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Banks, debts and workers

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BANKS, DEBTS AND WORKERS**ECONOMICS DEPARTMENT WORKING PAPERS No. 1640****By Oliver Denk and Priscilla Fialho**

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ABSTRACT/RÉSUMÉ

Banks, debts and workers

Private debt owed to banks and other financial institutions has been at unprecedented high levels. This paper studies the role of these high levels of debt for workers, based on an assembled micro-dataset that harmonises household surveys from 29 OECD countries. High debt is found to be associated with two bad outcomes for workers: weaker wage growth and an increased risk that they encounter a sharp fall in their wages. People who tend to be particularly affected are the low-skilled, individuals with unstable employment paths and financially vulnerable households. Strong bank supervision and macroprudential measures that aim to avoid credit overexpansion are two policies that can improve the links of private debt with labour income growth and risk. Overall, the evidence in this paper points to finance as one factor behind wage stagnation and the social divisions in today's labour markets.

JEL Classification: E24; G21; G28; J31

Keywords: Finance, credit, labour earnings, income growth, income risk

Banques, dettes et travailleurs

La dette privée envers les banques et autres institutions financières a atteint des niveaux sans précédent. Cet article étudie le rôle de ces niveaux élevés d'endettement pour les travailleurs, sur la base d'un ensemble de micro-données assemblées qui harmonise les enquêtes auprès des ménages de 29 pays de l'OCDE. Il s'avère qu'un endettement élevé est associé à deux mauvais résultats pour les travailleurs : une croissance plus faible des salaires et un risque accru de voir leurs salaires baisser fortement. Les personnes qui ont tendance à être particulièrement touchées sont les personnes peu qualifiées, les travailleurs aux trajectoires d'emploi instables et les ménages financièrement vulnérables. Une surveillance bancaire rigoureuse et des mesures macroprudentielles visant à éviter une surexpansion du crédit sont deux politiques qui peuvent améliorer les liens entre la dette privée et la croissance et le risque des revenus du travail. Dans l'ensemble, les données présentées dans cet article indiquent que la finance est l'un des facteurs à l'origine de la stagnation des salaires et des divisions sociales sur les marchés du travail actuels.

Classification JEL : E24 ; G21 ; G28 ; J31

Mots-clés : Finance, crédit, revenus du travail, croissance des revenus, risque de revenu

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Banks, Debts and Workers

By Oliver Denk and Priscilla Fialho¹

1. Introduction and main findings

1. Two of the most striking features of advanced economies in the past three decades are the massive build-up of private debt owed to banks and other financial institutions and the strong decline in the labour income growth of workers (Figure 1). Households and businesses are more indebted than at any moment in modern history. At the same time, wages have grown little and, as this paper will show, economic insecurity of workers arising from income risks has increased over the past 10-15 years as well. Could these two phenomena – the enormous rise of finance and the decline in the growth and stability of worker pay – be linked?

Figure 1. Private debt and wage growth in OECD countries

Note: The vertical axis on the left measures total credit to the non-financial private sector in per cent of GDP. Data are from the Bank for International Settlements and the World Bank as described in Section 2.2. The vertical axis on the right measures annual labour income growth per full-time equivalent employee, adjusted with a price deflator for private final consumption expenditures. Data for labour income are from the OECD Employment Outlook Database and hence different to the rest of the paper which uses household surveys, as national accounts-based data are more representative of average developments. The figure depicts the unweighted averages for the OECD countries in the empirical analysis of this paper.

¹ OECD Economics Department. Contact: Oliver.Denk@oecd.org and Priscilla.Fialho@oecd.org. We are grateful to Boris Cournède, with whom this project was initiated, and Peter Hoeller, who supervised the project. The paper also benefited from useful comments by Elena Crivellaro, Paula Garda, Catherine L. Mann and country delegates to the OECD. Special thanks go to Celia Rutkoski for editorial coordination.

2. This paper investigates the relationship of finance with labour income using micro-data for 29 OECD countries assembled from a variety of different sources. It examines the role of both the size and the structure of finance. Most of the analysis focuses on private credit (or debt). For the labour market, the approach integrates an analysis of labour income growth and income risk, two fundamental determinants of people's well-being. Workers care about how much they earn, and also about how stable this stream of income is.

3. Earlier OECD work relied on macro-data to estimate the relationship between finance and income growth (Cournède, Denk and Hoeller, 2015; Cournède and Denk, 2015). The present paper goes much beyond this work by using worker-level micro-data. Micro-data are required to analyse changes to the distribution of income growth, not only average income growth. In particular, they allow estimating the degree to which the empirical link between finance and income growth is due to changes in income risk, i.e. the incidence of large negative or positive income changes. Another advantage of the micro-data is that they allow investigating which groups of workers may be affected most (defined, for example, by age, gender or education).

4. The paper uses all the cross-country micro-data from household surveys made available by member countries to the OECD for examining the role of finance for workers. However, these data come with several drawbacks, in particular they do not allow linking worker with firm or industry data and the time series are short. Two implications are: for one, the study is reduced-form in the sense that it leaves out the role of firms from the analysis, which are likely to be an important intermediary between finance and the labour market. Second, the estimation relies on variation across countries and years, while controlling for many potentially confounding factors; hence, care must be taken not to give the estimates a strict causal interpretation.

5. The main findings of the paper are as follows:

- Debt or credit accumulation has, on average across countries, been associated with lower income growth. The negative link of credit with income growth is mainly explained by bank credit, rather than credit by other lenders. It is also mostly explained by credit to households, instead of credit to corporations. These results are in line with earlier OECD work based on macro-data.
- The negative association between credit expansion and labour income growth is robust. It holds for the majority of OECD countries, is not specific to the period since the global financial crisis, does not depend on a particular definition of labour earnings and is not influenced by policy reforms and trends such as globalisation or technological progress that occurred at the same time.
- The negative association between credit expansion and labour income growth could, in principle, be due to: i) labour income of most workers growing at a lower rate; ii) large labour income declines becoming more frequent; or iii) large labour income increases becoming less frequent. The micro-data analysis shows that the main explanation is a higher risk of large income declines.
- The findings of a correlation of more credit with lower labour income growth and greater labour income risk is based on samples mainly from the 1990s to the 2010s, a period in which private sector debt has grown to unprecedented levels. They leave the possibility open that these associations are more favourable at lower levels of indebtedness.
- The empirical link between credit expansion and income growth is particularly negative for: men, prime-age workers, the low-skilled, workers with unstable employment paths, financially vulnerable households and employees in agriculture, construction and metal production. These also tend to be the groups who are most likely to experience a large income decline.

- In contrast to credit, stock market financing is not related with labour income growth. Stock market financing is, however, strongly associated with a higher frequency of very large labour income increases, benefiting 1% of individuals.
- Understanding the precise channels through which finance and income growth and risk are related is difficult given the available data. The paper discusses channels that may explain why more credit is associated with lower income growth and higher income risk. It also discusses the data needed to test the importance of different channels.
- The empirical analysis identifies financial and structural policies that have usually been associated with a more favourable relationship of credit with income growth and risk:
 - Stronger banking supervision (including higher capital requirements for banks and more effective examinations by the supervisory authority) mitigates the link of more credit with lower labour income growth.
 - Macroprudential measures that aim to avoid credit overexpansion (such as loan-to-value ratios, debt-to-income ratios and caps on new loans) similarly appear to reduce the negative correlation between credit and income growth.
 - Fewer restrictions to international capital movements are another measure that mitigates the link of higher credit with lower income growth, perhaps because they improve the worldwide allocation of the capital that is financed with credit.
 - The increased frequency of large income declines associated with rising credit is particularly high in economies which are very open to trade. Credit-financed expansions of trade activities and global value chains may expose workers to more volatile earnings.
 - Stricter product market regulations reinforce the correlation of more credit with lower income growth, while reducing the correlation of more credit with higher income risk. Hence, extending credit seems to reduce income growth in a more similar manner across workers when competition is weak.

6. This is the first paper using cross-country micro-data for a close examination of financial development and income growth and risk. Heil (2018) provides an overview of the literature on finance and labour, and Jacoby (2009) gives a critical account of the role of finance for workers.

7. In related work, Pagano and Pica (2012), relying on cross-country industry-level data up to 2003, find no link of credit and stock market expansion with wage growth. Other papers, such as Boeri, Garibaldi and Moen (2013), Borio et al. (2015) and Berton et al. (2018), have looked at the role of finance for employment. However, a focus on labour income as in this paper seems preferable, since changes in earnings encompass changes in employment.

8. The role of finance has been studied in the context of wage volatility: Darcillon (2016) argues that financial expansion is related with higher wage volatility, while Buch and Pierdzioch (2014) do not find such a link. The volatility measures in these two papers are based on variation across industries or time and are therefore different to individual labour income risk, which is more closely tied to people's well-being.

9. One reason behind the negative association of credit with income growth, as highlighted in Cournède, Denk and Hoeller (2015), Cournède and Denk (2015) and in this paper, could be that credit is not allocated to where it is needed, but where the collateral is. The role of the lack of financing for intangible assets for productivity has been the subject of recent lines of enquiry (Demmou, Stefanescu and Arquíé, 2019; Demmou, Franco and Stefanescu, 2020).

10. The paper is also related to a recent strand of the literature on the shape of the earnings change distribution. For example, Guvenen et al. (2019) find that the US distribution of income growth is negatively skewed, i.e. large income declines occur more often than large income rises. Based on the results in this paper, high levels of credit could be one factor behind the negative skewness of the income change distribution.

11. The focus of the paper is on finance and labour income. However, the methodology is general and could be used for a joint analysis of income growth and income risk in the context of other policies and income concepts. Such lines of research would be related to previous OECD work examining the role of a suite of policies for individual income stability (Cournède, Garda and Ziemann, 2015). Another way of interpreting income risk is to view it as a measure of the degree of social mobility in the current work force, with greater income risk indicating a more fluid income ladder (OECD, 2018).

12. The rest of the paper is structured as follows. Section 2 describes the datasets and the empirical strategy. Section 3 presents the results for labour income growth and risk. Section 4 discusses how policies can shape the relationship of finance with earnings growth and risk. The last section offers concluding remarks and suggestions for future research.

2. Data and methodology

13. This section describes the data sources and empirical framework. Two types of datasets are used: individual-level panel data and country-level macroeconomic indicators.

2.1. Micro-level data sources

14. The analysis uses an individual-level panel dataset that assembles and harmonises data for 29 of the 37 OECD countries. For many European countries, information on labour income and labour market status of individual workers comes from the European Community Household Panel (ECHP) and the European Union Statistics on Income and Living Conditions (EU-SILC). The ECHP covers the years 1994 to 2000 and the EU-SILC the years 2003 to 2014. The two datasets include the following countries: Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Luxembourg, the Netherlands, Norway, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, Turkey and the United Kingdom.²

15. The ECHP and the EU-SILC are complemented with household panel surveys for six countries: Australia (Household, Income and Labour Dynamics in Australia Survey – HILDA – from 2001 to 2013), Germany (German Socio-Economic Panel – SOEP – from 1984 to 2012), Korea (Korea Labour and Income Panel Study – KLIPS – from 1999 to 2012), Switzerland (Swiss Household Panel – SHP – from 1999 to 2013) and the United States (Panel Study of Income Dynamics – PSID – from 1975 to 2011). The analysis requires observing the same individual for two consecutive years. However, the PSID became bi-annual in 1997. Hence, earnings information for individuals included in two consecutive survey waves is interpolated.

16. The two main outcomes of interest, labour income growth and risk, are calculated from the gross annual labour income, which includes income from dependent and self-employment.³ ECHP and EU-SILC also contain some information about other income sources, such as capital

² The Czech Republic, Estonia, Hungary, Iceland, Latvia, Norway, Poland, the Slovak Republic, Slovenia and Turkey are only included in the EU-SILC.

³ The number of hours worked is not available for the majority of the countries in the assembled dataset. Furthermore, for the countries for which hours are available, given that the source is not administrative, the measurement error could be significant. The analysis is therefore conducted on annual labour income.

income, but the number of missing values for these variables is large so that using them would considerably reduce the sample size. Labour income has been deflated with the consumer price index from the OECD Economic Outlook Database. The panel contains information on other variables that are used in the empirical analysis, such as monthly status in the labour market (not available for Korea) and personal characteristics, including age, gender, education and marital status.

17. The sample is cleaned in several meaningful ways. The baseline analysis includes only individuals who are between 25 and 60 years old so as to focus on the working-age population. Earnings for the young and individuals around the retirement age are influenced by the welfare system and other institutions beyond the scope of this paper. Moreover, the sample is restricted to individuals who work at least one month in each of the two years over which income growth and risk are calculated, hence to individuals who are minimally attached to the labour market.⁴ For some parts of the analysis, the sample is further restricted to individuals who work twelve months in both years. In this restricted sample, earnings changes are solely driven by changes in the hourly wage rate or the number of hours worked in a month, but not by differences in the number of months worked. The baseline sample has 1.4 million observations, with significant differences across countries, in part due to differences in the number of years available (Table 1).

18. As the number of months worked is not available in the KLIPS dataset, all observations for Korea are lost in the baseline sample and in the sample of full-year employed individuals. The sample size is also significantly reduced for the Netherlands and Sweden when conditioning on a certain number of months worked; these two countries have a high number of observations with zero months of employment. For the United States, the number of observations recording employed for the entire year is very low; consequently, many observations are lost when using the sample of full-year employed individuals.

2.2. Country-level indicators

19. Data on the size and the structure of finance are taken from the Bank for International Settlements (BIS) and the World Bank. The BIS series is total credit (such as loans or bonds) to the private non-financial sector by domestic and foreign lenders as a ratio to GDP (Dembiermont, Drehmann and Muksakunratana, 2013). The BIS also provides a decomposition of the total credit series into two sub-components on either side of the borrowing-lending relationship: household credit and corporate credit on the borrowing side, and bank credit and non-bank credit on the lending side. These credit data are complemented with data from the World Bank's Global Financial Development Database for the countries for which the BIS does not have data. In addition to credit, this paper uses the World Bank's Global Financial Development Database for stock market capitalisation, which is defined as the total value of all shares listed on the country's stock markets as a share of GDP (Čihák et al., 2012).

20. Additional variables are used in the analysis to understand how policies and institutions influence the interaction of finance with individual labour earnings. Capital account openness is measured with an index developed by Chinn and Ito (2006, 2008) and updated until 2014. The higher is the index, the higher is the level of capital account openness.

⁴ This sample selection excludes individuals who are long-term unemployed from the analysis. To the extent that these individuals usually do not have access to credit and their income probably comes mostly from social assistance, they are unlikely to be affected by the size and structure of finance. Transitions in and out of employment for shorter periods are taken into account with the changes in annual income.

Table 1. Number of observations

	Unrestricted sample	Baseline sample	Sample of full-year employed	Years covered
Australia	97 254	67 338	49 091	2001-13
Austria	56 625	41 566	34 975	1995-2000; 2004-14
Belgium	49 626	41 493	36 447	1994-2000; 2004-14
Czech Republic	58 617	47 162	42 534	2005-14
Denmark	66 270	31 034	27 559	1994-2000; 2003-13
Estonia	41 624	31 152	26 164	2004-14
Finland	104 804	40 963	31 803	1996-2000; 2004-14
France	107 127	87 751	76 475	1994-2000; 2004-14
Germany	233 414	161 207	133 464	1984-2012
Greece	51 844	41 201	35 594	1994-2000; 2003-14
Hungary	59 119	46 691	38 292	2005-14
Iceland	31 262	14 184	11 640	2004-14
Ireland	36 781	24 229	20 580	1994-2000; 2004-14
Italy	128 154	97 966	87 203	1994-2000; 2004-14
Korea	65 581	0	0	1999-2012
Latvia	29 543	21 424	17 515	2005-14
Luxembourg	39 044	33 140	29 885	1995-2000; 2003-14
Netherlands	106 255	30 366	26 208	1994-2000; 2005-14
Norway	64 364	31 995	30 157	2003-14
Poland	82 382	64 474	54 466	2005-14
Portugal	60 666	45 937	40 356	1994-2000; 2004-14
Slovak Republic	40 792	32 989	29 758	2005-13
Slovenia	90 070	62 846	55 945	2005-14
Spain	120 419	90 308	73 062	1994-2000; 2004-14
Sweden	56 019	19 179	16 795	1997-2000; 2004-14
Switzerland	39 886	30 751	22 979	1999-2013
Turkey	37 090	16 689	11 779	2006-12
United Kingdom	44 979	33 055	31 355	1994-2000; 2005-14
United States	171 573	129 539	14 913	1975-2011
All countries	2 171 184	1 416 629	1 106 994	1975-2014

21. Information on financial market reforms is taken from the IMF database compiled by Abiad, Detragiache and Tressel (2010) until 2005 and extended by Denk and Gomes (2017) up to 2015. The database provides information on seven aspects of financial policies, with the scores rising with financial liberalisation. The seven dimensions are: i) credit controls; ii) interest rate controls; iii) banking sector entry barriers; iv) capital account controls (i.e. the Chinn and Ito index mentioned above); v) government ownership of banks; vi) development of securities markets; and vii) banking supervision. The last dimension – banking supervision – is coded so that more supervision means more liberalisation. It is based on measures of bank capital requirements, the effectiveness of examinations by the supervisory agency, the independence of the supervisory agency and the range of banks for which the supervisory authority is responsible.

22. Macprudential regulations are measured using the data by Cerutti, Claessens and Laeven (2017) which account for the following twelve policy dimensions: i) general counter-cyclical capital buffer/ requirement; ii) leverage ratio for banks; iii) time-varying/dynamic loan-loss provisioning; iv) loan-to-value ratio; v) debt-to-income ratio; vi) limits on domestic currency loans; vii) limits on foreign currency loans; viii) reserve requirement ratios; ix) levy/tax on financial institutions; x) capital surcharges on systemically important financial institutions; xi) limits on interbank exposures; and xii) concentration limits. For each of the above items, Cerutti, Claessens and Laeven (2017) build a binary variable indicating whether these instruments were in place. Hence, the dataset does not capture the intensity of the measures.

23. The analysis controls for other policies and macroeconomic conditions. Indicators for trade openness (sum of exports and imports divided by GDP) and the business cycle (output gap) are taken from the OECD Economic Outlook Database. Data on job protection and product market regulation come from the OECD Employment Protection Legislation (EPL) and Product Market Regulation (PMR) indices. The PMR data, which are available every five years from 1998, have been extrapolated for the period before 1998 and interpolated for years within the five-year intervals. The interpolation procedure assumes that product market regulation does not change during the five-year window of missing data, meaning that there is a step change every five years. For the extrapolation, the level of product market regulation before 1998 is extended until the first year with an observation. Information on collective bargaining coverage is taken from the Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts (ICTWSS) database (Visser, 2019). Data have been interpolated for years with missing information. The relative investment price (investment deflator divided by value added deflator) from Schweltnus, Pak and Pionnier (2018) is used to control for technological progress.

2.3. Empirical framework

24. The estimation strategy exploits country and time variation for different characteristics of the financial system.⁵ Although this strategy cannot firmly establish that the relationships are causal, the robustness of the results in the next section suggests the existence of a systematic relationship between finance and the labour income growth and risk experienced by workers.

Labour income growth

25. Labour income growth between years $t - 1$ and t for worker i in country c is defined as the difference between y_{ict} and y_{ict-1} , or Δy_{ict} , where y_{ict} is the natural logarithm of annual gross labour earnings. This is an approximate measure of the earnings growth rate that treats positive and negative changes symmetrically. Another alternative would be the arc-percentage change, defined as the change in earnings from one year to the next divided by average earnings over the two years. This lies between -2 and 2 and also treats positive and negative changes symmetrically, although it is more difficult to interpret. The arc-percentage change is used as a robustness check in the empirical analysis.

26. The following specification uses OLS to estimate the conditional correlation between characteristics of the financial system and earnings growth:

$$\Delta y_{ict} = \alpha X_{ict} + \delta Z_{ct} + \beta Fin_{ct} + \gamma_c + \tau_t + \varepsilon_{ict}. \quad (1)$$

⁵ Heterogeneity across industries in dependence on external finance (Rajan and Zingales, 1998) cannot be exploited as an identification strategy in the context of this paper, as the household data do not list the industry in which an individual is employed.

The vectors X_{ict} and Z_{ct} contain individual characteristics (gender, age, a quadratic term for age, marital status and education) and country-level characteristics (change in the output gap from $t - 1$ to t , trade openness, EPL index and PMR index). Fin_{ct} measures the size or structure of finance; β represents thus the coefficient of interest.⁶ Different finance-related measures are used alternatively: total credit; bank and non-bank credit; total credit and share of bank credit; the lag of total credit; credit to households and credit to corporations; total credit and share of credit to households; and stock market capitalisation. The focus is on levels of finance, which are likely to be more relevant for long-term relationships with income growth than growth rates of finance.

27. All regressions also include country, γ_c , and year, τ_t , fixed effects. The year fixed effects capture global trends, such as globalisation and digitalisation, to the extent that they have been common across countries. Standard errors are clustered at the country-year level, the level of variation of the finance-related variables. Observations are attributed a weight that is inversely proportional to the total number of observations from the respective country and year to avoid that country-year clusters with more observations contribute more to the estimation. Individual fixed effects are not included due to the very high rotation in the panel.

28. The analysis also explores if the relationship between finance and labour income growth is heterogeneous across groups of workers. Groups are defined by gender, age, education and professional occupation. For each of these dimensions a group is indexed by d and there are D groups in total. Then, $G_d(X_{ict})$ denotes a dummy variable equalling unity if individual i belongs to group d in year t . The following specification is estimated using OLS, for each individual dimension separately:

$$\Delta y_{ict} = \alpha X_{ict} + \delta Z_{ct} + \sum_{d=1}^D \beta_d G_d(X_{ict}) Fin_{ct} + \gamma_c + \tau_t + \varepsilon_{ict}. \quad (2)$$

An additional specification is estimated that simultaneously includes interactions along all dimensions. Furthermore, as the interaction term of the finance-related variable with personal characteristics introduces variation at the individual level, the following alternative specification is estimated with country-year fixed effects:

$$\Delta y_{ict} = \alpha X_{ict} + \sum_{d=1}^D \beta_d G_d(X_{ict}) Fin_{ct} + \mu_{ct} + \varepsilon_{ict}. \quad (3)$$

The multiplicative fixed effect effectively controls for all variation at the country-year level that cannot be fully accounted for in the vector Z_{ct} and could confound the estimated relationship with finance. However, by removing all country-year variation this specification does not yield average effects, only effects for one group relative to another.

Labour income risk

29. Labour income risk is defined as the incidence of large (positive or negative) earnings changes. Hence, income risk is considered to rise if the distribution of income changes becomes wider, and in particular if the tails of the distribution stretch further away from the centre. The micro-level data are used to compute different percentiles of the earnings growth distribution for each country and year.

⁶ As discussed in the next section, the main results are robust to using the lagged value of measures of size and structure of finance, that is Fin_{ct-1} .

30. With $P_{ct}^p(\Delta y_{ict})$, where $p \in \{1, 10, 20, 30, 40, 50, 60, 70, 80, 90, 99\}$, as the percentile of the income growth distribution, the following specification is estimated using OLS:⁷

$$P_{ct}^p(\Delta y_{ict}) = \delta Z_{ct} + \beta Fin_{ct} + \gamma_c + \tau_t + \varepsilon_{ct}. \quad (4)$$

31. To have a specification that is close to the one for the analysis of income growth, socio-demographic information at the country-year level is averaged and included in the vector of control variables Z_{ct} , namely the proportion of males, the average age in the baseline sample, the average age squared, the proportion of individuals who are married and average education levels. Estimations for several percentiles provide a detailed picture of how the shape of the income growth distribution changes when financial characteristics change. In particular, one can analyse how each tail of the distribution is affected.

32. The framework to quantify the relationship between the financial structure and income risk uses aggregate measures at the country-year level, and hence an analysis of heterogeneous effects parallel to the one described before for income growth cannot be conducted. Instead, the paper presents descriptive statistics about the characteristics of individuals experiencing large positive and negative income changes.

The role of policies

33. From a policy point of view, it is important to understand whether there are institutions or regulations that can influence the relationship of finance with income growth and risk. To this end, Equations 1 and 4 are extended by including interaction terms of financial characteristics with policy indicators. Specifically, the following equations are estimated using OLS:

$$\Delta y_{ict} = \alpha X_{ict} + \delta Z_{ct} + \beta Fin_{ct} + \theta Pol_{ct} \times Fin_{ct} + \gamma_c + \tau_t + \varepsilon_{ict}; \quad (5)$$

$$P_{ct}^p(\Delta y_{ict}) = \delta Z_{ct} + \beta Fin_{ct} + \theta Pol_{ct} \times Fin_{ct} + \gamma_c + \tau_t + \varepsilon_{ct}. \quad (6)$$

34. As described in Section 2.2, alternative policies are considered for Pol_{ct} : the degree of capital openness; the extent of macroprudential regulations; a measure of financial liberalisation; the degree of trade openness; the stringency of employment protection legislation and product market regulation; and the coverage of collective bargaining.

35. Given that there are several policy indicators under consideration, for brevity and to discuss the results in a succinct manner, the following equations are also estimated:

$$P_{ct}^{90}(\Delta y_{ict}) - P_{ct}^{10}(\Delta y_{ict}) = \delta Z_{ct} + \beta Fin_{ct} + \theta Pol_{ct} \times Fin_{ct} + \gamma_c + \tau_t + \varepsilon_{ct}; \quad (7)$$

$$P_{ct}^{90}(\Delta y_{ict}) - P_{ct}^{50}(\Delta y_{ict}) = \delta Z_{ct} + \beta Fin_{ct} + \theta Pol_{ct} \times Fin_{ct} + \gamma_c + \tau_t + \varepsilon_{ct}; \quad (8)$$

$$P_{ct}^{50}(\Delta y_{ict}) - P_{ct}^{10}(\Delta y_{ict}) = \delta Z_{ct} + \beta Fin_{ct} + \theta Pol_{ct} \times Fin_{ct} + \gamma_c + \tau_t + \varepsilon_{ct}. \quad (9)$$

In these specifications, the dependent variable is an inter-percentile range, which summarises the income risk as measured by the width of the income growth distribution.

⁷ These OLS regressions are the natural estimation method in the present context. They quantify the effect on different quantiles in the income growth distribution of a particular country and year. Another common estimation method for distributional analysis is quantile regressions. However, if quantile regressions were applied in the present context, they would quantify the effect on different quantiles in the income growth distribution of the full sample when the observations for all countries and years are pooled. This is because the variable of interest (finance) varies at the country-year level. Quantile regressions are usually used when the variable of interest varies at the individual level.

3. Results

36. The first part of this section relies on the micro-level specifications to investigate income growth. The second part covers the country-level specification to analyse income risk. The third part explores the available data to shed some light on which channels may potentially be at work. As the previous section explained, the estimation approach exploits variation across countries and years. Although the results are therefore robust to controlling for many possibly confounding factors, estimation biases through reverse causality or omitted variables cannot be excluded. Hence, care must be taken not to give the estimates a strict causal interpretation.

3.1. Labour income growth

37. Income growth fluctuates with the business cycle (Figure 2). The figure emphasises the need to control for business cycle fluctuations. In the empirical analysis, the annual change in the output gap is thus used as a control variable. The change in the output gap is preferred to its level given that the dependent variable is the year-to-year change in earnings. Average annual earnings growth has been positive, except for 2009 and 2013. As explained in Section 2.1, for the majority of countries a different data source is used for the periods until 2000 and since 2004.

Figure 2. Real labour income growth over time

Note: For each year, the mean change in the log annual gross income from work is averaged across all countries in the harmonised dataset. The average is calculated for the baseline sample, as described in the previous section. Since countries have different time coverage, the figure focuses on a fixed set of countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, the United Kingdom and the United States. As explained in Section 2.1, for the majority of countries the data sources used before and after 2000 are different, which could affect level differences in income growth between these two periods.

38. Table 2 summarises the main empirical results for private credit and income growth. In the unrestricted sample of individuals, an increase in the credit-to-GDP-ratio by 10 percentage points is associated with 0.3 percentage points less income growth on average (Column 1). This result is statistically significant at the 1% level. When restricting the sample to individuals who are minimally attached to the labour market, the coefficient for total credit remains negative, of similar magnitude and statistically significant at the 5% level (Column 2). The result is robust

to lagging the credit variable to reduce concerns of reverse causality (Column 3). These credit coefficients are virtually identical to those in Cournède and Denk (2015) and Denk and Cournède (2015) who use GDP and household income growth instead of labour income growth and whose sample has very different country and time coverage. The results in Cournède and Denk (2015) continue to hold when either instrumental variables or system generalised method of moments are used for causal identification of the estimated links.

Table 2. Private credit and labour income growth: The main results

Percentage point change in labour income growth associated with an increase in credit by 10% of GDP

	(1) Unrestricted sample	(2) Baseline sample	(3) Baseline sample	(4) Baseline sample
Total credit (% of GDP)	-0.312*** (0.121)	-0.304** (0.139)	-	-0.349** (0.168)
Lag of total credit (% of GDP)	-	-	-0.379* (0.196)	-
EPL index	No	No	No	Yes
PMR index	No	No	No	Yes
Trade openness	No	No	No	Yes
No. of observations	2 166 640	1 413 317	1 413 317	1 381 864
No. of clusters	369	343	343	332
R ²	0.025	0.007	0.007	0.008

Note: The dependent variable is the change in the logarithm of real annual labour income, including from dependent and self-employment. Regressions are estimated using OLS. They include age, age squared, gender, marital status, education, the change in the output gap and country and year fixed effects. Column 1 takes the entire sample from the assembled panel dataset. Column 2 restricts the sample to individuals aged between 25 and 60 and who are employed at least one month in both years. This is the baseline sample used in the other columns. Standard errors, which are shown in brackets, are clustered at the country-year level. *** indicates statistical significance at the 1% level, ** at the 5% level and * at the 10% level.

39. Other factors varying between countries and from year to year could influence average income growth. If such factors are not taken into account, this could confound the relationship between credit and income growth. When other policies (the EPL and PMR indices) and trade openness (to control for globalisation) are added, total credit still has a negative and statistically significant association with income growth (Column 4). This is the preferred specification and will be taken as the baseline in the remainder of the paper.

40. Table 3 shows the results of several robustness checks. First, the conditional correlation between income growth and total credit is estimated without observations from the United States (Column 1). However, the main result is not driven by the United States. Second, the relationship between private credit and income growth could be non-linear, for example the two may only be negatively linked when credit attains a high level. The result in Column 2 indicates a convex relationship between private credit and income growth. According to the estimated coefficients, the minimum income growth is reached when private credit is above 356% of GDP, which is above the maximum in the sample. Third, when adding the relative investment price to control for technological progress, the absolute size of the coefficient declines (Column 3), but this is due to the reduction in the sample size (Column 4). The relationship has also been re-estimated with an interaction term between credit and a dummy variable for years before the beginning of the financial crisis in 2008. The results show that the association of credit expansion with lower labour income growth is not specific to the period since the onset of the global financial crisis.

Table 3. Private credit and labour income growth: Robustness checks

Percentage point change in labour income growth associated with an increase in credit by 10% of GDP

	(1) Baseline sample excluding the United States	(2) Baseline sample with non-linear model	(3) Baseline sample controlling for technological progress	(4) Column 3 sample without controlling for technological progress
Total credit (% of GDP)	-0.385** (0.121)	-1.229*** (0.430)	-0.145* (0.088)	-0.168* (0.088)
Total credit x Total credit (% of GDP)	-	0.000002*** (0.0000006)	-	-
No. of observations	1 279 780	1 381 864	1 072 283	1 072 283
No. of clusters	313	332	262	262
R ²	0.008	0.008	0.007	0.007

Note: The dependent variable is the change in the logarithm of real annual labour income, including from dependent and self-employment. Regressions are estimated using OLS. They include age, age squared, gender, marital status, education, the change in the output gap, EPL index, PMR index, trade openness and country and year fixed effects. Standard errors, which are shown in brackets, are clustered at the country-year level. The sample is restricted to individuals aged between 25 and 60 and who are employed at least one month in both years. *** indicates statistical significance at the 1% level, ** at the 5% level and * at the 10% level.

41. The association of total credit with income growth is negative for 18 of the 28 countries in the baseline sample. The relationship between credit and income growth is estimated as well using arc-percentage changes in income, instead of the change in log income. The results are effectively unaffected (Table A.1 in the annex). Finally, as an additional robustness check, the same baseline model is estimated at the aggregated country and year level, taking the cross-sectional average of all variables. The results are qualitatively and quantitatively consistent with the micro-level regression.

42. The total credit variable in Tables 2 and 3 includes all sources of credit to the private non-financial sector: bank credit and non-bank credit, as well as credit to households and credit to corporations. Non-bank credit comprises credit from non-banking institutions and individuals. Table 4 uses the BIS decomposition of total credit into bank and non-bank credit described in Section 2.2. Similarly, Table 5 uses the decomposition into credit to households and credit to corporations. In Column 1 of both tables, for comparison purposes, the result from Column 4 in Table 2 is replicated using the sample for which the respective BIS decomposition is available. For the data points for which the decomposition into bank and non-bank credit is available, the negative conditional correlation of total credit with income growth stays statistically significant at the 5% level, although its magnitude is lower. However, for the limited number of countries and years for which the decomposition into credit to households and credit to corporations exists, the coefficient is no longer statistically significant.

43. To understand whether the negative link between total credit and income growth is due to bank or non-bank credit, two different specifications are used. First, bank and non-bank credit are included both in the regression (Column 2 of Table 4). Second, the role of an increase in the share of bank credit, while total credit remains constant, is also estimated (Column 3 of Table 4). In the first case, the estimated associations could still be the result of more credit being available in the economy, regardless of the credit source. In the second case, the coefficient for the share of bank credit is estimated keeping total credit constant. Both specifications suggest that the link with income growth is mainly explained by bank credit, rather than credit by other lenders.

**Table 4. Private credit and labour income growth:
Decomposition into bank credit and non-bank credit**

Percentage point change in labour income growth associated with an increase in credit by 10% of GDP

	(1) Baseline sample	(2) Baseline sample	(3) Baseline sample
Total credit (% of GDP)	-0.141** (0.071)	-	-0.175*** (0.075)
Bank credit (% of GDP)	-	-0.443*** (0.162)	-
Non-bank credit (% of GDP)	-	-0.025 (0.088)	-
Share of bank credit (%)	-	-	-0.123*** (0.044)
No. of observations	1 222 538	1 222 538	1 222 538
No. of clusters	292	292	292
R ²	0.005	0.005	0.005

Note: The dependent variable is the change in the logarithm of real annual labour income, including from dependent and self-employment. Regressions are estimated using OLS. They include age, age squared, gender, marital status, education, the change in the output gap, EPL index, PMR index, trade openness and country and year fixed effects. Column 1 restricts the baseline sample to observations for which the decomposition into bank and non-bank credit is available. This is the same sample used in the other columns. Standard errors, which are shown in brackets, are clustered at the country-year level. *** indicates statistical significance at the 1% level, ** at the 5% level and * at the 10% level.

**Table 5. Private credit and labour income growth:
Decomposition into credit to households and credit to corporations**

Percentage point change in labour income growth associated with an increase in credit by 10% of GDP

	(1) Baseline sample	(2) Baseline sample	(3) Baseline sample
Total credit (% of GDP)	-0.088 (0.076)	-	-0.094 (0.077)
Credit to households (% of GDP)	-	-0.912** (0.379)	-
Credit to corporations (% of GDP)	-	0.152 (0.132)	-
Share of credit to households (%)	-	-	-0.208*** (0.067)
No. of observations	1 209 644	1 209 644	1 209 644
No. of clusters	286	286	286
R ²	0.005	0.005	0.005

Note: The dependent variable is the change in the logarithm of real annual labour income, including from dependent and self-employment. Regressions are estimated using OLS. They include age, age squared, gender, marital status, education, the change in the output gap, EPL index, PMR index, trade openness and country and year fixed effects. Column 1 restricts the baseline sample to observations for which the decomposition into credit to households and credit to corporations is available. This is the same sample used in the other columns. Standard errors, which are shown in brackets, are clustered at the country-year level. *** indicates statistical significance at the 1% level, ** at the 5% level and * at the 10% level.

44. A similar decomposition is conducted for credit to households and credit to corporations (Columns 2 and 3 of Table 5). The estimation results for the two specifications suggest that the negative conditional correlation between total credit and income growth is explained by credit to households, rather than by credit to private non-financial corporations. These results for the decompositions on the supply and demand side of the borrower-lender-relationship are similar to those based on macro-data in Cournède and Denk (2015), Gambacorta, Yang and Tsatsaronis (2014) and Langfield and Pagano (2016).

45. Additional empirical tests reveal no statistically significant association between stock market financing and labour income growth (Table A.2 in the annex).

46. One of the advantages of individual-level data is that they allow analysing the groups of workers who may be affected most when credit increases. Different groups are defined along the following dimensions: gender, age, education and professional occupation. For each of these dimensions, Equations 2 and 3 in Section 2.3 are estimated using OLS. The results with either additive or multiplicative fixed effects are qualitatively similar.

47. The negative link between income growth and total credit is found to be higher for men than women, although the difference is not economically large. When credit is interacted with four age groups – persons aged 25 to 29, 30 to 39, 40 to 49 and 50 to 59 – the negative conditional correlation between credit and income growth is stronger for individuals who are between 40 and 49 years old. Moreover, the negative correlation of income growth with credit monotonically weakens with educational attainment; that is, it is stronger for low-educated workers and closer to zero for high-educated workers. Finally, when analysing heterogeneity across occupations, the negative link between credit and income growth holds for all occupations, but is particularly strong for individuals working in agriculture, construction and the metallurgical industry (i.e. metal production and transformation).

3.2. *Labour income risk*

48. This section explores the consequences for the distribution of income growth when the size and structure of finance change, therefore moving beyond average relationships. The large number of individual observations for each country and each year are used to calculate different deciles of the income growth distribution. The data are also used to look at the two extremes of the distribution, the 1st percentile and the 99th percentile, even if particularly the 99th percentile tends to be poorly measured in survey data.

49. Figure 3 displays the evolution of the 90th, 50th and 10th percentiles of the income growth distribution. Median real wage growth has been relatively stable over time, oscillating around zero. Hence, the wage of the median worker has stagnated over time. The “bottom 10%” in the income growth distribution experience significant negative income changes. In many years, the income growth distribution averaged across countries seems slightly right-skewed; that is, real wage growth of the 90th percentile is slightly higher in absolute value than that of the 10th percentile.

50. One possible way of measuring labour income risk is to analyse the width of the income growth distribution. The wider the distribution is, the larger is the range of values for income growth that an individual can experience. In particular, if the income growth distribution has long tails, individuals are more likely to experience very large positive or negative changes in income from one year to the next.

Figure 3. Percentiles of the labour income growth distribution over time

Note: Each decile is calculated separately by country and year based on the individual observations available in the baseline sample. The 10th, 50th (or median) and 90th percentiles are then averaged across countries each year. Since countries have different time coverage, the figure focuses on a fixed set of countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, the United Kingdom and the United States. As explained in Section 2.1, for the majority of countries the data sources used before and after 2000 are different, which could affect level differences in the percentiles of the income growth distribution between these two periods.

51. Figure 4 plots the 90-10, 90-50 and 50-10 percentile ranges. The first measure provides an overview of the overall dispersion of income growth, the last two measures separately capture positive and negative income risk. In most years, the 90-50 percentile range exceeds the 50-10 percentile range, confirming the right-skewness of the income growth distribution. Income risk seems to have increased from 2004, the most recent year since when a consistent time series with the same data source is available. Comparisons to the 1990s should be taken with care, as for most European countries the ECHP is used instead of EU-SILC.

52. To analyse the association between finance-related measures and income risk, a separate model is estimated for each decile of the income growth distribution, as well as for the 1st and 99th percentiles, using the baseline sample and controlling for employment protection legislation, product market regulation and trade openness. Table A.3 in the annex gives the results for total credit, which are also represented in Figure 5. An increase in total credit by 10% of GDP is associated with a 2 percentage point fall of the 1st percentile of the income growth distribution, on average; that is, 1% of the population will experience much larger earnings drops from one year to the next than they would otherwise. Similarly, the same increase in total credit is related with almost a 1 percentage point fall for the 10th percentile. This result is statistically significant at the 1% level. Finally, the same increase in total credit to GDP is linked with a 0.5 percentage point fall of the 20th percentile of the income growth distribution. Overall, these results imply that at least 20% of individuals experience larger negative income shocks as total credit expands. For all the other deciles of the distribution, the coefficient is not statistically significant.

Figure 4. Dispersion of the labour income growth distribution over time

Note: Each percentile range is calculated separately by country and year based on the individual observations available in the baseline sample. The 90-10, 90-50 and 50-10 percentile ranges are then averaged across countries each year. Since countries have different time coverage, the figure focuses on a fixed set of countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, the United Kingdom and the United States. As explained in Section 2.1, for the majority of countries the data sources used before and after 2000 are different, which could affect level differences in the percentile ranges of the income growth distribution between these two periods.

Figure 5. Total credit and labour income risk

Note: The figure represents the estimation results from Table A.3 in the annex for different percentiles P of the labour income growth distribution. The solid line indicates the estimated coefficients, and the dashed lines indicate the 95% confidence interval for the coefficients.

53. Since a 10 percentage point increase in total credit is associated with a longer left tail for the income growth distribution, while leaving the right tail unaffected, an increase in the size of finance is linked with higher income risk. Specifically, credit expansion is related with larger negative income shocks.

54. Similar to the analysis conducted for average income growth, the analysis of income risk is replicated using the decomposition of total credit into bank and non-bank credit as well as the decomposition into credit to households and corporations. The detailed results are available in the annex (Tables A.4 and A.5). Figures 6, 7, 8 and 9 provide a graphical representation.

55. Like total credit, an increase in bank credit has a negative, statistically significant effect on the 1st, 10th and 20th percentiles of the income growth distribution. The magnitudes of the estimated coefficients for bank credit are similar to those for total credit. However, an increase in bank credit also seems to reduce the median and the 60th and 70th percentiles of the income growth distribution. The coefficients for the 60th and 70th percentiles are statistically significant at the 5% level and have the same order of magnitude as the coefficient for the 20th percentile. Overall, more bank credit is associated with increases in the incidence of large negative income shocks and decreases in the incidence of positive income shocks, shifting the distribution to the left.

Figure 6. Bank credit and labour income risk

Percentage point change in the percentile of the labour income growth distribution associated with an increase in bank credit by 10% of GDP

Note: The figure represents the estimation results from Column 1 of Table A.4 in the annex for different percentiles P of the labour income growth distribution. The solid line indicates the estimated coefficients, and the dashed lines indicate the 95% confidence interval for the coefficients.

56. A 10 percentage point increase in non-bank credit is associated with lower percentiles on the left side of the distribution and higher percentiles on the right side of the distribution, thus widening the distribution of income growth. In particular, non-bank credit has a negative, statistically significant effect on the 10th percentile of the distribution and a positive, statistically significant effect on the 90th percentile. The two approximately offset each other, which explains why on average non-bank credit is not statistically related with income growth.

Figure 7. Non-bank credit and labour income risk

Note: The figure represents the estimation results from Column 2 of Table A.4 in the annex for different percentiles P of the labour income growth distribution. The solid line indicates the estimated coefficients, and the dashed lines indicate the 95% confidence interval for the coefficients.

57. Credit to households significantly reduces the 50th, 60th, 70th and 80th percentiles of the income growth distribution, reducing the probability of experiencing positive income shocks and making the distribution more compact at the right tail. Credit to corporations increases the 90-10 percentile range by increasing both the 90-50 and 50-10 percentile ranges.

58. Table A.6 in the annex replicates the results of Table A.3, but for a 10 percentage point increase in stock market capitalisation instead of total credit. Figure 10 visualises the results. While stock market financing had no statistically significant relationship with average income growth, it has interesting links with income risk. A 10 percentage point increase in stock market capitalisation as a per cent of GDP is associated with a decrease in the 10th percentile of the income growth distribution by 0.5 percentage points. This result is statistically significant at the 10% level. The same rise in stock market capitalisation increases the 99th percentile by 2 percentage points. Therefore, stock market financing seems to have an economically significant link with the frequency of very large positive income shocks.

59. Robustness checks were also conducted for the analysis of income risk, similar to those for income growth. For example, the estimations in this section for total credit were replicated using arc-percentage changes instead of changes in log income (Table A.7 in the annex). The estimated coefficients are remarkably consistent for both measures of income growth.

60. Who are the individuals who experience large negative income shocks? Individuals who experience a shock below the 20th percentile of the income growth distribution are on average 42 years old and more likely to be male, married and to hold a high school degree as highest educational attainment. Many of these individuals work in personal services (including personal protection and house cleaning). Workers in the construction and building maintenance sector are also well represented among the group of individuals experiencing large negative income changes. These tend to be the population groups whose income growth is particularly affected when credit expands.

Figure 8. Credit to households and labour income risk

Percentage point change in the percentile of the labour income growth distribution associated with an increase in credit to households by 10% of GDP

Note: The figure represents the estimation results from Column 1 of Table A.5 in the annex for different percentiles P of the labour income growth distribution. The solid line indicates the estimated coefficients, and the dashed lines indicate the 95% confidence interval for the coefficients.

Figure 9. Credit to corporations and labour income risk

Percentage point change in the percentile of the labour income growth distribution associated with an increase in credit to corporations by 10% of GDP

Note: The figure represents the estimation results from Column 2 of Table A.5 in the annex for different percentiles P of the labour income growth distribution. The solid line indicates the estimated coefficients, and the dashed lines indicate the 95% confidence interval for the coefficients.

Figure 10. Stock market capitalisation and labour income risk

Percentage point change in the percentile of the labour income growth distribution associated with an increase in stock market capitalisation by 10% of GDP

Note: The figure represents the estimation results from Table A.6 in the annex for different percentiles P of the labour income growth distribution. The solid line indicates the estimated coefficients, and the dashed lines indicate the 95% confidence interval for the coefficients.

3.3. Potential mechanisms

61. Financial developments could affect individual workers through several mechanisms. For example, by loosening financial constraints, an expansion of credit or stock market financing could facilitate firm creation, creative destruction, mergers and acquisitions and firms' capacity to grow. The expansion of external financing will also influence firms' incentives to invest, innovate, substitute labour for capital, expand their trade activities and integrate into global value chains. The resulting reorganisation of production and restructuring should be reflected in firms' human resources management. Workers may be hired, laid off, re-assigned to a different position in the firm, moved to another establishment at a new location or required to work on a different schedule. Such changes are likely to be linked with developments in labour income and labour income risk.

62. Another possible channel, given that the negative link between income growth and credit is mostly explained by bank credit and credit to households, could be residential mobility. Easier access to credit is associated with higher household mobility, because it provides access to more housing options and makes it easier to finance moving costs (Andrews and Caldera Sánchez, 2011). However, if leverage rates become too high and house prices decline, households with negative equity may be unwilling to sell their house to move (Andrews, Caldera Sánchez and Johansson, 2011). Locked-in home owners are then more vulnerable to negative shocks in the local labour market.

63. Understanding the precise channels through which the size and structure of finance are related with income growth and risk is difficult. The lack of individual-level data on access to credit, level of indebtedness, days and hours worked and details of the employer inhibits a deeper analysis of the potential mechanisms at work.

64. A channel that can be analysed is the role of the self-employed whose income volatility could be directly affected by financial intermediation. In particular, credit may induce the self-employed to undertake more, possibly risky, credit-financed investment. The household survey data allow decomposing earnings into those from dependent employment and those from self-employment. When the dependent variable is growth in earnings from dependent employment only, the estimated coefficient for total credit in per cent of GDP⁸ is still negative, statistically significant at the 10% level and of a similar magnitude as in the entire baseline sample. Similarly, the relationship between credit and labour income risk is not much affected when focusing on dependent employment. Hence, the two links of credit with income growth and risk do not seem to be driven by self-employed workers or self-employment income.

65. Using additional information available in the household survey data on the number of months worked in a year, whether individuals changed job since the last reference year and some survey questions regarding households' finances, further empirical analyses are conducted to study the link between credit and average income growth. These results provide supplementary information on the groups of workers who are more likely affected by economic repercussions stemming from overly high credit.

66. To begin, Equation 1 is estimated again with total credit in per cent of GDP as financial characteristic of interest and an interaction term of total credit with a dummy variable to flag all individuals who were employed for 12 months in the current and previous year (Column 1 of Table 6). Alternatively, the original equation with total credit is estimated in a restricted sample of individuals who are employed 12 months over two years (Column 2 of Table 6).

67. The results indicate that workers who are employed for the full year without interruption are less affected by credit expansions, compared with those who have been without a job for at least one month. Nonetheless, since total credit is still negatively correlated with income growth when the sample is restricted to full-year employed individuals, some of the decline in income growth must be explained by changes in hours worked per month or changes in the hourly wage rate. Unemployment or non-employment shocks do not fully explain the link between credit and income growth.

68. Comparing individuals who changed jobs between the two years with those who did not, conditional on having been employed for 12 months in both years, job switchers are significantly less affected by credit expansion (Column 3 of Table 6). Job switchers could represent a selected group of workers with better outside options. Individuals with fewer outside options are more vulnerable to changes in their working conditions. The empirical link between total credit and income growth is negative and statistically different from zero in both sub-samples, suggesting that the result is not driven by job stayers alone.

⁸ The results in Sections 3.1 and 3.2 suggest that the association of more total credit with lower income growth and higher income risk is mostly due to bank credit. Nonetheless, the disaggregation of total credit into bank and non-bank credit is not available for 5 out of 29 countries. To preserve a sample as large as possible, the remainder of the paper uses total credit as the main variable of interest.

**Table 6. Private credit and labour income growth:
Distinguishing between individuals with different employment patterns**

Percentage point change in labour income growth associated with an increase in credit by 10% of GDP

	(1) Unrestricted sample	(2) Sample of full-year employed	(3) Sample of full-year employed
Total credit (% of GDP)	-0.365*** (0.135)	-0.269* (0.166)	-0.262* (0.154)
Employed 12 months in both years × Total credit (% of GDP)	0.094*** (0.029)	-	-
Changed job between $t - 1$ and t × Total credit (% of GDP)	-	-	0.051*** (0.029)
No. of observations	2 119 727	1 098 726	848 601
No. of clusters	358	332	272
R ²	0.025	0.007	0.007

Note: The dependent variable is the change in the logarithm of real annual labour income, including from dependent and self-employment. Regressions are estimated using OLS. They include age, age squared, gender, marital status, education, the change in the output gap, EPL index, PMR index, trade openness and country and year fixed effects. Column 1 takes the entire sample from the assembled panel dataset. Column 2 restricts the sample to individuals aged between 25 and 60 and who are employed 12 months in both years. Column 3 requires information on whether the individual has changed job or not in the past year. Standard errors, which are shown in brackets, are clustered at the country-year level. *** indicates statistical significance at the 1% level, ** at the 5% level and * at the 10% level.

69. Finally, the surveys used in this paper have some information on households' finances. For example, heads of households are asked whether they have arrears (in utility bills, mortgage repayment, loan repayment or other expenses). They are also asked whether the household would be able to afford unexpected expenses, which is a noisy measure for households that have some private savings which they would be able to use. This information is used in Table 7. Equation 1 is estimated with total credit and an interaction term of total credit with a dummy variable to flag individuals who belong to a household with any type of arrears (Column 3). Alternatively, an interaction term is included with a dummy variable to flag workers who belong to a household that can afford unexpected expenses (Column 6). Individuals who belong to a household with arrears and those who are part of a household that cannot afford unexpected expenses overlap to some extent. Among the individuals with arrears, 65% also belong to a household that cannot afford unexpected expenses.

70. The results suggest that households who can afford unexpected expenses, or who possess some liquid form of savings, are less affected by the expansion of credit than households who do not. Also, the negative link between total credit and income growth is no longer statistically significant when the sample is restricted to individuals belonging to households without arrears (Column 2) or households who can afford unexpected expenses (Column 4). While this evidence is not conclusive, it is in line with the interpretation that individuals in households with positive savings are less prone to accept changes in their working conditions or contract terms. Such workers may also not need to significantly reduce their reservation wage in case they experience periods of unexpected non-employment. Moreover, home owners with savings, who experience a negative local labour market shock, are less likely to be locked-in as savings can compensate for potential losses when moving to another region.

**Table 7. Private credit and labour income growth:
Distinguishing between households with and without financial difficulties**

Percentage point change in labour income growth associated with an increase in credit by 10% of GDP

	(1) Baseline sample with arrears	(2) Baseline sample without arrears	(3) Baseline sample	(4) Baseline sample with who can afford unexpected expenses	(5) Baseline sample with who cannot afford unexpected expenses	(6) Baseline sample
Total credit (% of GDP)	-0.699*** (0.315)	0.760 (0.499)	-0.339 (0.327)	-0.320 (0.197)	-0.705*** (0.179)	-0.496*** (0.174)
With arrears × Total credit (% of GDP)	-	-	-0.058 (0.039)	-	-	-
Can afford unexpected expenses × Total credit (% of GDP)	-	-	-	-	-	0.148*** (0.020)
No. of observations	104 271	205 979	310 250	658 134	365 152	1 023 286
No. of clusters	263	128	263	263	263	263
R ²	0.010	0.008	0.008	0.009	0.009	0.008

Note: The dependent variable is the change in the logarithm of real annual labour income, including from dependent and self-employment. Regressions are estimated using OLS. They include age, age squared, gender, marital status, education, the change in the output gap and country and year fixed effects. The sample is restricted to individuals aged between 25 and 60 and who are employed at least one month in both years. Standard errors, which are shown in brackets, are clustered at the country-year level. *** indicates statistical significance at the 1% level, ** at the 5% level and * at the 10% level.

71. To understand exactly which mechanisms could be at work between credit and income growth and risk, additional individual-level data would be necessary. For instance, by knowing the exact number of days and hours individuals worked, to infer the precise hourly wage rate, one could understand whether changes in income growth and risk are driven by changes in labour supply or returns to work. Observing the exact path of individuals in the labour market, whether they stayed at the same employer and same establishment, or whether they changed occupation, for example, would also be helpful to shed more light on the potential channels.

4. Which policies can mitigate the association between private credit and labour income growth and risk?

72. If debt and credit expansion, in particular of bank and household credit, has a negative association with income growth while also increasing the incidence of negative income changes, it is important to understand whether there are institutions or policies that can influence the link between finance and labour income. Several policies could play a role.

73. Financial regulations that aim to avoid credit overexpansion and overly high leverage, maintain financial stability, reduce systemic risk and improve the allocation of capital can be expected to influence how credit relates to income growth and risk. The ultimate objective of such measures is to ensure that finance serves the real economy, supporting productivity and employment. This paper considers the role of several financial market policies, including credit controls, capital account controls, the development of securities markets and bank supervision. Macroprudential regulations may also be an important factor, in particular loan-to-value ratios, debt-to-income ratios and limits on new loans.

74. To the extent that credit enhances firm dynamics, in the form of mergers, acquisitions and creative destruction, which may translate into workers being more vulnerable to frequent changes in their working conditions and at risk of displacement, one would expect that policies imposing barriers to entry for new firms and more generally restricting competition mitigate the positive link between credit and income risk. This can be empirically tested using the OECD Product Market Regulation index.

75. Stricter employment protection legislation is meant to prevent abusive dismissals and minimise the negative effects of layoffs for workers. Stricter employment protection legislation is also expected to reduce overall worker turnover. It generally reduces job destruction, but can also hamper job creation. Stricter employment protection legislation could therefore mitigate the positive association between finance and income risk if it prevents layoffs. On the other hand, it could also lead to an exacerbation if its preventive effect on job creation particularly affects workers who are unlucky enough to still experience a job loss. This section studies the influence of job dismissal legislation using the OECD Employment Protection Legislation index.

76. Higher collective bargaining coverage may also mitigate the negative link between credit and income growth or the positive relationship with income risk. Collective bargaining schemes commonly aim to preserve or improve working conditions. Nevertheless, collective bargaining, if exerting upward pressure on wages for employed workers, can also deter further job creation. In this case, if dismissed workers struggle to find new jobs, while wages of employed individuals continue to increase, it is possible that collective bargaining exacerbates the association of credit with higher income risk.

77. Another potential policy consideration is that easier access to credit could facilitate investment aimed at expanding firms' trade activities and integration into global value chains. If firms' revenues increase, this could translate into higher wage growth for employed workers. However, it could also result in the closure of domestic plants, worker displacement or downward pressure on domestic wages, in particular for low-skilled workers. While the effect on average wage growth is not obvious, as the benefits from trade and globalisation may not spread equally, one would expect income risk to increase. Openness to trade, measured as the sum of exports and imports divided by GDP, should therefore also correlate with the relationship between credit and the labour income growth distribution.

78. Equation 5 as laid out in Section 2.3 is estimated with alternative policy indicators. Most structural policies do not seem to have a role for the link between credit and income growth. In particular, the indicators for trade openness, EPL and collective bargaining coverage do not provide statistically significant results (Table A.8 in the annex). The interaction of the PMR index with credit expansion, however, is negative and statistically significant at the 10% level. Therefore, more stringent product market regulation seems to exacerbate the negative link between credit expansion and income growth.

79. The interaction term of credit with the macroprudential regulation indicator by Cerutti, Claessens and Laeven (2017), discussed in Section 2.2, is not statistically significant (Column 1 of Table 8). However, this macroprudential indicator is only available for a limited number of years, from 2000 to 2013, which could explain the lack of statistical significance. In fact, some components of this aggregated indicator seem particularly relevant in mitigating the negative association of credit with earnings growth, namely loan-to-value (LTV) ratios, debt-to-income (DTI) ratios and caps on new loans (Columns 1-3 of Table 9).

**Table 8. Private credit and labour income growth:
The role of financial policies (using aggregate indicators)**

Percentage point change in labour income growth associated with an increase in credit by 10% of GDP

	(1) Baseline sample	(2) Baseline sample	(3) Baseline sample
Total credit (% of GDP)	-0.759 (0.479)	-2.979* (1.779)	-2.441*** (0.796)
<i>Interaction with:</i>			
Macroprudential regulation	-0.023 (0.039)	-	-
Financial liberalisation	-	2.730 (1.737)	-
Capital account openness	-	-	0.799*** (0.280)
No. of observations	986 527	1 339 169	1 315 735
No. of clusters	219	320	313
R ²	0.009	0.008	0.009

Note: The dependent variable is the change in the logarithm of real annual labour income, including from dependent and self-employment. Regressions are estimated using OLS. They include age, age squared, gender, marital status, education, the change in the output gap, EPL index, PMR index, trade openness and country and year fixed effects. The sample is restricted to individuals aged between 25 and 60 and who are employed at least one month in both years. Standard errors, which are shown in brackets, are clustered at the country-year level. *** indicates statistical significance at the 1% level, ** at the 5% level and * at the 10% level.

80. Similarly, the estimated coefficient for the interaction term of credit with the financial liberalisation indicator is positive, although not statistically significant (Column 2 of Table 8). However, some of the sub-components of the overall financial liberalisation indicator, namely credit controls, securities markets and banking supervision have a meaningful effect (Columns 4-6 of Table 9). Stronger banking supervision (including higher bank capital requirements and more effective examinations by the supervisory agency) and an improved functioning of securities markets are measures that mitigate the negative relationship between credit expansion and income growth. Credit controls, which can prevent access to credit for persons with no credit record, on the other hand, seem to exacerbate the negative relationship between credit expansion and income growth.

81. Capital account openness appears also relevant for the relationship between credit and income growth. The higher is the indicator of capital account openness, the less negative is the link of credit with income growth (Column 3 of Table 8). This result echoes the findings in Caldera-Sánchez et al. (2016) who, based on aggregate data, find that international capital mobility is associated with higher GDP growth.

82. To analyse which policies can influence the empirical relationship between credit and income risk, Equations 6 to 9 are also estimated with alternative policy indicators. For brevity, Table 10 presents the results for Equation 7 with structural policies. The estimated coefficients for the interaction terms with financial policies can be found in Table A.9 of the annex; they do not provide statistically significant results.

**Table 9. Private credit and labour income growth:
The role of financial policies (using specific indicators)**

Percentage point change in labour income growth associated with an increase in credit by 10% of GDP

	(1) Baseline sample	(2) Baseline sample	(3) Baseline sample	(4) Baseline sample	(5) Baseline sample	(6) Baseline sample
Total credit (% of GDP)	-0.810 (0.562)	-0.811 (0.552)	-0.733 (0.528)	0.169 (0.220)	-5.813** (2.930)	-0.835** (0.335)
<i>Interaction with:</i>						
Loan-to-value ratio	0.337*** (0.097)	-	-	-	-	-
Strict cap on new loans	-	0.443*** (0.081)	-	-	-	-
Debt-to-income ratio	-	-	0.274*** (0.102)	-	-	-
Credit controls	-	-	-	-0.538* (0.230)	-	-
Securities markets	-	-	-	-	5.330* (2.825)	-
Banking supervision ¹	-	-	-	-	-	0.538** (0.231)
No. of observations	903 261	903 261	903 261	1 339 169	1 348 875	1 348 875
No. of clusters	200	200	200	320	324	324
R ²	0.011	0.011	0.010	0.007	0.008	0.007

1. The banking supervision index is constructed from measures of bank capital requirements, the effectiveness of examinations by the supervisory agency, the independence of the supervisory agency and the range of banks for which the supervisory authority is responsible. For details, see Denk and Gomes (2017).

Note: The dependent variable is the change in the logarithm of real annual labour income, including from dependent and self-employment. Regressions are estimated using OLS. They include age, age squared, gender, marital status, education, the change in the output gap, EPL index, PMR index, trade openness and country and year fixed effects. The sample is restricted to individuals aged between 25 and 60 and who are employed at least one month in both years. Standard errors, which are shown in brackets, are clustered at the country-year level. *** indicates statistical significance at the 1% level, ** at the 5% level and * at the 10% level.

83. The coefficient on the interaction of credit with trade openness is positive. Therefore, as trade openness increases, credit expansion may become detrimental for the volatility of earnings. In the baseline sample, the trade openness indicator varies between 15 and 400. For high levels of trade openness, an increase in total credit will be positively correlated with income risk. The coefficient on the interaction of credit with trade openness is particularly high (and statistically significant) for the difference between the 50th and 10th percentiles. Therefore, trade openness can exacerbate the link between credit and income risk especially by increasing the frequency of high negative income shocks.

84. A similar result is obtained for employment protection legislation. The higher is the EPL index, the more likely it is that credit is related with higher income risk. This occurs through a higher incidence of both large positive and negative income shocks. In the baseline sample, the average EPL index is 2. Therefore, at the average EPL index in the sample, an increase in credit is associated with greater income risk.

**Table 10. Private credit and labour income risk (90-10 percentile range):
The role of structural policies**

Percentage point change in the inter-percentile range of the labour income growth distribution associated with an increase in credit by 10% of GDP

	(1) Baseline sample	(2) Baseline sample	(3) Baseline sample	(4) Baseline sample
Total credit (% of GDP)	-0.888 (0.660)	-2.088* (1.112)	6.504*** (0.983)	0.261 (0.683)
<i>Interaction with:</i>				
Trade openness	0.008*** (0.003)	-	-	-
EPL index	-	1.422** (0.563)	-	-
PMR index	-	-	-3.892*** (0.616)	-
Collective bargaining coverage	-	-	-	0.010 (0.011)
No. of observations	332	332	332	332
R ²	0.767	0.775	0.790	0.759

Note: Regressions are estimated using OLS with data aggregated at the country-year level. The dependent variable is the difference between the 90th and 10th percentiles of the labour income growth distribution for each country-year pair. Labour income growth is measured as the change in the logarithm of real annual labour income, including from dependent and self-employment. Each regression includes average age, average age squared, proportion of men, proportion of married individuals, proportion of different education levels, the change in the output gap, EPL index, PMR index, trade openness and country and year fixed effects. The sample is restricted to individuals aged between 25 and 60 and who are employed at least one month in both years. Standard errors, which are shown in brackets, are clustered at the country-year level. *** indicates statistical significance at the 1% level, ** at the 5% level and * at the 10% level.

85. The influence of product market regulation goes in the opposite direction. The higher is the PMR index, the lower is the positive correlation between credit and income risk; that is, for high levels of product market regulation, credit expansion is less likely to increase income risk. A higher PMR index means higher state control (in the form of public ownership or involvement in business operations), barriers to entrepreneurship (through complex regulatory procedures, administrative burdens on start-ups or protection of incumbent firms) or barriers to trade and investment. Overall, a higher PMR index tends to be associated with less competition and lower firm dynamics. This could explain why earnings risk is lower when the PMR index is high. Taking the growth and risk results together, extending credit seems to reduce income growth in a more similar manner across workers when competition is weak.

86. It is also worth mentioning that, although capital account openness does not significantly affect the relationship between credit and overall income risk (from a statistical point of view), it contributes to increase each decile of the income growth distribution for a given level of total credit; that is, it shifts the distribution to the right, without affecting the width of the distribution. This shows how capital account openness reduces the negative association of credit expansion with average income growth.

5. Concluding remarks

87. Against the backdrop of the enormous build-up of private debt over the last few decades, this paper studies the relationship between the size and structure of finance and labour income growth and risk, using specifically assembled micro-data for 29 OECD countries. Debt or credit expansion has, on average across countries, been associated with lower income growth and greater income risk. The links of debt with income growth and risk are mostly explained by bank credit and credit to households. Stock market financing is only associated with a higher incidence of very large positive income shocks. Taken together, the evidence points to finance as one factor behind wage stagnation and the social divisions in today's labour markets. The availability of the sample, from the 1990s to the 2010s, leaves the possibility open that the associations between finance and income growth and risk are more favourable at lower levels of indebtedness.

88. The focus of the paper has been on long-term relationships between the size and structure of finance and the labour market. However, not only the size and structure of finance may matter for labour market outcomes, but also its growth rates, especially for shorter-term fluctuations. Emergency measures during the COVID-19 crisis have shown when fast step-ups in credit may be appropriate. Subsequent work could attempt to distinguish between the level and growth of finance and their respective roles for income growth and risk over different time horizons.

89. Understanding the precise channels through which the size and structure of finance relate with income growth and earnings risk is challenging. The lack of individual-level data on private savings and debt, access to credit, and days and hours worked inhibits a deeper analysis of the channels at work. For instance, by knowing the exact number of days and hours people work, it becomes possible to calculate the hourly wage rate. One could then understand whether changes in income growth and risk are driven by changes in hours worked or in hourly pay. Observing the exact path of individuals in the labour market, whether they stayed at the same employer, changed occupation, or switched between dependent and self-employment, would also shed light on the potential channels.

90. One promising avenue is the increased accessibility of linked employer-employee data (Criscuolo et al., 2020). In the context of characterising the labour income growth distribution, such data have, for example, been used by Busch, Fialho and Guvenen (2019) and Hoffmann and Malacrino (2019), but these studies are yet to put a specific focus on the size and structure of finance. The ability for understanding the connection of finance with income growth and risk for workers could be enhanced even further, if the information about employers in these linked employer-employee datasets could be expanded with firm-level financial variables from balance sheets and profit and loss statements, as in Card, Cardoso and Kline (2016).

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Annex A. Additional empirical results

Table A.1. Private credit and labour income growth: Using arc-percentage changes

Percentage point change in labour income growth associated with an increase in credit by 10% of GDP

	(1) Unrestricted sample	(2) Baseline sample	(3) Baseline sample	(4) Baseline sample
Total credit (% of GDP)	-0.386*** (0.122)	-0.329** (0.166)	-	-0.339* (0.185)
Lag of total credit (% of GDP)	-	-	-0.394* (0.213)	-
EPL index	No	No	No	Yes
PMR index	No	No	No	Yes
Trade openness	No	No	No	Yes
No. of observations	2 485 888	1 434 775	1 434 775	1 403 194
No. of clusters	369	343	343	332
R ²	0.003	0.001	0.001	0.001

Note: The dependent variable is the arc-percentage change of real annual labour income, including from dependent and self-employment. Regressions are estimated using OLS. They include age, age squared, gender, marital status, education, the change in the output gap and country and year fixed effects. Column 1 takes the entire sample from the assembled panel dataset. Column 2 restricts the sample to individuals aged between 25 and 60 and who are employed at least one month in both years. This is the baseline sample used in the other columns. Standard errors, which are shown in brackets, are clustered at the country-year level. *** indicates statistical significance at the 1% level, ** at the 5% level and * at the 10% level.

Table A.2. Stock market financing and labour income growth

Percentage point change in labour income growth
associated with an increase in stock market capitalisation by 10% of GDP

	(1) Unrestricted sample	(2) Baseline sample
Stock market capitalisation (% of GDP)	0.048 (0.177)	-0.153 (0.214)
EPL index	No	Yes
PMR index	No	Yes
Trade openness	No	Yes
No. of observations	2 126 832	1 357 506
No. of clusters	361	324
R ²	0.025	0.008

Note: The dependent variable is the change in the logarithm of real annual labour income, including from dependent and self-employment. Regressions are estimated using OLS. They include age, age squared, gender, marital status, education, the change in the output gap and country and year fixed effects. Column 1 takes the entire sample from the assembled panel dataset. Column 2 restricts the sample to individuals aged between 25 and 60 and who are employed at least one month in both years. Standard errors, which are shown in brackets, are clustered at the country-year level. *** indicates statistical significance at the 1% level, ** at the 5% level and * at the 10% level.

Table A.3. Private credit and labour income risk: The main results

Percentage point change in the percentile of the labour income growth distribution associated with an increase in credit by 10% of GDP

	Total credit (% of GDP)	No. of observations	R ²
P1	-2.025*** (0.565)	332	0.711
P10	-0.871*** (0.289)	332	0.690
P20	-0.518** (0.257)	332	0.556
P30	-0.389 (0.254)	332	0.407
P40	-0.345 (0.251)	332	0.322
P50	-0.340 (0.254)	332	0.300
P60	-0.350 (0.256)	332	0.350
P70	-0.352 (0.259)	332	0.426
P80	-0.249 (0.269)	332	0.524
P90	0.017 (0.311)	332	0.645
P99	0.496 (0.708)	332	0.701

Note: Regressions are estimated using OLS with data aggregated at the country-year level. The dependent variable is the respective decile or percentile P of the labour income growth distribution for each country-year pair. Labour income growth is measured as the change in the logarithm of real annual labour income, including from dependent and self-employment. Each regression includes average age, average age squared, proportion of men, proportion of married individuals, proportion of different education levels, the change in the output gap, EPL index, PMR index, trade openness and country and year fixed effects. Standard errors, which are shown in brackets, are heteroscedasticity-robust. *** indicates statistical significance at the 1% level, ** at the 5% level and * at the 10% level.

**Table A.4. Private credit and labour income risk:
Decomposition into bank credit and non-bank credit**

Percentage point change in the percentile of the labour income growth distribution associated with an increase in credit by 10% of GDP

	Bank credit (% of GDP)	Non-bank credit (% of GDP)	No. of observations	R ²
P1	-4.702*** (1.575)	-0.667 (0.731)	292	0.735
P10	-1.168** (0.501)	-0.486** (0.207)	292	0.719
P20	-0.552** (0.261)	-0.142 (0.138)	292	0.627
P30	-0.329 (0.232)	0.008 (0.108)	292	0.477
P40	-0.300 (0.208)	0.046 (0.089)	292	0.374
P50	-0.372* (0.210)	0.087 (0.094)	292	0.333
P60	-0.509** (0.237)	0.142 (0.107)	292	0.389
P70	-0.615** (0.289)	0.203 (0.128)	292	0.473
P80	-0.510 (0.386)	0.368 (0.170)	292	0.570
P90	0.035 (0.649)	0.709*** (0.247)	292	0.676
P99	2.480 (1.752)	-0.375 (0.789)	292	0.715

Note: Regressions are estimated using OLS with data aggregated at the country-year level. The dependent variable is the respective decile or percentile P of the labour income growth distribution for each country-year pair. Labour income growth is measured as the change in the logarithm of real annual labour income, including from dependent and self-employment. Each regression includes average age, average age squared, proportion of men, proportion of married individuals, proportion of different education levels, the change in the output gap, EPL index, PMR index, trade openness and country and year fixed effects. The sample is restricted to individuals aged between 25 and 60 and who are employed at least one month in both years. Standard errors, which are shown in brackets, are heteroscedasticity-robust. *** indicates statistical significance at the 1% level, ** at the 5% level and * at the 10% level.

**Table A.5. Private credit and labour income risk:
Decomposition into credit to households and credit to corporations**

Percentage point change in the percentile of the labour income growth distribution associated with an increase in credit by 10% of GDP

	Credit to households (% of GDP)	Credit to corporations (% of GDP)	No. of observations	R ²
P1	-4.005 (2.578)	-0.611 (0.874)	286	0.742
P10	-0.605 (0.908)	-0.544** (0.240)	286	0.725
P20	-0.568 (0.477)	-0.130 (0.161)	286	0.632
P30	-0.597 (0.438)	0.058 (0.137)	286	0.484
P40	-0.552 (0.411)	0.109 (0.119)	286	0.378
P50	-0.719* (0.419)	0.200 (0.127)	286	0.337
P60	-1.095** (0.469)	0.319** (0.148)	286	0.390
P70	-1.392** (0.575)	0.414** (0.184)	286	0.465
P80	-1.520** (0.756)	0.618** (0.249)	286	0.562
P90	-1.401 (1.215)	1.026*** (0.339)	286	0.676
P99	1.435 (2.920)	-0.445 (0.950)	286	0.720

Note: Regressions are estimated using OLS with data aggregated at the country-year level. The dependent variable is the respective decile or percentile P of the labour income growth distribution for each country-year pair. Labour income growth is measured as the change in the logarithm of real annual labour income, including from dependent and self-employment. Each regression includes average age, average age squared, proportion of men, proportion of married individuals, proportion of different education levels, the change in the output gap, EPL index, PMR index, trade openness and country and year fixed effects. The sample is restricted to individuals aged between 25 and 60 and who are employed at least one month in both years. Standard errors, which are shown in brackets, are heteroscedasticity-robust. *** indicates statistical significance at the 1% level, ** at the 5% level and * at the 10% level.

Table A.6. Stock market financing and labour income risk

Percentage point change in the percentile of the labour income growth distribution associated with an increase in stock market capitalisation by 10% of GDP

	Stock market capitalisation (% of GDP)	No. of observations	R ²
P1	-1.298 (0.882)	324	0.719
P10	-0.515* (0.282)	324	0.690
P20	-0.361 (0.249)	324	0.560
P30	-0.321 (0.242)	324	0.419
P40	-0.212 (0.237)	324	0.315
P50	-0.130 (0.237)	324	0.276
P60	-0.087 (0.239)	324	0.317
P70	-0.054 (0.245)	324	0.392
P80	0.003 (0.255)	324	0.502
P90	0.229 (0.284)	324	0.647
P99	2.147*** (0.738)	324	0.717

Note: Regressions are estimated using OLS with data aggregated at the country-year level. The dependent variable is the respective decile or percentile P of the labour income growth distribution for each country-year pair. Labour income growth is measured as the change in the logarithm of real annual labour income, including from dependent and self-employment. Each regression includes average age, average age squared, proportion of men, proportion of married individuals, proportion of different education levels, the change in the output gap, EPL index, PMR index, trade openness and country and year fixed effects. The sample is restricted to individuals aged between 25 and 60 and who are employed at least one month in both years. Standard errors, which are shown in brackets, are heteroscedasticity-robust. *** indicates statistical significance at the 1% level, ** at the 5% level and * at the 10% level.

Table A.7. Private credit and labour income risk: Using arc-percentage changes

Percentage point change in the percentile of the labour income growth distribution associated with an increase in credit by 10% of GDP

	Total credit (% of GDP)	No. of observations	R ²
P1	-2.207*** (0.540)	332	0.745
P10	-0.915*** (0.285)	332	0.720
P20	-0.522** (0.250)	332	0.581
P30	-0.387 (0.246)	332	0.418
P40	-0.337 (0.244)	332	0.326
P50	-0.331 (0.248)	332	0.299
P60	-0.344 (0.252)	332	0.351
P70	-0.337 (0.256)	332	0.429
P80	-0.217 (0.269)	332	0.539
P90	0.125 (0.331)	332	0.680
P99	0.755 (0.590)	332	0.734

Note: Regressions are estimated using OLS with data aggregated at the country-year level. The dependent variable is the respective decile or percentile P of the labour income growth distribution for each country-year pair. Labour income growth is measured as the arc-percentage change of real annual labour income, including from dependent and self-employment. Each regression includes average age, average age squared, proportion of men, proportion of married individuals, proportion of different education levels, the change in the output gap, EPL index, PMR index, trade openness and country and year fixed effects. The sample is restricted to individuals aged between 25 and 60 and who are employed at least one month in both years. Standard errors, which are shown in brackets, are heteroscedasticity-robust. *** indicates statistical significance at the 1% level, ** at the 5% level and * at the 10% level.

Table A.8. Private credit and labour income growth: The role of structural policies

Percentage point change in labour income growth associated with an increase in credit by 10% of GDP

	(1) Baseline sample	(2) Baseline sample	(3) Baseline sample	(4) Baseline sample
Total credit (% of GDP)	-0.574* (0.322)	-0.548* (0.308)	0.097 (0.358)	-0.557*** (0.163)
<i>Interaction with:</i>				
Trade openness	0.001 (0.001)	-	-	-
EPL index	-	0.095 (0.091)	-	-
PMR index	-	-	-0.296* (0.178)	-
Collective bargaining coverage	-	-	-	0.004 (0.003)
No. of observations	1 381 864	1 381 864	1 381 864	1 381 864
No. of clusters	332	332	332	332
R ²	0.008	0.008	0.008	0.008

Note: The dependent variable is the change in the logarithm of real annual labour income, including from dependent and self-employment. Regressions are estimated using OLS. They include age, age squared, gender, marital status, education, the change in the output gap, EPL index, PMR index, trade openness and country and year fixed effects. The sample is restricted to individuals aged between 25 and 60 and who are employed at least one month in both years. Standard errors, which are shown in brackets, are clustered at the country-year level. *** indicates statistical significance at the 1% level, ** at the 5% level and * at the 10% level.

**Table A.9. Private credit and labour income risk (90-10 percentile range):
The role of financial policies**

Percentage point change in the inter-percentile range of the labour income growth distribution associated with an increase in credit by 10% of GDP

	(1) Baseline sample	(2) Baseline sample	(3) Baseline sample
Total credit (% of GDP)	-0.324 (0.483)	3.154* (1.864)	0.794 (0.915)
<i>Interaction with:</i>			
Macprudential regulation	0.044 (0.079)	-	-
Financial liberalisation	-	-2.204 (1.782)	-
Capital account openness	-	-	-0.145 (0.267)
No. of observations	219	320	313
R ²	0.831	0.765	0.772

Note: Regressions are estimated using OLS with data aggregated at the country-year level. The dependent variable is the difference between the 90th and 10th percentiles of the labour income growth distribution for each country-year pair. Labour income growth is measured as the change in the logarithm of real annual labour income, including from dependent and self-employment. Each regression includes average age, average age squared, proportion of men, proportion of married individuals, proportion of different education levels, the change in the output gap, EPL index, PMR index, trade openness and country and year fixed effects. The sample is restricted to individuals aged between 25 and 60 and who are employed at least one month in both years. Standard errors, which are shown in brackets, are clustered at the country-year level. *** indicates statistical significance at the 1% level, ** at the 5% level and * at the 10% level.