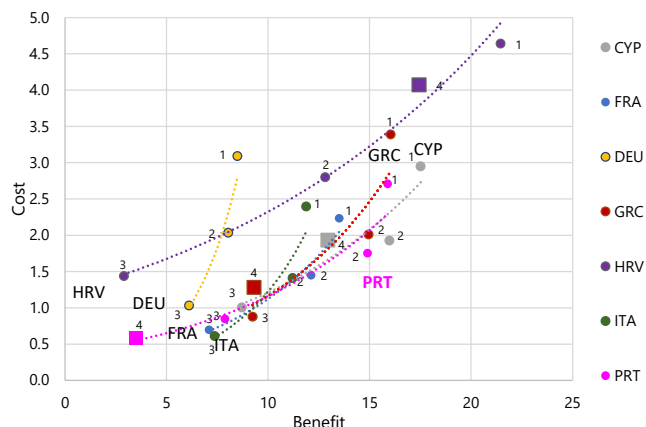
Figure 6. Simulation Results – The Effect of Policies

In the baseline, the shock mitigation policies in Portugal would save 3.5 percent of distressed households...

...and 1.7 percent of risky mortgage debt at a cost of 0.6 percent of GDP ...

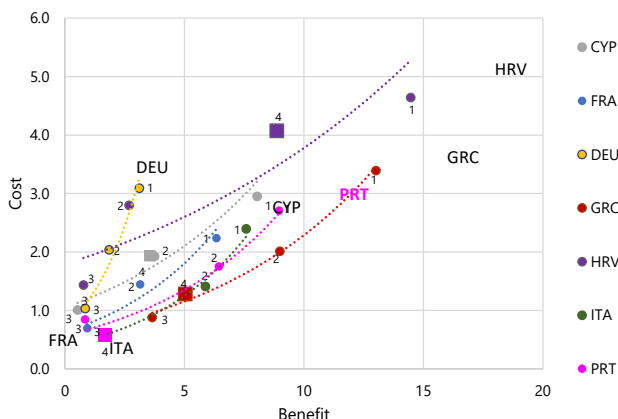
Households at Risk Saved vs Cost, Baseline

(Percent of Households; percent of GDP)



Mortgage Debt at Risk Saved vs Cost, Baseline

(Percent of Households; percent of GDP)

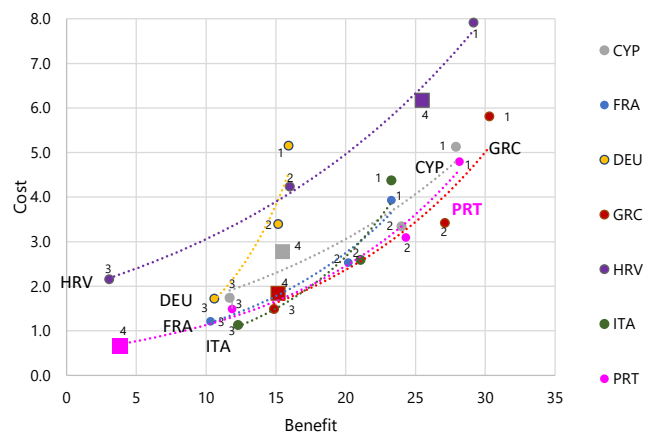


In the adverse, 3.8 percent of households would be saved...

...but only 2.5 percent of mortgage debt-at-risk at a cost of 0.7 percent of GDP.

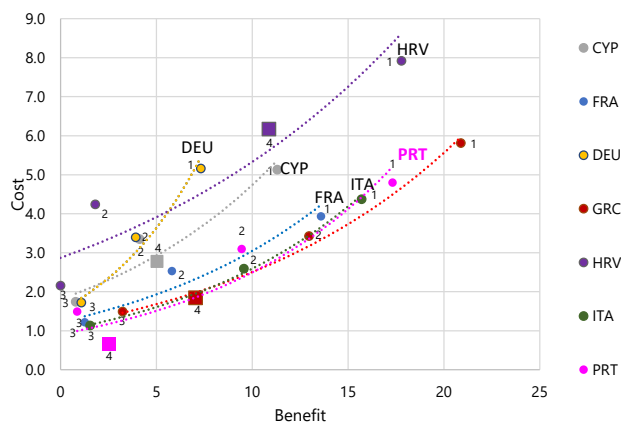
Households at Risk Saved vs Cost, Adverse

(Percent of Households; percent of GDP)



Mortgage Debt at Risk Saved vs Cost, Adverse

(Percent of Households; percent of GDP)



Sources: HFCS microdata; Eurostat; and IMF staff calculations. The ‘shock mitigation’ policies in Portugal include the reduction in the tax burden for fuel and electricity. Projections are as of end 2023. The charts illustrate the benefit and cost of each policy intervention for Portugal against major countries in Europe. Each country is represented by a curve. In the top panels, the benefit of the policy is measured by the share of households saved from distress. In the bottom panels, the benefit of each policy is measured by the decline in the mortgage debt-at-risk. The cost of the policy is measured by the fiscal expense as a share of GDP. The panels show the policy interventions announced by governments in Portugal (PRT), Croatia (HVR), Cyprus (CYP) and Greece (GRE), represented by subscript (4), shown in a square symbol. They also show three hypothetical interventions: (1) a broad policy (all households receive a subsidy); (2) a medium targeting policy (the poorest two-thirds of households receive a subsidy); (3) a narrow targeting policy (the bottom tercile receives a subsidy), shown in a circle symbol.

References

An, X., and Cordell, L., (2019), "Mortgage Loss Severities: What Keeps Them So High?", Federal Reserve Bank of Philadelphia, Working Paper 19-19, March.

Bank of Portugal (2022), "Financial Stability Report", November.

Decreto-Lei n.º 20-B/2023 (2023), Presidência do Conselho de Ministros, available at <https://dre.pt/dre/detalhe/decreto-lei/20-b-2023-210543863>

Decreto-Lei n.º 80-A/2022 (2022), Presidência do Conselho de Ministros, available at <https://dre.pt/dre/detalhe/decreto-lei/80-a-2022-203898270>

Hypostat (2022), "A Review of Europe's Mortgage and Housing Markets", European Mortgage Federation, September.

R República Portuguesa (2023), "Mas Habitação" available at <https://www.portugal.gov.pt/pt/gc23/comunicacao/noticia?i=governo-aprova-pacote-mais-habitacao>

Valderrama, L., Gorse, P., Marinkov, M., and Topalova, P., (2023), "European Housing Markets at a Turning Point – Risks, Household and Bank Vulnerabilities, and Policy Options", IMF Working Paper 2023/76.

Annex I. Assessing House Price Overvaluation

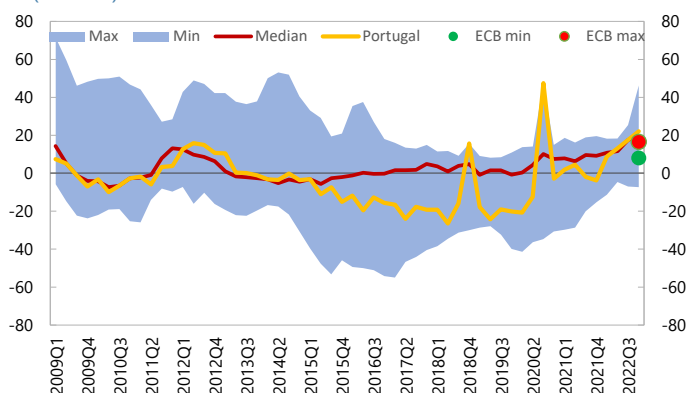
1. To measure house price overvaluation, we use a vector error correction model (VECM) that relates house prices to fundamentals. Following the literature (Turk, 2015), this approach estimates predicted equilibrium values for house prices derived from theoretical supply and demand determinants. The observed real housing price (p) is expressed as a function of the long-run equilibrium real housing price (p^*) which is determined by supply (housing stock, hs), and demand factors (real household disposable income, di , and real mortgage interest rate, R). In addition, we introduce a dummy to control for the intensity of macroprudential policy interventions¹ (MacroPru):

$$p_t = \alpha_1 + \beta_1 hs_t + \beta_2 di_t + \beta_3 R_t + \beta_4 RMacroPru_t + \varepsilon_{1t} = p^* + \varepsilon_{1t}$$

$$\Delta p_t = \alpha_2 + \varphi_1(p - p^*)_{t-1} + \sum_{i=0}^n \lambda_1 \Delta p_{t-1-i} + \sum_{i=0}^n \lambda_2 \Delta hs_{t-1-i} + \sum_{i=0}^n \lambda_3 \Delta di_{t-1-i} + \sum_{i=0}^n \lambda_4 \Delta R_{t-1-i} + \varepsilon_{2t}$$

2. Results suggests sizeable house price overvaluation in Portugal. The VECM estimates put over-valuation in 2022Q3 at around 20 percent (and at the upper end of the 8-16 percent range estimated for 2021 by the European Central Bank. This lies just above the median of the distribution of estimates for European countries with dynamic housing markets.² House prices have risen faster than fundamental factors could explain since the end of 2021. The model estimates indicate that the speed of adjustment differs from country to country, but points to a gradual adjustment in housing prices, with about 20 percent of disequilibria over one year in Portugal.

House Price Overvaluation in Europe (Percent)



¹ Macroprudential policy is proxied by a dummy which takes the value of +1 (-1) for each tool which is tightened (loosened) in a quarter. Typically, there are various tools that are tightened/loosened during the same quarter.

² Selected countries in Europe include Austria, Germany, France, Portugal, Slovakia, Spain, and Sweden. Although the text figure reports values for the period 2009Q1-2022Q4, individual VECMs extend further back (depending on data availability for individual countries).

Annex II. Technical Aspects of the Model

1. Identifying vulnerable households requires the use of microdata. To assess financial stability pressures and calibrate a targeted policy response, we need to account for the heterogeneity in household finances. We segment households across several characteristics such as housing tenure, income distribution, and financial position. This allows to identify vulnerable households who may be at the risk of default and stretched consumers that may be forced to adjust their consumption to avoid breaching their budget constraint.

2. We combine two sources of micro data to create a rich dataset of households' financials. The 2020 EU Statistics on Income and Living Conditions (EU-SILC) micro data contains information on housing costs, households' financial stretch, and households' debt obligation status since 2004. The latest (2017) Household Finance and Consumption Survey (HFCS) provides granular data on households' balance sheets, payments, income, and consumption. We age forward the HFCS survey to end-2021 using a matching procedure targeting a range of aggregate statistics on household income, indebtedness, consumption, mortgage rates, and prices sourced from Eurostat and national central banks.¹ For Portugal, EU-SILC has around 30,000 households in 2020 (326,000 observations in 2004-20). The HFCS survey covers under 6,000 households. Annex 1 Table 1 shows data coverage for all countries included in the analysis.

3. To measure household vulnerability, we simulate the overburden rate of each household under each scenario.² Equations (1) and (2) show the channels through which macrofinancial shocks affect households' ability to fulfil their debt service obligations and afford essential consumption. DSTI stands for debt service to income ratio, and DSECTI for debt service and essential consumption to income ratio:

$$DSTI_{T,j}^h = \frac{\sum_{k=1}^N (P_{t,k}^h + O_{t,k}^h \cdot i_{t,k}^h) + \sum_{s=1}^M (O_{t,s}^h \cdot \Delta i_{T-t,j} | s = floating)}{I_t^h \cdot (1 + \Delta inc_{T-t,j}^h)} \quad (1)$$

¹ We extrapolate household income using the cumulative growth of gross disposable income per capita. The change in nominal debt at the household level is projected to match the aggregate path for gross debt-to-income ratios. For each household, the consumption of goods and services is scaled up to include durables, renovation, and insurance expenses linked to the country weights of the HICP index. The amount of consumption grows with real private consumption per capita at the country level. Changes in food and energy prices follow wholesale price developments, and interest payments for floating rate lows are adjusted to moves in benchmark curves.

² The income projection is performed at the aggregate country level. It is worth noting that, in 2022, changes in income were heterogeneous across income classes with lower income households experiencing relatively higher income growth due to a pickup in employment (concentrated in this income class), the increases in the minimum wage (rising faster than average wage growth), and a concentration of extraordinary support on vulnerable households.

$$DSECTI_{T,j}^h = DSTI_{T,j}^h + \frac{food_t^h \cdot (1 + \Delta food_{T-t,j}^h) + utilities_t^h \cdot (1 + \Delta energy_{T-t,j}^h) + rent_t^h \cdot (1 + \Delta inf_{T-t,j}^h)}{I_t^h \cdot (1 + \Delta inc_{T-t,j}^h)} \quad (2)$$

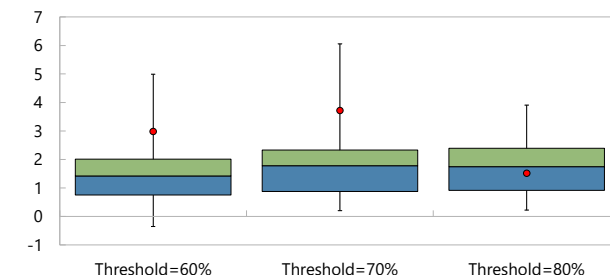
where I stands for household h gross household income, P is the principal repayment of outstanding loans, O is the amount of outstanding debt, i is the lending rate, N is the total number of loans, and M is the number of loans with interest rates to be re-set over the next two years. Rents are indexed to inflation. Projections are contingent on scenario $j \in \{1, \dots, 7\}$. The impact of shocks to interest rates (Δi), household income (Δinc), food ($\Delta food$), energy ($\Delta energy$), and inflation (Δinf) on debt servicing capacity is highly non-linear.³

A household is *financially vulnerable* if $DSECTI_{T,j}^h \geq 70\%$. This is the most significant threshold of mortgage default across countries. To allow benchmarking against estimates found in other studies, we also show results using the standard measure of default risk, i.e., $DSTI_{T,j}^h \geq 40\%$. For macroprudential policy purposes, we find that a DSTI ratio of 60 percent (defined on total household disposable income, rather than on gross income) is the most discriminatory limit for mortgage default in Portugal.

To assess the potential effect on consumption by stressed households, we identify a household as *economically vulnerable* if debt service and total consumption exceed gross income ($DSTCTI > 1$):

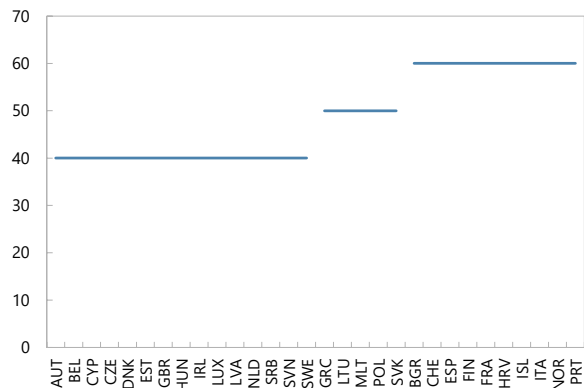
$$DSTCTI_{T,j}^h = DSECTI_{T,j}^h + \frac{other\ consumption_t^h \cdot (1 + \Delta other\ consumption_{T-t,j}^h)}{I_t^h \cdot (1 + \Delta inc_{T-t,j}^h)} \dots\dots\dots(3)$$

Est. Difference in Mortgage Loan PD by DSECTI Ratio Threshold (Percent)



Sources: EU-SILC microdata and IMF staff calculations. Note: The box plots show the country distributions for the estimated difference in the probability of mortgage loan default above and below various thresholds, based on country-level logit regressions controlling for household-level income and macroeconomic factors.

DSTI Threshold with Highest Sensitivity to Default Rate (Percent of household disposable income)



³ Household spending on food and utilities rises according to market prices; the quantity of food and energy remains constant over the forecasting horizon; and households do not adjust the composition of their consumption basket.

Annex II. Table 1. Portugal: Countries and Number of Households in Europe

ISO-Code	Country name	EU-SILC (latest year)
AUT	Austria	12,264
BEL	Belgium	16,074
BGR	Bulgaria	16,622
HRV	Croatia	18,731
CYP	Cyprus	10,945
CZE	Czech Republic	18,754
DNK	Denmark	13,467
EST	Estonia	15,108
FIN	Finland	22,692
FRA	France	21,926
DEU	Germany	
GRC	Greece	32,757
HUN	Hungary	13,035
ISL	Iceland	8,601
IRL	Ireland	10,683
ITA	Italy	43,099
LVA	Latvia	12,714
LTU	Lithuania	8,114
LUX	Luxembourg	7,218
MLT	Malta	9,552
NLD	Netherlands	28,516
NOR	Norway	14,306
POL	Poland	37,380
PRT	Portugal	27,695
ROU	Romania	16,861
SRB	Serbia	15,223

Source: Household Finance and Consumption Survey (HFCS), wave (latest) 2017; EU survey on income and living conditions (EU-SILC), 2020, (except for Iceland and United Kingdom 2019; Italy 2019); and IMF staff calculations. Only households for which income is positive are included. Household income includes employee income, self-employment income, pension income, income from financial assets, and income from unemployment benefit, social transfers, and private transfers. Simulations are performed on the 2017 HFCS data aged to 2021 using a matching procedure with aggregate statistics. Econometrics are conducted on the EU-SILC data over the period 2004-2020, including 9.4 million of observations.

Annex II. Table 2. Portugal: Cumulative Shocks in Europe by end 2023 (relative to 2021)

	Interest Rate (Percent)	Household Income^{1/} (Percent)	Food Price (Percent)	Energy Price (Percent)	Core Inflation (Percent)
Baseline (2022 October WEO)					
AE	2.42	13.68	7.56	84.72	10.50
PRT	2.42	17.88	7.56	84.72	9.49
Tightening (200bps)					
AE	4.42	13.68	7.56	84.72	10.50
PRT	4.42	17.88	7.56	84.72	9.49
Income (-10%)					
AE	2.42	2.32	7.56	84.72	10.50
PRT	2.42	6.09	7.56	84.72	9.49
Food & energy (20%)					
AE	2.42	13.68	29.07	121.67	10.50
PRT	2.42	17.88	29.07	121.67	9.49
Adverse (200bps; -10% income)					
AE	4.42	2.32	7.56	84.72	10.50
PRT	4.42	6.09	7.56	84.72	9.49
Cost of living (tightening; food & energy)					
AE	4.42	13.68	29.07	121.67	10.50
PRT	4.42	17.88	29.07	121.67	9.49

Source: October 2022 WEO; and IMF staff calculations.

1/Note that the income shock is relative to the baseline, implying, for Portugal, an income growth of 6 percent relative to initial conditions under the adverse scenario compared to nearly 18 percent under the baseline.

AE denotes advanced Europe (Euro Area) and includes Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Slovenia, and Slovakia. The WEO downside scenario considers a worsening of geopolitical developments accompanied by an increase in commodity prices, a sharper slowdown in the property sector in China, and lower potential output, relative to the WEO baseline.