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The Housing Net Worth Channel and the Public Finances: Evidence from a European Country Panel

David Cronin and Kieran McQuinn*

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Abstract

In the growing literature on the importance of household balance sheets to macroeconomic developments, the relationship between housing wealth and fiscal outturns needs consideration given the likely links between housing market developments and particular tax headings. We adopt the housing net worth model for this purpose. Using a panel dataset of 18 European countries over the period 1998 to 2017, we find changes in housing net worth having a significant impact on the primary budget balance, with increases (decreases) in housing net worth causing the budget balance to improve (dis-improve). Further support for the importance of this channel to the public finances arises by differentiating observations based on the amount of revenue raised under particular tax headings.

Keywords: Housing Wealth, House Prices, Government Budget Balance

JEL codes: E62, H31, G51

Declaration of interests: none

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1. Introduction

Over the past ten years or so, the relationship between household balance sheets, and in particular its housing component, and real economy variables has received considerable attention in the macroeconomics literature. Relatively few studies, however, have assessed the implications of housing developments' impact on public finance variables such as the government budget balance. Both direct and indirect linkages are likely to exist between household wealth and government budgets in a similar manner to those identified between those budgets and financial assets by Agnello *et al.* (2012). The housing component of household wealth can have direct effects on the public finances through a feed-through of housing wealth developments to taxation items such as property tax receipts and capital gains tax. Changes in housing wealth can also be expected to have an indirect influence on government revenues and expenditure through their impact on consumption and economic activity more generally, and associated tax headings.

These spheres of influence, and in particular indirect effects, tie in with the housing net wealth (HNW) channel that has been established as having a significant impact on macroeconomic variables in the US (principally by Mian *et al.* 2013, Mian and Sufi 2014, Mian *et al.* 2017, and Mian and Sufi 2018) and internationally (Cronin and McQuinn, 2021). The HNW channel literature shows that changes in housing net worth, which occur through a direct wealth effect arising from changes in house prices or borrowing constraints reflecting changed collateral values, are a determinant of economic activity and can cause variations in personal consumption expenditure and employment. It seems likely then that the channel would also have an influence on the public coffers through those variables' impact on tax receipts.

Against this background, we assess whether developments in the housing net worth channel have an effect on public finance outcomes, in particular the primary budget balance, using a cross-country panel of data of 18 European countries over the period 1998 to 2017. This is a period when there were unprecedented variations in house prices and credit levels across many western economies (see Dell'Ariccia *et al.*, 2020, and McQuinn, 2017) and considerable fluctuation in fiscal outcomes. The rest of the paper is laid out as follows: we first consider housing and credit developments across Europe over the past quarter century or so and how they may affect the public finances. We argue that the housing net worth channel methodology proposed by Atif Mian, Amir Sufi and co-authors can be used to examine the housing market-public finances relationship. We then outline the data used and the methodology employed to

examine the nature of the relationship. The empirical results indicate changes in housing net worth having a significant impact on the primary budget balance. Further support for this finding is obtained by differentiating between observations based on revenue gathered from particular headings.

2. Changes in housing net wealth and the public finances

The period from the mid-1990s to 2017 (the final year in the econometric dataset used here) saw substantial variations in household wealth and credit in an international context and particularly among European countries. De Bondt *et al.* (2020) highlight fluctuations in household net worth within the euro area over the period and argue that increased worth, particularly prior to 2007, mostly reflected a substantial rise in house prices. Credit provision has played a critical role in these shifts in household net worth in the euro area and in the wider European Union. In the run up to the financial crisis that took hold in 2008, EU countries witnessed a substantial expansion of credit with studies citing the adoption of the single currency as one of the main reasons for that increase. Le Leslé (2012) and McCarthy and McQuinn (2017) argue that while the gradual easing of regulatory controls within certain EU countries facilitated an increase in credit supply, the role of market innovations and, in particular, the onset of cross-border lending between credit institutions was also important.

During the late-2000s/early-2010s financial crisis, concerns arose about the sustainability of asset prices as private sector indebtedness increased sharply. Households' net worth declined at that time due to decreases in both financial and housing wealth. De Bondt *et al.* (2020) note that household net worth within the euro area has grown steadily since 2011, supported by the easing of monetary policy, improvements in the euro area economy and, ultimately, the increasing value of housing and financial sector assets.

Housing wealth is a substantial, and often the dominant, component of a country's household net wealth, with the provision of credit playing a critical role to its fluctuating value over time (Tsatsaronis and Zhu, 2004; Goodhart and Hofmann, 2008; Cheng *et al.* 2014; Favara and Imbs, 2015; Cerutti *et al.*, 2017).[1] House price shocks are an important contributor to macroeconomic fluctuations, while global supply-side shocks can affect house price

[1] By reference to financial liberation in Finland in the late 1980s, Oikarinen (2009) notes the tight connection between house prices and household borrowing and how greater availability of credit likely leads to a higher demand for housing, while house prices can influence household borrowing through various wealth effects. Such interaction can exacerbate boom-bust cycles and raise the fragility of the banking sector.

fluctuations (Beltratti and Morana, 2010). From a public finance perspective, it is important to assess how changes in housing variables affect fiscal outturns. The literature in this area is scant relative to assessing how variables like output growth influence the budget balance and it often focuses on periods when the credit dynamics outlined above were not prominent. Wolswijk (2010) provides a comprehensive overview of the relationship between public finances and housing markets. Observing that housing markets in Europe are predominantly national in nature, he indicates that volatility in those markets can have a disruptive effect on economic activity within countries via wealth effects and varying housing investment. Price and Dang (2011) and Price *et al.* (2014) note how asset and wealth effects are not usually considered in identifying the cyclical component of the budget balance and that asset price movements are often only partially related to the business cycle. Nevertheless, the effects of asset prices on the budget balance can be significant where indirect taxes on financial transactions are related to asset sales, including house sales, rather than output growth. These insights are shared by Liu *et al.* (2015). They show that asset price cycles exert a significant impact on government revenues even though they are not highly synchronised with the output cycle and find property prices to have a larger tax elasticity than stock prices. Likewise, Morris and Schuknecht (2007) identify the impact of asset prices, including house prices, as one of the "missing links" between budget balances and economic activity. In particular, unexpected windfall revenues can arise during upturns in asset markets. These effects arise across different tax categories, including income taxes, indirect taxes and corporation taxes.

Eshenbach and Schuknecht (2002) establish channels through which asset prices affect fiscal balances (via capital gains taxes, and via wealth effects on consumption and indirect taxes). Using OECD country data spanning from the mid-1960s through to 2000, they estimate that, on average, a 10-per cent change in real estate and stock prices has a similar effect on the budget balance as a one per cent change in output. Also using OECD country data, from 1970 to 2005, Tagkalakis (2011a) finds a one per cent increase in residential property prices causing government revenue volatility to rise by about 0.15-0.22 per cent. Tagkalakis (2011b) finds residential property prices having a larger effect on the primary budget balance than equity and commercial property prices. Morris and Schuknecht (2007) also find this to be the case. In examining the determinants of budget balances across a panel of OECD countries over a similar vintage to the two previously-mentioned studies, Tujula and Wolswijk (2007) observe asset price changes having only a limited impact.

Liu *et al.* (2015) draw attention to how temporary asset price movements can exert a large influence on fiscal outcomes, as was demonstrated during the Great Financial Crisis (GFC). This amounted to close to 3 per cent of GDP during the years preceding the GFC for countries experiencing house price booms (Ireland, Spain, the United States, the United Kingdom). Addison-Smyth and McQuinn (2010, 2016) find a substantial proportion of tax receipts in the Irish economy during its "Celtic Tiger" phase of the 2000s arising from dis-equilibrium in its housing market.

In this paper, we adopt a different methodological approach to those papers and use a more modern dataset, coincident with the use of a single currency in the euro area and the change in credit conditions outlined above. The methodology acknowledges the influence that fluctuations, often credit-driven, in housing wealth have on the wider economy and which has been modelled by Mian, Sufi and co-authors through a housing net worth (HNW) model (Mian *et al.*, 2013; Mian and Sufi, 2014; Mian and Sufi, 2017; and Mian and Sufi, 2018). A change-in-housing-net-worth variable, which captures both the change in house prices and housing's share of household net worth, is shown in those studies to have explanatory power over both consumption and employment variables. This variable is defined here as:

$$\Delta HNW_{i,t} = \frac{\Delta logHP_{i,t} * H_{i,t-1}}{NW_{i,t-1}} \qquad (1)$$

Where $\Delta HNW_{i,t}$ is the change in housing net worth in country i in year t, $\Delta logHP_{i,t}$ is the change in the natural log house price between $t-1$ and t, and H and NW are the value of dwellings and household net worth, respectively.

Mian *et al.* (2013) identify three means by which changes in housing net worth affect household spending: (i) a direct wealth effect; (ii) an indirect effect through the impact of the housing net worth shock on employment; and (iii) the impact of the shock on the collateral that households use to access credit to finance spending. These effects are found to be significant during the US housing collapse of 2006-9 and have also been shown to exercise influence on economic activity throughout the business cycle and across countries (Cronin and McQuinn, 2021).

Given that consumption and employment developments themselves will have an influence on tax revenue, it seems an obvious next step in the development of the HNW literature to assess the link between housing net worth and public finances outturns. In particular, if changes in housing net worth affect tax revenue then a link between that wealth variable and the government primary budget balance should be evident. We surmise that it will have an effect

on the public finances in a manner analogous to the above mechanisms, (i) and (ii), identified by Mian *et al.* (2013), namely through the direct wealth effect affecting property tax revenue and an indirect effect on direct taxes and indirect taxes through the channel's influence on economic activity. The HNW channel and its attendant modelling strategy thus seems like an apt mechanism for assessing how the housing market affects the budget balance.

Our modelling strategy then is in the vein of Mian *et al.* (2013) and Mian and Sufi (2014) where we regress the variable of interest – in this case, the primary budget balance - on the HNW variable in (1). To estimate the right-hand-side variable, $\Delta HNW_{i,t}$, we rely on a number of sources. The OECD provides data on household net worth, as a percentage of household disposable income, for the years 1995 up to, but not always including, 2019. The household net worth data represent the "total value of assets (financial as well as non-financial) minus the total value of outstanding liabilities of households (including non-profit institutions serving households)".[2] Non-financial assets take account of the value of dwellings but not any other non-financial assets, while financial assets and liabilities comprise currency and deposits; debt securities; loans; equity and investment fund shares/units; insurance, pensions and standardized guarantee schemes; financial derivatives and employee stock options; and other accounts receivable/payable. Net disposable income data (in own currency values) from the EU AMECO database are then used to convert the OECD household net worth data to nominal monetary values.[3] The OECD also provides the value of dwellings (item N1111; domestic currency) in the households-and-non-profit-institutions-serving-households sector of Table 9B (Balance Sheet for Non-Financial Assets – 2019 Archive) in its Annual National Accounts Archive.[4] These series extend up to 2016 or 2017 for the countries considered here. Housing's share of household net worth is then calculated as the ratio of nominal value of dwellings to the nominal value of household net worth.

The change in housing net worth variable in year t is the product of this housing share variable in year $t-1$ and the change in the natural logs of house prices between $t-1$ and t. House price data are sourced from the Bank of International Settlements database on international house prices.[5] Those data are less extensive in coverage than the OECD net worth and

[2] Household net worth, as a percentage of net disposable income, is sourced from https://data.oecd.org/hha/household-net-worth.htm.

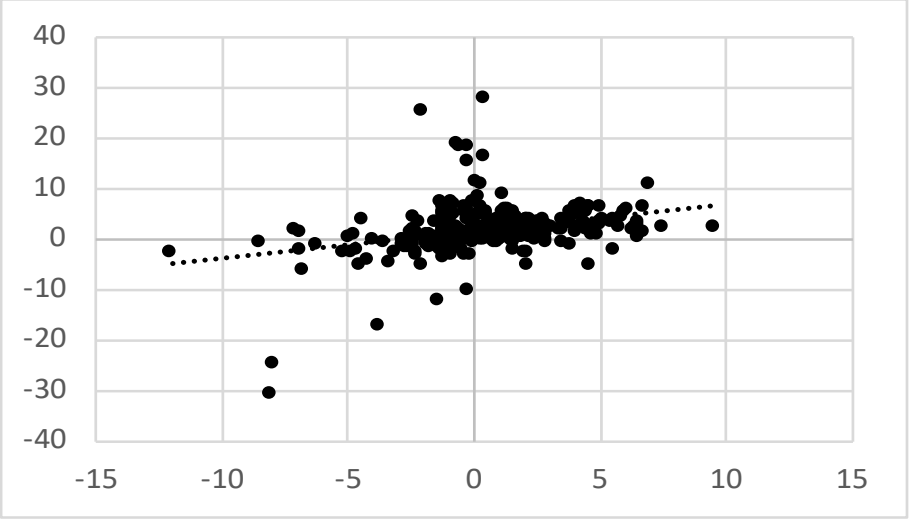
[3] See https://ec.europa.eu/economy_finance/ameco/user/serie/SelectSerie.cfm.

[4] See https://stats.oecd.org/Index.aspx?datasetcode=SNA_TABLE9B_ARCHIVE#.

[5] See https://www.bis.org/statistics/pp_detailed.htm?m=6%7C288%7C593.

dwellings series and so the resulting panel of the change in housing net worth observations is unbalanced in the time series components for each country. For the left-hand-side variable, the General Government primary budget balance expressed as a percentage of GDP (*GPBB*) is a standard measure of net lending within European countries with a positive value indicating the budget balance being in surplus and a negative value it being in deficit.[6] Figure 1 provides a scatter-plot of it and the change-in-HNW variable (expressed in percentage points) for the 18 European countries used here over the period 1998-2017.[7] The fitted trend line suggests a positive relationship between the two, which is as one would expect with better housing market performance being associated with stronger budget outturns.

Figure 1. Scatter plot of change-in-HNW and GPBB variables for 18 European countries, 1998-2017 (unbalanced, %)



Note: the horizontal axis shows the range of values of the GPBB, while the vertical axis shows the range of the change-in-HNW variable. Number of observations: 281.

3. Econometric results

(i) Baseline results

Against this background, we set out here to assess the effects of changes in housing net wealth on the General Government primary balance across 18 European countries for the years 1998 to 2017. Our basic regression is:

[6] The General Government primary budget balance and output gap (mentioned below) data are both sourced from the EU AMECO database.

[7] Those eighteen countries are Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Hungary, Italy, Latvia, Lithuania, Luxembourg, the Netherlands, Poland, Portugal, Slovakia, Slovenia, Sweden. The panel of data is unbalanced as there are not observations for all countries between 1998 and 2017. Further specifics on the data sample are included in the appendix.

$$GPBB_{i,t} = \alpha_i + \beta \Delta HNW_{i,t} + \theta ygap_{i,t} + \varepsilon_{i,t} \qquad (2)$$

Where $GPBB$ is the General Government primary budget balance, expressed as a percentage of GDP, ΔHNW is as defined previously, $ygap$ is the output gap, α_i and β are coefficients to be estimated (α has the subscript i as we allow for country-specific intercept terms in the panel regressions) and ε is an error term. The output gap is included as it captures both the automatic stabilisers and the discretionary policy response to the economic cycle (Tagkalakis, 2011b). The estimated β coefficient provides a measure of the sensitivity of the $GPBB$ to changes in housing net wealth.

The results of a panel fixed-effects (FE) model estimation of (2) is provided in column (i) of Table 1.[8] The highly-significant β coefficient has a value of 0.075 indicating that a one per cent increase (decrease) in the housing net worth variable improves (disimproves) the primary budget balance by just less than one tenth of one per cent of GDP. The coefficient on the output gap variable is 0.418, broadly in line with Larch and Turrini's (2010) measure of the average sensitivity of the budget balance to the output gap for the EU27 group. Given that outlier values seem to arise among the panel data, as indicated by the scatter plot of Figure 1, the results of a weighted least squares estimation (WLS), which "down-weights" observations with a high residual variance, of (2) is reported in column (ii).[9]

In column (iii) of Table 1, we estimate (2) using the Arellano-Bover/Blundell-Bond (Arellano and Bover, 1995; Blundell and Bond, 1998) dynamic panel model to address any endogeneity that might arise between contemporaneous values of ΔHNW and $GPBB$, an issue that has also been identified as a potential concern between personal consumption growth and ΔHNW (see Cronin and McQuinn, 2021). This model, which builds on Arellano and Bond (1991), is designed to address endogeneity issues by adopting instrumental variable estimation. In the Arellano-Bond (1991) approach, a first difference of the regression equation is used to eliminate the fixed effects and further lags of the dependent variable are used as instruments for differenced lags of the dependent variable (which are endogenous). The Arellano-Bover/Blundell-Bond model augments the Arellano-Bond (1991) by making an additional

[8] F-tests of the joint significance of the fixed effects are reported at the bottom of each column. The *p*-values reported in the tables strongly reject the null hypothesis that the cross-section effects are redundant throughout.

[9] The weighting uses the residual variances from the initial panel data estimator and a robust errors estimator that computes regression standard errors and covariance matrix allowing for heteroscedasticity. See Leamer (2010) and Romano and Wolf (2017) for more on applying weighted least squares.

assumption that first differences of the instrumental variables are uncorrelated with the fixed effects. The estimates of the coefficient on the $\Delta HNW_{i,t}$ variable in column (iii) only differs marginally from those in (i) and (ii).

The $\Delta logHP$ component of the ΔHNW regressor is used as the regressor in column (iv) of Table 1.[10] It has a lower coefficient value of 0.059, reflecting the housing share of net worth being less than unity and, accordingly, the elasticity with respect to house prices being smaller than the elasticities in the other columns.

Table 1. Panel Data Model: 1998-2017

Dependent variable: $GPBB_{i,t}$	(i)	(ii)	(iii)	(iv)
N	281	281	281	281
Countries	18	18	18	18
Estimation method	FE	WLS	DPD	FE
$\Delta HNW_{i,t}$	0.075 (2.686)	0.075 (3.098)	0.081 (4.000)	
$\Delta lHP_{i,t}$				0.059 (3.387)
$ygap_{i,t}$	0.418 (8.525)	0.418 (7.547)	0.337 (8.670)	0.396 (8.038)
Adj. R-square	0.571	0.571		0. 578
Fixed effects test (Prob.)	0.000	0.000	0.000	0.000

Note: t-statistics in brackets, DPD refers to the Arellano-Bover/Blundell-Bond model.

In Table 2, as a further robustness check, we present the results for (2) when a lagged dependent variable is included in the case of the models estimated in (i), (ii) and (iv) above.[11] By comparison with the results in Table 1, the addition of the lagged dependent variable has little impact on the coefficients of ΔHNW_{it} and ΔlHP_{it}, with both being only marginally smaller.

[10] This specification is somewhat similar to that of Addison-Smyth and McQuinn (2010, 2016) who examined the role played by changes in Irish house prices on different Government taxation aggregates.

[11] Being a dynamic panel model, the Arellano-Bover/Blundell-Bond model already has a lagged dependent variable in the specification.

Table 2. Panel Data Model with Lagged Dependent Variable: 1998-2017

Dependent variable: $GPBB_{i,t}$	(i)	(ii)	(iii)
N	281	281	281
Countries	18	18	18
Estimation Method	FE	WLS	FE
$\Delta HNW_{i,t}$	0.069 (2.906)	0.069 (2.744)	
$\Delta lHP_{i,t}$			0.050 (3.392)
$GPBB_{i,t-1}$	0.489 (10.121)	0.489 (7.364)	0.483 (10.042)
$ygap_{i,t}$	0.235 (5.191)	0.235 (3.729)	0.224 (4.935)
Adj. R-square	0.691	0.691	0.694
Fixed effects test (Prob.)	0.000	0.000	0.000

Note: t-statistics in brackets

(ii) Do variations in tax rates matter to the impact of the HNW channel?

We next assess whether higher or lower tax rates on the relevant tax headings matter to the influence the HNW channel has on the primary budget balance, with the expectation that a higher rate leads to a larger fiscal impact of a given change in housing net worth. To that end, we consider the property tax, direct tax on income, and indirect tax headings, availing of internationally-comparable tax revenue data published by, and based on the well-established methodology of, the OECD Revenue Statistics (OECD, 2020) to do so. This data source provides government taxation receipts by type of tax in national currency, as a percentage of GDP.[12] The property tax item includes recurrent taxes on immovable property, households' recurrent taxes on immovable property and other-than-household recurrent taxes on immovable property. For income tax, we take the heading "income, profit and capital gains", while for indirect tax we use the "taxes on goods and services" category. Data are available for 37

[12] We use these tax revenues as a percentage of GDP as a proxy for the particular tax rates that arise in each country for each relevant tax heading.

OECD economies, including the 18 countries under study here, on an annual basis from 1990 onwards.

These data allow us to consider whether differences in tax rates across countries have implications for the impact of the housing net worth channel on the public finances. If a country's exchequer raises more property-related tax than another, for example, we would expect this to lead to a given change in housing net worth having a greater impact on the budget balance. Table 3 summarises the average tax take for the three different taxation categories in each country considered here, with the average over the sample period 1998–2017 expressed as a percentage of GDP. The table entries indicate that there is significant variation across countries in the contribution that property tax and income tax make to the exchequer but that is less so the case for tax on goods and services.

Figure 2 illustrates the average variation in the different sources of taxation revenue over time through a plot of the coefficient of variation. That coefficient is a standard measure of variation for a series where the cross-sectional standard deviation for a series in each year is divided by the mean for that year. Plotting the variation over time provides an indication as to whether there has been significant deviation across the countries, on average, for the period in question. The graph shows that there has been significant variation in the property tax and income tax categories across countries over the period, while taxes on goods and services exhibit less variability. We now look to include the variation in the taxation items in our empirical specifications.

To do so, we specify a dummy variable, for example in the case of property tax, $DV_{i,t}^{P}$. This dummy variable for country i in year t has a value of one if its property taxation revenue, as a percentage of GDP, is above the sample mean in the given year and has a value of zero otherwise. We then interact the dummy with the $\Delta HNW_{i,t}$ variable. This leads to the following model:

$$GPBB_{i,t} = \alpha_i + \eta\, \Delta HNW_{i,t} + \delta_p(DV_{i,t}^{P} * \Delta HNW_{i,t}) + \theta ygap_{i,t} + \varepsilon_{i,t} \quad (3)$$

Accordingly, a significant, positive δ_p coefficient would indicate that a positive (negative) housing net worth shock in a high property tax regime has a more beneficial (adverse) effect on the primary budget balance. Separately, we also specify dummy variable values based on the same principle for the other two tax categories, taxes on income, profits and capital gains,

and taxes on goods and services, as $DV_{i,t}^{D}$ and $DV_{i,t}^{I}$, respectively, defined in the same way as the dummy variable for property tax. These then result in two further regressions for estimation:

$$GPBB_{i,t} = \alpha_i + \eta\Delta HNW_{i,t} + \delta_D(DV_{i,t}^{D} * \Delta HNW_{i,t}) + \theta ygap_{i,t} + \varepsilon_{i,t} \quad (4)$$

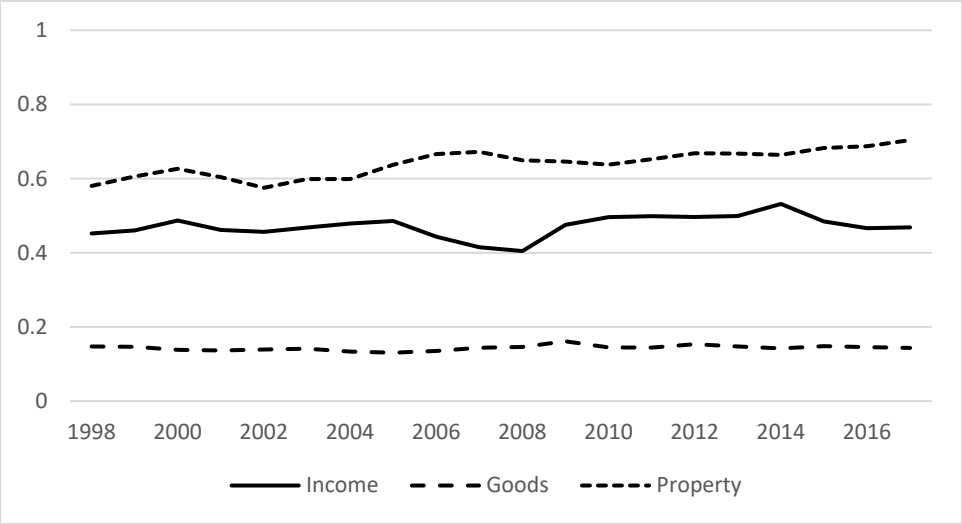
$$GPBB_{i,t} = \alpha_i + \eta\Delta HNW_{i,t} + \delta_I(DV_{i,t}^{I} * \Delta HNW_{i,t}) + \theta ygap_{i,t} + \varepsilon_{i,t} \quad (5)$$

Table 3. Taxation Revenue Headings as a % of GDP (1998 – 2017 average)

Country	(i) Property Tax	(ii) Taxes on income, profit and capital gains	(iii) Taxes on goods and services
Austria	0.6	12.1	12.0
Belgium	2.8	16.0	11.1
Czech Republic	0.4	7.6	10.8
Denmark	1.8	28.5	15.5
Finland	1.2	16.0	13.6
France	3.6	10.3	11.3
Germany	0.9	10.7	10.5
Hungary	0.9	8.4	15.5
Italy	2.3	13.5	11.1
Latvia	1.0	7.5	11.8
Lithuania	0.4	7.0	11.6
Luxembourg	3.1	13.3	10.2
The Netherlands	1.6	9.7	11.2
Poland	1.1	6.8	12.3
Portugal	1.4	8.9	13.1
Slovakia	0.5	6.5	11.5
Slovenia	0.6	7.3	13.9
Sweden	1.2	16.7	12.3

Source: OECD. See https://stats.oecd.org/Index.aspx?DataSetCode=RS_GBL for more details.

Figure 2. Coefficient of Variation for Different Taxation Categories: 1998-2017



Source: OECD. See https://stats.oecd.org/Index.aspx?DataSetCode=RS_GBL for more details.

The results of estimating these three regressions are shown in column (i), (ii) and (iii) of Table 4, respectively.

The significant positive δ_p coefficient in column (i) of Table 4 indicates that for observations where property taxation (as a percentage of GDP) is greater than the average for that year, the housing net worth channel has a larger impact on the GPBB.[13] In other words, when higher levels of property taxation arise, the impact of changes in housing net worth on the public finances of a country are accentuated. Likewise, column (ii) indicates a positive coefficient on δ_D, which is significant at the one per cent significance level. For indirect taxes, the coefficient on δ_I is insignificant in column (iii). This may reflect the relatively low coefficient of variation in this tax category, as displayed in Figure 2. Consequently, the data indicate that observations marked by relatively high property tax and income tax rates have budget balance outcomes that are more sensitive to housing net worth shocks but that this does not hold for taxes on goods and services.[14]

[13] The regressions in Table 4 were also estimated by weighted least squares with no material differences in the results arising.
[14] High-tax observations are predominantly associated with western European countries rather than central or European countries, pointing to the HNW channel being more influential on budget outturns in 'old' Europe.

Table 4. Panel Data Model with Interactive Dummies: 1998 -2017

Dependent variable: $GPBB_{i,t}$	(i) Taxes on property	(ii) Taxes on income, profits and capital gains	(iii) Taxes on goods and services
N	281	281	281
Countries	18	18	18
Estimation method	FE	FE	FE
$\Delta HNW_{i,t}$	0.064 (2.168)	0.059 (2.0477)	0.054 (1.636)
$DV_{i,t}^{P} * \Delta HNW_{i,t}$	0.151 (2.029)		
$DV_{i,t}^{D} * \Delta HNW_{i,t}$		0.228 (2.657)	
$DV_{i,t}^{I} * \Delta HNW_{i,t}$			0.079 (1.458)
$ygap_{i,t}$	0.415 (8.344)	0.423 (8.589)	0.434 (8.678)
Adj. R-square	0.584	0.589	0.581
Fixed effects test (Prob.)	0.000	0.000	0.000

Note: t-statistics in brackets

4. Conclusion

The past quarter of a century or so has seen substantial changes to household balance sheets arising over time across many western economies. Significant variations in the provision of credit in those countries, along with developments in the real economy, have contributed to large fluctuations in house prices and housing wealth, a major component of household net worth. This has been particularly the case in Europe, where the adoption of the single currency in 1999 led to sizeable transfers of credit across national borders. Given these developments, it is important to assess what impact variations in housing net wealth have had on the public finances in European countries since the late 1990s.

In this paper, using an 18-country European panel spanning the period 1996 to 2017 and the Mian-Sufi approach to assessing the influence of the housing net worth channel, we find a

robust, positive relationship between shocks to housing net worth and the primary budget balance. A ten per cent increase/decrease in housing net wealth causes the primary balance to rise/fall by just under one percentage point. We also find that if a country has a relatively high property tax rate, this adds to the impact of the household net worth channel on the budget balance. This result also holds for taxes on income, profits and capital gains, but not for taxes on goods and services.

These findings illustrate the relevance of fluctuations in housing wealth to fiscal performance. Since those wealth variations are often linked to credit developments, it underscores, as recently outlined in Dell'Ariccia *et al.* (2020), the dangers of credit-led economic growth that results in unsustainable growth in household balance sheets. To date, much of the literature has focussed on the financial stability implications of such developments. However, the results presented here also highlight the dangers to the public finances of a reliance on the housing market for revenue. Were a situation to arise, as was the case for some European countries in the run-up to the late-2000s financial crisis, that housing market developments were to become unsustainable than a subsequent correction in house prices and/or a sharp contraction in household credit, would, amongst other issues, pose difficulties for countries' fiscal performance.

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Appendix. Data Coverage

Table A1. Data coverage for each country

Total observations (N)	281
Austria	2001-2017
Belgium	1998-2016
Czechia	2009-2017
Denmark	1998-2017
Finland	1998-2016
France	1998-2017
Germany	1998-2017
Hungary	2008-2016
Italy	1998-2016
Latvia	2007-2015
Lithuania	1999-2016
Luxembourg	2000-2015
The Netherlands	1998-2017
Poland	2007-2015
Portugal	2009-2016
Slovenia	1998-2016
Slovakia	2007-2016
Sweden	1998-2017