Ups and downs in finance, ups without downs in inequality

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Funding:

The research and writing of this paper benefited from the monetary support of the following institutions: National Agency for Research (grant ANR-17-CE41-0009-01), Alexander von Humboldt-Foundation (grant AR8227), Independent Research Fund Denmark (grant 5052-00143b), Swedish Research Council for Health, Working Life and Welfare supports (grant 2015-00807), European Social Fund and state budget of the Czech Republic (grant CZ.03.1.51/0.0/0.0/15_009/0003702), Rozvoj Výzkumné Organizace (RVO:68378025), NPO "Systemic Risk Institute" LX22NPO5101, Chair in Family-Owned Business at IESE, Research Council of Norway (grant 287016), the Spanish Ministry of Science and Innovation (grant nr. PID2020-118807RB-I00/AEI/10.13039/501100011033), the Fritz Henkel Foundation (Endowed PhD Scholarship), Swedish Forte (grant nr. 2015-00807), from the European Research Council ERC Advanced Grant (grant nr. 340045), and the US National Science Foundation (grant SES-1528294).

Acknowledgements:

We would like to thank Louison Carroué and Julie Fournier for excellent research assistance in collecting bank reports. We are grateful to Leon Wansleben, the participants of the SocioCongress 2021 in Geneva, and two anonymous reviewers for helpful feedback.

Abstract

The upswing in finance in recent decades has led to rising inequality, but do downswings in finance lead to a symmetric decline in inequality? We analyze the asymmetry of the effect of ups and downs in finance, and the effect of increased capital requirements and the bonus cap on national earnings inequality. We use administrative employer-employee-linked data from 1990 to 2019 for twelve countries and data from bank reports, from 2009 to 2017 in 13 European countries. We find a strong asymmetry in the effect of upswings and downswings in finance on earnings inequality, a weak, if any, mitigating effect of capital requirements on finance's contribution to inequality, and a restructuring but no absolute effect of the bonus cap on financiers' earnings. We suggest that while rising financiers' wages increase inequality in upswings, they are resilient in downswings and thus downswings do not contribute to a symmetric decline in inequality.

Key words: Inequality, finance, financial crisis, regulation

JEL classification: N2 Financial Markets and Institutions, D31 Personal Income, Wealth and Their Distributions, G38 Government Policy and Regulation

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How to cite this paper:

Godechot, Olivier, Nils Neumann, Paula Apascaritei, István Boza, Martin Hallsten, Lasse Henriksen, Are Hermansen, Feng Hou, Jiwook Jung, Naomi Kodama, Alena Křížková, Zoltán Lippényi, Elvira Marta, Silvia Maja Melzer, Eunmi Mun, Halil Sabanci, Matthew Soener and Max Thaning. 2022. "Ups and downs in finance, ups without downs in inequality", *Socio-Economic Review*, mwac036, https://doi.org/10.1093/ser/mwac036

Partial replication package: https://osf.io/yrt9u/

1. Introduction

The financial crisis sparked a double-barreled debate about the role of finance in contemporary inequality. For one, the left-leaning #OccupyWallStreet movement placed blame on finance for elevating inequality to gilded age levels (Calhoun, 2013). Conversely, many public intellectuals indicted finance not so much for engendering inequality in times of economic upswing, but for not taking responsibility in times of downswing and crisis (Rajan, 2008; Attali, 2009). The latter commentators took umbrage that many financial firms continued to pay large bonuses while they defaulted or were bailed out by their respective governments. The case of AIG even inspired draft U.S. legislation to impose a prohibition of bonus payments in government-backed banks, albeit the bill never passed (Thomas, 2009).

Since then, research inspired by the first part of the controversy has focused on the impact of the financial upswing, i.e., on the increase in societal importance of finance as expressed, for instance, in turnover and profits relative to GDP, and the political power and symbolic status of financiers, etc. This research has shown that the upswing in finance has contributed significantly to rising inequality in earnings (Tomaskovic-Devey and Lin, 2011; Lin and Tomaskovic-Devey, 2013; Godechot, 2012; Kus, 2012; Dünhaupt, 2014; Flaherty, 2015; Denk and Cournède, 2015; Roberts and Kwon, 2017; Huber et al., 2020; Lin and Tobias-Neely, 2020; see also Hager, 2020). However, little attention has been paid to the second part of the controversy, and the link between finance and inequality in the post-crisis downswing, i.e., the decrease in societal importance of finance is unexplored. It thus remains obscure whether downswings in finance have resulted in symmetrical downswings in earnings inequality.

After 2008, two trends could contribute to a decline in earnings inequality: first, downward trends in financial markets, as measured for instance by bank profits and the volume of shares traded, and second, financial regulation. Although the decline in financial activity and policy interventions do not directly address the earnings of financiers, they could contribute to a reduction in their wages. A key reason for this is that earnings in finance are intended to be linked to performance through bonuses, and banks use unit-level formulas to calculate bonus pools (Godechot, 2017). A decrease in size and profitability of a market could thus translate into a decrease in earnings in the corresponding banking units. Moreover, a reduction in bank leverage due to the imposition of higher capital requirements could dilute the profitability of higher-risk activities and further depress bonus pools. Finally, the bonus cap the EU imposed in 2013 could increase labor costs of banks, as fixed wages are less flexible downward than bonuses in a financial downswing. Rational banks should therefore negotiate a reduction in total compensation, and rational financiers should accept such a reduction, as they may be better off with a less volatile compensation structure.

However, the asymmetric allocation of accountability for profits and losses to financiers may limit the impact of a decline in bank profitability on earnings

(Godechot, 2017). In addition, previous research on the "75% tax" for millionaires in France (Guillot, 2021) shows that top earners such as financiers have considerable bargaining power to circumvent costs of policies targeting their earnings. What is more, Murphy (2013) predicted that the European bonus cap would increase financiers' fixed remuneration to match remuneration in unregulated sectors, harm profitability of the European banking sector and incentivize financiers to take more risk (Murphy, 2013). The joint analysis of the effects of market-led and policy-led disruptions in finance on inequality thus also furthers our understanding of the mechanisms behind persistent earnings inequality.

To assess the contribution of finance to earnings inequality in up- and downswings and the effect of financial regulation, we use two novel and unique databases. First, building on a large research consortium, we rely on a composite of administrative, employer- and employee-linked data on earnings from 1990 to 2019 for twelve countries (Canada, Denmark, Norway, Sweden, France, Germany, Netherlands, Spain, Czechia, Hungary, South Korea, and Japan), complemented with World Bank indicators of financialization (GFDD) and earnings share estimates from Piketty and Saez (2003, updated in 2020) for the US. This allows us to document the evolution of top earnings shares and their distribution between financial and nonfinancial sectors on a much larger scale than has previously been done (Godechot, 2012; Bakija, Cole and Heim, 2012; Bell and Van Reenen, 2014). Second, to analyze the impact of the European bonus cap, we collected data on financiers' remuneration from Bank reports, from 2009 to 2017 in 13 European countries (Germany, Austria, Belgium, Denmark, Finland, France, Greece, Ireland, Italy, Netherlands, Spain, Sweden, United Kingdom) complemented with balance sheet indicators from COMPUSTAT data.

Based on this array of evidence, we make four contributions. First, we corroborate and substantiate previous research on the contribution of financiers' earnings to the inequality upswing. Moving beyond previous data limitations, we present evidence that the central mechanism through which this occurs is the granting of high wages in a growing financial industry. Second, we demonstrate that the contribution of finance to inequality did not decrease substantially with the decline in financial market activity. Third, we show that post-crisis increases in capital requirements have at best yielded a modest reduction in the contribution of finance to inequality. Finally, we show that the bonus cap led to a short-run decline in bonuses and a long-run increase in fixed salaries, leaving total remuneration, and thus the role of finance in earnings inequality, unchanged.

We argue that the central reason for the asymmetry in the contribution of finance to inequality in ups-and downswings is, that while financiers are rewarded for their perceived contribution to the success of the firm during upswings and therefore top earnings shares rise, the same financiers may negotiate a preservation of high wages during downswings because banks fear

losing top performers and suffering further losses. Hence, we suggest that the same organizational processes might underpin the response in wage formation to both market shocks and to regulatory pressure.

The remainder of the paper proceeds in four parts. In the second section, we briefly review the literature on how finance contributes to rising earnings inequality. In the third section, describe the data used. In the fourth section, we delineate the trends in top earnings shares and the overrepresentation of financiers in the top 1% earnings share and analyze the effect of financial activity on their evolution. We devote the fifth section to the measurement of the effects of financial regulation. We first analyze the impact of capital requirements on earnings inequality and second evaluate the adjustment of European banks' remuneration practices to the introduction of the bonus cap. In the conclusion, we discuss explanations for the asymmetry between upswing and downswing effects and policy implications of our research.

2. A synopsis of the Finance-Inequality nexus

Previous literature examining the finance-inequality nexus has de facto examined it during upswings, as it mostly relied on data from before the global financial crisis. However, it remains relevant to consider these findings as they have uncovered several channels through which finance impacts inequality, which may or may not also be effective in downswings. While there is a consensus that finance has contributed significantly to the rise in inequality, the literature remains divided on the mechanisms through which financialization contributes to income inequality. A first strand of literature builds on power resource theory and traces mechanisms at the political-economic macro level (Hager, 2020). These scholars argue that with financialization, non-financial firms prioritize financial revenue streams over investments in the production of goods and services (Krippner, 2005; Lin and Tomaskovic-Devey, 2013) and prioritize shareholder interest through dividend disbursement and downsizing of the workforce (Goldstein, 2012, Dünhaupt, 2014; Huber et al., 2020). In addition, this literature suggests that financialization contributes to a weakening of labor institutions by promoting labor flexibility aligned to market liquidity (Volscho and Kelly, 2012; Jung, 2015; Flaherty, 2015; Darcillon, 2015 and 2016). These structural changes in non-financial firms, combined with performance-based executive compensation then widened the pay gap between top managers and labor thus contributing to rising inequality.

A second stream of literature focuses on mechanisms of inequality aggravation at the micro-level. With financialization, these scholars argue, financial labor markets developed conducive conditions and a disproportionate increase in financiers' wages, yielding a significant financial wage premium (Tomaskovic-Devey and Lin, 2011; Godechot, 2012; Philippon and Reshef, 2012; Bakija, Cole and Heim, 2012; Denk and Cournède, 2015; Bell and Van Reenen, 2014; Godechot, 2017; Roberts and Kwon, 2022). Within this literature,

economists highlighted "winner-take-all"-effects that inflate returns to human capital (Gabaix and Landier, 2008; Célérier and Vallée, 2019), whereas sociologists have argued that financiers can appropriate intangible assets of banks and employ them as leverage in hold-up trials of force (Godechot, 2017).

The two literatures do not contradict each other, and neither examines the asymmetry of the contribution of finance to inequality in up-and downswings. However, clarifying the primary mechanism in upswings is crucial for understanding the asymmetry of the contribution in downswings. If finance contributes to inequality because of transformations at the macro-level, we ought to examine the evolution of bargaining processes between capital and labor in non-financial firms. Conversely, if the contribution occurs mainly through the financial labor market, we need to examine wage-setting processes in financial firms during downswings. Previous comparisons with cross-country macro data suggest that the primary mechanism by which finance contributes to inequality is that an increasing number of well-paid financiers are driving the rise of top earnings shares, while political-economic macro explanations are of secondary importance (Kus, 2012; Dünhaupt, 2014; Godechot, 2016; Huber et al., 2020). However, the absence of detailed micro-data on wages has so far precluded elucidation of micro-mechanisms in the link between finance and inequality and what reflux in finance may reduce inequality. In what follows, we thus add such elucidation with our unique micro-data and clarify the primary mechanisms during the downswing and shed light on the asymmetry in the contribution of finance to inequality in ups-and downs.

3. Data

Linked employer-employee administrative data

Building on a large-scale collaboration, we use administrative employer-employee linked data for twelve countries: Canada, Denmark, Sweden, Norway, France, Germany, Netherlands, Spain, Czechia, Hungary, South Korea, and Japan (cf. Table A1). Data on earnings inequality complement those used for income inequality but offer the distinct advantage of capturing inequality at the workplace.

We base our analysis on the direct analysis of linked employer-employee wage dataset in twelve countries. We thus rely on one billion worker-year observations and up to 150 million worker observations per year. For the U.S. we use secondhand estimates from Piketty and Saez (2003, updated in 2020) of national inequality based on U.S. Social Security data. Unfortunately, these estimates do not enable a decomposition of top shares between financiers and non-financiers. Some countries such as Canada, Denmark, Norway, Sweden, Netherlands, and France provide exhaustive information on the working population and permit reliable estimates for small groups in small units (such as financiers' earnings in the top 1 percent). Czechia and Hungary samples are comprehensive with

respectively 80% and 50% of the working population. In four countries (Germany, Spain, South Korea, and Japan), we use smaller samples between 4 and 8% of the working population. With respect to the common socioeconomic research, the latter samples are large and enable reliable estimates. Since our inequality measures are based on mean values, smaller samples, given they are representative and appropriately weighted, produce unbiased estimates. However, smaller samples may lead to more noisy and volatile estimates.

Top earnings shares may be biased for Japan and Germany. In Japan, CEO salaries are not included in the data, which could lower estimates. In Germany, top earnings are top coded around the top decile threshold. To address this limitation, we impute top earnings in Germany.[1] Nevertheless, it remains likely that we underestimate top 1% earnings shares in Germany.[2] We assume that in Japan and Germany levels of inequality may be affected by underestimation bias, but that the trends remain informative.

With this large-scale research endeavor we can track the evolution of top earnings shares, and their decomposition between finance (insurance sector included) and non-finance in a variety of political economies (Esping-Andersen, 1990; Hall and Soskice, 2001): two "liberal" Northern American economies (Canada, United States), three Scandinavian "social-democratic" economies (Sweden, Norway, Denmark), three "corporatist" western European economies (France, Germany, Netherlands), two eastern European transitioning economies (Czechia and Hungary) and one "Southern European Economy" (Spain, cf. Katrougalos, 1996), and two east Asian economies (South Korea and Japan). However, unlike the literature on comparative capitalism (Hall and Soskice, 2001; Amable, 2003), our country selection aims less to maximize the contrast between national economies than to ensure that our results are generalizable and not conditional on a particular institutional setting.

World Bank GFDD database

To measure the effects of post-crisis capital regulations we use the World Bank Global Financial Development Database (GFDD) from 1988 to 2017. This database provides common indicators of financialization (Kus, 2012; Godechot, 2016) such as *Stock market total value traded to GDP* (series GFDD.DM.02) or *Stock market capitalization to GDP* (GFDD.DM.01). It further contains aggregated indicators of banks' profits (such as *Bank return on equity pretax* – GFDD.EI.10) and indicators of bank capital, *bank capital to total assets* (GFDD.SI.03) and *bank regulatory capital to risk-weighted assets* (GFDD.SI.05). The latter ratio is a good indicator for capital regulation, as it corresponds with the benchmarks used to set capital requirements for banks in Europe and the US.

[1] In Germany, our imputation strategy uses contemporaneous and lagged information from individuals and workplaces to predict high earnings, using a tobit function estimated for multiple education by gender for East/West German populations.

[2] In the World Inequality Database (cf. https://wid.world/data/), Germany's top 1% income share (including income other than wages) lies between those of France and Canada.

However, this indicator is based on bank-internal risk measurement, and banks have certain de facto freedom to apply their own risk-weighting strategies. We therefore additionally use the indicator for bank capital to total assets, which is more robust to endogenous processes within banks. We further use two indicators to capture the effect of the leverage requirements, which is the second pillar of capital regulation introduced in the countries analyzed. We also use World Bank's Gpd per capita (API_NY.GDP.PCAP.CN) and OECD's trade union density (TUD).

European Bank Reports

With the introduction of the Capital Requirements Directive III in 2009 banks were required to disclose the remuneration of a part of their employees in their annual reports (CEBS, 2010). We exploit these annual bank reports to create our novel dataset on the remuneration of financiers for 25 European banks from 2009 to 2017 (see Table A2). The data form an unbalanced panel as the directive CRD III was not concurrently realized in every member state.[3] We include four main variables from these reports in our analysis: fixed remuneration, variable remuneration, total remuneration and the number of "material-risk-takers" subject to the disclosure requirements. The variable remuneration consists of deferred and non-deferred payments in the form of monetary payments, or instruments such as shares. Fixed remuneration is a fixed annual payment in monetary form. Total remuneration is the sum of fixed and variable remuneration. The bank reports contain aggregate statistics on total remuneration and the number of incumbents for "material-risk-takers". These are provided at the bank level and for specific functions or units, such as managing directors, investment banking, retail banking and independent control functions. Banks have the task to identify these material-risk-takers, defined as the employees "*whose professional activities have a material impact on the institution's risk profile*" (CEBS, 2010). This somewhat vague definition refers to employees in executive positions, independent control functions and decision makers in banking units.

We use the COMPUSTAT database to complement our dataset on financiers' remuneration with balance sheet indicators for respective banks. We use indicators for total assets and number of employees to capture the size of the balance sheets and workforce of banks. As a measure of profitability, we use the indicator earnings before interest and taxes (EBITDA) which is the sum of sales revenue less cost of goods sold and selling, general and administrative expenses.

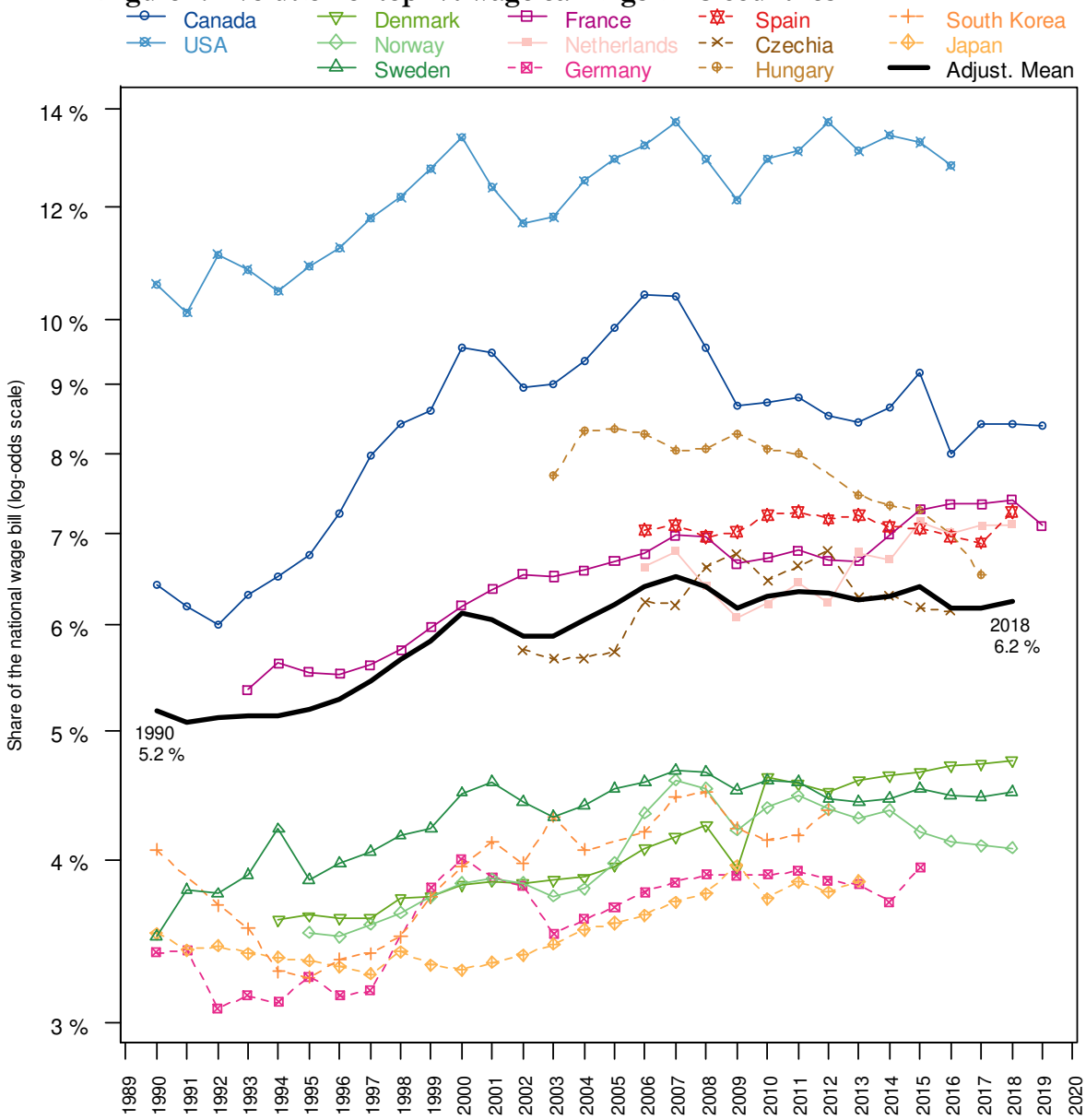
[3] We include only banks for which data is available since 2013 to increase sample size post-regulation.

4. The contribution of financiers' earnings to inequality and its asymmetry in upswings and downswings

Top earnings shares have the advantage of documenting inequality processes arising from the functioning of the labor market. However, unlike the top income and wealth shares compiled in the World Inequality Database (https://wid.world/fr/accueil/), they have not yet been systematically collected and harmonized across countries. Hence, our administrative earnings data enable us to produce estimates analogous to those compiled by Piketty and Saez (2003) for the U.S., for twelve additional countries. Figure 1 displays the evolution of top 1% earnings shares in 13 high wage countries and shows the familiar figure of strong rising inequalities during the 1990s and 2000s. It further shows that the financial crisis of 2008 led to a decrease in top 1% earnings shares in most countries. This drop is often temporary and lasts only one or two years in many countries. However, in some cases, e.g., in Canada, France, Hungary, or Norway, it spans to 2013 and beyond. In addition, in some countries (USA, Canada, Germany, Sweden) the dot.com crisis led to a similar temporary downswing in the top 1% earnings share.

Hence, combining the analysis of periods of increasing and decreasing inequality allows us to examine the relative contribution of finance to both parts of the evolution. We study this relation through the investigation of two causal channels: the direct impact of financial wages and the indirect impact of financial market activity.

Figure 1. Evolution of top 1% wage earnings in 13 countries



Note: For the USA, we use Saez updated estimates of Piketty and Saez (2003; cf. Table B5 in https://eml.berkeley.edu/~saez/TabFig2018.xls). For other countries source description, cf. Appendix A1.

The asymmetric contribution of financial wages to inequality

While previous studies have estimated the impact of financialization on income inequality using country-level regressions - with the risk of capturing an unobserved country-level trend - our unique micro-level data offer the advantage of decomposing the contribution of financial wages to the increase in the share of top earners. To do this, we first use a simple additive decomposition method

already present in the literature which has the advantage of providing an intuitive indicator of the share of the increase in inequality caused by the increase in top wages in finance (Bakija, Cole and Heim, 2012; Godechot, 2012; Philippon and Reshef, 2012; Bell and Van Reenen, 2014). We decompose the evolution of the top earnings shares as the sum of the evolution of two shares: of top earners who work in finance and of top earners who work outside finance (equation 1).

$$\Delta S_{nat\_top1} = \Delta S_{nat\_top1\&finance} + \Delta S_{nat\_top1\&non-finance} \qquad (1)$$

with earnings share $S_{nat\_top1\&sector} = \frac{\sum_i (w_{i,sector} > P99_{nat})}{\sum_i w_i}$

w_i: wage of individual i,
$P99_{nat}$: P99 threshold of the national wage distribution
sector: either finance or non-finance

In a second step, we express the contribution of finance to the evolution of inequality as the ratio of the evolution of the earnings share of workers belonging both to the finance sector and to the national top 1% over the evolution of the earnings share of the national top 1% (equation 2).

$$Finance\_contribution = \frac{\Delta S_{nat\_top1\&finance}}{\Delta S_{nat\_top1}} \qquad (2)$$

In Table 1, we first apply this formula to the pre-crisis upswing. To produce more reliable and more conservative estimates of finance's contribution to inequality, we apply this formula to inequality waves of maximum amplitude. We thus use the inequality minima as the start date and the inequality maxima as the end date for each country during the pre-financial crisis period.

This exercise confirms that finance contributed to the rise in inequality as has been shown for the USA, the UK and France (Bakija, Cole and Heim, 2012; Philippon and Reshef, 2012; Godechot, 2012; Bell and Van Reenen, 2014). For instance, in Table 1, the Canadian top 1% share moved from 6.0 % to 10.4% between 1992 and 2006, which is a 0.31-point increase per year. During the same period, the earnings share of the Canadian financiers of the top 1% moved from 0.9% to 2.2%, which is a 0.09-point increase per year. Therefore, the contribution of finance to inequality is 30% (0.09/0.31). This effect can be observed in almost all cases, with half of the increase in the share of the top 1% in Sweden and Norway being attributable to employees in finance, as well as 61% in South Korea, 43% in France, 41% in Denmark and 20% in Germany. The contribution of finance is stronger in Hungary, Netherlands, and Spain, but bear in mind that for those countries we measure the contribution at the peak of the financial upswing during a short period (three years in Hungary and one year in the two other). Finally, we find two exceptions, the Czech Republic, where finance does not contribute to the modest rise in inequality at all, and Japan, where finance was negatively correlated with rising inequality.

Although the magnitude of individual country evolutions remains heterogeneous, a clear common pattern can be discerned for the period before the crisis: The earnings share of top earners increased during this period, and

finance contributed to this increase (from 20% to 60% of the increase and 45% on average).

Has finance contributed to the decline in inequality? We calculate a similar decomposition as above for the decline in inequality. However, we must keep in mind that the post-crisis decline in inequality is much less homogeneous than the pre-crisis increases, with different start and end dates, durations, and magnitudes in each country. Nevertheless, this exercise indicates two findings: first, a smaller contribution of finance to the decline in inequality compared to the increase, and second, a heterogeneity in the magnitude of this phenomenon across countries.

In France, and Japan finance has a negative contribution to downswings in inequality, that is finance still contributes to increasing inequality while national inequality decreases. In three countries (Canada, Denmark, Hungary and Netherlands), finance has a much smaller contribution to the decrease in inequality than it has to the increase. Finally, the contribution of finance to the decline is equal or greater than its contribution to the increase in four countries (Norway, Sweden, Germany, and South Korea).

This previous decomposition has the advantage of being additive. However, the results depend on the size of finance and are only measurable if there is a significant change in the earnings share of top earners, and we miss a significant and persistent decline in inequality in these data. Therefore, we complement this first measure with a second indicator of finance's contribution to inequality which neutralizes the differences in size between countries with a large (e.g., Canada) or a small (e.g., Czech Republic) financial sector. For this, we estimate an over-representation ratio (OR) of the earnings of finance in the national top 1% with an odds ratio of the proportions of financial and non-financial earnings included in the national top 1%:

$$OR_{nat\_top1\ \&\ fin.} = \frac{\frac{P_{nat\_top1\ |\ fin.}}{\left(1-P_{nat\_top1|\ fin.}\right)}}{\frac{P_{nat\_top1|\ non-fin.}}{\left(1-P_{nat\_top1\ |\ non-fin.}\right)}} \qquad (3)$$

$$where\ P_{nat\_top1\ |\ fin.} = \frac{S_{nat\_top1\&fin.}}{S_{fin.}}$$

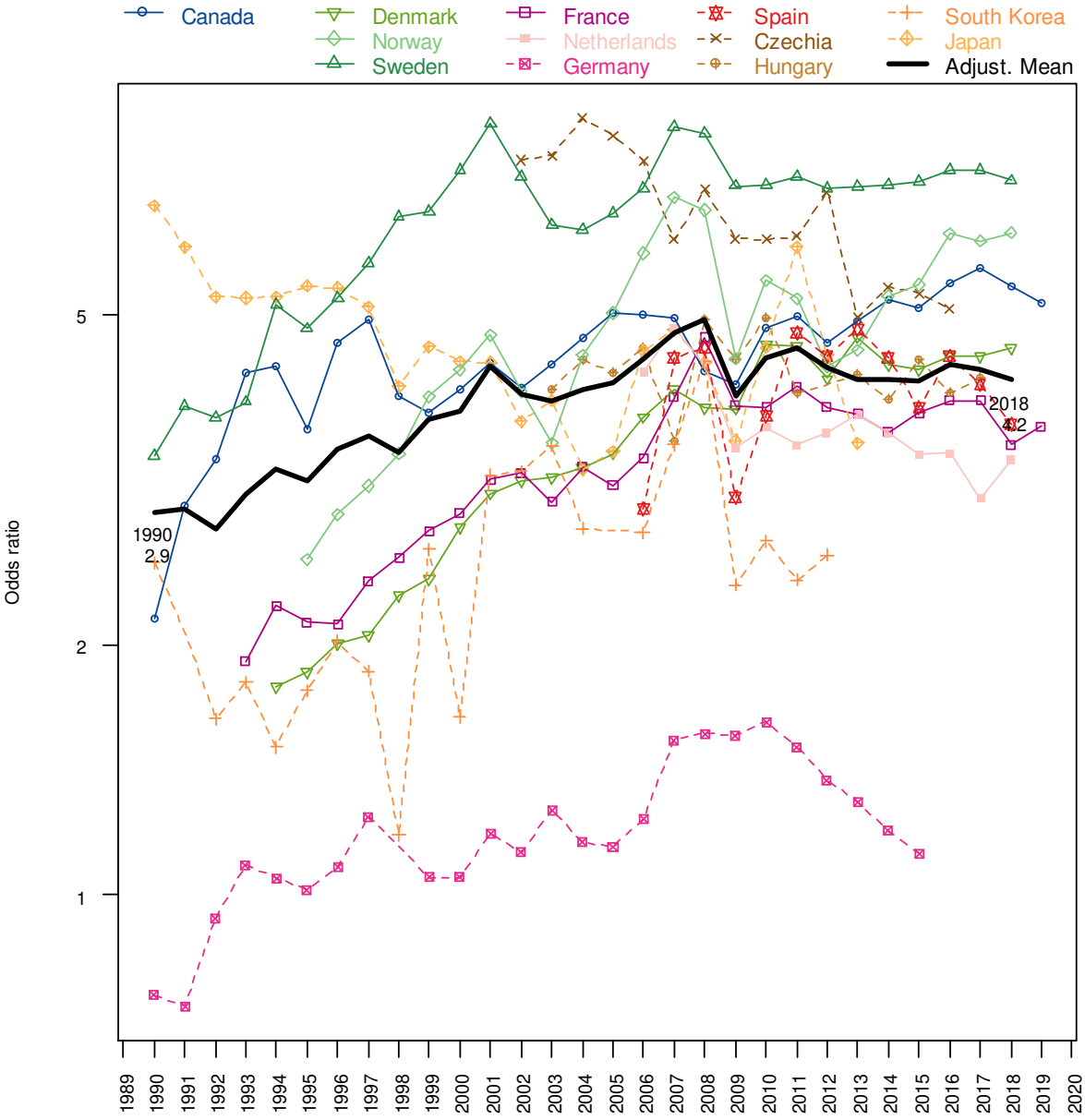
With this indicator, we calculate the over-representation of financiers' earnings in the national top 1% in contrast to that of workers working in the rest of the economy.

Table 1. Finance contribution to the pre-financial crisis upswing in inequality and to the financial crisis downswing in inequality

	Pre-financial crisis inequality upswing						Financial crisis inequality downswing				
Country	Time-Period	Earliest year top 1%	Latest year top 1%	Annual increase of top 1%	Annual increase of financiers of top 1%	Finance contribution	Time-Period	Latest year top 1%	Annual decrease of top 1%	Annual decrease of financiers of top 1%	Finance contribution
Japan	1997-2007	3.27%	3.71%	0.04%	0.00%	-10%	2009-2010	3.73%	-0.22%	0.12%	-53%
Denmark	1994-2008	3.59%	4.24%	0.05%	0.02%	39%	2008-2009	3.94%	-0.31%	-0.05%	16%
Spain	2006-2007	7.05%	7.10%	0.05%	0.31%	625%	2007-2017	6.90%	-0.02%	-0.01%	62%
Germany	1992-2008	3.08%	3.90%	0.05%	0.01%	19%	2008-2014	3.71%	-0.03%	-0.01%	47%
Sweden	1990-2007	3.49%	4.67%	0.07%	0.03%	50%	2007-2013	4.42%	-0.04%	-0.02%	59%
South Korea	1995-2008	3.25%	4.50%	0.10%	0.06%	61%	2008-2010	4.14%	-0.18%	-0.26%	141%
Norway	1996-2007	3.49%	4.59%	0.10%	0.05%	53%	2007-2018	4.08%	-0.05%	-0.03%	61%
France	1993-2007	5.37%	6.99%	0.12%	0.05%	43%	2007-2013	6.69%	-0.05%	0.01%	-29%
Netherlands	2006-2007	6.62%	6.80%	0.19%	0.28%	152%	2007-2009	6.07%	-0.36%	-0.22%	60%
Czechia	2003-2008	5.66%	6.62%	0.19%	0.01%	4%	2009-2010	6.48%	-0.29%	-0.02%	7%
Canada	1992-2006	6.01%	10.41%	0.31%	0.09%	30%	2006-2019	8.40%	-0.15%	-0.02%	12%
Hungary	2003-2005	7.72%	8.36%	0.32%	0.26%	83%	2009-2017	6.53%	-0.22%	-0.09%	41%
Average (year-weighted)	11.8 pre-crisis years			0.11%	0.05%	45%	7.2 post crisis years		-0.15%	-0.04%	29%
USA* (Bakija et al. 2010)	1993-2005	12.7%	17.0%	0.35%	0.10%	29%					
UK (Bell and Van Reenen 2014)	1999-2008	7.1%	8.9%	0.20%	0.16%	78%					

Note: The share of the national top 1% in Canada increased from 6.0% to 10.4% of the national wage bill during the inequality upswing between 1992 and 2006, an increase of +0.31 percentage points per year. 30% of this increase went to members of the national top 1% working in finance. During the post-financial crisis downswing in inequality, the top 1% share dropped to 8.4% of the national wage bill. The top 1% share decreased at an annual rate of -0.15%. 12% of this decrease accrued for members of the national top 1% working in finance. * Estimates from Bakija et al. are based on a notion of income rather than a notion of earnings.

Figure 2. Overrepresentation of financiers' earnings in the national top 1%



Note: In 1990, financiers' earnings are 2.1 overrepresented in the Canadian national top 1% wage share than they are in the rest of the Canadian wage distribution.

In Figure 2, we plot this indicator of finance's contribution to inequality. Hence, it summarizes the contrast visible in Figure A1 between top financiers' and top non-financiers' earnings shares. On average in 1992, finance earnings were 2.8 more represented in the national top 1% than nonfinancial earnings. It culminates at 4.9 in 2008, drops back in 2009 to 4 and further evolves between 4.5 and 4.1. Thus, besides the 2009 drop visible in figure 2, for countries such as Canada, France, South Korea, Sweden, Denmark, Spain, and Netherlands, we

don't see a durable downswing in the overrepresentation of finance in top 1 percent earnings shares.

As shown in Table 2, we find a significant decrease in finance's overrepresentation only in Czechia, Netherlands, and South Korea. In most countries, this indicator of finance's contribution to inequality remains at a high level without a clear trajectory, while in Canada, the overrepresentation of financiers among top earners continues to increase.

In this subsection, we used various methods to provide preliminary descriptive evidence on the asymmetric contribution of finance to inequality. Wages in finance contributed significantly and rather uniformly to the rise in inequality before the global financial crisis. This underscores the primacy of the financial labor market mechanism in the link between finance and inequality. This analysis further shows that wages in finance have contributed less and more heterogeneously to the decline in inequality.

Previous comparative research explaining cross-country variation in the financial wage premium has foregrounded the role of the institutional configuration of corporate governance and labor relations, as well as the (de)regulation of finance (Roberts and Kwon, 2017 and 2022; Kwon, 2018; Huber et al., 2020). This literature suggests that in countries with more advanced financial sectors, the financial wage premium is larger than in countries with a less developed financial sector. Our results do not contradict these findings. For instance, the distinct pattern of Czechia and to a lesser extent of Hungary (cf. table 2), is probably due to the specific trajectory of post-socialist economies which are less financialized and where financialization happens under the domination of foreign banks. Our results add a layer of complexity, suggesting taking the level of inequality into account and distinguish between the absolute and relative contributions of finance to inequality. Leaving some country-specific developments aside, such as in Japan, which was influenced by the banking crisis after 1990 (Hoshi and Kashyap, 1999), we do identify common patterns. Scandinavian and East Asian countries, especially Sweden, Norway and Korea, share lower and increasing levels of inequality (cf. figure 1). In an institutional environment resistant to inequality, finance appears as an isolated niche sector in which relatively high wages can develop. This contribution to inequality is modest (table 1 column 6, table 2 column 4), but, since inequality does not increase significantly in other sectors, the relative contribution to inequality is considerable. In addition, in these countries with lower inequality, the effect of finance is more likely to reverse during financial downswings. This pattern contrasts with that of more financialized countries such as the United States, Canada, and France, where inequality is higher and increased more before 2008. In these countries, the increase in top earnings in finance can be substantial, but finance is not the only sector in which wages increase, and the relative contribution of finance to inequality is therefore attenuated. Other sectors also contribute to the decline in inequality, while finance has resisted a permanent decline in top wages after the 2009 shock.

Table 2. Linear trends in top 1% shares and overrepresentation of financiers' earnings in the latter

	Top 1% share		Financiers of the top 1% share		Financiers' earnings overrepresentation	
Panel A	<=2007	>=2007	<=2007	>=2007	<=2007	>=2007
Year	0.099***	-0.014	0.027***	-0.008*	0.093***	-0.026*
	(0.008)	(0.009)	(0.003)	(0.005)	(0.014)	(0.015)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number obs.	162	138	144	128	144	128
R^2	0.971	0.983	0.895	0.900	0.830	0.882
Number groups: country	13	13	12	12	12	12
Panel B						
Canada × year	0.276***	-0.110***	0.081***	0.013	0.107***	0.087**
	(0.013)	(0.019)	(0.005)	(0.009)	(0.023)	(0.038)
Czechia × year	0.117*	-0.039	-0.017	-0.022*	-0.235*	-0.173***
	(0.069)	(0.028)	(0.024)	(0.013)	(0.123)	(0.056)
Denmark × year	0.040**	0.059***	0.019***	0.005	0.173***	0.046
	(0.019)	(0.021)	(0.007)	(0.010)	(0.034)	(0.042)
France × year	0.118***	0.050***	0.041***	0.035***	0.122***	-0.045
	(0.017)	(0.019)	(0.006)	(0.009)	(0.031)	(0.038)
Germany × year	0.041***	-0.005	0.008*	-0.013	0.028	-0.059
	(0.013)	(0.033)	(0.005)	(0.015)	(0.023)	(0.065)
Hungary × year	0.064	-0.154***	0.110***	-0.109***	-0.091	-0.019
	(0.091)	(0.024)	(0.032)	(0.011)	(0.163)	(0.048)
Japan × year	0.011	0.012	-0.026***	-0.002	-0.136***	-0.042
	(0.013)	(0.048)	(0.005)	(0.023)	(0.023)	(0.096)
Netherlands × year	0.186	0.077***	0.282*	0.015	0.557	-0.103**
	(0.406)	(0.021)	(0.143)	(0.010)	(0.728)	(0.042)
Norway × year	0.070***	-0.040*	0.038***	-0.022**	0.281***	0.003
	(0.021)	(0.021)	(0.008)	(0.010)	(0.038)	(0.042)
South Korea × year	0.051***	-0.045	0.037***	-0.095***	0.099***	-0.294**
	(0.015)	(0.060)	(0.005)	(0.029)	(0.026)	(0.121)
Spain × year	0.050	-0.002	0.313**	-0.008	1.516**	-0.008
	(0.406)	(0.021)	(0.143)	(0.010)	(0.728)	(0.042)
Sweden × year	0.058***	-0.017	0.029***	-0.011	0.256***	-0.063
	(0.013)	(0.021)	(0.005)	(0.010)	(0.023)	(0.042)
USA × year	0.176***	0.012				
	(0.013)	(0.028)				
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number obs.	162	138	144	128	144	128
R^2	0.991	0.991	0.971	0.955	0.935	0.908
Number groups country	13	13	12	12	12	12

Note: OLS models. Top 1% share models are directly expressed in percentage points. Hence, before 2007, the top 1% share increases by 0.1 percentage point per year (panel A, column 1). The odds ratio of top financial earnings overrepresentation increases by 0.09 unit per year. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

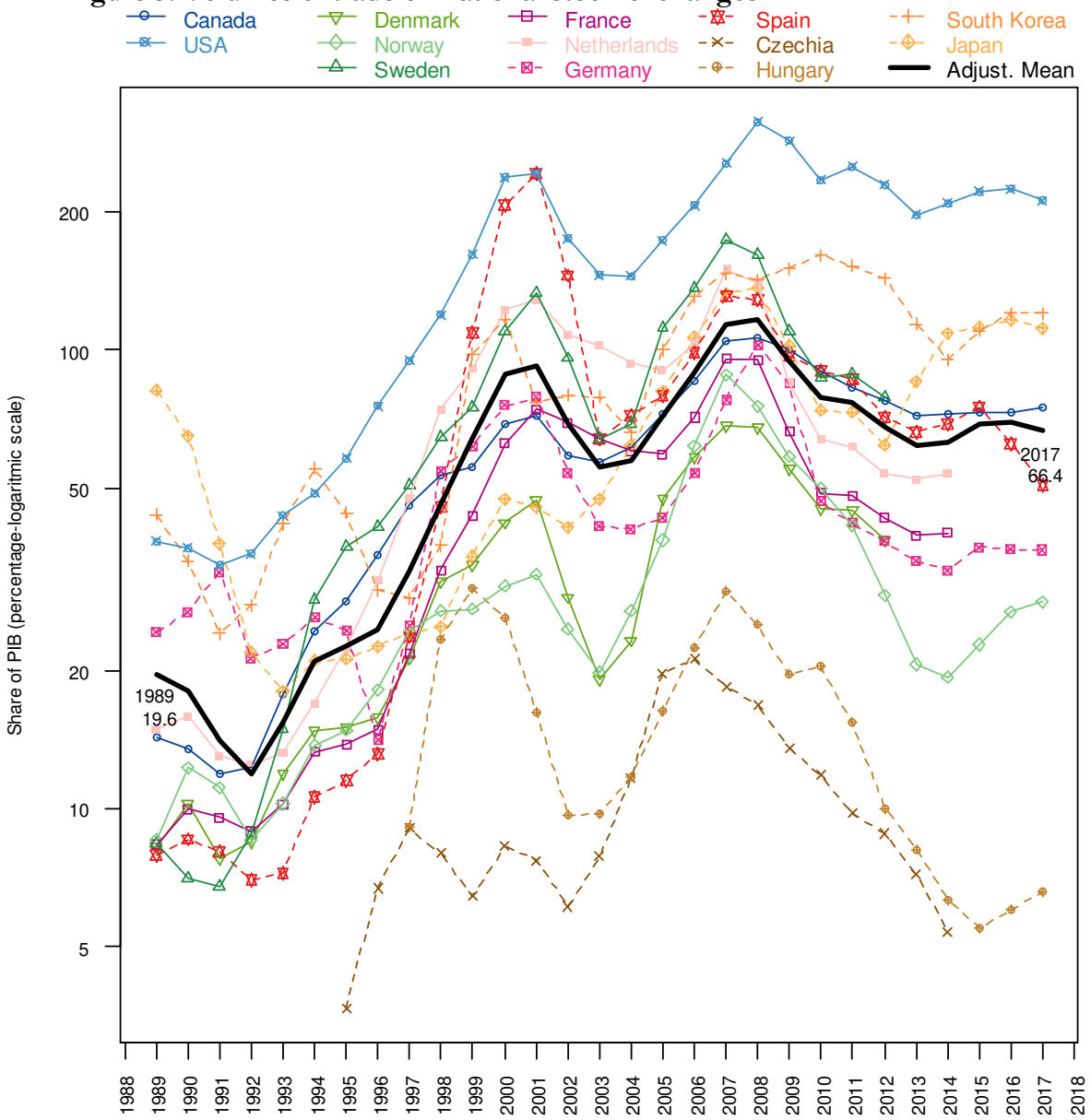
The asymmetric contribution of financial activities to inequality

How are the trajectories in financiers' earnings driven by the trajectories in national financial market activity? With the global financial crisis, the profitability of finance declined for all countries included in the analysis. For instance, as shown in Figure A1, the average pretax return on equity for banks (ROE) was well above 10%, with a maximum of 19% in 2005. In contrast, the ROE after 2007 fell under 10% with a historical low of 7% in 2009. Nevertheless, despite dismal returns, earnings remained high and contributed to the preservation of high levels of inequality.

To further analyze the asymmetry of finance's influence on inequality in upswing and downswing periods, we can draw on financial market indicators associated with rising inequality in the literature. These include stock market volume and capitalization to GDP (Godechot, 2012 and 2016; Kus, 2012; Dünhaupt, 2014; Huber et al., 2020). We use these indicators, first because previous research showed that the 1980-2007 upswing in finance is much more an upswing of financial market related activities than a global growth of finance (Greenwood and Scharfstein, 2013). Second, because banks set their bonus pools based on the profits of their internal units rather than the bank's overall profits (cf. Godechot, 2017), indicators capturing trading opportunities are more likely to affect the remuneration of top financiers than indicators focused on the bank's overall profits. In addition, with the within country indicators for financial market development we take cross-country differences in the effect of downswings on earnings inequality into account and our estimates are thus not confounded by such heterogeneity.

Figure 3 for volume of trade on national stock-exchanges and figure A2 for capitalization as a share of GDP show a similar pattern followed by most countries in our sample: a sharp increase in trade volume between 1992 and 2001, followed by a decline between 2001 and 2003, a renewed increase between 2003 and 2008, which reverses between 2008 and 2013.

Figure 3. Volumes of trade on national stock-exchanges



In Table 3, we follow Godechot (2016), and estimate the impact of trading volume on the top 1% share and finance earnings' overrepresentation in top 1% respectively with a simple panel model that employs country and year fixed effects.

$$ineq_{ctry,t} = volume_{ctry,t} + controls_{ctry,t} + country_{ctry} + year_t + u \quad (4)$$

Therefore, we measure the impact of the country specific evolution in trading volume on country specific measures of inequality. We introduce the same control variables as in Godechot (2016) which are GDP per capita, union rate,

and importation rate.[4] All independent variables are lagged. We provide two different measures of finance's activity asymmetry. First, we focus specifically on crisis years and thus interact finance activity with a dummy variable capturing the periods 2001-2003 and 2008-2013 of decrease in financial activities. Alternatively, to take all country-specific negative shocks into account, we introduce the cumulative sum of negative shocks as a supplementary variable: $(\sum_t[(\Delta_{t,\,t-1}volume_{ctry})*(\Delta_{t,t-1}volume_{ctry}<0)])$. This variable captures the marginal effect of financial activity downswings on inequality.[5]

Table 3. The asymmetric impact of trading volume on inequality and financial earnings overrepresentation in top earnings share

	Top 1% share			Finance earnings' over-representation in top 1%		
	(1)	(2)	(3)	(4)	(5)	(6)
GDP per capita	0.16***	0.14***	0.17***	0.58***	0.58***	0.59***
	(0.05)	(0.05)	(0.05)	(0.16)	(0.16)	(0.16)
Union rate	0.27***	0.24***	0.31***	0.18*	0.14*	0.35***
	(0.05)	(0.05)	(0.05)	(0.09)	(0.07)	(0.09)
Importation rate	0.05	0.07	0.08	0.07	0.08	0.09
	(0.07)	(0.07)	(0.07)	(0.12)	(0.11)	(0.11)
Volume of stocks traded /GDP	0.23**	0.57***	0.21*	0.68***	1.24***	0.82***
	(0.10)	(0.09)	(0.10)	(0.23)	(0.32)	(0.22)
Volume of stocks traded /GDP		-0.69***			-1.04***	
× Years in (2001-2003, 2008-2013)		(0.13)			(0.35)	
Cumulative sum of drops in			-0.13			-0.54***
volume of stocks traded /GDP			(0.08)			(0.14)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Num. obs.	266	266	266	239	239	239
R^2	0.60	0.63	0.60	0.45	0.49	0.48
Num. groups: country	13	13	13	12	12	12

Note: OLS models with country and year fixed effects and panel corrected standard errors in parenthesis. All independent variables are one-year lagged. Dependent and independent variables are country-demeaned and standardized. Hence, one standard deviation of stock exchange volume increases by 0.23 standard deviation the top 1% earnings share. ***p < 0.01; **p < 0.05; *p < 0.1

Models 1 and 4 show that the indicator of volume of stocks traded has a strong impact on inequality and an even stronger impact on finance's contribution to inequality. A one standard deviation increase in stocks traded

[4] Union density does not have a negative impact on inequality as in previous work (Kristal 2010, Godechot 2016). This might be because we analyze top earning shares instead of top income shares and focus on recent years where the impact of unions may have changed.

[5] A dependent variable x_{jt} can be decomposed as: $x_{jt}=\sum_t[(\Delta_{t,\,t-1}x_j)*(\Delta_{t,t-1}x_j<0)] + \sum_t[(\Delta_{t,t-1}x_j)*(\Delta_{t,t-1}x_j>=0)]+x_{j0}$

augments the top 1% earnings share by 0.23 standard deviation and the overrepresentation of finance in top 1% by 0.68 standard deviation. Models 2, 3, 5 and 6 show the asymmetry in the effect of this indicator in times of downswing. In times of upswing, a one standard deviation increase in trading volume produces respectively a 0.6 standard deviation increase in inequality and a 1.2 standard deviation in finance's contribution to inequality. During downswings, the marginal impact of decreasing trading volume is significantly lower than its positive effect in upswing periods (-0.7 and -1.0). Overall, the main effect for the share of the top 1% is eliminated and that for finance's contribution to inequality is divided by 6. When we use the cumulative downswing variable as an alternative measure of asymmetric causality, we find that decreases in financial activity has smaller impact on top 1% share than increases, but the gap between the two parameters is not significant ($p=0.15$) .[6] However, we do have a clear asymmetric effect of trading volume on our indicator of finance relative contribution to inequality: when trading volume increases by one standard deviation, finance earnings overrepresentation in the top 1% increases by 0.8 standard deviation. Conversely, when trading volume decreases by one standard deviation, the decreasing effect is only 0.3 (i.e., 0.82-0.54). Finally, table A3 shows a similar significant asymmetrical impact of upswings and downswings when using capitalization to GDP as the indicator of financial market activity.

Thus, these results show that while upswings in finance strongly contribute to upswings in inequality, downswings in finance do not contribute significantly to downswings in inequality. Subsequent to this analysis of the asymmetric effects of financial market activities, in the following we examine the effects of financial regulation designed to reduce risk-taking in the financial industry and, consequently, earnings in finance.

5. Finance, regulation, and inequality

Following the 2008 financial crisis, the approach to financial regulation around the world has changed fundamentally. As early as 2009, the Fed and the ECB expanded existing stress tests used internally into a general policy instrument. These stress tests model various economic crisis scenarios and mandate thus identified risk-prone banks to raise more capital (Goldstein, 2017; Tooze, 2018). In addition, the crisis shock provided the impetus for the creation of the Basel 3 framework at the Bank for International Settlements, with national legislators transposing large parts of these recommendations into national law as of 2013 (Helleiner, 2014). A focus in this accord was placed on increasing the quality and quantity of bank capital. This was done for instance with a minimum Common Equity Tier 1 ratio of 4.5% of risk-weighted assets and a minimum

[6] The asymmetric effect is significant when we use Capitalization to GDP as the financialization indicator. Cf. Table A3.

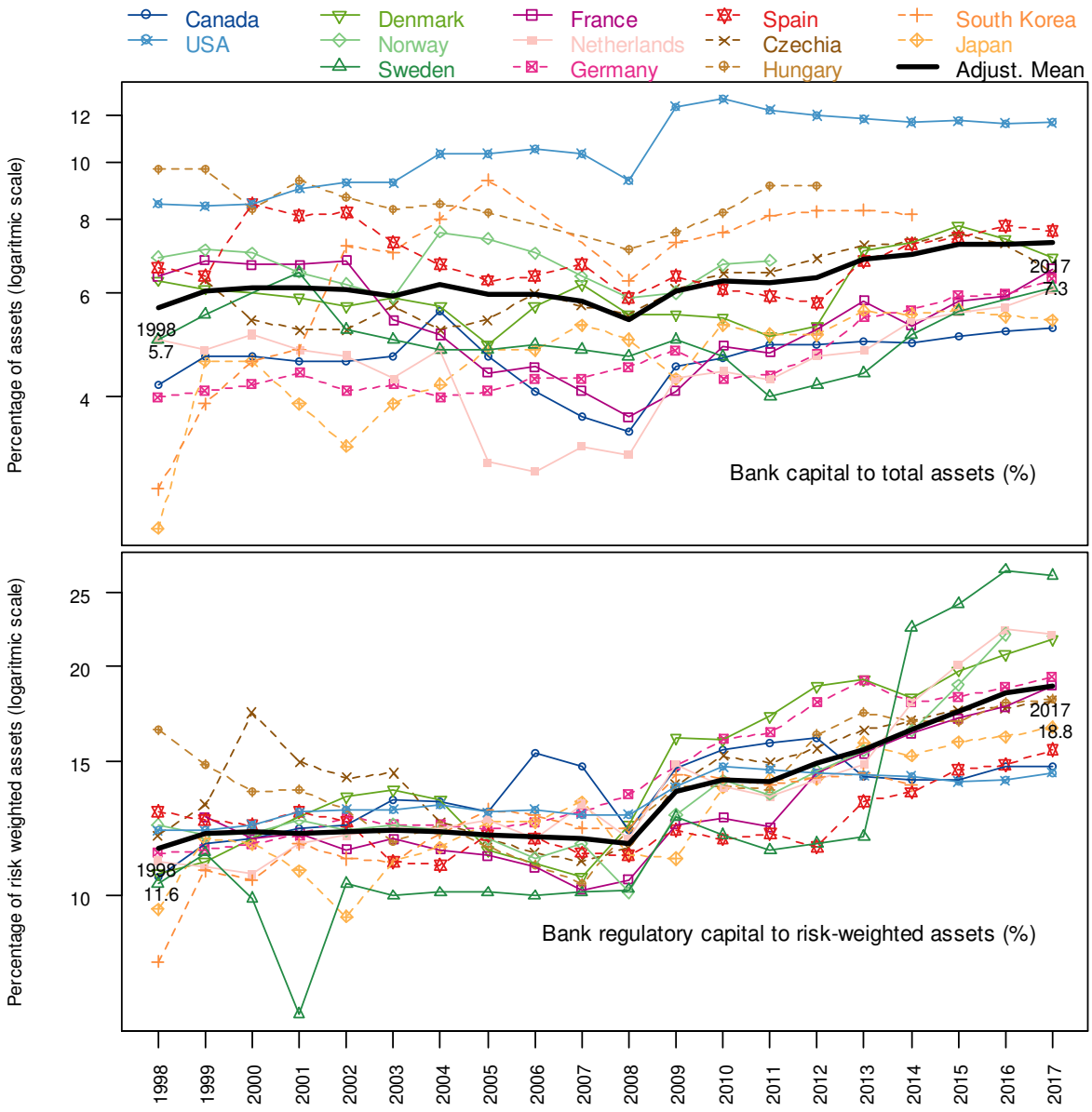
leverage ratio of Tier 1 capital to total assets of 3% without risk-weighting to reduce procyclical deleveraging.

The EU Commission introduced a two-part financial legislation in 2013 consisting of the Capital Requirements Directive IV (CRD IV) and the Capital Requirements Regulation (CRR). The CRR stipulates, among other things, the Common Equity Tier 1 capital ratio of 4.5% of risk-weighted assets and the leverage ratio of 3% of Tier 1 capital divided by total assets. The implementation of the Dodd-Frank Act in the U.S. has prompted the introduction of a capital ratio of 7% of risk-weighted assets and a leverage ratio of 5% each of which transcends the European legislature to a slight extent (Acharya, 2012; Eichengreen, 2014; Tooze, 2018).

The impact of regulations tackling systemic risk and introducing higher capital requirements on earnings in the financial industry provides valuable insights into states' ability to tackle inequality through intervention in market mechanisms rather than post-production interventions such as earnings taxes and social benefits. While post-production interventions address inequalities as quasi-market-outcomes, interventions in wage setting practices can be a further measure to address inequality, particularly at the top (through bonus caps) and bottom of the earnings distribution (through minimum wages). One might further assume that higher capital ratios lead to lower bank profitability, which in turn leads to lower top earnings for financiers whose remuneration is linked to performance. However, it could also be that capital requirements do not significantly reduce banks' profitability if introduced ratios do not lead to de facto increases in capital, or banks become more crisis-resistant and incur fewer losses because of higher capitalization. Moreover, if higher capitalization ratios do lead to reductions in profitability, wages for high-ranking financiers could remain high due to their bargaining power, while wages for lower-ranking employees or spending in other areas, such as shareholder allocations, could be cut instead. In the following we test these hypotheses.

In Figure 4, we depict the development of bank capital from 1998 to 2017. We can see an average increase in bank regulatory capital to risk-weighted assets from 11.9 % to 18.2% and a weaker increase in bank capital to total assets from 5.9% to 7.2 % between 1998 and 2017. Before the crisis, however, on average bank capital stagnated or slightly decreased for most countries. In the few years before the crisis, in countries such as the US, South Korea, Norway or Canada there was a significant decrease in bank capital. Thus, before 2008 on average the capital base of banks had eroded and, in some countries, substantially so.

Figure 4. Bank capital ratios



After the crisis, the increase in bank capital is clearly visible. Yet, the key post-crisis capital adjustment of banks in most countries was a restructuring of balance sheets toward assets that fall under the regulatory criteria, rather than increasing total capital. In some countries, for instance the U.S., Canada, or France there is a sharp increase for both indicators of capital after 2008, while most countries experienced a slight steady increase in bank capital over the post-crisis period. On average, we see a stronger post-crisis increase for regulatory capital to risk-weighted assets than for bank capital to total assets. This could be due to a concomitant restructuring of banks' balance sheets towards less risk-prone assets and capital falling under the regulatory criteria. In Sweden for

instance, we see a significant increase after 2013 in regulatory capital to risk-weighted assets, but a relatively slow increase in capital to total assets, which may be due to a restructuring of balance sheets of Swedish banks. In most countries the immediate post-crisis adjustment in bank capital seems to have a stronger effect on recapitalization than the introduction of higher capital requirements in the following years. For the U.S., for instance, capital rose strongly in 2009 but even fell slightly over the subsequent years.

Capital requirements and inequality

To test the impact of the two capital ratios on inequality and finance's contribution to inequality, we apply the same methodology as in the previous section. We use equation 4 and replace trading volume by one of the two capital ratios (Table 4). We further introduce an interaction term of these variables with the period (2009-2017) during which banks strengthened their capital base.

Our first ratio, bank capital to total assets, does not have any significant impact on inequality (model 3.1 and 3.2) or on finance's contribution to inequality (model 3.1). We still see that one standard deviation increase in bank capital to assets ratio decreases finance's contribution to inequality by 0.09 ($p=0.15$). When we decompose the period into pre- and post-crisis, we see that the stronger capital requirements have a slightly stronger impact than during the pre-crisis period with an additional significant effect of -0.25. Hence, the modest increase in capital ratios, as shown in Figure 4, had a modest effect in reducing the contribution of finance to inequality and no effect on reducing overall inequality.

Table 4. Impact of capital ratios on inequality

	Top 1% share		Finance earnings' over-representation in top 1%	
Panel A.	(1)	(2)	(3)	(4)
GDP per capita	0.06	0.06	0.12	0.12
	(0.04)	(0.05)	(0.16)	(0.16)
Union rate	0.10**	0.10**	0.19**	0.21**
	(0.04)	(0.04)	(0.07)	(0.07)
Importation rate	0.12**	0.12**	-0.29**	-0.25*
	(0.05)	(0.05)	(0.12)	(0.12)
Bank capital to total assets	0.05	0.03	-0.09	-0.03
	(0.06)	(0.07)	(0.06)	(0.07)
Bank capital to total assets × (Years > 2008)		0.04		-0.24*
		(0.12)		(0.13)
Country fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Num. obs.	199	199	181	181
R^2	0.52	0.52	0.46	0.47
Num. groups: country	13	13	12	12
Panel B.				
Bank regulatory capital to risk-weighted assets	0.08	0.14	0.09	0.22
	(0.09)	(0.15)	(0.06)	(0.23)
Bank regulatory capital to risk-weighted assets × (Years > 2008)		-0.09		-0.17
		(0.15)		(0.23)
Control variables	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Num. obs.	211	211	193	193
R^2	0.46	0.46	0.47	0.48
Num. groups: country	13	13	12	12

Note: OLS models with country and year fixed effects and panel corrected standard errors in parenthesis. Independent variables are one-year lagged. Dependent and independent variables are country-demeaned standardized. Hence, one standard deviation of bank capital ratio decreases by 0.09 standard deviation finance' overrepresentation in the top 1% earnings share. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Conversely, when we use the *bank regulatory capital to risk-weighted assets* ratio, we do not find any impact on our measures of inequality. This contrast suggests increasing the sophisticated *bank regulatory capital to risk-weighted assets* is less effective than increasing the crude *capital to assets* ratio. Of course, setting regulatory capital requirements targets were implemented to reduce risk-taking rather than top financiers' remuneration. Yet, top financiers' remuneration may be a proxy of banks' risk-taking and a sophisticated, tailor-made measure of capital might be more open to inventive bookkeeping and a politicization of

accounting. Thus, our findings suggest that risk does not decrease significantly when the sophisticated ratio of banks' regulatory capital to risk-weighted assets increases.

The bonus cap

In 2010, the European Commission proposed a first crisis-inspired directive, also known as the Capital Requirements Directive III, which introduced a first bonus regulation. This bonus regulation set a minimum of 40% to 60% of variable remuneration to be deferred over three years and a minimum of 50% to be paid in instruments such as shares.[7] The aim of this directive was to curb excessive risk-taking by bankers, which the Commission attributed to the high bonuses in the industry. With CRD IV/CRR, the Commission introduced a bonus cap based on, but exceeding, the first bonus scheme. Implemented as a directive with CRD IV, the bonus cap set a maximum variable to fixed remuneration ratio of 100% and 200% if the shareholders approve. Additionally, the Commission together with the European Banking Authority has introduced stricter guidelines for banks to identify regulated staff in 2014 to make implementation more uniform among member states.

Although a bonus regulation was introduced with CRD III, it is with the fixed/variable remuneration ratio set by CRD IV that the bonus cap promises to be truly effective for reducing variable remuneration. The probable adjustment of banks' remuneration practices to the bonus cap is to reduce variable remuneration in the short term to comply with the requirements and increase the fixed remuneration of their employees (Murphy, 2013). The effect on total remuneration is less unequivocal, as it could adhere to two alternative hypotheses. On the one hand, risk-averse employees might accept a reduction in total remuneration in exchange for a less risky composition of their remuneration. On the other hand, the strong bargaining power of financiers could prevent any attempt to reduce earnings and leave absolute remuneration levels unchanged (Guillot, 2021).

One difficulty in the analysis is that, as noted above, the requirements as to whose remuneration must be disclosed in bank reports have been made more stringent in 2014. Consequently, the number of material-risk-takers whose remuneration is disclosed in the reports almost doubled (exp (0.64)) (Table A4). This indicates that we need to take the larger perimeter of the material-risk-takers into account, to circumvent a downward bias of the impact of the bonus cap on earnings. The expansion of the population, through the more uniform measures to identify material-risk-takers, leads to the inclusion of lower ranking financiers who earn less. To avoid such bias, we control for the impact of the change in

[7] The directive applied to all credit institutions as defined in Directive 2006/48/EC and investment institutions as defined in Directive 2006/49/EC and was to be implemented from the start of.

size and check for the robustness of our estimates in a variety of functional forms.

In the following we use OLS regressions to analyze the effect of the bonus cap on the remuneration practices of European banks. We include three dependent variables: the log of fixed, variable, and total remuneration per material-risk-taker in each "job".[8] A "job" is defined by the intersection of a bank and a function within that bank (CEO of Barclays). As we use aggregate statistics per job, we weight observations with the number of material-risk-takers they represent. This prevents from giving disproportionate weight to observations with a small number of employees. In all models, we introduce "job" fixed effects. We thus control for time invariant heterogeneity bias, i.e., for bank and job-specific differences not easily quantifiable such as in corporate governance standards, human resource practices, shareholder fragmentation etc.

In model 1, Table 5, we use the regulation period (2014-2017) as our main independent variable. It captures the average within-job change in financier's remuneration during the regulated period (from 2014 on) in comparison to the unregulated period (before 2013). In model 2, year-dummies are taken as the main independent variables with 2013 as the reference category. With this we measure the yearly changes in remuneration before and after the introduction of the bonus cap. The second model thus addresses the short-run change in remuneration practices induced by the bonus cap. The analysis includes controls for total assets and number of total employees to control for bank size and earnings before interest and taxes to control for profitability of banks. Finally, we introduce a quadratic control specification of the number of material-risk-takers to account for the potential increase in material-risk-takers after 2013. In Table A5, we test whether our results are robust when we change our specification.

[8] All values in 2015 prices and converted to Euro based on ECB exchange rates.

Table 5. Job fixed effects for logged remuneration

	Model 1			Model 2		
	Fixed	Variable	Total	Fixed	Variable	Total
Regulated period	0.18**	-0.85	-0.02			
	(0.08)	(0.53)	(0.04)			
Total assets (log)	0.11	1.01***	0.38***	0.40**	2.81***	0.84***
	(0.09)	(0.33)	(0.10)	(0.17)	(0.67)	(0.17)
Earnings before interest and taxes (asinh)	0.00	0.02	0.01***	0.00	0.01	0.00
	(0.00)	(0.02)	(0.00)	(0.00)	(0.02)	(0.00)
Employees (log)	0.02**	0.30*	0.04***	0.01	0.17**	0.02
	(0.01)	(0.16)	(0.01)	(0.01)	(0.07)	(0.01)
Material risk takers	-0.36***	-0.97***	-0.57***	-0.32***	-0.52**	-0.53***
	(0.09)	(0.20)	(0.03)	(0.10)	(0.24)	(0.05)
Material risk takers (squared)	0.03***	0.12***	0.05***	0.03**	0.07**	0.05***
	(0.01)	(0.02)	(0.00)	(0.01)	(0.03)	(0.01)
2009				-0.14	-3.11***	-0.27***
				(0.10)	(0.26)	(0.06)
2010				-0.11*	-1.17**	-0.01
				(0.05)	(0.45)	(0.07)
2011				-0.12**	-1.54***	-0.22***
				(0.05)	(0.31)	(0.06)
2012				0.02	-0.31	0.01
				(0.04)	(0.20)	(0.05)
2014				0.14*	-1.30***	-0.06
				(0.07)	(0.39)	(0.04)
2015				0.24***	-0.96***	0.07
				(0.06)	(0.34)	(0.05)
2016				0.27***	-0.94***	0.05
				(0.06)	(0.28)	(0.09)
2017				0.27***	-0.40*	0.19***
				(0.06)	(0.23)	(0.06)
R^2	0.96	0.92	0.97	0.96	0.95	0.98
Num. obs.	405	364	428	405	364	428
Num. groups: jobs	69	66	72	69	66	72

Note: OLS models with job fixed effects, weighted by number of material risk takers and clustered robust standard errors in parentheses. Number of material risk takers in thousands. ***p < 0.01; **p < 0.05; *p < 0.1

As predicted the bonus cap led to a substantial increase in fixed wages. Model 1 in Table 5 shows a 20% increase in fixed wages (i.e., exp (0.18)) over the 2014-2017 regulatory period. Model 2 further specifies that fixed wages initially increased by 15% in 2014 and by an additional 12% in 2015 and did not decrease thereafter.

Conversely, the impact of the bonus cap on variable remuneration is less precise. Model 1 estimates a strong -57% negative effect (i.e., exp (-0.85)-1) which is insignificant at conventional levels (p=11%). In addition, Table A5 shows that the estimate of this parameter varies by specification and is not significant despite a high absolute value. Model 2 provides a more accurate picture of the annual evolution of bonuses and facilitates an understanding of the results of Model 1. In 2014, bonuses decreased substantially (-73%, i.e., exp (-1.30)-1) and significantly compared to their 2013 level. This short-term effect was attenuated in subsequent years, with log parameters falling from -1.3 to -0.96 and -0.94. That the parameter for variable remuneration and regulated period in Model 1 is not significant is also due to the evolution of bonuses before 2012. Bonuses were significantly lower in 2011 than in 2014. Therefore, the evaluation of the effect of the bonus cap depends on the determination of the reference period to which we compare the regulated period. If we take the year 2013 or both 2012 and 2013, there is a significant decrease in bonuses with the introduction of the bonus cap. If we take the period 2009-2013 as the reference period, no clear decline can be seen. In the latter case, the inclusion of years of deep crises with the 2009 GFC and 2010-2011 sovereign debt crisis may bias the reference period. Compared to the more normal years, it is therefore likely that there was a decrease in bonuses due to the bonus cap. Finally, we show the impact of the bonus cap on total remuneration. The results from our models show that the bonus cap did not lead to any significant change in total remuneration. This "null" result holds true for almost all specifications (Tables 5, A5).

Hence, the introduction of the bonus cap did lead to a robust increase in fixed remuneration of approximately 20%. The effect on variable remuneration is more difficult to interpret. While we measure a strong short-term downswing in variable remuneration in 2014, this decline is far from robust. This inconsistency could be due to the difficulty of simultaneously accounting for a change in remuneration and a change in the perimeter of material-risk-takers. It could also be because we do not capture the business climate determinants of financiers' remuneration. An alternative explanation is that banks may have complied in the short run to the new rules by reducing bonuses or using inventive accounting and loosened their compliance afterwards. In the UK for instance banks turned bonuses into so-called "role-based allowances" booked as fixed remuneration, and which thus do not appear as variable remuneration in their reports but continue to serve this purpose.[9] Finally, although the change in earning composition increases banks' salary costs because fixed salaries are less

[9] Cf. Schäfer and Arnold (2014) and EBA (2015).

downward flexible and should have led banks to reduce overall remuneration, banks have not adjusted in this direction.

In sum, apart from the modest restructuring of the remuneration practices of European banks by reducing variable remuneration and increasing fixed remuneration, a real reduction in top earnings in banks cannot be observed. Of course, we cannot exclude the impact of other time-varying confounding variables capturing the business climate. Nevertheless, it seems plausible that these developments are a result of the bonus cap since other plausible explanatory mechanisms are insignificant in our analysis.

6. Conclusion

Our study sheds new light on the finance-inequality nexus with four distinct contributions. Firstly, we corroborate with detailed administrative data for a large set of high wage countries that upswings in finance was a major driver of the increase in earnings inequality. This process occurs through a simple and powerful mechanism, the granting of high wages in a growing financial industry. Secondly, we have shown that the significant downswing in finance after the crisis did not contribute to a symmetrical decline in earnings inequality. Thirdly, we have shown that banks have significantly increased their capital since 2008 and this may well be influenced by higher capital requirements. However, this increase in bank capital did not contribute to a significant decline in top earnings and fostered only a modest decline in the overrepresentation of financiers among the top 1% earnings share. Fourthly, we have shown that the introduction of the bonus cap in the EU has contributed to a short-term decrease in variable remuneration and a consistent increase in fixed remuneration, while the total remuneration of top financiers remained unaffected by the bonus cap. Hence, neither the post-financial crisis downswing in financial activity nor financial regulation did contribute to a significant reduction in inequality to the extent that the 1990-2007 financial upswing contributed to its increase. The contribution of finance to inequality in times of upswing thus has long-term and hardly reversible effects.

Qualitative studies of banks' remuneration practices provide valuable insights into possible mechanisms of financial wage resilience (Godechot, 2017). When team leaders evaluate the performance of their supervisees for the distribution of bonuses, they assign asymmetric responsibility for gains and losses. Profit, which is actively sought, is considered a responsibility and an achievement of the financiers, while losses, not sought for, are considered a matter of bad luck. It is thus common that considerable bonuses are paid despite high trading losses, especially if the responsible financiers are promising talents and their sectors of activity are booming in the market. Moreover, when repeated dismal performance in a business unit forces cost-cutting, banks tend to cut the bonuses of younger bank employees and maintain the salaries of their star performers, whom they deem essential. This asymmetry could be exacerbated by the strong

bargaining power of finance employees, who can shift their activities to a competitor by taking technology, customers, colleagues, and subordinates with them. This would further be supported if employees indeed give priority to the fight against wage cuts over the fight for wage increases (Simiand, 1931; Keynes, 1936; Kahneman et al., 1986). Wage downward rigidity and stickiness in finance could therefore be a long-term fuel of global inequality.

There are country differences in the contribution of finance to inequality in ups and downs that future research needs to examine in more detail. While previous comparative research suggests that financial regulation explains country differences in the financial wage premium, post-crisis regulation did not differ substantially across our cases, and we show that their consequences were small. We suggest instead that differences in structural factors in national financial industries, such as size, international exposure, and the effective downturn, as well as organizational differences in wage-setting practices could explain country differences. It could be that in countries with more advanced financial sectors, the wage-setting norms of finance have "spilled over" to adjacent industries. Hence, in those countries, wage-setting norms may be less imperative in times of downswing to reduce wages of top bankers than in countries where financial sector wage-setting norms are a more niche phenomenon. Shedding light on this heterogeneity is inextricably linked to the analysis of the causal mechanisms behind resilient wages in finance. Thus, the analysis of cross-country heterogeneity could be a good starting point for the analysis of the causal mechanisms underlying the asymmetry of the effects of financial upswings and downswings on earnings inequality and vice versa.

Moreover, it is a worthwhile exercise for future research to analyze the shift in the dominance of traditional banks in finance to nonbank financial institutions operating in unlisted markets, as well as to private equity etc. These non-traditional forms of finance are central to financialized capitalism as noted in the recent financialization literature. If this trend proves predominant, wage resilience in finance and cross-country differences therein may also stem from alternative engines of value creation.

Finally, this research raises policy issues. By highlighting the asymmetry in the contribution of finance to earnings inequality in times of financial upswings and downswings we show that the structural redistribution of earnings through financialization is not readily reversible. That finance has lost prominence in public discourse over the past decade and has been overshadowed by the earnings of tech superstars, does not mean that it no longer plays a significant role. Policymakers seeking to curb inequality must therefore be mindful of the special role of finance. Policymakers should consider more effective measures to reduce excessive wages than the capital requirements and bonus cap analyzed in this paper. Capital regulations should avoid overly sophisticated risk-weighted capital measures, which can be used creatively by banks to circumvent the intention behind the policy. Crude measures for capital ratios, although less sophisticated, could be better suited. Bonus caps should be complemented by a

regulation of total wages, either through a cap or a specific and permanent payroll tax for top earners in finance.[10] Finally, these measures should not be limited to traditional banks but extended to all financial institutions. Preventing an upswing in the financial sector as a whole or in a submarket could be a way to avoid a permanent distortion of the earnings scale.

[10] A shortcoming of the "75% tax" for millionaires in France was that it was announced that this tax would be introduced for only two years (Guillot 2021). Therefore, most firms avoided reforming their remuneration scale and paid the bulk of the tax.

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Appendices

Appendix 1. Data description

Canada (1990–2019)**.** Data were generated by Statistics Canada. The data are population-level and include all sectors and industries and employees, working in establishments of at least two workers.

Czechia (2002–2016)**.** Data were taken from the Average Earnings Information System (ISPV) survey conducted by the private agency TREXIMA. The data consist of the entire population of public sector workplaces, plus a sample of private sector workplaces. The private sector sample consists of workplaces with at least 10 employees. A stratified sampling of private sector workplaces with 10–250 employees was taken based on the size of the workplace. All private sector workplaces with over 250 employees are included in the data. The data also spans all industries and sectors. In the end, the dataset covers 80% of Czech workforce and 96% of the workforce in establishments with 10 and more employees. Estimates are weighted to correspond to the complete workforce in establishments with 10 and more employees.

Denmark (1994–2018). The data consist of population-level observations of both private and public sector workplaces extracted from the labor market statistic register (Den Registerbaserede Arbejdsmarkedsstatistik -RAS), and earnings from the job register IDAN. We selected workers working in establishments of at least two workers. Demographics such as age, gender, and nativity come from the population register (Befolkningsregistret). In contrast to other countries, substantial administrative variations in recording of marginal jobs makes internally defined thresholds very volatile. Hence, we opted for an external benchmark, using one fourth of the average yearly wage reported in OECD publications (https://stats.oecd.org/, variable: AV_AN_WAGE).

France (1993–2019). Our analyses use data from the DADS social security register (*Déclaration annuelle de données sociales*). Access to the DADS data was obtained through the CASD (*Centre d'accès sécurisé aux données*) dedicated to researchers authorized by the French *Comité du secret statistique*. The data consist of population-level observations of private sector workers. State civil servants are missing before 2009 and excluded in the following years for consistency.

Germany (1990–2015). Data come from a customized sample for the project "Dynamics of Organizational Earnings Inequality: Investigation within the Comparative Organizational Inequality International Network (COIN)" of the Integrated Employment Biographies Sample (IEBS) of the Federal Employment Agency. It covers roughly 5% of the German working population and about 20,000 establishments, spanning the years 1999–2015. Estimates are weighted to correspond to the complete workforce.

Earnings not subject to social security because they are below the threshold for small-scale employment (e.g., newspaper delivery), which is currently 450 euros per month, are excluded from the sample. The earnings are also top coded at the social contribution limit, which differs by year and for East and West Germany. To impute the top-coded earnings, an imputation strategy based on the imputation from Card, Heining, and Kline (2013) was established, which accounts for individual and establishment wage prior to the censored period. However, rather than focusing on the mean individual and establishment wage prior to the censored observation as was done by Card, Heining, and Kline, we utilize information on lagged earnings. Given the limitation of our imputation, measures of exposure involving the top 1% should be therefore considered cautiously.

Hungary (2003–2017)**.** Our analyses use Admin2 and Admin3 data processed by the Databank of the Centre for Economics and Regional Studies. These data are generated by linking data from five governmental institutions (the Pension Directorate, the Tax Office, the Health Insurance Fund, the Office of Education, and the Public Employment Service). Both Admin2 and Admin3 data are 50% random sample of the Hungarian population followed from 2003 to 2011 and 2003 to 2017 respectively. As wages are right-censored in Admin3 before 2013 and not in Admin2, we combine results from the two datasets. The earnings concept is monthly earnings from each person's primary job. Monthly data were aggregated to obtain yearly earnings. Low-wage workers, defined as workers earning less than half of the yearly minimum wage, are dropped from the sample. We selected workers working in establishments of at least two workers.

Japan (1989–2013). Data are from the Basic Survey on Wage Structure conducted by the Ministry of Health, Labor, and Welfare of Japan. The survey is a two-stage design in which a sample of private sector establishments with at least five employees are selected, and then a uniform random sampling of workers among these establishments is taken. Firms' executives are not included in the data. The sample covers 4% of the workforce working in establishment with more than five workers. Estimates are weighted to correspond to the complete workforce.

Netherlands (2006-2018). Yearly data on employee wages and companies' sector and industry are provided by the Statistics Netherlands (CBS) within the System of Social-Statistics Database (SSB). We linked data on employees and employing firms to construct a dataset with population-level coverage of wages across all sectors and industries. The analyses include the highest-paying jobs of each employee in a given year and jobs with wages lower than age-specific minimal hourly wage are excluded.

Norway (1996–2018). Data were generated by Statistics Norway and are population-level, including all sectors and industries, although private sector identifiers are only available beginning in 1999. In contrast to other countries,

substantial administrative variations in recording of marginal jobs makes internally defined thresholds very volatile. Hence, we opted for an external benchmark, using one fourth of the average yearly wage reported in OECD publications (https://stats.oecd.org/, variable: AV_AN_WAGE). We selected workers working in establishments of at least two workers.

Spain (2006–2018). Our analyses use data from the Continuous Sample of Working Histories (CSWH) *(Muestra Continua de Vidas Laborales con datos fiscales)* from Spain's Social Security Office. The CSWH contains matched anonymized social security, income tax and census records for a 4% non-stratified random sample of the population who in one specific year had any connection with Spain's social security system (whether via employment, self-employment, unemployment, or retirement). The CSWH provides information on individuals' complete labor market histories from 1980 (or the year the individual registers with Social Security) to the year of data collection.

Because earnings from the social security records are top and bottom capped, we use earnings from tax records containing uncensored gross labor earnings for each job (tax records are available from 2006 onwards).

South Korea (1990–2012)**.** Data are from a survey conducted by the Korean Ministry of Labor. The data consists of a sample of private sector establishments, first stratified by size and then by region and industry. An establishment must have had a minimum of five employees to be included in the sample before 1999, and ten employees beginning in 1999. All industries except Agriculture are included. The dataset contains only full-time jobs. Estimates are weighted to produce national estimates.

Sweden (1990–2018)**.** The data used are from population-wide administrative registers from Statistics Sweden (the LISA database) and cover all sectors and industries.

Table A1. Presentation of linked-employer administrative data

Country	Start	End	Field	Definition of threshold	Threshold wage (end year)	Number workers (end year)	Source
Canada	1990	2018	Exhaustive	1/2 full time full year minimum wage	8921 Can $	15,571,107	Statistics Canada
Denmark	1994	2018	Exhaustive	1/4 OECD yearly wage	109,412 Da. Kr	2,039,139	RAS, IDAN and BES
Norway	1995	2018	Exhaustive	1/4 OECD yearly wage	139,875 No. Kr	1,410,206	Statistics Norway
Sweden	1990	2018	Exhaustive	1/3 prime age P50	100,660 Sw. Kr	4,519,342	Statistics Sweden
France	1993	2019	Exhaustive private sector	1/2 full time full year minimum wage	8,024 €	20,671,976	DADS
Germany	1990	2015	Sample of workers (6%) in 20,000 establishments	1/2 full time P10	12,871 €	1,120,354	IEBS
Netherlands	2006	2018	Exhaustive	Age-specific minimum hourly wage	4 € per hour	8,867,793	CBS
Spain	2006	2018	Random sample of workers born since 1962 (4%)	1/2 full time full year minimum wage	5,837 €	247,004	Continuous Sample of Working Histories (CSWH) and tax records
Czechia	2002	2016	Sample of workers (80%)	1/2 full time full year minimum wage	52,830 Cz. Kr	1,917,812	Average Earnings Information System (ISPV) survey
Hungary	2003	2017	Sample of workers (50%)	1/2 full time yearly minimum wage	765,000 HUF	1,147,366	Admin2 and Admin3
South Korea	1990	2012	Sample of workers (8%) out of a sample of private sector establishments size>5	1/2 full time full year minimum wage	4,763,200 KRW	613,369	Korean Ministry of Labor
Japan	1990	2013	Sample of workers (4%) out of a sample of private sector est. of size >5	1/2 full time P10	1,056,700 Yen	1,089,517	Basic Survey of Wage
USA	1990	2016	Exhaustive	No threshold	0 $	148,658,000	SSA in Piketty Saez (2003) updated (2020)

Table A2. Banks in sample

Bank	Country	Start year	End Year
ABN AMRO group	Netherlands	2011	2017
AIB group PLC	Ireland	2011	2017
Banco santander SA	Spain	2011	2017
Bank of ireland group PLC	Ireland	2010	2017
Bankia SA	Spain	2012	2017
Barclays PLC	United-Kingdom	2013	2017
BBVA	Spain	2011	2017
BNP Paribas	France	2009	2017
Commerzbank	Germany	2010	2017
Danske bank AS	Denmark	2011	2017
Deutsche bank AG	Germany	2010	2017
Erste group bank AG	Austria	2012	2017
HSBC HLDGS PLC	United-Kingdom	2013	2017
ING groep NV	Netherlands	2012	2017
Intesa sanpaolo SPA	Italy	2011	2017
Jyske bank	Denmark	2011	2017
National bank of greece	Greece	2013	2017
NATIXIS	France	2010	2017
Permanent TSB group HLDGS	Ireland	2014	2017
Skandinaviska enskilda bank	Sweden	2010	2017
Société générale group	France	2010	2017
Svenska handelsbanken	Sweden	2010	2017
Swedbank AB	Sweden	2009	2017
Sydbank AS	Denmark	2011	2017
Unicredit SPA	Italy	2009	2017

Table A3. The asymmetric effect of capitalization on inequality and finance's contribution to inequality

	Top 1% share			Finance earnings' over-representation in top 1%		
	(1)	(2)	(3)	(4)	(5)	(6)
GDP per capita	-0.02	0.01	0.09**	0.27*	0.28**	0.29**
	(0.05)	(0.04)	(0.04)	(0.14)	(0.13)	(0.14)
Union rate	0.25***	0.23***	0.30***	0.05	0.02	0.06
	(0.05)	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)
Importation rate	-0.10	-0.06	0.10*	-0.21*	-0.19*	-0.17
	(0.07)	(0.07)	(0.06)	(0.10)	(0.11)	(0.11)
Capitalization /GDP	0.35***	0.47***	0.54***	0.60***	0.73***	0.63***
	(0.07)	(0.06)	(0.08)	(0.14)	(0.19)	(0.15)
Capitalization /GDP		-0.43***			-0.44**	
× Years in (2001-2003, 2008-2013)		(0.13)			(0.21)	
Cumulative sum of drops			-0.45***			-0.09
in capitalization /GDP			(0.09)			(0.09)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Num. Obs.	270	270	270	243	243	243
R^2	0.61	0.63	0.67	0.51	0.53	0.51
Num. groups: country	13	13	13	12	12	12

Note: OLS models with country and year fixed effects and panel corrected standard errors in parenthesis. Dependent and independent variables are country demeaned standardized. All independent variables are one-year lagged. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Table A4. Job and bank fixed effects for logged number of material risk takers

	Log of the Number of material risk takers declared	
	Job FE	Bank FE
2009	-0.32	-0.08
	(0.42)	(0.50)
2010	0.11	0.21
	(0.22)	(0.39)
2011	0.23	0.14
	(0.14)	(0.23)
2012	0.08	0.10
	(0.09)	(0.16)
2014	0.64***	0.62***
	(0.10)	(0.13)
2015	0.62***	0.77***
	(0.12)	(0.13)
2016	0.59***	0.72***
	(0.13)	(0.17)
2017	0.55***	0.56***
	(0.15)	(0.19)
Total assets (log)	-0.83**	0.31
	(0.39)	(0.52)
Earnings before interest and taxes (asinh)	-0.02***	-0.01
	(0.01)	(0.02)
Number of employees in the	-0.06***	-0.02
Bank (log)	(0.02)	(0.03)
Position fixed effects	Yes	No
Bank fixed effects	No	Yes
R^2 (full model)	0.92	0.81
R^2 (proj model)	0.32	0.18
Num. obs.	428	171
Num. groups: Jobs	72	
Num. groups: Banks		25

Note: OLS models with job or bank fixed effects and cluster robust standard errors in parenthesis $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Table A5. Robustness checks. Impact of regulation on pay according to various specifications

Specif.	Control variables	Fixed	Variable	Total
	A. Regulated period parameter			
0	None	0.30***	-0.57*	0.14
		(0.08)	(0.31)	(0.11)
1	Total assets, Earnings, size of the banks	0.29***	-0.43	0.17
		(0.10)	(0.48)	(0.11)
2	Idem + Nb risk takers	0.28***	-0.43	0.16**
		(0.06)	(0.46)	(0.07)
3	Idem + (Nb risk takers)^2	0.18**	-0.85	-0.02
		(0.08)	(0.53)	(0.04)
4	Idem + (Nb risk takers)^3	0.21**	-0.52	0.01
		(0.09)	(0.47)	(0.05)
5	Idem + (Nb risk takers)^4	0.20**	-0.69	0.02
		(0.09)	(0.51)	(0.05)
	B. 2014 dummy variable parameter			
0	None	0.13**	-1.27***	-0.08
		(0.06)	(0.35)	(0.08)
1	Total assets, Earnings, size of the banks	0.14**	-1.27***	-0.05
		(0.06)	(0.32)	(0.09)
2	Idem + Nb risk takers	0.15**	-1.27***	-0.05
		(0.06)	(0.32)	(0.08)
3	Idem + (Nb risk takers)^2	0.14*	-1.30***	-0.06
		(0.07)	(0.39)	(0.04)
4	Idem + (Nb risk takers)^3	0.17**	-1.06***	-0.05
		(0.08)	(0.37)	(0.04)
5	Idem + (Nb risk takers)^4	0.17**	-1.06***	-0.05
		(0.08)	(0.37)	(0.03)

Note: OLS models with job effects and cluster robust standard errors in parenthesis.
$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Figure A1. Evolution of top earnings shares of financiers and non-financiers in the national top 1%

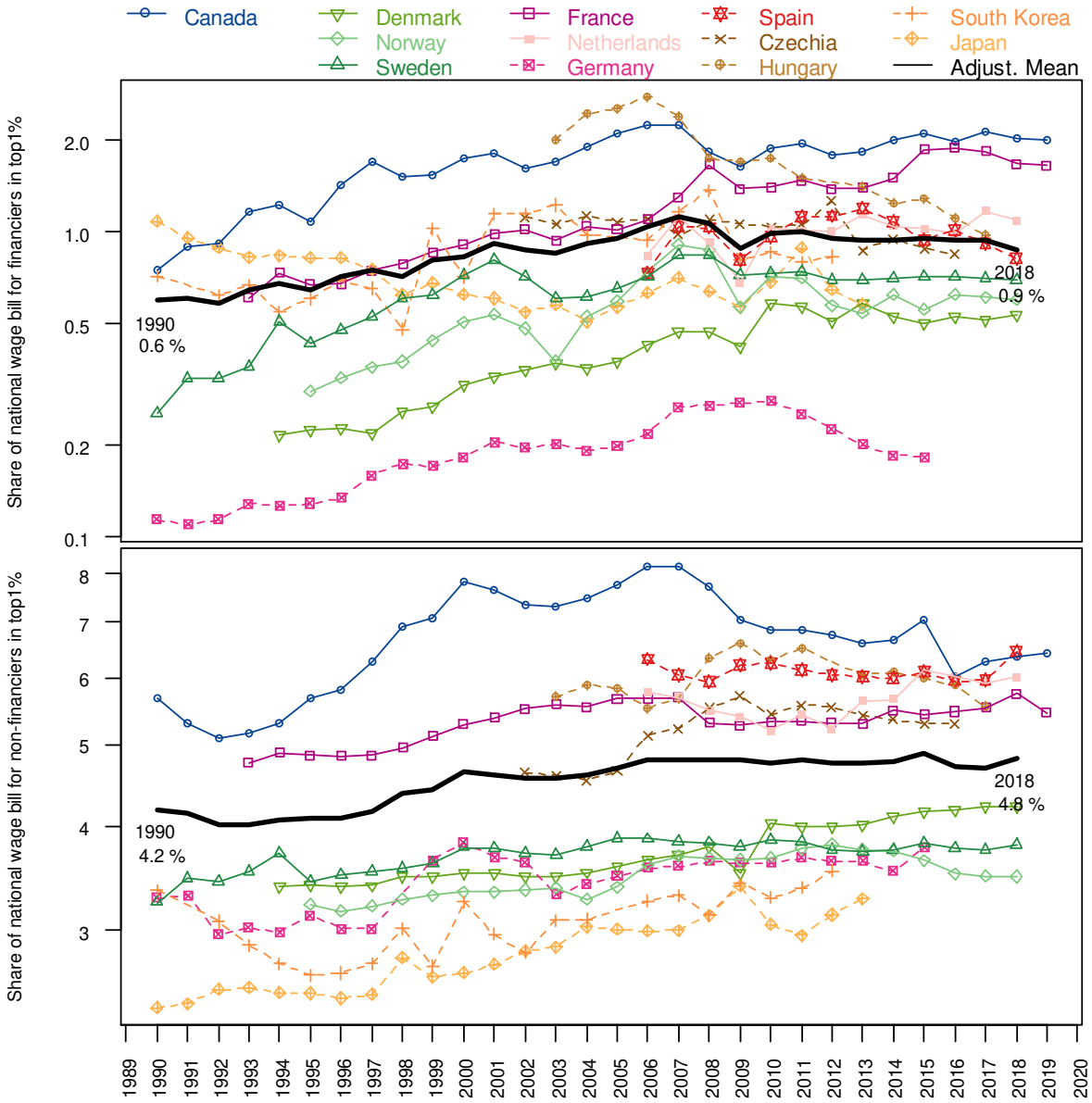

Figure A2. Banks' Return on Equity before tax

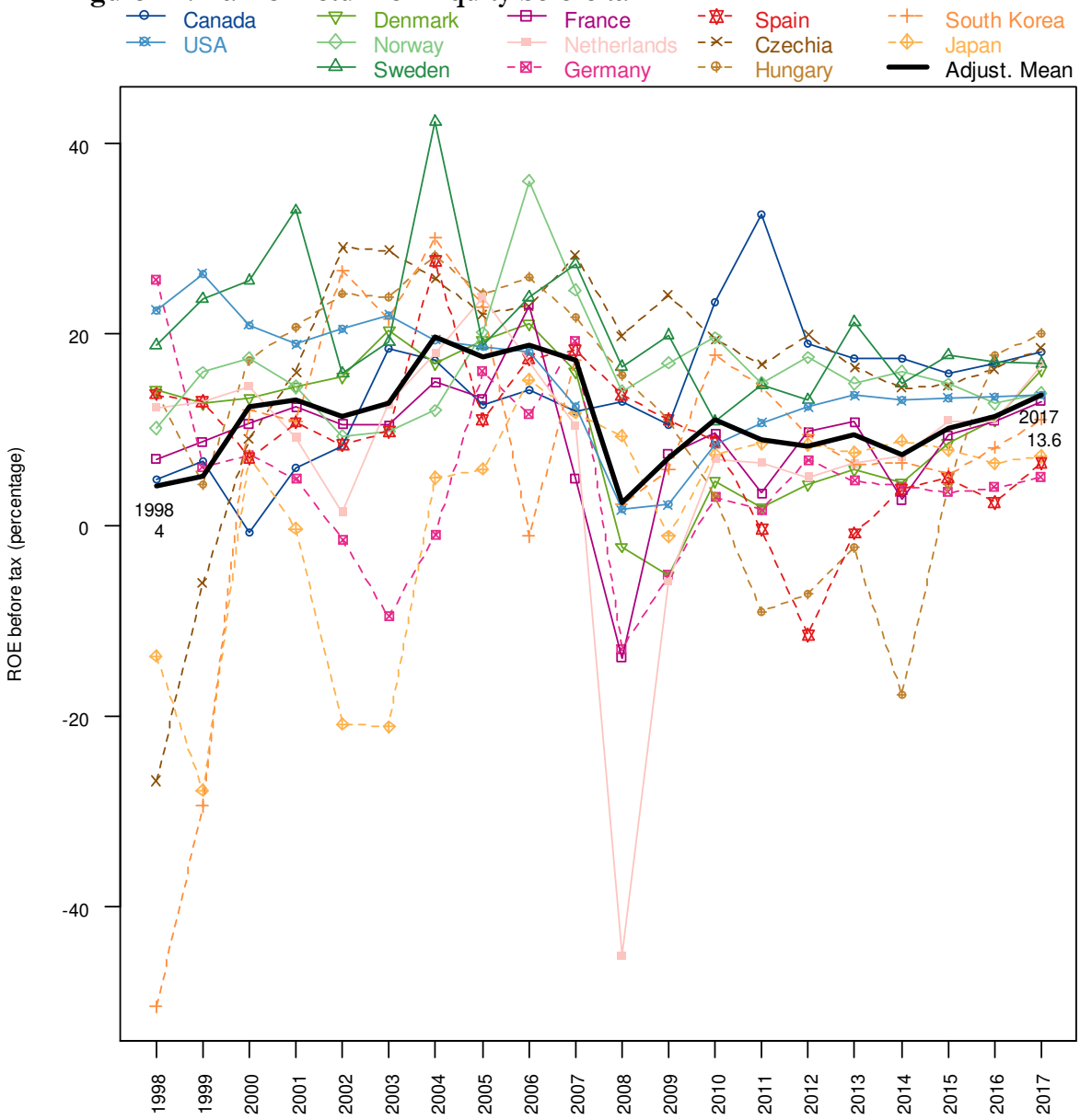

Figure A3. Capitalization to GDP