

The Impact of Financial Deregulation on Top Incomes

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Abstract. This paper investigates the effect of financial deregulation on the share of total incomes going to the top. Using data from the World Top Income Database and a recently created index on financial reform, the effect of financial deregulation on top income shares is estimated in a panel data setting with 18 developed countries over the period 1973-2005. In particular, we explore the share of total incomes going to the richest 10 percent of the population (percentiles 90-100) as well as its decomposition into the top 1 percent (percentile 99-100) and top 10-1 percent (percentiles 90-99). Our findings suggest that financial deregulation has a positive and significant direct effect on the top 10 percent by impacting the top 10-1 percent income share in the full sample as well as a positive and significant effect on the top 1 in Anglo-Saxon countries. Financial deregulation is also associated with rising top income shares for all studied income brackets through a negative effect on top marginal tax rates. Liberalizing interest rate controls, entry barriers and restrictions on banking activities as well as privatization of financial institutions seem to be the driving regulatory dimensions contributing to a rise in top income shares.

Keywords: Top incomes, Income inequality, Financial liberalization, Deregulation, Taxation

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Glossary

Top 10:	The share of total incomes going to the richest ten percent of the population in the income distribution (P90 to 100)
Top 1:	The share of total incomes going to the richest ten percent of the population in the income distribution (P99 to 100)
Top 10-1:	The share of total incomes going to the richest ten percent of the population in the income distribution, excluding the top 1 (P90 to 99)
Bottom 90:	The share of total incomes going to the poorest 90 percent of the population in the income distribution (P0 to P90)

Abbreviations

AR(1):	First order autocorrelation
AR(2):	Second order autocorrelation
FE:	Fixed effects estimation
GMM:	Generalized Method of Moments
OVB:	Omitted variable bias
U.S:	The United States of America
U.K:	The United Kingdom
WTID:	World Top Income Database

1. Introduction

"The two greatest ends of economic inquiry seem to me to be the furnishing of general answers to the two questions, first, why whole communities are rich or poor, and, secondly, why inside each community some individuals and families are above, and others below the average in wealth... Economists sometimes vaguely wonder why economic theory is so unpopular... Is there in this to excite surprise, if we reflect for a moment on the adequacy of the answer furnished by the theory of distribution, at the present taught, to the questions in which the ordinary person is interested?"

Edwin Cannan, 1912

The publication of Thomas Piketty's book *Capital in the 21st Century* in 2014 brought the topic of inequality back into the center of political debate. It was the aftermath of a global financial crisis that had left a heavy burden in terms of unemployment, falling real wages and the effects of fiscal austerity on the lower and middle classes. Meanwhile, top incomes continued to rise in most developed countries. There was emerging consensus among policy-makers and academics that an unregulated financial sector, inflated by soaring bonuses and executive compensation, was an important determinant in causing the greatest financial crash since the Great Depression. More and more critical voices are therefore being raised against a laissez-faire approach toward the financial sector, pushing academics to think about the real economic effects of financial regulation. Specifically, the distributive effects of an expanding financial sector are in this context one of the most relevant topics of research.

Thomas Piketty has, along with many collaborators, documented income and wealth shares for the top income brackets for number of countries dating back to the 19th century. A clear trend emerges, whereby top income shares sharply declined from very high levels in most countries after the Great Depression (Piketty, 2014). This drop has been attributed to both the Depression, as well as the dramatic economic effects of two World Wars. In the post-war decades, top income shares remained relatively flat, but have since the 1970s increased again. Today, top shares are back at pre-1930 levels in many developed countries. Furthermore, researchers have noted that the relatively close evolution of top income shares across the "Western" world has since the 1970s diverged between a group of largely Anglo-Saxon countries, and "the rest". Notably, Anglo-Saxon countries such as the U.S., U.K. and Australia have seen a sharp increase in top income

shares, especially at the very top (the top 1 and 0.1 percent). In contrast, these income shares have increased only marginally or remained flat for most of Continental Europe and Japan. A final trend is the increasing share of wage income, as opposed to capital income, for top earners (Atkinson et al., 2011).

A large number of potential explanations for these trends have been investigated by the body of research dedicated to the study of top incomes. Factors such as globalization, skill-biased technological change, changing social norms and lower marginal tax rates are among the most commonly studied determinants. However, as pointed out by many academics, these determinants largely fail to account for a number of the stylized facts seen in the evolution of top incomes. Specifically, they fail to account for the divergence between the Anglo-Saxon experience on one hand, and the experience of Continental Europe and Japan on the other (Atkinson et al., 2011).

One important factor that has not been sufficiently explored is the financial sector. This has been pointed out within the context of research carried out by Piketty and others (Krugman, 2014) as well as by researchers focusing on the impact of financial development more generally (Demirgüç-Kunt & Levine, 2009). The financial sector was largely unregulated until the Great Depression, when massive financial regulation such as interest rate controls, bank branch regulation in the U.S., capital controls etc. were first introduced (Philippon & Reshef, 2012). It was only during the 1970s that important deregulation of capital and financial markets took place, which led to significant financial development in many developed countries. The timing of the rise in top incomes and financial deregulation thus follow each other closely in their respective developments over the past century. Furthermore, as financial sector expansion (size of the financial sector in the overall economy) has been more pronounced in Anglo-Saxon countries as compared to Continental Europe and Japan, it has the potential to explain their differences with regards to the evolution of top income shares.

Our paper aims to investigate the effect of financial deregulation on the rise of top incomes in developed countries since the 1970s. We make use of the World Top Income Database, which consists of time series data on top income shares for over 20, mostly “Western”, countries from the turn of the 20th century until today. As a measure of financial deregulation this paper makes use of the database on financial reform by Abiad et al. (2010), which quantifies financial reform across seven dimensions from 1973-

2005.¹ Our final sample consists of 18 developed countries from 1973-2005.

Two channels through which financial deregulation may affect top income shares are investigated: a direct effect from deregulation to top incomes, and an indirect effect whereby financial deregulation has a first-stage impact on marginal tax rates, which, in turn, have a negative impact on top income shares. Our main specifications are fixed effects panel regressions correcting for AR(1) disturbances, and Beck-Katz regressions with country and year dummies, correcting for panel level heteroskedasticity and autocorrelation. In addition, we address endogeneity concerns and potential dynamic effects by employing an Arellano-Bond GMM estimation as well as a fixed effects regression including a lagged dependent variable among the regressors. Furthermore, a specification regressing the various regulatory dimensions of our financial deregulation index on top incomes is used to investigate which dimensions may drive the link from financial deregulation to top income shares. Finally, we carry out a number of robustness checks in order to assert the validity of our results.

Our results confirm that financial deregulation has a significant and positive effect on the top 10 and 10-1 income shares across our different specifications. No empirical evidence is found for the direct effect of financial deregulation on the top 1 percent income share in the full sample. The effect seems however to be present when looking only at the Anglo-Saxon countries. In addition, we find support for the indirect effect: financial deregulation has a significant and negative effect on top marginal tax rates, which, in turn, have a robust negative impact on all of the investigated top income shares. In terms of the effects of the various regulatory dimensions, we find that, in line with our theoretical predictions, liberalizing interest rate controls, entry barriers (including restrictions on banking activities) and privatization of financial institutions are the factors that contribute to rising top incomes. On the other hand, we find that the deregulation of the credit market and the creation of securities markets are beneficial for the bottom 90 percent income share. Although we expected securities markets regulation to be an important driver of rising top income shares, the results with regards to credit market liberalization are in line with previous theory. Specifically, widening access to credit (disproportionately benefiting the low earners) has been one of the main arguments in favor of financial deregulation being pro-equality.

¹ The seven regulatory dimensions are credit controls, interest rate controls, entry barriers, financial account restrictions, securities markets, privatization and prudential supervision.

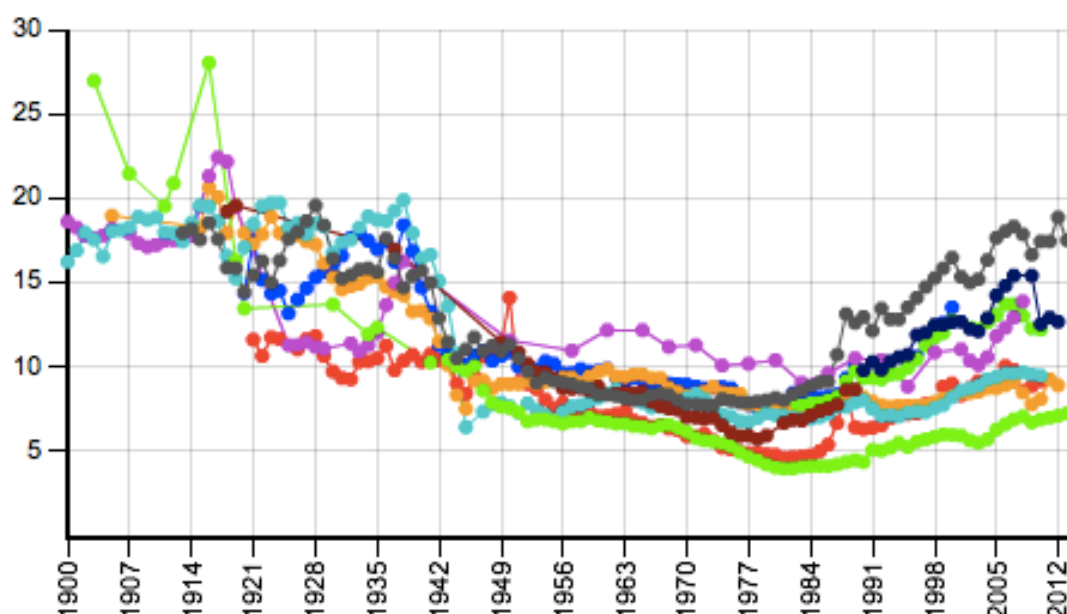
Our findings contribute both to the body of literature studying the determinants of rising top incomes as well as the research investigating the real effects of financial regulation. The results of our study are also important from a policy perspective. While our research does not aim to evaluate the net benefit of financial regulation overall, we contribute to an improved understanding of the distributive effects of financial sector regulation.

The remainder of this paper is organized as follows: background on the evolution of top incomes is described in chapter 2. Chapter 3 reviews previous literature, while chapter 4 specifies purpose and research questions as well as our theoretical predictions. Data and econometric method are introduced in chapter 5 and the analysis containing results, discussion and limitations, is presented the following chapter. Concluding remarks are laid out in chapter 7.

2. Background

The evolution of top income shares (the share of total income going to the top deciles/percentiles in the income distribution) has been thoroughly documented by a large number of academics around the world. Data on top income shares, based on tax records, has been consolidated in the database “World Top Incomes Database” at the initiative of Facundo Alvaredo, Tony Atkinson, Thomas Piketty and Emmanuel Saez.² In numerous research papers, these authors and others describe the dynamics of both income and wealth inequality over the past century for a large number of (mostly “Western”) countries.³ Top income shares in most countries have experienced somewhat of a U-shaped development over this time period (see figure 1).

Figure 1: Top 1% share of total income, selected countries 1900-2012



Countries in graph: Australia, Canada, France, Germany, Japan, Sweden, U.K., and U.S.A

Data source: World Top Incomes Database (2015), graphical representation by authors based on WTID online tool

Previous research on the evolution of top income shares has led to the identification of three main empirical trends. Firstly, top income shares dropped quite drastically during the first half of the 20th century. Piketty and Saez (2014) attribute this cross-country trend to the major macroeconomic disturbances during this time, specifically World War I and II, and the Great Depression. First and foremost, the wars led to physical destruction of

² a large number of academics have contributed with data from their respective countries, see appendix A3 for a full list of contributing authors

³ See for example Atkinson, Piketty and Saez (2011), Piketty and Saez (2003), Piketty and Saez (2014)

capital assets such as real estate and factories. Secondly, the burden of war financing led to a lack of investment, as most private saving flows were absorbed by the public deficits caused by the war. Thirdly, policies of financial repression (rent control, nationalization, capital controls etc.) induced a fall in relative asset prices. This period also saw the introduction of progressive income taxation (sometimes at confiscatory levels) as a means of war financing, perpetuating a fall in top income shares (ibid.).

A second observation by Atkinson et al. (2011) was that the trend of declining top shares was reversed in the second half of the 20th century, with top incomes starting to increase again in the 1970s. However, in the more recent period, top income shares no longer moved in a similar fashion in all of the countries studied. Rather, discrepancies emerged between on the one hand mostly Anglo-Saxon countries such as the U.S., U.K. and to some extent the Nordic countries, and on the other hand mostly Continental European countries such as Germany and France, and Japan. While the Anglo-Saxon countries have experienced a large increase in top incomes over the past decades, top income shares have remained relatively flat in Continental Europe and Japan.

The third and final empirical observation by Atkinson et al. (2011) is that top incomes are increasingly concentrated at the very top, with much of the gains accruing to the top 1 or even 0,1 percent. Furthermore, the lion's share of increasing top incomes consists of wage income. Whereas in the beginning of the 20th century top incomes consisted mainly of capital incomes, the top incomes of today are made up of around 70 percent wage incomes, i.e. salaries, bonuses and benefits. Piketty & Saez (2003) were among the first to observe this change within top incomes. They noted that "the composition of income in the top income groups has shifted dramatically over the century: the working rich have now replaced the coupon-clipping rentiers" (p. 3). In Atkinson et al. (2011), the authors somewhat nuance this conclusion in stating that capital incomes continue to play an important role in top incomes, even though wage incomes now take precedence.

To summarize, three main phenomena stand out when looking at the past 40 years: top income shares started rising again after having declined since the start of the 20th century. There is considerable divergence between developed countries. Top income shares have risen dramatically in some (mostly Anglo-Saxon) countries, whereas they have risen only moderately in others (mostly Continental Europe). Furthermore, the recent increase in top incomes has mainly been driven by an unprecedented surge in top wages.

Why does it matter?

One can question why economists should care about the evolution of top income shares. If people at the top of the income ladder see their income shares increase, but all income groups get richer, is that not what we consider to be a Pareto-improvement for society?

The recent popular interest for questions regarding inequality, such as the "We are the 99 percent" movement in the U.S. or the vivid debate sparked after the release of Thomas Piketty's book *Capital in the 21st Century*, seem to indicate that inequality in and of itself does matter. As Milanovic (2007) notes, people do care about the income of others, not in the sense of envy, but in the sense of justice and self-worth. In other words, the income of others enters into people's welfare functions. This has been confirmed by economists such as Sen (2000) as well as researchers of empirical happiness studies such as Frank (2004), who argues that relative income actually matters more for happiness than absolute income.

In addition, one can raise a number of "functionalist" arguments along the lines of Thorbecke & Charumilind (2002) who review the empirical findings of the link between inequality and a number of social factors such as political conflict, crime, health and education. To this end, Milanovic (2007) points out that "(...) there are functionalist (or instrumentalist) arguments in favor of complementarity between equality and efficiency that are as strong as, and arguably stronger than, the opposite arguments, which see the two (equality and efficiency) as a tradeoff" (p. 3).

In terms of pure economic justifications for studying specifically top incomes, Atkinson et al. (2011) emphasize their impact on growth and resources. They note for example that the top 1 percent has captured 58 percent of real economic growth per family over the period 1976-2007 in the U.S, implying that average real income of the bottom 99 percent grew at only 0,6 percent per year over this period. Similarly, comparing French and U.S. average real family incomes over the same period, U.S. macroeconomic performance seems to outdo that of France (32,2 percent vs. 27,1 percent real growth, respectively). However, when excluding the top 1 percent, the conclusion is reversed since average growth of the bottom 99 percent in the U.S. was merely 17,9 percent compared to 26,4 percent in France.

On the topic of relating top income shares to growth, the empirical data is inconclusive. Piketty & Saez (2006a) observe that causal examinations of the WTID series do not present evidence in favor of a systematic relationship between income concentration and growth. Most countries in the database that experienced decades of high growth in the post-war decades had an unprecedented low-income concentration. Therefore, the authors conclude that the huge fall in wealth concentration that took place in the first half of the century cannot explain the low levels of growth during that period. Milanovic et al. (2007) furthermore note “the frequent claim that inequality promotes accumulation and growth does not get much support from history. On the contrary, great economic inequality has always been correlated with extreme concentration of political power, and that power has always been used to widen the income gaps through rent-seeking and rent-keeping, forces that demonstrably retard economic growth.” (p 30) In most recent decades however the U.S. and U.K. have grown faster than Continental Europe or Japan despite having a more concentrated distribution of income (Piketty & Saez, 2006a).

To summarize, there are moral, functionalist and economic justifications for studying the development of top income shares. Investigating both the mechanisms behind changes in the income distribution, as well as the real effects of inequality are therefore rightfully at the center of today’s economic debate.

3. Literature review

This chapter presents an overview of previous literature on the mechanisms that give rise to changes in top income shares. After an assessment of the broad range of determinants suggested in previous literature and a reasoning about why current state of knowledge is insufficient in trying to explain the empirical trends, we turn to the topic of interest of this paper: the effect of financial deregulation on top income shares. Focus in the literature review is limited to the study of determinants in explaining the recent rise in top incomes in developed countries since the 1970s.

3.1. Income and different measures of income inequality

As a first step to investigate top income shares, a rigorous definition of income is in order. As Piketty & Saez (2014) note, the total flow of income corresponds to the total quantity of goods and services produced and distributed each year. In turn, it can be categorized into its separate parts: labor income and capital income. Labor income consists of the different types of labor compensation such as wages, salaries, bonuses and earnings from nonwage labor. Capital incomes on the other hand correspond to flows such as rent, dividends, interests, business profits, capital gains and other income from capital assets. Furthermore, one can analyze either primary income, which is defined as income before taxes and government transfers, or disposable income, which can be defined as primary income after taxes and government transfers (p. 842). While disposable income is useful in terms of analyzing what different income groups actually have at their disposal, this paper follows research by Piketty, Saez and others, who analyze primary incomes.

A second remark should be made before reviewing previous literature, much of which focuses on inequality as measured by the Gini index. An explanation of the conceptual difference between Gini and top income shares is justified, as well as a motivation for why this paper is focusing on the latter. As Piketty (2014) describes, although the Gini (and to some extent the Theil) index is by far the most commonly used inequality measure, it does raise a few concerns. Firstly, the Gini index is a simple numerical index, going from 0 (most equal) to 1 (completely unequal), used to summarize all information about the income distribution; how much the top, middle and bottom of the hierarchy earn. Although appealing, the index can be misleading, as it is “impossible to summarize a multidimensional reality with a unidimensional index without unduly simplifying

matters and mixing up things that should not be treated together” (p 265). In other words, the Gini index does not tell us much about how inequality is distributed within the population (what inequality in the very top, or at the very bottom looks like, for example). A second argument made by Piketty (2014) is that analyzing income shares is a more transparent and pedagogic way of presenting inequality, compared to the somewhat abstract Gini index. This paper thus focuses on the top income shares along the lines of Piketty and the other authors of the WTID. However, the reader should be aware that previous inequality research has mostly been done using the Gini index. Results from these types of studies are therefore in some cases not directly transferable to our scenario.

3.2. Suggested explanations for the evolution of top incomes

We now look more closely at the three stylized facts (rising top incomes after a long period of decline, divergence between Anglo-Saxon and Continental Europe, and rising top incomes driven by rising top wages) that have been observed by Piketty and others regarding the evolution of top incomes over the past 30-40 years, and investigate what explanations have been proposed for these developments.

Technological change

In terms of explaining why top incomes have begun to rise again after a long period of decline, many academics attribute the developments to so-called skill-biased technological change. Acemoglu & Autor (2011) for example expand the original Tinbergen (1974) model for relating wage inequality to technology. In Tinbergen’s setting, technology is described as skill-biased in the sense that it increases the productivity of skilled workers. Therefore, despite the increase in supply of high-skilled workers thanks to higher education, increasing high-skill wages can be explained by the (relative) increase in demand for high-skilled labor caused by technological progress. According to this view, there is a race between technological progress and the supply of skills on the labor market. Acemoglu & Autor (2011) augment the model to account for the observed developments in the U.S. labor market. Others, such as Katz & Murphy (1992) have also provided support for this argument.

A number of authors such as Roine & Waldenström (2014) and Piketty & Saez (2014) have however noted that the skill-bias explanation cannot by itself account for the

changes in top incomes that have been observed over the past decades. In particular, it does not account for the changes within the top decile in most countries, where the top percent have seen their incomes increase more than the following nine percentiles (Roine & Waldenström, 2014; p 85). Secondly, it does not account for the differences in the evolution of top income shares between Anglo-Saxon countries, and Continental Europe and Japan, who have had access to the same technology.

Globalization

Another frequent explanation for rising top incomes is the globalization hypothesis, which states that increasing international trade leads to higher wage inequality in developed countries due to the comparative advantage of capital in developed countries. The theoretical foundation of this argument goes back to the classic work of Stolper & Samuelson (1941), who developed the hypothesis within the context of Heckscher-Ohlin trade theory framework. According to their hypothesis, as international trade leads to specialization, low-skilled workers in developed countries should see their real wages decrease in both absolute and relative terms. More recently, the globalization hypothesis has been modified by for example Krugman (2008). A large body of research has empirically investigated the effect of globalization on income inequality and top incomes specifically. Bergh & Nilsson (2010) find that policy reforms toward trade openness have on average increased income inequality in the past decades. The relationship is only significant in middle- and high-income stages of development, in line with theory. However, when looking at top income shares specifically, Roine et al. (2009) do not find evidence in support of the globalization hypothesis. If anything, globalization seems to reduce top income shares in developed countries, a result in line with other empirical studies such as Milanovic (2002) and Spilimbergo (1999).

Piketty (2014) lays out two main factors contributing to a rise of top wages in the U.S. Firstly, he notes that the past 30-40 years have seen rising inequality in access to skills and higher education. According to Piketty, higher tuition fees and lack of public investment may have driven this development. Secondly, managerial compensation has exploded over this time period. This is accredited to changing incentives and social norms, as well as the drop in top marginal tax rates.

In terms of increasing managerial compensation, the most common explanation is the “fat cat” theory, which argues that CEOs increasingly bargain for higher compensation

from captive boards at the expense of shareholders (Bebchuk et al., 2002). Furthermore, Roine & Waldenström (2014) mention the “hierarchy” model in explaining rising managerial income. According to this view, executive pay increases in tandem with the size of firms. The underlying idea is that managerial compensation is related to the aggregate compensation of employees being supervised by each manager. However, such models have an empirical difficulty in explaining the rise in top incomes. For example Frydman & Saks (2010) point out that that executive pay grew very little in the U.S. between 1945-1970 even though firm sizes increased significantly over this period.

Another theory along these lines, supported by Murphy & Zabojnik (2004), argues that CEO skills have become less firm specific and more general. Therefore, the market for the most talented CEOs is increasingly global and competitive with a larger amount of external CEO hires and higher equilibrium wages. This analysis is largely in line with the much less recent “superstar theory” developed by Rosen (1981). The basic model implies that convexity of the net maximum revenue function “implies that the income distribution is stretched out in its right-hand tail compared to the distribution of talent transformation” (p 846). In other words, a small difference in talent leads to large earnings differentials. Due to both technological progress and an increase in the size of the potential market for CEOs, the “most talented” are given disproportionately large rewards. A similar idea was developed by Frank & Cook (1995) who conclude that an increasing amount of markets have seen the emergence of “superstars”. In their setting, as the importance of performance grows with an increasingly competitive market for managers, hiring a “superstar” becomes more important, leading to huge rewards for the small group of “winners” (CEOs, lawyers, investment bankers). Once again, however, this theory does not necessarily explain differences in top income shares between Anglo-Saxon countries and Continental Europe.

Taxation

A further potential determinant of top incomes is the role played by top marginal tax rates. The timing of change in top marginal tax rates followed by changes in top incomes was already pointed out by Feenberg & Poterba (1993). Piketty & Saez (2006a) further developed the idea, noting that Ireland and Sweden, countries that avoided the war and/or depression shocks in the first half of the 20th century, but who developed progressive taxation, also experienced falling top incomes during the post-WWII period. They argue that since top income shares fell significantly in these countries in the post-

war decades after implementation of high top tax rates, changes in the tax structure might be the most important determinant of long-run income concentration. In their article about the U.S. tax system however, Piketty & Saez (2006b) make a more cautious claim. They note that while there is clear evidence for a short-term impact of changes in marginal tax rates on top incomes it is hard to establish long-term causality.

According to the standard labor supply model, an individual optimizes utility from income (labor) and leisure. Lowering tax rates creates both a substitution effect and wealth effect, which, in theory, impact top incomes in opposite directions (Saez et al., 2012). This basic model can be further amended with different choices in terms of labor, such as intensity of work, long-term career choices but the general trade-off persists and theory is unable to conclude which of the effects prevails.

Piketty et al. (2014) conducted a study on optimal tax rates where three elasticities that determine how the real economy is affected by changes in top tax rates are identified and estimated. A first (supply-side) elasticity is in accordance with the more classic economic argument that a high tax rate creates disincentives for productive work, entrepreneurship and investment among top earners. A second (tax avoidance) elasticity is put forward by those who argue that top income shares have not actually increased, but that they were previously hidden from tax statements through various mechanisms of tax avoidance. This line of thought has been forwarded by for example Feenberg & Poterba (1993). A third (bargaining) elasticity originates from the argument that top earners bargain for higher wages (pure rent extraction), which is wasteful for the economy, and that the marginal return of bargaining is negatively correlated with top tax rates are low.

Looking at macro data, the Piketty et al. (2014) conclude that total top tax elasticity is quite high (0,5) but that tax avoidance cannot explain the response to top tax rates. They furthermore assert that cuts in top tax rates (around 1980 for most countries) have not been associated with higher economic growth (thus not supporting the supply-side elasticity argument). Evidence pointing in favor of the bargaining argument is strengthened when examining CEO pay using micro-data. Firstly, the authors show that the component of CEO pay not directly linked to CEO performance (but rather to industry-wide performance) increases with lower tax rates. Secondly, they find that CEO pay, controlling for firm characteristics and performance, is strongly and negatively correlated with top marginal tax rates, especially for firms with poor governance. In sum,

the argument in favor of high top tax rates, which should limit executives' rent extraction in the form of executive pay, is strong (ibid.).

To summarize, there is a large body of research dedicated to the determinants of inequality. However, there is little empirically supported theory providing clear links between the factors discussed above and top income shares. On the contrary, most of the common factors claimed to contribute to rising inequality in Western countries are also claimed to have the opposite effect. Furthermore, many of the preferred explanations such as skill-biased technological change, globalization and the range of theories explaining rising managerial income have trouble accounting for the divergence between the two groups of Western countries over the past 30-40 years. Arguably, any successful explanation for the determinants of top incomes should be able to account for this phenomenon. The following subsection explores the role of the financial deregulation as a potential determinant.

The financial sector

The financial sector as a potential explanatory factor for the evolution of top income shares in developed countries is the focus of this paper. The motivation for looking more closely at the financial sector, and specifically financial regulation, is threefold. Firstly, the size of the financial sector maps the evolution of top incomes relatively closely when looking at the second half of the 20th century (see chapter 5.2, trends in the data).

A second important reason for exploring the relationship between the financial sector and top incomes is the fact that the divergence between Anglo-Saxon and other developed country top incomes is a characteristic also found in the financial sector (Edey & Hviding, 1995). Anglo-Saxon countries such as the U.S. and U.K. were among the first to liberalize financial markets, and financial markets are more developed there compared to most of Continental Europe or Japan. Looking at financial deregulation as a potential determinant of the divergent development of top incomes in our country sample thus seems justified.

Thirdly, the link between finance and top incomes has not been sufficiently explored in neither the finance-growth literature nor in the literature exploring determinants of top incomes. Several researchers, such as Demirgüç-Kunt & Levine (2005) in a review of research on finance and inequality point out that “there is also startlingly little research

on how formal financial sector policies—such as bank regulations or securities markets laws—affect inequality [...] this is a serious gap.” (p. 313) Although the topic since has started to gain attention by authors mentioned below, research has not been conclusive as to whether the distributive effects of financial deregulation are positive or negative.

Classic work relating the financial sector to inequality such as Aghion & Bolton (1997) and Galor & Zeira (1993) focuses on how financial development disproportionately benefits the poor by alleviating capital constraints. From their perspective, and that of for example Banarjee & Newman (1993), financial development has a negative linear relationship with inequality. Other theoretical views are in favor of financial development having a Kuznet-like inverted U-shaped effect on inequality over time. Greenwood & Jovanovic (1989), for example, argue that financial development initially benefits the rich, but as financial widening increases opportunities for the poor, the effect on the income distribution is eventually pro-equality. Authors such as Beck et al. (2007) and Clarke et al. (2003) have investigated these theories empirically and have found support mainly for the linear hypothesis.

In terms of measuring the effect of financial deregulation on inequality, Delis et al. (2013), using the same measures of financial deregulation as this thesis, find that liberalization significantly reduces income inequality. The effect is specifically pronounced for more developed countries. The paper however looks at inequality as measured by the Gini coefficient, which, as mentioned earlier, does not tell us much about what happens at the top of the income distribution. Focusing exclusively on U.S. bank branching regulation, Beck et al. (2010) find that although inequality increased in the U.S. in the following period (1970-90), deregulation contributed to a disproportionate rise in lower incomes over the period. They explain this by three factors: broader access to credit, lower capital requirements when lending to entrepreneurs, and higher demand for low-skilled labor due to lower costs of capital.

However, although classic economic theory would suggest that financial development reduces inequality, there are several theories suggesting otherwise. Claessens & Perotti (2007) agree that financial development is important to reduce inequality through a broadening of the financial system and wider access to credit. However, they find that in practice, financial reforms often lead to financial deepening, which disproportionately benefits the already affluent. In particular, they look at how insiders attempt to influence

financial reform policies that can further benefit the wealthy. Jaumotte et al. (2013) find that the equalizing effects of trade liberalization are offset by financial globalization, which is associated with increasing inequality. They point out that financial deepening⁴ may disproportionately benefit those who already have high collateral and/or incomes, exacerbating inequality of access to finance.

Another influential paper by Philippon & Reshef (2009) examines the role of the financial sector in rising top wages in the U.S. from a human capital perspective. The authors find that financial deregulation is associated with a high earnings premium for finance employees due to skill complexity and high intensity as compared with other sectors. This is especially true for top executive compensation in finance, for which they find an earnings premium of 250 percent, compared to 50 percent for the average finance wage. Looking at the entire 20th century, they find that wage premiums and skill intensity in the financial sector are high in the period 1909-1930 and 1980-2000. This corresponds quite well to the level of regulation in the financial sector, which was low pre-1930, and was re-liberalized after 1980. Overall, they find that the financial sector alone accounts for 15-20 percent of the increase in wage inequality since 1980.

In trying to empirically investigate to what extent the “superstar theory” hold in the U.S., Kaplan & Rauh (2010) look at the extent to which the top income groups are represented by executives from four different sectors: the financial sector, non-financial sector, corporate lawyers, and athletes and celebrities. They note that financial sector executives make up an important share of the very top earners. For example, they find that the managers of Wall Street’s 25 largest hedge funds earned more than all the CEOs of S&P 500 companies combined in 2004, and that this trend has since increased. Similarly, Bakija et al. (2012) analyze the professions of the top 0,1 percent income share in the U.S. and find that finance professionals in this group have had substantially faster income growth than almost all other professionals.

In line with these findings, Korinek & Kreamer (2014) argue that deregulation allowed for unprecedented profits in the financial sector, especially benefiting the financial elite. In building a model that balances regulation against risk-taking in the financial sector, they identify several channels through which deregulation affects the income distribution. One of the channels is caused by the introduction of discretionary bailouts into the

⁴ *Financial deepening* refers to the increasing relative size of the financial sector in relation to the size of the economy, whereas *financial widening* refers to the diversity of the financial system (number of actors and financial instruments) (Siddaiah, 2011; p 4)

equation. Specifically, the implicit promise of bailouts increases financial risk-taking and expected bank profits in the financial sector. This in turn increases the risk of a credit crunch, which disproportionately affects workers through tax-financed bailout transfers to the financial sector. In addition, financial deregulation opens up for financial innovation and the creation of financial products with high-expected returns and corresponding high risk. In an ideal setting, complete insurance markets would allow for workers to take part in the upside of financial innovation, and not only the downside through bailouts. Since this is not the case, the distributive effects of financial innovation are in favor of the top. As mentioned by Becsi & Wang (1997), many of the financial crises in developed countries preceded by deregulation in the 1970s-80s have entailed costs up to 10 percent of GDP. More drastically, the IMF has estimated the total cost of the 2007-9 financial crisis to a fifth of global GDP (The Telegraph, 2009).

Another model predicting financial liberalization to negatively impact wage equality is that of Larrain (2012). In his setting, due to capital-skill complementarity, financial liberalization increases the demand for skilled labor. This leads to increasing equilibrium wage inequality (in direct contradiction with for example Beck et al., 2010). Larrain analyzes two periods of liberalization in both the U.S. and Europe, and estimates the differential effect of liberalization across industries depending on the level of capital-skill complementarity and external financing dependence. The main results indeed point toward financial liberalization having increased wage inequality especially for finance-dependent industries, and more so in U.S. than in Europe due to relative labor market flexibility.

In a panel data setting, Roine et al. (2009) use stock market capitalization as a proxy for financial development for the past century and estimate its effect on top income shares from the WTID database. The authors find that financial development has been pro-rich over the long term.

An indirect channel: financial deregulation, tax and top incomes

Previous literature suggests that there might be an additional, indirect link between financial deregulation and top incomes going through top marginal taxes. This channel would entail financial deregulation having a first stage negative impact on top marginal tax rates. In a second stage, top marginal tax rates, as previously discussed, have a negative impact on top income shares. As the second stage has already been discussed above, we now turn to existing theory and evidence in favor of a link between financial

deregulation and tax reform.

Capital mobility can be seen as the major link between financial deregulation and tax reforms. Reducing or eliminating regulations in the financial sector might make capital more mobile as it facilitates the option of moving capital abroad. In other words, financial deregulation makes the “exit” option, in order to benefit from lower taxes elsewhere, a credible threat (Steinmo, 1994). If the top marginal tax rate is seen as the outcome of a bargain between the government and the people affected by this tax, the tax rate is expected to decrease when capital becomes more mobile due to a shift in bargaining power. This argument is embedded in larger body of literature sometimes called the globalization theory of taxation (Tanzi & Mclure, 1996). With increased mobility, countries are expected compete with each other as both gains from lowering taxes marginally and losses from increasing them are expected to rise (Lee, 1989).

While a rather large body of literature does describe the globalization mechanism, only few directly link it to financial deregulation. Accordingly, there is little empirical evidence at this point in time. One quantitative analysis conducted by Hallerberg & Basinger (1998) analyzing different potential drivers of tax regulation did not find conclusive results for the impact of financial deregulation.⁵

In conclusion, financial deregulation has been brought up as potential explanatory factor for rising top income shares, but has never been thoroughly analyzed in a cross-country panel set-up. What regards the direct effect from financial deregulation to top incomes, different studies have found opposing evidence as to whether the impact of finance is positive or negative with regards to inequality. Our research, investigating this channel in depth for a broad set of developed countries over 40 years, thus aims to improve the understanding of financial deregulation as a potential determinant of rising top incomes. Secondly, this paper aims to quantitatively analyze an indirect effect from financial deregulation to top incomes via top marginal tax rates. Although this channel has been suggested in previous literature, claims have been mainly theoretical. Our empirical analysis contributes to existing literature by attempting to provide an answer to the question of whether a) financial deregulation negatively impacts top marginal tax rates, and b) top marginal tax rates negatively impact top income shares.

⁵ Appendix A1 contains a literature review on potential triggers of tax reforms in order to include all relevant controls when econometrically testing the relationship between financial deregulation and top income shares.

4. Purpose, research questions and theoretical predictions

While there has been extensive research on the determinants of rising top incomes, the pool of potential explanatory factors is far from exhaustive. The role of the financial sector in the context of rising top incomes has been overlooked in previous literature, which academics in the field also point out. For example, Atkinson et al. (2011) suggest that the WTID database should be used to test relationships with additional key economic drivers such as the financial sector. In a review of *Capital in the 21st Century*, Paul Krugman writes “(...) I don’t think *Capital in the Twenty-First Century* adequately answers the most telling criticism of the executive power hypothesis: the concentration of very high incomes in finance” (Krugman, 2014). He concludes that the biggest disappointment with the book is the failure to take financial deregulation into account. Although authors such as Roine et al. (2009) have looked at financial development as measured by stock market capitalization, an investigation into the effects of regulation in and of itself on top incomes for a wide set of countries has to our knowledge never been done.

From the finance-growth nexus literature, an extensive examination of the effect of financial deregulation on inequality is justified. As Korinek & Kreamer (2014) note, research on financial regulation has been scarcely dedicated to studying the distributive effects of financial intermediation. As they point out, while literature on financial regulation has mainly been concerned with efficiency, a given policy maker cannot reasonably disregard the distributive effects of financial deregulation. Others such as Larrain (2012) emphasize that the finance-inequality literature that does exist has been largely model-based. Our panel-data approach, empirically examining the impact of financial deregulation on top incomes, contributes to closing this research gap. Although Delis et al. (2013) have analyzed the effect of financial deregulation on inequality as measured by the Gini coefficient, our unique contribution involves looking specifically at top income shares. This provides further insight into the various effects from financial deregulation to different income groups, going beyond the more general measure of inequality provided by the Gini.

When looking at the top income share stylized facts over the past 40 years, specifically regarding the large rise in the top percentile in Anglo-Saxon countries, financial regulation appears to have potential explanatory power in terms of setting these

countries aside. As pointed out in Edey & Hviding (1995), Anglo-Saxon countries such as the U.S., U.K., New Zealand, Australia (and to some extent the Nordic countries) led the way when financial deregulation took off in the 1970s. One can therefore argue that financial deregulation could explain the divergence in top income shares between these two groups.

This thesis thus aims to add to both the literature on the determinants of rising top incomes in developed countries as well as to that of the real effects of the financial sector. This paper aims to answer the following research questions:

1. Has financial deregulation contributed to the rise in top income shares (top 10, top 10-1, top 1 percent) in developed countries over the past 40 years?
2. Specifically, does financial deregulation affect these income shares through the following two channels:
 1. a direct channel – by directly contributing to higher top income shares
 2. an indirect channel – by having a negative impact on top marginal tax rates, which, in turn, has a negative impact on top income shares

Limitation of scope

This paper mainly focuses on the impact of financial regulations on top incomes, not the effect of actual financial flows. Of course, the two concepts are linked, and if a relationship between financial deregulation and top incomes exist, it should be possible to identify by looking at actual financial sector development. However, studying “financial flows” is not as straightforward as it may sound and therefore deserves to be examined at length in a separate paper. As mentioned in the literature review, there are several ways in which real financial sector development can be measured depending on which issues and channels one chooses to focus on (financial deepening, financial widening, share of finance in the total economy, share of finance in total employment etc.). This paper is therefore limited to the study of the topic of financial deregulation, and its various components.

Furthermore, as already stated in the literature review, it is crucial to point out that top income shares and inequality are, while related, two clearly distinct concepts and our research is merely focusing on the former. Similarly, although the evolutions of wealth and income inequality are closely linked (Piketty, 2014), only the latter will be discussed.

The scope of this research is consciously limited to developed countries. While this does reduce the generalizability it does to some extent increase the internal validity. This is further discussed in chapter 5.

This paper covers the years 1973-2005, analyzing the wave of deregulation that went through all Western countries during the 1980s and early 1990s. Given the continuous developments and changes that are occurring in the financial sector over time further investigation would be needed in order to directly transfer results to other time periods. While other authors use a longer panel for when looking into different explanations of top incomes, our reduced sample with rich data permits us to analyze the impact of one driving factor in more detail focusing on one major episode of financial deregulation throughout Western countries.

4.1. Theoretical predictions

The aim of this section is to clarify the theoretical predictions that are applicable to our study and to condense these predictions into hypotheses. This is not a straightforward process. As noted by Roine et al. (2009) for example, there are as many predictions of positive/negative/nonlinear effects as there are variables suggested in various theories explaining top incomes. Consequently, as noted in chapter 2, previous research suggests both negative and positive relationships between financial deregulation and top incomes. However, the motivation behind our topic of study was based on the observation that financial deregulation and top income shares are closely linked, and exhibit similar divergent patterns between Anglo-Saxon and non-Anglo-Saxon countries. We therefore predict a positive relationship between financial deregulation and top income shares.

A direct link: financial deregulation and top incomes

Based on previous research review as well as observations in data, financial deregulation is expected to increase the share of total income going to the top in the context of our panel of countries and the covered timeframe.

Hypothesis 1: Financial deregulation increases the share of total incomes going to the top 10, top 10-1 and top 1 percent.

Linking back to the literature review in chapter 3, three channels can be identified through which this relationship may take place: increasing inequality of capital incomes, of capital incomes and wages, and of wages alone.

Firstly, if financial deregulation primarily leads to financial deepening, this could disproportionately benefit the already affluent due to higher returns on capital (Claessens & Perotti, 2007). In particular, if the rate of return on capital depends on the initial level of wealth, then financial deepening caused by deregulation may increase inequality by disproportionately increasing capital incomes of top earners (Piketty, 2014).

Secondly, financial liberalization should lead to an expansion of the sector as well as financial innovation, which increases risk-taking in the sector along the lines of Korinek & Kreamer (2014). Higher risk-taking increases expected returns in the financial sector (both wages and returns on financial assets) at the expense of the large public, who only partake in the negative real effects of financial crises.

A third potential link is that financial deregulation increases the wage difference between skilled and unskilled labor through financial development and capital-skill complementarity. Deregulation could thus be a contributing force to the rising high-skill wage premium, especially in finance-dependent industries (Larrain, 2012). A second wage-related argument, along the lines of Philippon & Reshef (2009), based on the observation that financial deregulation leads to an expansion of the financial sector (share of finance in total employment) and higher skill intensity (thereby higher wages), thereby contributing to overall wage inequality.

An indirect channel: financial deregulation, tax and top incomes

Based on the literature review, financial deregulation could lead to decreasing top marginal tax rates through increased bargaining power of top earners. Since we expect marginal tax rates to have a demonstrably negative effect on top income shares, financial deregulation thus contributes to this process of rising top incomes.

Hypothesis 2: Financial deregulation leads to lower top marginal tax rates, which, in turn lead to increasing shares of total income going to the top 10, top 10-1 and top 1 percent.

Previous literature provides some evidence for the first stage of this process: financial deregulation, mainly by facilitating capital mobility, should have a negative impact on marginal tax rates. When capital mobility increases, the option of “exit” in order to take advantage of more advantageous tax regimes elsewhere becomes a credible threat for policy makers, who respond by lowering top marginal tax rates (Steinmo, 1994; Tanzi & Maclure, 1996; Hallerberg & Basinger, 1998).

As for the second stage, whether lower top marginal tax rates have an impact on top income shares, results have been more mixed. Previous literature has been unable to determine whether the substitution or income effect dominates in response to changes in top marginal tax rates (Saez et al., 2012). Recent literature focusing specifically on top income shares over the long run however point towards a robust negative relationship between top marginal taxes and top incomes (Piketty et al., 2014; Roine et al., 2009). Our hypothesis is therefore that lower top marginal tax rates contribute to rising top incomes.

The different dimensions of financial deregulation

In order to better understand what drivers, if any, link financial deregulation to top incomes, this section offers a closer look at the different dimensions of financial regulation. The index of financial deregulation used in this paper is comprised of seven regulatory dimensions (see chapter 5.1, data). The effects of the different regulatory dimensions on top incomes are tested separately in the quantitative analysis. These dimensions are therefore the basis for our theoretical predictions below.

There is currently little theory directly linking the different components of financial deregulation to inequality. Combining whatever research does exist (on the real economic effects of regulatory dimensions for example) with economic reasoning, theoretical predictions are formulated regarding the effects of the different regulatory dimensions on top income shares. Although our main hypothesis states that financial deregulation contributes to rising top income shares, this does not mean that all of the regulatory dimensions are expected to have this effect. On the contrary, we expect that two dimensions (reducing credit controls and increasing prudential supervision) have a negative impact on top income shares.

It should be mentioned that the following hypotheses are secondary to our main hypotheses above. This is primarily due to the lack of previous literature and theory.

These hypotheses are therefore consciously of a more speculative nature. We however believe that a discussion of the separate regulatory dimensions is beneficial as a basis for understanding the mechanisms linking financial deregulation to top incomes.

Hypothesis 3a: Reducing restrictions on international capital mobility increases the share of total incomes going to the top 10, top 10-1 and top 1 percent.

Liberalization of international capital flows is expected to increase the share of total income going to the top both through direct and indirect channels. International capital mobility creates a larger global financial market (improved market efficiency, risk diversification). This is expected to generate higher average returns on capital, which disproportionately benefit the top earners who draw a larger share of their income from returns to capital (capital income channel). The globalization of finance also contributes to an expansion of the sector and employment in finance (wage channel). The indirect link is described in further detail in hypothesis 2 and goes through the tax rate: when capital becomes more mobile, the affluent have an increased bargaining power in influencing top marginal tax rates due to a threat of leaving the country or moving their money abroad. Reduced top marginal taxes in turn are expected to increase the share of total income going to the top.

Hypothesis 3b: Reducing entry barriers into the financial sector and restrictions on banking activities increases the share of total incomes going to the top 10, top 10-1 and top 1 percent.

Reducing entry barriers into the financial sector is expected to contribute to an increase in competition leading to higher efficiency and enhanced financial deepening. Perhaps more importantly, removing restrictions on the activities that banks are allowed to engage in should significantly increase financial deepening. A good example of this is the repeal of the Glass-Steagall Act in the U.S. in the 1980-90s, which allowed for deposit banks to engage in more risky activities such as investment banking, insurance and securities trading. According to Neale et al. (2010) this greatly increased returns in the financial sector while contributing to higher systemic risk. On the other hand, increased competition could potentially lead to lower profits and reduced wages in the financial sector. This mitigating factor is however estimated to be less important. Lower entry barriers and a more liberalized scope of banking activities are hence hypothesized to contribute to rising top incomes both through the capital income and wage channel.

Hypothesis 3c: Reducing credit constraints decreases the share of total incomes going to the top 10, top 10-1 and top 1 percent.

The expansion of the credit market is perhaps the only clear element of financial regulation that both theoretically and empirically contributes to financial widening. Increased access to credit is a common argument used by those who argue that financial deregulation is beneficial for equality (Beck et al., 2010). By facilitating access to credit, the bottom 90 percent are therefore expected to benefit disproportionately compared to top earners.

Hypothesis 3d: The development of securities market increases the share of total incomes going to the top 10, top 10-1 and top 1 percent.

The development of securities market (i.e. markets for bonds, equities and derivatives) is a classic example of financial deepening, whereby more complex financial products become available. These products supposedly carry higher returns, which are expected to disproportionately benefit the affluent, who draw a larger share of their income from capital (capital channel). Furthermore, the development of securities markets has been a driving force in the expansion of the financial sector, and thus employment (wage channel).

Hypothesis 3e: Abandoning interest rate controls increases the share of total incomes going to the top 10, top 10-1 and top 1 percent.

One of the main motivations behind introducing interest rate controls was to protect poorer individuals from being exploited by high interest rates. Another was to limit the emergence of high-return, high-risk assets, which could introduce fragility into the economic system. Despite these motivations, interest rate controls create distortions on the credit market, which can actually be counterproductive in terms of helping poorer individuals gain access to credit. This is because banks instead responded by being more cautious in their lending (Luttrell, 1968). What the overall effect of liberalizing interest rates could be is therefore difficult to predict. This paper however hypothesizes that the net effect of abandoning interest rate controls on top income shares is positive, both through the wage and capital channel. This is because even if deregulation benefits the bottom 90 percent, the gain for the very top in terms of higher returns on financial assets, as well as through an expanding financial sector, is likely to be even higher.

Hypothesis 3f: The implementation of prudential supervision of the financial sector decreases the share of total incomes going to the top 10, top 10-1 and top 1 percent.

As discussed by Abiad et al. (2010) and others, prudential supervision limits excessive risk taking in the financial sector. When financial institutions take too much risk in order to earn higher returns, they implicitly redistribute the cost of this risk taking to the rest of the society (Claessens & Perotti, 2007; Korinek & Kreamer, 2014). Prudential supervision, such as the introduction of various measures to limit the expansion of the financial sector and high-risk activities, should therefore disproportionately benefit the bottom 90 percent.

Hypothesis 3g: Privatizations in the financial market increase the share of total incomes going to the top 10, top 10-1 and top 1 percent.

Privatization of major financial institutions is expected to have a positive effect on top income shares. This is because privately owned financial institutions may be more innovative and risk-taking than government owned financial institutions, thereby contributing to financial deepening. In addition, government owned institutions might operate based on additional goals besides profitability such as equity in access to credit, to the benefit of the bottom 90 percent.

5. Data and Method

5.1. Data

This study uses a balanced panel data set of 18 countries over the years 1973-2005. In order to ensure homogeneity, the sample is constituted by developed countries only. As Roine et al. (2009) point out, a relatively homogenous sample of countries has certain advantages. Since the impact of a number of variables, such as globalization, may depend on the level of development, factor endowments, and technology levels, estimating the effects on relatively similar countries increases our potential to find accurate results.

A complete list of all the countries contained in the sample can be found in appendix A2. The variables of interest and the explanatory variables are complemented with a number of controls that previous research suggests are relevant factors for top income shares. An overview of all variables and their respective sources can be found in table 1. Descriptive statistics are available in table A1 in appendix A3.

Table 1: Variable overview

Variable	Variable definition	Source
Top10incomeshare	Share of total incomes going to the top 10 percent of the population (P90-100)	The World Top Incomes Database, (WTID), 2011
Top1incomeshare	Share of total incomes going to the top 1 percent of the population (P99-100)	WTID (2011)
Top10-1incomeshare	Share of total incomes going to the top 10 of the income distribution, excluding the top 1 percent (P90-99)	WTID (2011)
Financial reform	Financial Reform Index, normalized	Abiad et al. (2010)
KOF eco	Index of globalization, economic dimension	Dreher (2006)
KOF soc	Index of globalization, social dimension	Dreher (2006)
Marg tax	Top statutory marginal tax rate	Piketty et al. (2014)
H capital	Index of human capital per person, based on years of schooling and returns to education	Penn World Table (2015)
GDPpc	GDP per capita	Maddison (2013)
Gov spending	Government spending (as a share of GDP)	OECD (2013)
Inflation	Inflation	World Bank (2015)
Patents	Number of patents	OECD (2013)
Polity IV	Polity IV measure of the country regime	Polity IV Project (2002)
PopM	Population	Maddison (2013)
Govright	Cabinet posts of right-wing parties in percentage of total cabinet posts	Comparative Political Data Set (2014)
Debt	Public debt (as a share of GDP)	OECD (2013)
Deficit	Deficit	OECD (2013)

Top incomes

For top income data this paper makes use of the World Top Incomes Database (WTID) maintained by Facundo Alvaredo, Anthony Atkinson, Thomas Piketty and Emmanuel Saez, which compiles data gathered by contributing authors in different countries.⁶ The authors define the income variable as follows: “Income includes cash market income before individual taxes and credits, and excludes government transfers (such as social security benefits, unemployment insurance benefits, or means-tested transfers) as well as noncash benefits (such as employer or government provided health insurance)” (Piketty et al., 2014, p. 252).

In order to construct a database covering the development of top incomes over a long time period, the authors have taken advantage of the only consistently available long-term source on incomes (first used systematically in research by Kuznets): tax data. In the beginning of the 20th century, progressive income tax systems were set up in most Western countries. The subsequent tax administration tabulations on income tax returns have been retrieved for currently around 30 countries for up to 120 years. The data series are thus uniquely long-term, annual and quite homogenous across countries. However, as the share of the population paying income tax historically was around 10-15 percent, the database primarily consists of time series for top income shares (top 10, 1, 0.1 percent etc.) (Piketty, 2005).

We follow the categorization of the data suggested by the WTID and mainly look at the following income brackets: the top 10 percent defined as the share of total income going to the richest 10 percent of the population (percentiles 90-100 of the population), the top 1 percent corresponding to the share of total income going to the richest 1 percent (percentile 99-100) and the top 10-1 percent (percentile 90-99). We will hereafter refer to these three groups as top 10, top 1 and top 10-1, respectively.

Data quality

The top income data suffers from a number of limitations. Firstly, individuals have always had an incentive to underreport incomes for tax evasion purposes. As Piketty and his co-authors state themselves, the tendency to underreport is lower at lower levels of income, mainly because people with lower levels of income are less likely to have access to complicated tax evasion strategies. For the very rich, both tax evasion and tax

⁶ A list of all contributing authors can be found in appendix A4

avoidance can be an issue. The very rich have historically taken measures to ensure that income is taxed where tax rates are lowest: asset appreciation as opposed to income for example, or ensuring that remuneration takes the form of stock options or benefits as opposed to salaries. Furthermore, the use of tax havens as a means of evading national taxes has also been prevalent (Atkinson et al., 2011).

Assuming that the rich underreport their incomes more relative to other income groups, there is a risk that the top income shares are underestimated. Furthermore, tax-reporting systems differ between countries and have been subject to important reforms within countries over time. One example is the change in taxation of couples (Atkinson et al., 2011).

A further prevalent critique of the WTID data is that it may suffer from mobility in and out of the top income groups. Atkinson et al. (2011) however reference a number of studies that have analyzed individual income mobility in the U.S. and Canada. The findings suggest that the probability of dropping in or out of the top income groups has been surprisingly low over the long term.

According to Atkinson et al. (2011), one additional important limitation of the top income data is the exclusion of capital gains for most of the series (as part of the lacking long-term, cross-country coherent reporting of capital income). Roine & Waldenström (2008) note that the treatment of capital gains and losses is a difficult income component to grasp (even if it should in principle be included according to the classic Haig-Simons definition of income). This is because realized capital gains only turn up in the tax data for the year of the sale, even though the asset in question may have appreciated over a long period of time. Furthermore, it may cause significant mobility in the top income groups as capital gains for a low/middle-income individual in a single year can put them in the top income bracket. Roine and Waldenström (2014) found that the inclusion of capital gains can be quite important. They noted that when capital gains are included in in Swedish top income data, top income shares have increased drastically while income shares excluding capital gains have remained flat.

Despite the shortcomings of the tax data, it does present significant benefits in comparison to the more widely used household survey data usually used in the inequality literature. Firstly, household survey data suffers from incomplete and missing response as

well as measurement error. Also, tax data naturally draws on much larger samples than household survey data. Furthermore, surveys are usually carried out at intervals rather than on an annual basis (Atkinson et al., 2011).

The data has been complemented through linear interpolation for up to 10 years when values were missing inside the panel. A graphical view of the data it seems to confirm that using linear trends in the interpolation is appropriate.

The division of top incomes into the top 10, top 10-1 and top 1 income shares is by no means the result of some absolute categorization. However, despite the arbitrary division, the top 10-1 and top 1 income groups do present significant differences. The top 10-1 is generally described as upper middle class or as high-skill and high-wage professionals. The top 1 on the other hand, sometimes simply referred to as “the rich”, includes to a greater extent top executives, entrepreneurs and rentiers (Roine et al., 2009; Piketty, 2014). One concrete way to illustrate these differences is to look at the share of capital vs. labor income in the different income groups, which thanks to the tax data is available for most of our countries. On average, the share of labor income in the total incomes of the top 10-1 percent amounts to around 76 percent, whereas it accounts for merely 56 percent for the top 1 percent income group (the rest being defined as capital/business income).

Financial deregulation

This paper uses the database on financial deregulation constructed by Abiad et al. (2010). The authors have created an index of financial liberalization reforms using seven distinct dimensions. Each dimension is graded from zero to three, with zero indicating full repression and three indicating full liberalization. For each country the seven dimensions are weighted equally when aggregated into one index, of which we use the normalized index ranging from zero to one, with zero indicating full repression and one indicating full liberalization. The seven dimensions are described below. The variable names used in the regressions are indicated in brackets when they differ:⁷

⁷ See appendix A4 for a detailed descriptions of each dimension

- A. Credit controls and excessively high reserve requirements (Credit controls):
 - a. Whether there are minimum bank lending requirements to certain “priority” sectors, sometimes at subsidized rates
 - b. Whether there are credit ceilings for lending to certain sectors, or general ceilings on the rate of credit expansion
 - c. Whether there are excessively high reserve requirements in place, which cannot be justified by prudential purposes (threshold at 20 percent)
- B. Interest rate controls
 - a. Whether interest rates (for both deposits and lending) are administratively set, or directly controlled by the government
 - b. Whether there are interest rate bands, ceilings or floors
- C. Entry barriers
 - a. At what level are the entry barriers into the financial system?
 - b. Are there restrictions in the form of outright prohibition of foreign bank participation, restrictions on banks’ activities or geographic area of operation, or excessively restrictive licensing requirements?
- D. State ownership in the banking sector (Privatization)
 - a. Share of banking sector assets controlled by state-owned banks
 - b. Thresholds of 50, 25 and 10 percent are used to delineate the grades between full repression and full liberalization
- E. Financial account restrictions (Intl. capital)
 - a. Whether there are restrictions on international financial transactions, including multiple exchange rates for different transactions, transaction taxes or outright caps on capital movement specifically regarding financial credits
- F. Prudential regulations and supervision of the banking sector (Banking superv)
 - a. The only dimension where more regulation is coded as more liberalized
 - b. Based on whether the country follows capital adequacy rules based on Basel, if there is an independent banking supervisory agency, if certain financial institutions are exempt from supervisory oversight etc.
- G. Securities market policy (Security markets)
 - a. Codes the level of encouragement/restrictions on the development of securities markets
 - b. Whether the government auctions securities, if debt and equity markets are established and if there are policies in place to encourage such

establishments, such as tax incentives or development of depository and settlement systems.

- c. Whether policies on securities markets foster openness toward foreign investors (Abiad et al., 2010)

Correlation is high between the different regulatory dimensions, which indicates that most countries that are restrictive in one area are so in others as well (Abiad et al., 2010).⁸

Data quality

The chosen database covers a wide variety of countries over a long time period. There are however other more important reasons why this index is appropriate for our investigation. Firstly, Abiad et al. (2010) have created a database that is much more detailed, precise and granular than other existing indices. Many other measures of financial liberalization are binary while this one distinguishes between four different stages (liberalized, partly liberalized, partly repressed, fully repressed) in all seven dimensions.

Furthermore, the index by Abiad et al. (2010) covers a broader range of regulatory dimensions compared to other existing indices. An index by Edison and Warnock (2003) for example measures financial liberalization merely by the proportion of total stock market capitalization available to foreigners. Others, such as the financial deregulation index by Schindler (2009), also focus on a single dimension of financial liberalization. It is unclear to what extent a single dimension is representative for regulation in the financial sector.

There are a few indices constructed in a similar way (measuring several dimensions) than the one by Abiad et al. (2010), but that cover fewer countries and/or years (see Williamson & Mahar, 1998; Bandiera et al., 2000; Kaminsky & Schmukler, 2003; Laeven, 2003). It is interesting to note that all these indices contain very similar dimensions as the chosen index; this further confirms that the index is covering relevant regulatory dimensions. Inquiring the relevance of the various dimensions further, we find that all of them are seen by literature as important measures of financial regulation: Versluysen

⁸ A table showing the correlation coefficients amongst the different dimensions can be found in appendix A5.

(1988) defines in a World Bank report the following as main areas of financial deregulation: interest rate controls, international capital flows, securities markets, prudential supervision and entry barriers. All of these dimensions are covered in the index by Abiad et al. (2010). Credit controls, one of the additional dimensions, is widely confirmed as a main element of financial deregulation and is included in most of the other measures that have been analyzed. Similarly, a description of areas of financial deregulation by the OECD corresponds exactly to the dimensions of the index with a single exception of the privatization dimension (Edey & Hviding, 1995). The dimension of the state ownership in the banking sector appears to be the one with least foundation within the body of literature. This might come from the fact that state ownership is often not perceived as a regulation per se.

Naturally, there are potential limitations inherent to the chosen index, despite its advantages in terms of range, detail and construction. It is important to note that the index is a manual categorization of the regulatory situation. While the authors are careful in order to use coding rules that are clear-cut and do not allow for ambiguity, we still think that some dimensions might allow for minor ambiguities and the authors do admit that “some degree of judgment is exercised” (Abiad et al, 2010; p. 286). Within the banking sector entry dimension for example, the coding for question two is defined as equal to 0 “when the entry of new domestic banks is not allowed or strictly regulated” and equal to 1 “when the entry of new domestic banks or other financial institutions is allowed into the domestic market”. The cut off between the two options remains to be defined by the person who is coding the regulations. It is conceivable that in a small number of cases different people could classify the same case in a different way since it might be hard to define where exactly the limit lies of “strictly regulated”.

Furthermore it is important to note that the index solely measures regulations. As in any other field, *de jure* regulations of the financial market can differ quite a lot from the *de facto* situation. While this is a limitation, we do not have any reason to believe that this limitation would induce a systematic bias when estimating the effect of financial deregulation on top incomes.

Top marginal tax rates

For the top marginal tax rates data we make use of the dataset constructed by Piketty et al. (2014). What we refer to as top marginal tax rate is based on the top statutory

individual income tax rate and includes tax rates on ordinary income from both central and local government when existing. The main source of the dataset is the annual OECD publication “Tax Wages” which is available from the early 1980s. For certain countries, the data was completed with additional sources; a detailed description is available in appendix A5.

From a theoretical point of view, the argument of capital mobility, the foundation for the expected mechanism in the first stage, would be most applicable to capital taxation as opposed to labor income taxation. We however use top statutory individual income tax rates as a naïve proxy for capital tax in our estimations due to lack of available data on capital tax rates. The limitations of this approach should be kept in mind when interpreting our results.

Data quality

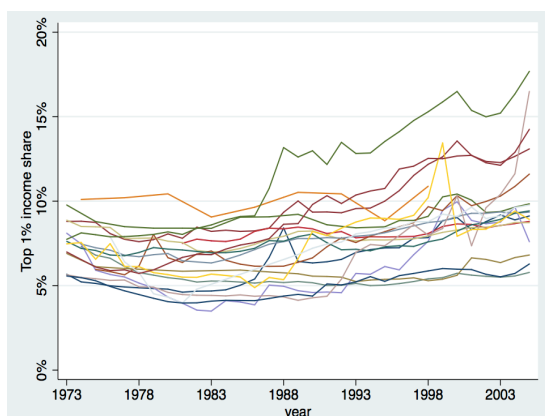
Secondary sources such as the OECD data, which is a collection of data from every member country, might be susceptible to typographical errors due to the manual transfer of information. Piketty et al. (2014) have however verified the data with the original information available on a country level and/or country experts whenever possible in order to increase the quality of the data.

5.2. Trends in the data

In order to gain a preliminary understanding of the different main variables, we plot their development over time. Figure 2 illustrates the share of total incomes going to the top 1 percent over the sample time period 1973-2005 for all 18 countries. There is a small but positive overall trend over the period and certain divergence between countries towards the end of the period. This development has been pointed out by many before us.

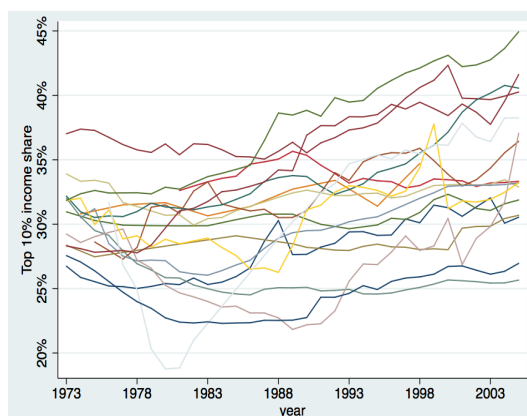
Our second dependent variable, the income share of the top 10 percent over the same time period for all sample countries, is mapped in figure 3. Here, there are larger movements over time, and much bigger differences between countries, which are exacerbated towards the end of the period. Within our sample, the share of incomes going to the top 10 percent differs from between 25 to 45 percent in 2005. Some countries experienced a clear decrease in the share of total income going to the top 10-1 percent while others experienced a strong increase.

Figure 2: Top 1% share of total incomes 1973-2005



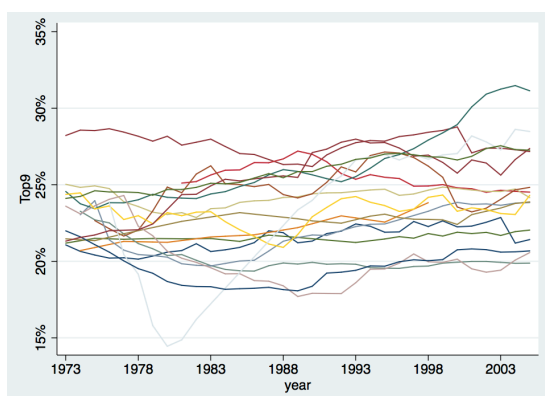
Data source: World Top Income Database (2015),
graphical representation by the authors

Figure 3: Top 10% share of total incomes 1973-2005



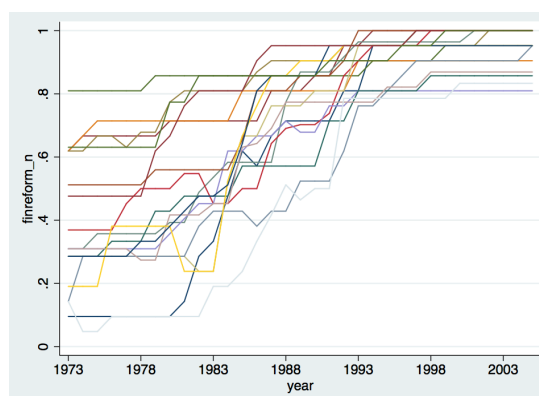
Data source: World Top Income Database (2015),
graphical representation by the authors

Figure 4: Top 10-1% share of total incomes 1973-2005



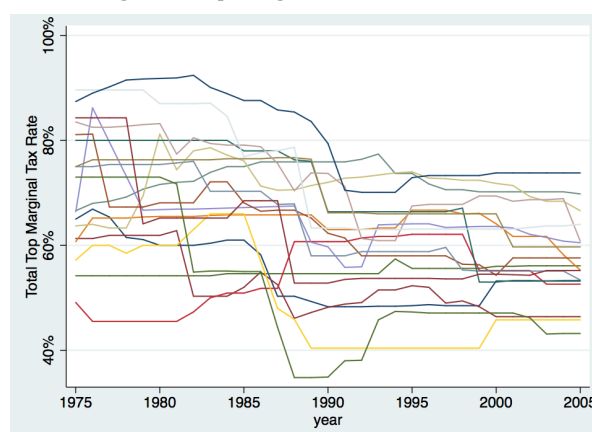
Data source: World Top Income Database (2014),
graphical representation by the authors

Figure 5: Financial liberalization 1973-2005



Data source: Abiad et al. (2010),
graphical representation by the authors

Figure 6: Top marginal tax rates 1973-2005



Data source: Piketty et al. (2014),
graphical representation by the authors

The top 10-1 income shares are illustrated in figure 4. In contrast with the top 1 and top 10, the top 10-1 does not display a clear positive or negative trend. There are important variations between countries and it is hard to identify any clear overall trend. Consequently, as observed in previous research, the rising income share of the top 10 is mainly driven by rising incomes in the top percentile.

Our main explanatory variable, the financial liberalization index, is illustrated in figure 5. Clearly, countries started out with big variations in regulatory levels, but converged over time with a majority moving towards very high degrees of liberalization between 1975-1995. One conclusion is that period saw significant regulatory reforms in the financial sector in almost all the countries in our sample. The graph illustrates one problematic aspect with the index used for our quantitative analysis: the fact that it is bounded between 0 and 1. This is not necessarily problematic per se, but the fact that several countries obtain the highest score of financial liberalization toward the end of the period may bias our results downwards. If these countries are those associated with important increases in top income shares (Anglo-Saxon countries, according to our predictions), there may be financial liberalization measures not picked up by our index (which, by construction, cannot grade them any higher). We keep these limitations in mind for our quantitative analysis.

Figure 6 shows the evolution of top marginal tax rates, the variable we see as the link between financial deregulation and top incomes for the indirect channel. There is indeed an inverse development whereby top marginal tax rates decrease and converge over time, in tandem with increasing financial liberalization. As for the direct channel, this brief visual analysis is insufficient to conclude on any relation. While there are many different visible breaks, there is seems to be a strong downwards trend around the middle of the 1980s, which is preceded by the changes in financial deregulation in the early 1980s and followed by an increase in top incomes in the late 1980s and early 1990s.

Although we cannot by visual inspection conclude a clear relationship between rising financial liberalization and top income shares, the trends seem to follow a parallel path. Although certain authors (such as Perugini, 2013) argue that the causal link goes from inequality toward liberalization as opposed to the direction that we put forward in this paper, it would appear as though liberalization precedes top income shares. Namely, when looking at the data, liberalization mainly took place during the 1980s whereas top

income shares remained relatively flat until the late 1980s/early 1990s. This is not to suggest however that rising inequality has no effect on financial reforms.

5.3. Econometric method

Direct effect

We have the opportunity of conducting panel data estimations as we have data for a range of 18 countries over 33 years. This allows us to control for unobservable time-invariant and country fixed effects. In order to assess the direct effect of financial deregulation on different top income brackets, we run two main econometric regressions that are described in detail below. In order to assess the importance of every dimension of financial deregulation as well as strengthening our argument in terms of the channels through which the mechanism operates we run the above-mentioned regressions using the decomposed financial deregulation index. Using the seven dimensions separately allows us to identify which regulatory aspects that are linked to top income shares.

Note that the financial liberalization parameter is included in all specification with a three-year lag. This is because the regulation is expected to take effect on top incomes only after a certain period of time. When choosing the appropriate lag to use, we looked at a correlation matrix between the financial liberalization index and top 1 percent income shares. Correlation peaks after three years, which is thus the lag that we chose. Using a three-year lag has the added value of avoiding potential problems with reverse causality from top incomes to financial regulation.

Fixed effects correcting for AR (1) disturbances

Our first specification is a fixed effects panel data accounting for AR(1) disturbances based on the strategy developed by Baltagi & Wu (1999). We deem that limiting ourselves to a standard fixed effects regression is not appropriate, as we most probably will have problems with serial correlation due to the potential omission of relevant variables. The model is assumed to take the following form:

$$Y_{it} = \mathbf{X}'_{it} + \mu_i + \varepsilon_{it} \quad (1)$$

$$\varepsilon_{it} = \rho\varepsilon_{it-1} + v_{it} \quad (2)$$

where the error term ε_{it} follows a stationary AR(1) process, and v_{it} is assumed to be independent and identically distributed (i.i.d.) with mean zero and variance σ_v^2 , and

$$|\rho| < 1.$$

The variables are defined as follows: Y_{it} is our dependent variable for country i at year t consisting of the share (percent) of total income going to the top 10, 1 and 10-1 percent respectively in the income distribution. \mathbf{X}'_{it} consists of our main explanatory variables (financial liberalization and marginal tax rate) as well as a range of control variables. Furthermore, μ_i stands for the time-invariant country fixed effect and ε_i is the error term.

When conducting fixed effects panel estimation, one assumes that the error terms are correlated with some or all of the explanatory variables. This is in line with our expectations based on theory and models used in similar papers. A Hausman test confirms that a fixed effects model as opposed to a random effects model is appropriate for our estimations.

The technique involved in correcting for this stationary AR(1) error term involves estimating a model where group means from the data have been subtracted from each term. The country fixed effects thus disappear and the transformation generates:

$$Y_{itij} - \bar{Y}_i = \beta(\mathbf{X}'_{itij} - \bar{\mathbf{X}}'_i) + (\varepsilon_{itij} - \bar{\varepsilon}_i) \quad (3)$$

Equation (3) can in this way be used to estimate ρ in (2). Given ρ , a Cochrane-Orcutt transformation is performed on each panel, within-panel means are removed and the overall mean is added back to the variables. OLS on the transformed equation now should generate correct estimates.

Beck-Katz with panel-corrected standard errors

Our second specification is a linear Beck-Katz regression, which corrects for panel-level autocorrelation and heteroskedasticity. In addition to including time-invariant country-specific effects, this specification allows us to include time effects to reduce the risk of omitted variable bias. This specification was first suggested by Beck & Katz (1995).

Beck and Katz (1995) suggest to estimate the coefficients by OLS and then compute the panel corrected standard errors. The main strength of the Beck-Katz approach is the fact that it takes into account the complexity of the errors, in particular panel level

heteroskedasticity and serial correlation, leading to more conservative estimations of the standard errors than feasible generalized least squares (FGLS) (Kristensen & Wawro, 2003). Those standard errors are shown to be more reliable by Monte Carlo studies (Beck & Katz, 1995; 1996).

The model is supposed to take the form as specified in (1) with an added time dummy w_t among the explanatory variables. This term should ideally pick up for shocks that take place in a given year and that are not controlled for. The disturbance term is assumed to be autocorrelated along t and i , and thus takes the following form:

$$\varepsilon_{it} = \rho_i \varepsilon_{it-1} + v_{it} \quad (4)$$

We use this panel-level specific AR(1) correction model, where the AR(1) coefficient is assumed to be specific for each panel. The estimation is done using Prais-Winsten estimates as autocorrelation is expected in our model. This means that each panel-level ρ_i in (4) is computed using residuals of an OLS regression across all panels.

Indirect channel

In order to assess the indirect effect of financial deregulation on top incomes going through the effect of changes in top marginal tax rates we run a combination of two different regressions.

In a first step we assess the effect of financial deregulation on top marginal tax rates through two different specifications in order to confirm robustness. We run a fixed effects regression correcting for AR (1) disturbances as well as a Beck-Katz linear regression with panel-corrected standard errors used by many authors working on the determinants of tax incomes (see for example Mahon, 2004 and Swank & Steinmo, 2002). This additional specification allows for across-panel heteroskedasticity while at the same time correcting for correlation between countries. We furthermore correct for AR(1) disturbances. The regressions include a new set of controls, which, by literature, are deemed to be relevant in explaining the evolution of top marginal tax rates (see A1 for a detailed description). In a second step, we run the fixed effects regression correcting for AR(1) disturbances and the Beck-Katz specification described above in order to assess the impact of top marginal tax rate on the three top income brackets.

The combination of these two regressions permits us to evaluate the size of the indirect effect of financial deregulation on top incomes through its impact on marginal tax rates, and ultimately quantify the total effect of financial deregulation as a combination of direct and indirect effect.

Robustness checks

Dynamic panel estimations

As a first robustness check we employ two linear dynamic specifications in order to address potential endogeneity concerns. Specifically, we think that there could be a dynamic relationship whereby the income share in period t is dependent on the income share in period $t-1$. This may be relevant to test due to persistence in inequality (Delis et al., 2014). A dynamic panel regression model includes a lagged dependent variable in the regression:

$$Y_{it} = \alpha Y_{it-1} + \beta X'_{it} + \varepsilon_{it} \quad (5)$$

$$\varepsilon_{it} = \mu_i + v_{it} \quad (6)$$

$$E[\mu_i] = E[v_{it}] = E[\mu_i v_{it}] = 0 \quad (7)$$

The error term is comprised of two orthogonal components: a fixed effect μ_i and the idiosyncratic term v_{it} . The immediate response is to take first differences, which would eliminate the unobserved fixed effect μ_i . However, since the regressors are correlated with the first differenced error term, this approach introduces a so-called Nickell-bias (Nickell, 1981).

The standard way of dealing with this is to combine first-differencing with an instrumental variable approach or GMM to eliminate the individual-specific effect. As mentioned by Delis et al. (2014) however, it is tricky to find good instruments for bank regulations that are not correlated with our outcome variable.

We therefore turn to the Arellano-Bond (1991) generalized method of moments (GMM) procedure, which makes use of an “internal” instrument. The Arellano-Bond approach is to use lagged levels of the dependent variable as instruments for the first difference of the dependent variable and thereafter apply GMM. It is therefore often referred to as the “difference GMM”. The following model is estimated using GMM:

$$\Delta Y_{it} = \alpha' \Delta Y_{it-1} + \beta' \Delta X'_{it} + \mu_i + v_{it} \quad (8)$$

where μ_i and v_{it} are assumed to be independently and identically distributed. The dynamic panel model (8) is estimated using the following orthogonality conditions:

$$E(Y_{1t-s}\Delta v_{it}) = 0 \text{ for } t = 3, \dots, T \text{ and } 2 \leq s \leq T - 1 \quad (9)$$

Y_{1t-s} are lags of our dependent variable. These lags are used as instruments for v_{it} from (8) in differences.

The Arellano-Bond GMM procedure is designed for “small T, large N” panels, which is the main disadvantage of our application, as we have a relatively long panel. However, the other conditions are suitable for our data: the relationship is linear (not a priori certain, but is tested for in our paper), the dependent variable may be dynamic (depending on its own past values), the explanatory variables are not strictly exogenous (correlated with past and possibly current values of the error fixed individual effects) in addition to displaying heteroskedasticity and within-country autocorrelation. It has been suggested that the Arellano-Bover (1995)/Blundell-Bond (1998) system GMM estimator, which augments the Arellano-Bond estimator, may be superior as it performs better when the dependent variable exhibits a close to random walk behavior. However, as the system GMM estimator produces an even larger amount of instruments (the number of instruments is quartic in T) (Roodman, 2006). Given our relatively long panel, the Arellano-Bond approach is therefore more suitable. This does not mean however that our large T is not problematic in the Arellano-Bond setting. The system GMM is therefore not our preferred specification.

Since we risk losing efficiency due to our large T when using Arellano-Bond, we also employ a second dynamic model: our habitual fixed effects regression correcting for AR(1) disturbances, where a lagged dependent variable is included among the regressors. Nickell (1981) showed that introducing a lagged dependent variable can induce bias, especially if T is small. Since we have a relatively long panel, this bias should be limited in our setting. Therefore, conducting a dynamic FE AR(1) regression in addition to the Arellano-Bond GMM regression is deemed justified, and the two estimations are compared in our results section. The model is estimated as described in equations (1)-(3), but with the lagged dependent variable Y_{it-1} included among the regressors.

Anglo-Saxon countries

As previously mentioned, one of the stylized facts regarding the evolution of top incomes over the past 40 years is the fact that there has been a divergence between a first group of (mostly Anglo-Saxon) countries and a second group of countries (consisting of Continental Europe and Japan). Our data set includes six countries, which are usually defined as Anglo-Saxon: Australia, Canada, Ireland, New Zealand, United Kingdom and United States. Along the lines of Roine et al. (2009) we include an interaction term with an Anglo-Saxon dummy that takes on a value of 1 if the country is Anglo-Saxon and 0 otherwise. The dummy variable is thereafter interacted with our financial liberalization variable and is used in our standard fixed effects regression correcting for AR(1) disturbances. This allows us to assess whether the effect of financial deregulation on top incomes differs is different for the Anglo-Saxon countries.

Nonlinear effects

It could be possible that the impact of financial liberalization on top incomes is dependent on the stage of development. In order to investigate the presence of such nonlinear effects we create dummy variables for low, middle and high income as measured by GDP per capita along the lines of Roine et al (2009).⁹ We then interact these dummy variables with financial deregulation and run our ordinary regression.

Three-year average data

As annual macroeconomic data sometimes tends to be noisy (Roine et al., 2009) we also run our regressions using three-year non-overlapping averages of the data. Both three year and five year averages are common in the literature and we chose to use the former in order to retain a larger number of observations for our estimations. This is in line with Delis et al. (2013). One major limitation to this approach is that we cannot rule out that annual noise may consist of systematic measurement error. In this case averaging will only perpetuate the noise.

⁹ Following the categorization of Roine et al. (2009) we define the different income ranges as follows: High income if GDP per capita is greater or equal to 15365 USD per year, middle income if GDP per capita is between 15365 and 9702 USD per year, and low income if GDP per capita is less than or equal to 9701 USD per year.

6. Analysis

6.1. Results

In the following section, we present our results from two main specifications, from the decomposed financial deregulation index as well as from our indirect effects model where we test the effect of financial deregulation on marginal tax rates. This is followed by a robustness section where we estimate our regressions using a dynamic panel GMM estimator as well as using three-year averaged data. In addition, we test for Anglo-Saxon particularities and for nonlinear effects.

Main results

We begin by presenting the main results for the top 10, top 10-1 and top 1. A baseline fixed effects (FE) regression generates significant results for our main variable, 3-year lagged financial deregulation index (FIN3), but tests confirm our suspicion of first-order autocorrelation. We therefore directly move on to our first preferred specification, a fixed effects model correcting for AR(1) disturbances in the error term. The results of our specification for the top 10 percent are presented in table 2.

Table 2: FE regression correcting for AR(1) Top 10% income share

VARIABLES	Xtregar, dependent variable: top 10% income share Annual data			
FIN3	2.551*** (0.00808)	2.547*** (0.00905)	2.399** (0.0133)	2.099** (0.0265)
KOF eco		-0.000496 (0.987)	-0.0106 (0.727)	-0.00520 (0.860)
KOF soc			0.0621*** (0.00762)	0.0606*** (0.00766)
Marg Tax				-6.794*** (1.42e-05)
Polity IV	1.720*** (0.000101)	1.719*** (0.000119)	1.789*** (4.78e-05)	2.000*** (2.00e-06)
GDPpc	0.267** (0.0117)	0.267** (0.0132)	0.221** (0.0386)	0.209** (0.0378)
H Capital	5.067*** (0.00344)	5.111*** (0.00470)	4.112** (0.0220)	4.058** (0.0165)
Patents	0.000149** (0.0349)	0.000149** (0.0355)	0.000148** (0.0336)	0.000116* (0.0811)
Gov spend	-5.740 (0.343)	-5.739 (0.345)	-6.131 (0.309)	-5.062 (0.388)
Inflation	0.0115 (0.600)	0.0116 (0.595)	0.0174 (0.427)	0.0197 (0.362)
Population	-2.27e-05 (0.800)	-2.31e-05 (0.799)	-2.08e-05 (0.811)	1.19e-05 (0.878)
Observations	452	452	452	452
N	17	17	17	17

P-values in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Looking at the results, we note a positive and highly significant relation between financial deregulation and the top 10, even when adding our additional explanatory variables. It would thus appear that financial deregulation has a positive impact on the share of incomes going to the top 10 percent income share. Economic globalization on the other hand is weak and not statistically significant. Social globalization however, is weakly positive and robustly significant. Furthermore, top marginal tax rate has a strong and negative effect on the top 10 income share. This is in line with previous research. A raise in marginal taxes of 10 percentage points is associated with a decrease in the share of total incomes going to the top 10 percent income bracket of 0,7-1,2 percentage points, depending on the type of data that is used (using 3-year averaged data, the magnitude is more than 50 percent higher).

Among our controls, institutions, GDP per capita and human capital are most significant. Patents is also significant and positive, but of economically insignificant magnitude. It is interesting to note that institutional quality shows a robust and positive correlation with incomes going to the top share. This finding counters previous research, which states that institutions might mitigate increasing inequality. We interpret this result cautiously, as most of the countries in our sample obtain the highest degree of institutional quality throughout the sample period. Similarly, education has a strong and positive effect on the share of incomes going to the top. This result also counters previous research, which suggests that high levels of education might moderate rising top income shares.

Table 3 outlines the results for the top 10-1 percent income share. Results for our main explanatory variables are similar, but slightly weaker than for the top 10 percent. The coefficient for financial deregulation is however reduced by half in terms of magnitude. We suspect that noise in the data makes top marginal tax rates insignificant in the annual data specification, as it returns to similar levels as for the top ten percent income share when using averaged data (see robustness section). We furthermore note that GDP per capita loses significance and magnitude for this income group.

**Table 3: FE regression correcting for AR(1) disturbances,
Top 10-1% income share**

VARIABLES	Xtregar, dependent variable: top 10-1% income share			
	(1)	(2)	(3)	(4)
FIN3	1.198** (0.0281)	1.175** (0.0325)	1.105** (0.0422)	1.092** (0.0447)
KOF eco		0.00560 (0.745)	0.000414 (0.981)	0.00179 (0.917)
KOF soc			0.0410*** (0.00162)	0.0413*** (0.00150)
Marg Tax				-0.861 (0.331)
Polity IV	1.267*** (2.93e-06)	1.258*** (4.03e-06)	1.297*** (1.33e-06)	1.312*** (8.13e-07)
GDPpc	-0.0678 (0.309)	-0.0706 (0.294)	-0.0984 (0.139)	-0.0974 (0.139)
H Capital	5.043*** (9.29e-06)	4.969*** (2.16e-05)	4.413*** (0.000120)	4.368*** (0.000111)
Patents	3.29e-05 (0.435)	3.17e-05 (0.455)	3.25e-05 (0.436)	3.00e-05 (0.470)
Gov spend	0.652 (0.848)	0.569 (0.868)	0.340 (0.920)	0.440 (0.896)
Inflation	-0.0153 (0.204)	-0.0155 (0.201)	-0.0121 (0.313)	-0.0120 (0.319)
Population	1.08e-05 (0.875)	1.18e-05 (0.865)	1.31e-05 (0.844)	1.74e-05 (0.786)
Observations	452	452	452	452
N	17	17	17	17

P-values in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 4 illustrates the results for the top 1 percent income share. Financial deregulation is significant and relatively similar in terms of magnitude to that of the top 10-1. When adding marginal tax rates however, financial deregulation is only significant at a 15 percent significance level. Furthermore, none of the globalization variables are significant. The top marginal tax rate is unchanged in terms of significance, but with a slightly lower magnitude. Regarding controls, institutions and GDP per capita are similar to previous specifications. However, government spending is now significant and negative, which is what we expect from previous research. Inflation is also significant and weakly positive. It should be noted that Finland only has data for the top 1, which means that this estimation has an additional country compared to the previous two estimations.

**Table 4: FE regression correcting for AR(1) disturbances,
Top 1 % income share**

VARIABLES	Xtregar, dependent variable: top 1 % income share			
	Annual data			
	(1)	(2)	(3)	(4)
FIN3	1.310** (0.0262)	1.301** (0.0320)	1.235** (0.0422)	0.871 (0.142)
KOF eco		0.00117 (0.948)	-0.00341 (0.852)	0.000495 (0.978)
KOF soc			0.0180 (0.197)	0.0154 (0.255)
Marg Tax				-5.097*** (2.57e-07)
Polity IV	0.295 (0.240)	0.293 (0.247)	0.321 (0.204)	0.513** (0.0374)
GDPpc	0.320*** (1.85e-08)	0.319*** (3.90e-08)	0.304*** (2.41e-07)	0.288*** (3.88e-07)
H Capital	0.388 (0.679)	0.375 (0.705)	0.117 (0.907)	0.388 (0.688)
Patents	7.95e-05* (0.0510)	7.98e-05* (0.0509)	7.89e-05* (0.0521)	5.58e-05 (0.156)
Gov spend	-6.721* (0.0714)	-6.729* (0.0721)	-6.908* (0.0644)	-5.997* (0.0981)
Inflation	0.0274* (0.0533)	0.0274* (0.0533)	0.0299** (0.0367)	0.0342** (0.0144)
Population	6.03e-06 (0.886)	5.73e-06 (0.893)	6.81e-06 (0.871)	2.34e-05 (0.559)
Observations	481	481	481	481
N	18	18	18	18

P-values in parentheses

*** p<0.01, ** p<0.05, * p<0.1

We now move on to our second preferred specification, namely cross-sectional, time-series Beck-Katz regression with country and year dummies, correcting for autocorrelation and heteroskedasticity within panels. Time effects are now included in order to reduce the risk of omitted variable bias.¹⁰ The results are presented in table 5. Although significance is reduced throughout the specifications, financial deregulation remains significant for the top 10 and top 10-1, and it is just below the significance level for the top 1. The magnitude of financial deregulation coefficients is lower compared to previous results. This could indicate that the financial deregulation variable was picking up for other factors in previous estimates that are now controlled for by the year dummies.

The coefficient of the marginal tax rate is highly significant and has its strongest effect on the top 10 percent income share. In terms of size, the coefficients are similar in magnitude compared to the FE regression correcting for AR(1) disturbances.

¹⁰ The inclusion of time effects was not possible in the FE correcting for AR(1) disturbances (*xtregar*) in STATA

Table 5: Beck-Katz estimations

VARIABLES	(1) Top 10	(2) Top 10	(3) Top 10-1	(4) Top10-1	(5) Top 1	(6) Top 1
FIN3	1.400* (0.0705)	1.344* (0.0813)	0.620 (0.116)	0.649* (0.0999)	1.924*** (2.45e-06)	0.652 (0.102)
KOFeco		-0.0504*** (0.00520)		-0.0292*** (0.00445)		0.0139 (0.300)
KOFsoc		0.0137 (0.282)		0.0165** (0.0335)		-0.00472 (0.518)
Marg Tax		-7.433*** (0)		-1.538*** (0.00893)		-4.989*** (0)
Observations	469	469	469	469	499	499
R-squared	0.950	0.956	0.951	0.952	0.837	0.886
N	17	17	17	17	18	18

P-values in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Note: controls and year dummies are included but hidden from the table

Indirect channel

Based on our previous estimations, decreasing marginal tax rates seems to be the single most statistically and economically strong factor associated with rising top incomes. The effect is robust to altering controls, sample countries and years. Hypothesis 2 suggests that financial deregulation could, in addition to having a direct effect on top incomes, have an indirect effect on top incomes by influencing tax reform. The first stage of this link, the correlations between financial deregulation and top marginal tax rates, is now investigated. A standard panel fixed effects regression is used to estimate the effect of financial deregulation on marginal top tax rates. An F-test rules out the need for year dummies. Table 6 reports the results of this estimation in columns (1) and (2).

It would appear that aside from the one year lagged average tax rate of all countries, which is per definition a (weakly) endogenous variable, financial deregulation is the biggest predictor of tax reform. Although the coefficient is less significant when adding all controls and explanatory variables, it is still significant at the 10% level. The Beck-Katz specification using standard errors corrected for panel data presents us with similar results with stronger and highly significant coefficients for financial deregulation.

Table 6: The effect of financial deregulation on marginal tax rates

Dependent variable	(1)	(2)	(3)	(4)
Marginal tax rate	FE AR(1)	FE AR(1)	Beck-Katz	Beck-Katz
FIN3	-0.207*** (0.000271)	-0.105* (0.0632)	-0.210*** (0)	-0.181*** (0)
AVtax1		0.566* (0.0755)		0.347*** (1.53e-07)
govright1_1		2.20e-05 (0.696)		4.37e-05 (0.146)
debt1		-0.000475** (0.0167)		0.000215*** (0.000221)
deficit1		0.00119 (0.265)		0.000523 (0.110)
KOFeco1_1		0.000117 (0.702)		-0.000170* (0.0820)
unemp1	-0.000895 (0.292)	0.00157* (0.0985)	-0.000508 (0.269)	-0.00109** (0.0185)
GDP1	9.88e-09 (0.199)	1.34e-08*** (0.00276)	-2.86e-09 (0.336)	-6.48e-09*** (0.000124)
GDPgrowth1	0.276 (0.157)	0.152 (0.486)	0.0800 (0.195)	0.0769 (0.184)
Observations	466	404	466	404
N	16	16	16	16

P-values in parentheses, *** p<0.01, ** p<0.05, * p<0.1

The interpretation of the tax estimations is that an increase in deregulation by 10 percentage points is associated with a 1 – 1,8 percentage point reduction in top marginal tax rates. When conducting estimations with the separate regulatory dimensions, reducing restrictions on international capital is the strongest driving factor, in accordance with theory. Surprisingly enough, credit controls and prudential supervision are also robust and negative factors associated with lower marginal tax rates.

The results presented in table 6 are combined with the coefficients obtained from the impact of top marginal tax rate on top incomes in order to calculate the size of the indirect effect. The results are presented in chapter 6.2.

Dimensions of financial deregulation

As it would appear that financial deregulation is indeed associated with rising top incomes, we now investigate which of the regulatory dimensions that are driving this trend. The habitual FE estimation is thus carried out with each of the seven dimensions included separately. The results are presented in table 7. The separate dimensions are not normalized, implying that coefficients cannot be compared with previous estimates. We therefore focus on the signs and significance when discussing these results.

Table 7: FE correcting for AR(1) disturbances with decomposed financial deregulation index

	(1)	(2)	(3)
VARIABLES	Top 10	Top 10-1	Top 1
Credit controls	-0.283** (0.0195)	-0.196** (0.0221)	-0.158** (0.0144)
Int. rate controls	0.144 (0.181)	0.268*** (0.000441)	-0.0580 (0.376)
Entry barriers	0.114 (0.325)	0.263*** (0.00156)	0.0255 (0.725)
Banking superv	0.123 (0.202)	0.00340 (0.956)	0.0959* (0.0933)
Privatization	0.426*** (0.000258)	0.105 (0.123)	0.250*** (0.000183)
Intl. capital	-0.0607 (0.702)	-0.0275 (0.774)	-0.0831 (0.374)
Security markets	-0.956*** (6.67e-09)	-0.431*** (4.49e-05)	-0.165* (0.0831)
KOFeco	-0.0239 (0.103)	-0.0178* (0.0933)	0.00449 (0.570)
KOFsoc	0.0633*** (2.44e-06)	0.0437*** (5.69e-07)	0.0230*** (0.00138)
Marg Tax	-12.33*** (0)	-7.187*** (0)	-4.698*** (0)
Observations	469	469	499
N	17	17	18

Robust p-values in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Note: controls are included, but hidden from the table

Credit controls and securities markets both have negative and significant coefficients with respect to all three top income shares with the largest magnitude on the top 10 percent income share. It would thus appear that both credit controls and securities markets liberalization are associated with decreasing top income shares.

With a similar magnitude privatization has a positive effect that is highly significant for the top 10 and top 1. Interest rate controls and entry barriers are positive, but have significant coefficients only for the top 10-1. International capital restrictions, a dimension that we expected to be of interest, does not show significant results. The fact that banking supervision does not seem to have a statistically significant relationship with top incomes is in line with our hypothesis.

The additional variables of interest, economic and social globalization as well as marginal tax rate are in line with the results from our previous specifications.

Robustness checks

We have conducted several additional regressions in order to test the robustness of our results. First, a dynamic relationship is tested using both Arellano-Bond GMM and FE correcting for AR(1) disturbances to investigate whether persistence in inequality could be a potential source of bias. Secondly, we check if the results are robust to controlling specifically for Anglo-Saxon countries, as we have reason to believe that they may have different characteristics compared to the rest of our sample. Thirdly, we test for non-linear effects along the lines of Greenwood & Jovanovic (1989) to see if the effects of financial deregulation are different depending on the level of economic development. Finally, we run our preferred regression on three-year averaged panel data in order to control for potential noise.

Dynamic specifications

In order to assess the robustness of our results, we test for dynamic effects where a lagged dependent variable is included among regressors. We make use of an Arellano-Bond “difference GMM” estimator, which allows for serial correlation and heteroskedasticity as well as endogenous regressors. The estimator is however designed for panel data with a relatively short time period. We keep this drawback in mind when interpreting our results. In addition, we include a lagged dependent variable among regressors in our habitual fixed effects model that corrects for AR(1) serial correlation. The results are presented in table 8.

We firstly note that our lagged dependent variable is highly significant and close to one in magnitude for all specifications. In terms of financial deregulation, the magnitude of the coefficient is robust when comparing it to the Beck-Katz specification. FIN3 is significant at the 10 and 5 percent significance level respectively for the top 10 and 10-1 when using Arellano-Bond, and at the 10 percent significance level for the top 10 when (and not far from being significant at the 10 percent level for the top 10-1) using FE. For the top 1 however, financial deregulation loses significance as well as magnitude in both specifications. It would thus appear that the effect of financial deregulation is robust only for the top 10 and 10-1 income shares.

Table 8: Dynamic panel estimations

VARIABLES	Arellano-Bond GMM			FE AR(1) with lagged dependent variable		
	(1)	(2)	(3)	(4)	(5)	(6)
	Top 10	Top 10-1	Top 1	Top 10	Top 10-1	Top 1
L.Depvar	0.756*** (0)	0.782*** (0)	0.786*** (0)	0.802*** (0)	0.804*** (0)	0.786*** (0)
FIN3	1.146* (0.0620)	0.809** (0.0444)	0.293 (0.316)	1.170** (0.0412)	0.504 (0.125)	0.380 (0.281)
KOFeco	-0.0600** (0.0293)	-0.0236** (0.0198)	-0.0230 (0.315)	-0.0489*** (0.00194)	-0.0134 (0.130)	-0.0221** (0.0147)
KOFsoc	0.0259*** (0.00153)	0.0174*** (0.00333)	0.0167 (0.106)	0.0205 (0.101)	0.0184*** (0.00970)	0.0117* (0.0929)
Marg Tax	-5.262*** (0)	-2.120*** (0.000741)	-2.464*** (0.00247)	-5.356*** (1.20e-07)	-2.539*** (1.63e-05)	-2.402*** (7.49e-05)
Observations	430	430	459	433	433	462
N	17	17	18	17	17	18

Robust p-values in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Note: controls are included but hidden from table

Top marginal tax rate has a highly significant coefficient for both top 10 and top 1, but the magnitude is decreased significantly for the top 10-1 and top 1. Both economic and social globalization variables are significant for the top 10 and 10-1, and the magnitudes of the coefficients are in line with previous specifications. For the top 1 however, neither is significant.

A Sargan test shows that overidentifying restrictions are not valid for the Arellano-Bond estimation. However, the Sargan test is only valid for i.i.d. error terms. As Arellano and Bond (1991) point out, the Sargan test has a tendency to reject the null too often in the presence of heteroskedasticity, which is a problem in our data. We therefore run all estimations with the *vc(robust)* option, generating robust variance estimators. We also conduct an Arellano-Bond test of remaining serial correlation. At a 1 % significance level, we cannot reject the hypothesis of no remaining serial correlation (i.e. it would appear that remaining serial correlation of order 1 and 2 of the first differenced error terms is not a problem). In terms of comparing the two models where we face a trade-off between consistency and efficiency, we conclude that results are indeed similar between the two estimations. The only important difference can be seen for the top 10-1 where financial deregulation is significant in the Arellano-Bond estimation but not in the FE estimation. As Arellano-Bond should be more consistent than the FE model, we are inclined to favor this result.

Three-year averaged data

Authors such as Roine et al. (2009) have suggested that annual macroeconomic data can be noisy, and that it might therefore be preferable to use averaged in a panel data setting. Along the lines of Roine et al. (2009), Delis et al. (2013) and Bergh & Nilsson (2010) we therefore run our preferred regressions with three-year averaged data as a further robustness check. The results are presented in table 9. We note that financial liberalization just misses the 10 % significance level for the top 10-1 income share, and that it is almost significant for the top 10 while being insignificant for top 1, which is in line with the results from running the regression on annual data. One reason for why we might lose significance is that the number of observations is decreased by two thirds (since we now only have 11 (three-year) periods). In terms of magnitude, the coefficient of financial reform is slightly higher than previous FE estimates using annual data.

As for marginal tax, we find significant coefficients for all top income brackets. For the top 10 percent income we find a magnitude that is twice as large as the coefficient of annual data. The tax coefficient is similar in magnitude and significance when comparing annual and averaged data regressions for the top 1 income share. For the top 10-1 income share, which surprisingly enough did not produce significant results using annual data, we find a strong and highly significant coefficient as well. When it comes to economic and social globalization, the results are largely similar to the annual data regressions. Economic globalization is however slightly more significant in the averaged data regression.

Table 9: Estimations using 3-year averaged data

VARIABLES	FE correcting for AR(1) disturbances			Arellano-Bond GMM		
	(1) Top 10	(2) Top 10-1	(3) Top 1	(4) Top 10	(5) Top 10-1	(6) Top 1
LDepVar				0.307** (0.0211)	0.149 (0.296)	0.449*** (4.22e-05)
FIN3	3.094 (0.128)	2.319 (0.101)	0.734 (0.400)	2.827*** (0.00450)	3.175*** (0.000611)	0.854 (0.172)
KOFeco	-0.100* (0.0773)	-0.0794** (0.0441)	0.0339 (0.150)	-0.0932 (0.203)	-0.0706 (0.154)	-0.00805 (0.797)
KOFsoc	0.131*** (0.00304)	0.114*** (0.000232)	0.0251 (0.146)	0.0512** (0.0105)	0.0418** (0.0205)	0.0118 (0.347)
Marg Tax	-12.15*** (0.000768)	-6.742*** (0.00694)	-5.025*** (0.000964)	-12.26*** (5.56e-11)	-6.887*** (0.00783)	-4.292*** (7.02e-06)
Observations	140	140	157	129	129	151
N	17	17	18	17	17	18

Robust pval in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Note: controls are included but hidden from the table

Results are stronger when applying Arellano-Bond GMM estimations using 3-year averaged data (see table 9). Firstly, as expected, the coefficient on the lagged dependent variable is lower in magnitude. This is of course due to the fact that we are now dealing with 3-year averages, which reduces persistence in the dependent variables between time periods. As for financial deregulation, the results for top 10 and top 10-1 are much stronger compared to annual data estimations. The coefficients are highly significant and close to the FE estimates in magnitude. However, the same results do not hold for the top 1, for which financial deregulation remains insignificant. The results for marginal tax rates are similar to FE estimates.

We thus conclude that the results using three-year averaged data, which we predict may be less noisy, are mixed. While Beck-Katz results are less significant for our main explanatory variable, Arellano-Bond GMM results show stronger effects from financial deregulation to the top 10 and 10-1. For the top 1 however, results remain weak.

Anglo-Saxon

In order to assess whether there might be differences between Anglo-Saxon countries and the rest of our sample, we run our habitual FE regression including an interaction term between a dummy for Anglo-Saxon countries and financial deregulation (AngloFIN). The results of the estimations for our three top income groups are presented in table 10. When looking at the top 10 income share, both the interaction term and financial reforms become insignificant, although the coefficient for FIN3 remains relatively robust in terms of magnitude. For the top 10-1 the interaction term does not show significant results but financial deregulation is significant with a coefficient in the range of the ones in previous specifications. As in previous specifications, financial deregulation does not show a significant coefficient for the top 1, while for this income bracket the interaction term is highly significant and strong. This result seems to indicate that, in Anglo-Saxon countries, as opposed to the rest of the sample, financial deregulation does have an effect on the top 1 income share. Alternatively it could be the case that there are differences between Anglo-Saxon countries and the rest of our sample regarding the top 1 percent that we have not been able to control for.

Table 10: FE correcting for AR(1) disturbances – including Anglo-Saxon interaction effects

	(1)	(2)	(3)
VARIABLES	Top 10	Top 10-1	Top 1
FIN3	1.286 (0.276)	1.301* (0.0608)	-0.278 (0.695)
AngloFIN	1.996 (0.254)	-0.522 (0.627)	2.707*** (0.00630)
KOFeco	-0.00490 (0.868)	0.00159 (0.926)	-0.000968 (0.955)
KOFsoc	0.0638*** (0.00510)	0.0409*** (0.00170)	0.0219 (0.105)
Marg Tax	-6.851*** (1.18e-05)	-0.864 (0.330)	-5.131*** (1.62e-07)
Observations	452	452	481
N	17	17	18

P-values in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Note: controls are included but hidden from the table

Nonlinear effects

Our habitual regression is now carried out testing for nonlinear effects, in particular whether the impact of financial deregulation depends on the level of economic development. The results from our interaction between dummies for low, medium and high-income countries and financial deregulation are presented in appendix A7. The coefficients do not seem to differ depending on level of development for any of the top income brackets. The coefficients for different interaction dummies are similar and a joint F-test shows that they are not jointly significant at any usual significance level. In sum, no evidence is for the presence of nonlinear effects.

To summarize this section on robustness, we conclude that the results are somewhat stronger when using averaged data. An Anglo-Saxon interaction term does not generate significant results for the top 10 and 10-1, but is strong and highly significant for the top 1. This does not necessarily weaken our results, as we had not found sufficiently strong evidence in previous estimates of a link between financial deregulation and the top 1. However, it does suggest that there are differences between the Anglo-Saxon countries and the rest of our sample that have not been controlled for, and that have an impact on the top 1 percent. Finally, we do not find support for non-linear effects of financial liberalization.

Overall, we find evidence of both a direct and indirect link between financial regulation and top incomes throughout our specifications. A direct effect is however not found for the top 1. The magnitude of the financial deregulation coefficient varies significantly between our different specifications. Various measures are taken to ensure that important determinants of top incomes are controlled for and that unobservable fixed country and time effects are included to reduce the risk of OVB. Furthermore, we employ more sophisticated estimation techniques (Arellano-Bond GMM and FE with lagged dependent variable among regressors) to address concerns such as persistence in top income shares as well as endogenous regressors. Despite these efforts, the fact that coefficients vary across specifications indicates that endogeneity may still be a concern. In addition, a significant Anglo-Saxon interaction term indicates that we have not been able to control for all relevant factors that impact the top 1.

6.2. Discussion

In this section we analyze the results of our quantitative estimations by interpreting the various effects found while linking the findings back to our research questions and theoretical predictions. We start by discussing our main results, followed by in-depth analysis of both the direct and indirect channels between financial deregulation and top incomes. This is followed by an analysis of the various regulatory dimensions and their respective potential effects on top incomes. Thereafter, the Anglo-Saxon particularities are examined at length. The section is concluded by a discussion on policy implications.

Firstly, we conclude that our quantitative analysis has shown positive results for our direct link: conditional correlation between financial deregulation and top income shares. This relationship is robust for the top 10 (P90 to 100) and the top 10-1 (P90 to P99) income share. We furthermore find significant results for the Top 1 (P99 to P100) in Anglo-Saxon countries.

For the indirect link, we find strong and robust results with regards to conditional correlation from financial deregulation to top marginal tax rates. Top marginal tax rates are in turn shown to have a strong and robust negative effect on all of the three top income shares.

In order to further understand the explanatory power of the results, we calculate the share of the total increase in top incomes (top 10 and top 10-1) over the analyzed period,

which can be explained by our estimated coefficients for financial deregulation (for details on the calculations see appendix A8). Financial deregulation can, depending on the specification, through its direct effect explain between 18-29 percent of the total variation in the share of income going to the top 10-1 percent and between 12-22 percent of the total variation in the share of income going to the top 10. As for the indirect effect, financial deregulation is able to explain between 2-8 percent of the total variation in the top 10-1, 9-16 percent in the top 1 and 8-14 percent in the top 10. The combined total effect is thus 25-32 percent for top 10-1 and 29-30 percent for the top 10. Given how little attention previous research has attached to the study of financial deregulation as a driver of top incomes, these are strong results. However, we once again stress that our results can merely be regarded as evidence of conditional correlation between our main variables, and not as proof of causality. Furthermore, due to concerns about econometric validity, these results should be interpreted cautiously.

Direct link

For the top 10-1, our hypothesis regarding the role of financial deregulation is confirmed throughout our various econometric specifications while significant results for the top 1 are only found for the subset of Anglo-Saxon countries. Throughout this paper, different channels driving the effect from financial deregulation to top incomes have been discussed. From our results, we can however not determine whether the link goes primarily through the wage channel, the capital channel, or a combination of both.

There are several potential explanations for why financial deregulation would lead to increasing wage incomes in the top 10-1 group. Firstly, financial deregulation could lead to the expansion of the financial sector and its demand for high-skilled labor, which subsequently has led to higher wages in the financial sector, in turn contributing to higher top wage shares (along the lines of Philippon & Reshef, 2009). Secondly, financial deregulation may increase the supply of capital, which has increased the demand of high-skill labor (due to capital-skill complementarity) across all finance-dependent industries (along the lines of Larrain, 2012). One could potentially add the link suggested by Korinek & Kreamer (2014), which states that financial deregulation leads to riskier activities, thereby shifting income from ‘workers’ to ‘bankers’. Since the build-up of risk can lead to costly tax-financed bailouts and credit crunches, both of which negatively affect workers, high-risk activities with high expected profits ultimately affects the distribution in favor of the financial sector. As the top 10-1 draws a more significant

share of their income from wages, our direct channel results could imply that the wage channel is the most important link from financial deregulation to top incomes.

Previous research such as that done by Kaplan & Rauh (2010) and Bakija et al. (2012) suggest that finance professionals account for an important share of top earners in the U.S. and that their wages compared to other industries have increased dramatically. However, in terms of magnitude, the share of finance professionals in the top 10-1 income share cannot reasonably be large enough to explain our results. We would therefore argue that the most probable link from financial deregulation to top wage income goes through both rising financial sector wages and high-skilled labor wages overall.

The main argument, drawing on previous literature, for why financial deregulation would affect the top incomes through rising capital incomes is the financial deepening channel along the lines of Claessens & Perotti (2007). This argument is based on the idea that financial deregulation leads to financial deepening rather than financial widening, thereby primarily benefitting the already affluent. Financial deepening could entail the innovation of complex, high-risk and high-return financial products. As Piketty (2014) mentions, if access to these high-return assets is unequal, or depends on initial level of wealth (only the affluent can invest in complex financial products through wealth management for example), then this development may cause inequality in the return on capital.

To summarize, there are several ways in which financial deregulation could impact the top 10-1 income share. Future research is needed in order to assert whether the primary link is from financial deregulation to top wages, capital returns, or a combination of both.

Our quantitative analysis has only been able to link financial deregulation with the top 10, through its impact on the top 10-1 but not the top 1 in the full sample. It therefore seems important to recall what sets the upper middle class (top 10-1) and “the rich” (top 1) apart, besides relative income shares. Most importantly, the share of total income coming from labor is higher for the top 10-1 income bracket than the top 1 (the average over the whole analyzed period for the countries where data is available was about 70 percent labor income as share of total income for the top 10-1 against roughly 50 percent for the top 1). At first glance, one possible explanation for the divergent results would be

that financial deregulation has had a stronger impact on the income from wage than from capital. However, as Piketty and Saez (2006a) for example observed, the share of wages in the incomes of the top 1 percent has gradually increased from previously even lower levels. Therefore, although wage incomes continue to represent a lower share of total incomes of the top 1 compared to the top 10-1, the financial deregulation-wage channel cannot explain why we do not see a link between financial deregulation and the top 1.

The significance of the interaction term between an Anglo-Saxon dummy and financial deregulation for the top 1 indicates that financial deregulation can indeed have an impact on this income bracket. It seems however that this impact is conditional on the presence of certain other factors. Anglo-Saxon countries seem to create a particularly favorable environment enabling the top 1 to access the benefits of financial deregulation. Potential explanations for this that have been presented in previous literature include the fact that Anglo-Saxon countries have on average more flexible labor markets, and social norms favoring higher levels of inequality.

Although support is not found for the effect of financial deregulation on the top 1 income share in the full panel we argue that this does not necessarily imply that the link is non-existent. Based on our results, there are two main possibilities with regards to the link between the financial sector and the top 1 percent.

The first possibility is that financial sector development does indeed have a positive impact on the top 1 percent income shares. Two reasons could explain why we cannot find support for this link in our quantitative analysis.

Firstly, it could be argued that our financial deregulation index *does not sufficiently allow for variation in the grading of regulation between countries*. The financial liberalization index by Abiad et al. (2010) used in our estimations was created for a large set of both developing and developed countries. This means that the variation between the developed countries in our sample, especially for the later half of our time period, is perhaps not large enough. In addition, as the grading of each regulatory dimension only goes from zero and three, regulatory differences between Anglo-Saxon countries (where the top 1 has increased most drastically) and other countries in our sample, are perhaps not captured by the index. Looking at the trends in the data (see chapter 5.2), we see that a large share

of the countries in our sample reach high levels of liberalization according to the financial deregulation index. This is a problem for our estimations, as the bounded nature of our variable (ranging from 0 to 21 and when normalized from 0 to 1) may induce a downward bias for the financial deregulation coefficient. Clearly, this does not mean that additional regulatory differences between countries do not exist. They may simply not be accounted for in the construction of the index grading system. The argument could therefore be made according to which financial deregulation does have an impact on the top 1 percent, but that our index fails to capture the regulatory differences between countries that give rise to these effects.

Secondly, it could be the case that, although financial sector development (expansion of the sector, increasing employment and/or wages in finance, rising returns on capital) does matter for the 1 percent, *after a certain level of deregulation, this does not sufficiently depend on increased liberalization per se*. According to this argument, although financial sector development in for example Anglo-Saxon countries has been more extensive than in other countries, these differences are not primarily/only due to differences in regulation. Other factors, such as historical importance of finance, globalization, political system etc. may be the determinant factors of an expansion of the financial sector. Although financial deregulation could still be an important factor, it is probably not the only factor that influences the size of the financial sector. This argument would go against our hypothesis regarding the importance of financial deregulation for the rising top 1 percent income shares, but does not exclude the role of the financial sector in these developments.

The second possibility is that the financial sector does not play a role in the rise of the top 1 percent income share (at least through the direct effect). Although this possibility cannot be excluded, we argue that there is sufficient evidence pointing towards this explanation being false. Previous research suggests that rising top incomes are related to the financial sector in a variety of ways. Firstly, compensation in an expanding financial sector carries large premiums compared to other high-skilled professions as pointed out by Philippon & Reshef (2009) and Kaplan & Rauh (2010). Secondly, authors such as Claessens & Perotti (2007) argue that the expansion of the financial sector has led to financial deepening (mainly focusing on the U.S., where the top 1 income share has increased the most), which has led to higher average returns. They argue that the very top has benefited disproportionately from this development.

To summarize, the lack of support found in this paper for the role of financial deregulation for the top 1 percent income share in the full sample cannot be regarded as evidence against the potential relationship between the financial sector and the top 1 percent. We cannot however determine whether our results are due to limitations in our estimations (limits in the grading of the financial liberalization proxy or econometric concerns), or whether financial sector expansion may be driven by other factors, not accounted for in our quantitative analysis, than purely regulation.

The indirect link

Our empirical results show support for our indirect link hypothesis whereby financial deregulation negatively impacts top marginal tax rates, which, in turn, negatively affect top income shares.

Firstly, we find a robust negative effect of financial deregulation on top marginal tax rates. The link between financial deregulation and top marginal tax rates has been extensively discussed in previous literature. The main mechanism brought forward is an increase in bargaining power of those in favor of lower top marginal tax rates (Steinmo, 1994; Edey & Hviding, 1995). Along these lines, financial deregulation, especially when coupled with globalization, created a credible threat of “exit” from capital-rich individuals. Politicians respond by lowering top marginal tax rates, creating a competitive “race-to-the-bottom” global tax policy environment. In line with these theoretical arguments, our empirical results indicate that financial account restrictions (restrictions on capital mobility) is one of the strongest driving factors contributing to lower marginal tax rates.

One critique of this view is taking the perspective of a broader overall picture of a political consensus moving toward a more free-market agenda in the 1970-80s, which pushed for a range of reforms of which both financial deregulation and lower top tax rates are important components. However, the timing of financial deregulation preceding tax reform presents valuable evidence in favor of our argument.

Secondly, we find evidence of strong elasticity from top tax rates to top income shares throughout our specifications. The marginal tax rate variable is, independently of the choice of econometric specification, by far the most strong and robust determinant of all

three top income brackets. These results are in line with for example Piketty et al. (2014), who found strong evidence in favor of the “bargaining” elasticity channel. Specifically, they found that CEOs bargain more aggressively for higher executive compensation in a context of lower tax rates.

Regulatory dimensions

When looking at the impact of the different dimensions of financial deregulation we note that as expected, there seem to be different mechanisms with sometimes opposing effects at hand. This is in line with our theoretical predictions. Our results indicate that three dimensions are associated with rising top incomes: interest rate controls, entry barriers and restrictions on banking activities, and privatization of financial institutions.

Firstly, removing interest rate controls has a highly significant and positive conditional correlation with the share of income going to the top 10-1, in line with our hypothesis. This could potentially indicate that a liberalization of deposit and lending rates has had a distributional effect in favor of the top. One reasoning behind the introduction of interest rate controls was to limit lending rates with the objective of securing access to credit for the poor. These results suggest that the equalizing effects of interest rate controls have been stronger than its distortionary effects in terms of its impact on the income distribution.

Furthermore, we find a positive and significant effect from the entry barrier variable on the top 10-1 income share. This variable measures both actual entry barriers for domestic and foreign banks, but also restrictions on bank branching and on the range of activities that banks are allowed to engage in. Liberalization of banking activities has allowed for savings banks to develop investment-banking departments, leading to engagements in international securities markets. This directly connects back to our prediction that a development of the securities markets would benefit the affluent and could counterbalance the results found for the securities market dimension, which indeed only measures the establishment of a securities market but not its further development.

Privatization of financial institutions has a highly significant positive effect on the top 1 percent income share and is almost significant for top 10-1 percent income share. These results are in line with our hypothesis and the reasoning that privatization of financial institutions increases innovation and the availability of high-return financial products.

On the other hand, credit controls and security markets show a significant and negative effect with respect to all of the analyzed top income brackets, indicating that this type of financial deregulation is associated with decreasing top income shares. The results with regards to credit controls are in line with our hypothesis as well as previous research.

The second dimension displaying a negative effect on top incomes is the securities market policy variable. Contrary to our hypothesis, these results indicate that the bottom 90 percent in the income distribution benefit when a securities market is created and when it is more open. A potential explanation for these results is the fact that the index mainly focuses on the creation of a securities market and less on its development. Accordingly, both Anglo-Saxon as well as the other countries in our sample obtain the maximum score for about half of the analyzed period even though in reality the level of development of their securities markets differ quite a lot (BIS, 2015). This is directly linked to the fact that we are looking at regulations and not actual flows. As previously mentioned, the entry barrier dimension of the index might in reality be more directly related to actual securities markets than the securities markets sub-index.

We do not find significant results for the dimensions of banking supervision and international capital mobility. With regards to banking supervision, these results are not surprising. Although we hypothesized about a negative link between prudential supervision and top income shares, our results indicate that this effect does not take place.

Capital mobility is described in previous literature as the main dimension of financial deregulation driving the indirect effect through top marginal tax rates. The effect of capital mobility on top marginal tax rates was confirmed in a separate regression, as well as the effect of marginal tax rates on top incomes. However, we expected capital mobility to also have a direct effect on top incomes through the possibility to earn higher returns on capital in a global financial market. One potential explanation for why capital mobility does not show an impact on top incomes is, once again, the potential divergence between regulations and actual flows.

Although the results of our quantitative analysis looking at the separate regulatory dimensions have been discussed at length, it should once again be stressed that our

results should merely be regarded as indicative, and not definitive. The limitations of the financial liberalization index, as reiterated throughout the paper, are especially important when looking at the sub-dimensions. In particular, as each variable can only take one out of four possible values, and our sample countries obtain relatively high scores throughout the period, there is little variation within each sub-index. Finally, as previously mentioned, the bounded nature of our variables implies that we may suffer from downward bias in our estimates.

Anglo-Saxon

As restated throughout this paper, it has been confirmed in previous literature that Anglo-Saxon countries differ from the rest in terms of financial deregulation, the evolution of top incomes as well as other factors. An interaction term that tests the effect of financial deregulation on the Anglo-Saxon group specifically is not significant for neither the top 10 nor top 10-1 income shares. For the top 1 income bracket we find that, as previously, financial deregulation alone does not have a significant impact by itself, but once interacted with the Anglo-Saxon dummy, it becomes significant. This indicates that financial deregulation does indeed have an effect on the share of total income going to the top 1 in the specific setup of Anglo-Saxon countries. Given the results of previous literature, indicating that Anglo-Saxon context is very particular with respect to financial deregulation, top incomes but also other factors such as institutional set-up, this result is not particularly surprising. This finding points out the need for further research developing the understanding of the interaction between the different variables of interest as well as the importance of the Anglo-Saxon context to different income brackets (top 10 vs. top 1).

Nonlinear effects

With regards to nonlinear effects depending on the level of development, our empirical results confirm those of for example Roine et al. (2009). We do not find any signs of nonlinear effects when estimating our regressions including dummies for different levels of development. However, as our sample of countries and the sample period are relatively limited, we cannot, based on these results, safely conclude that the effect of financial deregulation on top incomes is linear; nonlinear effects might be present in other more diverse samples might. The average level of GDP per capita is relatively high in 1973 for the countries in our sample and our sample is hence somewhat skewed towards the high-income class. Therefore, there may not be enough variation in the data

at lower levels of both GDP per capita for us to find potential nonlinear effects. Future research should, as mentioned below, further explore the effects of financial deregulation in top income shares in developing-country settings in order to assert the linearity of these effects.

Policy Implications

This paper exclusively evaluates the (direct and indirect) distributive effect of financial deregulation but does not further discuss other effects that such a change in policy might have. A broad set of other possible consequences of financial deregulation come to mind (impact on growth in general and the development of an efficient financial system in particular). Clearly, policy makers on occasion face trade-offs between different policy aims. Our policy implications merely relate to one factor, namely that of the distributive effects of financial regulation. This is not to say that policy makers necessarily face the trade-off between equality and growth: recent literature indicates that inequality is not necessarily associated with higher growth, as has been previously claimed (Milanovic et al., 2007). In any case, a thorough understanding of the impacts of financial liberalization on inequality from a policy-perspective is arguably important. These results, by shedding light on the effects of financial regulation, contribute to this discussion.

6.3. Limitations

In addition to previously discussed limitations, the following precisions need to be added. The main limitations concern those of the quality of our data as well as those associated with our econometric specifications.

Data

Firstly, as further discussed in chapter 5.1, there are inherent limitations in the data used in our empirical analysis. The nature of tax record data implies that we may underestimate the actual top income shares due to misleading tax reporting as well as tax avoidance and evasion. These shortcomings however, discussed at length in for example Atkinson et al. (2011); do not at first glance tend to undermine our argument. Rather, as top income shares may be underestimated, the effect of financial deregulation may be even stronger than our empirical analysis suggests. An additional limitation with the WTID is the fact that tax schemes have changed across time in several of the countries included in our sample potentially causing a discontinuity in the data.

With regards to the tax data, it is imaginable that a cut in top marginal tax leads to less tax avoidance and more honest reporting of incomes (Feenberg and Poterba 1993). The impact of tax cuts in increasing the share of total income going to the top may thus be misinterpreted. According to this argument, top incomes might not have changed at all, but are in the context of lower top tax rates more honestly reported. However, as mentioned in Piketty et al. (2014), the arguments in favor of the tax avoidance channel are weak. Specifically, top income shares based on a broader definition of income (including for example realized capital gains, which is one of the main potential channels of tax avoidance) has increased in tandem with the more narrow definition of income subject to a progressive tax scheme. We therefore argue that a bias due to tax-avoidance is not of great concern in our paper.

Econometric concerns

We see our main econometric concern arise from potential endogeneity. The difference in the magnitude of the results from the FE specification and both Beck-Katz and AB GMM indicates this may be a concern. Omitted variable bias (OVV) is likely to be the source of this problem. If omitted variables influence both financial deregulation and top incomes at the same time, this may bias our results. In order to limit the risk of OVV, a large set of controls suggested by previous literature has been used to control for the potential explanations that have been suggested for changes in top incomes. Additionally, we control for both time-invariant fixed country and year effects with the hope to control for unobserved factors. However, despite these measures, the risk of OVV cannot be fully eliminated.

Various authors have mentioned the potential problem of reverse causality where income inequality could also influence financial regulations (Roine et al., 2009). One potential mechanism for this link could be the expectation of the affluent that such regulations have a direct impact on returns to their capital. In that case we would expect the top income brackets to lobby stronger for their advantages when they are richer. The danger of reversed causality is reduced in our research as financial deregulation is used with a three-year lag in all specifications. Furthermore, when looking at the timing of deregulation and increases in top income (see chapter 5.2, a first look at the data), it does not look like rising incomes precede deregulation, rather the opposite (see chapter 5.1, trends in the data). However, the risk of reverse causality cannot be ruled out completely.

A further potential problem is the fact that both our dependent and our main explanatory variables are bounded. While this does seem to be only a minor concern for the top income variables, which while bound, never actually get close to or reach the limits (the share of total income going to the top 1, for example, is bounded by 100% but will never actually reach that cap) (Roine et al., 2009), the situation is different for the financial deregulation variable (and in particular its sub-dimensions) where some of the countries in the sample obtain the maximum score. While there is a certain potential bias associated to this problem, we would expect it to be downwards oriented, meaning that we are underestimating the actual effect of financial deregulation.

Generalizability

A few comments should be made with regards to the generalizability of our results. The analyzed sample consists merely of developed countries. It is unclear to what extent our results are generalizable to a wider sample of countries and in particular to less developed countries. More research is needed in order to understand the mechanisms at play looking at a larger set of countries at different levels of economic development. Obviously, a well-functioning financial sector is crucial for growth, and removing distortionary financial regulation could potentially also be beneficial for reducing inequality in developing countries.

In addition, the period covered by this paper (1973-2005) was a time of important regulatory and actual change in the financial sector for most of the countries in the sample. Previous research suggests that today's deregulated financial sector in terms of its effect on wages is similar to that of the pre-financial regulation era around the turn of the 20th century. However, we cannot assert with confidence that our results are directly transferable to other time periods. This would suggest that the effects of financial regulation on top incomes are not exclusively important in the time period studied in this paper. Of particular interest is the role of the financial sector and its regulation in the context of the recent crisis. This period will, once that the corresponding data becomes available, be an important additional source of information, permitting further insight into the role of financial sector regulation in times of crisis.

7. Conclusion

This paper investigates the impact of financial deregulation on top incomes in developed countries over the period 1973-2005. While potential determinants of top income shares have been extensively studied in previous literature, several trends remain unaccounted for. Specifically, previous research has not been able to sufficiently explain the divergence between Anglo-Saxon countries, in which top incomes have drastically increased, and other developed countries, in which top incomes have remained relatively flat over recent decades. Our unique contribution lies in a thorough empirical analysis of the role of financial regulation in this context. The necessity of such a cross-country examination has been mentioned by researchers of top incomes. Furthermore, researchers in the finance-growth nexus literature have emphasized the lack of empirical investigations of the distributive effects of financial regulation.

This thesis takes an empirical panel data approach to the study of distributive effects of financial sector regulation, specifically focusing on top income shares. The paper investigates the effect of financial deregulation on top income shares (the top 10, 1 and 10-1 percent income shares) through a direct impact. Furthermore, we investigate an indirect channel, whereby financial liberalization negatively impacts top marginal tax rates, which, in turn, negatively impact top income shares. Furthermore, the various financial regulatory dimensions are investigated separately. Our main specifications are fixed effects panel regressions correcting for serial correlation, and Beck-Katz with fixed country and year effects. Moreover, we carry out a number of robustness checks testing for a dynamic relationship as well as Anglo-Saxon particularities and non-linear effects.

Our findings give support for the claim that financial deregulation is associated with a rise in top income shares. However, in the full sample, this relationship holds only for the top 10 percent (P90 to 100) and the top 10-1 percent (P90 to P99) income shares. Concerning our hypothesis regarding the effect of financial liberalization on the top 1 percent income share (P99 to 100), we only find a significant and positive effect in Anglo-Saxon countries.

As for the indirect effect, the results indicate that financial deregulation has a robust negative impact on top marginal tax rates. Furthermore, top marginal tax rates are shown to have a strong negative effect on all of the investigated income shares. These results are robust to different econometric specifications, the inclusion of various control variables,

testing for nonlinear effects and the inclusion of an Anglo-Saxon dummy variable.

When looking at the various regulatory dimensions separately, the results suggest that the repeal of interest rate controls, privatization of financial institutions, removal of entry barriers and restrictions on banking activities are regulatory dimensions that contribute to enhanced top income shares. On the other hand, removing credit controls and creating securities markets are regulatory dimensions that contribute to increased equality.

Although our findings are not proof of causality, they do suggest that the financial sector has a role in the rise of top income shares in developed countries, something that should be further investigated. Important gaps remain in the research field studying determinants of top incomes. We see mainly three areas where enhanced data could permit to further develop our research in particular: a broader set of countries (including developing countries) as well as a longer time period (including the recent crisis) will, as soon as data is available, create the possibility to further investigate the impact of financial deregulation on top incomes. Specifically, it would allow researchers to explore nonlinear effects in terms of the impact of financial liberalization on top incomes (for example depending on the quality of institutions or the level of development).

Further research using more sophisticated top income data distinguishing between wage and capital income as well as the inclusion of capital gains, would shed more light on the role of the financial sector on rising top incomes and in particular on the different potential operating channels. The design of the chosen index for financial deregulation (at this time the broadest and most developed available) induced certain limitations to our research. In particular, enhanced and more granular data on the liberalized side of the scale could potentially permit the finding of a direct channel linking financial deregulation also to the share of incomes going to the top 1.

The dynamics of income inequality is a complex and multi-faceted field of research, with critical implications for the well being of society at large. Hopefully, this paper makes a small contribution to the important endeavor of understanding the underlying mechanisms behind the disparities in income levels between different groups in society.

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9. Appendix

A1: Literature review of determinants of tax reforms

While research on tax reforms has been largely focusing on its consequences, there is a smaller body of research investigating its causes. The research focusing on tax reforms in Latin America and other developing countries will not be discussed here. Findings of that body of research cannot directly be applied to our thesis since our sample is constituted by developed countries only.

We identify two major themes of causes that are identified by literature which are relevant in our context:

International integration explanations

Different variations of the globalization thesis argue that capital has become more mobile, which has increased the bargaining power of the affluent in the discussion on tax regulations (Steinmo, 1994). The increase in capital mobility is often ascribed to globalization (see for example Brys et al. (2011), Schjelderup (1993)). Steinmo (1994) and Hallerberg and Basinger (1998) amongst others combine globalization and financial deregulation to explain increased capital mobility. While Steinmo (1994) conducts a purely qualitative analysis, Hallerberg and Mark (1998) do not find statistically significant result. It becomes hence clear that this link needs further investigation.

The argument of capital mobility can be combined with the reasoning of tax competition. Given the increased mobility of capital, a change in tax regulation in a *major* country creates a tax competition where most countries will decrease their marginal tax rates in order to retain capital (Lee et al., 1989; Steinmo, 1994; Hallerberg and Basinger, 1998; Brys et al., 2011).

Political explanations

As for any reform, the political orientation of the ruling party or coalition has been brought up as explanation for the tax reforms in the 1980s and 1990s. While some authors do include a measure of the median voter (see for example Swank (2006)), others consider a measure of the share of right wing politicians in power to be sufficient in order to represent the political will of the population in general (see for example Brys et al. (2011) or Hallerberg and Mark (1998)).

An important change in paradigms is described as another potential cause of change in tax regulations. Brys et al. (2011) describe a shift in the focus of tax regulations towards growth generation through improved incentives. It was commonly agreed that this goal was best reached through a broad tax base but low marginal tax rates. At the same time the redistribution argument lost in importance. At the same time the Steinmo (1994) describes a general willingness to change the regulations since they were perceived as malfunctioning, especially in the United States.

Besides the mechanisms that are discussed as causing changes in tax regulations we identify the following controls as being used in most researches in this area: GDP, GDP per capita and its growth, debt and deficit and unemployment.

A2: Countries included in the data sample

Australia	Netherlands
Canada	New Zealand
Denmark	Norway
Finland	Portugal
France	Spain
Germany	Sweden
Ireland	Switzerland
Italy	United Kingdom
Japan	United States

A3: Descriptive statistics

Table A1: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Top10incomeshare	508	31.20026	4.682436	18.77	44.94
Top9incomeshare	507	23.34821	2.863214	14.45	31.48
Top1incomeshare	540	7.739778	2.394967	3.49	17.68
Top1including capital gains	189	88.42328	50.22154	1	171
Financial reform	594	.7165705	.2577389	.047619	1
KOFeco	594	66.94558	15.09633	26.39765	97.09286
KOFsoc	594	68.33238	15.13252	33.68246	93.67905
Margtax	558	.6371505	.1167377	.348	.924

PopM	594	42731.73	60114.93	2992.3	295583
Inflation	594	5.823555	5.345587 -	1.773408	27.04135
polityIV	594	9.737374	1.576081	-9	10
H capital	594	2.82011	.3947359	1.770002	3.574813
Patents	540	2112.349	5839.364	0	49778.43
Gov spend	594	.167956	.0433427	.0628835	2901611
GDP	594	791456.9	1394594	21103	9009770

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A5: The financial reform index in detail

Detailed description of each sub-index as described by the authors Abiad et al. (2010) including table A2 indicating correlations between the sub-indices:

Credit Controls and Reserve Requirements

1. Are reserve requirements restrictive?

- Coded as 0 if reserve requirement is more than 20 percent.
- Coded as 1 if reserve requirements are reduced to 10 to 20 percent or complicated regulations to set reserve requirements are simplified as a step toward reducing reserve requirements.
- Coded as 2 if reserve requirements are less than 10 percent.

2. Are there minimum amounts of credit that must be channeled to certain sectors?

- Coded as 0 if credit allocations are determined by the central bank or mandatory credit allocations to certain sectors exist.
- Coded as 1 if mandatory credit allocations to certain sectors are eliminated or do not exist.

3. Are there any credits supplied to certain sectors at subsidized rates?

- Coded as 0 when banks have to supply credits at subsidized rates to certain sectors.
- Coded as 1 when the mandatory requirement of credit allocation at subsidized rates is eliminated or banks do not have to supply credits at subsidized rates.

These three questions' scores are summed as follows: fully liberalized.4, largely liberalized.3, partially repressed.1 or 2, and fully repressed.0.

4. Are there any aggregate credit ceilings?

- Coded as 0 if ceilings on expansion of bank credit are in place. This includes bank-specific credit ceilings imposed by the central bank.
- Coded as 1 if no restrictions exist on the expansion of bank credit.

The final sub-index is a weighted average of the sum of the first three categories (with a weigh of 3/4), and of the last category (with a weigh of 1/4).

Interest Rate Liberalization

Deposit rates and lending rates are separately considered, in coding this measure, in order to look at the type of regulations for each set of rates. They are coded as being government set or subject to a binding ceiling or floor (code.0), fluctuating within a band (code.1) or freely floating (code.2). The coding is based on the matrix in Table A1.

Table A2: Coding matrix for interest rate liberalization

Lending rates	Deposit rates		
	0	1	2
0	FR	PR	PR
1	PR	PR	LL
2	PR	LL	FL

Banking Sector Entry

1. To what extent does the government allow foreign banks to enter into a domestic market? This question is coded to examine whether a country allows the entry of foreign banks into a domestic market; whether branching restrictions of foreign banks are eased; to what degree the equity ownership of domestic banks by nonresidents is allowed.

- Coded as 0 when no entry of foreign banks is allowed; or tight restrictions on the opening of new foreign banks are in place.
- Coded as 1 when foreign bank entry is allowed, but nonresidents must hold less than 50 percent equity share.
- Coded as 2 when the majority of share of equity ownership of domestic banks by nonresidents is allowed; or equal treatment is ensured for both foreign banks and domestic banks; or an unlimited number of branching is allowed for foreign banks.

2. Does the government allow the entry of new domestic banks?

- 5. Coded as 0 when the entry of new domestic banks is not allowed or strictly regulated.
- 6. Coded as 1 when the entry of new domestic banks or other financial institutions is allowed into the domestic market.

3. Are there restrictions on branching?

- Coded as 0 when branching restrictions are in place.
- Coded as 1 when there are no branching restrictions or if restrictions are eased.

4. Does the government allow banks to engage in a wide range of activities?

- Coded as 0 when the range of activities that banks can take consists of only banking activities.
- Coded as 1 when banks are allowed to become universal banks.

These four questions' scores are summed as follows: fully liberalized=4 or 5, largely liberalized=3, partially repressed=1 or 2, and fully repressed=0.

Financial Account Restrictions

1. Is the exchange rate system unified?

- Coded as 0 when a special exchange rate regime for either capital or current account transactions exists.
- Coded as 1 when the exchange rate system is unified.

2. Does a country set restrictions on capital inflow?

- Coded as 0 when restrictions exist on capital inflows.
- Coded as 1 when banks are allowed to borrow from abroad freely without restrictions and there are no tight restrictions on other capital inflows.

3. Does a country set restrictions on capital outflow?

- Coded as 0 when restrictions exist on capital outflows.
- Coded as 1 when capital outflows are allowed to flow freely or with minima approval restrictions.

These three questions' scores are summed as follows: fully liberalized=3, largely liberalized=2, partially repressed=1, and fully repressed=0.

Privatization

Privatization of banks is coded as follows:

- Fully liberalized if no state banks exist or state-owned banks do not consist of any significant portion of banks and/or the percentage of public bank assets is less than 10 percent.
- Largely liberalized if most banks are privately owned and/or the percentage of public bank assets is from 10 to 25 percent.
- Partially repressed if many banks are privately owned but major banks are still state-owned and/or the percentage of public bank assets is 25 to 50 percent.
- Fully repressed if major banks are all state-owned banks and/or the percentage of public bank assets is from 50 to 100 percent.

Securities Markets

1. Has a country taken measures to develop securities markets?

- Coded as 0 if a securities market does not exist.
- Coded as 1 when a securities market is starting to form with the introduction of auctioning of treasury bills or the establishment of a security commission.
- Coded as 2 when further measures have been taken to develop securities markets

(tax exemptions, introduction of medium and long-term government bonds in order to build the benchmark of a yield curve, policies to develop corporate bond and equity markets, or the introduction of a primary dealer system to develop government security markets).

- Coded as 3 when further policy measures have been taken to develop derivative markets or to broaden the institutional investor base by deregulating portfolio investments and pension funds, or completing the full deregulation of stock exchanges.

2. Is a country's equity market open to foreign investors?

- Coded as 0 if no foreign equity ownership is allowed.
- Coded as 1 when foreign equity ownership is allowed but there is less than 50 percent foreign ownership.
- Coded as 2 when a majority equity share of foreign ownership is allowed.

These two questions' scores are summed as follows: fully liberalized=4 or 5, largely liberalized=3, partially repressed=1 or 2, and fully repressed=0. If information on the second subdimension was not available (which was the case for some low-income countries), the measure was coded using information on securities market development. If information on securities markets only was considered, a 0–3 scale was assigned based on the score on securities markets.

Banking Sector Supervision

1. Has a country adopted a capital adequacy ratio based on the Basel standard? (0/1)

Coded as 0 if the Basel risk-weighted capital adequacy ratio is not implemented.

Date of implementation is important, in terms of passing legislation to enforce the Basel requirement of 8 percent capital adequacy ratio (CAR).

- Coded as 1 when Basel CAR is in force. (Note: If the large majority of banks meet the prudential requirement of an 8 percent risk-weighted capital adequacy ratio, but this is not a mandatory ratio as in Basel, the measure is still classified as 1.) Prior to 1993, when the Basel regulations were not in place internationally, this measure takes the value of 0.

2. Is the banking supervisory agency independent from executives' influence? (0/1/2)

A banking supervisory agency's independence is ensured when the banking supervisory agency can resolve banks' problems without delays. Delays are often caused by the lack of autonomy of the banking supervisory agency, which is caused by political interference. For example, when the banking supervisory agency has to obtain approval from different

agencies such as the ministry of finance in revoking or suspending licenses of banks or liquidating banks' assets, or when the ultimate jurisdiction of the banking supervisory agency is the ministry of finance, it often causes delays in resolving banking problems.

In addition to the independence from political interference, the banking supervisory agency also has to be given enough power to resolve banks' problems promptly.

- Coded as 0 when the banking supervisory agency does not have an adequate legal framework to promptly intervene in banks' activities; and/or when there is the lack of legal framework for the independence of the supervisory agency such as the appointment and removal of the head of the banking supervisory agency; or the ultimate jurisdiction of the banking supervision is under the ministry of finance; or when a frequent turnover of the head of the supervisory agency is experienced.
- Coded as 1 when the objective supervisory agency is clearly defined and an adequate legal framework to resolve banking problems is provided (the revocation and the suspension of authorization of banks, liquidation of banks, and the removal of banks' executives, and so on) but potential problems remain concerning the independence of the banking supervisory agency (for example, when the ministry of finance may intervene into the banking supervision in such as case that the board of the banking supervisory agency board is chaired by the ministry of finance, although the fixed term of the board is ensured by law); or although clear legal objectives and legal independence are observed, the adequate legal framework for resolving problems is not well articulated.
- Coded as 2 when a legal framework for the objectives and the resolution of troubled banks is set up and if the banking supervisory agency is legally independent from the executive branch and actually not interfered with by the executive branch.

3. Does a banking supervisory agency conduct effective supervisions through on-site and off-site examinations? (0/1/2)

Conducting on-site and off-site examinations of banks is an important way to monitor banks' balance sheets.

- Coded as 0 when a country has no legal framework and practices of on-site and off-site examinations is not provided or when no on-site and off-site examinations are conducted.
- Coded as 1 when the legal framework of on-site and off-site examinations is set up and the banking supervision agency have conducted examinations but in an

ineffective or insufficient manner.

- Coded as 2 when the banking supervisory agency conducts effective and sophisticated examinations.

4. Does a country's banking supervisory agency cover all financial institutions without exception? (0/1)

If some kinds of banks are not exclusively supervised by the banking supervisory agency or if offshore intermediaries of banks are excluded from the supervision, the effectiveness of the banking supervision is seriously undermined.

- Coded as 1 when all banks are under supervision by supervisory agencies without exception.
- Coded as 0 if some kind of financial institutions are not exclusively supervised by the banking supervisory agency or are excluded from banking supervisory agency oversight.

These questions' scores are summed as follows:

Score of 6: highly regulated

Score between 4 and 5: largely regulated

Score between 2 and 3: less regulated

Score between 0 and 1: not regulated.

Table A3: Correlation matrix, dimensions of financial deregulation

	Credit controls	Interest rate	Entry barriers	Bank regulation	Privatiza tion	Capital account	Securities markets
Credit controls	1						
Interest rate	0,651	1					
Entry barriers	0,565	0,55	1				
Bank regulation	0,608	0,59	0,565	1			
Privatization	0,494	0,437	0,435	0,481	1		
Capital account	0,587	0,606	0,513	0,578	0,517	1	
Securities markets	0,624	0,628	0,545	0,642	0,492	0,676	1

Source: Abiad et al. (2010)

A6: Additional sources of the Top Marginal Tax Rate Dataset

Additional sources for specific countries, as described by Piketty et al. (2014):

Australia: Source is Atkinson and Leigh (2010).

Canada: The tax rates series were taken from and described in Saez and Veall (2007), in their long version from Appendix table E1, which considers the case of Ontario, the largest province.

Denmark: The information for the years before 1975 was obtained from Esben Schultz from income tax statistics.

Finland: The top tax rate data was provided by Markus Jantti based on income tax statistics published annually in Finland.

France: Source is Roine, Vlachos and Waldenstrom (2009).

Germany: Source is Roine, Vlachos and Waldenstrom (2009).

Ireland: tax rates for 1964-1971 obtained from Brian Nolan based on his compilation of individual income tax statistics (top tax rates for 1960-3 are assumed the same as those in 1964 for lack of better information).

Italy: The source is the chapter on top income shares in Italy by Alvaredo in Atkinson and Piketty (2010).

Japan: Local taxes were taken from the National Tax Administration data, as well as Moriguchi and Saez chapter on Japan in Atkinson and Piketty (2010). 57 Local tax rates were assumed to be constant from 1960 to 1975 (due to lack of better information).

Netherlands: The top tax rate data before 1975 was provided by Floris Zoutman based on internal income tax statistics at the ministry of finance in the Netherlands.

New Zealand: Source is Atkinson and Leigh (2010).

Norway: The top tax rate data was provided by Rolf Aaberge based on income tax statistics published annually in Norway.

Portugal: Source is the chapter by Alvaredo on top income shares in Portugal in Atkinson and Piketty (2010), appendix table 11.A.2.

Spain: Source is the chapter by Alvaredo and Saez on top income shares in Spain in Atkinson and Piketty (2010), appendix table 10.A.1. We use the maximum average tax rate of 50 percent (and then reduced to 44 percent) for the period 1960-1975.

Sweden: Source is Roine, Vlachos and Waldenstrom (2009).

Switzerland: Numbers obtained from Swiss annual income tax statistics.

United Kingdom: Source is Atkinson and Leigh (2010).

United States: Source for Federal top tax rate is the Tax Policy Center. The average state

tax rate is estimated using actual top statutory state income tax rates weighted by the fraction of high income tax returns in each state (as of 2007). We assume that state rates have not changed during the period 1960 to 1975.

A7: Additional regression tables

Table A4: Non-linear effects of financial deregulation and GDP per capita

	(1)	(2)	(3)
VARIABLES	Top 10	Top9	Top 1
GDPpc	0.202** (0.0994)	-0.111* (0.0922)	0.311*** (2.29e-08)
Interaction_FL	2.474 (1.586)	1.899** (0.0352)	0.674 (0.504)
Interaction_FM	1.799* (0.961)	1.254** (0.0245)	0.457 (0.442)
Interaction_FH	1.617* (0.954)	0.966* (0.0811)	0.646 (0.267)
KOFeco	0.0127 (0.0300)	0.00919 (0.598)	0.00543 (0.761)
KOFsoc	0.0520** (0.0232)	0.0417*** (0.00184)	0.00626 (0.645)
Marg tax	-6.000*** (1.578)	-0.751 (0.408)	-4.716*** (1.60e-06)
Observations	452	452	481
Number of wdi1	17	17	18

Robust p-values in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Note: controls included but hidden from table

A8: Share of explained variation

Table A5 shows the share of total variation explained by our explanatory variables for each specification separately.

A5: Explained change as a share of actual change (rounded)

	Top 10	Top 10-1	Top 1
Direct effect			
FE AR(1)	22%	29%	
Beck-Katz	14%	18%	
AB GMM	12%	21%	
Indirect effect			
FE AR(1)	8%	2%	9%
Beck-Katz	14%	8%	10%
Total effect =Direct effect + indirect effect			
FE AR(1)	30%	32%	
Beck-Katz	29%	25%	