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Working Paper No. 709

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Labour market fluctuations and the housing net worth channel in the EU

David Cronin and Kieran McQuinn*

Abstract:

The credit-driven housing net worth channel has been identified as a determinant of the sharp drop in US employment between 2007 and 2009. We examine the impact of this channel on the labour market in Europe using panel data for 20 countries covering the period 1996 to 2017. This period saw substantial changes in both credit provision and labour market performance in the EU. While some of our results are similar to those found in analysis of the US labour market, there are also important differences. For the full panel, we find changes in housing net worth having a significant effect on total employment and its non-traded and traded sector components, with a larger effect in the non-traded sector. Further estimations show that these significant effects on employment pertain to the post-2007 era when credit conditions were considerably more restrictive. In contrast to the US evidence, we find significant wage responses to housing net worth shocks arising in the EU.

Keywords: Housing Net Wealth, Employment, Wages.

JEL codes: E24, E32, E51.

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1. Introduction

The credit-driven housing net worth channel is established as having a significant impact on macroeconomic and labour variables in the US and internationally (Mian *et al.* (2013), Mian and Sufi (2014), Mian and Sufi (2017), and Mian and Sufi (2018)). As postulated in those contributions, changes in housing net worth, that occur through a direct wealth effect arising from a fall in house prices or tighter borrowing constraints reflecting lower collateral values, are a driver of economic activity and, in the case of labour markets, cause a decline in employment. The channel primarily operates through household behaviour. The basic contention is that when households (i.e., homeowners) are highly leveraged, any reduction in house prices causes a fall in their consumption expenditure and that then feeds through into labour markets and the wider economy. The most high-profile empirical assessments of the channel have been conducted on US data.¹

In relation to labour markets, Mian and Sufi (2014) contend that the deterioration in household balance sheets was critical to the decline in US employment over the period 2007–2009. At that time, a sharp fall in the net wealth of households suppressed their consumption expenditure through direct wealth effects and tighter borrowing constraints driven by the decrease in collateral value available to them. Mian and Sufi’s research shows that this had a significant effect on the US labour market; in particular, counties with larger falls in housing net worth saw a bigger decline in non-traded employment.

In this paper, we use a measure of changes in housing net worth, calculated using OECD and EU AMECO data, to assess the validity of the channel across 20 EU countries over the period from 1996 to 2017 (the final year for which data for calculation of the change in housing net worth are available). In particular, the net worth data are used to explain labour market developments in this block of countries, i.e. to assess the role and significance of the channel in shaping employment and wage developments. While Mian and Sufi conceive of the housing net worth channel as an influence on economic activity during a downturn in the housing market and wider economy, the panel and the time period covered here allows us to assess the relevance of the housing net worth variable in Europe during different economic and credit circumstances. That includes a situation of favourable credit conditions (1996-2007), a severe

¹ Using a 22-country OECD panel, Cronin and McQuinn (2021) confirm the relevance of the housing net worth channel to consumption beyond the United States.

downturn (2008-2011), and a mild economic recovery (2012-2017). The period 2008-2011 saw a sharp reduction in housing wealth in Europe, providing a specific sample comparable to that studied by Mian and Sufi (2014) for the US.²

Following a period of financial liberalisation in national and global financial markets during the 1980s and 1990s, the introduction of the euro in 1999 was a pivotal moment in the provision of credit to households (and the public more generally) in Europe. Euro area member states, and other EU member states, initially saw an elevated provision of lending by financial institutions in the years after the adoption of the single currency, with monetary union facilitating greater cross-member state lending by financial institutions. The Great Financial Crisis (GFC) that took effect in 2008 and the European sovereign bond crisis of 2009-11 that followed, however, led to a sharp reduction in credit provided to households. Simultaneously, EU countries saw substantial changes to their labour markets with the relatively low unemployment rates observed through the late 1990s and early-to-mid 2000s giving way to considerable increases in unemployment. After 2011, while European economies returned to more normal economic activity, some of the effects of the 2008-2011 period of crisis persisted with further deleveraging of household and bank balance sheets occurring.

While the results reported below are similar in some respects to those found by Mian and Sufi (2014) for the US, there are also notable differences. For the sample period as a whole, the credit-driven housing demand channel has a significant impact on total employment. The channel also operates through both the tradable and non-tradable sectors of the economy with a larger effect observed in the latter. This stands in contrast to Mian and Sufi's (2014) empirical finding that the effects of the channel occur in the non-traded component of the US economy only, but it is not out of line with their view that the effects of the channel can occur in both sectors with the greater impact arising in the non-traded sector.

We then break up the dataset into three sub-samples (1996-2007, 2008-2011, 2012-2017) on the basis of a consideration of how credit conditions in the EU developed over time. The econometric results indicate that the channel did not have a significant effect on employment in 1996-2007 when credit conditions were loose. In contrast, the channel does affect employment adversely during the severe downturn of 2008-2011 and the recovery period

² A significant literature exists examining the relationship between housing markets, credit provision and the real economy across countries. Examples include but are not confined to Kishor and Marfatia (2017), Goodhart and Hofmann (2008), Aron, Duca, Muellbauer, Murata and Murphy (2010) and Musso, Neri and Livio (2011).

between 2012 and 2017 when credit supply was constrained. Consequently, the channel operates in the EU on the downside of the economic and credit cycle in affecting employment, as Mian and Sufi (2014) report for the US, but does not have an impact during a period of strong credit growth and buoyant economic conditions.

In the later part of the paper, we consider how the housing net worth channel affects wage developments. If the channel was not affecting employment during an economic upswing then it is possible that it could be have been having an effect on wages instead. We find that this is indeed the case during the 1996-2007 period with a positive relationship arising between the change in overall nominal compensation of employees and the change in housing net worth. During the severe downturn of 2008-2011, both wages and employment are adversely affected by the negative changes in net worth that were prevalent at that time. Since 2012, the channel does not have a significant effect on compensation of employees.

The rest of the paper is structured as follows. The next section considers how credit conditions, which affect housing net worth, developed and changed in the EU over the period 1996 to 2017 is considered. Section 3 then describes the data used in the econometric analysis. In section 4, the effects of the housing net wealth channel on employment are presented and discussed. Section 5 considers how the channel operated on wage developments over the sample period. Section 6 concludes by drawing together the import of the results presented in the paper.

2. *Changing credit provision and the household demand channel*

The credit-driven household demand channel, as outlined by Mian and Sufi (2018), has the principal characteristic that an expansion in credit supply results in a boom-bust cycle in both household debt and economic activity, with a large accumulation of household debt in the pre-recession period being followed by a collapse in asset prices and consumption. Greater credit provision affects the real economy through an increase in household debt, as opposed to a rise in the productive capacity of firms. The downturn in economic activity that follows initially occurs through a fall in household demand and is then exacerbated by “nominal rigidities, constraints on monetary policy, banking sector disruptions and legacy distortions from the boom” (Mian and Sufi (2018, p. 32)).

The financial crisis of 2007/08 led to a refinement of research in this area with a growing interest not just in the impact changes in total household wealth on consumption but in the role played by household debt and net wealth in that relationship. Dynan (2012), Christelis *et al.*

(2015), Le Blanc and Lydon (2019), and Baker (2018) note that differences in indebtedness across households or regions can lead to variations in the relationship between consumption and wealth shocks. On the other hand, Kaplan *et al.* (2020a) argue that, after controlling for the drop in house prices, a relatively minor, independent effect of initial housing exposure and initial leverage is found on non-durable expenditure.

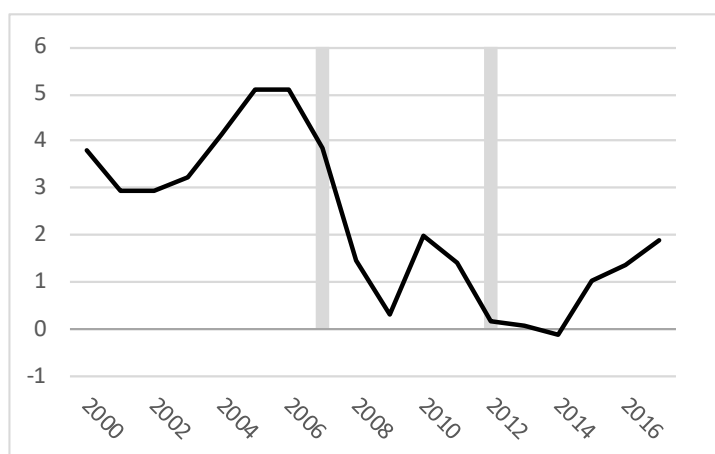
Whilst a boom and bust in credit expansion over the period 1996–2017 arose internationally, the case of European countries stands out. Prior to the introduction of the euro, those countries had seen changes in how credit is provided to households and other sectors of the economy. International financial markets had been the subject of substantial liberalisation and heightened competition through the 1980s and 1990s that had the effect of easing the liquidity constraints facing households (Boone *et al.*, 2001). These changes in financial markets included the removal of credit ceilings, interest rate deregulation, and the taking away of barriers to competition among credit institutions. There were also financial innovations in banking (e.g., securitisation) and important policy initiatives (e.g., the Second Banking Directive in EU countries) at that time.

The origination and introduction of the single currency in the late 1990s added to the extension of credit to EU households with Mian *et al.* (2017) citing the introduction of the euro as a positive credit supply shock in Europe. A number of factors help explain the impact of the single currency on credit conditions. Le Leslé (2012) and McCarthy and McQuinn (2017)) argue that fewer regulatory controls, market innovations and, in particular, the onset of cross-border lending between credit institutions had a substantial effect on credit provision. A deeper and more integrated bond market after 1999 improved the funding choices of European financial institutions by allowing the use of more market-based capital structures, thereby, enabling institutions with a surplus of funds to lend to those in deficit. The euro is also one of the reasons why European financial institutions tend to be more procyclical in their loan-loss provisioning compared to institutions in other developed countries (Huizinga and Laeven, 2019). The single currency also limits potential real exchange rate adjustment in euro area member states, removing a stabilising influence on credit conditions in the face of output shocks. Huizinga and Laeven (2019) conclude that the sensitivity of provisioning to output growth has significant implications for bank lending in Europe, as they find that loan growth is positively related to bank capitalization and negatively to loan-loss reserves. Against this

background, EU countries, both within the euro area and those outside of it, operate in credit markets that are sensitive to financial and economic shocks.

Antoshin *et al.* (2017) provide an in-depth study and chronology of the relationship between credit growth and economic developments in Europe since the introduction of the euro. They subdivide the period 1999 to 2017 into three distinct phases: gradual acceleration and boom (1999–08), bust (2009–11), and a sluggish recovery (2012–17). They conclude that almost a decade after the Great Financial Crisis took hold in 2008, bank lending and economic activity in Europe had only partially recovered with restricted credit flows being the norm in 2017. This, in large part, reflects recovery from boom-bust episodes originating in financial market developments being weaker and more prolonged than other upturns. This was common to both advanced euro area countries and advanced non-euro-area member states.³ This chronology informs the breakdown of our full sample of data into three sub-samples for the regression analysis reported in sections 4 and 5 below.

Figure 1. Loans to euro area households (as a percentage of GDP)



Source: European Central Bank (ECB) and European Commission.

Note: the shaded bars indicate the breakdown of the sample into 2000-2007, 2008-2011, and 2012-2017 sub-periods.

Developments in the extension of euro area credit to households can be illustrated further through Figure 1, which covers the period 2000 to 2017. The chart plots the total amount of loans extended within the euro area to households as a percentage of euro area GDP each year.

³ Everaert *et al.* (2015) document how the credit boom-bust that occurred in the euro area also occurred in Central, Eastern, and Southeastern Europe (CESEE). Credit expanded strongly in that bloc of countries between 2003 and 2008 in the context of convergence towards, and integration with, the rest of Europe. Credit growth then paused or became negative with the ratio of credit to GDP remaining broadly unchanged between 2009 and 2012 with households over-indebted and banks exercising tighter lending policies.

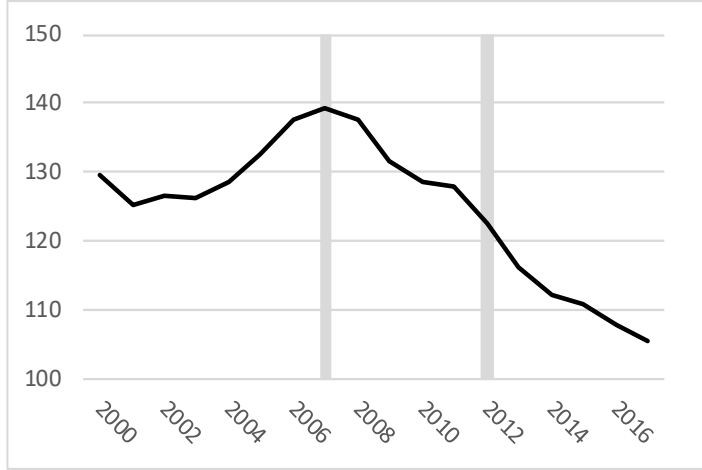
From the chart, three different sub-periods of credit extension are apparent. The initial phase 2000–2007 witnessed strong growth in credit extension to the household sector, with annual growth rates of close to or above 3 per cent. The second period, 2008–2011, was one of low or stagnant loan growth to households. The subsequent post-crisis recovery period of 2012–2017 initially saw no new loan growth. A pickup did subsequently occur, but not at pre-2008 rates.

For the initial phase (1996-2007) in the credit cycle considered here, the sustained increase in lending was not accompanied by an increase in traditional deposits. Instead, the growing gap between loans and deposits was financed by banks by an increased use of market-based funding in the form of debt securities and borrowing on the money market. To illustrate this, Figure 2 plots the ratio of total loans to total deposits of euro area households and non-financial corporations (NFCs) over the period from 2000 to 2017. A clear wedge emerges between deposits and loans over time with the ratio rising from just over 125 per cent in 2000 to almost 140 per cent by end-2007. Within the euro area, the abolition of exchange rate risk between countries greatly facilitated the use of wholesale funding across member countries. This resulted in a growing gap between traditional deposits and total lending. The emergence of the gap between traditional deposits and credit rendered many European financial institutions, as well as households and firms, particularly vulnerable to the impact of the Great Financial Crisis that took effect in 2007/8 and precipitated a significant degree of deleveraging across the European financial system over the period 2008-2011. As Figure 2 shows, the loan-to-deposit ratio declined in the years after 2007 and had a value of 105 per cent by 2017. The adverse effect on European credit provision during those years is noted by Feyen *et al.* (2012), Giannetti and Laeven, (2012), Altavilla *et al.* (2015) and Acharya *et al.* (2018).

The nexus between the banking and sovereign sectors in many euro area member states prolonged the impact of the initial financial shock, with the cost of financial support provided to banks by state authorities and the effects of the crisis on the sustainability of the public finances causing severe disruption in European sovereign bond markets. The impact of the financial crisis on European economies culminated with countries such as Greece and Portugal entering official support programmes in 2011. The scale of financial distress prior to 2012 inevitably had consequences for the recovery period in the euro area and the EU more generally thereafter. As noted in Antoshin *et al.* (2017), bank lending in Europe after the financial crisis

has been subdued, and they contend that much of the economic recovery experienced by European countries after 2012 were “credit-less” in nature.⁴

Figure 2. Loan to deposit ratio for euro area households and NFCs (%)



Source: European Central Bank (ECB)

Note: Entries are end-year values. The shaded bars indicate the breakdown of the sample into 2000-2007, 2008-2011, and 2012-2017 sub-periods.

3. *Data and methodology*

There have been significant fluctuations in the credit extended to households across European countries over the period 1996 to 2017, which beggars an assessment of the relationship between European labour markets and the housing net worth channel over this period. The severe financial sector-driven downturn in the European economy between 2008 and 2011 provides a similar basis for assessing the effect of the channel on employment and wages as that of Mian and Sufi’s (2014) study of the 2007-2009 US recession. The other sub-periods of 1996-2007 and 2012-2017 provide data to see the effect housing net worth has on the labour market in different economic circumstances.

Following Mian-Sufi (2014), the basic regression specification used below is:

$$\Delta \ln E_{i,t}^S = \alpha_i + \delta \Delta HNW_{i,t} + \varepsilon_{i,t} \quad (1)$$

Where $\Delta \ln E_{i,t}^S$ is the change in the natural log of employment in sector S of country i in year t , $\Delta HNW_{i,t}$ is the change in housing net wealth in country i in year t , α_i and δ are coefficients (α has the subscript i as we allow for country-specific intercept terms in the panel regressions)

⁴ The term “credit-less” recovery is attributed to Calvo *et al.* (2006a, 2006b) and Claessens *et al.* (2009).

and ε is an error term. As well as considering total employment, we also consider employment in its traded and non-traded sectors.

One issue, which has been cited in the application of the Mian and Sufi framework is their use of expensive and hard-to-access proprietary data. This, inevitably, poses difficulties in replicating their empirical results. Therefore, along with Kaplan *et al.* (2020a), we regard our application as also serving as a robustness check on their findings as all of our data are available from official sources.⁵

The annual change in housing net wealth, $\Delta HNW_{i,t}$, is the product of the change in the natural logs of house prices between years $t - 1$ and t for country i and the ratio of the value of dwellings to the value of household total net worth in year $t - 1$ for country i . The OECD provides, on an annual basis, measures of household net worth as a percentage of net disposable income.⁶ The coverage is for the years between 1995 and 2017, although data are not available for all years for each country. This timeframe then dictates the overall sample size employed in the regression analysis. Household total net worth is measured by the OECD as “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)”.⁷ Net disposable income from the EU AMECO database is used to convert household net worth from a percentage of net disposable income to a domestic currency measure.⁸ The value of dwellings, which is measured in domestic currency, is sourced as series N1111 from Table 9b (“Balance sheets for non-financial assets, 2019 archive”) of the OECD Financial Accounts Archive.⁹

The ratio of the value of dwellings to that of household total net worth then follows. The change in housing net wealth variable (ΔHNW_t) is then calculated by multiplying this ratio for year $t - 1$ by the change in the natural logs of house prices between years $t - 1$ and t . The house price series is compiled from two sources: house price levels for a particular year are

⁵ The use of country-level data may mask the type of geographical differences within individual countries that Mian and Sufi consider in their US studies of the housing net worth channel. By the same token, however, there is a heterogeneity of market and institutional differences between countries in the sample here.

⁶ Source: <https://data.oecd.org/hha/household-net-worth.htm>.

⁷ It also notes that the financial assets and liabilities included are: “currency and deposits; debt securities; loans; equity and investment fund shares/units; insurance, pensions and standardised guarantee schemes; financial derivatives and employee stock options; and other accounts receivable/payable.”

⁸ https://ec.europa.eu/economy_finance/ameco/user/serie/SelectSerie.cfm

⁹ https://stats.oecd.org/Index.aspx?datasetcode=SNA_TABLE9B_ARCHIVE#.

taken from Bricongne *et al.* (2019) and observations for the remaining years are generated from the cross-country house price indices of Mack and Martínez-García (2011).^{10 11} House price coverage is not as extensive as for the dwellings-to-household total net worth ratio and, consequently, it dictates the country coverage of the ΔHNW_t series (and that of the other variables used in the regressions below).

Three change-in-employment variables are used as alternative regressands in equation (1), namely changes in total employment and in its two components: traded employment and non-traded employment. Those data are sourced from the European Commission’s New Cronos database. It provides employment data for EU member states at a sectoral level.¹² Following definitions used in Bradford Jensen *et al.* (2005) and Schmillen (2011), we use these sectoral data to construct measures of traded and non-traded employment. Non-traded employment is the sum of employment in nine components of total employment and traded employment is the aggregate of the remaining 12 categories.¹³ Those categories are outlined in Table A.1 in the appendix. In later regressions, changes in total nominal compensation per employee (on a whole economy basis) is used as a left-hand-side variable, with the series taken from the EU AMECO database.¹⁴

As a robustness check, two control variables are added to the right-hand-side of (1) above in some regressions. Those are construction’s share of total employment (*CONSHARE*) in a country’s economy and the openness of the economy (*OPENNESS*). The former is calculated using the data series described in the previous paragraph, while the openness variable is the sum of exports plus imports divided by GDP, with those three series sourced from the EU AMECO database.¹⁵ Table 1 then indicates the country and years in the compiled dataset and used in the regression analysis in subsequent sections.

¹⁰ The particular year varies depending on the country.

¹¹ The house price indices are used to backcast and forecast the house price level from Bricongne *et al.* (2019).

¹² <https://ec.europa.eu/eurostat>.

¹³ [Sectoral employment data are available at a NACE Rev 1.1 basis from 1983–2008 and at a NACE Rev 2 basis from 2008 – 2017.](#) The definition of some categories of employment differ between pre-2008 and post-2008 definitions, affecting the construction of the non-traded employment variable. The category “electricity, gas and water supply” is sub-divided into two categories in the later period, as shown in the appendix. A similar procedure follows for the “hotel and restaurants” and “health and social work” categories.

¹⁴ See item 15.1 at https://ec.europa.eu/economy_finance/ameco/user/serie/SelectSerie.cfm

¹⁵ See items 6.1, 9.1 and 9.2 at https://ec.europa.eu/economy_finance/ameco/user/serie/SelectSerie.cfm

Table 1. Data coverage for each country

Total observations (N)	342
Austria	2001-2017
Belgium	1996-2016
Czechia	2009-2017
Denmark	1996-2017
France	1996-2017
Finland	1996-2016
Germany	1996-2017
Greece	1996-2016
Hungary	2008-2016
Italy	1996-2016
Latvia	2007-2015
Lithuania	1999-2016
Luxembourg	2000-2016
The Netherlands	1996-2017
Poland	2007-2015
Portugal	2009-2016
Slovenia	1997-2016
Slovakia	2007-2016
Sweden	1996-2017
United Kingdom	1996-2017

In Table 2, we present a summary of some of the key variables for each country for the sample period available. It can be seen that home-ownerships rates in 2019 ranged from 43.6 per cent in Germany to just under 91 per cent in Hungary. Latvia registered the largest average decrease in housing net wealth and house prices at -0.02 and -0.47 per cent per annum respectively, while Lithuania experienced the largest increase in both variables. The correlation coefficient between the changes in housing net wealth and house prices across the different countries is 0.89.

Table 2. Summary of key data for each country

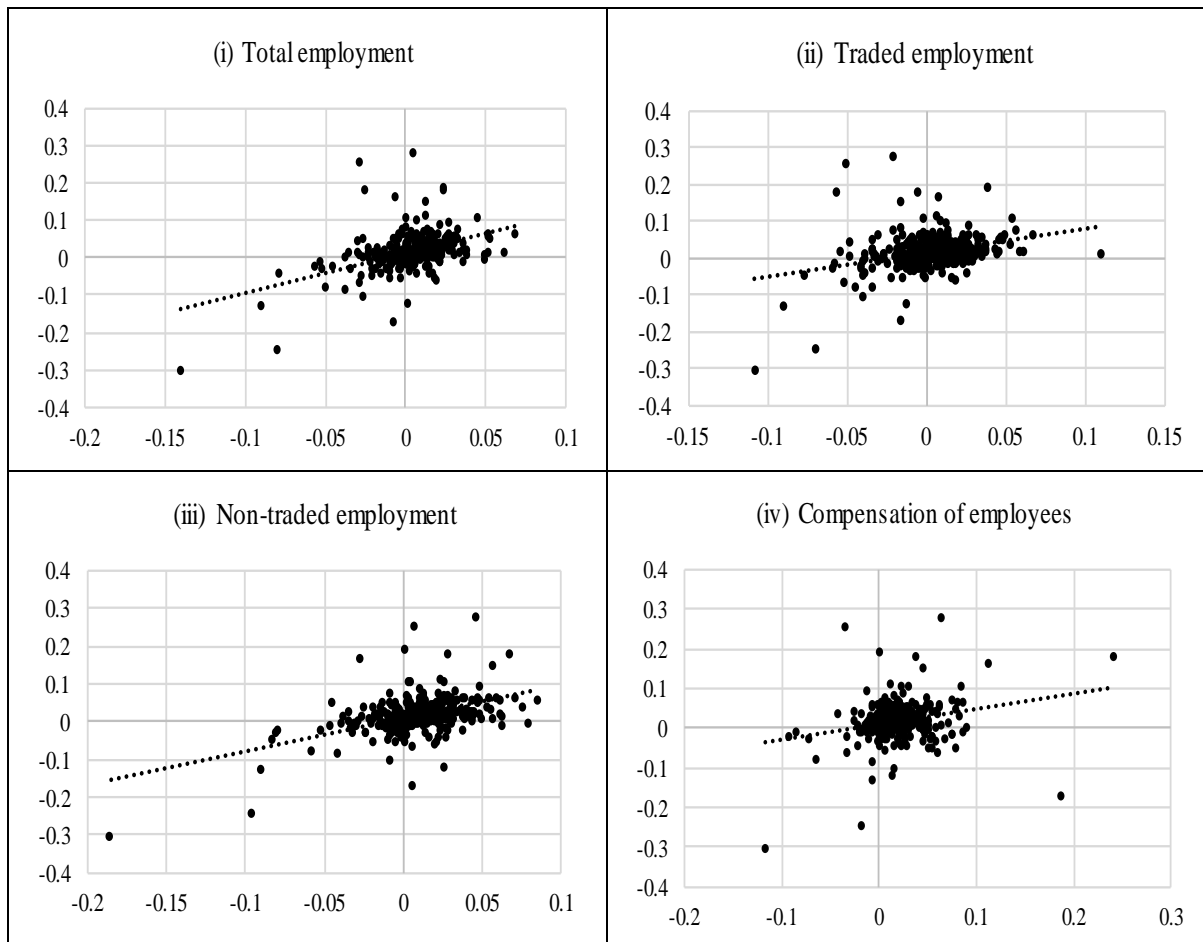
	(i) Homeownership rate	(ii) Change in housing net wealth	(iii) Change in house prices	(iv) Non-traded employment as a % of total	(v) Annual employment growth
Austria	47.6	1.9	3.95	41.8	0.66
Belgium	66.5	1.5	4.76	46.0	0.90
Czechia	75.9	0.9	2.15	37.4	0.27
Denmark	53.2	2.3	4.82	46.6	0.21
France	61.1	2.1	4.57	44.9	0.89
Finland	64.1	3.3	5.44	43.4	0.87
Germany	43.6	0.7	1.42	41.8	0.61
Greece	73	0.6	2.16	39.1	0.04
Hungary	90.9	0.6	2.0	39.9	1.01
Italy	71	0.6	2.21	39.2	0.61
Latvia	77.7	-1.7	-0.47	39.4	-0.48
Lithuania	90.2	4.9	9.78	38.5	-0.52
Luxembourg	67.3				
The Netherlands	58.3	1.5	4.77	42.2	1.02
Poland	81.1	0.5	2.13	34.1	0.49
Portugal	72.3	0.2	0.67	40.6	0.35
Slovenia	74.4	2.7	4.68	34.7	0.48
Slovakia	90.0	1.9	3.67	40.8	0.72
Sweden	57.6	2.2	6.93	47.7	0.90
United Kingdom	65.3	1.6	6.78	46.3	0.86

Note: Homeownership rates are for 2019 and are from the OECD. For columns (ii) to (v), the figure is the average over the sample period in question. The sample period for each country is summarised in Table A.2 in the appendix. All data are expressed in percentage terms.

In Figure 3, we show full-sample scatter plots of the relevant left-hand-side variables (changes in employment and nominal compensation) and changes in housing net wealth, with linear trend lines added. These panels suggest a positive relationship between each labour market variable and housing net wealth, with those relationships quantified on a more formal basis in

the next two sections. The negative change-in-housing-net-worth observations are concentrated in the 2008-2011 and 2012-2017 sub-samples.

Figure 3. Changes in employment/ nominal compensation per employee and housing net wealth shocks, 20 EU countries, 1996-2017 (unbalanced)



Note: x-axis: change in employment/total nominal compensation; y-axis: change in housing net wealth; sample size: 342 observations.

4. *The effect of changes in housing net wealth on employment*

Columns (i) to (iii) of Table 3 show the estimation results of regression specification (1) above, where the alternative dependent variables are changes in the natural logs of total employment (TOT), and of its sub-sectors: traded employment (TRAD) and non-traded employment (NTRAD), respectively. Fixed country effects are used throughout, with F-tests of the joint significance of fixed effects reported at the bottom of each column (the p -values reported in Table 3 strongly reject the null hypothesis that the cross-section effects are redundant).¹⁶ In

¹⁶ For space reasons, the country fixed effects are not reported here but are available from the authors. The common intercept term and its t-ratio from each regression is reported in each table.

each column, the δ coefficient is positive and statistically significant at the one percent level. The coefficient values on the ΔHNW variable in columns (ii) and (iii) indicate a larger effect of housing net wealth shocks on the non-traded sector compared to the traded sector. This is to be expected as changes in housing net wealth will have an effect on the non-traded sector, which depends on domestic consumers and their financial circumstances. In contrast, traded employment will depend more on international economic conditions and so the effect of changed housing net wealth on it should not be as strong. Nevertheless, at a national level (as opposed to the county-based analysis of Mian-Sufi, 2014), the channel could be expected to have an influence on traded employment, as arises here, as there is an inevitable degree of interaction between the traded and non-traded sectors of the economy.

Table 3. The housing net worth channel and employment: full sample results

Dependent variable: $\Delta lE_{i,t}$	(i)	(ii)	(iii)		(iv)	(v)	(vi)
Employment category	TOT	TRAD	NTRAD		TOT	TRAD	NTRAD
N	342	342	342		342	342	342
Countries	20	20	20		20	20	20
<i>intercept</i>	0.002 (2.150)	0.000 (0.137)	0.049 (3.709)		-0.010 (-0.847)	0.008 (0.537)	-0.034 (-2.088)
$\Delta HNW_{i,t}$	0.207 (10.060)	0.164 (6.457)	0.272 (10.218)		0.210 (10.327)	0.173 (6.988)	0.269 (10.142)
$CONSHARE_{i,t}$					-0.070 (-0.610)	-0.403 (-2.892)	0.380 (2.541)
$OPENNESS_{i,t}$					0.018 (2.661)	0.022 (2.608)	0.012 (1.300)
Adj. R-square	0.283	0.152	0.256		0.300	0.206	0.267
Fixed effects test (Prob.)	0.000	0.004	0.039		0.000	0.002	0.013

Note: t-ratios in brackets.

Columns (iv) to (vi) of Table 3 report the results of the estimation of a variant of (1) as follows:

$$\Delta \ln E_{i,t}^S = \alpha_i + \delta \Delta HNW_{i,t} + \rho CONSHARE_{i,t} + \theta OPENNESS_{i,t} + \varepsilon_{i,t} \quad (2)$$

Two variables are added here to control other possible influences on the change in employment variable. The first is construction's share of total employment, *CONSHARE*. This is included to control for the relative importance of this industry in the economy. This was a sector that was affected more than most during the 2008-2011 downturn (Whitehead *et al.*, 2014). Consequently, it may magnify or add to the effects of a deterioration in housing net wealth on employment and should be controlled for. The variable has a statistically insignificant coefficient in column (iv) of Table 3 but not in columns (v) and (vi).

The second control variable, *OPENNESS*, is imports and exports' combined share of GDP, capturing the national economy's exposure to international economic developments. It has a significant positive coefficient in the *TRAD* column (v), but not in the *TOT* and *NTRAD* columns (iv and vi, respectively), indicating it to be an influence on traded employment. Notwithstanding the significance or insignificance of these control variables for the respective sectors, the coefficients on ΔHNW are broadly unchanged in columns (iv) to (vi) of Table 3 compared to those reported in columns (i) to (iii).

Recently, the importance of leverage to the housing net worth channel's impact on macroeconomic variables such as consumption has been contested (by, for example, Kaplan *et al.*, 2020b). In Table 4, we report the results of substituting the log change in house prices, $dlHP_{i,t}$, for $\Delta HNW_{i,t}$ in (1) and (2). The coefficients on $dlHP_{i,t}$ are in all cases much smaller than their $\Delta HNW_{i,t}$ counterparts in Table 3. This would indicate that it is important to consider leverage as well as the change in house prices in terms of the impact the channel has on real economy variables.¹⁷

¹⁷ We also considered whether the dwellings' initial (i.e., $t - 1$) share of household wealth affected coefficient values by adding a multiplicative dummy variable to (1). It is the product of $\Delta HNW_{i,t}$ and a dummy variable which has a value of one if dwelling's share of household wealth exceeds the sample average (of 0.491), and is otherwise zero. The coefficient on this multiplicative dummy variable is insignificant in all estimations.

Table 4. The housing net worth channel and employment: alternative regressor

Dependent variable: $\Delta lE_{i,t}$	(i)	(ii)	(iii)		(iv)	(v)	(vi)
Employment category	TOT	TRAD	NTRAD		TOT	TRAD	NTRAD
N	342	342	342		342	342	342
Countries	20	20	20		20	20	20
<i>intercept</i>	0.001 (0.950)	-0.001 (-0.698)	0.004 (2.560)		-0.017 (-1.327)	0.003 (0.189)	-0.041 (-2.498)
<i>dlHP_{i,t}</i>	0.121 (9.640)	0.100 (6.546)	0.153 (9.247)		0.125 (9.968)	0.106 (7.081)	0.153 (9.284)
<i>CONSHARE_{i,t}</i>					-0.032 (-0.610)	-0.372 (-2.681)	0.431 (2.825)
<i>OPENNESS_{i,t}</i>					0.020 (2.949)	0.024 (2.839)	0.014 (1.557)
Adj. R-square	0.268	0.156	0.221		0.288	0.209	0.236
Fixed effects test (Prob.)	0.001	0.010	0.183		0.002	0.004	0.057

Note: t-ratios in brackets.

Given the discussion in section 2, which showed a changing credit environment in Europe over the sample period, we next estimated (1) and (2) for the sub-periods 1996-2007, 2008-2011, and 2012-2017 to see whether the influence of the housing net wealth channel on employment wanes or strengthens depending on credit conditions. The results are presented in Table 5 and indicate the housing net wealth channel's effect on employment is dependent on economic and financial circumstances. Columns (i) to (iii) show that during the 1996-2007 period, when there was a plentiful supply of credit to the non-bank public and when housing net wealth was generally rising from one year to the next, the channel has no effect on total employment. The same holds for traded sector employment, while a positive influence on non-traded sector employment is of marginal significance. In contrast, the housing net wealth channel has a significant influence on employment across the two sectors and the economy as a whole during the severe downturn of 2008-2011 (as reported in columns (iv) to (vi)). Similar qualitative findings occur for the 2012-2017 recovery period (columns (vii) to (ix)), which, given the

discussion in section 2, could be considered to have a greater similarity to 2008-2011 than the 1996-2007 period.

An explanation for these results may have its roots in the asymmetrical response of consumption to changes in housing net worth and specifically the central role played by house prices and credit conditions in affecting housing net wealth over the period in question. Many European countries experienced sizeable house price booms in the period leading up to 2007 only for significant contractions in prices to follow over the following years (see Whitehead *et al.*, 2014, for details). Recent studies by Hviid and Kuchler (2017) and de Roiste *et al.* (2019) argue that asymmetrical housing wealth effects can be explained by the role played by household indebtedness over the residential property market cycle. Depending on where the housing market is in its cycle, either the precautionary savings effect or the collateral effect will prevail in determining household behaviour in relation to consumption and saving. When the market is experiencing an expansionary phase and house prices are increasing, the precautionary motive results in households saving whatever equity gains arise and hence consumption does not increase, with little impact on labour market developments from this source. In a downturn, however, when house prices fall, the resulting collateral effect is more pressing and the increasingly over-indebted position of the household results in reduced consumption and increased unemployment. Accordingly, the absence of the housing net worth channel having an effect on employment during the boom period of 1996 to 2007 may reflect wealth gains being maintained rather than expended by households, while the significant effects on employment thereafter reflect their over-indebtedness and need for retrenchment in their spending.

Another feature of the results here is the significant effects that the housing net worth channel can have on the traded sector, as well as the non-traded sector. This stands in contrast to Mian and Sufi's (2014) assessment for the US. A possible reason for this difference is that their study is conducted at a county level where, they argue, non-traded employment is heavily dependent on local demand, while the traded sector is dependent on economic conditions at the national and global level. The data examined here are at the national level. It would be reasonable to expect the housing net wealth channel to have a broader effect at the country level and, consequently, to affect demand for traded goods and services.

Table 5. The housing net worth channel and employment: sub-sample results

Dependent variable: $\Delta lE_{i,t}$	(i)	(ii)	(iii)		(iv)	(v)	(vi)		(vii)	(viii)	(ix)
	1996-2007				2008-2011				2012-2017		
Employment category	TOT	TRAD	NTRAD		TOT	TRAD	NTRAD		TOT	TRAD	NTRAD
N	158	158	158		78	78	78		106	106	106
Countries	17	17	17		20	20	20		20	20	20
<i>intercept</i>	0.010 (4.966)	0.008 (3.028)	0.013 (4.798)		-0.003 (-1.372)	-0.006 (-1.979)	0.000 (0.033)		0.005 (3.493)	0.004 (2.777)	0.005 (2.615)
$\Delta HNW_{i,t}$	0.024 (0.614)	-0.320 (-0.632)	0.108* (2.066)		0.259 (4.757)	0.242 (3.595)	0.275 (4.083)		0.342 (5.967)	0.320 (4.756)	0.374 (4.256)
Adj. R-square	0.019	0.013	0.042		0.387	0.198	0.383		0.437	0.397	0.241

Note: t-ratios in brackets.

Footnote: the results of the regressions where the control variables, CONSHARE and OPENNESS, are included are available on request from the authors but have no material effect on the ΔHNW coefficient values or their significance, with the exception of * above where the coefficient value (t-statistic) is 0.071 (1.274).

5. *The effect of the housing net worth channel on wages*

The regression results in the last section indicate the housing net worth channel having a significant or insignificant effect on employment depending on the stage of the economic and financial cycle. It is possible that labour market adjustment to housing net worth shocks occurs through wages as well as, or as an alternative, to employment. Consequently, we estimate (3) to see whether the housing net worth channel affects changes in total wages:

$$\Delta \ln W_{i,t} = \alpha_i + \vartheta \cdot \Delta HNW_{i,t} + \varepsilon_{i,t} \quad (3)$$

Where W indicates nominal compensation of employees.

The regressions results pertaining to this equation are shown in Table 6.^{18 19} The full-sample estimates indicate the housing net wealth channel having a positive effect on wage growth, such that an increase (decrease) in housing net worth causes wages to rise (fall). The sub-period estimations differ somewhat from this, with the same positive relationship between the variables arising both in the benign 1996-2007 period and in the downturn of 2008-2011 but the channel having no effect on wage developments in the 2012-2017 recovery period.

These sub-sample results when taken in conjunction with those in Table 5 indicate the housing net worth channel having an impact on the labour market (taken as a whole) through wages in the upside of the economic cycle of 1996 to 2007 and through employment in the period 2012 to 2017. During the period of greatest economic and financial turbulence, 2008-2011, the channel operated through both wages and employment. This latter period is most comparable with Mian and Sufi's study of the 2007-2009 US downturn where they show the channel having employment effects but no impact on wages.

The influence of the housing net worth channel on both wages and employment in the European context is somewhat surprising when compared with the US experience and the considerable literature on the flexibility of labour markets between the EU and the US. This may be due to the relatively larger and prolonged impact of the financial crisis on the European economy. A significant literature has compared and contrasted the response of the US authorities to the financial crisis with that of European institutions with Blanchard and Leigh (2012, 2013) and

¹⁸ A wage breakdown between the traded and non-traded sectors of the economy was not possible.

¹⁹ The regressions were also augmented by the control variables CONSHARE and OPENNESS in a second set of estimations. The estimates of the coefficient on $\Delta HNW_{i,t}$ (available on request from the authors) do not materially differ from those in Table 5.

Mody (2015) arguing that the European policy's focus on austerity in 2010/2011 impeded and delayed the European recovery. This can be contrasted with the passage into law in US in 2009, of the American Recovery and Reinvestment Act (ARRA), the primary objective of which was to support employment measures in light of the post-2007 economic downturn.

Table 6. The housing net worth channel and wages: full sample and sub-sample results

Dependent variable: $\Delta W_{i,t}$	(i)		(ii)	(iii)	(iv)
	1996-2017		1996-2007	2008-2011	2012-2017
N	342		158	78	106
Countries	20		17	20	20
<i>intercept</i>	0.024 (15.862)		0.033 (14.963)	0.028 (6.624)	0.018 (13.458)
$\Delta HNW_{i,t}$	0.408 (13.777)		0.228 (5.277)	0.351 (3.818)	0.088 (1.526)
Adj. R-square	0.436		0.726	0.061	0.691

Note: t-ratios in brackets.

6. Conclusion

The results in this paper provide an insight into the consequences for European labour markets of shocks to housing net worth. Since the early 1990s, household balance sheets across developed economies have experienced significant changes mainly due to the variations observed in the provision of credit, reflecting the increased integration of the financial sector and the real economy in that period. This leaves the household balance sheet and the influence of credit provision on its housing component to have a channel of influence on economic activity. Contributions by Mian *et al.* (2013) and Mian and Sufi (2014) quantify the channel as having an effect on US consumption and employment behaviour during the 2007-2009 period.

The opening up of capital markets in Europe from the mid-1990s and the adoption of the single currency at the turn of the century led to many changes within the European financial sector, which on balance resulted in a significant increase in the provision of credit across the

participating countries in the period up to 2008. The sharp downturn in economic and financial conditions between 2008 and 2011 and the period of slow recovery thereafter provides the basis for examining how the housing net worth channel affects economic variables in different circumstances, with the focus on the labour market in EU member states.

In some respects, the results presented here for the EU are broadly in line with the Mian and Sufi (2014) investigation of the channel's influence in the US downturn of 2007-2009. Over the entire sample, and the 2008-2011 recessionary and 2012-2017 recovery periods, we find the housing net worth channel having a significant impact on employment, which is stronger in the non-traded sector, with falls in housing net worth causing a decrease in employment. We also consider the channel's role in labour market developments during a period of strong economic and credit growth (1996-2007) and find the channel to have no significant effect on employment but a positive influence on wages. The same qualitative influence on wages (i.e. a significant positive coefficient on the housing net worth variable) also arises during the 2008-2011 period, so that the channel also has explanatory power over wage developments during a period of downturn in European economies. It has no impact on wage developments during the post-crisis period of 2012 to 2017. We have argued above that these findings may follow from the contrasting influences of the precautionary savings and collateral effects on household decisions in response to variations in housing wealth.

Finally, the impact of the household demand channel on wages as well as employment levels may reflect the severity of the financial crisis across European economies. The austerity-based policy response of European macroeconomic and financial policy during the 2008-2011 downturn may have exacerbated the impact of the financial crisis causing both wage and employment responses to housing net worth shocks. This may explain the more expansionary policy stance adopted by EU institutions in response to the Covid-19 crisis.

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Appendix

Table A.1 Construction of Sectoral Employment Aggregates

	<i>1996-2008 definition</i>	<i>2008-2017 definition</i>
<i>Non-traded sector</i>		
	Electricity, gas and water supply	Electricity, gas, steam and air conditioning supply
		Water supply; sewerage, waste management and remediation activities
		Construction
	Hotels and restaurants	Accommodation and food service activities
		Public administration and defence; compulsory social security
		Education
	Health and social work	Human health and social work activities
		Arts, entertainment and recreation
	Other community, social and personal service activities	Other service activities
<i>Traded sector</i>		
		Agriculture, forestry and fishing
		Mining and quarrying
		Manufacturing
		Wholesale and retail trade; repair of motor vehicles and motorcycles
		Transportation and storage
		Information and communication
		Financial and insurance activities
		Real estate activities
		Professional, scientific and technical activities
		Administrative and support service activities
		Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use
		Activities of extraterritorial organisations and bodies

Table A.2. Data coverage for sample averages in Table 2

	Change in housing net wealth	Change in house prices	Non-traded employment as a % of total	Annual employment growth
Austria	2001-2017		1995-2017	1996-2017
Belgium	1996-2016		1995-2017	1996-2017
Czechia	2009-2017		1997-2017	1998-2017
Denmark	1996-2017		1995-2017	1996-2017
France	1996-2017		1995-2017	1996-2017
Finland	1996-2016		1995-2017	1996-2017
Germany	1996-2017		1995-2017	1996-2017
Greece	1996-2016		1995-2017	1996-2017
Hungary	2008-2016		1996-2017	1997-2017
Italy	1996-2016		1995-2017	1996-2017
Latvia	2007-2015		1998-2017	1999-2017
Lithuania	1999-2016		1998-2017	1999-2017
Luxembourg				
The Netherlands	1996-2017		1995-2017	1996-2017
Poland	2007-2015		2000-2017	1998-2017
Portugal	2009-2016		1995-2017	1996-2017
Slovenia	1996-2016		1997-2017	1997-2017
Slovakia	2007-2016		1998-2017	1999-2017
Sweden	1996-2017		1995-2017	1996-2017
United Kingdom	1996-2017		1995-2017	1996-2017