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Abstract

This paper studies the developments in the income taxes of Sweden, the United Kingdom, and the United States during the first half of the twentieth century. We present the evolution of marginal and average effective tax rates, number of taxpayers, and income tax due over the whole income distribution, and calculate the corresponding indices of progressivity and redistribution.

Our results show that redistribution through the income tax increased during the period, but with varying intensity and mechanisms. During World War I this was a joint effect of increases in the amount of revenue collected (average effective tax rate) and progressivity, whereas during World War II revenue increased again but progressivity diminished, as the tax incorporated more low- and middle-income taxpayers. The income tax in the United Kingdom was always the most redistributive of the three, and after 1945 also the one that remained most progressive.

Keywords: Taxation, Redistribution, Progressivity, Income tax, World Wars
JEL codes: H23, H24, N42, N44

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1. Introduction

Income taxes are a central feature of modern Western fiscal systems. They provide a significant share of public income, represent a strong instrument for income redistribution, and are at the basis of the establishment of a "fiscal contract". They became one of the core components of the fiscal toolkit that emerged from the early decades of the twentieth century, at a time when progressive taxation was increasingly perceived as "fair" and "legitimate" (Scheve and Stasavage, 2016). Despite of the changes in political attitudes towards progressive fiscal policy in recent decades (Steinmo, 2003), income taxation still heads up revenue collection in many advanced countries.

In this paper, we present and discuss the operation of income taxes in Sweden, the United Kingdom, and the United States, during the first half of the twentieth century. These three countries have had income taxes for a long time: the United Kingdom was the pioneer in implementing a modern permanent tax on income in the mid nineteenth century; Sweden was one of the early followers in 1903, and the United States adopted such a tax right before World War I. This happened similarly in France, a case that will be added in following versions of the paper. While we do not claim that the experience of these four countries is representative of the history of Western income taxes, they are chosen for their correspondence with different welfare state regimes (Esping-Andersen, 1990). Sweden has been portrayed by most of the literature as the prototype of Scandinavian welfare state, with high social spending and low inequality, the two Anglo-Saxon countries belong to the so-called "Liberal" group (even if remarkable differences exist between the two of them), while France illustrates the Continental welfare state in the classic typology.

The paper looks at how income taxes developed throughout the first half of the twentieth century, when they experienced deep regulatory changes in relation to war, political mobilization, and economic and administrative modernization. This was the period when income taxes developed some of the main features that characterize modern taxation, such as progressive schemes and, later in time, broad tax bases. A growing body of literature has described and analysed some of the major innovations implemented at that time, such as the boost in top marginal tax rates (e.g., Scheve and Stasavage, 2016), the expansion of the tax to low and middle incomes (e.g., Whiting, 1990; Steinmo, 2003), and the evolution of administrative procedures (e.g., Daunton, 2002; Mehrotra, 2013). However, our knowledge is still rather limited when it comes to the impact that all these changes had on the distribution of

the tax burden across social groups. How did they alter the income taxes paid by households at different points of the income distribution? What was the evolution of tax progressivity and redistribution, and how did they differ across countries?

We attempt to provide an answer to these questions using the historical tax statistics and the tax regulations in place at that time. We make use of the method of Blanchet et al. (2017) to disaggregate the grouped income tax statistics, which allows us to work with a million synthetic observations per country-year, representing the income distribution in a manner similar to what modern microdata would do. We then proceed to micro-simulate the tax payments by applying the corresponding family deductions and statutory tax rates (as well as other country-relevant deductions and regulations). Our estimates of tax payments and effective rates of taxation tally closely with the original evidence in grouped terms, while they provide much richer distributive information.

In this version of the paper, we show complete results for the United States and the United Kingdom, while for Sweden an extension remains to be done (the incorporation of the local income tax). Redistribution through the income tax increased during the first half of the twentieth century, but with varying intensity and mechanisms. In the United Kingdom and the United States during World War I, this was a joint effect of increases in the amount of revenue collected (i.e., higher average tax rate) and progressivity, whereas during World War II revenue increased again but progressivity diminished, as the tax incorporated more low- and middle-income taxpayers. In the case of the United States, for which we have yearly data from 1917 to 1950, income tax redistribution and progressivity diminished during the 1920s. The policies implemented as a response to the Great Depression in the 1930s made up for part of this retrenchment and prepared the ground for the unprecedented spike in redistribution that took place during World War II. In fact, while the country began with the lowest level of income tax redistribution (because the tax was confined to a very small portion of the population), it experienced the highest growth in redistribution throughout the period, more than twentyfold from 1917 to 1946.

The income tax in the United Kingdom, on the other hand, was always the most redistributive of the three, and after 1945 also the one that remained most progressive. Sweden, by contrast, had a systematically broader tax base than the two Anglo-Saxon countries: it was already collecting income tax revenue from almost a fourth of its population in the early 1910s, and more than a half by the early 1920s. This seems consistent with some appreciations made by previous literature on the nexus between low progressivity and the

attainment of redistribution via social spending (Lindert, 2004; Prasad and Deng, 2009). Our study of income taxes is part of a wider research agenda in which we attempt to look at the progressivity of the tax system in general, and its relationship with the development of welfare states.

The paper proceeds as follows. The next section introduces the previous literature on fiscal progressivity and redistribution during the early 20th century, while the third one presents a brief overview of the history of income taxes in our countries of interest. The fourth section discusses the methods and data, and the fifth one presents our results. The last section concludes.

2.   Previous literature

A burgeoning literature has discussed the relationship between fiscal progressivity and the development of welfare states. One of the starting points for this discussion was Steinmo's realization that the Swedish tax system looked less progressive than that of the United States in the late 20th century, even though Sweden was the champion of equality and redistribution at the time (Steinmo, 1993). Several authors have since then concluded that highly redistributive welfare systems (i.e., those that attain the largest reductions in inequality) are mostly funded by regressive taxation, such as consumption taxes or social contributions. The causes of this finding remain open for discussion: while, according to Steinmo, the origin was to be found in different political institutions (particularly, Swedish corporatism), other authors have argued that progressive taxes could trigger political opposition or have adverse economic consequences, and have been therefore considered ineffective instruments for redistribution (Wilensky, 2002; Lindert, 2004; Kato, 2003; Beramendi and Rueda, 2007). Timmons (2005) crucially contributed to this debate by advancing the idea of a "fiscal contract", a correspondence between taxpayers and beneficiaries of public spending that would lead governments to finance social expenditure through regressive taxes.

Many of these studies, however, have been based on comparisons of revenue structures or tax rates across countries. In an important step forward, more recent work has entered the realm of microdata and distributive analysis, providing evaluations of how public finances impact households at different income levels, and thus how they affect inequality. For example, Prasad and Deng (2009) confirmed the contrast between the United States and several European countries in 1979-2000, with the former attaining lower levels of

redistribution despite having a more progressive tax system. A similar conclusion can be reached by comparing the operation of US taxes in Piketty and Saez (2007) with that of the Swedish tax system as obtained by Bengtsson et al. (2016) or Lantz (2021). Torregrosa-Hetland (2015) showed that reforms in Spain during the period 1960-1990 reduced tax regressivity and funded increases in social spending, but without converging with the European core in redistribution levels.

Despite of all these recent advancements, most of the literature has dealt with these issues mostly for the decades after 1970, often due to the lack of available data for earlier periods. Hence, some important questions remain unanswered: would similar insights extend to the past, into the historical origins of current welfare systems? Or, alternatively, did welfare systems that were eventually more successful at redistribution start off as more progressive as well? To answer them, we need to look closely at what happened during the first half of the 20th century, a period characterized by the introduction and expansion of income taxes.[4] In this paper we focus on this specific type of tax, which might be thought of as a central component of the fiscal contract. Its early development could make systems more progressive at the same time that it facilitated the strengthening of fiscal citizenship and steered public spending demands.

Income taxes have been indeed one of the most important features of modern fiscal systems. They not only provide a high share of public revenues today in many developed countries, but also play a fundamental role in redistribution. While most of redistribution since the 1970s is traceable to social spending, a non-negligible part of it is also due to the direct effects of income taxes on the income distribution (Jesuit and Mahler, 2017). Indeed, the income tax is normally the only tax with a relevant impact on income inequality by itself, as most other progressive taxes are too small to play a significant role. Moreover, it has been argued that they can also influence pre-tax income inequality through their effects on incentives for economic activity (Roine et al., 2009) and tax planning (Rubolino and Waldenström, 2020).

For many authors, the introduction of modern income taxes in the nineteenth and twentieth centuries was related to representative government and suffrage extension, as part of a progressive program (e.g., Piketty, 2001; Acemoglu and Robinson, 2006; Mehrotra, 2013). However, even though they came to be important redistributive instruments in modern times,

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[4] The growth of the other major tax components of modern fiscal states, such as social contributions and value added taxes, is mostly a phenomenon of the second half of the century.

some have argued that they were not originally conceived as such. According to Mares and Queralt (2015), the introduction of income taxes in the nineteenth and early-twentieth centuries was often supported by conservative agrarian forces, as it allowed to shift the tax burden to the rising industrial sector. Similar insights have been recently provided by Beramendi et al. (2019) and Emmanegger et al. (2019), who emphasize the importance of inter-elite competition and industrialization in the process of implementation of modern income taxation. In the same vein, Aidt and Jensen (2009) show evidence that, in Western countries, the extension of the franchise first had in fact a negative impact on the likelihood of income tax adoption, since those getting the vote were potential taxpayers. It was only at higher levels that suffrage exerted a positive influence, when those getting the vote were not potential taxpayers due to their low incomes.

Alongside these institutional and structural factors, the early expansion of income taxes was often linked to revenue needs and war mobilization. For example, Rodriguez (1981) held that progressive income taxation in Sweden was introduced and reinforced in order to meet the demand for defense spending, similarly to what Witte (1985) posited for the case of the United States. From a different angle, Scheve and Stasavage (2016) argued that increases in income and inheritance taxes were the result of social solidarity during the World Wars, as governments tried to compensate the battle efforts of the working class by taxing the rich.[5] Morgan and Prasad (2009) also acknowledged the role of World War I in the expansion of income taxes in France and the United States, but qualified this association by looking at patterns of industrialization and the growth of the state: while an advanced industrial economy and a small federal state favored a political coalition of farmers and labor in support of income taxes, the opposite situation steered France towards indirect taxation. A related argument is put forward by Limberg (2020), who argues that banking crises facilitated the adoption of personal income taxes because of both the associated revenue needs and demands for fiscal fairness.

All in all, while the account of the history of income taxes is extensive, there is one crucial aspect that remains understudied: we hardly have quantitative estimations of how tax payments were distributed, and how they impacted on inequality. This is essential to grasp the actual redistributive effects of income taxation, and to further advance our understanding on the origins of modern fiscal and welfare states. The paper is dedicated to filling this gap.

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[5] Haffert (2019) has recently argued that this effect was conditional on the destruction of capital stock of the economy.

3.   The history of income taxes in Sweden, the United Kingdom and the United States

The nineteenth century witnessed the initial development of one of the most relevant fiscal instruments of the modern era, the income tax. The first attempts to introduce a tax on earned incomes took place during the Revolutionary Wars and the Napoleonic Wars amid the unprecedented mobilization of manpower and economic resources. The Austrian Empire, Belgium, Denmark, France, the Netherlands, Norway, and the United Kingdom, all adopted some sort of modern income tax, albeit temporarily; at the end of the military conflicts, all countries returned to their previous fiscal systems. It was not until 1842, under the leadership of the conservative Prime Minister Robert Peel, that a new and permanent tax on earned incomes was introduced in the United Kingdom. Modern income taxes were shortly after adopted by other European and Western countries, making the income tax a "lasting feature of the tax system" (Aidt and Jensen, 2009, 162).

The early income tax in the United Kingdom was a schedular tax, meaning that incomes from different origins were assessed and reported separately. In 1909 a complementary "supertax" was introduced, which affected very wealthy taxpayers and entailed the declaration of their combined income from all sources. In this same year, family deductions for taxpayers with children came into play. A couple of years earlier, in 1907, the tax also began to differentiate between the so-called earned income (i.e., labour income) and unearned income (i.e., capital income), the latter being subject to higher marginal tax rates (HMSO, 1920). Prior to these reforms, graduation was largely confined to exemption limits and abatements for low and middle incomes.[6]

The Swedish predecessor of the modern income tax was implemented in 1903, as the central feature of a major tax reform. The Minister of Finance defended this new fiscal agenda on the grounds that "there can be no question that future revenue lays in the progressive income tax" (Steinmo, 1993, 64). This first Swedish income tax was only slightly progressive, with rates ranging from 1% to 5%, but it rapidly became an important source of revenue. The preceding system already included some taxes on labour and capital incomes, with a rate

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[6] Before the 1907 reform, there was only one income tax rate. Progressivity was achieved through a system of so-called 'abatements' that exempted low and middle incomes from paying the tax (a summary of the standard tax rate and abatements in place from 1896/97 to 1906/07 can be found in the 50th Report of the Commissioners of His Majesty's Inland Revenue, Table CLXVII, p. 189). Reduced marginal tax rates for middle-income taxpayers were enacted sporadically during the nineteenth century, such as during the Crimean War in 1853/54.

generally set at 1%, which were transformed into local revenues by a new reform in 1911. At the same time, the progressivity of the income tax was increased, notably by including an assessment of wealth in the tax base (Stenkula, Johansson and Du Rietz, 2014; Henrekson and Stenkula, 2015).

By contrast, the United States had to wait until 1913 to implement a permanent income tax, even if the country had flirted with this idea since the outbreak of the War of 1812. A temporary federal income tax came into force in 1861 during the Civil War, followed by the attempt in 1894 of enacting a permanent progressive income tax amid a severe economic crisis. The latter came as a result of a quest for a fairer fiscal and social order by Western and Southern Populists, which eventually influenced the position of the Democratic Party to their favour (Brownlee, 2016). The subsequent Supreme Court's ruling of unconstitutionality, though, delayed the enactment of such a controversial tax for almost twenty more years. The permanent federal income tax was finally adopted just before the outburst of World War I, when support for this measure had grown across the political spectrum and a constitutional amendment legalizing a federal income tax had been ratified by a majority of state legislatures (Brownlee, 2016; Mehrotra, 2013).

The adoption of these first income taxes was not trivial; the year after enacting them, the percentage of direct taxes over central government revenues increased by 7 percentage points for the early adopters (Mares and Queralt, 2015). However, they were certainly minor in revenue terms by contemporary standards. At the end of the 19th century most states collected less than 10% of GDP from all their sources of revenue combined (Steinmo, 2003; Goenaga et al., 2018), and top marginal tax rates (those applying to the highest income category) were also rather limited, not exceeding 10% (Scheve and Stasavage, 2016). Indeed, the British historical experience exemplifies the extent to which the tax was not even acknowledged as a permanent part of the revenue system by the major parliamentary parties, as governments consistently reaffirmed their commitment to abolish it "as soon as revenue considerations permitted" (Steinmo, 1993, 55).

The two World Wars fundamentally altered the tax systems of most Western countries. Scheve and Stasavage (2016) argue that the unprecedented mobilization of manpower created the conditions to tax the rich as never before: if labour was to be conscripted, the rich had to be taxed more heavily in order to compensate the unequal distribution of the military burden. This was done through the income tax, as well as through other means, like excess profits taxes and estate taxes. As a result, in both the United

Kingdom and the United States the share of direct taxes increased during the conflicts (Daunton, 2002; Broadberry and Howlett, 2005; Rockoff, 2012; Brownlee, 2016). Other authors have emphasized revenue considerations as the driving force behind the surge in the top rates: a relatively easy way to raise taxes was to touch on the ability to pay of the wealthy, who concentrated very significant shares of total income in this period. For example, Witte (1985) argues that revenue demands rather than redistributive concerns were at the heart of wartime tax reforms in the United States during World War I.[7] A parallel opinion is voiced about the Swedish case by Rodriguez (1981), who states that the main reason for relying on the income tax, and therefore on progressive taxation, was its effectiveness in generating revenue increases, mainly for defense spending.

The extent of these changes can be observed in Figure 1, which displays the evolution of marginal income tax rates from ca. 1900 to ca. 1960. The two World Wars pushed the top marginal rates up to unprecedented levels, climbing above 90% in the United Kingdom and the United States during World War II. In all places, the distance between top and bottom marginal tax rates grew, which suggests increasing progressivity. At the same time, World War I gave rise to an increasing number of tax brackets, most notably in the United States.

Even in a non-belligerent country like Sweden, renewed military efforts required substantial state revenues and income taxes rose significantly throughout the period. Temporary defence taxes were enacted during the two World Wars and were made permanent in their aftermath. As a consequence, the marginal tax rate for low-income earners at the end of World War II almost tripled compared to the pre-war levels, while the rates for high-income earners increased more than threefold in the same time span (Du Rietz, Johansson, and Stenkula, 2015). The impact of the wars was, nevertheless, more moderate than in the United Kingdom or the United States, and marginal rates did not soar as much as in belligerent countries (Steinmo, 1993).

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[7] Relatedly, Gilbert (1970, p. 87) discusses the debate of McAdoo's 1917 plan, underlining that equity considerations were normally thought with respect to future generations or returning soldiers (i.e., in contrasting taxes versus loans).

Figure 1. Marginal tax rates and number of brackets (1900-1960)
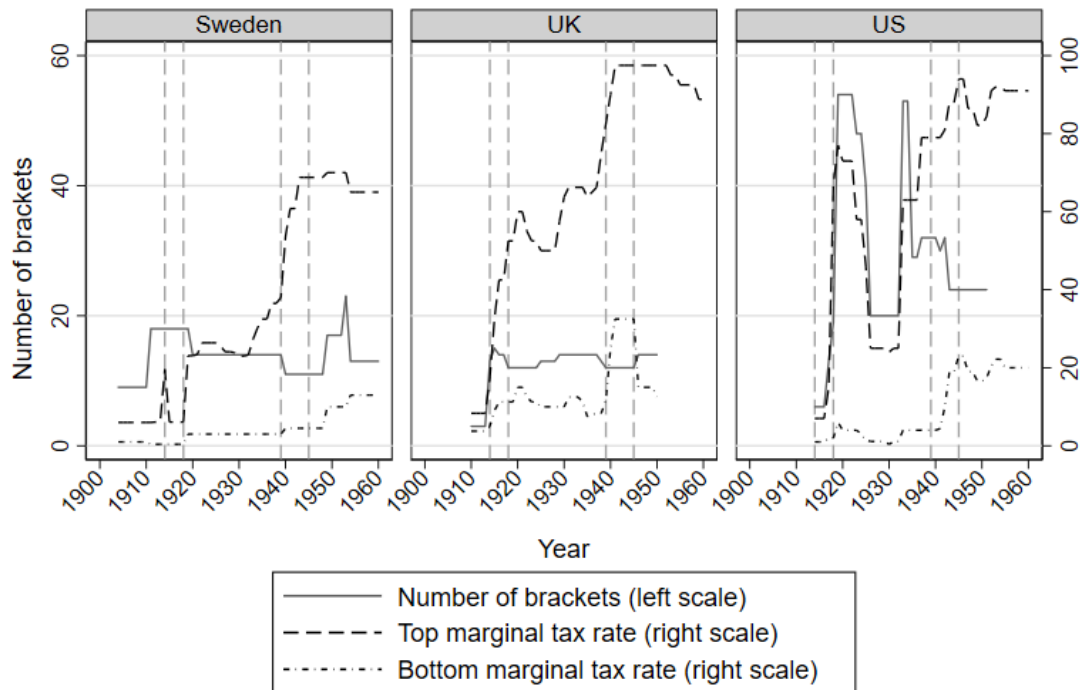
Sources: Sweden from Henrekson and Stenkula (2015), US from *Statistics of Income* (1945), and UK from Scheve and Stasavage (2016) and own calculations from *Reports of the Commissioners...*
Notes: Bottom marginal tax rates in the United Kingdom after 1920 reflect the tax rate relief established as a percentage of the standard tax rate. For instance, The Financial Act of 1931 modified the previous relief from five-ninths of the standard rate on the first £250 of taxable income to one-half of the standard rate on the first £175 (which was equivalent to 12.5%). Prior to the 1920 reform, the figure shows the lowest tax rate on earned income (the lowest rate on unearned income was higher). The number of tax brackets in this same country include not just the income tax rates and surtax rates, but also the reduced rates in place since 1920.

It is however noteworthy that while top marginal rates escalated in the United States during the wars, some deductions were also introduced. All deductions, exemptions, and cases of special treatment for specific incomes create a wedge between total income and taxable income, and therefore affect the distribution of the tax burden across income levels. Several of the many deductions in the US income tax have been said to specially benefit the rich: this was the case of the deduction for charitable donations created in 1917 (Lindsey, 2003; Thorndike, 2013b), the exemption of interest income from Liberty Bonds (Kang and Rockoff, 2015), and the reduced rates applied to capital gains. Deductions for these concepts (that were also in place during World War II) mitigated the impact that the rise in top marginal tax rates had on high incomes, and some of them will be considered in our calculation of effective tax rates and tax progressivity (see next sections). The combination of very high marginal rates at

the top and generous deductions was a vehicle for tax avoidance by the rich.[8] As such, the reforms of the 1920s pushed forward by the Secretary of the Treasure Andrew Mellon, which reduced the top marginal tax rates, have been interpreted not only as a conservative or "return-to-normal" policy, but also as an attempt to reduce tax avoidance (Smiley and Keehn, 1995).[9]

The Great Depression brought about another wave of fiscal reforms in the three countries. After a period of retrenchment in the United States in the 1920s, the large deficits generated by Hoover's expansive policy in the aftermath of the Great Crash of 1929 led the way to staggering income tax increases. Top marginal tax rates surged to similar levels than in World War I (above 60 percent), while the number of tax brackets boosted (albeit temporarily) and bottom tax rates witnessed a milder increase. These reforms, however, could not fully compensate for the erosion of the tax base caused by the economic crisis, and income tax revenue as a share of total public revenue fell during the early 1930s (Brownlee, 2016; see also Figure 3 below). Top marginal tax rates were further increased by the Roosevelt administration as part of the comprehensive 1935 tax reform, which left the top income tax rate above the levels reached during World War I. Despite of the political tensions that the New Deal tax reforms generated, marginal tax rates did not recede before the outbreak of World War II.

The Great Depression also left an imprint on British fiscal policy. The Labour government, under the leadership of chancellor Philip Snowden, increased top tax rates during three consecutive years from 1929 to 1931.[10] At the same time, the rise in the standard rate and the reduction in family deductions increased the tax burden on middle incomes (Daunton, 2002). This expansionary fiscal policy was stalled and partially reversed in the subsequent years by the National Government, with most of the measures aimed at reducing the fiscal pressure on middle incomes (such as cutting down the bottom rates, as shown in Figure 1). The rise in top marginal tax rates was largely sustained until World War II, when the military needs build up again the pressure on the fiscal system of most countries.

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[8] Similarly, in Sweden after the Second World War it was recognized that deductions and avoidance opportunities contributed to reducing the taxable incomes of the more affluent: *"The use of deductions for various types of insurance premiums, as well as the breakdown of capital income through the division of wealth across several family members, and the enjoyment of fringe benefits (cars, travel, etc.) instead of cash payments"* (translated by the authors from Hagstroem, 1949, p. 41).

[9] With lower marginal tax rates, the amount of tax payment avoided by a given deduction in the tax base is reduced.

[10] Since sur-tax for 1929/30 was assessed in 1930/31, the increase in top marginal tax rates for 1929/30 was enacted by the 1930 Financial Act (74th Report of the Commissioners, 1932).

In Sweden, the number of brackets was left unchanged during the thirties, and so was the bottom marginal tax rate. Marginal rates at the top, however, escalated quite markedly. This was due to the introduction of an extra income tax in 1932 for incomes above 6,000 krs, and a general increase in tax rates in the middle of the decade. The rates in the standard income tax were also raised in the aftermath of the Great Depression, by setting a higher multiplier, which the Parliament had the power to change annually in response to revenue needs (Du Rietz, Johansson, and Stenkula, 2015).

The two World Wars also affected exemption limits profoundly, as they were reduced in the three countries by war finance regulations: in the United States, the personal exemption for single persons lied at 3,000$ in 1914, and dropped to 1,000$ in 1918. In Sweden the threshold had been at 1,000kr since 1904, and was reduced to 800kr in 1912, while in the United Kingdom it went from 160£ to 130£ in 1915.[11] Similarly, during World War II the exemption for singles in the United States went from 1,000$ (1939) to 500$ (1943). The threshold in the United Kingdom was also reduced during the early years of the conflict (from 125£ in 1939 to 110£ in 1941), whereas in Sweden it was kept at 600kr throughout the war.[12] These reductions in the legislation of income taxes were reinforced by the effects of war inflation, resulting in much more intense reductions of the real value of the thresholds (Torregrosa-Hetland and Sabaté, 2019). After World War II, tax thresholds were in all countries below average per capita GDP.

Because of this, the share of taxpayers in the population increased significantly during or in the immediate aftermath of the two World Wars (see Figure 2). Millions of citizens previously relieved from the income tax owing to their low earnings started paying it during these episodes – sometimes, even if their purchasing power had not increased accordingly (Torregrosa-Hetland and Sabaté, 2019). The number of tax returns soared in the United States from 358,000 in 1914 to 7.3 million in 1921, while it went from 742,000 in 1913 to over 2 million in 1921 in Sweden, and from 1.2 to 5.5 million in the United Kingdom during the same period. Although the 1920s witnessed a period of retrenchment, particularly in the United Kingdom and the United States, the number of taxpayers did not go down to the

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[11] In Sweden (before 1920) and in the United Kingdom the tax thresholds (obligation to make a return) did not represent an exempted fraction of income, although in the United Kingdom most of the income below the threshold was exempted through the operation of personal deductions.

[12] The exemption limits discussed in the text correspond to single persons. Deductions for spouses, when they existed (they were introduced during or after World War I in the United Kingdom and Sweden), also affected the level of income at which couples started paying the tax. These deductions for spouses were reduced in the United States during World War I, and in both Anglo-saxon countries during World War II.

pre-war levels. In the United Kingdom, the Great Depression brought in a new expansion of taxpayers through a significant reduction in family deductions (as mentioned above).

Even though the erosion of the exemption limits was less pronounced during World War II, the increase in the number of taxpayers was even more dramatic: almost 40 million households started paying the income tax in the United States at some point between 1939 and 1945, and more than 10 million in the United Kingdom. As Steinmo put it, what once was a "class tax" had been transformed in a few years into a "mass tax" (Steinmo, 2003). The Anglo-Saxon countries passed the 50% of the population during World War II, while in Sweden this had already taken place in the 1920s; in all countries over 75 percent of the population was filing income tax returns by 1950.

Figure 2. Share of tax returns and taxpayers in the population (1900-1960)
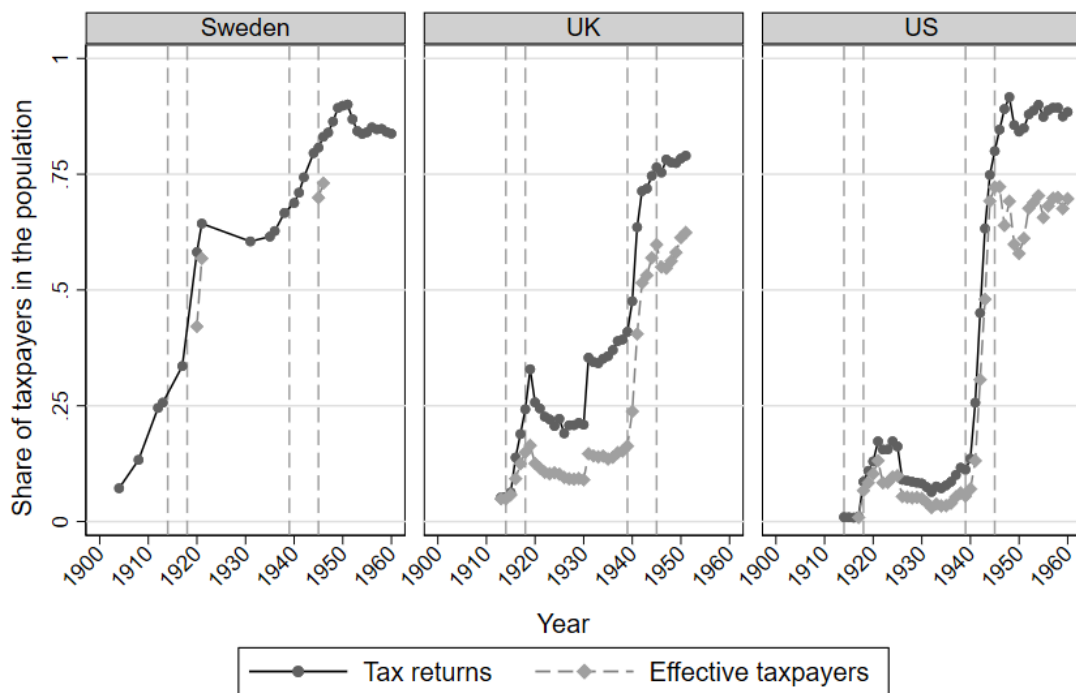
Sources: Sweden from *Taxeringen...* and Henrekson and Stenkula (2015), US from *Statistics of Income* (1945), and UK from *Reports of the Commissioners...* Total population (tax units) from World Wealth and Income Database.
Notes: effective taxpayers are defined as tax returns with positive tax due. In Sweden, the sources do not provide a series of effective taxpayers: the values shown are derived from our calculations. Before 1920, given the absence of an exempted threshold, the number would be very close to that of tax returns. For the total population (number of tax units), we use the series of the World Wealth and Income Database. These are defined as adult population – married women, since in this period joint filing was the norm. In our further simulations for the United States, we use a series adjusted for the number of married women who effectively filed a separate return (see Torregrosa-Hetland and Sabaté, 2021), but we show here the original one for consistency between countries. The difference is so small that it would not be visible in the figure.

Because of all these changes, income tax revenue as a share of GDP increased substantially, particularly during World War II (see Figure 3, grey line), and also as a share of total public revenue (dark line in Figure 3). As has been already described elsewhere (e.g., Peacock and Wiseman, 1961; Rasler and Thompson, 1985; Sabaté, 2016), public revenues did not return to pre-war levels in the aftermath of the two military conflicts. The evolution of the income tax followed, unsurprisingly, a similar pattern: even if progressive taxation was attenuated soon after the end of the two military conflicts, wartime reforms had expanded the scale and scope of the income tax irreversibly.

Figure 3. Income tax as a share of GDP and total tax revenue (1900-1960)
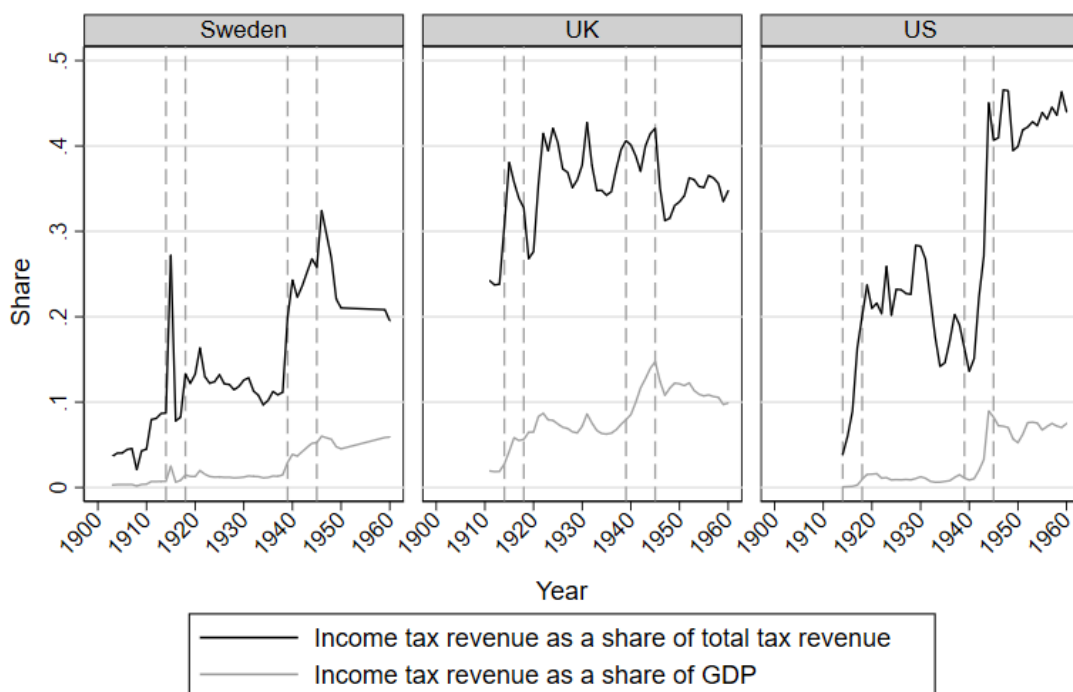
Sources: GDP from Measuring Worth (UK and US) and Schön and Krantz (2015) (Sweden). Income tax revenue from Office of Management and budget, Historical tables (US), *Reports of the Commissioners…* (UK), *Taxeringen…* and Statistical Yearbooks (Sweden). Total tax revenue (federal income tax) from Office of Management and budget and Historical tables (US). Income tax revenue as a share of total central government revenue from Thomas and Dimsdale (2017) (UK). The Swedish total tax revenue data has been kindly provided by Magnus Henrekson and Mikael Stenkula.
Note: The Swedish income tax revenue refers only to the central state tax.

4. Methods and data

In this paper, we estimate the distribution of tax payments across the population of these three countries over the first half of the twentieth century. Departing from original tax statistics and the official regulations, we micro-simulate the tax dues paid by taxpayers at different points of the income distribution. With this, we estimate their effective tax rates, and the corresponding indices of progressivity and redistribution. This section describes our data and methods.[13]

We use the original tax statistics compiled by tax administrations and statistical agencies, which provide the distributions of income, tax returns, and (for some years) tax due. The most complete series exist for the United States, in which the data are available yearly since 1914 (although some information is not available before 1917).[14] In Sweden and the United Kingdom the series are limited to narrower periods. In the former, data is available (from diverse sources) for some years at irregular intervals; the paper draws from estimates for 1912, 1913, 1917, 1920, 1921, 1945, and 1946 (further versions will incorporate some additional estimates, particularly for the 1930s). In the United Kingdom, the distribution of income was only compiled by the Commissioners of the Inland Revenue right before and after the World Wars (1911/12, 1919/20, 1937/38 and 1949/50), and therefore we can only estimate effective tax rates and indices of progressivity and redistribution for those years.[15]

These data are generally limited to tax units that filled the income tax form for the tax authorities and their corresponding reported incomes, so it lacks information on the number of people exempted, as well as their income. To fill this gap (in order to have total population as the reference throughout), we gathered information on the total income and the total number of tax units (individuals or families that are considered one unit for the purpose

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[13] A more detailed account, with country-specific sources, adjustments and calculations, can be found in our methodological notes (Torregrosa-Hetland and Sabaté, 2021).

[14] Our account and the data we use for the United States only correspond to the federal income tax. A majority of the states introduced additional personal income taxes during the twentieth century, and most of them did so in the period prior to 1940. Two states actually had income taxes *before* the enactment of the federal tax: Wisconsin since 1911 and Mississippi since 1912 (Dincecco and Troiano, 2015; Penniman, 1980). We cannot, however, include these state taxes in our analysis because it would make the calculations too complex, given that each state had its own rules for the state income tax (tax base definition, allowances, rates, etc.).

[15] The data for 1937/38 and for the WWII benchmarks come from several Reports of the Commissioners of Inland Revenue complemented by Scott and Walker (2020), and for 1911/12 directly from Scott and Walker (2020). Estimates of the distribution of income were also compiled for the fiscal years 1938/39 and 1948/49, but we prefer the benchmarks when the proper special investigations by the Comissioners were conducted. See more details in Torregrosa-Hetland and Sabaté (2021). Our post-WWII benchmark is however more distant from the end of the war than in the other countries, which implies that our estimates pick up the fiscal reforms implemented during the late 1940s. This is particularly relevant in terms of marginal tax rates for incomes below £12.000, which had decreased compared to the levels of 1945/46 (at the same time, most allowances had increased since the end of the war).

of income tax, including those with incomes below the exemption limits). These data come from various works in the top incomes literature (Piketty and Saez, 2003; Atkinson, 2007; Roine and Waldenström, 2008). The residual between total income of all tax units in the economy and income assessed by the tax authorities corresponds to exempted income, whereas the analogous residual between total number of tax units and tax returns is the number of tax units exempted.[16]

The aforementioned distributions of income are grouped in the sources by income levels that generally do not coincide with those of the brackets in the tax schedules, and also change across countries and over the years. For instance, the distribution of the tax base and tax due in the United Kingdom in 1937/38 is based on 24 income levels ranging from a minimum of £200 to over £50,000, whereas in 1949/50 the same information is divided in 12 levels which span from £135 to over £20,000. On the other hand, the tax schedule is divided in 13 brackets ranging from £125 to over £50,000 in 1937/38, and in 12 brackets from £135 to over £20,000 in 1949/50 (that do not coincide, however, with the 12 income levels in the distribution of the tax base and tax due mentioned above). Thus, in order to make calculations comparable across countries and over time, and to illustrate the distribution of tax rates over the whole population, we first need to disaggregate and create a synthetic sample of taxpayers from which we can later select the quantiles of interest. To do so, we follow the recent method and software developed by Blanchet et al. (2017).

Blanchet et al.'s method disaggregates data from grouped statistics, such as cumulative income shares, and has been devised precisely for tax data. The procedure generates a synthetic sample consistent in mean and distribution with the original grouped information inputted (cumulative share of tax returns and total income for each income bracket, as well as the total average income), using the properties of the Pareto coefficients. The resulting samples contain 1 million equally weighted observations for each year; a number high enough to capture the high variability present in the upper part of the income distribution. These synthetic samples are consistent with the original data in terms of number of units and average incomes in each bracket.[17]

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[16] Note that the residual might also include incomes not reported by those who filed returns (fraud) and it is therefore only an approximation of the revenues of the exempted population.
[17] Tables and figures comparing our synthetic sample with the original data can be found in Torregrosa-Hetland and Sabaté (2021).

Once the synthetic sample has been generated, we apply the regulations in force to simulate the operation of the tax.[18] We estimate tax payments for each observation (one million, each representing average income in its quantile). Incomes in the original source follow the legal definition of the tax base, which normally corresponds to gross income (total amount originally received by the tax unit) excluding deductions for the associated costs (for instance, housing repairs).

Our first step is to deduct family deductions from the tax base to obtain taxable income. These are personal deductions made for the taxpayer, and his spouse and children when present. Indeed, income taxes were generally a family matter until well into the second half of the twentieth century. Married women in Sweden were not allowed to file returns separately from their husbands until 1971. In the United Kingdom, married women could submit separate income tax declarations since 1914, but this did not affect the total amount paid by the couple (which was still based on both incomes combined). The possibility to have the two incomes assessed separately did not come, as in Sweden, until 1971. In the United States, on the contrary, separate returns could be filed, but the number of married women doing so was very low throughout the period considered here: an average of 2.5% of total tax returns between 1917 and 1946 (nevertheless, we have adjusted for this separate filing in our estimations). The implications of these regulations, as well as the treatment of children, will be taken up in future work.

Since family deductions depend on family circumstances, we generate eight synthetic taxpayer types within each observation: singles and couples, with zero, one, two, or three or more children, and we apply to each the corresponding deduction to their tax base. These deductions were by far the most important quantitatively, but we also include others of particular significance for the different countries, such as deductions for charitable donations, interests, and others in the United States, for earned income in the United Kingdom, and for differences in cost of living in Sweden.[19]

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[18] To our knowledge, this has been done very few times in previous literature. One notable precedent is Piketty (2001, see methodology in annex B.3), who did similar calculations for France.

[19] The deductions in the United States are not simulated at the tax unit level, but imputed using a regression with the data by income level groups in Geloso et al. (2018) – see the methodological notes for more information. In the United Kingdom, we take into account the so-called "earned income allowance", which allowed taxpayers to deduct a percentage of their earned income (in contrast with the so-called "unearned income" or "investment income"). This deduction amounted to about 20-30% of personal and family deductions during the 1930s and 1940s. In Sweden, we take into account the different family deductions given for the cost of living (*ortsavdrag*), using the distribution of taxpayers in five different city groups according to their price levels. This system was introduced in the 1920 tax reform.

Once we have the taxable income of each synthetic taxpayer, we apply the statutory tax rates of the legal tax schedule and obtain the corresponding tax due. After this, we calculate the average tax due for each income level as a weighted average of the different family types (recall that we have 1 million observations, each representing a different income level).[20] Figure 4 summarizes this procedure.

Figure 4. Estimating income tax payments
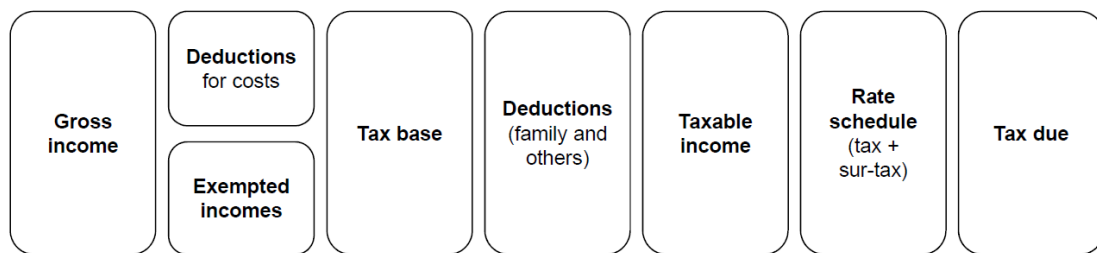
Source: Authors' elaboration.

Finally, we find the effective income tax rate for each observation by dividing the tax due by its tax base. When calculated in grouped form (i.e., total tax due of taxpayers in each income bracket, divided by the total income of the same group), these effective tax rates are largely consistent with those provided or obtainable from the tax statistics (see Torregrosa-Hetland and Sabaté, 2021). The main differences are mostly found at the upper part of the income distribution, where the groups in the original statistics are defined very narrowly (sometimes accounting for merely hundreds or even dozens of taxpayers). This tiny size renders the estimates less precise. The comparison, overall, suggests that our estimations are a reasonable depiction of the original tax data provided by the tax authorities.

Effective tax rates are a good illustration of the distributive impacts of an income tax. They show us which percentage of their income was paid in taxes by families in different income levels. When effective tax rates are increasing in income, the tax is progressive – but progressivity might be very strong at some points of the distribution and very weak, or non-existent, at others. Importantly, progressivity does not only arise because of graduated tax rates; it is also influenced by the operation of all types of deductions. Even if we perform all

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[20] The information on the distribution by family types comes from the tax statistics themselves. We complement it with data from the Swedish Census of 1945 (*Folkräkningen 1945*). The same family distributions (weights) have been used over several years, since there is no yearly information and this feature does not experience abrupt changes; Piketty (2001) followed the same approach for 1915-44.

calculations with the million observations, in the results section we focus on average effective tax rates by percentiles and permilles of the population (calculated as a simple averages).

We also estimate synthetic indicators of progressivity and redistribution. In order to be consistent with modern practice using present-day income tax data, we follow the general framework in public economics, which is based on concentration curves (Kakwani, 1977; Lambert, 2001; Boadway and Keen, 2000). Progressivity and redistribution are two closely related concepts, but they are not interchangeable. As was said above, a tax is *progressive* if the effective tax rates are increasing in income, which can also be expressed as tax payments being more concentrated than income. *Redistribution* refers to the effected change in inequality, which depends on progressivity but also on the size of taxation (i.e., a very concentrated tax might not reduce inequality much if it raises limited revenue). In this framework, we measure progressivity using the Kakwani index, which is obtained as the difference between the concentration of tax payments C_T and the Gini index of gross incomes G_Y:

$$K = C_T - G_Y \tag{1}$$

The index equals 0 when the tax is proportional (i.e., where tax payments are concentrated to the same extent as incomes), and gets positive values when the tax is progressive.[21]

Redistribution is measured with the Reynolds-Smolensky index, which corresponds to the difference between the Gini indices of gross and net incomes (i.e., before and after tax):

$$RS = G_Y - G_{Y-T} \tag{2}$$

A tax is redistributive if RS > 0. For these calculations, we use the 'progres' stata module developed by Peichl and van Kerm (2007). The relationship between these indices is given by the expression:

$$RS = [\frac{aetr}{(1-aetr)} K] - RR \tag{3}$$

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[21] Because it takes the concentration of gross income into account, this measure of progressivity varies with inequality. A similarly concentrated tax (across the population) would be more concentrated (across income) if combined with a less unequal distribution of the tax base.

where RR is the effect of re-ranking between tax units. Redistribution by the income tax is thus positively affected by progressivity (K) and the average effective rate on total income (aetr = total tax revenue / total tax base). The intuition behind this equation is straightforward. On the one hand, higher levels of progressivity reflect a skewed tax burden falling upon the shoulders of upper income groups, which translates into a levelling of the income distribution. On the other hand, the average effective tax rate reflects the amount of revenue collected by the income tax: the higher the amount extracted from the economy, the more impact the tax will have on the distribution of income. All in all, redistribution might increase as a result of higher levels of progressivity, higher average effective tax rates, or both. We could imagine a situation in which progressivity decreases and redistribution increases (we would just need the average effective tax rates to be on the rise enough so as to compensate the first effect), or a parallel case in which redistribution comes with shrinking revenue collection (as long as progressivity increases). In the following sections, we will discuss not just the variation in total redistribution during the period, but also the relative importance of progressivity and amount of revenue in understanding its historical evolution.

5.   Results

5.1.   Marginal tax rates

Figure 5 presents the average marginal tax rates by percentiles of the income distribution, focusing on the changes experienced through both World Wars. These were the two periods with some of the most important fiscal changes of the first half of the century, and for which we have the best coverage across our sample of countries. The very high marginal tax rates imposed upon high earnings during World War I in the United States (63 and 65% of income in the Revenue Acts of 1917 and 1918 respectively) only affected a tiny segment of the most affluent citizens. Before these reforms, the top 1 percent of the population was facing marginal rates of 2.2%, whereas the top permille was charged at the margin at 4.6%. By 1919, when the progressivity of the income tax was at its maximum, the marginal tax rate imposed upon the top 1 percent had increased to 16%, and soared to 36% at the top permille.

The marginal tax rates at the top in Sweden increased less than in the United States, from an average of 3.6% in 1912 to 7.6% in 1920 for the top percentile (5.1% to 12.8% in the top permille). These higher rates, in any case, were also confined to the very wealthy. The

main development in the period was the widening of the tax base. A major reform in 1920 consolidated the "temporary" tax increases of the war period, instituting a system where the majority of the taxpaying population faced the same marginal rate. A widening tax base can also be found in the United Kingdom at the end of World War I; even if it did not go as far, the expansion was larger. Interestingly, both the highest and the lowest average marginal tax rates by percentile in the United Kingdom were above the rates in the two other countries, even though the highest *statutory* marginal tax rates were found in the United States. This evidences the highly skewed distribution of tax brackets in the latter case, with very high rates affecting a very limited group of taxpayers.

Figure 5. *Average marginal tax rates by percentile of the income distribution*
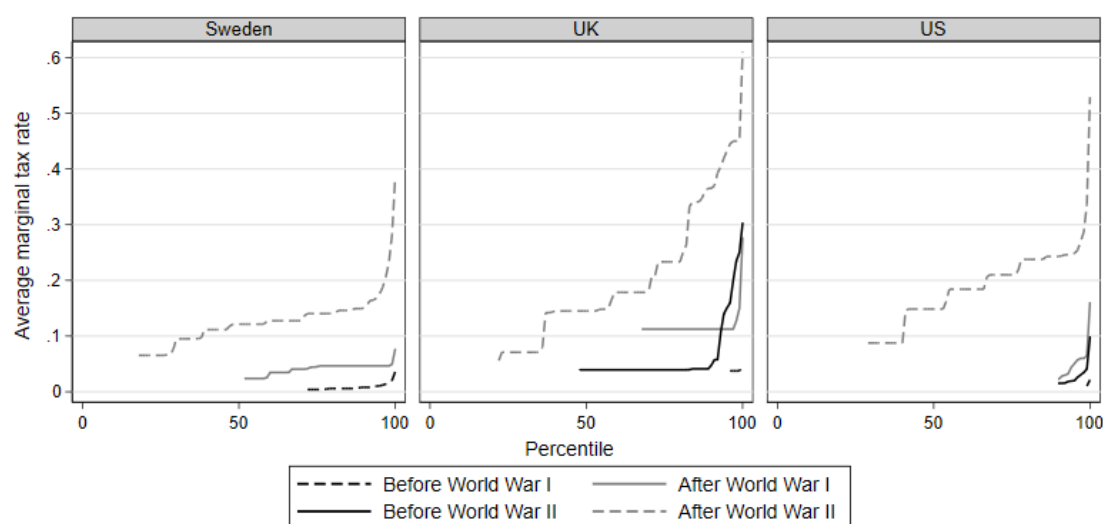
Source: Own calculations with data from *Statistics of Income for 1945* (US)*, Taxeringen till inkomst…* (Sweden), and *Reports of the Commissioners…*. (UK).
Notes: "Before World War I" corresponds to 1912 in Sweden, 1911 in the United Kingdom, and 1917 in the United States, and the "After World War I" to 1920, 1919 and 1919 respectively. Regarding World War II, the years used are 1937 in the United Kingdom and 1939 in the United States; for after the war, 1946 in Sweden and the United States, and 1949 in the United Kingdom. The choice is always due to data availability. In the United Kingdom, "earned" and "unearned" income were taxed at different tax rates from 1914 to 1919 (from 1920 onwards the same tax rates applied to both types of income, but "earned income" was entitled to special allowances); we only show rates for earned income here, while the rates for unearned income were significantly higher.

The average marginal tax rates in Sweden were considerably below those of the Anglo-Saxon countries across most of the income distribution, which is consistent with the previous

literature. Bottom marginal tax rates, however, converged to similar levels in the three countries at the end of the period (around 8% for the first percentiles of taxpayers).[22]

In the United States, the pre-World War II scenario almost overlaps with the situation immediately after World War I. Indeed, the tax was made smaller in the 1920s and then expanded again as a consequence of the Great Depression. By the end of World War II, people in the top income percentile were facing marginal tax rates of 61% (United Kingdom, 1949), 52.9% (United States), and 38.3% (Sweden).[23] These rates were much higher than those of the beginning of the period, but clearly below the maximum statutory rates, which lied at 97.5% in the United Kingdom, 94% in the United States, and 68.75% in Sweden.

This is because the very high statutory rates at the top were generally confined to a very narrow group of taxpayers.[24] For example, in 1946, percentiles 29 to 66 in the United States faced an average marginal income tax rate between 9 and 20%, whereas percentiles 67 to 98 fell between 21 and 30%. Only the two very top percentiles of the income distribution were taxed at higher marginal rates, 52.9% being the estimated figure for the highest one. Despite of the impressive top statutory rate in place in the country in 1946 (94%), this only affected the taxpayers with over 200,000$ in taxable income, which meant approximately 1,400 people… i.e., 0.003% of tax returns in that year! This extremely skewed structure was most intense in the United States. The maximum in terms of number of brackets was attained in World War I (56 brackets) and the Great Depression (55 brackets in 1933-34). In terms of a top rate restricted to very few people, the highest point was reached in 1937, when the tax schedule included 33 brackets, with a top marginal tax rate of 79%, affecting people with incomes over 5 million $. This was so extreme a threshold that it became known as "the Rockefeller tax" (Thorndike, 2013a). A similar situation was found in the United Kingdom in 1937, when the maximum tax rate concerned around 300 people (with taxable incomes above £50,000). As a point of comparison, the maximum rate in 1949 affected some 1,700 people (taxable income above £20,000), which reflects the expansion of the top bracket during the

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[22] These percentiles are constructed based on gross taxpayer income. Taxable income varied according to the family structure of each taxpaying unit, so a percentile represents taxpayers with different levels of taxable income and therefore facing different tax rates. Shown in the graph is the weighted average for all taxpayer types.

[23] Our results are consistent with those of Rydqvist et al. (2008), who calculated series of marginal taxes on dividend income and capital gains for several countries, showing that they were significantly below the top statutory marginal rates. In Sweden, it was only around 1980 that the top percentile paid a marginal tax rate close to the statutory top rate (Roine and Waldenström, 2009).

[24] This point has also been made earlier by Roine et al. (2009), while also discussing that top rates over the twentieth century were applied to relatively larger groups of taxpayers in Scandinavia and the United Kingdom than in the United States or Japan.

war (although it still affected a very reduced group of taxpayers). During World War I, by contrast, the number of taxpayers under the top marginal rate decreased from around 37,700 to 10,000.

The literature has argued that top marginal rates have significant incentive effects (on labour, wage bargaining, and capital accumulation), which could lead to a reduction of inequality *ex ante* (Piketty, 2001; Roine et al. 2009; Atkinson and Leigh, 2013; Piketty et al., 2014). Marginal tax rates only apply to the last portion of the taxpayers' income, and as such affect decisions at the margin: decisions to take on extra work or make a new investment, but also to report the additional income or try to hide it from the tax authorities. However, marginal taxation should not be mistaken with the actual level of the tax burden on high income individuals– or on any income level, for this matter. For that, we need to look at effective tax rates.

The average marginal tax rates in Sweden were considerably below those of the Anglo-Saxon countries across most of the income distribution, which is consistent with the previous literature. Bottom marginal tax rates, however, converged to similar levels in the three countries at the end of the period (around 8% for the first percentiles of taxpayers).[25]

5.2. *Effective tax rates*

We turn now to look at the average effective tax rates paid by each percentile of the income distribution. Effective tax rates are significantly below the marginal tax rates for two reasons. The first is a mechanic effect: since the marginal rate faced by a taxpayer only applies to the top portion of his income, the average effective rate will always be lower (as long as there is a progressive schedule in place). Secondly, allowances increase this distance as they introduce a wedge between the tax base (the denominator in the effective tax rate) and taxable income (to which the statutory rates are applied).

Figure 6 provides the effective tax rates by percentile of income, focusing again on the years before and after both World Wars. As in the case of marginal tax rates, effective tax rates imposed upon high incomes increased significantly during the two wars in the United States, particularly during World War II. In 1919, the top one percent of the income distribution paid

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[25] These percentiles are constructed based on gross taxpayer income. Taxable income varied according to the family structure of each taxpaying unit, so a percentile represents taxpayers with different levels of taxable income and therefore facing different tax rates. Shown in the graph is the weighted average for all taxpayer types.

8.1% of their income in this tax (up from 1% in 1917); this had gone down to 4.6% by 1939, but increased again during World War II up to 33% in 1946. Despite of this substantial growth, effective tax rates were considerably lower than marginal tax rates across the whole income distribution. For instance, the marginal tax rate estimated for the top percentile in 1946 was 52.9%, i.e. a difference of twenty points compared to the effective tax rate for this same year. This illustrates the need to go beyond marginal tax rates and to look at effective taxation in order to evaluate the progressivity of income taxes, and their impact at the top of the distribution.

Figure 6. Average effective tax rates by percentile of the income distribution
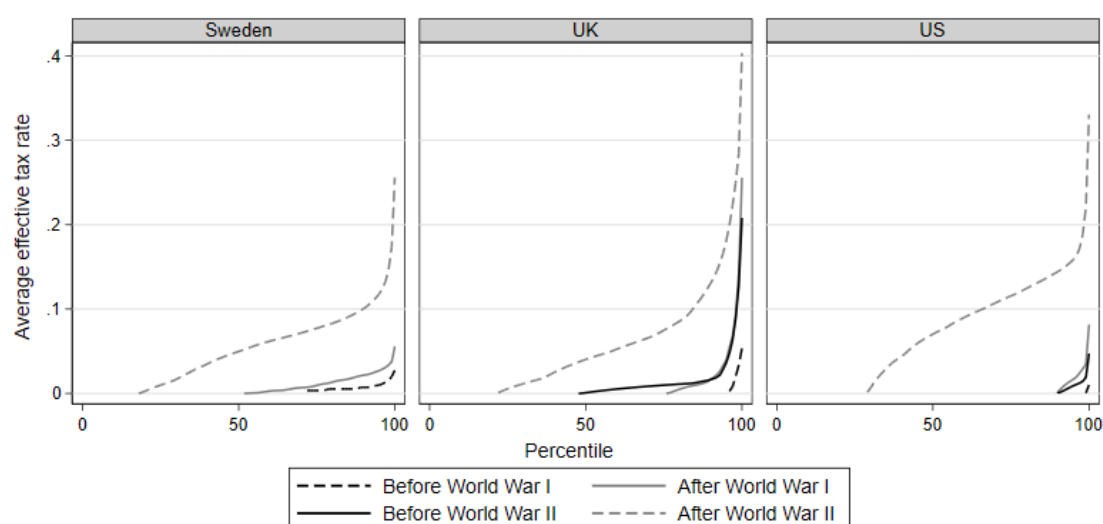
Source: Own calculations with data from *Statistics of Income for 1945* (US)*, Taxeringen till inkomst…* and *Skattetaxeringarna* (Sweden), and Scott and Walker (2020) and *Reports of the Commissioners…* (UK).
Notes: The figure shows the *average* effective tax rates by percentile of the income distribution. Not every individual represented by each percentile paid the same effective tax rate; in fact, in the lowest percentiles with a positive average effective tax rates many individuals could be completely exempted. For instance, in Sweden after World War I (grey line in the leftmost box) the 52nd percentile was the lowest one to pay the tax (with an average effective tax rate of 0.006%). But at this level of income, only some single individuals without children were paying the tax, which means that 85% of the population represented by this percentile was actually exempted (this also explains the very low level of the average effective tax rate for these percentiles).

The United Kingdom presents an analogous scenario, with increasing average effective rates on high incomes during the two wars, but at significantly lower levels than those of their marginal counterparts. Nevertheless, it was the country with the highest taxation of the top incomes, at 40.3% for the top 1 percent in the aftermath of WWII. The United States lied at some distance, with 33% in 1946, despite having virtually the same top statutory marginal

rates as shown above (which, again, reflects its extremely skewed distribution of tax brackets). The United Kingdom also widened the tax base during both wars, increasing the pressure on the low levels of the income distribution. This clearly set this country aside from the United States, where the income tax was restricted to the upper incomes well up to the eve of World War II. It was not until the outbreak of the war that the US expanded the tax base downwards to comparable levels than the other two countries. Indeed, as could be seen in Figure 2, the number of taxpayers increased more sharply in the United Kingdom than in the United States during World War I, but the growth was more pronounced in the United States during World War II.

A similar picture can be found in Sweden during World War I, even if the magnitudes were substantially different. While the marginal tax rate imposed upon the top percentile reached 7.6% in 1920, the average effective tax rate lied at 5.5%. By the end of the World War II, the top 1 percent faced an average marginal rate of 38.3%, but the effective tax rate was 25.6%. This was the lowest top effective tax rate of the three countries, but it is affected by the fact that we do not include local taxes yet – which will be tackled in future work. By contrast, the tax covered a higher share of the population than in the United Kingdom and the United States already at the beginning of our period, with almost half of the income distribution in the rolls by the end of World War I (a level only reached in the United Kingdom after the tax reforms of the 1930s and in the United States after World War II). Despite of this initial disparity, in all countries only the poorest fifth of the population did not pay income tax in the end of our period.

Tables 1 to 3 translate the previous tax rates into actual monetary units by showing the average tax base, income tax due, and post-tax income for selected percentiles in each country. In line with the previous discussion, the United Kingdom after World War II shows the biggest difference between tax base and post-tax income, as the average taxpayer in the top percentile saw their tax base of £3,833 decline to £1,977 through the operation of the income tax. This was higher, both in absolute and in relative terms, than the reduction in income in any of the percentiles below (e.g., percentile 25 moved from an average tax base of £150 to a post-tax income of £149). As a result of this, the British income tax in 1949 reduced the share of income in the hands of the top 1 percent from 11.4% in terms of tax base to 6.9% in post-tax income. The same pattern can be observed in the other two countries, if only mitigated by less progressive schemes. In Sweden, for instance, the average taxpayer in the

top percentile retained almost 70% of his pre-tax income (compared to 52% in the United Kingdom and 59% in the United States).

Table 1. Tax base, tax due and post-tax income in Sweden

Percentile	Tax base		Tax due		Post-tax income	
	kr	%	kr	%	kr	%
Pre-WWI (1913)						
75	859.2	1.1	3.0	0.3	856.1	1.1
90	1230.2	1.6	9.0	0.9	1221.1	1.6
95	1687.8	2.2	17.4	1.8	1670.4	2.2
100	17728.6	22.6	641.3	64.7	17087.4	22.1
Post-WWI (1920)						
55	1169.8	0.6	0.8	0.0	1169.0	0.6
75	2277.3	1.1	21.9	0.4	2255.5	1.2
90	3819.2	1.9	82.8	1.4	3736.4	1.9
95	4939.0	2.5	133.7	2.3	4805.3	2.5
100	39246.7	19.6	3235.7	56.8	36011.1	18.5
Post-WWII (1946)						
25	1074.1	0.3	10.6	0.0	1063.5	0.3
50	2525.9	0.7	125.8	0.4	2400.0	0.8
75	4329.7	1.3	334.9	1.0	3994.8	1.3
90	6485.3	1.9	652.3	1.8	5833.0	1.9
95	8534.0	2.5	1007.6	2.8	7526.4	2.4
100	34460.1	10.0	10468.1	29.1	23992.0	7.7

Source: Own calculations with data from *Taxeringen till inkomst…* and *Skattetaxeringarna*.
Notes: The columns "kr" show the average income and tax due in each percentile. The columns "%" show the percentage of each percentile over the total amount. The column "tax base" shows the gross income as per Figure 4 but excluding deductions for costs and exempted income (tax base). The column "post-tax income" shows tax base minus tax due.

While the income tax in the aftermath of World War II had the biggest impact on the income of the rich, the pre-World War II schemes placed a higher share of the income tax burden on these individuals. Take the United States income tax in 1917: the top percentile bore almost 100% of the tax payments. However, the actual incidence on their income was relatively mild, particularly in comparison with what was to come: the effective tax rate was around 1%, compared to 33.1% in 1946 (at a time when the income tax had reached middle incomes, and hence the top percentile assumed only 33% of the tax payments).

Table 2. Tax base, tax due and post-tax income in the United Kingdom

Percentile	Tax base		Tax due		Post-tax income	
	£	%	£	%	£	%
Pre-WWI (1911)						
96	171.2	2.1	0.4	0.2	170.8	2.1
100	2425.3	29.4	152.7	86.4	2272.6	28.2
Post-WWI (1919)						
76	139.4	0.9	0.0	0.0	139.4	1.0
90	192.5	1.2	3.2	0.2	189.3	1.3
95	269.6	1.7	10.7	0.8	258.9	1.8
100	3057.6	19.6	1061.2	80.9	1996.3	14.0
Pre-WWII (1937)						
50	128.6	0.8	0.1	0.0	128.5	0.8
75	181.7	1.1	1.8	0.2	180.0	1.1
90	247.3	1.5	4.1	0.4	243.2	1.5
95	338.6	2.0	12.4	1.1	326.1	2.1
100	2810.8	16.6	803.0	72.8	2007.9	12.7
Post-WWII (1949)						
25	150.0	0.4	0.8	0.0	149.2	0.5
50	256.2	0.8	10.3	0.2	245.9	0.8
75	380.3	1.1	28.5	0.6	351.8	1.2
90	549.5	1.6	71.9	1.5	477.7	1.6
95	726.2	2.2	131.7	2.8	594.6	2.1
100	3833.2	11.4	1856.6	37.4	1976.6	6.9

Source: Own calculations with data from Scott and Walker (2020) and *Reports of the Commissioners…*
Notes: The columns "£" show the average income and tax due in each percentile. The columns "%" show the percentage of each percentile over the total amount. The column "tax base" shows the gross income as per Figure 4 but excluding deductions for costs and exempted income (tax base). The column "post-tax income" shows tax base minus tax due.

The United States was indeed the country that restricted the payment of the income tax to higher incomes for a longer period (in the eve of World War II, 86% of the income tax was still paid by the very rich). In Sweden, by contrast, the top 1 percent bore not more than 65% of the tax payments already in 1913, a trend that only sharpened in the following decades. The United Kingdom was in the middle of these two extremes: the top percentile bore 86% of total income tax payments in 1911 (significantly below the 100% seen in the United States a few years later, and similar to what this country would reach before World War II). World War I and the Great Depression brought this figure down to 81% and 73% respectively. The reduction of family allowances implemented by Chancellor of the Exchequer Neville Chamberlain in 1931 was particularly relevant to this effect, since it expanded the tax to the

entire upper half of the income distribution (even if the share of the tax in the lowest percentiles was very small – the one bore by percentile 50 was merely 0.01% in 1937).[26]

Table 3. Tax base, tax due and post-tax income in the United States

Percentile	Tax base		Tax due		Post-tax income	
	$	%	$	%	$	%
WWII (1917)						
95	2200.1	2.9	0.0	0.0	2200.1	3.0
99	2977.2	3.4	1.7	0.0	2977.0	3.4
100	15956.6	18.0	566.8	100	15389.8	17.5
Post-WWI (1919)						
90	1089.6	0.9	2.0	0.1	1087.5	1.0
95	2355.2	2.0	44.0	1.3	2311.1	2.1
100	15160.0	13.1	2896.7	83.4	12263.3	10.9
Pre-WWII (1939)						
90	1014.9	1.0	0.2	0.0	1014.7	1.1
95	2231.1	2.3	22.0	1.2	2209.2	2.3
100	12158.4	12.5	1639.4	86.2	10518.9	11.0
Post-WWII (1946)						
29	552.7	0.3	0.4	0.0	552.3	0.3
50	1495.9	0.7	105.2	0.3	1390.7	0.8
75	2649.9	1.3	306.6	1.0	2343.3	1.3
90	3758.3	1.8	542.8	1.8	3215.5	1.8
95	4615.8	2.2	732.7	2.4	3883.2	2.2
100	24790.6	12.0	10105.0	33.0	14685.6	8.3

Source: Own calculations with data from *Statistics of Income for 1945*.
Notes: The columns "$" show the average income and tax due in each percentile. The columns "%" show the percentage of each percentile over the total amount. The column "tax base" shows the gross income as per Figure 4 but excluding deductions for costs and exempted income (tax base). The column "post-tax income" shows tax base minus tax due.

All of this reflects the progressivity of the income taxes implemented in the three countries during the first half of the twentieth century. In section 5.4 we estimate indices of progressivity and redistribution, which encapsulate in an appropriate manner these elements. But first, we make a brief detour to examine the evolution of effective tax rates in the United States throughout the entire period.

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[26] Recall that not all tax units represented by percentiles with positive average effective tax rates necessarily paid the tax. In such percentiles (particularly the lowest ones) at least one tax unit paid the tax, but many more could be exempted through the operation of allowances.

5.3. Effective tax rates in the United States

As mentioned above, the US sources provide us with enough information to estimate yearly effective tax rates since 1917. Figure 7 displays these rates for some selected percentiles of the income distribution over the whole period. In line with our previous discussion, the highest levels of effective taxation on the top 1% of tax units were attained during World War II (above 30% at the end of the conflict). The previous peak was found in the aftermath of World War I, when the top effective tax rate reached 8.1% (1919). The rate diminished during the entire 1920s up until 1931, when the fiscal reforms implemented by Hoover's and Roosevelt's administrations as a response to the Great Depression brought the tax rate up again. The peak tax rate on the top 1 percent associated with the New Deal came in 1937, when it attained 5.8%.

Figure 7. Average effective tax rates in the United States (1917-46)
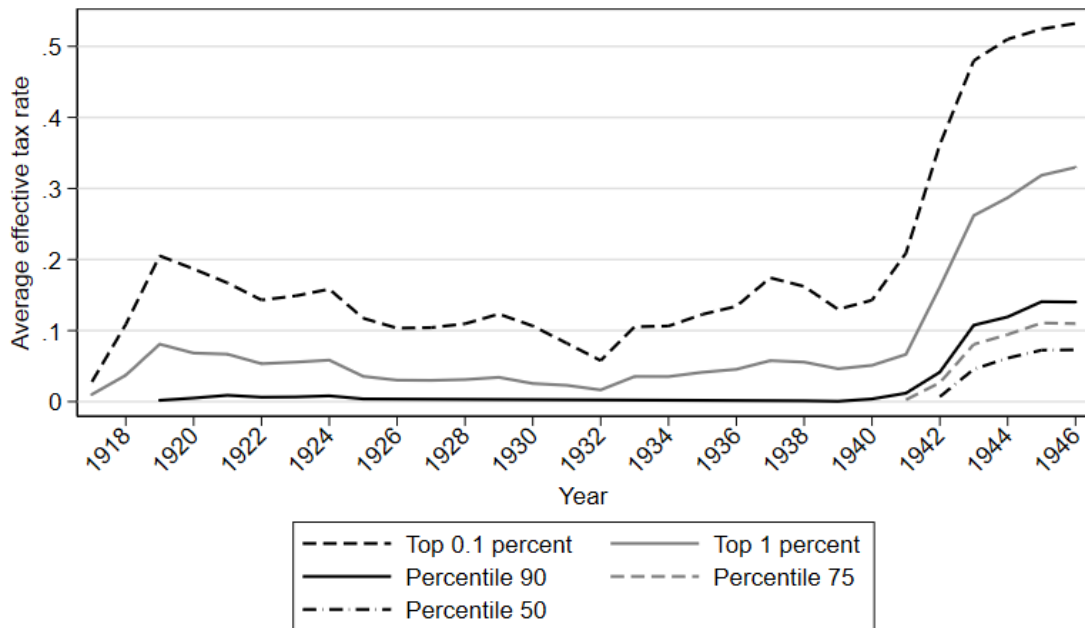
Source: Own calculations with data from *Statistics of Income for 1945*.

Percentile 90, on the other hand, was basically untouched by the income tax since the Republican reforms of 1924 and 1926 (effective in tax years 1925 and 1926 in the figure), which strived to reduce the tax burden on high and middle incomes. Andrew Mellon's 1926 reform increased family deductions and reduced the number of tax brackets (from 40 to 20 in the surtax), bringing the top marginal tax rate down to 25%. It was only during World War II

that the tax expanded downwards and reached middle incomes, both as a result of the erosion of allowances and exemption limits and the increase in the bottom marginal tax rates. Before that, the income tax was clearly a "class tax" paid only by the very rich. This was also seen in Table 3: well up to the eve of World War II, the top percentile bore as much as 86% of the total income tax payments.

5.4. *Indices of progressivity and redistribution*

The increasing complexity and high tax rates of the first half of the twentieth century suggest strongly progressive and redistributive effects of the income tax. However, in the process of construction of the post-war welfare states more families were also incorporated into the tax net. What were the final effects on progressivity and redistribution of all these dynamics? Table 4 presents the aforementioned Kakwani and Reynolds-Smolensky indices for the years before and after the wars (and before and after the Great Depression for the United States), together with the corresponding average effective tax rates.

World War I was clearly associated with rising levels of progressivity in the United Kingdom and the United States, due to the unprecedented increase in effective tax rates together with a relatively modest downward expansion of the tax. As seen in the previous section, this was particularly true in the latter case, where the income tax barely affected the richest 10% of the population by 1919 – consistently, the United States shows the highest progressivity levels of all the estimates in the post-World War I. On the contrary, progressivity decreased during World War II owing to the record-breaking incorporation of low- and middle income taxpayers in the two Anglo-Saxon countries (especially in the United States).[27] Even if top effective tax rates burgeoned to their historical peaks in the 1940s, the downward extension to middle incomes prevailed over the latter in determining the overall effect of the war. As a result, both the United Kingdom and the United States witnessed their highest levels of income tax progressivity right in the aftermath of World War I, when the tax rates and the high thresholds combined to place a higher share of the tax burden on the shoulders of the well-off.

By contrast, progressivity diminished in Sweden between 1913 and 1920 due to the combination of a relatively comprehensive income tax (including half of the population

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[27] Kakwani index values slightly above 20 are quite normal nowadays. In the study of Wagstaff et al. (1999), the values for our countries lied at 8.91 for Sweden (1990), 22.78 for the United Kingdom (1993), and 23.71 for the United States (1987).

within its reach) and low top marginal rates.[28] Future versions of the paper will incorporate estimates for the late 1930s to evaluate the situation after the Great Depression and the changes during World War II. But by 1946, the Swedish income tax had attained the lowest level of progressivity of the three available benchmarks. It was also the lowest of all our estimates for the three countries, even if close to the United States in the same year. This seems consistent with the findings of previous comparative literature on later periods (Steinmo, 1993; Prasad and Deng, 2009).

Table 4. Progressivity and redistribution indices

	Progressivity	Redistribution	Average effective tax rate	Taxpayers as % of total tax units
Sweden				
Pre-WWI (1913)	36.11	0.44	1.22	29.1
Post-WWI (1920)	32.92	0.96	2.85	42.1
Post-WWII (1946)	26.58	3.08	10.38	73.1
United Kingdom				
Pre-WWI (1911)	31.40	0.69	2.14	4.7
Post-WWI (1919)	55.67	5.11	8.40	16.4
Pre-WWII (1937)	49.04	3.41	6.50	14.9
Post-WWII (1949)	39.55	6.43	13.99	58.1
United States				
Pre-WWI (1917)	33.30	0.20	0.60	0.9
Post-WWI (1919)	69.37	1.93	2.71	8.4
Pre-Great Dep. (1928)	59.23	0.86	1.44	5.1
Post-Great Dep.(1937)	61.48	1.50	2.38	5.3
Pre-WWII (1939)	62.03	1.08	1.71	5.5
Post-WWII (1946)	27.94	4.70	14.40	72.3

Source: Authors' calculations.
Notes: The column "Taxpayers as % of total tax units" shows the ratio of taxpayers over total tax units directly provided by the original sources. In the case of Sweden, and in the United Kingdom in 1911, we estimate the same ratio based on our own synthetic series, since the original sources do not provide the total number of effective taxpayers (recall that "tax returns" correspond to individuals who filled the income tax form, whereas "taxpayers" account for tax returns with a positive tax due). The ratios based on our own estimates are largely consistent with those of the original sources.

Redistribution followed a related but distinctive path. It increased during wartimes in the three countries, reaching the highest levels at the end of the period. It therefore not only grew when progressivity was on the rise (World War I in the United Kingdom and the United States), but also when it was lingering (World War II in the same countries, and World War I in Sweden).

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[28] It should be noted that additional income taxes enacted during the World War were no longer in effect in 1920, so these estimates do not represent the maximum progressivity reached.

As mentioned in section 4, redistribution depends not just on the progressivity of the tax system, but also on the amount of revenue that it collects. A very progressive system that affects a tiny percentage of the population and leaves most of the total income untouched will barely affect the level of inequality. The decreasing levels of income tax progressivity during World War II in both Anglo-Saxon countries went along with a marked expansion of revenue collection (average effective tax rates increased more than two-fold and nine-fold in the United Kingdom and the United States respectively). Crucially, the system became *less* progressive, but it remained still progressive after all. Hence, it was the expansion of the tax, rather the growth of progressivity, what drove redistribution during World War II.

By contrast, the redistributive effect of World War I in the United Kingdom and the United States can be traced back to a joint effect of increases in the progressivity of the tax scheme and the amount of revenue collected. The British system, on its part, remained the most redistributive of all throughout the period (and the most progressive by the mid-twentieth century). Prior to the end of World War II this was the result of the large amount of revenue collected: even if progressivity was higher in the United States, the income tax collected in the United Kingdom affected more income. After World War II, progressivity led the wedge with the United States instead.

Figure 8 presents the evolution of redistribution through the income tax and its components in the United States for the entire period. The very high levels of progressivity implemented in World War I slowly decreased during the following fifteen years, to increase again (to slightly lower levels) due to the tax reforms implemented on the rich as a response to the Great Depression. The evolution of progressivity mimics to a large extent that of tax rates at the top, at least until the outbreak of World War II. During the early forties, the unprecedented broadening of the tax to middle incomes entailed a reduction in progressivity (despite the rise in top tax rates). Redistribution also followed a similar path than that of top tax rates, but in this case throughout the whole period. The reforms of World War II brought redistribution to the highest level of the series: the combination of a progressive tax scheme, which involved more than half the population, led the tax to reduce inequality by near 5 Gini points by 1946.

Figure 8. Redistribution through the income tax in the United States, 1917-1946
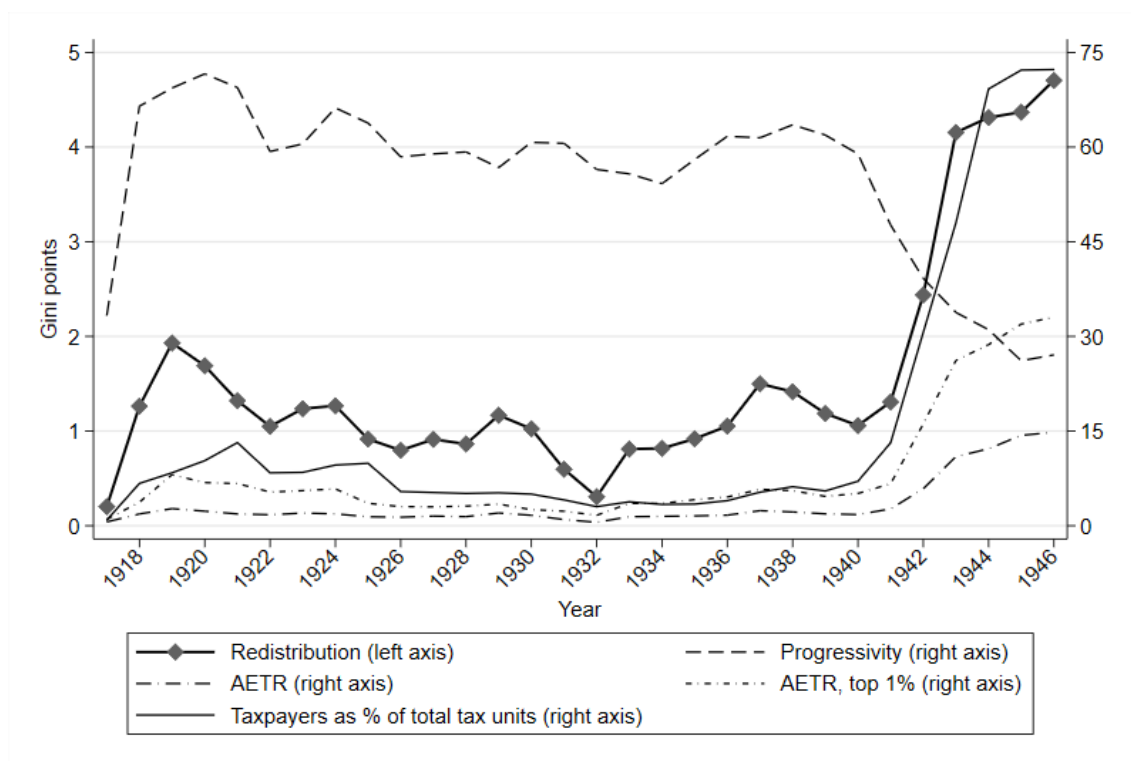
Source: Authors' calculations.
Notes: AETR = Average Effective Tax Rate. The estimations for 1917 are subject to particular uncertainty because of the low share of tax units subject to the tax (see Appendix A).

The "mass tax" has undergone many significant reforms since then in the three countries. The eighties left a wave of base-broadening, deductions-restricting reforms, and in the late 20th and early 21st century tensions towards dualization increased (that is, the tendency to expand differential treatment to capital gains and capital income). The levels of redistribution attained after World War II are high when compared to more recent standards. Around 1990, a study on redistribution through the income tax in twelve OECD countries found that they reduced inequality by about 1.5 to 4.5 Gini points, with an average of 3.2 (Wagstaff et al., 1999). In particular, the values found for the countries covered here were 3.96 (Sweden, 1990), 3.52 (United Kingdom, 1993) and 3.76 (United States, 1987). In both the United Kingdom and the United States, these were clearly below the levels achieved during and in the aftermath of World War II. By contrast, the Swedish income tax was more redistributive in 1990 than in the aftermath of the war. However, it is important to take into account that adding local income taxes to our Swedish estimates will likely increase the average effective tax rate and the level of redistribution, even if it will reduce progressivity (since these taxes were, for the most, proportional).

6.   Conclusions

The first half of the twentieth century witnessed the emergence and consolidation of modern income taxes. During the World Wars, marginal tax rates soared and tax bases broadened to unprecedented levels in most Western countries. In this paper we look at the evolution of income tax progressivity and redistribution throughout this period in Sweden, the United Kingdom, and the United States. To do so, we present new disaggregated estimates of income tax due and effective tax rates for several benchmarks based on country-specific historical tax statistics and tax regulations. In this version of the paper, we focus much of our attention on the two World Wars and, to a lesser extent, the Great Depression. In future iterations we will add new Swedish estimations for the 1930s, and will also present analogous data for France, which will allow us to have illustrative examples for each of the welfare state regimes identified by Esping-Andersen (1990).

Our results indicate that redistribution through the income tax increased in the three countries during the two World Wars, but the magnitude of the effect and the mechanisms at play differed between them. During World War I, higher levels of progressivity and a larger amount of revenue collected by the tax agencies in the United Kingdom and the United States drove up the redistributive impact of the tax. By contrast, redistribution increased during World War II despite of the fact that progressivity diminished noticeably. This was mainly the result of low and middle income taxpayers being incorporated into the income tax, which on the one hand mitigated the progressive impact of soaring top marginal tax rates, but on the other increased the amount of revenue collected. Pending to process new data for the 1930s in Sweden, our results for this Scandinavian country suggest that redistribution increased throughout the period, but progressivity diminished between 1913 and 1920 (and possibly as well during World War II). Unlike the two Anglo-Saxon countries, the Swedish state income tax was quite early characterized by a broad base and comparatively moderate marginal and effective rates (although some of these conclusions may vary when the local income tax has been included in the simulation).

Our database of taxpayers and their corresponding tax variables (incomes, allowances, tax payments) allows several further analyses. First, in a related paper, we have estimated how much of the downward extension of these income taxes was due to inflation, and how this affected their progressivity and redistributive effects (Torregrosa-Hetland and Sabaté, 2019). Secondly, we can study the treatment of families in the different countries and

their variation across time: were families favoured in the tax, even when taking into account their higher needs (i.e., using equivalent income)? Thirdly, we intend to incorporate other taxes into the database, to be able to establish the joint distributive effects of the tax systems in these countries, and how the needs of war finance were confronted in each case.

References

AIDT, T. S. and JENSEN, P.S. (2009): "The taxman tools up: An event history study of the introduction of the personal income tax", *Journal of Public Economics*, 93 (1-2): pp. 160–175.

ATKINSON, A. (2007): "The Distribution of Top Incomes in the United Kingdom 1908-2000", in A.B Atkinson and T. Piketty (eds.) *Top Incomes over the Twentieth Century: a contrast between continental European and English-speaking countries*. Oxford: Oxford University Press, pp. 82-140.

ATKINSON, A., and LEIGH, A. (2013): "The Distribution of Top Incomes in Five Anglo-Saxon Countries Over the Long Run", *The Economic Record*, vol. 89, pages 31-47.

BLANCHET, T., FOURNIER, J., and PIKETTY, T. (2017): "Generalized Pareto Curves: Theory and Applications". WID.world Working Paper Series 2017/3.

BENGTSSON, N., B. HOLMLUND, and D. WALDENSTRÖM (2016). "Lifetime versus Annual Tax Progressivity: Sweden, 1968-2009". *Scandinavian Journal of Economics* 118(4), 619–645.

BERAMENDI, P., and RUEDA, D. (2007). "Social democracy constrained: Indirect taxation in industrialized democracies". *British Journal of Political Science*, 619-641.

BROADBERRY, S. and HOWLETT, P. (2005): "The United Kingdom during World War I: business as usual?", in S. Broadberry and M. Harrison (eds.) *The Economics of World War I*, New York: Cambridge University Press, pp. 206-234.

BROWNLEE, E. (2016): *Federal Taxation in America: A History*, New York: Cambridge University Press, 3rd edition

DAUNTON, M. (2002): *Just Taxes. The politics of taxation in Britain, 1914-1979*, Cambridge University Press, Cambridge.

DINCECCO, M., and TROIANO, U. (2015). "Broadening the state: policy responses to the introduction of the income tax". NBER working paper No. w21373.

DU RIETZ, G., JOHANSSON, D., and STENKULA, M. (2015): "Swedish Labor Income Taxation (1862-2013)", in Mangus Henrekson and Mikael Stenkula (ed.) *Swedish Taxation. Developments since 1862*, Palgrave Macmillan US, pp. 35-122.

ESPING-ANDERSEN, G. (1990). *The three worlds of welfare capitalism*. Princeton University Press.

GELOSO, V., MAGNESS, P., MOORE, J. and SCHLOSSER, P. (2018): "How Pronounced Is the U-Curve? Revisiting Income Inequality in the United States, 1917-1945" (February 4, 2018).

GILBERT, C. (1970): *American Financing of World War I*. Westport, Connecticut: Greenwood Publishing Corporation.

GOENAGA, A., SABATÉ, O., AND TEORELL, J. (2018): "War and state capacity in the long nineteenth century", *STANCE Working Paper Series, 2018*(6), 1–65.

HAFFERT, L. (2019): "War Mobilization or War Destruction? The Unequal Rise of Progressive Taxation Revisited", *Review of International Organizations,* 14:59-82

HAGSTROEM, K. G. (1949): "Inkomstinflation och inkomstnivellering i Sverige". *Skandinaviska Bankens kvartalsskrift*, 30 (2), april 1949, pp. 39-41.

HENREKSON, M., and STENKULA, M. (2015): "Swedish Taxation since 1862: An Introduction and Overview", in Mangus Henrekson and Mikael Stenkula (ed.) *Swedish Taxation. Developments since 1862*, Palgrave Macmillan US, pp. 1-33.

IMMERVOLL, H. (2005): "Falling Up the Stairs: the Effects of "Bracket Creep" on Household Incomes", *Review of Income and Wealth* 51 (1), pp. 37-62.

JESUIT, D., & MAHLER, V. (2017). "Fiscal Redistribution in Comparative Perspective: Recent Evidence from the Luxembourg Income Study (LIS) Data Centre". In M. Buggeln, M. Daunton, & A. Nützenadel (Eds.), *The Political Economy of Public Finance: Taxation, State Spending and Debt since the 1970s* (pp. 177-198). Cambridge: Cambridge University Press.

KANG, S.W. & ROCKOFF, H. (2015): "Capitalizing patriotism: the Liberty loans of World War I", *Financial History Review*, vol 22(01), pages 45-78.

KATO, J. (2003). *Regressive Taxation and the Welfare State: Path Dependence and Policy Diffusion*. Cambridge: Cambridge University Press.

LANTZ, G. (2021). "Letting the masses pay for the welfare state: tax regressivity in postwar Sweden". *European Review of Economic History*, 25(1), 160-179.

LIMBERG, J. (2020). "Banking crises and the modern tax state". *Socio-Economic Review* (forthcoming).

LINDERT, P. (2004). *Growing Public: Social Spending and Economic Growth Since the Eighteenth Century.* Cambridge: Cambridge University Press.

LINDSEY, V. (2003): "The Charitable Contribution Deduction: A Historical Review and a Look to the Future", *Nebraska Law Review*, 81: 1056.

MARES, I., and QUERALT, D. (2015): "The Non-Democratic Origins of Income Taxation", *Comparative Political Studies*, 48 (14): pp. 1974-2009.

MEHROTRA, A.K. (2013): *Making the Modern American Fiscal State: Law, Politics, and the Rise of Progressive Taxation, 1877-1929*, New York: Cambridge University Press.

MORGAN, K. and PRASAD, M. (2009): "The Origins of Tax Systems: A French American Comparison", *American Journal of Sociology,* 114 (5), pp. 1350–1394

PEACOCK, A.T., and WISEMAN, J. (1961): *The growth of public expenditures in the United Kingdom,* Princeton, N.J.: Princeton University Press.

PEICHL, A., and VAN KERM, P. (2007). PROGRES: Stata module to measure distributive effects of an income tax.

PENNIMAN, C. (1980). *State Income Taxation*. Baltimore: Johns Hopkins University Press.

PIKETTY, T. (2001): *Les hauts revenus en France au XXe siècle. Inégalités et redistributions, 1901-1998*. Ed. Grasset.

PIKETTY, T. and SAEZ, E. (2003): "Income inequality in the United States, 1913–1998", *The Quarterly journal of economics*, *118*(1), 1-41.

PIKETTY, T. and E. SAEZ (2007). "How Progressive Is the U.S. Federal Tax System? A Historical and International Perspective". *Journal of Economic Perspectives* 21(1), 3–24.

PIKETTY, T., SAEZ, E. & STANTCHEVA, S. (2014): "Optimal taxation of top labor incomes: A tale of three elasticities", *American economic journal: economic policy*, 6(1), 230-71.

PRASAD, M. and Y. DENG (2009). "Taxation and the worlds of welfare". *Socio-Economic Review* 7, 431–457.

RASLER, K.A., and THOMPSON, W.R. (1985): "War Making and State Making: Governmental Expenditures, Tax Revenues, and Global Wars", *American Political Science Review*, 79 (2): 491-507.

ROCKOFF, H. (2012): *America's Economic Way of War. War and the US Economy from the Spanish-American War to the Persian Gulf War*. Cambridge: Cambridge University Press.

RODRIGUEZ, E. (1981). *Den svenska skattehistorien.* Lund: Liber Läromedel.

ROINE, J., VLACHOS, J., & WALDENSTRÖM, D. (2009): "The long-run determinants of inequality: What can we learn from top income data?", *Journal of Public Economics*, *93*(7-8), 974-988.

ROINE, J. & WALDENSTRÖM, D. (2008): "The evolution of top incomes in an egalitarian society: Sweden, 1903–2004", *Journal of public economics*, *92*(1-2), 366-387.

ROINE, J. & WALDENSTRÖM, D. (2009): "Top incomes in Sweden over the twentieth century". In: Atkinson, A.B., Piketty, T. (Eds.), *Top Incomes: A Global Perspective*, vol. II. Oxford University Press, Oxford.

RUBOLINO, E., & WALDENSTRÖM, D. (2020). "Tax progressivity and top incomes: evidence from tax reforms". *The Journal of Economic Inequality*, 18(3), 261-289.

RYDQVIST, K., SPIZMAN, J. & STREBULAEV, I. (2009): "The Evolution of Aggregate Stock Ownership – A Unified Explanation", CEPR Discussion Papers 7356.

SABATÉ, O. (2016): "Does military pressure boost fiscal capacity? Evidence from late-modern military revolutions in Europe and North-America", *European Review of Economic History*, 20 (3): 275-298.

SCHEVE, K., and D.STASAVAGE (2016): *Taxing the Rich. A History of Fiscal Fairness in the United States and Europe*. Princeton University Press.

SMILEY, G. and KEEHN, R. H. (1995): "Federal personal income tax policy in the 1920s", *Journal of Economic History*, 55(2), pp. 285-303.

SMITH, J.P. (2001): "Progressivity of the Commonwealth Personal Income Tax, 1917-1997", *The Australian Economic Review*, 34 (3), 263-278.

STEINER, V. and HAAN, P. (2004): "Distributional and Fiscal Effects of the German Tax Reform 2000. A Behavioral Microsimulation Analysis", DIW-Discussion Paper, No. 419.

STEINMO, S. (1993): *Taxation and Democracy: Swedish, British and American Approaches to Financing the Modern State*, New Haven and London: Yale University Press.

-- (2003): "The evolution of policy ideas: tax policy in the 20th century", *British Journal of Politics and International Relations*, Vol. 5, No. 2, pp. 206–236.

STENKULA, M., JOHANSSON, D., and DU RIETZ, G. (2014): "Marginal taxation on labour income in Sweden from 1862 to 2010", *Scandinavian Economic History Review*, 62 (2): pp. 163-187.

THOMAS, R. and DIMSDALE, N. (2017): 'A millennium of UK Data', Bank of England OBRA dataset, Research datasets | Bank of England

THORNDIKE, J. (2013a). *Their Fair Share: Taxing the Rich in the Age of FDR*, Urban Institute Press.

-- (2013b): "Making the World Safe for Philanthropy: The Wartime Origins and Peacetime Development of the Tax Deduction for Charitable Giving", Urban Institute working paper, unnumbered.

TIMMONS, J. (2005). "The Fiscal Contract: States, Taxes, and Public Services". *World Politics* 57, 530–576.

TORREGROSA-HETLAND, S. (2015). *Tax system and redistribution: the Spanish fiscal transition (1960-1990)*. Ph. D. thesis, University of Barcelona.

TORREGROSA-HETLAND, S., and SABATÉ, O. (2019). "Income tax progressivity and war inflation during the two World Wars". *STANCE Working Papers Series*, 2019 (1).

-- (2021): "Methodological notes for "Income taxes and redistribution in the early 20th century" and "Income tax progressivity and inflation during the World Wars"". *Lund Papers in Economic History: General Issues*; no. 223.

WAGSTAFF, A., VAN DOORSLAER, E., VAN DER BURG, H., CALONGE, S., CHRISTIANSEN, T., CITONI, G., GERDTHAM, U., GERFIN, M., GROSS, L., HÄKINNEN, U., JOHN, J., JOHNSON, P., KLAVUS, J., LACHAUD, C., LAURIDSEN, J., LEU, R., NOLAN, B., PERAN, E., PROPPER, C., PUFFER, F., ROCHAIX, L., RODRÍGUEZ, M. SCHELLHORN, M., SUNDBERG, G., and WINKELHAKE, O. (1999): "Redistributive effect, Progressivity and Differential Tax Treatment: Personal Income Taxes in twelve OECD countries", *Journal of Public Economics*, 72: 73-98.

WHITING, R.C. (1990): "Taxation and the Working Class, 1915-24", *The Historical Journal*, 33 (4): pp. 895-916.

WILENSKY, H. L. (2002). *Rich Democracies: Political Economy, Public Policy, and Performance.* University of California Press.

WITTE, J. (1985): *The Politics and Development of the Federal Income Tax*, Madison: University of Wisconsin Press.

Appendix 1. Robustness of progressivity and redistribution estimations under a minimum income cap

The disaggregation procedure that we use to obtain the synthetic distribution of taxpayers relies on the information about reported incomes of those who filed a return. Therefore, the procedure is less accurate when the filing threshold was high and the percentage of population filing was low. We have performed some alternative estimations in order to show how much the indices of progressivity and redistribution would vary if we put some restrictions on the values of incomes below the threshold.

We have used three alternative caps on minimum incomes: a) the value of 300$ a year in 1990; b) the value of the poverty line of 1.90$ a day in 1990; c) double the previous amount (which sometimes means to cap all incomes at just below the threshold). Alternative a) is a very small correction of some unrealistically low incomes, while alternative c) entails probably a too big correction for the earliest years (it represents 35% of average incomes in Sweden in 1912, 21% in the United Kingdom in 1911, and 14% in the United States in 1917, while the corresponding figures for the last years are 17, 15 and 10% respectively).

If we impose a minimum cap on low incomes, the distribution automatically becomes less unequal, and the progressivity index therefore goes up (since it is calculated as concentration of the tax minus gini index of pre-tax incomes). The redistribution index is normally less affected because both the pre-tax and the post-tax Gini indices move in the same direction as a result of this adjustment. Because average incomes were higher in the United States, the correction is less intense there and the indices therefore change very little.

Table A1 shows the estimates under the most extreme cap (corresponding to option c). Results for the other caps are available upon request. Our main conclusions hold: income tax redistribution increased during the World Wars in the three countries, as well as during the Great Depression in the United States (the only country for which we have data for this period). Such growth in the redistributive impact of the tax is driven by increases in the level of progressivity during World War I in the United Kingdom and the United States (but not in Sweden), and by increases in the revenue level during World War II (in fact, progressivity diminished during World War II because of the downward expansion of the tax). Similarly, the United Kingdom remains the most redistributive country throughout the period, while the United States maintains some of the most progressive income tax schemes.

Table A1. Progressivity and redistribution under a minimum income cap

	Sweden			
	Baseline		Minimum cap on low incomes	
	Progressivity	Redistribution	Progressivity	Redistribution
1912	36.11	0.44	44.50	0.51
1913	35.33	0.45	43.78	0.53
1917	26.77	0.51	41.95	0.70
1920	32.92	0.96	39.97	1.10
1921	27.38	1.02	30.92	1.12
1945	27.04	3.07	27.86	3.14
1946	26.58	3.08	26.82	3.10
	United Kingdom			
	Baseline		Minimum cap on low incomes	
	Progressivity	Redistribution	Progressivity	Redistribution
1911	31.40	0.69	38.23	0.80
1919	55.67	5.11	56.16	5.13
1937	49.04	3.41	49.87	3.45
1949	39.55	6.43	39.78	6.46
	United States			
	Baseline		Minimum cap on low incomes	
	Progressivity	Redistribution	Progressivity	Redistribution
1917	33.30	0.20	38.46	0.22
1919	69.37	1.93	69.37	1.93
1926	58.46	0.80	58.57	0.80
1937	61.48	1.50	61.51	1.50
1939	62.03	1.08	62.07	1.08
1946	27.94	4.70	27.94	4.70

Source: Authors' calculations.
Notes: The columns "Minimum cap on low incomes" adjust our baseline estimates with a cap on low incomes on 3.80$ a day in 1990 (corresponding to option c in the text).

Appendix 2. Alternative indicators of redistribution

Even if the Reynolds-Smolensky index is the most used indicator to measure redistribution, it can have some shortcomings, particularly for historical studies. In this appendix we add a different indicator that contributes to our previous results in two ways: 1) by bypassing the uncertainty about income levels *for some countries and years*, and 2) by providing a more straightforward quantification of reductions in inequality.

Table A2 shows the percentage reduction in income ratios, for some selected percentiles. This indicator is calculated as follows:

$$Percentage\ reduction\_xy: \frac{(R_G - R_P)}{(R_G)}$$

R_G being the ratio in gross incomes, and R_P the ratio in post-tax incomes, defined as follows:

$$R_G = \frac{average\ gross\ income\ in\ percentile\ x}{average\ gross\ income\ in\ percentile\ y}$$

$$R_P = \frac{average\ posttax\ income\ in\ percentile\ x}{average\ posttax\ income\ in\ percentile\ y}$$

We have calculated the p90p10, p90p50, and p50p10 indicators. However, percentile 90 did not pay income taxes in many of the country-years that we analyse in the paper. Therefore, we add p99p10 to illustrate the reduction of inequality between the top and the bottom with an indicator that can be calculated for all countries and years. It should be noted that the average income at the 10th percentile is subject to some uncertainty, so we consider the reduction in the p90p50 ratio to be more reliable, particularly for the years around World War II.

The results tell the same story as the ones showed in the main text: redistribution increased during both wars in all countries, and decreased in the 1920s (in those country-years for which we have data). The trajectory of the p99p10 indicator in the United States aligns closely to the one of the Reynolds-Smolensky index shown in Figure 8. The income tax in the United Kingdom was always the most redistributive, reducing the ratio between percentile99 and percentile10 by 14.5% in 1919 and by 28.6% in 1949. The United States and Sweden lied considerably behind during World War I (near or below 5%), and both grew more redistributive by the end of the period (17.5% reduction in Sweden and 22.2% in the United States). When looking at the ratios p90p10, the United States appears to be reducing distances the most by the end of the period – which points to the importance of this level of income to determine the total levels of redistribution measured by the Reynolds-Smolensky index.

The estimates for Sweden, it should be noted, are expected to increase when local income taxes have been added to the calculations.

Table A2. Percentage reduction in income ratios (from gross income to post-tax income)

Sweden				
	p99p10	p90p10	p90p50	p50p10
1912	2.0%	0.7%	0.7%	
1913	2.0%	0.7%	0.7%	
1917	2.3%	0.8%	0.8%	
1920	3.8%	2.2%	2.2%	
1921	4.7%	3.5%	2.9%	0.6%
1945	16.8%	9.7%	5.5%	4.4%
1946	17.5%	10.1%	5.3%	5.0%
United Kingdom				
	p99p10	p90p10	p90p50	p50p10
1911	3.5%			
1919	14.5%	1.6%	1.6%	
1937	13.0%	1.6%	1.6%	0.1%
1949	28.6%	13.1%	9.4%	4.0%
United States				
	p99p10	p90p10	p90p50	p50p10
1917	0.0%			
1918	1.4%			
1919	3.5%	0.2%	0.2%	
1920	2.6%	0.5%	0.5%	
1921	2.7%	0.9%	0.9%	
1922	2.0%	0.6%	0.6%	
1923	2.2%	0.7%	0.7%	
1924	2.2%	0.8%	0.8%	
1925	1.2%	0.4%	0.4%	
1926	0.8%			
1927	0.8%			
1928	0.8%			
1929	0.8%			
1930	0.3%			
1931	0.7%			
1932	0.5%			
1933	1.5%			
1934	1.4%			
1935	1.6%			
1936	1.8%			
1937	2.1%			
1938	2.1%	0.1%	0.1%	
1939	1.9%	0.0%	0.0%	
1940	2.1%	0.4%	0.4%	
1941	2.5%	1.2%	1.2%	
1942	8.1%	4.1%	3.7%	0.4%
1943	14.7%	9.0%	7.1%	2.0%

1944	16.1%	10.0%	7.1%	3.1%
1945	21.3%	14.5%	8.1%	7.0%
1946	22.2%	14.4%	8.0%	7.0%

Source: Authors' calculations.

Notes: Columns with no data correspond to years where income percentile in the numerator did not pay income tax (and the reduction would thus be 0).

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