

Debt Shift, Financial Development and Income Inequality in Europe

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Abstract

Does financial development increase income inequality? Ambiguous answers to this question to date may be due to over-aggregation of 'financial development'. In data over 1990–2012 for 26 EU economies, we study the effects on income inequality of different components of financial development. We find that bank credit to real estate and financial asset markets, which raises the wage share of the Finance, Insurance and Real Estate (FIRE) sector, increases income inequality. Credit to non-financial business and for household consumption supports broader income formation, decreasing income inequality. There was a large shift in bank credit allocation since the 1990s, away from supporting investments by non-financial firms and towards financing capital gains in real estate and financial asset markets. Combined with our new findings, this 'debt shift' helps to understand the growth of inequality.

Keywords: income inequality, financial development, debt shift, Europe

JEL Classification: E51, G21, I30

1 Introduction

Since the late 1980s, income inequality has risen substantially in most OECD countries (Piketty, 2014; OECD, 2015; Milanovic, 2016). After the 2008 crisis, research attention to a possible connection of this phenomenon with the growth of finance has increased. Does financial development increase income inequality? In this paper we show that the answer depends on the kind of financial development. We adopt bank credit as a measure for financial development, and find that credit to real estate and financial asset markets increases income inequality, but credit to non-financial business and household consumer credit decreases income inequality. This finding helps to explain the rise in income inequality in recent decades: since the 1990s, bank credit allocation has shifted away from non-financial business and towards real estate and financial asset markets.

We construct measures for two components of financial development for 26 EU economies from 1990 (or 1995) to 2010 and 2012 (depending on the inequality measure we use) and report results with and without the post-2007 crisis years. By using such recent data we account for the changing relation between finance and inequality since the 1990s due to structural changes such as funding innovations, bank internationalization, the credit boom of the early 2000s and the 2007 crisis and its aftermath.

In panel fixed-effects regressions, we analyze impacts of bank credit on different measures for income inequality. While we see no significant effects of a total-credit measure of financial development on Gini income inequality, once we distinguish between the two types of credit, we observe robust, opposite effects. Bank credit to the business and consumer sector decreases income inequality, while credit to real estate and financial asset markets increases inequality. These results suggest that the shift in the allocation of bank credit ('debt shift', for short) matters to the explanation of trends in income inequality in Europe. We suggest a possible causal channel. More credit flowing to asset markets increased asset prices, resulting in rising capital gains and growth of incomes connected to capital gains in the finance, insurance and real estate (FIRE) sector. Since FIRE-sector incomes are relatively high, if 'debt shift' increased

FIRE-sector incomes more than other incomes, this implies a rise in income inequality.

The new findings add to a literature which is still scant. The finance-inequality nexus is ‘under-investigated’ (Gimet and Lagoarde-Segot, 2011, p.1698) and this is especially true for developed economies; in particular, Bertola (2010) notes that there is little research on inequality in the European Union (EU). By studying EU economies, we remove some of the heterogeneity in other studies, which may hide significant relations within clusters of economies. Another feature of our paper is that we observe different impacts on total-income Gini coefficients and on Theil indices for pay inequality, which are sensitive to regionally concentrated income dynamics. By varying factors that condition the finance-inequality nexus — wage shares and housing markets, trade and investment — we are able to shed some light on the conditional relation between financial development and inequality. We find that the effect of lending to non-financial business is weaker in labor markets that already foster more equality, with higher wage shares. It is also weaker in economies which are more open, and in which investment constraints are smaller. We find evidence on regional effects: in economies where the FIRE sector’s value-added share is larger, or where real house prices are higher, lending to real estate and financial markets increases regional pay inequality more.

There are differences between pre-crisis and post-crisis effects. Growth in bank credit to non-financial business clearly reduced total-income inequality in the full sample and weakly in a sample excluding the crisis years. Growth in credit to the FIRE sector increased income inequality in both time samples, but the pre-crisis coefficient is double the size of the coefficient for the sample including the crisis years. This links to literature on inequality dynamics in asset price booms. Again, these differences are not observed for a total-credit measure of financial development, which supports our disaggregation of credit.

The paper is structured as follows. In the next section, we discuss how shifts in the allocation of bank credit may change the relation between financial development and income inequality. In section 3 we present the data and variables. In sections 4 and

5 we discuss the methodology and present our findings, respectively. Section 6 offers robustness checks, while section 7 concludes with a summary and discussion of this paper's limitations and further work.

2 Debt Shift and the Finance-Inequality Nexus

The impact of financial development on inequality is theoretically ambiguous. Financial development may ameliorate income inequality due to decreasing barriers and increasing returns to investment and due to more risk insurance opportunities (Greenwood and Jovanovic, 1990; Galor and Zeira, 1993; Banerjee and Newman, 1993). This was empirically borne out in studies using data on developing countries since the 1960s (Clarke et al., 2006; Beck et al., 2007; Claessens and Perotti, 2007). Beck et al. (2007, p.27) report that "financial development disproportionately boosts incomes of the poorest quintile and reduces income inequality". Other measures than credit volumes yield similar results. Mookerjee and Kalipioni (2010) find in a sample of developed and developing countries that greater access to bank branches robustly reduces income inequality, while barriers to bank access significantly increase inequality.

Results for advanced economies are mixed.¹ Beck et al. (2007) report that financial development reduced inequality in the U.S. But Van Arnum and Naples (2013) find that the growth of the U.S. financial sector has contributed to the exacerbation of inequality in recent decades. Likewise, Denk and Cournéde (2015) find that financial expansion has held back income growth of low- and middle-income households in OECD economies. The harmful effect of financial development on income distribution has been also confirmed for broader country samples (Gimet and Lagoarde-Segot, 2011; Jauch and Watzka, 2012; Jaumotte et al., 2013).

One reason for these mixed findings may be that 'total credit to the private sector' is often used as the proxy for financial development. The composition of the stock of bank credit has, however, changed dramatically in recent decades. Bezemer et al.

¹See Demirgüç-Kunt and Levine (2009); Malinen (2016); Bazilier and Hericourt (2017) for a survey of the literature on financial development and inequality.

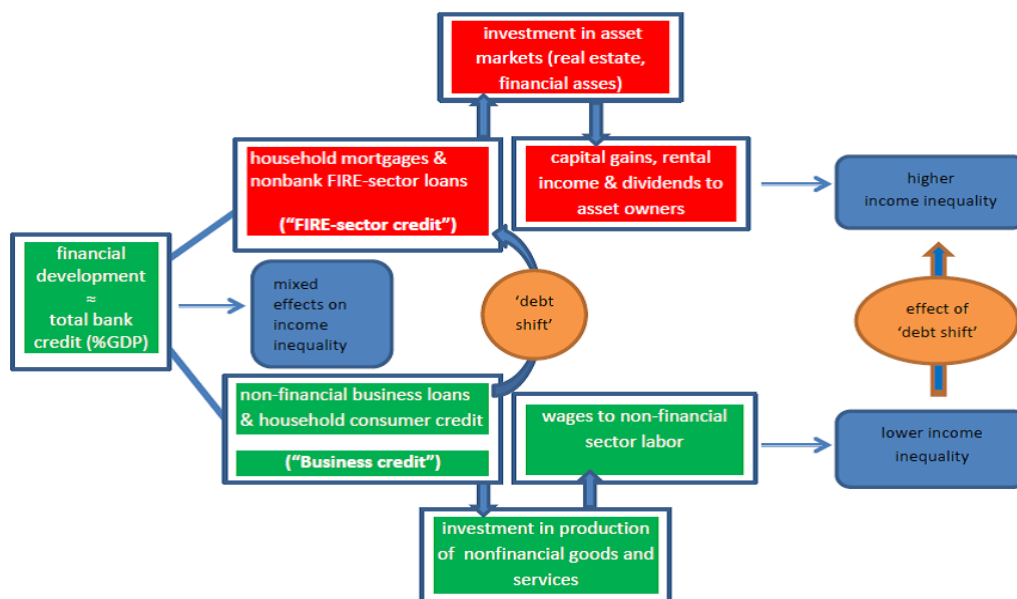
(2016) report that the large rise in total bank credit in a balanced panel of 14 countries from 1990 to 2011 was mainly due to the growth in credit to real estate and financial asset markets, from 30% to 66% of GDP on average. In the same sample, bank credit to non-financial business was about stable, from 41% of GDP in 1995 to 46% of GDP in 2008. Similarly, Jorda et al. (2016) report an increase from 30% to 60% in household mortgage credit as share of GDP since 1900 in a sample of 17 countries, with most of that increase since the 1980s.

This 'sea change' in the composition (rather than only the level) of bank credit has so far not registered in the inequality literature. Yet it should matter to the theoretical channels from financial development to inequality. The traditional arguments for inequality-decreasing effects of financial development include decreasing investment barriers and risk, with increasing opportunities for consumption smoothing. These arguments are relevant to non-financial business loans and consumer credit. Credit supporting investment and demand in the real sector has the potential to generate employment and higher wages and thereby a more equal income distribution. There are important qualifiers to this effect, including labor market institutions, the economy's wage share, industrial structure, and degree of openness. But given the right conditions in each of these areas, real-sector investment supported by domestic financial development can be a powerful income equalizer.

For credit to asset markets, another set of arguments comes into play, which rationalizes inequality-increasing effects of financial development. Piketty (2014) identifies redistribution between wage earners and owners of capital as a key reason for rising income inequality — where 'capital' includes real estate and financial assets. Bank credit to real estate markets drives up house prices (Favara and Imbs, 2015) and generates capital gains. Capital gains due to rising prices of bonds, stocks and real estate will increase incomes in the forms of dividends, interest, rental incomes, and financial fees in the Finance, Insurance and Real Estate (FIRE) sector, where incomes are typically already high. This is why credit to asset markets tends to increase income inequality.

Indeed the 'Great Mortgaging' (Jorda et al., 2016) after the 1980s was a time of large

Figure 1: Debt shift and its impact on income inequality



income growth for the FIRE-sector, which expanded rapidly (Greenwood and Scharfstein, 2013). For 26 EU economies analyzed in the present paper, the value-added share of the FIRE sector doubled or tripled between 1990 and 2012. One of the causes of the growth in FIRE-sector income shares was the shift in the allocation of bank credit towards real estate and financial asset markets, which we labeled 'debt shift'. And one of the consequences of debt shift, we argue, was increased income inequality. Figure 1 illustrates debt shift and its impact on income inequality.

In the interest of brevity, from here on we will label mortgages and loans to financial business jointly as *FIRECredit*, and we will label bank credit to non-financial business and for household consumption *BusinessCredit* (a more accurate, but also more cumbersome name would be 'credit supporting demand and investment in goods-and-non-financial-services markets'). We choose this delineation as a proxy distinction between financial-development effects that run through markets for goods and services, as distinct from financial-development effects that run through asset markets. On the one hand, consumer credit supports demand for goods and services provided by non-financial businesses, and loans to non-financial business mainly (but not exclusively) support their supply. On the other hand, household mortgages and loans

to financial business mainly (but not exclusively) support demand for real estate and financial assets, respectively.

In sum, the production and sale of goods and services – directly linked to wage formation for most of the labor force – has very different effects on income distribution than do rising prices in real estate and financial markets, which generate capital gains, dividends, interest income and rental income for owners of real estate and financial assets. Some of these incomes flow to homeowner middle-income households. But on average income from assets falls disproportionately to the high-income population segments working in the FIRE-sector. In contrast, wages generated in goods and services markets are more widely distributed. For instance, Adam and Tzamourani (2015) study effects of asset prices on wealth (not income) inequality. They note that in the euro area, equity price capital gains are concentrated among the households at the top end of the wealth distribution and house price gains benefit the median households (except in Germany which has a low homeownership rate). We conjecture that similar distributional effects may hold for income. Inequality may also change due to differences in the availability of loans. Mortgages are less available to lower-income, more credit-constrained households. Denk and Cazenave-Lacroutz (2015) find that in most EMU countries, credit to households (mostly mortgages) is more unequally distributed than household disposable income: the top 40% of households hold 65% of households credit, while the top 20% hold 40%. Since credit shares rise over the income distribution, increasing FIRE credit would lead to more income inequality.

Because of the various channels between credit and income inequality, credit supporting the FIRE sector will have different impacts than credit supporting non-financial business investment and consumer demand. For research purposes, it is then problematic to lump these credit categories together in one credit-to-GDP measure of financial development, without distinction between credit types. This is likely to yield mixed findings on the finance-inequality nexus. Depending on the extent of ‘debt shift’ (the shift in credit allocation towards supporting FIRE-sector incomes), the finance-inequality nexus could be either positive or negative. In cross-country regression anal-

ysis, these opposing effects could well cancel out so that the average effect is small and statistically insignificant. But underneath the aggregate, the two credit categories we distinguish in this paper may have significant, but opposite effects on income inequality. To test these effects is the aim of this paper.

There is some, but not much research supporting this approach to the finance-inequality nexus. Kus (2012) examines variables related to capital gains (e.g. stock market valuations). Controlling for labor market institutions, unemployment, globalization and social spending, he reports a positive association of capital gains with income inequality for OECD economies over 1995–2007. Roine and Waldenström (2012) show for Sweden that capital gains explain most of inequality increase since the 1980s.

The role of capital gains implies a distinction between phases of the business cycle. Roine and Waldenström (2014) find for a sample of developed economies that top income shares which are driven by capital gains rise faster in periods of above-average growth. In our analysis we will control for the output gap and distinguish the post-2007 years from the full 1990–2012 sample. The mortgage-fueled house price and financial market boom until 2007 (which may have increased income inequality) turned into a housing market and equity market crises with capital losses, negative equity, and rising unemployment. FIRE-sector credit effects on inequality are likely to have been different in two periods.

Our paper connects to literature which shows that credit to non-financial firms has fundamentally different impacts than does credit to asset markets, as mortgage credit to households or as loans to non-bank financial firms (Werner, 1997, 2012). Economies with more household credit (most of which are mortgages) experience slower income growth (Jappelli et al., 2013; Büyükkarabacak and Valev, 2010; Beck et al., 2012; Bezeimer et al., 2016; Jorda et al., 2016), larger external imbalances (Büyükkarabacak and Krause, 2009) and higher probabilities of crisis, with longer post-crisis recessions (Rose and Spiegel, 2011; IMF, 2012; Sutherland et al., 2012; Babecky et al., 2013). We add to this literature that growth in mortgages and in credit to financial asset markets tends to increase income inequality by concentrating income growth more in the FIRE sector.

3 Data

3.1 Data and variables description

We use annual observations of income and pay inequality measures for 26 EU countries over the period 1990–2012, with the time period determined by data availability. Table ?? in Appendix A describes the construction and data sources for all inequality variables. The distinction between income and pay inequality is based on the definition of income provided by the Luxembourg Income Study, which includes labor income (wages), capital income (rental income and income from financial assets), and transfer income. Thus, pay inequality is constructed only for wage income, while income inequality takes into account also capital and transfer incomes. We use the Gini income inequality index for 1990–2012, taken from the Standardized World Income Inequality Database (SWIID). We choose a Gini net index based on disposable incomes (post-tax, post-transfers).²

Credit to the FIRE sector supports generation of wages for employees of this sector plus significant non-wage incomes as dividends, interest and rental incomes; credit to non-financial business is more directly linked to non-financial-sector wages incomes. This suggests that inequality measures need to be sensitive to wage and total-income differences. In order to observe effects on wage income inequality and total-income inequality, we will also use the industrial pay inequality measure *payineq100* constructed in the University of Texas Inequality Project (UTIP) from UNIDO Industrial Statistics, available from 1990 until 2008. This isolates wage inequality dynamics rather than total-income inequality, as in the Gini. Total incomes, which are captured in the Gini index, are not the same as wage incomes, captured in the Theil industrial pay index. Industrial pay inequality is defined as the between-industry component of a Theil's T statistic. We refer to the Appendix for details.

A striking feature of FIRE-sector income growth is its regional concentration, linked to real estate dynamics and financial-sector employment. Von Ehrlich and Seidel (2015)

²Our results are robust to using a Gini market index instead (before taxes and transfers).

show that increasing financial access for non-financial business reduces inequality between regions by spreading investment opportunities more equally over space. But in a house price boom due to rising mortgage lending (Favara and Imbs, 2015), price increases tend to be strongly spatially concentrated. And to the extent that FIRE sector employment is regionally concentrated — typically, in the capital or other major cities — its relative income growth will increase regional income inequality. Therefore, in addition to the countrywide *payineq100* Theil index, we will also use three regional pay inequality measures — a within-region Theil index (*TW*), a between-region Theil index (*TB*), and an overall regional Theil index (*TO*). The overall Theil inequality index (*TO*) is the sum of a country’s between-region and within-region Theil components. Theil indices are available from 1995 to 2010. Note that even though all Theil indices refer to wage inequality, not all reflect regional wage inequality. *TO* is different from industrial pay inequality *payineq100*, which does not reflect regional variation in between-industry pay inequality.³

The data for bank credit were collected from the consolidated balance sheets of Monetary Financial Institutions in central bank statistics of each country. We distinguish four types of domestic bank credit: credit to non-financial business, credit to non-bank financial business (insurance companies, pension funds, and other non-bank financial institutions), household consumption credit, and mortgages to households, all reported as percentages of GDP. A detailed description of the credit dataset is provided in Bezemer et al. (2017).

One challenge we face in the analysis is that we do not have a sufficiently long time dimension of panel, especially since we use annual observations. There is a risk of reflecting short-term business cycles movement rather than the underlying finance-inequality relation. We address this problem in two ways. First, by including in the control variables the output gap as a proxy for the business cycle. And second, by also running the sensitivity analysis using 3-year averages for all variables.

³The regional pay inequality Theil indices *TO*, *TW* and *TB* are based on data on employment and wages in six sectors and all NUTS2 regions, for each country of the European Union. We recomputed *TO*, *TW* and *TB* indices from the Europe-wide basis used in UTIP to country-based data. We refer to Appendix B for details.

We will consider a wide range of control variables. Some are common in the inequality literature, including income levels, income growth, inflation, unemployment, levels of education, government expenditures and trade openness. In addition we included other plausible covariates of income inequality: wage shares, labor union strength, the economy's industrial structure, population growth, financial deregulation, asset prices, and capital flows. We now briefly motivate these covariates.

Income levels and growth influence inequality depending on the distribution of growth over income levels (Dollar and Kraay, 2002). Inflation may lead to pressure for rising nominal wages, with that pressure unevenly distributed over income levels, and depending on labor union strength (Kus, 2012). In addition, higher inflation hurts low-income households who hold more currency and benefits high-income households with more capital (Albanesi, 2007). Rising unemployment typically hurts lower income groups disproportionately and increases inequality. It also creates downward pressure on wages for those employed, which may create additional effects on the distributions of income and pay (Van Arnum and Naples, 2013). More education may widen income gaps, depending on the educational system and the income premium on a year of schooling (Van Arnum and Naples, 2013; Dabla-Norris et al., 2015).

Redistributive fiscal policy through higher government expenditures may reduce income inequality (Heshmati and Kim, 2014). Trade openness raises wages more in tradable sectors and so increases income inequality, depending on the sectoral income distributions and skill premia across sectors (Lakner and Milanovic, 2015; Milanovic, 2016). Economies with high wage shares tend to be less unequal, and so are those with minimum wages. Industrial structure, measured by the share of manufacturing value added in total VA, captures changes in inequality due to income dynamics which are industry-specific. Table ?? in Appendix A provides details on construction and sources for all variables. Descriptive statistics are reported in Table ??.

Any study on finance and inequality has to consider reverse causality and endogeneity. Causality might run from inequality to financial development, or both may be caused by an unobserved third factor. Larger household indebtedness and higher in-

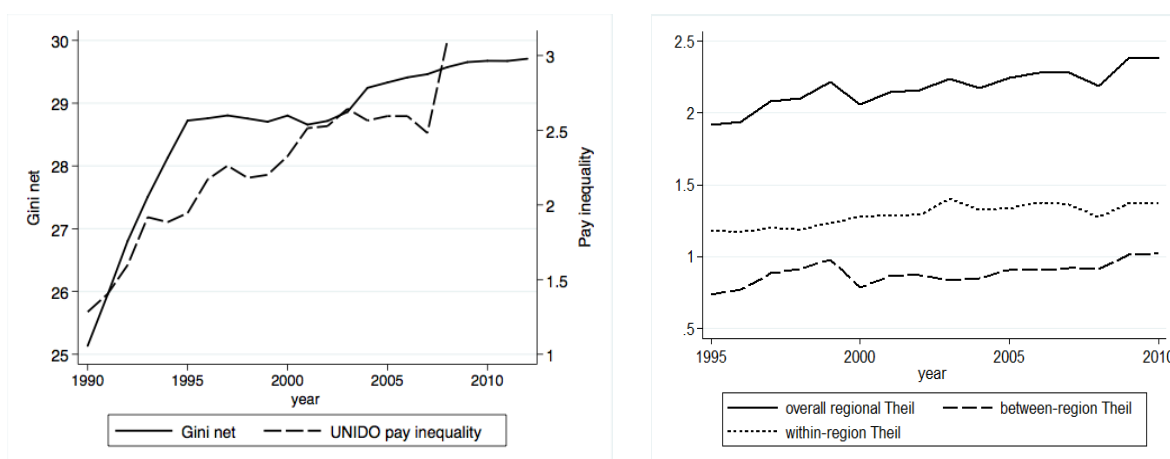
come inequality may be jointly caused by governments providing cheap credit to low-income households (Rajan, 2010). Inequality, once rising, may be self-reinforcing if it constrains effective demand (Carroll et al., 2014). Rising income inequality may cause poorer households to borrow more to sustain their consumption levels (Kumhof et al., 2015). There is evidence from the U.S. (where median incomes have long been stagnant but top incomes have raced away) for a ‘keeping up with the Joneses’ effect as a driving force in the growth of mortgage and consumer lending and increasing household indebtedness (Onaran et al., 2011; Coibion et al., 2014). Previous studies (e.g., Clarke et al., 2006; Kunieda et al., 2014) instrument financial development with legal origin or other institutional factors. These cannot be used as instruments for disaggregated credit categories. We will use lagged credit variables and also GMM specifications.

3.2 Trends in Income Inequality and Financial Development

Figure 2 shows the development of income and pay inequality for EU countries over 1990–2012. We show the unweighted average over 26 countries. The Gini index increased mildly after 1995, but pay inequality rose fast in most of the time period, with temporary stability in the late 1990s and mid 2000s. Within-region pay inequality rose steadily until 2003 and was about flat afterward, until 2010. The between-region Theil index of pay inequality rose over 1995–1998 and then dropped remarkably over 1998–2000, possibly due to the start of EMU phase 3 (euro introduction). From 2000 to 2010, between-region pay inequality rose again, less steeply than before 2000.

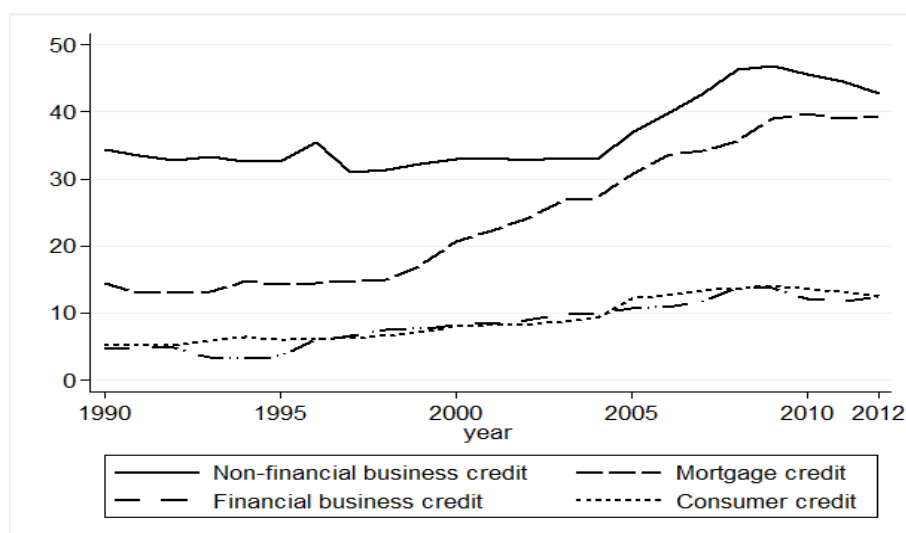
Figure 3 presents trends in disaggregated bank credit over 1990–2012, as unweighted averages over an (unbalanced) panel of 26 countries each year. Although the unbalanced nature of the panel distorts the trends somewhat, they are qualitatively similar to those reported in Jorda et al. (2016) and Bezemer et al. (2016). We observe a strong increase in household mortgage credit, almost tripling from 15% to 40% of GDP on average from the late 1990s until 2010. We see proportionally similar increases in consumer credit and bank credit to non-bank financials, each rising from 5% to 14% of GDP over 1990–2012. Bank credit to non-financial business was stagnant as a share of

Figure 2: Income and (regional) pay inequality in Europe



Sources: SWIID; University of Texas Inequality Project based on UNIDO Industrial Statistics; authors' calculations.

Figure 3: Disaggregated bank credit over 1990–2012



Sources: central banks' statistics; authors' calculations

GDP from 1990 to 2004, but then increased from 32% to 46% until the 2007 crisis, after which it fell to 42%. Further exploration showed that this remarkable rise after 2004 is driven by six countries (Bulgaria, Denmark, Estonia, Ireland, Lithuania, and Spain).

In Table 1 we explore correlations over time and between countries of inequality and financial development. The Gini index and countrywide pay inequality measures are both negatively correlated to credit of all types. The strongest negative correlations of pay inequality are with the non-financial business credit share of GDP; for the Gini, all correlations are much weaker, consistent with the small variation in these data. The Theil regional indices present a diverse picture. Only consumer credit is

Table 1: Correlations of inequality measures with credit variables

	Gini	Pay ineq	Theil overall	Theil between	Theil within
Total credit	-0.14***	-0.48***	-0.05	-0.11*	0.08
<i>BusinessCredit</i> (1+2)	-0.13***	-0.43***	-0.18***	-0.32***	0.15***
1. Non-financial business credit	-0.12***	-0.41***	-0.25***	-0.37***	0.07
2. Hhs consumer credit	-0.08	-0.33***	-0.08	-0.09	0.34***
<i>FIRECredit</i> (3+4)	-0.16***	-0.40***	0.05	0.08	-0.02
3. Financial business credit	-0.10*	-0.27***	0.19***	0.25***	-0.001
4. Hhs mortgage credit	-0.15***	-0.42***	-0.03	-0.02	-0.03

Note: The table reports pairwise correlation coefficients. ***p<0.001, **p<0.05, *p<0.1.

significantly and positively correlated to within-region wage inequality. For between-regions and overall regional inequality, we find again strongly negative correlations with non-financial business and financial business credits, and much smaller negative correlations with consumer and mortgage credit.

These explorations suggest that it is especially the non-financial business credit component of financial development which drives any impact on inequality; and that regional effects are observable mostly between-regions, not within-regions. Below we test these impressions.

4 Methodology

We analyze the relation between bank credit and different measures of income and pay inequality in panel fixed-effects regressions using annual data, controlling for a number of covariates.⁴ The baseline model specification is as follows:

$$INEQ_{it} = \alpha + \beta CRED_{it-1} + \gamma CTRL_{it} + \mu_i + \epsilon_{it}, \quad i = 1, \dots, N; t = 1, \dots, T, \quad (1)$$

where $INEQ_{it}$ is the Gini or Theil index for income or pay inequality in country i and year t ; $CRED_{it-1}$ is a matrix of bank credit to the private sector, including either total bank credit, as in the finance-and-inequality literature to date; or the two categories of credit denoted *BusinessCredit* and *FIRECredit*. *BusinessCredit* is measured by the stock

⁴As a robustness check, we estimated regressions for 3-year non-overlapping averages of annual data. This accounts for low variability of inequality measures and decreases sensitivity of outcomes to short-term variations.

of bank loans to non-financial business credit plus household consumer credit, scaled by GDP. *FIRECredit* is measured by the stock of bank loans to nonbank financial institutions plus household mortgage credit, scaled by GDP.

Further, β is a vector of estimated parameters for credit variables. All categories of credit are included in the model with a one-year lag, to account somewhat for reverse causality; in robustness checks we will also use 3-year lags and instrumented variables to do this more thoroughly. $CTRL_{it}$ is a matrix of control variables, described in Section 3.1. μ_i are unobserved country-fixed effects; ϵ_{it} is a white noise error term with mean 0. Standard errors are clustered on a country level to account for the presence of heteroscedasticity and autocorrelation in the error term.

5 Estimation Results

In Table 2 we report the estimation results with a total-credit specification of financial development. As control variables we include those most widely used (income levels and growth, inflation, unemployment and education) plus the output gap, wage shares and industrial structure.⁵ We observe that higher inflation and lower output gaps (both signifying a business cycle upswing) increase total-income inequality. Controlling for this, for 26 EU countries over 1990–2012 we do not find evidence of a significant correlation of lagged financial development to total-income inequality. But we do find that lagged financial development negatively correlates to between-regions pay inequality, and (weakly) to overall regional pay inequality.

In Table 3 we turn to the separate effects of credit aggregates. Consistent with the hypotheses developed in section 2, lagged *FIRECredit* correlates positively and significantly to Gini income inequality. The coefficient before 2008 is double the size of the coefficient including the post–2007 crisis years. This suggests that the inequality-increasing effect of *FIRECredit* was linked to the credit boom and strong income growth

⁵Many other variables could in theory be argued to affect income inequality. We base model selection on the literature review, but also probed the results for robustness to including other variables. In Appendix A we report results with additional control variables, most of which are insignificant and none of which would change the results presented here, had they been included in the regression.

Table 2: Total bank credit and inequality

	Gini12'	Gini07'	Pay inequality	Theil overall	Theil between	Theil within
Total bank credit _{t-1}	-0.004 (0.009)	-0.004 (0.017)	-0.004 (0.005)	-0.006 * (0.003)	-0.005 *** (0.001)	-0.001 (0.002)
GDP per capita	3.300 (2.429)	4.449 (2.670)	1.050 (0.622)	0.784 (0.853)	1.099 ** (0.491)	-0.314 (0.543)
Income growth	0.080 * (0.047)	0.107 (0.072)	0.006 (0.022)	0.006 (0.020)	0.024 (0.016)	-0.018 * (0.010)
Output gap	-0.212 *** (0.059)	-0.220 ** (0.085)	-0.036 (0.039)	-0.019 (0.027)	-0.024 * (0.013)	0.005 (0.023)
Wage share (as % GDP)	0.039 (0.089)	-0.012 (0.127)	-0.021 (0.027)	0.016 (0.038)	0.039 (0.029)	-0.023 (0.018)
VA share of manufacturing	0.084 (0.113)	0.076 (0.137)	0.050 (0.047)	-0.003 (0.080)	-0.066 (0.051)	0.064 (0.040)
Inflation	3.752 ** (1.577)	6.078 *** (1.860)	2.002 *** (0.608)	-7.130 (4.484)	-3.707 * (2.061)	-3.422 (2.922)
Unemployment	-0.113 (0.108)	0.021 (0.109)	0.066 ** (0.027)	-0.028 (0.025)	-0.011 (0.013)	-0.017 (0.017)
Schooling years	0.203 (0.258)	0.015 (0.300)	0.357 ** (0.142)	0.195 (0.123)	0.039 (0.040)	0.155 (0.106)
Observations	382	255	244	292	292	292
Countries	26	24	25	25	25	25
R-squared	0.15	0.15	0.24	0.14	0.26	0.12

Notes: The dependent variables are: the Gini net income inequality index for 1990–2012 and 1990–2007; the UTIP-UNIDO industrial pay inequality index ($\times 100$) for 1990–2008; the overall Theil regional pay inequality index (the sum of within and between Theil components); the Theil between-region index; and the Theil within-region index for 1995–2010. Credit variables are one-year lagged. The Table reports coefficient estimates with robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Constant term and country-fixed effects are included (not shown).

before 2008. The effect is also apparent for pay inequality, where the data run until 2008. We do not observe significant correlations with the regional Theil measures for pay inequality.

In contrast, *BusinessCredit* (which is mostly credit to non-financial firms) reduces total-income Gini inequality, albeit the coefficient is weakly significant before the crisis. Countries with more *BusinessCredit* saw larger reductions or smaller increases in income inequality. There is no significant result for inter-industry pay inequality, suggesting that the Gini results are not driven by between-industry dynamics, but reflect falling income inequality across all industries. The reduction in inequality that *BusinessCredit* causes has a clear regional dimension. It significantly reduces between-region pay inequality (TB), which translates into a significant negative coefficient also for the overall Theil index (TO). As before, higher income growth and lower output gaps are linked to higher total-income inequality. Between-industry pay inequality in-

Table 3: **Business/FIRE credit and income/pay inequality**

	Gini12'	Gini07'	Pay inequality	Theil overall	Theil between	Theil within
<i>FIRECredit</i> _{t-1} (fin. bus. & real estate)	0.016 ** (0.008)	0.033 ** (0.015)	0.010 ** (0.005)	0.004 (0.004)	0.001 (0.004)	0.002 (0.003)
<i>BusinessCredit</i> _{t-1} (non-fin. bus. & hh cons.)	-0.036 ** (0.014)	-0.042 * (0.024)	-0.008 (0.010)	-0.015 ** (0.006)	-0.011 ** (0.005)	-0.003 (0.003)
GDP per capita	2.309 (2.288)	3.738 (2.503)	0.650 (0.580)	0.564 (0.780)	0.759 (0.457)	-0.194 (0.562)
Income growth	0.088 ** (0.043)	0.183 *** (0.048)	0.002 (0.028)	0.002 (0.018)	0.020 (0.015)	-0.018 ** (0.009)
Output gap	-0.175 *** (0.059)	-0.258 *** (0.082)	-0.039 (0.044)	-0.020 (0.029)	-0.019 (0.014)	-0.001 (0.024)
Wage share (as % GDP)	0.051 (0.088)	0.095 (0.133)	0.025 (0.031)	0.030 (0.036)	0.050 (0.032)	-0.019 (0.015)
VA share of manufacturing	0.035 (0.081)	0.190 (0.131)	0.183 *** (0.039)	0.015 (0.087)	-0.067 (0.048)	0.083 * (0.048)
Inflation	4.975 (6.758)	6.016 (6.488)	-5.060 (4.012)	-2.185 (1.860)	-1.642 (2.019)	-0.543 (1.081)
Unemployment	-0.030 (0.092)	0.051 (0.080)	0.059 ** (0.024)	-0.025 (0.025)	-0.009 (0.013)	-0.017 (0.019)
Schooling years	0.074 (0.196)	0.082 (0.256)	0.423 *** (0.128)	0.179 (0.118)	0.036 (0.043)	0.143 (0.104)
Observations	355	233	218	271	271	271
Countries	25	23	24	24	24	24
R-squared	0.17	0.30	0.36	0.14	0.30	0.13

Notes: The dependent variables are: the Gini net income inequality index for 1990–2012 and 1990–2007; the UTIP-UNIDO industrial pay inequality index ($\times 100$) for 1990–2008; the overall Theil regional pay inequality index (the sum of within and between Theil components); the Theil between-region index; and the Theil within-region index for 1995–2010. Credit variables are one-year lagged. The Table reports coefficient estimates with robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Constant term and country-fixed effects are included (not shown).

creases with unemployment, education levels (presumably due to skill premiums) and manufacturing shares, perhaps reflecting the income equalizing influence of a growing services sector.

The relation between financial development and income inequality may be hump-shaped (Greenwood and Jovanovic, 1990). That is, at low levels of financial development, more credit may increase inequality since not all benefit from it, but as more people gain access to finance, this helps to smooth out the income distribution (Kim and Lin, 2011). To check whether there is a nonlinear relation between credit categories and inequality, we add quadratic terms of credit categories in the next specification. Since the quadratic term of *FIRECredit* is insignificant for all inequality measures, we report in Table 4 only the results when the quadratic term of *BusinessCredit* is included.

Figure 4 depicts marginal effects of *BusinessCredit* on Gini and Theil indices con-

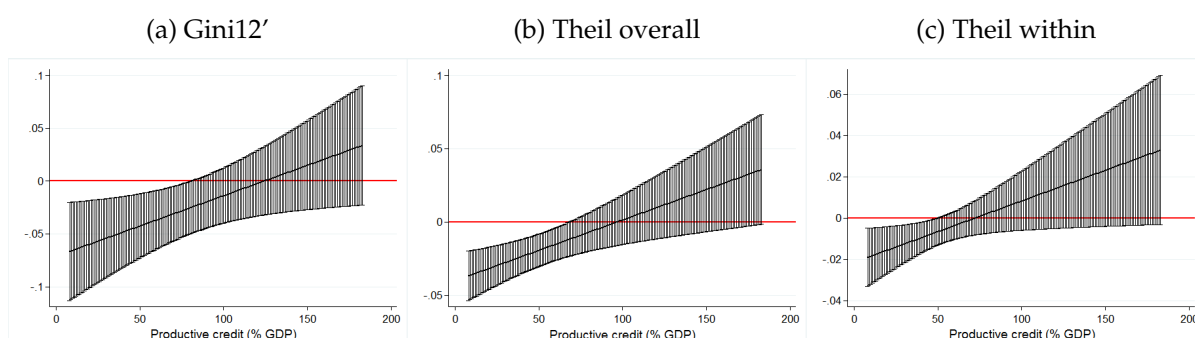
Table 4: Non-linear relationships: credit and inequality

	Gini12'	Gini07'	Pay inequality	Theil overall	Theil between	Theil within
$FIRECredit_{t-1}$	0.012 (0.008)	0.032 * (0.016)	0.010 ** (0.005)	0.001 (0.003)	0.001 (0.004)	0.0001 (0.003)
$BusinessCredit_{t-1}$	-0.071 ** (0.025)	-0.046 (0.060)	-0.001 (0.025)	-0.040 *** (0.009)	-0.019 *** (0.005)	-0.021 ** (0.008)
$BusinessCredit_{t-1}^2$	0.0003** (0.000)	0.0001 (0.001)	-0.0001 (0.000)	0.0002*** (0.000)	0.0001 (0.000)	0.0002** (0.000)
Observations	355	233	218	271	271	271
R-squared	0.19	0.30	0.36	0.19	0.31	0.18

Notes: The dependent variables are: the Gini net income inequality index for 1990–2012 and 1990–2007; the UTIP-UNIDO industrial pay inequality index ($\times 100$) for 1990–2008; the overall Theil regional pay inequality index (the sum of within and between Theil components); the Theil between-region index; and the Theil within-region index for 1995–2010. Credit variables are one-year lagged. The Table reports coefficient estimates with robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Constant term, control variables, and country-fixed effects are included (not shown).

ditional on different levels of this credit. At threshold levels of *BusinessCredit* below 88% of GDP (96% of all observations), lagged *BusinessCredit* significantly reduces Gini income inequality, with this effect diminishing as credit levels rise. Only at very high levels of credit (above 123% GDP), the effect of *BusinessCredit* is positive but statistically insignificant. Similarly, lagged *BusinessCredit* has negative, significant effects on the Theil overall index and the Theil within-region index below 70% and 47%, respectively, which comprises 60% of the sample. We conclude that nonlinear effects are present for regional but not for country-wide pay inequality. The income inequality-reducing effect of *BusinessCredit* is robust to accounting for the nonlinear effects.

Figure 4: The effect of *BusinessCredit* on inequality conditional on credit level



Notes: Solid lines show marginal effects of *BusinessCredit* on inequality at different levels of credit; vertical boundaries indicate 95% confidence interval. The marginal effects are significant when solid lines and confidence intervals are above (below) zero.

5.1 FIRE-sector credit effects on inequality: conditioning factors

So far, we tested a reduced form of the causal chain depicted in Figure 1. In this section we tease out evidence on the intervening steps by examining factors that could condition the impact of financial development on income inequality if the Figure 1 causal chain operates.

First, we suggested that a rising share of FIRE sector income is the transmission channel from FIRE-sector credit to financial development. This implies that in economies with larger FIRE sectors, the effect of FIRE-sector credit on income inequality will be larger. Also, since FIRE-sector incomes rise due to increasing asset prices, in economies with higher asset prices, the effect of FIRE-sector credit on income inequality will be larger. To test this transmission channel, we interact *FIRECredit* with FIRE-sector size (measured as the share of FIRE-sector value-added in total value-added) and real house prices (a proxy for asset prices).

In Table 5, panel 5.1. we find that the higher the value-added share of the FIRE sector, the bigger is the positive impact of *FIRECredit* on overall and between-regions pay inequality. Figure 5 illustrates that the effect is significant for value-added shares larger than 17% of total value-added, accounting for 25-45% of all observations. In Table 5, panel 5.2. we find that *FIRECredit* increases both country-wide and overall regional pay inequality more when the real house price index is above 107 (see Figure 6). This holds for 60% of all observations with house price data. For TW (within-region) inequality, the total marginal effect is significant for a real house price index above 123 (49% of observations). This suggests that FIRE-sector credit affects the regional wage distribution, but not total incomes.

These results on conditioning factors (house price and FIRE-sector size) are no hard proof for a specific causal sequence. Alternatively, one can imagine that rising inequality due to some other driver (such as managerial compensation) results in top incomes being invested such that it increases real estate prices and FIREsector incomes. Alternative explanations cannot be excluded, but the results we presented are at least consistent with the channels outlined in Figure 1.

Table 5: The effect of *FIRECredit* conditional on FIRE sector size, house prices

	Gini12'	Gini07'	Pay inequality	Theil overall	Theil between	Theil within
5.1. FIRE sector size						
<i>FIRECredit</i> _{<i>t</i>-1}	0.008 (0.042)	0.051 (0.079)	-0.025 (0.029)	-0.026 * (0.015)	-0.023 * (0.013)	-0.003 (0.009)
Share of FIRE VA	0.027 (0.212)	0.293 (0.307)	-0.242 * (0.128)	-0.065 (0.070)	-0.050 (0.056)	-0.015 (0.050)
<i>FIRECredit</i> _{<i>t</i>-1} × Share of FIRE VA	0.0001 (0.003)	-0.002 (0.006)	0.002 (0.002)	0.002 ** (0.001)	0.002 * (0.001)	0.0001 (0.001)
<i>BusinessCredit</i> _{<i>t</i>-1}	-0.043 *** (0.014)	-0.063 *** (0.020)	-0.004 (0.009)	-0.016 *** (0.005)	-0.013 *** (0.004)	-0.003 (0.003)
Observations	347	225	214	271	271	271
R-squared	0.18	0.34	0.42	0.17	0.34	0.13
5.2. Real house prices						
<i>FIRECredit</i> _{<i>t</i>-1}	-0.013 (0.021)	-0.022 (0.047)	-0.026 (0.020)	-0.017 (0.012)	0.001 * (0.009)	-0.018 * (0.010)
Real house price	0.004 (0.012)	-0.021 (0.016)	-0.017 *** (0.006)	-0.009 (0.006)	-0.003 (0.003)	-0.006 (0.004)
<i>FIRECredit</i> _{<i>t</i>-1} × real house price	0.0001 (0.000)	0.0001 (0.000)	0.0003** (0.000)	0.0002* (0.000)	0.0001 (0.000)	0.0002** (0.000)
<i>BusinessCredit</i> _{<i>t</i>-1}	-0.0363** (0.015)	-0.034 (0.023)	-0.020 ** (0.008)	-0.012 * (0.007)	-0.010 * (0.006)	-0.002 (0.004)
Observations	317	196	182	244	244	244
R-squared	0.22	0.30	0.532	0.16	0.32	0.20

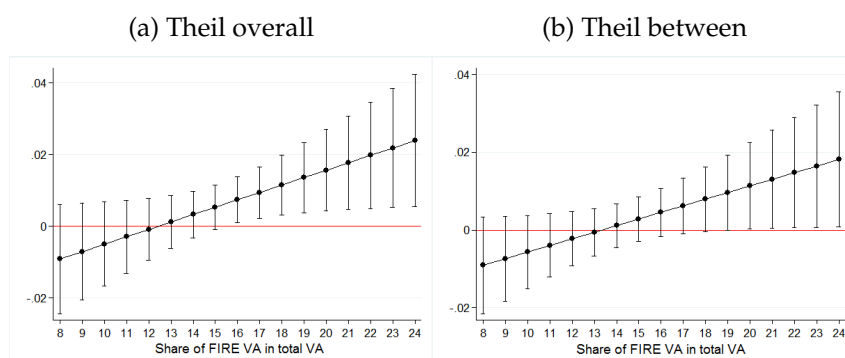
Notes: The dependent variables are: the Gini net income inequality index for 1990–2012 and 1990–2007; the UTIP-UNIDO industrial pay inequality index ($\times 100$) for 1990–2008; the overall Theil regional pay inequality index (the sum of within and between Theil components); the Theil between-region index; and the Theil within-region index for 1995–2010. Credit variables are one-year lagged. The Table reports coefficient estimates with robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Constant term, control variables, and country-fixed effects are included (not shown).

5.2 Business credit effects on inequality: conditioning factors

Second, we examine factors that condition the impact of *BusinessCredit* on income inequality. We will consider: investment shares, trade openness and wage shares.

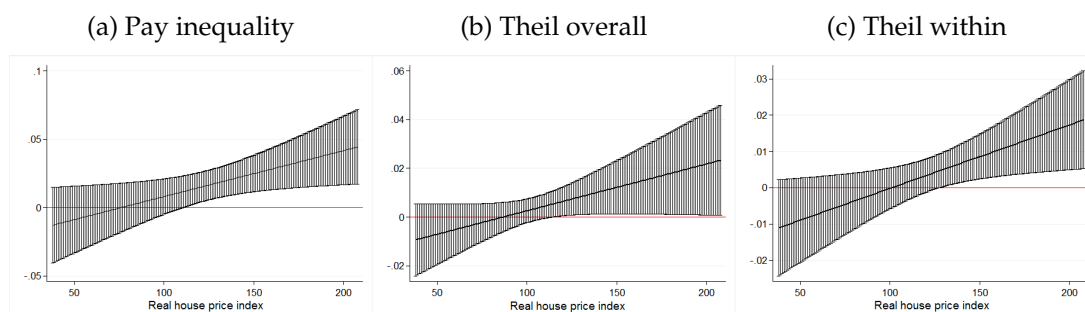
BusinessCredit loosens financing constraints on investment. We analyze this effect under the assumption that industries with lower returns are more investment-constrained. If this is the case, then more *BusinessCredit* loosens investment constraints more in industries with lower wages, reducing wage inequality. The effect of loosening financing constraints on total-income inequality is not so clear. More investment due to larger availability of *BusinessCredit* may raise wages but it may simultaneously generate more capital income, which typically increases income inequality. The net effect of looser financing constraints on income inequality is the balance of the effects on

Figure 5: The effect of *FIRECredit* on inequality conditional on the FIRE sector size



Notes: Solid lines show marginal effects of *FIRECredit* on inequality at different FIRE sector size; vertical boundaries indicate 95% confidence interval. The marginal effects are significant when solid lines and confidence intervals are above (below) zero.

Figure 6: The effect of *FIRECredit* on inequality conditional on real house prices



Notes: Solid lines show marginal effects of *FIRECredit* on inequality at different real house prices; vertical boundaries indicate 95% confidence interval. The marginal effects are significant when solid lines and confidence intervals are above (below) zero.

wages and capital incomes.

We cannot observe financing constraints on investment directly, but we proxy them by non-residential investment as a share of GDP, assuming that the more investment-to-GDP there is in an economy, the smaller are financing constraints on investment. In country-years where the financing constraint is more binding (where non-residential investment shares are lower), *BusinessCredit* can be expected to reduce pay inequality more.

In Table 6, panel 6.1. we interact *BusinessCredit* with non-residential investment. In the regression on inter-industry country-wide pay inequality, the interaction term is indeed smaller for smaller investment levels. The marginal effect is only significantly negative for low values of investment (below 16% GDP) (see Figure 7). These results suggest that *BusinessCredit* reduces pay inequality by stimulating investment. In a regression on the more ambiguous Gini index for total incomes, we find that the

interaction term is negative above a threshold for the investment share of 16% GDP, which includes 75% of the sample, using the full sample until 2012. There are no regional inequality effects for *BusinessCredit*, and no pre-crisis effects (possibly due to the smaller sample).

It is not clear why the correlation of inequality and business credit becomes more negative over rising investment levels. We checked that this is not driven by outliers, extreme values or model specifications. We conclude that inequality in other income components than wages behaves differently over investment levels than do wages. This merits further research using more fine-grained data on investment and income. Overall, the results are consistent with credit to business and consumers reducing wage inequality (but not total-income inequality) by stimulating investment.

A second channel of transmission may be trade openness. The degree to which investment leads to more domestic employment and wages may depend on trade openness. This degree is likely to be smaller when effects of business credit leak away via trade, influencing foreign income distributions rather than domestic. Also, in more open economies, credit is more likely to go to vibrant export sectors with relatively high wages. To explore the conditioning effect of trade openness, we interact credit aggregates with trade shares. The regression results in Table 6, panel 6.2. show that for trade openness up to 87% of GDP (46% of all observations), *BusinessCredit* reduces pay inequality. This effect diminishes as openness increases. However, openness almost never reverses the effect (see Figure 8). It is only above a threshold of 146% of GDP (amounting to just 15% of all observations) that the *BusinessCredit* effect on pay inequality is significantly positive. There is no significant trade interaction effect on the total-income Gini index, suggesting that redistribution (the difference between Gini and Theil indices) counters the effect of trade openness on wages.

Third, in addition to investment shares and trade openness, the degree to which investment leads to more employment and wages depends also on how much wage shares can rise. In economies where wage shares are already high, for instance due to strong trade unions or for structural reasons, *BusinessCredit* cannot make much of a dif-

Table 6: The effect of *BusinessCredit* conditional on investment, openness, wages

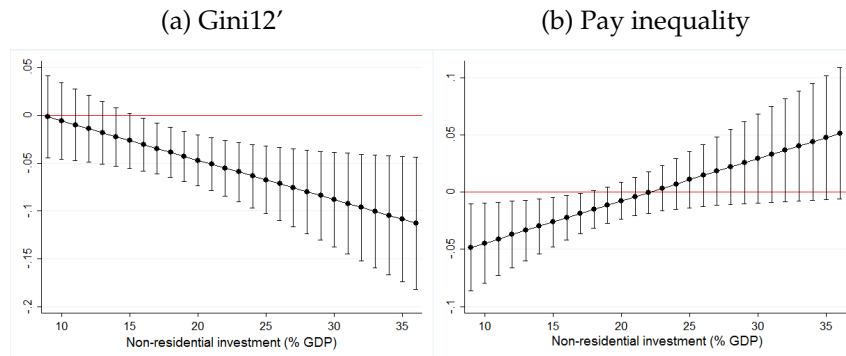
	Gini12'	Gini07'	Pay inequality	Theil overall	Theil between	Theil within
6.1. Non-residential investment						
<i>FIRECredit</i> _{t-1}	0.011 (0.009)	0.030 (0.018)	0.014 *** (0.005)	0.004 (0.004)	0.002 (0.004)	0.003 (0.003)
<i>BusinessCredit</i> _{t-1}	0.035 (0.037)	-0.003 (0.092)	-0.082 ** (0.034)	-0.029 (0.017)	-0.020 (0.014)	-0.009 (0.010)
Non-residential investment	0.190 ** (0.090)	0.004 (0.106)	-0.157 * (0.081)	-0.115 ** (0.055)	-0.052 (0.044)	-0.063 (0.038)
<i>BusinessCredit</i> _{t-1} × non-residential investment	-0.004 ** (0.002)	-0.002 (0.004)	0.004 ** (0.002)	0.001 (0.001)	0.001 (0.001)	0.000 (0.000)
Observations	355	233	218	271	271	271
R-squared	0.21	0.30	0.42	0.19	0.32	0.16
6.2. Trade openness						
<i>FIRECredit</i> _{t-1}	0.017 ** (0.008)	0.031 * (0.016)	0.010 * (0.005)	0.003 (0.004)	0.001 (0.004)	0.003 (0.003)
<i>BusinessCredit</i> _{t-1}	-0.029 (0.024)	-0.052 (0.050)	-0.049 *** (0.009)	-0.024 ** (0.010)	-0.013 * (0.007)	-0.012 * (0.006)
Trade openness	0.001 (0.022)	0.007 (0.020)	-0.024 ** (0.011)	-0.006 (0.004)	0.002 (0.003)	-0.008 ** (0.003)
<i>BusinessCredit</i> _{t-1} × trade openness	-0.0001 (0.000)	0.000 (0.000)	0.0005*** (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Observations	355	233	218	271	271	271
R-squared	0.17	0.30	0.43	0.15	0.30	0.15
6.3. Wage share in GDP						
<i>FIRECredit</i> _{t-1}	0.012 * (0.006)	0.032 *** (0.010)	0.010 * (0.005)	0.003 (0.003)	0.001 (0.004)	0.002 (0.003)
<i>BusinessCredit</i> _{t-1}	-0.330 *** (0.097)	-0.404 ** (0.154)	0.051 (0.086)	-0.080 ** (0.034)	-0.050 ** (0.019)	-0.030 (0.028)
Wage share as % GDP	-0.147 (0.112)	-0.149 (0.173)	0.062 (0.062)	-0.017 (0.051)	0.022 (0.043)	-0.039 (0.027)
<i>BusinessCredit</i> _{t-1} × wage share	0.005 *** (0.002)	0.007 ** (0.003)	-0.001 (0.002)	0.001 * (0.001)	0.001 * (0.000)	0.000 (0.001)
Observations	355	233	218	271	271	271
R-squared	0.23	0.37	0.37	0.16	0.31	0.14

Notes: The dependent variables are: the Gini net income inequality index for 1990–2012 and 1990–2007; the UTIP-UNIDO industrial pay inequality index ($\times 100$) for 1990–2008; the overall Theil regional pay inequality index (the sum of within and between Theil components); the Theil between-region index; and the Theil within-region index for 1995–2010. Credit variables are one-year lagged. The Table reports coefficient estimates with robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Constant term, control variables, and country-fixed effects are included (not shown).

ference to the wage distribution. In Table 6, panel 6.3. we find that when wage shares are below 58% of GDP (72% of all observations), *BusinessCredit* reduces Gini income inequality as well as overall and between-region Theil pay inequality (see Figure 9). The effect diminishes as the wage share increases.

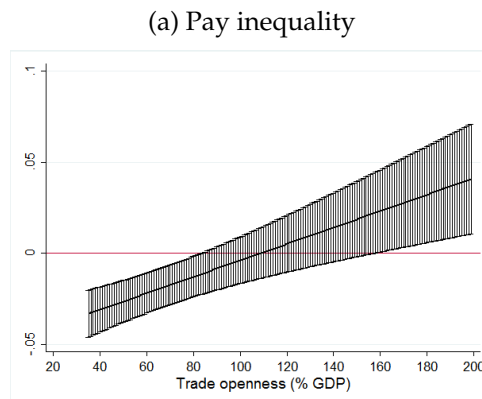
In sum, in this and the previous sections we explored transmission channels from *FIRECredit* and *BusinessCredit* to income inequality. We find qualified evidence that investment, trade openness and wages shares matter to the effect of *BusinessCredit* on

Figure 7: The effect of business credit on inequality conditional on investment



Notes: Solid lines show marginal effects of *BusinessCredit* on inequality at different levels of non-residential investment; vertical boundaries indicate 95% confidence interval. The marginal effects are significant when solid lines and confidence intervals are above (below) zero.

Figure 8: The effect of business credit on inequality conditional on trade openness



Notes: The solid line shows the marginal effect of *BusinessCredit* on pay inequality at different levels of trade openness; vertical boundaries indicate 95% confidence interval. The marginal effect is significant when solid lines and confidence intervals are above (below) zero.

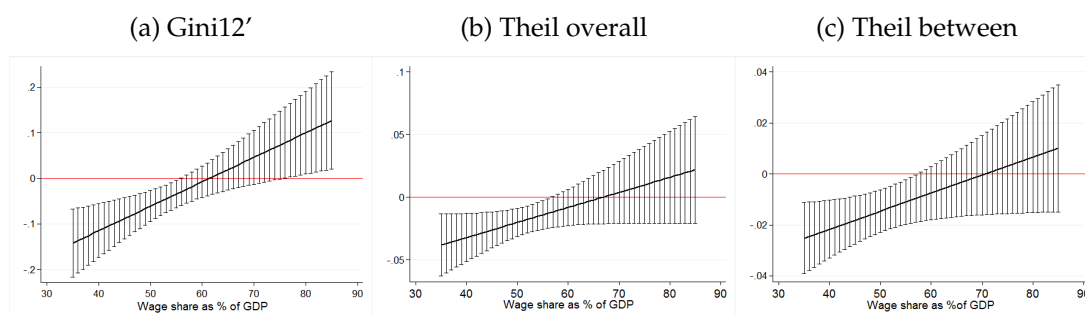
inequality, consistent with the steps in the Figure 1 causal chain. We noted that these results also suggest several follow-up questions for future research.

6 Robustness checks

We conducted an extensive sensitivity analysis to check the robustness of our results to modifications in methodology, model specifications, country sample, and inclusion of additional variables. The results are presented in Appendix A.

First, we re-estimated all models including a more extensive set of control variables. The results are reported in Table ???. The findings for credit categories are comparable to the benchmark results, while most of the additional controls were insignificant and

Figure 9: The effect of business credit on inequality conditional on wage share



Notes: The solid line shows the marginal effect of *BusinessCredit* on inequality at different levels of wage share; vertical boundaries indicate 95% confidence interval. The marginal effect is significant when solid lines and confidence intervals are above (below) zero.

did not affect the outcomes. A noteworthy result is that higher government expenditures are associated with larger Gini income inequality, but lower pay inequality. One explanation for this finding is that higher government subsidies to non-financial firms could stimulate investment and employment, giving rise to both more wage incomes and larger wage equality, and higher capital incomes leading to higher total-income inequality. More research into this tentative explanation is warranted.

A second robustness check was to re-estimate all models using a random-effects regression instead of fixed-effects. The Hausman test in several cases pointed towards using a random effects model, while in other cases the fixed-effects model was indicated. The estimation results from RE models (see Table ??) are weaker than for FE models, although generally they are qualitatively comparable. In the RE specification, *FIREcredit* no longer significantly affects pay inequality and *BusinessCredit* no longer impacts Gini inequality in the pre-crisis period.

Third, we address the potential endogeneity problem, noted in Section 2. Previous studies (e.g., Clarke et al., 2006; Kunieda et al., 2014) instrument financial development with legal origin or other institutional factors. However, it is unclear what variables could serve as suitable instruments for disaggregated credit categories. Therefore, we instrument credit variables with their lags, using IV-GMM as well as fixed-effects IV regressions. All the instruments in IV-GMM were dropped, with test statistics suggesting that instrumented credit variables are exogenous. The outcomes of the fixed-effects IV regressions are similar to our main results, both in terms of significance and mag-

nitude of estimates. Table ?? reports the results of IV fixed-effects regressions with the 2nd and 3rd lags of credit categories used as instruments (we also estimated longer lag windows up to 6 lags, which did not alter the results).

Another concern was that inequality measures in annual data may not vary enough over time to observe effects. This motivates our next robustness check where we conduct the analysis using 3-year non-overlapping averages of annual data over 1990–2012. The results are reported in Table ?. The findings here are qualitatively similar to the outcomes of the analysis based on annual observations.⁶

To control for time fixed effects we included year or period (for 3-year data) dummies. The results were not affected and time dummies were jointly insignificant. Therefore, we did not include them in the benchmark analysis.

We also controlled for alternative measures of government expenditures, using the cyclical component of expenditure of general government and cyclically adjusted total expenditure of general government. The former was insignificant, while the latter had a similar impact as did the non-adjusted government expenditure.

In this sample, it is possible that some countries drive the results, so that the sample-average coefficient are not representative for the whole sample. To explore sensitivity of the results to this, we re-did the analysis while dropping each country, one by one, from the sample. This did not alter the main outcomes.

Last, since we study EU countries, we include EMU dummy to test whether becoming an EMU member influenced countries' income and pay inequality. We find a significant effect only for Theil between-regions inter-industry wage inequality measures: EMU membership contributed to reducing between-region pay inequality.⁷ This result, which does not affect the outcomes for credit categories, is relevant to the discussion of the impact of EMU membership on regional disparities.

⁶Alternatively, instead of using Gini index that exhibits low variability, we measured income inequality by the ratio between 90th and 10th percentile of income distribution, and between 80th and 20th percentiles, which both show higher variation. The data for these ratios, from EU-SILC dataset, were available only for half of our sample. The estimation results (available on request) for the percentile ratios were similar to Gini net in our main analysis.

⁷This result goes in contrast with Bouvet (2010) who finds that euro adoption worsened regional inequality in poorer EU states, but had negligible effect on regional inequality in advanced EU states.

7 Conclusion

In this paper we revisited the question whether financial development decreases income inequality, with a new focus. We discussed how ambiguous answers in the literature to date may be due to over-aggregation. The indicator for financial development is typically bank credit stocks to the private sector, without distinction in the use of credit. We disaggregate bank credit into credit to real estate and financial asset markets, which increases the income share of the Finance, Insurance and Real Estate (FIRE) sector and, we expect, increases income inequality. The other category is credit to non-financial business and for household consumption, which more broadly supports investment, demand, employment and wages, and is expected to decrease income inequality.

We find evidence for the different effects of these two credit aggregates in data over 1990–2012 for 26 EU economies. We also register differences in effects on total-income versus pay inequality, and within pay inequality on regional inequality versus country-level inequality measures. Among other findings, we find that credit to non-financial business and to consumers tends to smooth both Gini total-income and regional pay inequality, whereas FIRE sector credit has the opposite effect. The literature documents a large shift in bank credit allocation since the 1990s, away from supporting investments by firms in the real sector and towards financing capital gains in real estate and financial asset markets. Combined with our new findings, this 'debt shift' helps to understand the growth of inequality.

We then probe the conditions for financial development to decrease or increase income inequality. The inequality-reducing effect of non-financial business plus consumer bank credit varies with levels of investment, trade openness and wage shares. The inequality-increasing effect of 'FIRE sector' credit varies with the FIRE sector's share in the economy and house prices.

The findings on the opposite effect of credit to the FIRE-sector on one hand and to non-financial business or consumers on the other hand are remarkably consistent. This invites more work to extend the analysis to other countries. We note several open questions regarding the transmission channels from credit to inequality. This could be

studied in more detail, using sector-level and firm-level data. The present approach could also be extended to other issues. By moving from broad credit aggregates to distinction of credit by its uses, we may gain a more detailed understanding of the impacts not only on inequality, but also on other macroeconomic outcomes such as stability and growth.

The disaggregation applied in this paper is one possibility, and it is only an imperfect way to separate effects running through asset markets from effects running through goods-and-services markets. The same reasoning would suggest other disaggregations if the focus of analysis is different. For instance, within credit to non-financial business, there is much that is not necessarily financing output growth and wage formation, but rather commercial real estate, mergers and takeovers, or share buyback programs. These uses of credit will affect inequality (and other outcomes) through different channels, perhaps more akin to capital-gain channels we have described for FIRE-sector. With more detailed data, this sort of effects can be studied better.

A policy implication of our work is that, since financial-sector dynamics matters so clearly to income inequality, financial-sector policies should be formulated not only in pursuit of financial-sector efficiency and stability, but also consistent with income distribution objectives.

Acknowledgments

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