Income inequality in historial perspective

Portugal (1890-2006)

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Acknowledgements

Regrettably, this challenge was too ambitious and now I'm more concerned about how to prevent the world from changing me.

Afterwards, during my doctoral courses I attended a series of lectures by Luís Bértola focused on income inequality in historical perspective. They seduced me to the extreme of convincing me to think: that's what I want to do. And I'm totally satisfied with my decision.

A special thought for the group of people that began with me this doctoral adventure: Alfonso Aguilar, Francesc Camprubí, Montserrat de Riquer, Mauro Dockhorn, Tomàs Fernández de Sevilla, José Jofre, Manuel Quintero, Carolina Román, Anna Solé and Joan Sogues. It has been a nice adventure and I'm proud to begin it with you. Carolina was responsible of the Uruguayan connection. As a result I met Henry Willebald in Tartu; it was definitely a special moment. When I participated in the first Economic History Latin American Congress History in Montevideo I got to discover the *asado* and the *mate*. It was fantastic, but it was even greater to share it with you. You, Uruguayans will always be in my heart.

The years I have been in the Department of Economic History have been a very nice experience. I have felt totally involved and committed with the Department's life and activities from the first day, when Jordi Catalan introduced me to all the members of the Department office by office. I would like to thank all my companions to be part of this fantastic human group. I have always been able to work in a wonderful and friendly environment and, beyond work, there was always time for fun, small talk and friendship.

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I have also been part of the Economic History group of the Xarxa de Referència d'R+D+I en Economia i Polítiques Públiques, a research group led by Dani Tirado and Alfonso Herranz and focused on income inequality and public policies. It has been very stimulating to be part of this group and being able to share and discuss my research with people with similar research interests. My thesis sometimes reminded me the movie *The loneliness of the long*

Going abroad to present my first work and seeing how other researchers worked, discussed and criticized papers made me grew professionally. It was stimulating, and it was worth doing it from the very beginning. When in 2007 I participated in my first Summer School in Tartu organized by Globaleuronet I was fearful and nervous but after that experience I felt that I had left the nest to begin to fly.

I also did two research stays in *Instituto de Ciencias Sociais* (ICS) in Lisbon. I would like to thank this institution for the all the facilities they offered me. There I could find an excellent environment for research and I could strengthen my research links with Pedro Lains, with whom I learnt a lot. I also discovered the outstanding Portuguese gastronomy and particularly the *Bacalhau à Brás*. Besides, I got to discover a fantastic city, a lovely culture, and the Portuguese people who were always charming with me. I only regret that I have not always been able to transmit my nice feelings for the Portuguese in my hometown, which may be due to the existence of a few but very well known outliers such as José Mourinho and Cristiano Ronaldo.

And second, and particularly, to the love of my live and to the fruits of this love: Marina and Elisa.

> To determine the laws which regulate this distribution (between rents, profits and wages), is the principal problem in Political Economy[1]
>
> David Ricardo (1817)

CHAPTER 1

Introduction

The quote that opens this Introductory Chapter shows to what extent economic inequality was in the centre of the analysis of classical economists. In spite of that, with the turn to the twentieth century it suddenly lost its pre-eminence and was gradually marginalised as an object of study in mainstream economics. This fact is well illustrated by the influential Pareto criterion in welfare economics, according to which, one distribution is superior to another when at least one individual is better off and nobody is worse off. As a result, distributional issues became completely neglected. Against this background, Branko Milanovic has recently commented that the Pareto criterion:

"*Is in effect a prescription for immobility, stagnation, doing nothing, and –most important- keeping power and privilege where they currently are.*"[2]

However, the ice-age of distributional analysis came to an end in the early 1990s.[3] Anthony Atkinson titled his presidential address to the Royal Economic Society "Bringing income distribution in from the cold", in order to:

"*Highlight the way in which the subject of income distribution has in the past been marginalised. For much of this century, it has been very much out in the cold. There are signs that in the 1990s it is being welcomed back (…) and I would like to use this occasion to*

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[1] Ricardo (1817), p.4.
[2] Milanovic (2011b), pp. 22-23.
[3] Kuznets (1955) is an important exception in this regard.

give further impetus to the re-incorporation of income distribution into the main body of economic analysis."[4]

Indeed, the last decades have been the scenario of an impressive boom in studies on income distribution. These studies have transformed how we think about inequality today: the way to measure it theoretically, the empirical strategy to estimate it, the sources used, the reasons behind its evolution and also its impact on other variables such as the rate of economic growth, institutional changes, etc.

Distributional analyses have gained importance in the literature also due to the changes that have taken place in the real world. After WWII, the world economy experienced an accelerated process of economic growth, at historical maximum rates. In the most developed economies, growth was accompanied by the unprecedented prosperity of the whole population through higher real wages and the creation and expansion of the modern Welfare State. In this context, income distribution was not under discussion, because an equal distribution was embodied in the model of mass production for mass consumption. However, after the 1970s oil crisis, the economic paradigm changed deeply, having an important impact on income inequality.

Indeed, the last decades have been characterized by increasing income inequality in developed countries,[5] former communist economies and fast-industrializing countries such as China, and by unsustainable and persistent high inequality levels in other regions, such as Latin America.[6] This has attracted the interest of public opinion and is becoming a key political issue. Even before the Great Recession, there was an increasing concern among researchers, and society in general, on the fact that economic growth was not enough if all gains were concentrated in small and wealthy groups. In Portugal, for instance, real incomes of the top 10% income earners have increased at 3.3% yearly during last two decades whereas those of the remaining 90% have decreased at 0.4% yearly.

Thus, public interest may have also pressured economic researchers to satisfy social demands of better information on the magnitude, characteristics, dynamics, causes and consequences of inequality. And last, but not least, it

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[4] Atkinson (1997), p.297.
[5] Atkinson and Piketty (2007), OECD (2011).
[6] De Ferranti et al. (2004).

may have encouraged them to try to provide some strategies to reduce extreme inequality.

This thesis aims to contribute to this new wave of studies on economic inequality with an analysis of the Portuguese case. More specifically, in this thesis I provide a long term perspective of the evolution of Portuguese inequality, from both the personal and the spatial point of view, from the late nineteenth/early twentieth century onwards. This research joins the ranks of a growing literature on the long-term evolution of inequality, being the first one to analyse in depth the Portuguese case for such a long time span. In the remaining of this chapter I provide a short review of the relevant literature on the topic and a short historical background on Portugal, in which I focus specifically on the state of the art on the evolution of the country's inequality. Besides, in the last section, I summarise the content of the thesis and outline their main contributions.

1.1.- Personal inequality

The revival in the literature on income distribution has brought about new explanations on the reasons for changes in inequality. Undoubtedly, the Kuznets Curve hypothesis has been the leitmotiv of most studies and the protagonist of an enormous literature.[7] The obsession with the Kuznets Curve hypothesis led to a race to test it, during which Kuznets' main message was often forgotten: that the inverted U-curve would be the result of the process of structural change that transforms an agricultural economy into an industrialized one, and that it should never be isolated from its historical context and, even less, tested in cross country studies. However, as may be seen in the following chapters, a careful use of the Kuznets Curve *as was raised by Kuznets* may help to understand the long term evolution of inequality in certain countries such as twentieth century Portugal. In this regards, in addition to structural change, in order to explain the right hand-side of the curve, Kuznets also emphasised the role of political decisions in the form of new taxes and government induced inflation, that affected specially top income groups. In the same vein, he stressed the importance of demographic factors, such as higher birth rates of the poor, which would reduce the share

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[7] See Ahluwalia (1976), Papanek and Kyn (1986), Anand and Kanbur (1973), Li, Squire and Zou (1998) and Barro (2000).

of income of a fix proportion of top income earners; the emergence of new industries in a growing economy, which would diminish the concentration of economic power in the hands of the pre-existent economic elites; and finally, the increase in services income, which would be less marked among the top income groups than among the lower income groups would also push towards income equalization.

Beyond the forces identified by Kuznets, the recent literature has focused on a long list of other factors that may contribute to explain actual changes in inequality. To begin with, according to the Stapler-Samuelson theory, global forces such as trade and migrations may have an impact on inequality depending on each country's relative endowments of land, capital and labour. According to this theory, an increase in the relative supply (decrease in the relative demand) of one factor of production would imply a decrease in its price, which would have consequences on inequality, since production factors are not equally distributed throughout a society's income distribution. For instance, immigration would reduce wages relative to capital income (and increase inequality), whereas exports of labour intensive goods would increase labour relative demand and wages (and reduce inequality). Williamson and Lindert (2003) provide a good summary on the effects of globalization on inequality in historical perspective.

The impact of globalisation on wage inequality has also been analysed by several authors both in historical perspective[8] and in the recent decades.[9] In fact, the steep increase in wage inequality during the last decades has fostered research on this topic. In this case, the impact of globalization (trade and migrations) depends on its effects on the relative demand and supply of skilled labour. In skilled labour abundant countries, globalization would trigger wage inequality, whereas in unskilled labour abundant countries globalization would compress it.

Besides globalization, technological change, labour institutions and social norms may also explain the recent increase in wage inequality. The skill-biased technical change hypothesis states that technological progress is complementary to skilled labour and thus increases skilled labour relative demand and wage inequality. Those analyses also take into account increases in the relative supply of skilled labour due to the expansion of education,

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[8] See Anderson (2001).
[9] See Wood (1995 and 1998).

which would partially offset the impact on wage inequality provoked by the rise in the demand for skills.[10] Other scholars emphasise the impact of the erosion of labour market institutions such as trade unions, minimum wages and unemployment benefits, which are closely related to the change in the prevailing social norms.[11] I come back to this debate in Chapter 3.

Atkinson, Piketty and Saez (2011), on the basis of the new top income estimates, have argued that the long and widespread decline of top income shares during the first half of the twentieth century was mainly due to the shocks provoked by the two World Wars and the Great Depression which, through different mechanisms, such as high inflations or direct destructions, tended to erode the capital income of the more privileged. Afterwards, between the 1950s and the 1980s, top income shares stabilized at low levels. In some countries, such us the US and Japan, the wage controls that were imposed during WWII were maintained thereafter and tended to erode top relative wages and wage inequality.[12] Besides, the progressive agenda introduced in income and inheritance taxes also seems to have prevented the recovery of top incomes to the levels of the early 1910s. By contrast, from the eighties onwards top incomes increased again at a quick pace in Anglo-Saxon countries. This was largely due to the erosion of progressive fiscal taxes, as well as the boom of top wages, which was related to changes in social norms and new remuneration practices. Actually, the recent boost in top wages has increased the share that labour returns account for within top incomes. As a consequence, and opposite to what was usual in history, in some developed countries class differences (i.e. differences between labour and capital owners) are being replaced since the 1980s by wage dispersion as one of the main components of inequality.

From a different perspective, the recent theoretical developments have suggested some radical changes in the instrumental role attributed to inequality. For most than two centuries it was overwhelmingly considered that inequality was not only good, but also indispensable for growth. The classical distinction between landowners, bourgeois and workers attributed to capitalists the capacity to save and invest. Hence, high inequality was good for growth because it allowed higher incomes for the bourgeoisie, which was the

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[10] See Acemoglu (2002), Katz and Murphy (1992), Juhn, Murphy and Pierce (1993) and Levy and Murnane (1992).

[11] See Lemieux (2008), Card (1992), Freeman (1993), DiNardo, Fortin and Lemieux (1996).

[12] Atkinson, Piketty and Saez (2011) and Goldin and Margo (1992).

social group responsible to invest in physical capital and to accelerate the capital accumulation of an economy.

On the other hand, the notion that the income received by each individual is strictly related to its productivity led to the conclusion that market income distribution is the most efficient one. Besides, inequality would promote the effort of individuals to be more productive in order to earn more income, which ultimately would benefit the whole society. Or in Adam Smith words':

"By pursuing his own interest, he frequently promotes that of the society more effectually than when he really intends to promote it."[13]

In this context, worrying about inequality would be useless, because any attempt to redistribute income in order to promote equality would distort the efficient market income distribution. The trade off efficiency-equity, then, stated that a society should choose one of these because they are mutually incompatible; i.e. each society must choose between having a bigger pie or a smaller one with similar slices.

However, recent research has questioned the classical efficiency-equality trade-off from different perspectives. On the one hand, Galor and Zeira (1993) argue that the imperfection of capital markets may exclude a high proportion of the population from credit access in unequal societies. This would prevent the expansion of physical and, especially, human capital among poor families, which would ultimately reduce the potential growth rate. In this context, Barro (2000) states that inequality would only hamper economic growth in relatively poor societies, because capital market imperfections tend to diminish as a country develops.

Following the median voter theories, Alesina and Rodrik (1994) and Persson and Tabellini (1994) suggest that high inequality may increase fiscal redistribution policies, which would discourage capital accumulation and reduce the rate of growth. However, Bénabou (2000) argues that neither inequality and redistribution nor redistribution and growth are empirically related. More concretely, and in contrast to the median voter theories, he finds more support to redistribution in equal societies. Rodriguez (2004) argues that the lobby action of the wealthiest in unequal societies distorts government decisions, which move away from voters' preferences. In this vein, by means

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[13] Smith (1776), p.456.

of a non-median voter model, Rodriguez relates high inequality to low redistribution and low growth. Therefore, whichever the political channel, inequality and growth would be negatively correlated.

Alesina and Perotti (1996) argue that high inequality fuels social unrest and violence that lead to political instability. The subsequent volatility in the economic environment would reduce investment and, thus, the growth rate of an economy. Finally, Engerman and Sokoloff (2000) and Acemoglu, Johnson and Robinson (2002) defend that an initial high inequality level would lead to the development of "bad institutions" oriented to preserve the privileges of the elites and to harm the long term prospects of economic growth.

In general terms, then, the instrumental role of inequality has switched from being considered a neutral issue or even a necessary condition for growth to become disruptive for economic growth. Aghion, Caroli and Garcia-Peñalosa (1999) stated on the recent literature on inequality that:

"The picture they draw is impressively unambiguous, since they all suggest that greater inequality reduces the rate of growth."[14]

1.2.- Empirics

The recent literature on inequality has identified the optimal characteristics that a complete personal income inequality estimate should have. The well known Deninger and Squire's (1996) world income inequality data set was built upon three requirements: the observations included had to be based on household surveys, and they had to comprehensively cover population and income sources.

However, the scarcity of suitable empirical sources to estimate personal income inequality before the 1950s forced economists and economic historians to rely on partial measures of inequality for a very long period. The most popular alternative was the functional income distribution, which measures the fraction of total income pertaining to wage earners, capital owners and landowners. This way of measuring income inequality is closely linked to the classical economists' division of society in three groups

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[14] Aghion, Caroli and Garcia-Peñalosa (1999), p. 1617.

depending on the nature of income: landowners, capitalists and labourers, which received rents, profits and wages, respectively.

The class society may have been a more or less accurate picture of an agricultural economy in its first stages of industrialization, that is, for the context in which it was designed. However, classical studies focusing on the functional income distribution have been losing ground because of their inability to capture income dispersion inside each social class and, specially, among wage earners. Those differentials, that may have been modest in preindustrial economies, expanded during industrialisation, shrinking the significance of the functional approach. In current societies, for instance, there use to be wage earners both at the very top of the income distribution, such as top executives and bankers, and also at the bottom, earning minimum wages. This income disparity is also common among capital owners. Besides, there is an increasing share of the population that receive both capital and wage incomes.

In fact, in some cases the evolution of functional and personal income inequality runs in opposite directions, because of the changes in income distribution inside each social group. A detailed analysis of the structure of personal income inequality clearly shows that a lot of things may happen inside the black boxes of the functional income distribution.

This limitation was overcome with the first systematic and nation-wide household budget surveys (HBS), which were conducted from the 1950s onwards for a small (but gradually increasing) number of countries. Thereafter, most modern studies on inequality have been based on indices of personal income inequality, which are estimated from HBS covering all population and income sources. The appearance of HBS represented therefore an important step forward and allowed estimating more robust and reliable measures of income inequality.

However, the absence of HBS before the 1950s has forced economic historians to look for alternative sources, methodologies and approaches to measure income inequality. Indeed, researchers' creativity has generated a wide new range of measures and indices to measure inequality: the Williamson index, the Extraction Ratio, top income shares, etc. On the other hand, new sources of information have been exploited in order to approach personal income inequality, such as social tables, census, wage data and fiscal statistics.

The Williamson index[15] is an attempt to approach functional income distribution with very low data requirements. It is the ratio of per capita GDP to unskilled wage, being a very rude and simple approach to inequality. However, by only taking into account the relative situation of unskilled workers to the average income is able to provide a fairly accurate picture on the evolution of overall income inequality in historical societies. Despite that, Prados de la Escosura (2008) argues that the Williamson Index ceases to be representative of inequality in developed economies, in which the proportion of unskilled workers is lower and the index overstates actual income dispersion.

Another strategy to measure inequality in historical societies is the Extraction Ratio (ER),[16] which is the ratio of a society's actual inequality to its maximum feasible inequality. Maximum inequality is estimated under the assumption that almost all population lives with subsistence incomes and a tiny elite receives all economic surplus. Thus, a higher ER would mean a higher effectiveness of the elites to extract surplus. This measure has the virtue of highlighting that the same level of inequality is more damaging in poor countries. At the same time, it warns against direct comparisons of inequality between countries with very different income levels. However, as a country grows and gets richer, the ER tends to decrease and gradually loses significance.

For sure, the main breakthrough in the long term estimation of inequality is due to the pioneering book by Piketty (2001) on top income shares for France. Thomas Piketty engineered a new way to estimate inequality with data sources that had always been available to the community of researchers and that had been largely neglected. By means of the Personal Income Tax statistics he was able to estimate the fraction of income pertaining to the richest fractiles of the population (10%, 5%, 1%, 0.5%, 0.1%, 0.05% and 0.01%) from the early twentieth century onwards. The main advantage of top incomes is the exploitation of statistical sources that are available in most developed countries, which has a high comparative potential. Indeed, this study had a deep impact in the literature and currently dozens of top income shares estimates have been produced for different countries.[17] Although this measure only covers a tiny fraction of the population it is very informative, and some

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[15] See Williamson (1997).
[16] Milanovic, Lindert and Williamson (2011).
[17] See Atkinson and Piketty (2007) and (2010).

studies, such as Leigh (2007), state that top income shares are a good proxy for overall personal income inequality.

Finally, some historical research has tried to obtain a complete measure of personal income inequality through different strategies. To start with, Rossi, Tonniolo and Vechi's (2001) estimates for Italy from the 1880s to the 1960s are based on the collection of thousands of family budget surveys at the local level, which allowed them to provide national estimates for different time periods. The problem of their research strategy is that is hugely data demanding and difficult to reproduce internationally. A different strategy was followed by Bértola (2005) for Uruguay. He complemented the functional income distribution with estimates of income dispersion inside each social group, which were obtained from a variety of sources such as census, wage data, taxes, etc.[18] These modifications allowed to overcome the aforementioned limitations of the functional income distribution and provided a more reliable picture of actual income inequality in Uruguay. Besides, this strategy has the advantage that similar studies may be performed in other countries, which would allow having more or less comparable international estimates. A similar approach to overall income distribution on the basis of historical sources is provided by the so-called "social tables", which estimate inequality on the basis of a division of society in different categories and an estimation of each category's size and average income. Despite the doubtful quality of some of these estimates, they are the best inequality proxies for the period before the twentieth century all over the world.[19] All this innovations in the way of estimating inequality have brought about a great improvement in the historical knowledge on the long term evolution of economic inequality in several countries for which there was a total lack of information on distributional issues.

This thesis contributes to this wave of studies by adding new time series on top income shares, wage inequality, extraction ratio and personal income inequality for Portugal throughout the twentieth century. In addition, it also provides a systematic comparison between the different available indicators, and shows that, while all inequality measurements have its potential, they should not be used indistinctively for the same purposes, because they often evolve in opposite directions. Unfortunately, more than often, these

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[18] See also Bértola, Castelnovo, Rodríguez and Willebald (2010) estimates for Brazil and Chile and Prados de la Escosura (2008) for Spain.
[19] See Milanovic, Lindert and Williamson (2011).

differences have been ignored and there has been the temptation of forcing indices to say more than they can. The use of top income shares to test the Kuznets curve hypothesis, for instance, may lead to mistaken results, as may be seen in Chapter 4. Bearing this caveat in mind, this dissertation aims to extract the maximum potential from all the estimated indexes in order to characterize the long-term Portuguese distributive pattern.

1.3.- Regional inequality

This thesis complements the long-term study of Portugal personal income distribution with the first historical estimates of Portuguese regional inequality. Inequality among regions is an essential component of overall inequality of a country. This is due to the fact that individuals are not evenly distributed across the space and some regions concentrate more rich individuals than others. As a result, in each country there may be a wide variation among regional pc GDPs.

The spatial distribution of economic activity is related to the process of economic development, which does not occur simultaneously throughout a country. It is also conditioned by the level of market integration, trade policy, natural endowments, technical change, agglomeration economies, regional policies, etc. More concretely, there are two main competing theories on the factors that explain regional inequality, which provide different predictions. According to the Neoclassical theory, initial regional inequality is due to factor endowments and factor prices. However, during the course of development, the integration of national markets, trade and migrations would foster the equalization of factor prices and thus per capita GDP levels. By contrast, the New Economic Geography, which largely derives from Krugman's (1991) seminal work, provided a new paradigm to think about the nature and evolution of regional inequality. According to this theory, industrialization and market integration may increase regional inequality. The existence of scale economies would tend to spatially concentrate economic activity and the decline in transport costs would even reinforce this process during the integration of the national markets, until a second stage where the emergence of congestion costs would lead to regional income convergence.

Empirically, Williamson (1965) found that regional inequality follows an inverted-U curve through the process of economic growth and market

integration. This finding has been confirmed by recent estimates of regional GDPs for several countries.[20]

Research on present regional disparities is very abundant. The decentralized character of some countries and the political aim of regional cohesion have led to the implementation of different policies and the production of regional data. However, once more, data on regional inequality are much scarcer for the past. In this regard, Geary and Stark (2002) have provided a new methodology to estimate regional GDP with relatively low data requirements. Under the assumption that wages reflect productivity levels, they distribute the national GDP among the different regions of a country according to regional wage levels and active population. This methodology has already been used to estimate long-term series of regional GDPs in several countries such as: Great Britain, Italy, Spain, Belgium, Sweden, etc.,[21] and is also applied in this thesis to provide Portuguese regional GDP estimates from 1890 onwards.

1.4.- Why Portugal?

There are lots of reasons to focus this dissertation on Portugal. But, above all of them, there is one that makes this country an exceptional case: Portugal is today one of the most unequal European countries.[22] Exceptionality calls the attention of the public and is always worth studying. Is high inequality an intrinsic Portuguese feature? Has it always been the case? Is this the outcome of the Portuguese model of growth? In order to answer these questions, this thesis takes a long term scope, covering all the process of development of Portugal from a backward agricultural economy towards a post-industrial one.

Portugal during the twentieth century has experienced deep transformations in economic, political and social terms. Here we will briefly review the main features of this process. In the political arena, Portugal in the early twentieth century was a parliamentary monarchy with two political parties (*regeneracionista* and *progressista*) that shared the political power in subsequent turns. Pinto (2000) characterized this regime as oligarchic, corrupt and clientelist,

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[20] See Rosés, Tirado and Martínez-Galarraga (2013), Combes et al. (2011), Felice (2011).

[21] See Buyst (2010), Felice (2011), Rosés, Tirado and Martínez-Galarraga (2010) and Enflo, Henning and Schön (2010).

[22] According to the European Union Statistics on Income and Living Conditions (EU-SILC, 2010), in 2009 Portugal was the fourth more unequal European country after Lithuania, Letonia and Spain. In 2006 Portugal led this ranking.

comparable to those in power in Spain and Italy. In 1910 a military coup established the Republican regime, a parliamentary system in which the president was elected by the Parliament. During the republican period the right to vote was only granted to literate men, the education system was nationalized and the church was separated from the state. The Democratic Party won all the elections, with the exception of 1921, when they lost the ballot but a military coup brought them back to power. Given the instability of the republican regime, Portuguese participation in the First World War did not help to its consolidation. Public debt and inflation rates soared, and there were 45 government crises between 1910 and 1926 and 29 Finance Ministers between 1919 and 1923.[23] In addition, the inability of the opposition to win the elections and rule the country led to different attempts to conquer power by force that finally succeeded in 1926, when the regime collapsed. The resistance to the coup in order to defend the Republic was weak. However, the consensus among the new ruling forces was also weak. At the beginning, the 1926 coup was intended to lead to a new liberal system, more presidential and with a bipartisan Parliament. However, between 1926 and the consolidation of the regime in 1932 there was an intense discussion on the kind of regime that would be established: liberal-conservative, authoritarian-conservative or nationalistic-fascist. Antonio de Oliveira Salazar was part of the first government of the new regime, but he quickly resigned. He came back in 1928 as Finance Minister and put public finances in order. Salazar, that was first seen as a technocrat, gradually reinforced his political influence and gained support inside the regime. In 1932 he became Prime Minister and approved a new constitution that instituted the *Estado Novo* (The New State). The New State had a technocratic government and all political decisions were concentrated in Salazar, who controlled all the areas of the New State.[24]

The *Estado Novo* was a nationalistic, protectionist, traditionalist, and highly interventionist dictatorial regime with a social and economic corporatist organization. This new regime was designed to bring stability and harmony to the relationships between the different social classes with conflicting interests. A single-party State where unions were illegal, without freedom of speech, freedom of press or the right to strike, and which strongly repressed

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[23] See Pinto (2000) and Silva Lopes (2005).
[24] Pinto (2000).

dissidence, achieved a situation of "social peace", in which conflicts were often solved against the working class' interests.[25]

Salazar ruled the country until 1968, when he suffered a brain haemorrhage and was replaced by Marcelo Caetano. Caetano arrived when the regime was being increasingly contested by the legal opposition, which denounced anti-democratic policies in the Presidential elections; by the military, increasingly unsatisfied by the continuous failures in the military actions that were undertaken to keep control of the colonies; and by the population in general, that demanded more political freedom and better life conditions. In this context, Caetano implemented a liberal agenda that created tensions with the more conservative factions of the regime. Besides, in some areas, such as labour organization, he made a step back, that also left unsatisfied the pro-liberal groups, which at the end contributed to weaken his position.[26]

Finally, the dictatorship collapsed in 1974 after a military coup by the *Movimento das Forças Armadas* (Armed Forces Movement) in an episode known as the *Revoluçao dos cravos* in April 25th 1974. This coup was aimed to lead Portugal to democratisation, decolonization and development. Portugal started a revolutionary process in which large banks and companies were nationalized, the agrarian reform was implemented in Southern Portugal, and those identified with the dictatorial regime were removed from political, military, judiciary and administrative posts.[27]

In 1975 the first Constituent elections gave the victory to the Socialist Party. In 1976 the New Constitution was approved and democracy began to consolidate. In 1986, Portugal joined the EEC and continued converging in institutional terms with the European standards.

Political instability during the twentieth century had a direct impact on social stability. During the Republican period episodes of social unrest were frequent. The military coups against Republican governments (1915, 1917, 1921) were violent and caused hundreds of casualties. Besides, the decision to participate in the First World War added economic instability to the political turmoil. In this context, the diminishing life standards fuelled unions' activity and strikes, which were fought down by the government. The New State also had to confront different insurrectional episodes, in 1934 and, specially, during

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[25] See Mattoso (1994), Patriarca (1995) and Dias (2005).
[26] Barreto (1990).
[27] Barahona de Brito et al (2004).

the early 1940s, that were severely repressed by the government. This failure forced unions to abandon their insurrectional revolutionary strategy and to find complicities with the rest of the oppositional forces in order to overthrow the New State.[28]

Attempts to change the system from inside, for example, by presenting independent candidates to the presidential elections also failed. In the 1958 elections, for instance, the opposition presented Humberto Delgado, the youngest Portuguese General, as a candidate. Despite his popularity, he lost the elections due to fraud. This episode convinced large sectors of the opposition that the only way to overturn the regime was through a military coup. General Delgado participated in a coup in 1962 that failed and was assassinated by the Portuguese political police (PIDE) in 1965.

The military coup of 1974 had strong popular support, which may explain the revolutionary measures taken during the first years. Then, after the endorsement of the 1976 Constitution that legalized union action, social conflict was gradually appeased and integrated in the new Portuguese institutional framework.

In parallel, Portugal grew and undertook gradual modernization throughout the twentieth century. Portugal's growth rates were around 1.4% during the first half of the century. The country diverged from the core European economies until 1929, to begin to converge with them afterwards, basically due to the latter's slow growth.[29] During the golden age of capitalism, Portugal grew at a very high pace, rapidly converging with the European core. From the transition to democracy to the entrance into the EEC, economic growth became sluggish. Finally, from 1986 to the end of the century, economic growth accelerated and Portugal converged again with the European core countries.

This growth process provoked severe sectoral changes. In the early twentieth century, Portugal was a backward agricultural economy: 62% of active population was in the agricultural sector and less than 20% in the industrial and services sectors. This situation barely changed until the 1950s. Afterwards structural change accelerated and at the end of the century agriculture only

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[28] Mattoso (1994).

[29] See Lains (2003), p.373. The core European countries considered by this author are Belgium, Denmark, France, Germany (West Germany to 1991), Italy, Netherlands, Norway, Sweden, and the UK.

retained 5% of the active population, 35% were in the industrial sector and the remaining 60% in the services one.[30]

The acceleration of structural change from the 1950s onwards is closely related with the international growth boom of the period. There are however, internal factors that help to explain that structural change was so slow until the 1950s. On the one hand, the first third of the twentieth century was very unstable in social and political terms, which hindered industrialization. Later on, when the *Estado Novo* began to consolidate, the economic policy implemented by the Salazar regime was aimed to achieve an equilibrium between the agrarian and the industrial sectors. Mattoso (1994) and Aguiar and Martins (2005) argue that government policies slowed down industrialization until the 1950s. Then, after the first development plan of 1953 the conditions for industrialization improved. Portugal joined the EFTA in 1960, trade openness increased and Portugal left behind the Import-substituting industrialization model (ISI) to adopt an Export-oriented industrialization (EOI) strategy. Both internal and external migrations increased substantially. Foreign direct investment (FDI) was allowed under certain conditions, which had a positive impact on the adoption of new technologies; imports of capital goods also contributed to the increase in industrial productivity.[31]

Poor human capital levels were another of the obstacles that hindered economic growth during the first half of the twentieth century. In 1930, Portuguese literacy rate was only 40%. This drawback was tackled through the rapid extension of the primary education system (at the expense of its quality level). Secondary school enrolment also improved gradually until the 1970s, whereas higher education did not increase until the 1970s.[32] As a result, the contribution of human capital to growth was rather modest from the 1910s until the 1970s, but it accounts for 41% of total economic growth between the 1970s and the 1990s. Capital deepening always was the main growth factor, whereas the contribution of Total Factor Productivity was rather low.[33] Portugal, similarly to the Eastern European countries, implemented an extensive model of growth, in contrast with the intensive model implemented in Western Europe.

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[30] See Valerio (2001).
[31] Mateus (2005).
[32] Amaral (2005).
[33] Lains (2003), p. 377.

What do we know about the changes in Portuguese income distribution throughout the process of industrialization? Not much. Despite the fact that inequality has always been mentioned by Portuguese historiography to explain the most relevant events of the country's history during the twentieth century, the lack of empirical evidence has forced researchers to sustain their arguments on qualitative evidence and guesses.

However, there are some exceptions in which informed opinions were accompanied by some evidence. To start with, Reis, Pereira and Martins (2012) state that inequality declined in Portugal between the sixteenth and the eighteenth century.[34] Besides, they argue that inequality was quite high in Europe during this period, but emphasise the fact that Portugal was among the less unequal European countries. This finding is essential because it suggests that the current high Portuguese inequality is not rooted in ancient times. In fact, as is argued in Chapter 4, high inequality in Portugal seems to be a twentieth century phenomenon.

On a more recent period, Alarcao (1948) stated that real wages in 1918, which were very low in comparative perspective, fell by an additional 17% until 1944. The evolution of real wages, then, would point to an increase in inequality during this period. Matoso (1994), Pinto (2005) and Patriarca (1995) also sustain this finding.

The absence of empirical information on income distribution became less extreme since the 1950s and, specially, from the 1980s onwards. In this context, Silva (1982) stated that industrialization and urbanization was responsible for the increase in income inequality and poverty that took place from 1950 to 1974. According to Silva, agricultural workers' living standards lagged behind the general prosperity of the country (in terms of per capita GDP) while new industrial workers that came from rural areas had to face difficult living conditions in the new urban areas. On the basis of data from the Portuguese household budget surveys, Castanheira and Ribeiro (1977) show an increase of the Gini coefficient from 0.35 to 0.39 between 1967-68 and 1973-74, and Pereirinha (1988) also depicts a slight increase in inequality for the same period. Despite that, all these authors show that the relative situation of the bottom half of the distribution improved during this brief

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[34] These authors use the available Portuguese fiscal sources (*décimas*) at the local level to estimate income inequality.

period. This would contradict Silva's suggestions on the decreasing living standard of the worse-off, at least for the last years of the dictatorship.

For the democratic period, Pereirinha (1988), also on the basis of household budget surveys, found a decline in inequality from the mid 1970s to 1980. Gouveia and Tavarés (1995) analysed the period from 1980 to 1990 using the same sources and found that the Gini index decreased, using 6 different income definitions.[35] This finding induced the authors to ask themselves: *why did inequality decrease in Portugal at the same time as it increased in most other OECD countries?[36]* However, this comparative anomaly disappeared during the following decade. According to Rodrigues (2007) inequality increased again during the 1990s from 0.32 to 0.35 (disposable income definition), a trend that continued until 2005, when the Gini index scored 0.38 and Portugal was the most unequal European country. After that, inequality began to decline until 0.34 in 2011.[37] This high inequality has also had a substantial impact on poverty, which today is one of the main problems of Portugal.

Other analyses have focused on partial measures of inequality. Pereirinha (1988), on the basis of industrial wages for the period from 1953 to 1980, found an inverted-U curve of industrial wage dispersion with a peak of maximum inequality in 1959, being the balance of the whole period egalitarian. The dissimilar evolution of wage inequality and personal income inequality is not contradictory, because the first measure only analyses a fraction of the whole population and both measures do not have to evolve necessarily together. For the subsequent period, Cardoso (1998) reported an increase in wage inequality between 1983 and 1992 that he attributed to technological change and institutional factors. This increasing trend continued until 2006, according to Centeno and Novo (2009), which also emphasise the role of the increasing relative demand of skilled labour as a major determinant of this trend.

Finally, there are some estimates of the evolution of regional inequality from the 1950s onwards. Abreu (1969) carried out an estimate of regional GDPs for

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[35] The decline registered in the Gini index from 1980 to 1990 was: from 0 3680 to 0.3676 in household income; from 0.3305 to 0.3200 in per capita income; from 0.3132 to 0.3092 in equivalent income; from 0.4238 to 0.4090 in total expenditure; from 0 3796 to 0.3578 in per capita expenditure; and from 0.3956 to 0.3682 in equivalent expenditure.

[36] See Gouveia and Tavarés (1995), p. 13.

[37] See The European Union Statistics on Income and Living Conditions (EU-SILC): http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database

1953 and 1963, and Conceição (1975) for 1970. Thereafter, from the 1980s onwards the Portuguese Statistical Institute (INE) has provided the evolution of Portuguese regional GDPs. However, before the second half of the twentieth century there is no information on GDP data at the regional level.

To sum up, there is a relatively good knowledge on the evolution of inequality in Portugal since the 1980s. However, empirical evidence is far scarcer and of lower quality between 1950 and 1980, whereas the decades before the 1950s have remained completely unexplored. This thesis aims to fill this gap by providing the first set of long-term distributional estimates for the twentieth century, which will allow a careful analysis of the relationship between inequality and development from different perspectives and throughout the whole process of Portuguese industrialization.

1.5.- Structure of the thesis and main findings

This thesis is structured as follows. Chapter 2 presents new series of the evolution of top income and wealth shares in Portugal between 1936 and 2006, estimated on the basis of information on the Portuguese Personal Income Tax and the Estate Tax. Top wealth shares were quite high in comparative terms, and they increased until the 1950s to decrease afterwards. As for top income shares, they declined during WWII, but recovered thereafter until the 1950s. In the second half of the century, top income shares declined sharply to increase again from the 1990s onwards. This pattern lines up Portugal with the Anglo-Saxon countries' experience, where top incomes shares increased during the last fifth of the century. Apparently, the trends in Portuguese top incomes might be explained by rapid structural change and economic growth during the golden age.

Chapter 3 provides new series of the evolution of wage inequality in Portugal from the 1920s onwards. These series account for wage differentials between sectors and also due to skill premiums. Wage inequality in Portugal followed an N-curve, peaking in the late 1950s and reaching its minimum in the 1980s. Inequality between sectors was behind the evolution of global wage inequality until the 1980s, when wage differentials due to skill levels became the main force pushing up wage inequality.

The evolution of wage inequality seems to line up with the international experience, specially from the 1980s onwards, when wage dispersion increased in most OECD countries. Besides, the Portuguese experience seems to fit in what might be called an "Extended Kuznets Curve" hypothesis, according to which wage inequality would follow and N-curve throughout the transformation from an agricultural towards a post-industrial economy.

Chapter 4 presents new estimates of personal income inequality for Portugal from the 1920s to the 1980s, when official sources are already available. This is the first long term estimation on personal inequality for Portugal. The starting point of the estimates is the functional income distribution. It is combined with the wage dispersion database presented in Chapter 3, which allows accounting for income dispersion among wage earners. Finally, income dispersion among landowners and industrial proprietors has been estimated on the basis of industrial and land tax statistics.

This database is used to calculate a wide set of distribution indexes: the GE (0) and Gini indexes of inequality, a Polarization index, the Extraction Ratio and a Welfare index. Those indexes show that inequality increased almost continuously in Portugal (with the exception of the period of democratic transition in which there was a sudden and intense decrease in inequality). In this respect, Salazar's regime appears as deeply regressive from the distributional point of view. Not only inequality increased during that period, but also the Extraction Ratio boomed and welfare stagnated during the first decades of the regime. Despite that, the democratic period has not reversed this regressive tendency and both income inequality and the Extraction ratio have increased, whereas welfare has stagnated since the beginning of the twenty-first century.

Finally, Chapter 5 presents decennial estimates of regional GDPs for Portugal from 1890 to 1960 (when official data is already available), based on the application of Geary and Stark's (2002) methodology. This estimate is a joint work with Pedro Lains from Instituto de Ciencias Sociais and Marc Badia-Miró from Universitat de Barcelona and is part of a broader European project aimed to estimate regional GDPs for different countries with a homogeneous methodology, in order to have a comparable regional dataset. The Portuguese results show that regional inequality followed an inverted U-curve that peaked in 1970. The results also show that economic activity tended to concentrate

around the coastal regions, and that the regional GDP ranking was fairly stable through time.

CHAPTER 2

The evolution of top income and wealth shares in Portugal since 1936[1]

2.1.- Introduction

The historical estimation of top income and wealth shares (TIS and TWS) from fiscal sources is a frequent strategy to measure long-term inequality, given the scarcity of other sources of information that could provide better and more comprehensive indicators, such as household budget surveys.[2] Although TIS are a partial measure of inequality, Leigh (2007) demonstrated that they may constitute a good proxy for global income inequality for the second half of the twentieth century. The new indicators of long-term Portuguese economic inequality presented here may contribute to increase the number of countries for which information on top income and wealth shares is available.

The Portuguese TIS presented in this paper show a decrease in inequality during the Second World War which was then compensated for in the early 1950s. In contrast, top wealth shares remained unaffected by the conflict and grew continuously until the mid 1950s. From the mid 1950s till the early 1980s, both top income and wealth shares declined sharply. Finally, during the 1990s, top income shares increased again.

This is not the only estimation of Portuguese TIS. Alvaredo (2008 and 2009) provided an alternative series which has some differences from ours. Appendix 2 of this paper analyses these differences and shows that they are a result of a more critical study and discussion of the sources in our case, which is accompanied by greater transparency in the treatment of data and also a more accurate and balanced interpretation of the results.

The study of the Portuguese case has an intrinsic value, because it allows an analysis of the distributive impact of two features which, according to economic theory, are essential to an understanding of the evolution of inequality: political regimes (dictatorship vs. democracy) and economic

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[1] This chapter has been published in Revista de Historia Económica, Journal of Iberian and Latin American Economic History (2010), Volume 28(1).
[2] See Atkinson and Piketty (2007).

growth. In this regard, in 1926 a military coup put an end to the Republican period in Portugal and established a dictatorship that lasted till 1974. This was characterized by intense political repression and a significant lack of public liberties. This long dictatorship also prohibited labour unions and any kind of workers' movement in order to keep wages down, a situation which should have increased income inequality. In spite of this, from the mid 1950s onwards, inequality, measured through both top income and wealth shares, began to diminish. After the *Revoluçao dos Cravos* of April 25th of 1974, which marked the end of the dictatorship and opened the democratic era, top income and wealth shares continued falling, but at the same pace as during the pre-democratic era. Finally, the last years of the twentieth century were characterized by an intense increase in top income shares. At first sight it would seem that, contrary to what could be expected, political variables were not decisive in determining distributive patterns in Portugal throughout the twentieth century.

The other main characteristic feature of recent Portuguese history was the country's rapid economic growth during the golden age of capitalism. Portugal, following the south European pattern, was catching up quickly with the core European countries during most of the twentieth century (Lains, 2003). These new TIS and TWS series point to the fact that structural change was the main force driving the evolution of income inequality during the transition from an agrarian economy towards an industrialised and service-oriented one.

The remainder of this paper is structured as follows: Section 2 presents the data and methodology used; Section 3 shows the main results; Section 4 tries to account for the causes behind the inequality trends, and Section 5 concludes.

2.2.- Data and methodology

The methodology used to derive top income and wealth shares is based on the pioneering paper by Piketty (2001) and involves estimating the income and wealth shares of the richest fractiles of the population. Information on individual incomes and wealth comes from tax return statistics, structured in different income and wealth brackets. To obtain the different top income and

wealth shares, the number of tax units and their incomes or wealth are divided by the total reference population and the total reference income or wealth, respectively. The estimation of income and wealth thresholds and the income and wealth belonging to each fractile are calculated by assuming that incomes and wealth are distributed according to a Pareto function.

2.2.1.- Top income shares

The main basis for the estimation of top income shares is the Portuguese income tax, which underwent significant transformations after the first attempt to introduce it, in the context of the 1922 failed fiscal reform. The ambition and complexity of this reform, the prevailing administrative weakness, government instability and tax evasion are some of the factors that may explain the complete failure to implement the tax in that year. In 1929, a commission headed by Antonio de Oliveira Salazar designed a new fiscal reform aimed at producing a simpler system, one that was more likely to be applied. The main concern of the reformers was to increase public revenues in order to be able to balance the government budget, which had been out of control since World War I.[3]

The new fiscal system did not imply a complete change with respect to the previous one, and was characterized by the existence of several taxes for specific types of income. These different taxes were applicable to the "normal" or presumed returns of taxpayers, and not to the actual figures as in modern fiscal systems. The sum of all the returns assessed by the specific taxes was then taxed again by the *imposto complementar* (complementary tax) with progressive rates. More specifically, the returns taxed by the *imposto complementar* were the sum of the assessed returns in the *contribuiçao predial* (land tax), *imposto sobre a industria agrícola[4]* (agricultural industry tax), *contribuiçao industrial* (industrial tax), *imposto profissional* (professional tax) and *imposto sobre a aplicaçao de capitais* (capital tax). The *imposto complementar* had two sections: section A for individuals and section B for entities. The replacement of the *imposto pessoal* (the failed personal tax established in the 1922 reform) by the

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[3] Leitao (1997). Although monetary stability was first achieved in 1924, during the Republican period, the years immediately after the 1926 military coup saw the financial situation get substantially worse (Valerio, 1994).

[4] This tax was created in 1963 but was only collected in 1964, 1975, 1981, 1982, 1984, 1987 and 1988.

imposto complementar was a step backwards in terms of modernizing the design of the Portuguese fiscal system, but it had two positive features: it introduced a soft personalization and, most importantly, it was fully applied. [5]

This system remained effective until the 1958-65 fiscal reform, which was intended to introduce real income assessment and to leave behind the "normal" or presumed income tax system. Nevertheless, it maintained the prevailing fiscal structure, that is to say, separate taxes for different kinds of incomes and a superposed tax over them all: the *imposto complementar*. This reform was drawn up by a commission headed by Teixeira Ribeiro, who some years later denounced the move away from the principles established in the reform, such as the return determination system, which in some cases ended up being characterized again by the "normal" or presumed income assessment.[6]

Later, the new constitution approved in 1976 set out the principles that should characterize the Portuguese fiscal system under the new democracy. However, although these principles contradicted the existing tax structure, the necessary fiscal reform was not implemented until 1988. This reform was guided by three principles: equity, efficiency and simplicity. The previous system was completely abandoned. The taxation of personal incomes became entirely covered by one single tax: the *imposto sobre o rendimento*. This tax has two sections, the IRS (*imposto sobre o rendimento das pessoas singulares*) for individuals, which has been used for our estimations, and the IRC (*imposto sobre o rendimento das pessoas colectivas*) for entities. The IRS is direct, personal and based on real returns assessment. This latter reform allowed Portugal to join the group of countries with a modern fiscal system.

As regards tax rates, these have always been progressive, although they have changed significantly since the first personal income tax was established. The tax rate structure evolved in two different directions. On the one hand, the

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[5] Between 1940 and 1950, there was another income tax, the *imposto suplementar* (supplementary tax), which had two sections: section A was levied on some of the incomes assessed by the *imposto profissional* and section B on incomes coming from public positions or companies. Given that income assessed by the *imposto profissional* was already included in the *imposto complementar*, section A of *imposto suplementar* has not been considered here. It would, however, have been useful to include section B in the estimation, but it was not possible due to the characteristics of the sources. In spite of this, the *imposto sumplementar* had a minor quantitative importance and its exclusion is not likely to have biased our estimations.
[6] Ribeiro (1968).

number of marginal rates decreased from almost 200 during the 1930s to between four and five during the 1990s. On the other hand, the top marginal tax rate increased rapidly after the mid 1940s. It was 4.97% until 1945, rose to 30% between 1946 and 1963, to 45% between 1964 and 1975 and to 80% between 1976 and 1981, after the *Revoluçao dos cravos*, during the period in which the extreme left ruled the country. Finally, in 1989 it was fixed at 40%. The effects of the second process (the increase in the top marginal tax rate) have been much more intense than those of the first one (the decrease in the number of marginal tax rates) and, as a consequence, Portuguese personal tax has become increasingly progressive since its introduction.

The establishment of an income tax was a slow and progressive phenomenon in most countries over the twentieth century. At first, it usually covered a small fraction of the total population which increased subsequently. In this regard the Portuguese experience is not an exception. As shown in Table 2.1, the population covered by the income tax increased from 1936 to 1945, then fell substantially in 1946 (from 2.91% to 0.39%) and, from then on, increased continuously, reaching 68.3% in 2000. This coverage level has allowed the yearly estimation of the top 0.5% income share for almost the whole period under study.[7] In contrast, there is no information on the top 1% share between 1946 and 1956, and the top 5% and 10% can only be calculated from 1976 onwards, when the tax coverage increased significantly. In addition, in the Portuguese case, the problem of the low coverage of the income tax is made worse by the exemption of public servants and military personnel from the tax. This exemption, however, is probably not a serious problem for the estimation of the upper top income shares presented in this paper, because, as may be seen in Figure 2.1, those groups' incomes were not high enough to be included within the top 1% income group. The statistical information published by the Portuguese Ministry of Finance on the income tax returns also varied over time. In order to estimate top income shares, the best possible statistical information would be the total returns assessed for each tax unit, distributed among different income brackets. Unfortunately, this information is not available for the whole period studied and a number of adjustments have been necessary in order to obtain a homogeneous series.

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[7] Values for 1946-48 have been interpolated, see below.

Table 2.1 – Income Tax coverage in Portugal (1936-2000)										
1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946
1.4%	1.5%	1.5%	1.6%	1.7%	1.8%	1.9%	2.1%	2.2%	2.9%	0.3%
1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957
0.4%	0.5%	0.5%		0.7%	0.7%	0.8%	0.8%	0.8%	1.0%	1.0%
1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
1.1%	1.0%	0.9%	0.9%	1.0%	1.2%	0.8%	1.3%	1.3%	1.5%	1.7%
1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
1.9%	2.2%	2.5%	3.0%	3.5%	4.1%	3.5%	18.2%	14.7%		17.9%
1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
21.0%	27.6%								46.6%	57.0%
1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	
57.0%	59.0%	57.0%	59.4%	58.1%	60.4%	62.8%	63.7%	64.9%	68.3%	

Source: *Estatística das contribuçoes e impostos* and population censuses.

Figure 2.1 - Yearly incomes of different public employees and military personnel and average incomes of the richest 1% group in Portugal
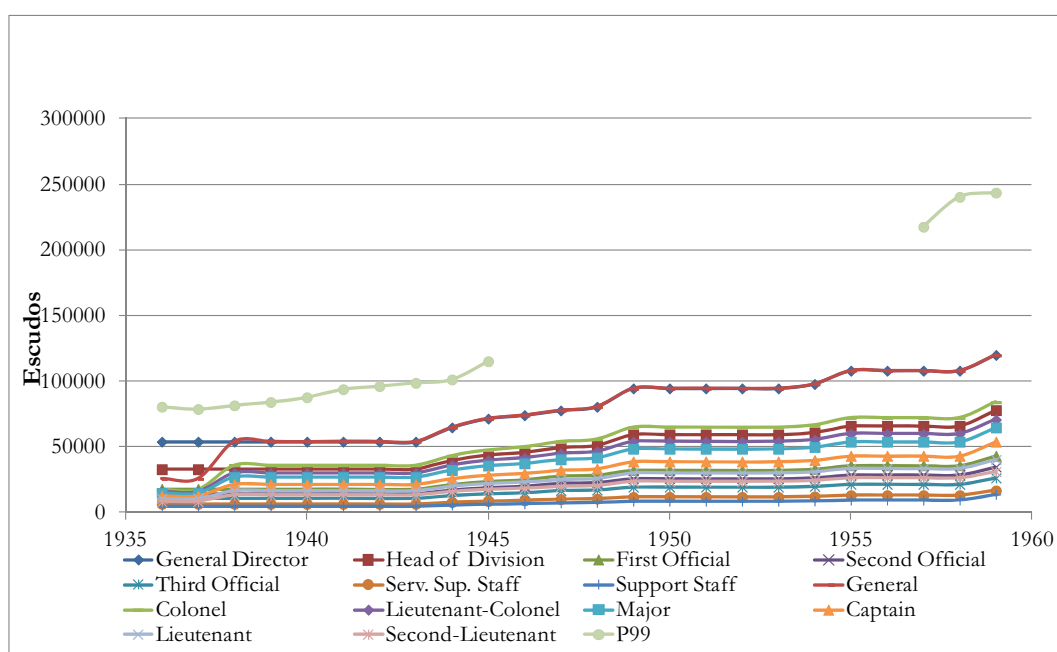
Source: Oliveira Marques (1991) and Batista et al. (1997)

From 1936 to 1945, there is information on the number of tax units, classified into different brackets according to the tax paid. In order to obtain top income shares, it has been necessary, first, to classify the information according to the income assessed by each tax unit, rather than to the taxes paid. This was achieved by dividing each bracket threshold by its corresponding tax rate. The second step involves estimating the total amount of income assessed in each bracket. This was done by assuming that returns were Pareto distributed.[8]

From 1946 to 1963 the statistics published by the Ministry of Finance regarding the *imposto complementar* give information on the total incomes of all tax units, classified in different income brackets. In addition, for each bracket there is information on the number of tax units. This is the information needed for the construction of the series, so no adjustment is necessary.

From 1964 to 1981, the statistics published have the same structure, but the concept of income is now taxable income, i.e. total income less deductions. There were six kinds of deductions, regulated by the articles 3, 28, 29, 30, 84 and 91 of the complementary tax code. 68% of deductions were due to article 29 and associated with family circumstances (a personal deduction, a deduction per partner and per number of children). A further 27% of deductions were due to article 28 and associated with different circumstances, such as different specific taxes paid, social contributions paid by workers, interests and debt obligations, pensions paid by taxpayers and half of the remunerations received by wage-earners. The remaining articles were of minor importance and only accounted for 5% of total deductions. There is, however, no clear way of knowing how the deductions were distributed among tax units. Were they regressive or progressive? The description of deductions in the tax code is too generalist and does not allow deductions to be added to taxable income. Here, it has been assumed that they were distributed in the same way as before 1963, when there is information on both total income and taxable income distributed among different brackets.[9] It must be stressed that deductions were quantitatively very important (about 60% of taxable income).

Between 1982 and 1988, statistical information is too aggregated, and does not distinguish between different income brackets. This prevents the estimation of

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[8] The standard Pareto interpolation method was already used by Kuznets (1953); see Feenberg and Poterba (1993).

[9] Appendix 1 gives a detailed explanation of the method used to allocate deductions.

top income shares for most of the 1980s. Finally, from 1989 onwards, the official statistics give the same information as between 1946 and 1963. Again, no adjustment is necessary.

The number of income brackets in which tax statistics are classified also varied over time. Until 1945 there were nine income brackets, while between 1945 and 1963 this number rose to 31. Between 1964 and 1976 the number of brackets decreased again to sixteen, falling further to twelve in the period up to 1979 and to eleven up to 1981. During the last period, from 1989 onwards, the number of income brackets was fixed at twenty. In general, although more brackets allow better estimations (less dependent on the Pareto assumptions), the number of income brackets over this period is sufficient to guarantee the robustness of the estimations.

Once a homogeneous series for the total income of taxpayers, distributed in different brackets according to their income, has been obtained, the income shares of the top fractiles (P90, P95, P99, P99.5, P99.9, P99.95 and P99.99, equivalent to the top 10%, 5%, 1% income shares, etc.) can be estimated. To this end, the first step involves defining the number of tax units that formed the top fractiles. The unit of taxation of Portuguese income tax is a married couple or a single individual. In order to estimate the total reference population, the number of married women has been subtracted from the total population aged 20 or over. This information has been taken from the Portuguese population censuses, which were published decennially during the period under study. The values between census years have been obtained through linear interpolation.

The following step consists of estimating the income threshold of each fractile, i.e. the income of the poorest member of each fractile, and then estimating the amount of income above each fractile's income threshold.[10] Finally, this amount must be divided by the total reference income.

The total reference income should have been obtained from national accounts, by subtracting from the personal sector income (PSI) those concepts on which income tax was not levied.[11] However, in the case of Portugal, the information

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[10] To this end, the standard Pareto interpolation method has been used, see Feenberg and Poterba (1993).

[11] This is the standard method followed in this kind of study, although reference income can also be obtained from tax statistics by adding those tax units not covered.

needed to make this adjustment is not available for the whole period under study and, therefore, it has been necessary to take the PSI as the total reference income. PSI figures for 1953-1994 are from Pinheiro (1997) and, from 1995 onwards, from the national accounts published online by the INE (National Statistics Institute). Before 1953, PSI figures are not available, and it has been assumed that, between 1936 and 1952, the average PSI/GDP ratio was the same as in the period 1953-62 (80.36%).[12] Thus, GDP data from Batista et al. (1997) have been used to estimate yearly figures of PSI between 1936 and 1953, and a continuous series has been obtained by equalizing the values of PSI in the years in which there is a change of source (1953 and 1995), and by rescaling the series for the previous years.

Figure 2.2 – Ratio PSI/GDP

Source: Pinheiro et al (1997), Batista et al. (1997) and INE online statistics

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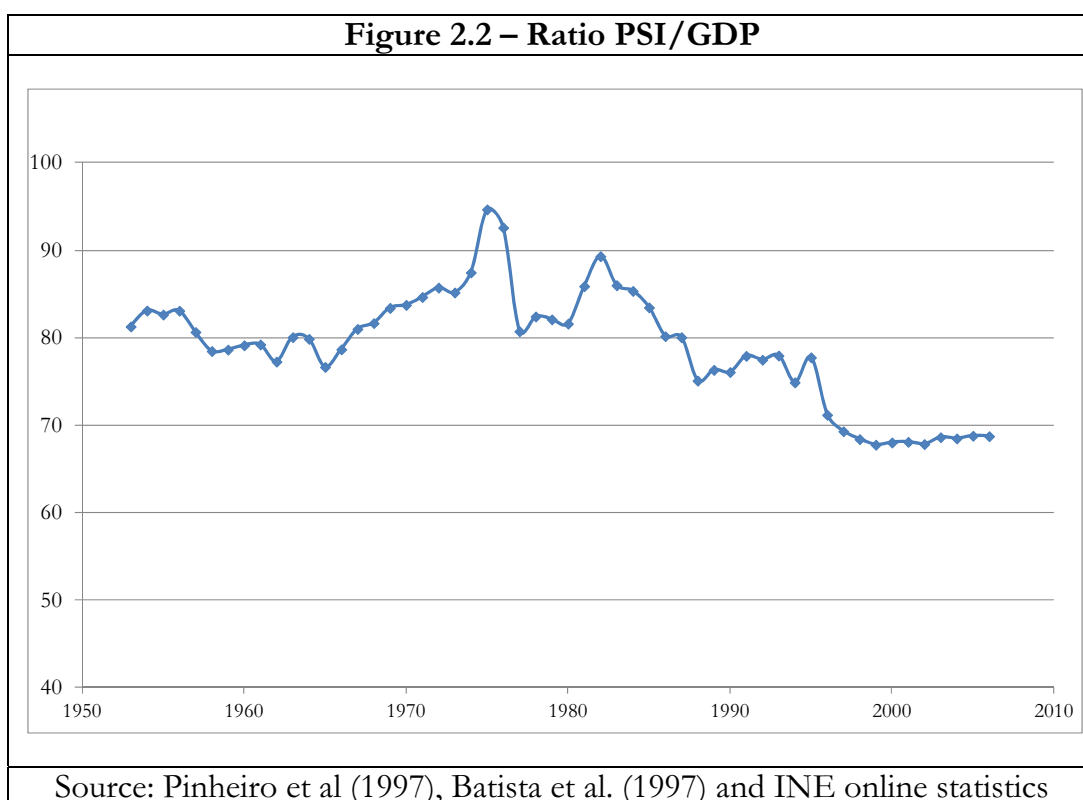
[12] As can be seen in Figure 2.2, the PSI/GDP ratio was relatively stable from the early fifties to the mid sixties, but subsequently it fluctuated severely. There is, in any case, a great degree of uncertainty surrounding the evolution of the PSI between 1936 and 1952, due to the high economic instability of that period, and the final figures may be biased as a result. However, it is not possible to correct this on the basis of the available information.

In several years, the scarcity of data prevents us from estimating some top income shares and, in these cases, the criteria established by Leigh (2007) are adopted, i.e. the missing data are linearly interpolated if the number of missing years is four or fewer.[13]

The tax statistics have some discontinuities causing some breaks in the series. Firstly, from 1945 to 1946 the characteristics of the statistical information published changed, as described above. However, the adjustments introduced in the estimation have minimised any potential distortions due to this change, and the different series estimated are fairly stable. Secondly, between 1963 and 1964 the fiscal system was redesigned. As a consequence, between 1963 and 1965 the data show a short but intense increase in the top income shares that may be attributable to regulation changes in income tax. Finally, between 1982 and 1988 there is a gap in the series and the major changes in tax regulation codes that took place at the time prevent any comparison between the level of the top income shares in 1981 and 1989. Actually, top income shares of 1980 turn out to be clearly understated when compared with the estimate of the top 10% provided by other sources such as the Household Income and Expenditure Survey (HIES).[14] In sum, there are two significant discontinuities in the series (1963 and 1982-88) which must be corrected in order to estimate long-term coherent series.

In order to have a consistent long-term view of the evolution of top income shares, these discontinuities have been dealt with according to the following criteria. Firstly, given that figures for 1965 are more reliable than those of 1963 (before the fiscal reform), the TIS levels of 1963 have been assumed to be the same as in 1965 and have been projected backwards accordingly.

Secondly, given that the TIS for 1980 are clearly understated, we have taken the values provided by HIES as the top 10% income shares of 1980. Top 10% income share levels of 1990 have also been modified in the same way to make them comparable with the previous years. The remaining TIS for 1980 and 1990 have been adjusted to the level of the top 10% TIS. To estimate TIS after 1989, the TIS levels of 1990 have been projected backwards and forwards according to the growth rates of the different TIS. As for 1965-1980,

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[13] See Leigh (2007), p. 10. This was the case in: (1) 1978 for all top income shares; (2) 1959-61 and 1964 for the top 1%; and (3) 1946-48 for the top 0.05%. Between 1982 and 1988 data are also missing, but they have not been linearly interpolated due to the size of the gap.
[14] The top decile income share is 12.5 in our series in 1980 and 26.7 in HIES in 1980.

we have kept the 1965 value, from fiscal sources, and TIS between 1965 and 1980 have been adjusted by applying the growth rate of the different TIS corrected by the ratio (Fiscal TIS 1965 – HIES TIS 1980)/(Fiscal TIS 1965 – Fiscal TIS 1980).[15]

As noted above, Appendix 2 compares our estimation of top income shares with that of Alvaredo. These two estimations have three major differences: the method used to add deductions to taxable income, the total reference income and a higher transparency in the treatment of the original data in our estimation. All these differences suggest greater reliability in the case of our series.

2.2.2.- Top wealth shares

The methodology used to derive top wealth shares is the same as that used to estimate top income shares. The information on the individual stock of wealth is taken from the *Imposto sobre sucessoes e doaçoes* (estate tax). This tax was levied on the stock of wealth above a minimum threshold left by the decedents. In practice, this tax mainly assessed real estate with cadastral values.[16] In spite of this, during the period studied most wealth was in the form of real estate and thus, this source would be a good proxy of the total wealth left by decedents. The Portuguese tax authorities published detailed information for estate tax returns from 1936 to 1982. However, after this year, the reported information became too aggregated to allow the estimation of top wealth shares. The

[15] This correction has been made to connect the TIS levels properly between 1965 and 1980. Projecting the HIES TIS for 1980 backwards according to the growth rates obtained from fiscal sources, the TIS levels of 1965 would have been too high. Given that TIS for 1965 are relatively reliable because this was the first year after the reform, we have preferred to maintain the TIS levels of 1965 and to correct the TIS growth rates in order to connect the series appropriately. In Guilera (2008) the series of top income shares before adjusting for the breaks of the sixties and the eighties can be seen. A final adjustment regards the biases that could have been generated by the normal income assessment system used until the sixties if it was not corrected yearly according to inflation. The comparison of the evolution of the average incomes of the top fractiles with inflation rates seems to indicate that valuations were made yearly except for 1941-43. The inflation of these years was only assumed in 1944-45. In this sense, it is possible that the real turning point for the evolution of TIS, shown in the graphs of section 3, was in 1945 and not in 1943 and that the previous decline would perhaps have been more moderate. However, this would not significantly change the picture of this period. For the rest of the period, the empirical evidence suggests that income assessment was made yearly.

[16] See Valerio (1994).

characteristics of the statistical information published until 1982 are almost constant over time, and the source reports the number of taxpayers distributed in different wealth brackets.[17] The total reference wealth is the total wealth declared by the decedents, and the total reference population is the number of dead people over the age of 19. This last piece of information was taken from the Portuguese population censuses, and figures between censuses have been obtained through linear interpolation.

The coverage of the source is very high throughout the whole period under analysis. It was above 60% of deceased people till the mid 1950s, and increased from then on, to fluctuate between 80 and 90% since the mid 1960s. These high coverage rates indicate that almost all the decedents who left some legacy to their heirs were covered by this tax.

The source provides the total wealth of the decedents minus tax exemptions, distributed among different wealth brackets. The tax statistics also provide information on tax exemptions and people exempt from paying taxes, classified into different brackets according to their wealth. These have been added to the taxed wealth and individuals and the resulting figures have been used to estimate the series.

Regarding the cadastral valuation of real estate, the possible distortions that could be introduced by this system would not be very significant because wealth underestimation would affect both the numerator and the denominator (total reference wealth) and the possible biasing effects would be counterbalanced.

The sample of observations from the estate tax is clearly biased in terms of age. The usual way to correct this is the estate multiplier method which involves dividing the sample into different age groups and dividing each of them per its mortality rate. Unfortunately, Portuguese tax sources do not provide the age of the decedents and the measures of inequality presented refer to the deceased and not to the living population. Given that, in general terms, people tend to increase their wealth throughout their lives, the estate tax observations are likely to miss the relatively young-and-poor people and,

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[17] There were 8 wealth brackets between 1936 and 1958, 11 between 1959 and 1976 and 8 between 1977 and 1982. The minimum wealth threshold was 100 escudos between 1936 and 1944, 500 between 1945 and 1958, 5,000 between 1959 and 1976, and 100,000 between 1977 and 1982.

then, to understate the level of the top wealth shares. In this regard, other case studies show ambiguous outcomes on the possible distortions derived from the non application of the estate multiplier method. Whereas in France and Sweden the age bias of this kind of sample had a minimum impact on wealth concentration estimations, in the case of the United Kingdom it was sizeable.[18]

2. 3. The facts

Several different periods may be distinguished in the evolution of Portuguese top incomes and wealth shares. First of all, the Second World War seems to have had a significant impact on top income shares. Although Portugal was neutral during the war, the conflict may have eroded top income shares until 1945. Subsequently, the situation changed and by the early 1950s top income shares had recovered their pre-war values. In contrast, top wealth shares remained unaffected by the conflict, following an increasing trend that lasted at least until the mid 1950s. The second period was characterized by a significant decrease in both top income and wealth shares. After several years of relative stability of top income shares and increasing wealth concentration, from the late 1950s onwards both magnitudes fell substantially until 1981. Finally, the third period, from 1989 onwards (for which there is no information on wealth shares), was again characterized by an increase in top income shares. The next paragraphs describe these changes in more detail.

2.3.1.- Top income shares

As can be seen in Figure 2.3, top income shares fell by 30% between 1939 and 1944. This decrease was quite similar for all the fractiles for which information is available (top 1% and above). The recovery of top income shares after World War II also affected all fractiles, but was more intense for those located at the end of the income distribution. This meant not only an increase in inequality between the very rich and the rest of the population, but also a wider dispersion within the richest 1%. Later, from the early 1950s to the early 1980s, top income shares declined considerably. The decrease between 1952

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[18] See Piketty et al. (2006), Roine and Waldenström (2007) and Atkinson, Gordon and Harrison (1989).

and 1981 was again higher for those fractiles located at the end of income distribution, i.e. there was a process of income convergence within the richest 1%.[19] The lack of statistical data makes it impossible to discern what happened between 1981 and 1989, but, after this parenthesis, top income shares increased until the end of the period under study. To observe these trends in more detail, Figures 2.4, 2.5 and 2.6 show the evolution of different top income shares from 1936 onwards. Indeed, once the shock of the Second World War had been overcome, the most outstanding feature of the different figures is the huge decline in top income shares that took place from the late 1950s to the 1980s and its increase during the last two decades.
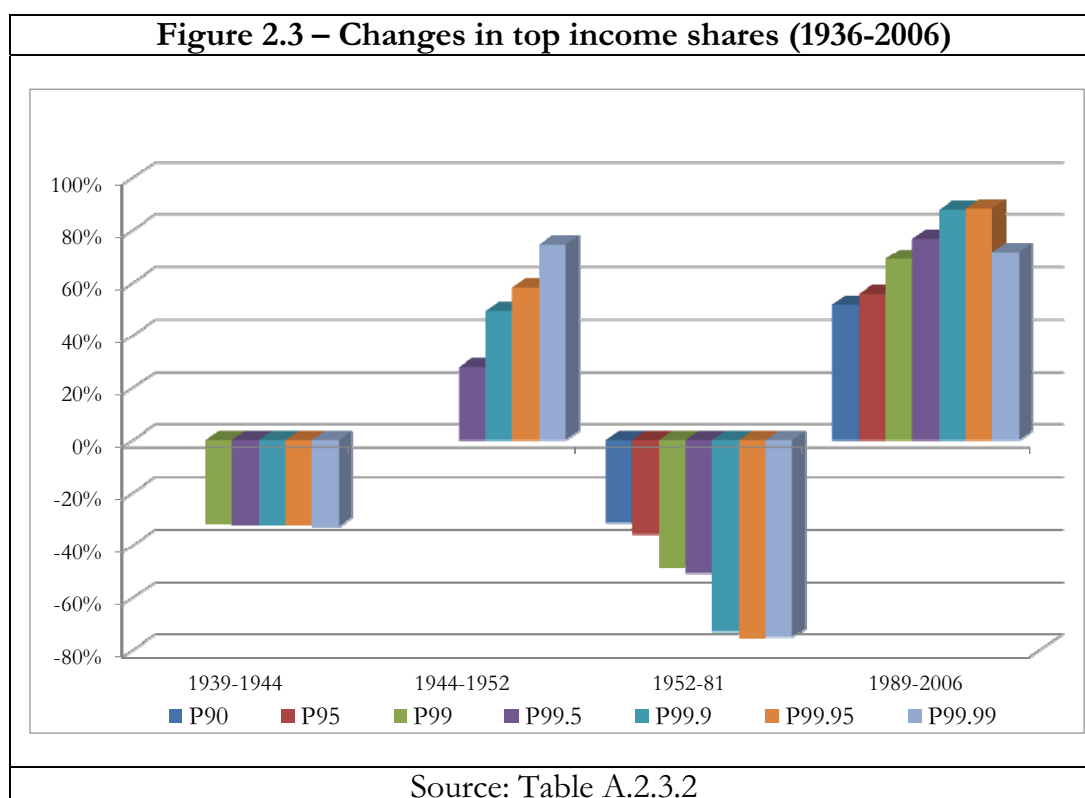
Figure 2.3 – Changes in top income shares (1936-2006)

Source: Table A.2.3.2

Figure 2.4 – Top income shares over 10% (1936-2006)

Legend: P90, P95, P99, P99.5, P99.9, P99.95, P99.99
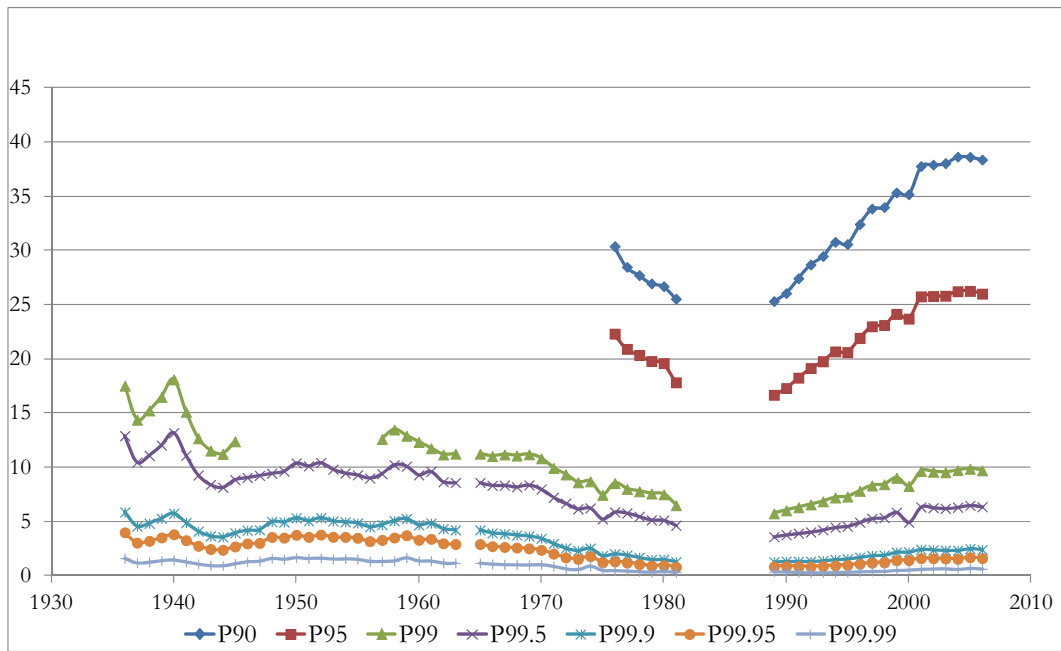
Source: Table A.2.3.2

Figure 2.5 - Top income shares over 1% (1936-2006)

Legend: P99, P99.5, P99.9, P99.95, P99.99
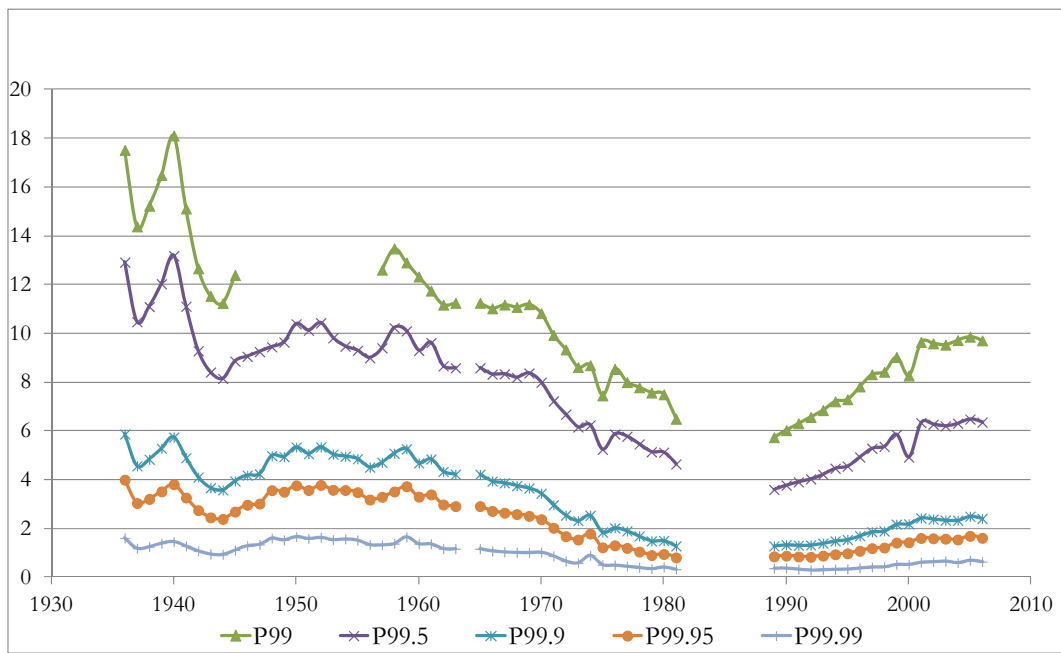
Source: Table A.2.3.2

Figure 2.6 - Top income shares over 0.1% (1936-2006)
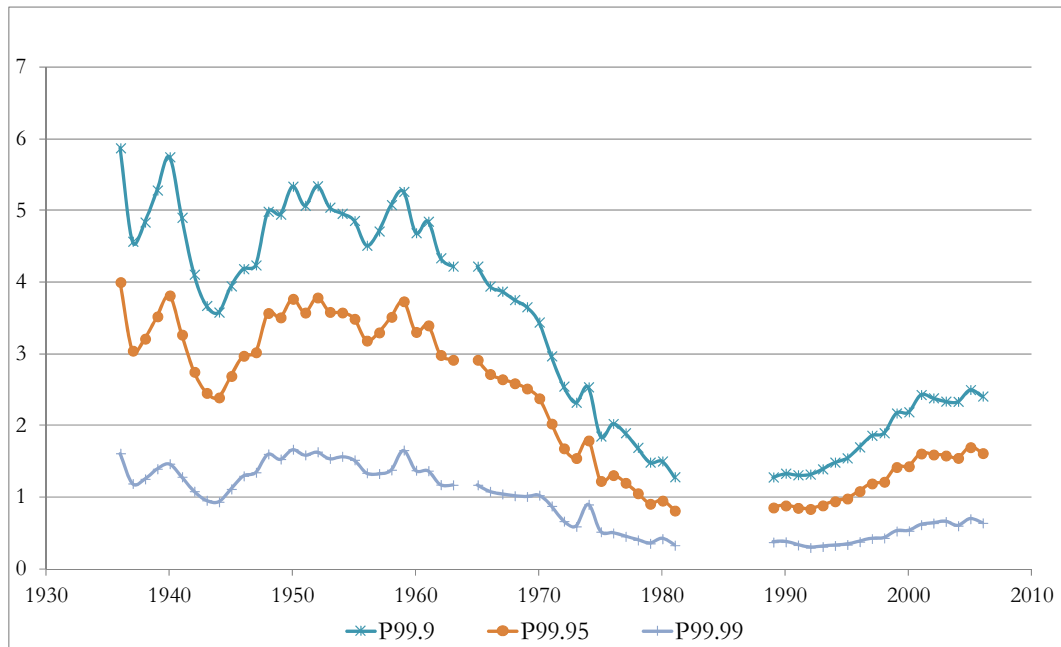
Source: Table A.2.3.2

Figure 2.7 shows different ratios that reveal how many times richer (on average) tax units from the upper percentile of each ratio were than tax units from the lower one. The top 1% is taken as reference because it is the largest share for which information is available for almost all years. Increases in the different ratios indicate an increasing dispersion among the very rich and vice versa. As can be seen in this figure, the different ratios evolved in the same direction. There was a relative stability until the mid 1940s, while from then to the late 1950s there was a process of slight divergence; however, data for this period are not complete and it is only possible to compare 1945 with 1957. From the early 1960s to the late 1970s there was a significant convergence process. From the late 1980s to the early 1990s the ratios fell and they increased again until 2005. The ratio P99.99/P99 is perhaps the most appropriate for characterizing the dispersion between the very rich. Until the mid 1940s the top 0.01% was around eight times richer than the top 1% and in 1959 this ratio reached its historical maximum (12.8). From then onwards it began to fall dramatically and in 1979 the top 0.01% was only 4.7 times richer

than the top 1%. Nevertheless, in 1974 this ratio peaked at almost 11, during a short but intense rise-and-fall movement that could be related to the major political changes of that year.[20] In 1989 the ratio was 6.5, it fell to 4.5 in 1992 and it increased again to 7 in 2005.

Figure 2.7 - Percentile ratios (1936-2006)

Source: Table A.2.3.2
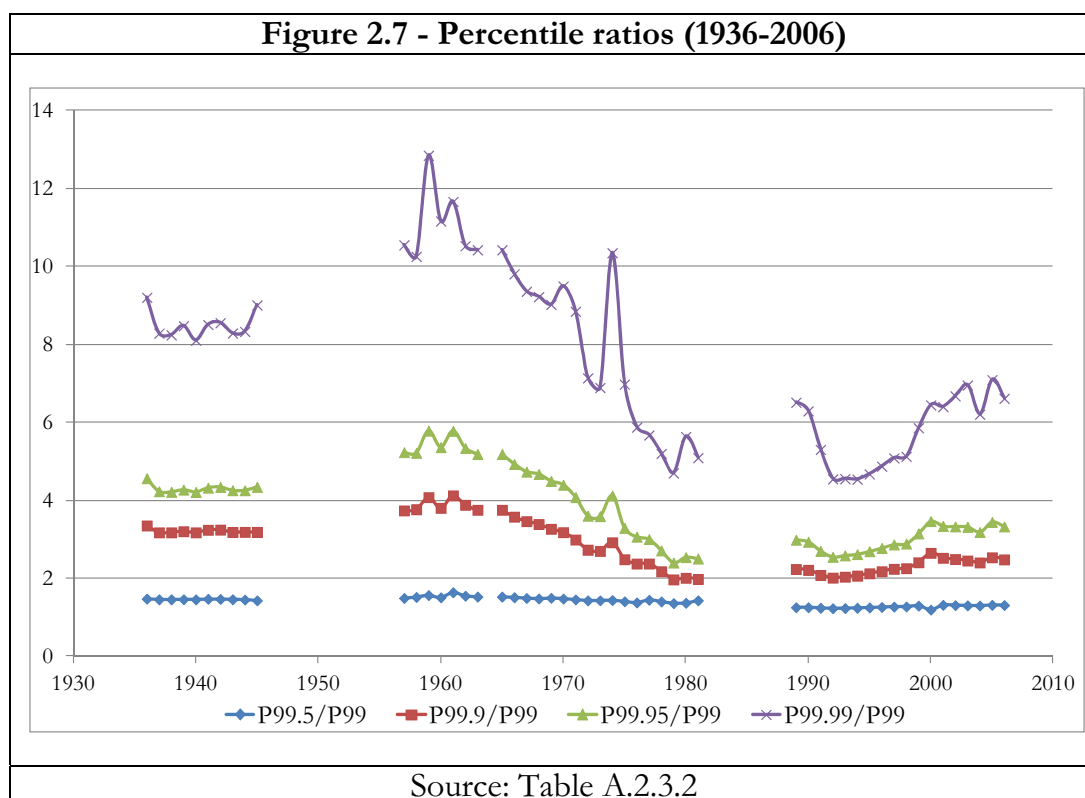
Figure 2.8 compares the top 1% income shares of nine developed countries with the new series. As may be seen in the graph, there is a common long-term decline in the series until the mid 1970s. It can also be seen that the shock of the Second World War provoked a significant decline in the top 1% income shares of most countries. However, unlike what occurred in other countries, top income shares in Portugal, Australia and New Zealand recovered their pre-war values in the early 1950s.[21]

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[20] The top 0.01% is the only group that increases its income share in 1974, because the P99-99.99 income share decreases in this year. This could be related with a more severe income assessment of some very rich individuals that only occurred in 1974.
[21] In the case of Portugal there are no data for the top 1% income shares for the post-war period, but this recovery can be seen in the evolution of the upper fractiles.

Figure 2.8 - Top 1% income shares
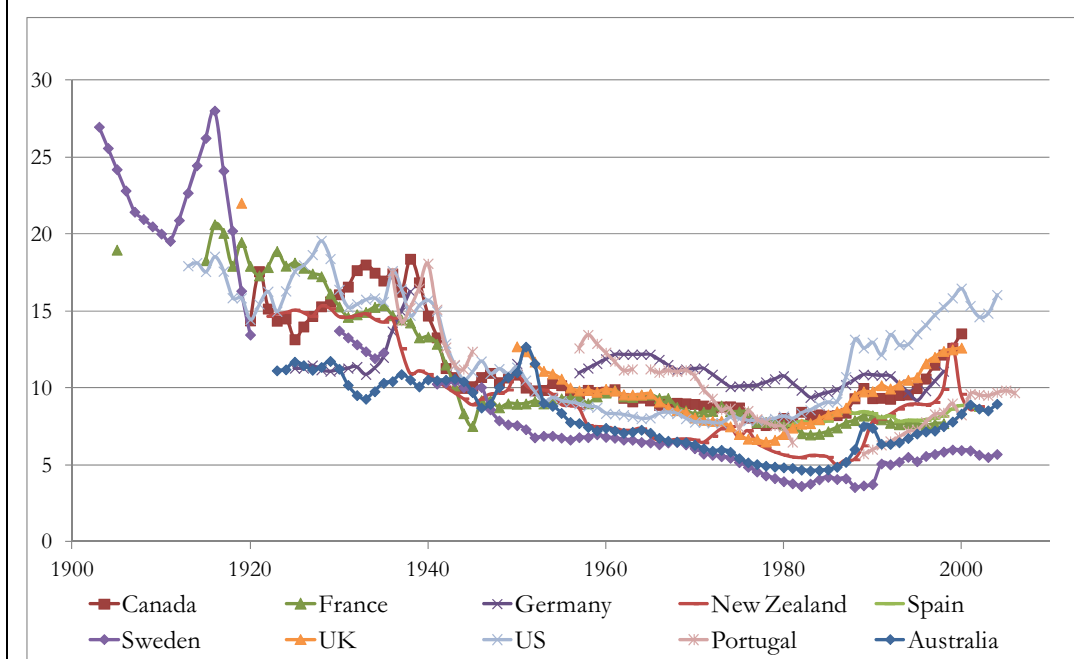
Source: Leigh (2006) and Table A.2.3.2

After the mid 1970s, whereas top income shares increased in Anglo-Saxon countries, they remained more or less stable in other countries (Piketty and Saez, 2006). Once again, Portugal seems to buck this stylised trend because, at least from the late 1980s onwards, top income shares in Portugal clearly increased.

The comparison of TIS levels among the different countries may be more problematic because of the disparity of the tax systems and its accuracy. Taking this into account, it seems that Portugal was a "member" of the high TIS group until the 1970s but it became a low TIS country from the 1990s onwards. In this regard, contemporary Portugal has usually been included among those European countries with a higher degree of inequality.[22] However, top income shares seem to indicate that the very rich are not at the root of this phenomenon, and that it may instead be a poverty-related issue, because the Portuguese top income shares have been low in comparative terms during the last two decades.

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[22] Rodrigues (1999).

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2.3.2.- Top wealth shares

As may be seen in Figure 2.9, the evolution of top wealth shares may be divided into two different periods. Until the mid 1950s or the early 1960s (depending on the share), they increased considerably, especially in the case of the richest fractiles. This is consistent with both a process of increasing inequality between the very rich and the rest of the population and a process of wealth divergence within the very rich group. The situation changed subsequently and top wealth shares declined continuously until at least 1982. The decrease of top wealth shares was again more intense in the case of the richest fractiles, i.e. there was a process of decreasing inequality between the very rich and the rest of the population and also a process of wealth convergence within the very rich group.

Figure 2.9 - Changes in top wealth shares (1936-82)

Source: Table A.2.3.1
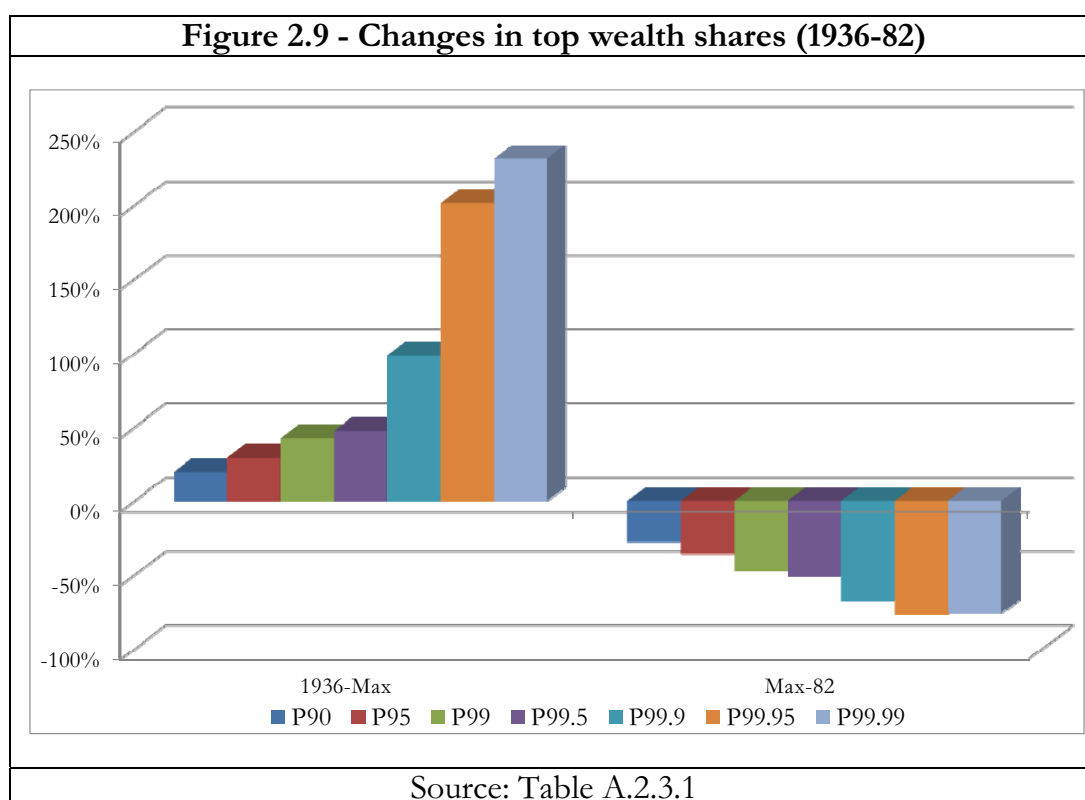
Figures 2.10 and 2.11 show the yearly evolution of top wealth shares, which followed an inverted U-curve with maximum values of wealth concentration during the mid 1950s and early 1960s. These figures also show two short but

very intense increases in top wealth shares in 1947 and 1974, which can be explained by the impact that the death of a few very rich individuals may have had on this kind of estimation. In this sense, in both 1947 and 1974 two extremely rich citizens died in the district of Lisbon which explains these two peaks.[23]

Figure 2.10 – Top wealth shares (1936-82)

Source: Table A.2.3.1
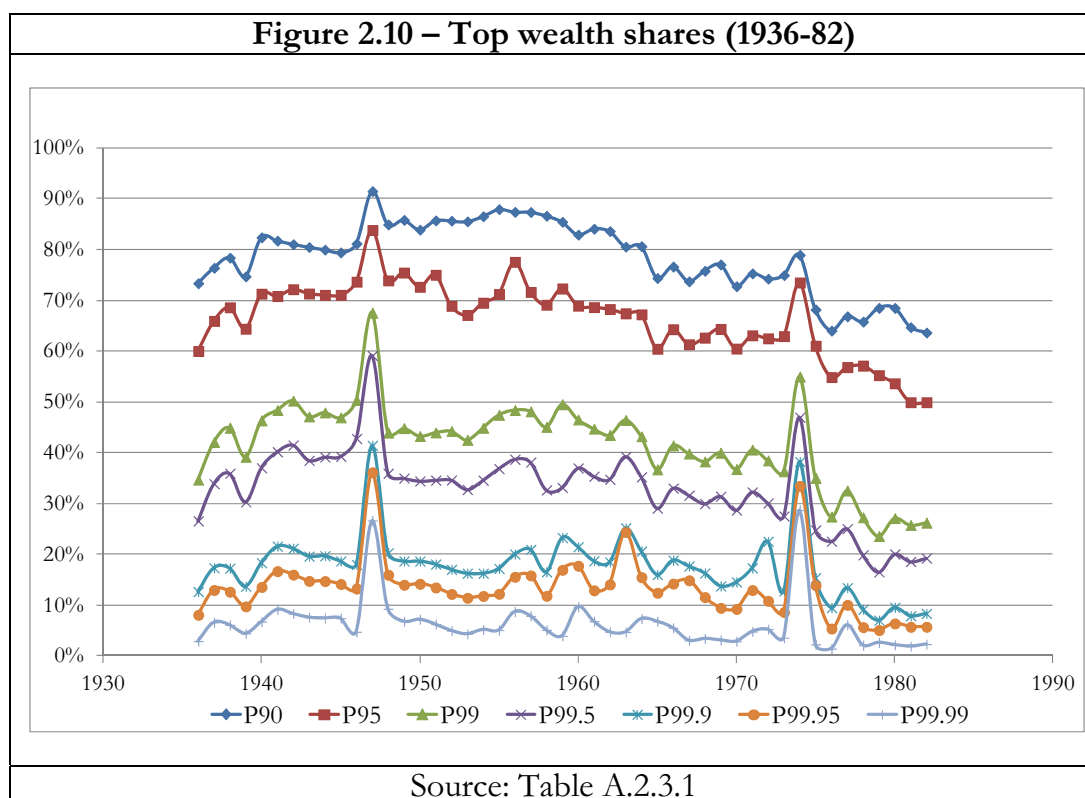
In the case of wealth concentration, the Portuguese experience is somewhat exceptional in comparative perspective, as may be seen in Figure 2.12. Whereas in most other countries (with the partial exception of Switzerland), there was a long-term decline in wealth concentration throughout the twentieth century, in Portugal it increased till the mid twentieth century to decline afterwards. However, from a longer-term perspective, the evolution of wealth concentration in France throughout the nineteenth and twentieth centuries also followed an inverted U-curve. Accordingly, the evolution of Portuguese wealth concentration might fit the pattern of the most industrialised countries, although with a half-century delay.

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[23] The impact of extremely rich persons' deaths on these estimations is also observable in other countries such as the UK during the seventies, see Figure 12.

Figure 2.11 - Top wealth shares over 0.1% (1936-82)
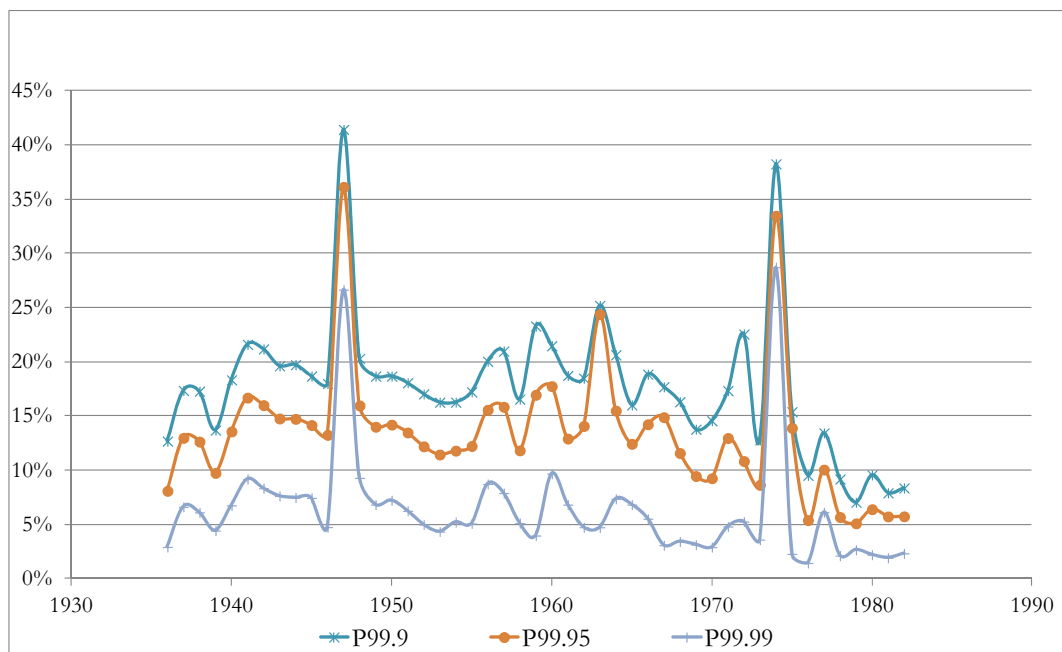
Source: Table A.2.3.1

Figure 2.12 - Top 1% wealth share
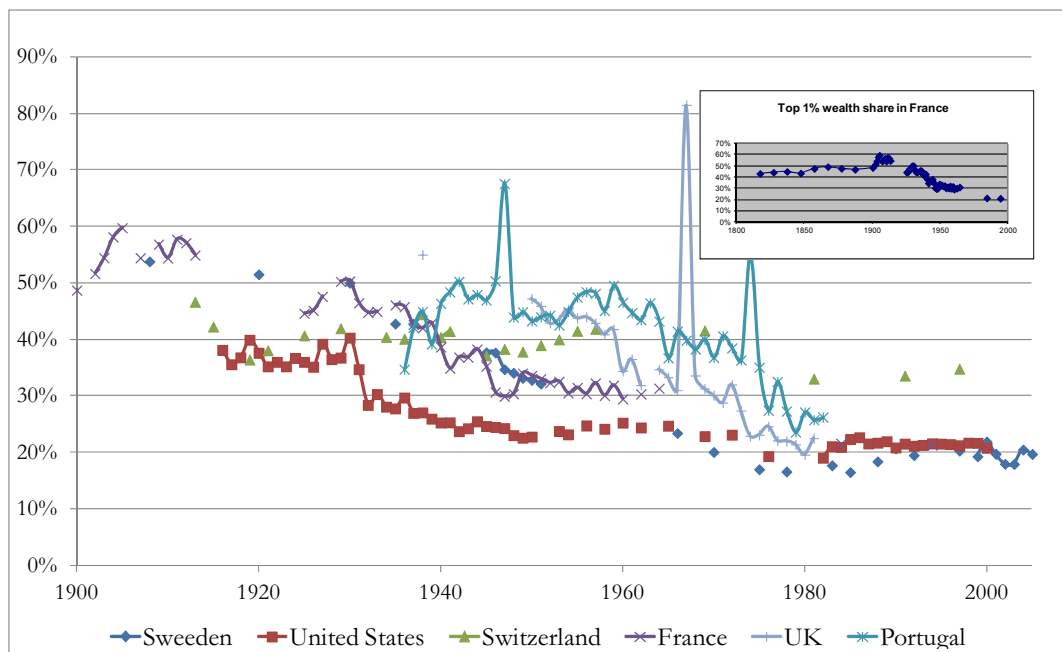
Source: Roine and Waldenström (2007) for Sweden; Kopczuk and Saez (2004) for the US; Dell, Piketty and Saez (2005) for Switzerland; Piketty, Postel Vinay and Rosenthal (2006) for France; Atkinson, Gordon and Harrison (1989) for the UK and Table A.2.3.1 for Portugal.

2.4.- Behind the facts

It is not possible to offer a complete account of the reasons behind the detected trends in Portuguese top income and wealth shares here. However, some general considerations may serve as a guide for a future research agenda. Most studies related with TIS defend the idea that the main explanation for the decline of TIS until the 1970s was associated with the shocks of the two World Wars and also with the role of progressive taxation and other public policies. As noted above, Portuguese TIS began to decline in the 1950s, and the Salazar regime was not as committed to the implementation of progressive policies as the governments in other developed countries. Thus, we may look for alternative explanations to understand the evolution of TIS, such as the impact of the extraordinary economic growth of the post-war decades.

In this sense, one of the main features that differentiated the period after 1950 from the previous decades in Portugal was the rapid structural change from an agrarian economy towards an industrial and service-oriented one, as may be seen in Table 2.2. The original Kuznets hypothesis relates the process of structural change to the existence of an inverted-U curve in the evolution of income inequality. However, income inequality can be measured in different ways. A measure of income inequality with high population coverage is likely to follow an inverted U-curve during the transition from an agrarian economy to a modern one, for the reasons argued in Kuznets (1955). In contrast, a partial income inequality measure, such as top income shares, is likely to show a decline in inequality during this process of transition, and for the same reasons.[24] This is due to the fact that, although the gradual transition of the labour force to better paid jobs could increase inequality within the lower classes (which were more homogeneous in terms of their incomes at the beginning of the process), it may also increase the income share accruing to the bottom fractiles, a process which might prevent top income *share* increases. This seems to have been the case in Portugal, at least till the 1980s (if the fluctuations associated with the Second World War are excluded). Top income shares would only increase again after the early 1990s, when the process of structural change was almost complete.

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[24] In fact, the original formulation of the Kuznets curve predicts a decline of the top 20% income share from the very beginning of the process of transition; see Kuznets (1955), p. 15.

Table 2.2 – Male labour force (1911-1950) and total employment (1960-1990) in Portugal				
	Agriculture	Industry	Services	Total male labour force
	Percentage			000
1911	61.0	21.7	17.3	1,629
1920	[60.9]	[21.2]	[17.9]	1,691
1930	60.9	20.7	18.4	1,967
1940	57.8	21.0	21.1	2,241
1950	53.8	24.6	21.6	2,562
1960	43.1	28.2	28.7	2,713
1970	27.6	33.9	38.6	2,263
1980	19.2	37.7	43.1	2,544
1990	13.1	37.3	49.6	2,476
Sources: Lains (2006) for 1911-1950, and Valério (ed.) (2001), p. 164 for 1960-1990.				

Another event which may help to explain the decline of TIS from the high levels of the first half of the twentieth century is the skilled labour-intensive growth process experienced by most industrializing countries. A larger share of increasingly skilled workers is required for the economy to continue growing and these workers have to be remunerated accordingly. The outcome of this process is the increasing income share of the middle classes that has characterised the mass consumption society, and must also have contributed to the erosion of TIS. In this regard, this process would have a higher incidence once a country has already overcome the first stages of the Kuznets curve, and it would extend the period of time of declining TIS.

Compared with the effects of structural change, political factors seem to have had a minor impact on Portuguese TIS and TWS. During most of the dictatorial period top income and wealth shares declined. In addition, it is surprising to see that the evolution of the different top income and wealth shares was not especially sensitive to the profound political and social changes that occurred after the *Revoluçao dos cravos* of 25 April 1974 and the transition to democracy. Top income and wealth shares declined during the early years of the democratic era, but at the same pace as during the pre-revolutionary

period. This finding is highly relevant from the point of view of Portuguese history, since the country's upper classes did not seem to have been particularly damaged by the revolutionary process. What is more, during the democratic era a decrease of TIS through the political channel might be expected. Once the population obtained a political voice, a more progressive political agenda might tend to redistribute income and thus reduce TIS. However, just the opposite happened, suggesting a situation of imperfect democracy, with forces such as lobby interests limiting the strength of voters' demands.

2.5. Concluding remarks

This paper has presented new long-term series of the evolution of top income and wealth shares in Portugal from 1936 onwards. The Portuguese case study may help to enlarge the current comparative inequality database developed with the methodology established by Piketty (2001). Available comparative information on income inequality has been compiled since the 1950s (Deininger and Squire, 1996), but the methodologies used differ across countries and over time, which seriously limits the consistency of the studies based on these databases. In contrast, top income and wealth shares are all estimated from tax sources, following the same methodology, and, in many cases, they provide information for the whole of the twentieth century.[25]

Whereas top income shares in Portugal declined during WWII and recovered during the post-war period, top wealth shares increased till the mid 1950s. From the mid 1950s to the early 1980s top income and wealth shares declined sharply, and then, during the last decade of the twentieth century, top income shares increased again. This pattern is quite similar to the experience of other countries: the decline of top income shares during the "Golden Age" has been observed in most other cases, and their increase during the last two decades seems to put Portugal on a par with the experience of Anglo-Saxon countries.

The reasons behind the trends observed in Portuguese top income and wealth shares remain poorly understood. Here it has been suggested that the factors governing the evolution of top income shares were economic and not political.

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[25] Although comparability problems should not be forgotten; see Atkinson (2007) and Piketty (2007).

In this sense, during most of the dictatorship top income shares declined, and the transition to democracy seems to have had a minor impact on top income share trends. On the other hand, the rapid structural change which occurred from the 1950s onwards seems to be a key factor in the explanation of the Portuguese distributive pattern.

Appendix 2.1

Figure A.2.1.1 shows the distributional functions of the incomes of the different tax units under different hypotheses in 1963 and 1965. The vertical axis shows the percentage of income (relative to the total income assessed) accumulated through tax units, which are shown in the horizontal axis. The first function (1) shows the distributional function of total incomes in 1963, whereas the second function shows the distributional function of taxable incomes in the same year. As may be seen in the graph, when deductions are subtracted, the distributional function moves upwards. This implies that deductions were progressive to income. For 1965 information is only available for taxable income, which is shown in the third function. This has almost the same shape as taxable income in 1963. In order to allocate deductions among the income of different tax units for 1965, two different scenarios have been simulated and compared to the situation in 1963. The fourth function shows the distributional function of incomes when deductions are allocated proportionally to income, whereas the fifth function shows the distributional function when deductions are equally distributed among all tax units. Not surprisingly, the third and fourth functions have exactly the same shape, because the fourth function is the outcome of allocating deductions in a proportional system. On the other hand, the fifth function swung downwards in line with the progressive character of the deductions. As may be seen, the distributional function of total incomes for 1963 is between these two last scenarios. The sixth function is the arithmetic average of the proportional (4) and progressive (5) scenarios and has been the alternative chosen to allocate deductions for its proximity to the total income function of 1963 (1).

Figure A.2.1.1 – Allocation of 1964-1981 deductions

- 1963 Income (%)
- 1963 Income minus deductions (%)
- 1965 Income minus deductions (%)
- 1965 Income with deductions equally distributed (%)
- 1965 Income with deductions distributed prop to income (%)
- 1965 Income with dedutions between eq. D. and prop. Inc.
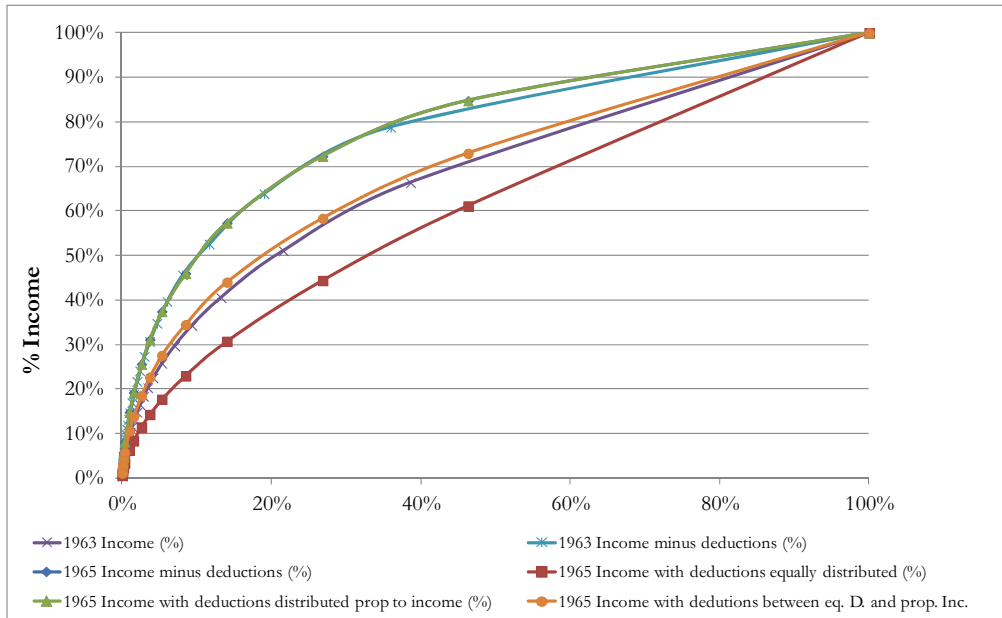
Source: Own elaboration from Portuguese tax statistics

Appendix 2.2

This appendix analyses the reasons why two series which were estimated with the same sources and methodology show different outcomes. There are four main differences between our series and those of Alvaredo (2008): the reference income definition, the method used to add deductions to taxable income, the transparency in the treatment of the sources and the adjustment of TIS levels in order to have long-term consistent series.

Alvaredo's reference income is defined as *wages and salaries from National Accounts net of effective social security contributions, plus 50% of social transfers, plus 66% of unincorporated business income plus all nonbusiness, non labor income reported on tax returns.* He is able to estimate this figure from 1989 onwards, that is around 60% of total GDP, which is the percentage he applies backwards to calculate the total income reference. The difference between our 80.36% and Alvaredo's 60% is the reason why his series have persistently higher levels than our non-adjusted ones, as may be seen in Figure A.2.2.1 Some inconsistencies should, however, be highlighted here. Firstly, as may be seen in Figure 2.2, the ratio PSI/GDP falls steeply between 1989 and 2000, from 76 to 65% of GDP. It is difficult to believe that the income reference estimated by Alvaredo remained constant around 60%. Secondly, given the high variability of the PSI/GDP ratio from the mid 1960s onwards, it is not reasonable to assume a constant rate for this period. Taking these facts into account, our method of defining the total income reference seems more appropriate.

From 1964 to 1981, to add deductions to taxable income, Alvaredo (2008) adds family deductions proportionally to population and other deductions proportionally to income. This does not constitute an important difference between the two methods. However, if we compare Alvaredo's series with our non-adjusted ones, in our series a sizeable discontinuity appears between 1963 and 1965 (see Figure A2.2.1). It could seem that this discontinuity was associated with our inappropriate method of adding deductions to taxable income but the real cause of this discontinuity is the fiscal reform of the mid 1960s. This major fiscal reform is totally ignored by Alvaredo (2008) and it is the reason behind the discontinuity in our non-adjusted series. What is more surprising is that Alvaredo's series are fairly stable during the 1960s. This is

largely due to the fact the he only provides top income shares above 0.1%. Tax sources, however, allow estimating yearly income shares above the top 0.5% and, with a parenthesis of ten years, also the top 1%. In fact, Alvaredo's table A, column 4 illustrates that he could also have estimated the top 0.5 and 1% income shares. If those income shares had been estimated, the discontinuities would have appeared.[26]

Finally, the levels of our series have been adjusted in 1963, 1980 and 1990 in order to correct the discontinuities of our series (see text). The break of the 1960s does not appear in Alvaredo's series for the reasons explained above. The discontinuity of the 1980s in Alvaredo's series is not adjusted, and this leads to unrealistic results when they are compared with the alternative sources available such as HIES. Whereas HIES show a slight decrease of the top 10% income share, Alvaredo's series show a sizeable increase of top income shares during the 1980s.

The differences between the two estimations indicate the improved reliability and long-term consistency of our series compared with those of Alvaredo.

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[26] Alvaredo's method of adding deductions is more proportional to population than ours and this is the reason why these discontinuities do not appear in his top 0.1% income share. However, they would have had an important impact on the top 0.5 and 1% income share if he had calculated them.

A.2.2.1 - Top income shares: Alvaredo Vs Guilera
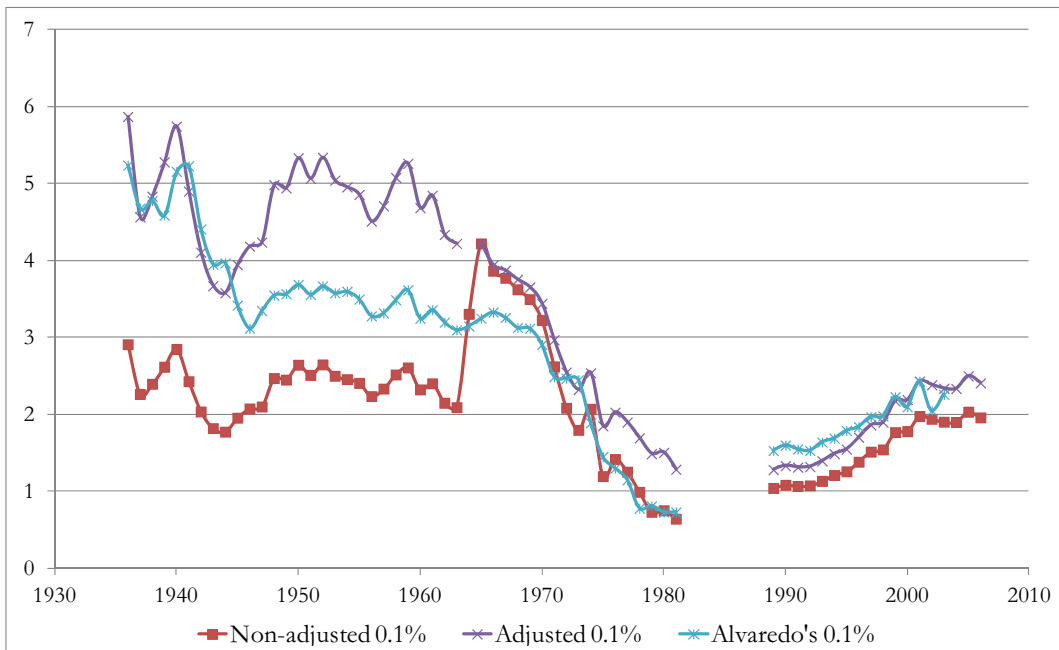
Sources: Table A.2.3.2, Guilera (2008) and Alvaredo (2008)

Legend: Non-adjusted 0.1% — Adjusted 0.1% — Alvaredo's 0.1%

Appendix 2.3 – Top income and wealth shares
Table A.2.3.1 – Portuguese top wealth shares (%)

	P90	P95	P99	P99.5	P99.9	P99.95	P99.99
1936	73.35	60.02	34.71	26.59	12.69	8.10	2.92
1937	76.39	65.94	42.10	33.90	17.36	12.99	6.63
1938	78.38	68.60	44.92	35.94	17.29	12.64	6.11
1939	74.70	64.41	39.20	30.34	13.71	9.76	4.44
1940	82.39	71.29	46.36	37.04	18.34	13.58	6.76
1941	81.72	70.83	48.40	40.19	21.60	16.70	9.19
1942	81.03	72.17	50.25	41.51	21.19	16.01	8.34
1943	80.46	71.31	47.14	38.50	19.64	14.77	7.63
1944	79.96	71.05	47.92	39.15	19.74	14.74	7.48
1945	79.41	71.06	46.95	39.29	18.69	14.17	7.45
1946	81.16	73.66	50.38	42.81	18.00	13.26	4.75
1947	91.48	83.83	67.56	59.12	41.43	36.15	26.66
1948	84.92	73.91	43.95	35.96	20.31	15.97	9.30
1949	85.82	75.46	44.85	35.02	18.69	14.01	6.83
1950	83.89	72.64	43.28	34.44	18.68	14.21	7.22
1951	85.71	75.02	43.98	34.61	18.08	13.48	6.26
1952	85.65	68.89	44.26	34.64	17.04	12.21	5.00
1953	85.52	67.10	42.53	32.76	16.28	11.45	4.35
1954	86.53	69.51	44.91	34.58	16.28	11.81	5.21
1955	87.92	71.23	47.46	36.86	17.23	12.24	5.09
1956	87.40	77.56	48.41	38.71	20.04	15.58	8.74
1957	87.37	71.64	48.14	38.15	20.99	15.85	7.89
1958	86.63	69.11	45.09	32.68	16.56	11.83	5.13
1959	85.43	72.32	49.54	33.16	23.30	16.96	3.98
1960	82.90	68.93	46.54	37.00	21.49	17.76	9.69
1961	84.08	68.65	44.73	35.37	18.74	12.92	6.84
1962	83.61	68.26	43.49	34.77	18.48	14.09	4.74
1963	80.54	67.43	46.44	39.24	25.20	24.40	4.73
1964	80.64	67.23	43.22	35.26	20.65	15.50	7.36
1965	74.37	60.45	36.72	29.10	16.02	12.44	6.83
1966	76.63	64.29	41.44	33.02	18.86	14.24	5.54
1967	73.72	61.34	39.84	31.63	17.70	14.89	3.08
1968	75.79	62.65	38.28	29.98	16.32	11.59	3.43
1969	77.04	64.35	40.00	31.42	13.78	9.47	3.14
1970	72.76	60.49	36.79	28.72	14.57	9.26	2.91
1971	75.29	63.09	40.60	32.28	17.35	12.97	4.81
1972	74.24	62.51	38.48	30.10	22.56	10.84	5.27
1973	74.94	62.93	36.35	27.55	12.80	8.65	3.61
1974	78.93	73.50	54.99	46.99	38.26	33.48	28.73
1975	68.18	61.05	35.05	24.79	15.40	13.90	2.28
1976	64.02	54.88	27.43	22.57	9.53	5.40	1.44
1977	66.84	56.85	32.54	25.07	13.44	10.06	6.13
1978	65.79	57.14	27.29	19.92	9.19	5.68	2.13
1979	68.49	55.25	23.62	16.55	7.04	5.10	2.66
1980	68.49	53.67	27.13	20.06	9.56	6.41	2.21
1981	64.70	49.95	25.78	18.59	7.92	5.74	1.93
1982	63.64	49.94	26.24	19.27	8.36	5.75	2.33

Source: See text

Table A.2.3.2 – Portuguese top income shares (%)

	P90	P95	P99	P99.5	P99.9	P99.95	P99.99
1936			17.52	12.92	5.87	4.00	1.61
1937			14.39	10.48	4.57	3.04	1.19
1938			15.23	11.10	4.84	3.21	1.26
1939			16.49	12.03	5.28	3.52	1.40
1940			18.11	13.19	5.75	3.81	1.47
1941			15.12	11.11	4.90	3.27	1.29
1942			12.67	9.29	4.11	2.75	1.08
1943			11.54	8.41	3.67	2.46	0.96
1944			11.24	8.15	3.58	2.39	0.94
1945			12.39	8.86	3.95	2.69	1.12
1946				9.06	4.19	2.97	1.30
1947				9.25	4.24	3.02	1.35
1948				9.45	4.99	3.57	1.60
1949				9.64	4.95	3.51	1.53
1950				10.39	5.34	3.77	1.67
1951				10.13	5.07	3.57	1.59
1952				10.43	5.34	3.79	1.63
1953				9.82	5.04	3.58	1.54
1954				9.47	4.96	3.58	1.57
1955				9.30	4.86	3.49	1.52
1956				9.00	4.51	3.18	1.34
1957			12.61	9.41	4.71	3.30	1.33
1958			13.48	10.23	5.08	3.52	1.38
1959			12.90	10.10	5.26	3.73	1.66
1960			12.33	9.30	4.69	3.30	1.38
1961			11.75	9.62	4.85	3.40	1.37
1962			11.18	8.67	4.34	2.98	1.18
1963			11.25	8.59	4.22	2.92	1.17
1964							
1965			11.25	8.59	4.22	2.92	1.17
1966			11.03	8.33	3.94	2.72	1.08
1967			11.18	8.34	3.87	2.65	1.05
1968			11.08	8.19	3.76	2.59	1.02
1969			11.19	8.37	3.66	2.52	1.01
1970			10.82	7.99	3.44	2.38	1.03
1971			9.94	7.23	2.97	2.03	0.88
1972			9.34	6.68	2.55	1.68	0.67
1973			8.61	6.16	2.32	1.55	0.59
1974			8.69	6.25	2.54	1.79	0.90
1975			7.45	5.24	1.85	1.23	0.52
1976	30.40	22.32	8.54	5.87	2.03	1.31	0.50
1977	28.48	20.92	8.00	5.78	1.90	1.20	0.45
1978	27.72	20.36	7.79	5.46	1.69	1.06	0.40
1979	26.96	19.80	7.57	5.15	1.49	0.91	0.36
1980	26.70	19.61	7.50	5.13	1.51	0.95	0.42
1981	25.55	17.84	6.50	4.65	1.29	0.81	0.33
1982							
1983							
1984							
1985							
1986							
1987							
1988							
1989	25.33	16.69	5.74	3.60	1.28	0.86	0.37
1990	26.07	17.30	6.03	3.78	1.33	0.88	0.38
1991	27.44	18.26	6.31	3.91	1.31	0.85	0.33
1992	28.70	19.15	6.57	4.03	1.32	0.84	0.30
1993	29.48	19.78	6.85	4.22	1.40	0.89	0.31
1994	30.80	20.69	7.21	4.47	1.49	0.94	0.33
1995	30.59	20.62	7.29	4.55	1.55	0.98	0.34
1996	32.43	21.93	7.82	4.93	1.70	1.08	0.38
1997	33.87	23.00	8.32	5.28	1.86	1.19	0.42
1998	34.00	23.12	8.43	5.36	1.90	1.22	0.43
1999	35.35	24.15	9.03	5.85	2.17	1.42	0.53
2000	35.19	23.72	8.27	4.93	2.19	1.43	0.53
2001	37.78	25.77	9.64	6.34	2.43	1.61	0.62
2002	37.92	25.80	9.59	6.27	2.39	1.60	0.64
2003	38.06	25.82	9.54	6.20	2.34	1.58	0.66
2004	38.65	26.23	9.73	6.31	2.34	1.55	0.60
2005	38.63	26.27	9.86	6.48	2.50	1.70	0.70
2006	38.38	26.02	9.71	6.36	2.41	1.62	0.64

Source: See text

CHAPTER 3

The evolution of wage inequality in Portugal since 1921

3.1.- Introduction

OECD economies have experienced a well-documented increase in wage inequality over the last few decades. This trend has attracted the attention of public opinion and has been a frequent object of study in the economic literature.[1] This chapter aims to contribute to this debate by providing new series of wage inequality for Portugal since the early 1920s. Unlike most literature on the topic, which focuses on certain components of wage dispersion (such as skill premia or intersectoral wage differences) and adopts a shorter-term perspective, here I estimate a long-term series of overall wage inequality and its components.[2] In addition to its long time span, the interest of this series is that it allows observing the evolution of wage inequality over the whole industrialisation and post-industrialisation process of the country.

This new Portuguese series show that inter-sectoral wage inequality was the main driving force behind the changes in the country's overall wage dispersion while the agrarian sector remained large. However, with the decline of this sector, wage differences between skilled and unskilled workers became the main explanatory force of the evolution of overall wage inequality.

On the other hand, the new series shows that Portuguese wage dispersion followed an N-curve in the long-run. This would be consistent with the original Kuznets' prediction on the evolution of wage inequality, when this is extended to encompass the post-industrial period, in what might be called an "extended Kuznets' curve" (EKC) hypothesis. According to this, after the inverted-U curve described by Kuznets, wage inequality may be expected to increase again due to one of the most fundamental changes of post-industrial societies: the boom in human capital formation and its impact on the skill composition of the labour force. The EKC hypothesis fits well with the Portuguese series and seems to be a good description of the changes that take

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[1] See, for instance, Atkinson (2008) and Galbraith (2007).
[2] Söderberg (1991) also estimated a series of wage inequality for Sweden between 1880 and 1950 covering all economic sectors and different skill categories.

place in the wage distribution throughout the transformation of a backward agricultural economy into a post industrial one.[3]

The rest of the chapter is structured as follows. The next section summarises the data sources and methodology used to estimate the Portuguese wage inequality series (which are described in more detail in Appendix A.3.1). The third section describes the historical background and the evolution of wage inequality in Portugal. Section four explains the Portuguese experience on the basis of the "Extendend Kuznets' Curve" hypothesis. Finally, the last section concludes.

3.2.- Data and methodology

The data sources and the methodology used to construct the Portuguese wage database presented in this chapter are described in detail in Appendix A.3.1. Here I summarise the main limitations of the data and the methodological choices that were taken to carry out the estimation.[4]

The database covers all economic sectors. Workers are classified in these economic sectors and, as far as possible, in different skill categories. However, the main shortcomings of the series are related with the lack of information for certain wage categories. Unfortunately, information on wage differences among skill categories is relatively scarce for some periods and sectors. More concretely, it is not available for the agricultural sector during the whole period under study, for the industrial sector before 1944 and for the service sector before 1985. In addition, in the case of services, there is no information on average wages until 1950.

A second problem is that the number of sectors and skill groups on which there is information available varies over time, due to a number of

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[3] In a similar vein, Conceição and Galbraith (2001) have proposed an "augmented Kuznets Curve hypothesis", which predicts that in advanced economies highly specialised in the production of knowledge goods, inequality will increase because of the monopolistic nature of this kind of industry. They developed this theory on the basis of a new global dataset (UTIP-UNIDO) of the evolution in pay inequality in the manufacturing sector. Subsequently, Galbraith (2007) has claimed that the increase in pay inequality since the 1980s was a global event driven by global forces: most notably, the onset of economic monetarism.

[4] Lains, Gomes and Guilera (2013) provide a first version of this estimation for the period 1944-84.

discontinuities in the sources, which have had to be accounted for in the estimation process. The first discontinuity affects the period between 1934 and 1944, for which there is no wage information. Besides, as has been indicated, before 1934 the sources do not provide information on wage premia associated with skill differentials. As a consequence, the series before and after this break are not directly comparable. In fact, before 1934 our estimate is just a measure of between inequality or, in other words, inequality due to wage differentials between sectors; i.e. it just reflects a single component of overall wage inequality. Actually, as is shown below, its level in 1934 is quite consistent with the estimate of between inequality for 1944.

The second discontinuity occurs in 1950, when the available sources incorporate information on 5 service sectors. This increases the coverage of the series, but it also increases artificially wage inequality. In 1953 the sources incorporate three additional sectors (Basic metals and electric and transport equipment; Other manufacturing; and Electricity, gas and water supply), but this does not generate distortions in the overall series. In 1985 there is another major change in the sources. Until then, the sources only consider two skill groups but, thereafter, 8 skill groups are detailed for each economic sector, which obviously provokes an upward jump in the series. Finally, from 1995 onwards the sources provide information on 16 economic sectors that were previously grouped under only two headings (Mining and Industry). The main discontinuities in the sources (1950, 1985 and 1995) have been dealt with by equalizing wage inequality before each break with its level after the break, and extrapolating the difference backwards.

In order to test the potential distortions that these discontinuities may have introduced in the series, I have carried out a sensitivity analysis for those three discontinuities. In 1950 5 new economic sectors are incorporated in my database, provoking an increase in inequality. Beyond this change in the level of inequality, I have tested if this increase in coverage affected the evolution of wage inequality. Figure 3.1 shows the GE (0) index of wage inequality of the full available sample (that is, eight sectors before 1950 and 13 sectors afterwards) and a counterfactual index that has been estimated by considering only the 8 sectors that where already available in 1949 for the period until 1953. As may be seen in the figure, in 1950 there is a change in the levels of wage inequality but the trends in inequality are relatively similar after this break with both indexes.

Figure 3.1 - Sensitivity analysis. GE (0) 8 sectors vs. GE (0) full sample. 1944=100

Source: see text.
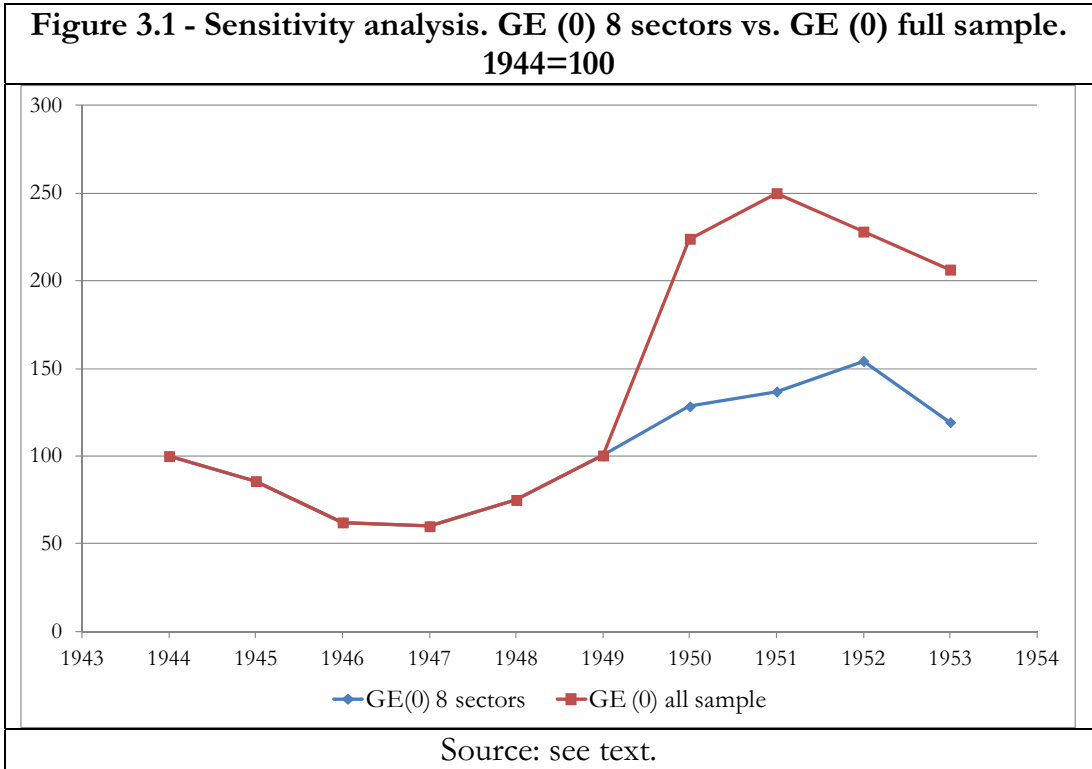
In 1985 there is a change in the sources used (from the Portuguese Statistical Yearbooks to *Quadros de Pessoal*, see Appendix 3.1), which are far more rich and reliable after 1985. Fortunately, the sources used until 1984 are already available until 1989, which allow to trace the evolution of the GE (0) index between 1985 and 1989 using both sources of information. As has already been said, there is a jump in the series due to the fact that *Quadros de Pessoal* report 8 skill categories, compared with just two categories for the previous period. Regarding the trends, Figure 3.2 shows that, although the yearly evolution of both indexes is not the same, in the long term both series show a clear increase in wage dispersion in the early 1980s (by 8 to 14% between 1985 and 1989). This suggests that the GE (0) index based on the Statistical Yearbooks would be able to capture the overall long-term evolution of wage inequality, despite its lower coverage than the GE (0) QdP index.

Figure 3.2- Sensitivity analysis. GE(0) 1985-1989 according to Portuguese Statistical Yearbooks (PSY) and Quadros de Pessoal (QdP). 1985=100

Source: see text.
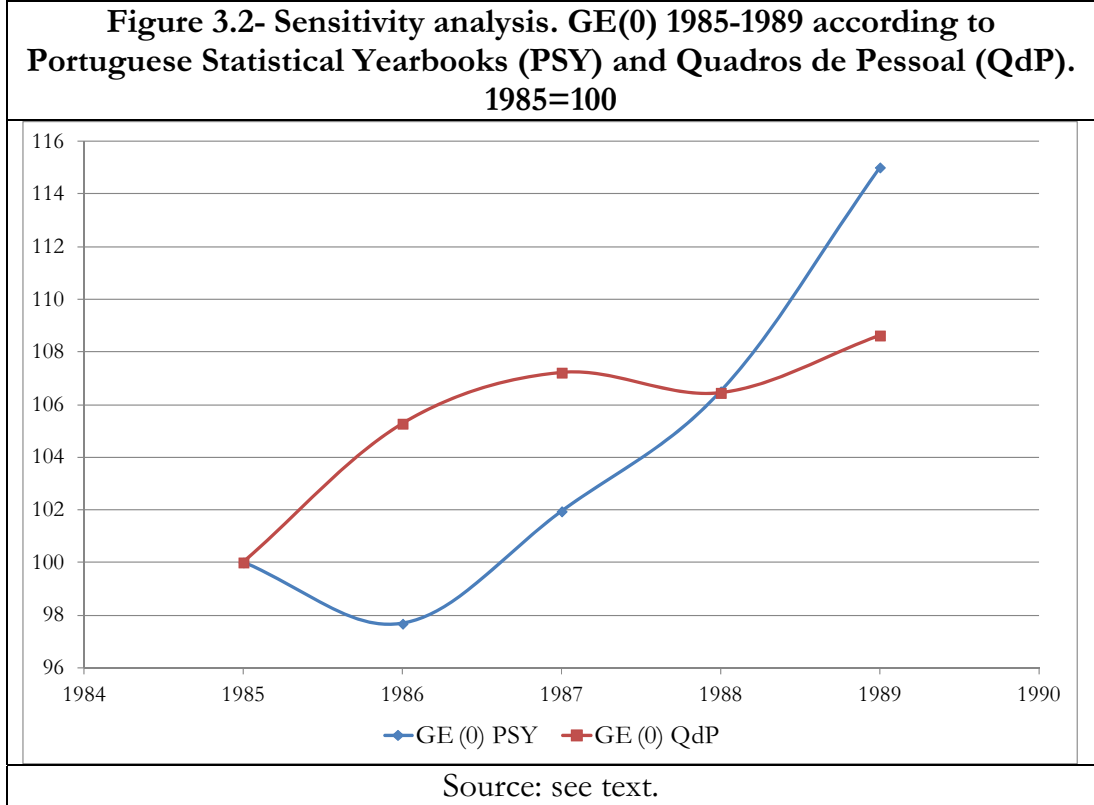
Finally, in the case of 1995, the *Quadros de Pessoal* report information on 16 economic sectors that were previously grouped under only two headings (Mining and Industry). This higher disaggregation of information provokes again a jump in the levels of inequality that has been adjusted for. To test the potential distortions on the trends of inequality, Figure 3.3 shows the *GE (0) 9 sectors* index that estimates inequality using the sectoral structure reported until 1994, and the GE (0) for the full sample, that incorporates the new sectors reported in 1995. As it may be seen in this Figure, there is a difference between the levels of the series, but the trends of both indexes after 1995 are the same. This suggests that the higher disaggregation of the series after 1995 do not affect its tendency, and thus, the evolution of wage inequality between 1985 and 1994 may closely reflect the actual evolution of wage inequality.

To sum up, there are three main discontinuities in the series: 1950, 1985 and 1995. In all cases the sources provide richer and more reliable information after those breaks, which provoke an upward jump in the estimated levels of inequality, but those jumps have been corrected for in the final series. In addition, the sensitivity analyses that have just been presented show that the change in the baseline information would not substantially affect the long-

term trend of the series. This result provides some support to the long term consistency and reliability of the wage dispersion series that are presented here.

Figure 3.3 - Sensitivity analysis. GE (0) 9 sectors vs. GE (0) full sample. 1985=100

Source: see text.
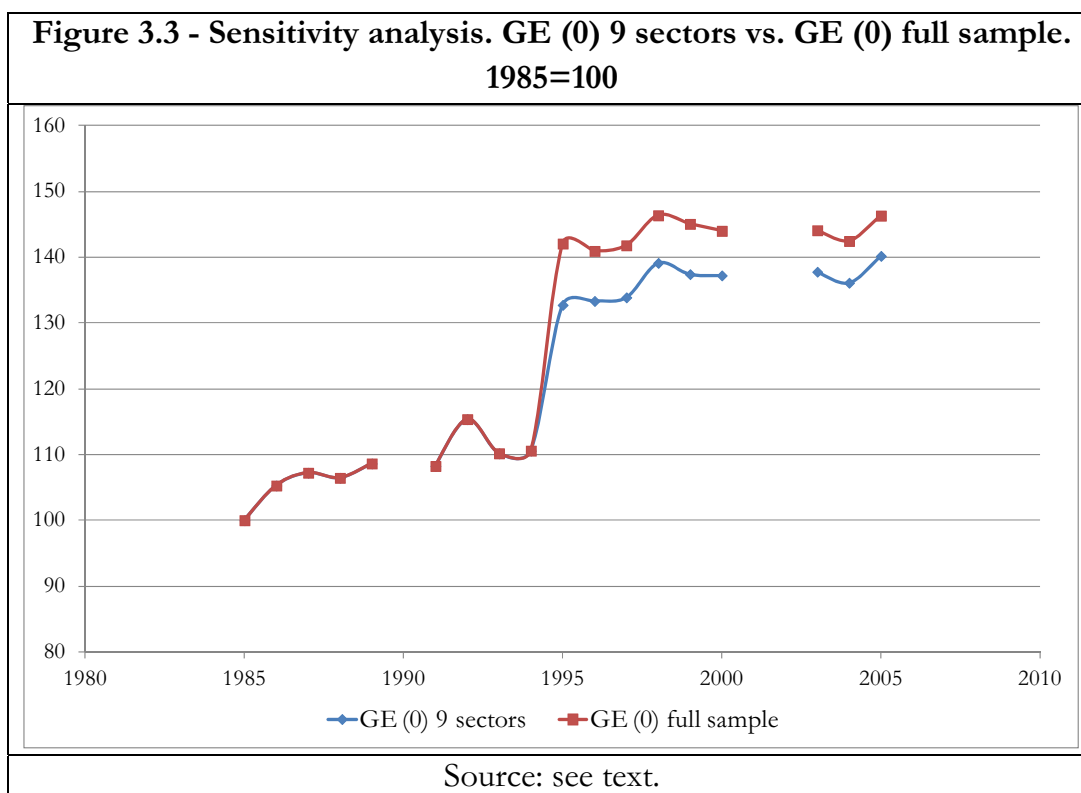
On the basis of this information I have estimated a GE(0) index of wage inequality. This has been chosen, as opposed to other better known indices (such as the Gini coefficient), because it offers certain advantages, such as its potential to be decomposed. The GE(0) index (mean logarithmic deviation) can be defined as:[5]

$$GE(0) = \frac{1}{n} \cdot \sum_i \cdot \log\left(\frac{\mu}{y_i}\right) \qquad (1)$$

where n is the number of individuals in the sample, μ is the average wage, and y_i is the individual wage.

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[5] I have also estimated the GE(1) index, with very similar results. More detailed information on those indices can be found in Mookherjee and Shorrocks (1982).

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The GE(0)index can be decomposed as:

$$GE(0) = \sum_k \frac{n_k}{n} \cdot GE(0)_0{}^k + \sum_k \frac{n_k}{n} \cdot \log\left(\frac{\mu}{\mu_k}\right) \tag{2}$$

where n_k is the number of individuals in sector k and μ_k is the average wage of sector k. The first term in the equation is a measure of inequality within each sector, while the second term measures inequality between sectors.

The GE(0) index can be further decomposed to see if the changes in these "between" and "within" coefficients are due to changes in prices or quantities, as follows:[6]

$$\Delta GE(0) = \sum_k \overline{\left(\frac{n_k}{n}\right)} \cdot \Delta T_0{}^k + \sum_k \overline{GE(0)_0}{}^k \cdot \Delta \frac{n_k}{n} + \sum_k \left(\overline{\left(\frac{\mu_k}{\mu}\right)} - \left(\log \overline{\frac{\mu_k}{\mu}}\right)\right) \cdot \Delta \frac{n_k}{n} +$$

$$+ \sum_k \left(\overline{\left(\frac{n_k \cdot \mu_k}{n \cdot \mu}\right)} - \overline{\left(\frac{n_k}{n}\right)}\right) \cdot \Delta \log\left(\frac{\mu_k}{\mu}\right) \tag{3}$$

where

$$\overline{GE(0)}_0{}^k = \frac{1}{2} \cdot \left(GE(0)_0{}^k(t) + GE(0)_0{}^k(t+1)\right) \tag{4}$$

The first term in this expression represents the impact of changes in the skill premia within each sector on total inequality; the second and third terms indicate the effect of changes in the labour shares on the within and between components, respectively; and the last term is the contribution to total inequality change of variations in the relative wage of each sector (i.e. sectoral wage/average wage).

In other words, overall wage inequality may increase for four different factors: (1) an increase in wage inequality inside each economic sector; (2) an increase (decrease) in the size of the more unequal (equal) sectors; (3) an increase in the size of the sectors with higher (lower) average wages and (4) an increase (decrease) in the average wage of the sectors with higher (lower) average

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[6] The original decomposition proposed by Mookherjee and Shorrocks (1982) has been modified in order to improve its potential. More specifically, in the original decomposition, the fourth term contains $\log(\mu)$ and not $\log(\mu_k/\mu)$. The global result does not change, but using the relative wage of each sector instead of the absolute wage enables us to determine the exact contribution of each sector to the yearly change in inequality of the fourth component.

wages. The effect of these four factors on wage inequality is captured by the four components of equation 3. As is shown below, this decomposition provides a deeper understanding on the nature and the evolution of overall wage inequality.

3.3.- The evolution of wage inequality in Portugal since the early 1920s.

As has been indicated in the introductory chapter, during the twentieth century Portugal was subject to significant transformations, which were closely related to the evolution of its wage distribution. Broadly speaking, present-day Portugal is a post-industrial economy, while in the early twentieth century it was still an agricultural country. Its transformation accelerated from the 1950s onwards, when Portugal experienced a golden age of economic growth. The same radical evolution has taken place in the political system, with a dictatorship ruling the country from 1926 to 1974, and the subsequent transit towards democratization. Finally, the exposure of the Portuguese economy to the international economy has also changed radically, first, via trade and migrations, and, later on, through the economic and political integration into the EEC.

Figure 3.4 shows the evolution of Portuguese wage distribution between 1921 and the early twenty-first century. Up to 1927 (between-sectors) wage inequality fell. Thereafter, although the gap in the series does not allow drawing final conclusions, wage inequality seem to have increased up to 1959, with at least two clear growth episodes, the first one in the late twenties and early thirties, and the second one during the fifties. It then fell markedly until 1981. Finally, over the last 25 years there has been a slow increase in wage inequality. If we examine the two components of the GE(0) index, two different patterns emerge. On the one hand, wage inequality among sectors (the between component) increased from 1927 to 1959, and declined continuously thereafter. On the other hand, inequality within each sector (the within component) was characterised by its long-term relative stability up to the late 1980s, although with some short-term fluctuations, such as a mild growth during the 1960s and, specially, a sudden fall in the mid-1970s that left the index slightly below its previous average long-term level. This changed completely in the late eighties, when the index started growing steadily. The global picture suggests that, while the between component was the driving

force behind the evolution of overall wage inequality until the eighties, the within component has been driving it since then. In the same vein, if until the 1990s the largest share of overall wage inequality was associated to wage differentials between the different economic sectors, these were replaced by the within component thereafter.

Figure 3.4 – Wage Inequality and its components. Portugal (1920-2005)

Sources: See Appendix 3.1
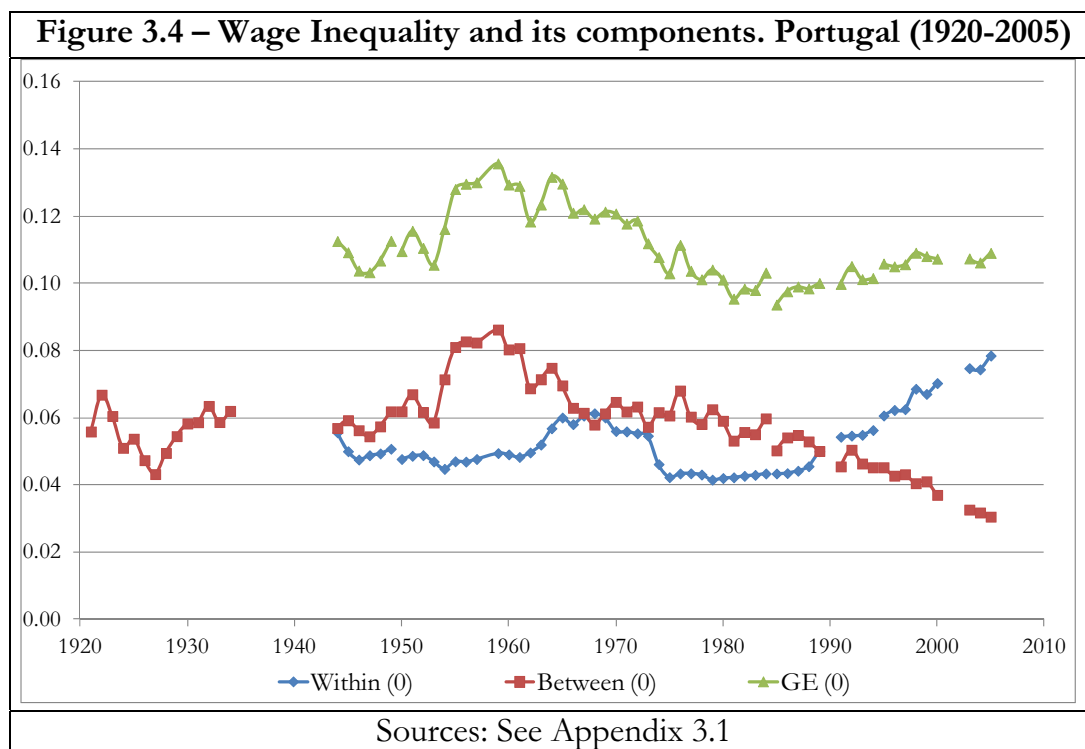
Equation (3) serves as an excellent guide for understanding the nature of the changes in the within and between inequality series that are represented in Figure 3.4. As discussed above, the yearly changes in the between and within inequality series can be decomposed into two components each. The two components of each series are related to movements in relative wages and the sectoral composition of active population, respectively. More concretely, the within inequality series may be decomposed into changes in the skill premium (Component 1) or changes in the relative size of the sectors with different internal inequality. (Component 2). Similarly, the between coefficient may be decomposed in order to see if its evolution is due to changes in the relative size of those sectors with higher (or lower) wages than the average (Component 3) or to changes in the wages of those sectors (Component 4). Figure 3.5 shows the contribution of each component to wage inequality

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changes. The sum of the contributions of the four components each year explains the annual changes in wage inequality. The contribution of these factors to wage inequality growth is multiplied per 1000 in this figure for clarity of exposition. Besides, this figure shows the different series as three-year averages to smooth them and avoid short term oscillations that would difficult the interpretation of the series.

Figure 3.5 - Contribution of each component to overall wage inequality changes (x1000, three year averages)

Source: See text
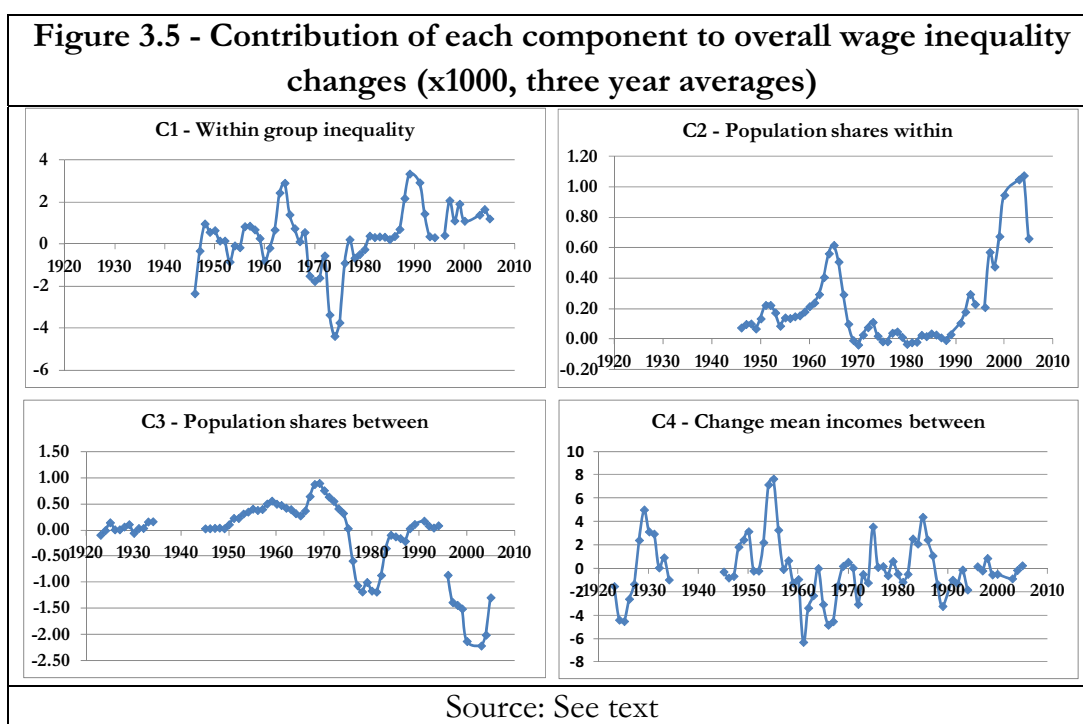
As may be seen in the figure, the contribution of Component 2 to wage inequality changes was positive throughout most of the period under study. This indicates that economic growth in Portugal has been characterised by the increasing size of the most unequal sectors at the expense of the most egalitarian ones. In addition, the contribution of this component was substantially higher from the 1990s onwards than before. One of the factors behind Component 2 is the gradual transition of the labour force from agriculture (totally egalitarian by design) to the other sectors until the mid-

eighties.[7] Later on, the labour transition from industry to the service sectors was the main factor driving the increase in the second component.

The figure also indicates that the contribution of the first component (skill premium) was always greater than that of the second one and, as such, it was the main factor responsible for the short term oscillations in the within coefficient. As can be seen in Figure 3.5, the skill premium had a long-term tendency to increase, given that it has positive values for most of the period studied. Only from the mid 1960s to the late 1970s (and, specially, since the 1974 revolution) did this component fall. Thereafter, from the mid 1980s onwards, the contribution of this component to wage inequality growth was again positive.

Regarding the between inequality, Component 3 measures the impact of changes in the relative size of those sectors with higher (or lower) wages than the average on inequality changes. The contribution of this component was positive until the mid-seventies and negative thereafter. Its evolution until the mid-eighties is due entirely to the expulsion of labour from the agricultural sector. When the majority of the labour force was engaged in agriculture, the agricultural wage was close to the national average, and the movement of labour out of this sector generated inequality. However, as the relative size of the agricultural sector declined at the expense of the other economic sectors with higher average wages, agricultural wage became increasingly lower than the national wage. For that reason, further decreases in the size of the agricultural sector provoked a decline in wage inequality. Finally, at the end of the period, once the agricultural sector became marginal from the mid-nineties onwards, the decline in the third component was associated to the increasing size of sectors with wages close to the national average, namely construction, wholesale and retail trade and other services.

Finally, the fourth component measures the impact of changes in the wage levels of the different sectors on inequality changes. The contribution of this component to wage inequality growth was positive when the wages of the highest- and lowest-paid sectors diverged from the average and negative when they converged. This component was mostly positive until 1959 and mostly negative thereafter. This evolution also reflects the impact of Portuguese

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[7] Although the agricultural sector is totally egalitarian by design, it is reasonable to assume that, due to the relatively low skills required to work in this sector, its wage dispersion would have been quite modest, compared with the rest of the economy.

structural change. Up to the late 1950s, as economic growth began to accelerate, new economic sectors emerged that were able to pay increasing wages, whereas the traditional ones (such as agriculture) remained stagnated, due to the large labour surplus in those traditional sectors, that kept their wages down. As this surplus was gradually absorbed, the intersectoral wage divergence first slowed down and, later on, was reversed and the wages of the different sectors began to converge.

To sum up, wage inequality in Portugal followed an N-curve. Between-sectors inequality drove the increase and further decrease in wage inequality until the 1980s, when within-sectors inequality took the lead and inequality increased again. Besides, after the 1990s within-sectors inequality accounted for most of overall wage inequality. Variations in wage inequality over time were the result of changes in wages and movements of labour between sectors. As is shown in Figure 3.5, the contribution of wage changes (C1 and C4) to wage inequality has always been greater than the contribution of changes in labour shares (C2 and C3). However, both factors (wages and labour shares) pushed the between and the within coefficients in similar directions: drawing an inverse-U curve for the between coefficient and an intense increase in the within coefficient during the last decades.

How did Portugal behave in comparison to other countries? Unfortunately, it is difficult to answer this question due to the lack of comparable long-run series. In most countries, the poor quality of the available sources does not allow estimating comprehensive wage inequality series that, like the one that is presented here, cover all wage earners (of different sectors and skill levels). In some cases, agricultural wages are not included, while in others information is only provided for the top or bottom wage earners. Typically those studies do not illustrate wage dispersion between economic sectors and, in most cases, the period of time covered is not sufficiently long to include the whole transition from an agrarian to a post-industrial economy.[8]

The main attempt to compute long-term wage dispersion series is Atkinson (2008), who analyses the evolution of wage inequality since the 1930s onwards in 19 OECD countries, and concludes that, although there was not a common pattern, inequality tended to follow a W-curve. More specifically, in the

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[8] See, for instance, Goldin and Margo (1992), Galbraith and Kum (2005) and Atkinson (2008).

countries under consideration, wage inequality fell during the 1930s and the 1940s, increased from the 1950s to the mid-1960s, fell again until the late 1970s and finally increased from the 1980s onwards. However, it is not clear to what extent the first stages of the curve can be considered as a general description of the evolution of wage inequality in the OECD countries, due to the partial character of the empirical information and the low number of countries covered. Indeed, before the 1950s there is only information for five countries (the US, the UK, Canada, Germany and France), and the series only include agricultural wages for the US, Canada and Germany.[9]

By contrast, the right hand side of this curve is more robust. There is an overwhelming consensus that wage inequality has increased in the most developed economies since the 1980s. This has been well illustrated, for example, by Atkinson (2008), and also by Galbraith (2007), whose global dataset on pay inequality (UTIP-UNIDO) was built from a variety of industrial statistics. While the increase in wage inequality differs in intensity and characteristics, it is today a global phenomenon, which has led researchers to seek its causes in technological change, globalisation and institutional factors.[10] Before that increase, the evolution of wage inequality in the OECD countries was also very similar to the Portuguese case, increasing from 1950 to the mid 1960s (late 1950s in Portugal) and declining thereafter. Therefore, the Portuguese series seems to line up with the international pattern, at least since 1950.

As has been indicated, for the first half of the 20th century, the number of countries covered by Atkinson (2008) is lower and the estimated wage inequality indexes exclude significant groups of wage earners. The exclusion of agricultural wages is especially sensitive, given that this sector was quantitatively relevant during the first stages of development. Besides, as has been pointed out, in the case of Portugal the agricultural sector was a major driver of wage inequality until the 1980s. Atkinson's series therefore, may be biased in its first decades due to this exclusion.

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[9]More concretely, before the 1950s agricultural wages are included in the US from 1939 onwards, in Germany between 1929 and 1937, and in Canada only in 1931.
[10] See Acemoglu (2002), Katz and Murphy (1992), Juhn, Murphy and Pierce (1993), Levy and Murnane (1992), Lemieux (2008), Card (1992), Freeman (1993), DiNardo, Fortin and Lemieux (1996) and Autor and Katz and Kearney (2005 and 2006)

In this context, it is difficult to put the Portuguese case in a long term comparative perspective. The Swedish case, however, provides an interesting exception. Söderberg's (1991) and Atkinson (2008) offer statistical data that allow tracing the evolution of wage inequality in Sweden since 1870 onwards (also covering, therefore, the whole transition from an agrarian to a post-industrial economy). And the Swedish experience is fully consistent with the Portuguese series shown above, since wage inequality also followed a N-curve, increasing up to the 1930s, decreasing to the mid 1980s, and rising again thereafter. In that context, the next section presents a hypothesis to try to account for the N-curve found in the evolution of wage inequality in Portugal and also in Sweden. Further research in this area is required to know if this hypothesis may be generalized to other countries' experiences.

3.4.- The Portuguese case: an "extended Kuznets curve"?

This section aims to provide a plausible explanation for the long term evolution of wage inequality in Portugal. Recent literature has put forward several candidate explanatory factors, such as globalization, technical change and institutions. Here I suggest that Portuguese wage inequality followed to a large extent what may be called an "extended Kuznets curve". This hypothesis does not seek to refute alternative explanations, but may be considered as complementary to them.

The hypothesis of the "extended Kuznets curve" is based on the original kuznetsian framework, and provides a schematic model for the evolution of wage inequality during the transition from an agricultural economy to a post-industrial one, which may also serve to historically accommodate the different underlying driving forces of wage inequality.

As is well known, the original Kuznets' (1955) hypothesis of the inverted U-curve emerged from a very simple model of an industrialising economy. Kuznets considered just two sectors: agricultural and non agricultural. In the non agricultural sector both income and income dispersion were higher than in the agricultural one. Kuznets allowed for some variability in the model through different possible income ratios between sectors and also through different possible levels of income dispersion inside each sector. By contrast, he considered that wages remained constant over time. Finally, he assumed

that, at the beginning of the industrialisation process, the agricultural sector accounted for 80% of active population, and also that, in each time period, 10% of active population moved from the agricultural to the non agricultural sector. Thus, changes in the evolution of income inequality would be the result of labour movements between sectors.

Following Kuznets (1955), I propose a simplified wage inequality scenario which would fit the experience of countries in their transition from an agricultural to a post-industrial economy. I introduce two changes on the original Kuznets' hypothesis. Firstly, my analysis focuses on wage inequality and not on income inequality.[11] And, secondly, I split the non-agricultural sector into two groups: skilled and unskilled labour. Actually, Kuznets did not neglect the role of the skill composition of the labour force, as the assumption of higher income dispersion in the non agricultural sector clearly shows. However, Kuznets' original hypothesis was only dynamic in the relation between the agricultural and the non agricultural sectors. By contrast, he defined a static non agricultural sector with higher incomes and higher inequality, which did not change over time. Instead, I assume that, in the non agricultural sector, the share of skilled workers increases over time.

To sum up, I assume that the labour force is divided in two economic sectors: agricultural and non-agricultural. In turn, the latter is divided between unskilled and skilled labour. I also assume, as Kuznets, that at the beginning of the industrialisation process 80% of the labour force was employed in the agricultural sector and the remaining 20% in the non-agricultural sector. I also consider that, in each time period, 10% of the labour force moved from the agricultural to the non-agricultural sector. Finally, I also assume that, at the beginning of the process, only 5% of non-agricultural workers were skilled, and that, in each time period, an additional 5% of the non-agricultural labour force became skilled.

Regarding the average wages of the three groups of workers, I assume two alternative scenarios. In the first one, the average wages of skilled non-agricultural workers are 50% higher than those of unskilled non-agricultural

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[11] Despite the Kuznets hypothesis refers to income inequality, the framework he uses may equally fit well to the evolution of wage inequality. To be more precise, a two sector economy with higher incomes and income dispersion in the non agricultural sector, and a progressive labour transition to the modern sector, may also be reasonable assumptions on the evolution of wage dispersion.

workers, while the latter are 50% higher than agricultural wages. In the second scenario, the difference between each pair of categories is 100%. In both cases, relative wages (between the different groups) are assumed to be constant over time. Those scenarios are broad enough to reflect real wage dispersion in a wide variety of countries and they actually set a reasonable scenario for the Portuguese case. [12]

Finally, and in line with Kuznets (1955), I assume three different possible wage dispersion levels within each group: i) "equal"; ii) "medium"; and iii) "unequal". Under all these three scenarios, wage dispersion is higher among non-agricultural skilled workers than among non-agricultural unskilled workers, and this, in turn is higher than among agricultural workers. The available empirical evidence lends support to these assumptions.[13] Table 3.1 shows the amount of wage income pertaining to each decile of the three groups of workers under each of the three dispersion scenarios. As may be seen in the table, in the "equal" scenario agricultural sector is completely egalitarian, because all workers receive the same wage. In the non-agricultural sector, the first decile of unskilled workers receives 9% of the wage income of this group, whereas the tenth decile receives 11%. Finally, wage dispersion is higher among the skilled workers: whereas their first decile receives 6% of the wage income of this group, the tenth decile receives 14%. The table shows how wage dispersion in each group is higher in the "medium" and "unequal" scenarios.

On the basis of these alternative assumptions, I have simulated the evolution of overall wage inequality in six different scenarios (i.e. under the six possible different combinations of the described assumptions on the level and dispersion of wages in each group of workers). This evolution, as measured by the GE(0) index, is presented in Figure 3.6, and Appendix 3.2 shows the relative wage levels and sectoral shares under each scenario.

The series depicted in Figure 3.6 show that wage inequality follows an N-curve under all different assumptions. More specifically, wage inequality peaks when the agricultural sector employs 20-40% of the labour force, and starts

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[12] As a reference, in Portugal between 1944 and the present, non-agricultural skilled wages have been between 40% and 200% higher than non-agricultural unskilled wages; and non-agricultural unskilled wages have been 1 to 2 times as high as agricultural wages.
[13] See Lemieux (2007), Table 1. The U.S. statistics on wage inequality (1974-2004) show that wage dispersion increases at higher education levels. The Portuguese data also show that wage dispersion increases in more highly skilled occupations.

increasing again when the agricultural sector is marginal and 36% of the labour force consists of non-agricultural skilled workers.

	Equal				**Medium**				**Unequal**		
	Agr	Nunsk	Nsk		Agr	Nunsk	Nsk		Agr	Nunsk	Nsk
d1	10.0	9.0	6.0	d1	9.0	8.0	5.0	d1	8.0	7.0	4.0
d2	10.0	9.2	6.9	d2	9.2	8.4	6.1	d2	8.4	7.7	5.3
d3	10.0	9.4	7.8	d3	9.4	8.9	7.2	d3	8.9	8.3	6.7
d4	10.0	9.7	8.7	d4	9.7	9.3	8.3	d4	9.3	9.0	8.0
d5	10.0	9.9	9.6	d5	9.9	9.8	9.4	d5	9.8	9.7	9.3
d6	10.0	10.1	10.4	d6	10.1	10.2	10.6	d6	10.2	10.3	10.7
d7	10.0	10.3	11.3	d7	10.3	10.7	11.7	d7	10.7	11.0	12.0
d8	10.0	10.6	12.2	d8	10.6	11.1	12.8	d8	11.1	11.7	13.3
d9	10.0	10.8	13.1	d9	10.8	11.6	13.9	d9	11.6	12.3	14.7
d10	10.0	11.0	14.0	d10	11.0	12.0	15.0	d10	12.0	13.0	16.0

Table 3.1 – Alternative wage dispersion scenarios for each group of workers (share of each group's wage income by deciles, %)

Agr: labour in the agricultural sector; Nunsk: unskilled labour in the non-agricultural sectors; Nsk: skilled labour in the non-agricultural sectors.

Source: author's own elaboration

Figure 3.6 – The evolution of wage inequality under different scenarios, (GE(0) index)
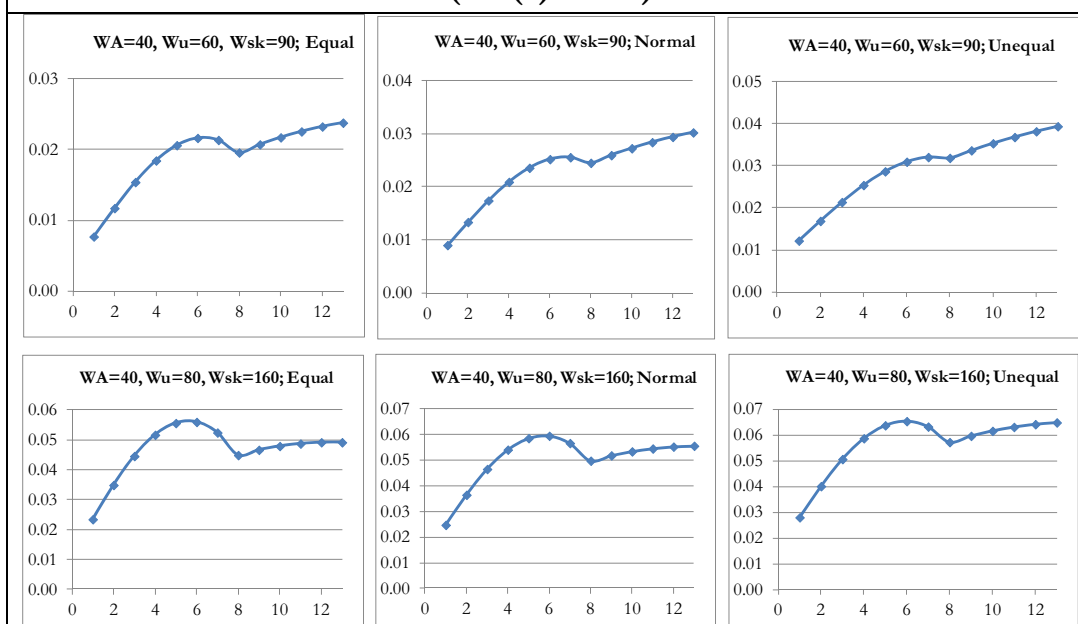
Source: See Appendix 3.2.

Note: the horizontal axis indicates the time period (see text).

Obviously, this is a highly simplified portrait of reality. More specifically, the assumption that the relative wages of the groups and the wage inequality within each group remain constant over time is not especially convincing. In fact, these simulations are just an instrument, in the spirit of the *original* Kuznets' hypothesis (which also includes the assumption of constant relative wages) to help understanding the forces that underlie the evolution of wage inequality through the process of transformation from a traditional economy to a post-industrial one.

On the other hand, if changes in relative wages were allowed for in the model, they would probably amplify the changes in inequality predicted by this "extended Kuznets' curve". To begin with, the left-hand side of the curve (i.e. the original Kuznets' inverted U) reflects the transition from a labour market dominated by agriculture to one dominated by non agricultural sectors. In this context, Lewis' (1954) growth model predicts that, when industrialisation begins, agricultural wages are likely to remain constant due to large labour surpluses in the agricultural sector. Thus, agricultural wages may fall behind industrial wages for a while. However, once the labour surpluses are exhausted, agricultural wages may converge once more with industrial wages. These changes in relative wages would first increase and then compress wage inequality, which would reinforce the trends predicted by the "extended Kuznets' curve" hypothesis.

In the case of the right-hand side of the curve, inequality starts growing again due to the increase in the proportion of skilled workers. However, in the real world, wage inequality may also increase due to changes in the skill premium. As we will see, both phenomena may be closely related.

There are several hypotheses in the literature to explain the recent increase in wage inequality and the skill premium. Conceição and Galbraith (2001), who were the first to broach the subject of an augmented Kuznets curve, divide the economy into three sectors: sector S, producing low-tech services; sector C, producing consumer goods and machinery; and sector K, the most advanced of the three, producing knowledge goods. A post-industrial economy becomes increasingly specialized in sector K, which works under monopolistic competition and is very unequal, while the wages paid are necessarily high because companies have a strong incentive to contract the best talent since

"the winner takes it all". Accordingly, wage inequality is likely to grow in a post-industrial economy increasingly specialized in Sector K.

Trade and migrations may also have an important impact on wage inequality through changes in the relative demand and supply of skilled labour. The size and direction of the impact has changed over time and also depends on the international context and country characteristics.[14] In the Portuguese case, Lains, Gomes and Guilera (2013) suggest that both emigration of unskilled workers and exports of low-skilled labour intensive goods were the main force driving down the skill premium from the mid 1960s to the 1980s.

Other authors have considered skill-biased technical change to be the main cause of the recent increase in wage inequality.[15] The argument is that, as technology is complementary to skilled labour, it increases the relative demand for skilled labour and hence its relative wage. However, Lemieux (2008) has pointed out that, in some countries, wage inequality increases are concentrated at the very top of the wage distribution, which might invalidate the technical change argument. Indeed, wage increases only affecting the top 10% of wage earners do not seem to be technologically driven, given that technological change would affect a wider proportion of workers.

Autor, Katz and Kearney (2006) have improved the traditional distinction between skilled and unskilled workers by distinguishing between three different groups: skilled workers in non-routine (abstract) cognitive tasks, skilled workers engaged in routine tasks and unskilled workers engaged in non-routine manual tasks. According to this classification, skill-biased technical change would have a positive impact on the wages of the first group but not on those of the second. This could help to explain why workers at the top of the distribution have done well, whereas those in the middle have lost ground and converged with unskilled workers, in a scenario of increasing polarization of the labour market.[16] Finally, according to Piketty and Saez (2006), rises in top income and wage shares since the 1980s can be attributed basically to several non-economic factors: the introduction of new remuneration tools, such as pay-for-performance systems, that generate more dispersion; the increasing power enjoyed by executives to fix their own pay; and changes in

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[14] See Anderson (2001) and Wood (1995 and 1998).

[15] See Acemoglu (2002), Katz and Murphy (1992), Juhn, Murphy and Pierce (1993) and Levy and Murnane (1992).

[16] See also Gray (2011).

the prevailing social norms that have allowed sharp increases in the top wages that previously would have been unthinkable. In addition, liberalization policies in the labour market and the falling rate of unionisation may also have had an impact on wage inequality.[17]

As we have seen, there are different possible causes to explain the recent increase in wage dispersion. However, what they have in common is that they begin to have a noticeable effect once the share of skilled labour becomes significant. This would seem to be a pre-condition for the expansion of sector K in the Conceição and Galbraith model. Furthermore, the macroeconomic impact of skill-biased technical change on wage inequality may also be negligible below a certain threshold of skilled labour.

Similarly, changes in labour market institutions could result in greater pay inequality only when the share of skilled labour gains importance. In an industrial economy, labour force characteristics are relatively homogeneous and different workers' interests tend to converge. Both factors favour high rates of unionisation and political demands for a specific type of labour market regulation. The result is a compression in the wage distribution. However, in a post-industrial economy, with a higher share of skilled labour, working classes become increasingly heterogeneous. As a consequence, common interests become increasingly hard to define, which hinders collective action. This in turn erodes labour market institutions and fuels wage inequality. From this perspective, the increasing participation of skilled labour in an economy seems to facilitate institutional changes causing wage inequality to grow.

In the same vein, Blackburn and Prandy (1965) claim that the proximity between white-collar workers and management can lead to a sharing of values and a sense of cultural homogeneity, thereby alienating this group of workers from the trade union movement. This argument would account for the negative impact of white-collar status on unionisation and, by contrast, for the positive correlation between trade union membership and jobs requiring physical or manual work (Riley, 1997). Indeed, the emergence of a post-industrial society has been closely associated with the increasing share of skilled, white-collar workers in total employment, which may help to explain the decline in unionisation.

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[17] See Lemieux (2008), Card (1992), Freeman (1993), DiNardo, Fortin and Lemieux (1996) and Autor, Katz and Kearney (2005).

In summary, all these arguments indicate that the evolution of relative wages in post-industrial societies tend to generate increasing wage dispersion. This would actually reinforce the trends predicted by the right-hand side of the "extended Kuznets' curve" presented before, which only takes into account labour movements between sectors, under the assumption (in line with the *original* Kuznets curve) of constant relative wages. In other words, the predictions of the "extended Kuznets' curve" hypothesis may be considered as complementary to other prevailing interpretations of the evolution of wage dispersion over time.

Coming back to the empirics, the "extended Kuznets' curve" hypothesis may help to understand the Portuguese experience. As has been shown in section three, the evolution of wage inequality in Portugal fits well with the predictions of the curve. Not only wage inequality followed an N-curve, but also the evolution of the within and the between coefficients are consistent with the hypothesis that underlie the "extended Kuznets' curve". As has already been pointed out, the left hand side of the Portuguese curve (the inverted U) was mainly driven by between-sectors inequality and, more specifically, by the transition of labour from agriculture to the modern sector. On the other hand, the final increase in wage inequality in Portugal is entirely due to the increase in within-sectors inequality (since between-sectors inequality actually ran in the opposite direction).

When the within- and between-sectors inequality are decomposed into their components (see Figure 3.5), the "extended-Kuznets' curve" hypothesis can only account for the evolution of components 2 and 3 (sector labour shares), but not of components 1 and 4 (skill premium and sectoral average wages). This limitation is the consequence of the underlying assumption that labour shares are the forces driving wage inequality, and that relative wages are constant (which, as has been indicated, is exactly the same assumption contained in the *original* Kuznets Curve hypothesis). This should not lead to the mistaken conclusion that changes in relative wages were unimportant. Figure 3.5 shows that components 2 and 3 evolved as predicted by the hypothesis, but components 1 and 4 were also relevant in the evolution of overall inequality, and they actually varied with greater intensity than components 2 and 3. Yet, all four components followed similar trends; in

other words, the movement in prices reinforced the trends predicted by the "extended Kuznets' curve" hypothesis.[18]

If this were a coincidence, the "extended Kuznets' curve" would probably be nothing more than the evolution presented by one particular case. However, as has been discussed above, changes in labour shares (between sectors and skill levels) may have been driving the evolution in relative wages. This means that the latter would actually be embedded in the hypothesis, while intensifying its effects.

In short, the long-term evolution of wage inequality in Portugal can be divided in two periods. The first, during which inequality followed an inverted-U, lasted until the eighties and was characterized by the pre-eminence of inter-sectoral forces. The decomposition of the GE(0) index during this period shows that the behaviour of its subcomponents fits perfectly well with the predictions made by the *original* Kuznets inverted-U hypothesis. More specifically, during this period (the inverted U), the evolution of the second, third and fourth components of inequality perfectly reflect the predictions of the *original* Kuznets hypothesis, according to which, during the transition from an agricultural economy towards an industrialized one: (1) labour moves from relatively egalitarian to relatively unequal sectors (i.e. there is a long-term increase in the second component); and (2), this labour transition is likely to increase inequality during its initial stages and reduce it later on, which is consistent with the evolution in the third and fourth components.

By contrast, during the last two decades, the wage differentials between different skill groups have been the driving force behind the evolution of wage inequality, which would be consistent with the prediction of a Kuznets' hypothesis extended to encompass the post-industrial period. In this case, the final increase in inequality is explained by: (1) the increasing labour share of the most unequal sectors; and (2), the rising skill premium. As has been pointed out, while only the first factor is accounted for by the "extended Kuznets' curve" hypothesis, the second may be largely considered as a closely associated process.

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[18] The main exception here is the sharp fall in the within group coefficient during the transition to democracy.

3.5.- Final remarks

This chapter has presented a long-term estimation of wage inequality for Portugal from the 1920s onwards. This series, which is the first to cover this long time period, shows that Portuguese wage inequality followed an N-curve. Wage inequality increased until the late 1950s, declined until the early 1980s and increased again thereafter. These trends seem to be in line with the international experience, especially in the case of the last growth episode, which has been shared by most OECD countries

The decomposition of the series into its main components indicates that labour transition and wage changes between sectors drove wage inequality until the 1980s. However, during the last decades, the increase in wage inequality has been due to the increasing wage dispersion between different skill categories and the larger share of the more unequal sectors.

In order to put the Portuguese distributive pattern in context, this chapter has also presented an "extended Kuznets' curve" hypothesis, which tries to extend Kuznets' (1955) original hypothesis (constrained to the study of wage inequality), to encompass the post-industrial economies' experience. According to the prediction of this "extended Kuznets' curve" hypothesis, wage inequality may be expected to follow an N-curve during the transition from a traditional economy to a post-industrial one. This prediction finds empirical support in the recent rise in wage inequality in post-industrial economies, which has been largely explained by the increasing share of skilled labour within the total active population.

The evolution of Portuguese wage inequality fits well with the "extended Kuznets' curve" hypothesis. In addition, the new series allow identifying the main forces behind this evolution. Section 3 shows that wage inequality between sectors was the fundamental driving force of wage dispersion until the 1980s, when it was replaced by inequality within sectors, which is exactly what the "extended Kuznets's curve" hypothesis predicts. Moreover, maximum wage inequality in Portugal was recorded when 40% of the labour force was engaged in agriculture (again in line with the hypothesis predictions). However, the new growth in wage inequality started when this sector still accounted for 20% of the labour force, which is slightly higher than the hypothesis predictions.

The steep increase in global wage inequality in recent decades has been at the heart of a lively debate among economists, and has awoken the interest of the public in general. Recent studies have forwarded a number of hypotheses to account for this phenomenon, but no consensus has yet been reached. On this matter, this chapter provides a rather simple answer: wage inequality is increasing because workers are becoming increasingly different. This apparently trivial response may explain not only the recent rise in wage inequality but also its long term evolution. Actually, the central role of labour force composition is also to be found at the heart of the *original* Kuznets Curve hypothesis. It proved to be highly persuasive and influential in its original formulation, and so the extension of this same simple idea may be useful in explaining the recent global boom in wage inequality.

Appendix 3.1: Sources and estimation of wage indices

A.3.1.1 Wages

a) 1921-84

Agriculture

Agricultural wages are taken from various chapters of the *Anuário Estatístico de Portugal* published by the Portuguese Statistics Office (INE). For the period 1921-1928 they come from the chapter *Indústria*; for 1929-1954 from *Produção e Consumo*; for 1955-1982 from *Preços e salários* and for 1983-84 from *Emprego é salários*. The information is fairly homogeneous for the whole period and comprises male and female daily wages for different activities in each Portuguese district.[19] The number of agricultural activities listed in the source falls over time, ranging from 28 to 1 for males and from 15 to 1 for females. Male and female daily wages in each Portuguese district are estimated as an unweighted average of wages for different activities. For the country as a whole, male and female daily wages are calculated as the weighted average of the wages of all districts.

Industry

Industrial wages are also taken from the *Anuário Estatístico de Portugal*. For the period 1921-1934, wages are drawn from the chapter *Indústria*. The source reports information on average daily wages for 30 sectors, by gender and for each Portuguese district. To estimate the national wage for each sector, a weighted average is calculated on the basis of the active population in each district and sector. Female wages are excluded because those data were not systematically collected and this might introduce a bias in the estimation.

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[19] Despite some of these activities are more skilled tan others, it is not possible to know the number of hours or days worked in each one of them. Besides, most of the agricultural activities are seasonal and, therefore, agricultural workers may have worked in activities of different skill content over the year. These difficulties did not allow estimating series for skilled and unskilled agricultural workers.

From 1944 onwards, industrial wages come from a yearly survey conducted by the Portuguese Statistics Office (INE), which includes information on firms with 10 or more employees, and is published in the following chapters of the *Anuário Estatístico*: "*Produção e Consumo*" (1944-1967), "*Indústrias extractivas*" and "*Indústrias transformadoras*" (1968-1970), "*Rendimentos, salários e preços*" and "*Mão-de-obra*" (1971-1981) and "*Emprego e salários*" (1982-84). The structure of the data is not constant over time because both the number of industrial sectors and the categories of workers considered changed during the period studied. For 1944-1955, the survey classified workers into three main groups: employees (*empregados*), industrial workers (*assalariados industriais*) and other workers (*outros assalariados*). Employees were those with a longer term contract, whereas industrial and other workers earned daily wages. More specifically, employees were wage earners with management responsibilities, earning a regular return (such as administrators, managers, economists, engineers, technical directors, secretaries, stenographers, typists, accountants, staff in charge of ordinary tasks in laboratories, personnel recruitment and staff of the social services of the company, i.e. clinics, schools, sports and other leisure activities). "Industrial" and "other" workers comprised all personnel that participated directly in the production system, including masters and foremen. Both categories of workers received similar wages: sometimes industrial workers' wages were higher than other workers' wages and vice versa. That suggests that both categories of workers were quite homogeneous. For employees (which we have classified here as "skilled workers"), the source gives information on their number at either December 31 or the period of maximum activity of the year, and also on the total wages received by this group in the whole year. For workers (which we have classified here as "unskilled workers"), the source gives information on their number at either December 31 or the period of maximum activity, the number of working days per year and the total wages paid per year to this group.

For 1956-1970, the source provides information on two occupational groups: employees (*empregados, administrativos, técnicos e de escritório*) and other workers (only one group). For employees ("skilled workers"), the source gives information on either their number at December 31 or their monthly average, and also on the total wages received by this group in the whole year. For other workers, the source gives information on either their number at December 31 or their monthly average, on the number of working days per year and on the total wages paid per year to this group. For 1971-1981, the information on

wages is again classified into three groups: *dirigentes*, *outro pessoal* (both of them employees) and other workers. For employees ("skilled workers"), the source gives information on the monthly wage and the monthly average number of workers in each group (*dirigentes* and *outro pessoal*). For other workers ("unskilled workers"), the source provides information on hourly wages and the monthly average number of workers. For 1982-84, there are only two groups of workers: employees (*Dirigentes, Administrativos, técnicos e outros empregados*) and workers (*operarios*). For employees ("skilled workers"), the source gives information on the monthly wage and the monthly average number of employees. For workers ("unskilled workers"), the source provides information on hourly wages and the monthly average number of workers.

For s*killed workers,* for 1944-1955, daily wages are estimated by dividing the total amount of wages paid each year by the number of employees at December 31 and then by dividing the outcome by 304 working days. For 1956-1970, daily wages are estimated by dividing the total amount of wages paid each year by the monthly average number of employees and then by dividing the outcome by 304 working days. For 1971-1974, daily wages are estimated by dividing monthly wages by 25.33 (i.e., 304 working days divided by 12 months). For 1975-84, daily wages are estimated by dividing monthly wages by 21 (i.e., 252 working days divided by 12 months). Between 1971 and 1981, monthly wages are a weighted average of the wages for the two groups of employees that are distinguished in the source. For *unskilled workers,* for 1944-1970, daily wages are estimated by dividing the total amount of wages paid each year by the number of working days per year. For 1971-1984, daily wages are estimated by multiplying hourly wages by eight (hours worked per day).

In the case of employees, until 1975 I have assumed a total of 304 working days a year, i.e., six working days per week less official and religious holidays. The six-day working week was confirmed by law in 1934, *Decreto n. 24402* (Patriarca, 1995, pp. 372), whereas the five-day working week was established only after 1976 (Leite and Almeida, 2001, pp. 169; and Barreto, 1990, pp. 57-117). During the Estado Novo there were nine days of official and religious holidays per year (Araújo. *et al.*, 1969, p. 207), and this situation did not change until 1976, *Decreto* 874/76, See Leite and Almeida (2001), pp. 200-201. By contrast, from 1976 to 1984 I assumed a total of 248 working days a year

because in 1976 the five working days week was introduced, and there were 13 days of official holidays, see Leite and Almeida (2001), pp. 206-207.

The number of industrial sectors considered in the survey is especially volatile: during these thirty years it varied from 21 to 187 sectors. To obtain homogenous data, the sectoral structure provided by Pinheiro (1997) is used as reference, and the information is aggregated to fit that sectoral breakdown (CAErev1). In order to aggregate the different sub-sectors into these reference sectors, sectoral wages are weighted according to the number of workers in each sub-sector.

The aggregation of the different industrial sectors of the sources used to fit the sectoral structure used by Pinheiro (1997) may be seen in Table A.3.1.1.

Table A.3.1.1 - Aggregation of the different industrial sectors of the sources used to fit the sectoral structure by Pinheiro (1997)

1921-34

Mining and quarrying
Industrias mineiras e de carvao
Indústria das pedras
Food, drink & tobacco
Industrias da alimentaçao
Industrias da alimentaçao (clase II, alimentos líquidos)
Textiles and clothing & leather and footwear
Industrias téxteis
Industrias do vestuario e anexos
Industrias do calçado
Industrias das peles e anexos
Wood and products of wood and cork & furniture
Industrias da madeira e do mobiliario
Pulp, paper, paper products, printing & publishing
Industrias do papel
Industrias gráficas e anexos
Industrias de arte do precisao
Chemicals
Industrias químicas
Non- metalic mineral products
Industria ceramica
Industria vidrieira
Basic metals & electrical and transport equipment
Industria metalúrgica
Carrosaría
Other manufacturing
Pequenas industrias e industrias especiais

Table A.3.1.1 (cont)

1944-52

Mining and quarrying
Extractivas
Minas
Pedreiras
Food, drink & tobacco
Da alimentaçao
Descasque de arroz
Moagem de farinhas espoadas
Refinaçao de açucar
Conservas da peixe
Lacticinios
Chocolates e cacaus
Cerveja
Do Tabaco
Textiles and clothing & leather and footwear
Téxteis
Téxtil de lanificios
Téxtil de algodoes e outras fibras
Corte e preparaçao do pelo
Chapelaria
Do colro e das peles
Wood and products of wood and cork & furniture
Da madeira e derivados
Folheados e contraplacados
Cortiça
Resinosos
Pulp, paper, paper products, printing & publishing
Do papel
Chemicals
Química
Fósforos
Borracha
Non- metalic mineral products
Cerámica
Vidrios
Cal hidráulica
Basic metals & electrical and transport equipment
Cemento
Fibrocimento
Dos minerals nao metálicos
Other manufacturing

Mining and quarrying
Extractivas
Minas
Pedreiras
Extracçao de carvao
Extracçao de mineiros de ferro
Extracçao de minerais metalíferos
Extracçao de pèdra, argila, saibro e arena
Sal e outroa menarais para ind. Química
Minerals no metàl·lics
Food, drink & tobacco
Da Alimentaçao
Conservas carne
Fabricaçao de gelatos
Lacticinios
Conservas da peixe
Conservas de frutas e produtos hortícolas
Enlatamento e conservaçao de peixe e outros produtos de pesc:
conservas em azeite ou molhos pelo sal
Congelaçao peixe
Descasque de arroz
Moagem da farinhas espoadas
Moagem da farinhas espoadas, milho e centeio
Moagem da farinhas espoadas, trigo
Moagem da farinhas espoadas
Bolachas e biscotos
Daçaria e pastelaria
Refinaçao de açucar
Chocolates e cacaus
Confeitaria
Clarificaçao e refinaçao de oleos comestiveis
Clarificaçao e refinaçao de azeite
Clarificaçao e refinaçao de outros oleos comestiveis
Margarina
Massa alimenticias
Torrefacçao
Moagem da pimentao
Alimentos para o gado
Fermentos e levaduras
Amidos, féculas e dextrinas
Gelo
Aguardentes preparados
Licores e outros espirituosos
Cerveja
Aguas minero-medicinais
Vinhos espumantes e espumosos
Bebidas nao alcohólicas e das aguas gaseificadas
Tabaco

Table A.3.1.1 (cont)

1953-1970
Textiles and clothing & leather and footwear
Textil de la
Textil de algodao
Textil de outras fibras
Textil de algodao e otras fibras
Textil de algodao, fibras sinteticas e artificiais
Textil das fibras duras e mistas
Tapeçaria
Passamanarias
Malhas
Cordoaria
Redes
Telas impermeáveis, oleados e encerados
Corte e preparaçao do pelo
Seiras e capachos
Chapelaria
Curtumes
Wood and products of wood and cork & furniture
Folheados e contraplacados
Aglomerados de particulos
Industrias da cortiça
Pulp, paper, paper products, printing & publishing
Fabricaçao de pasta
Fabricaçao de papel e cartao
Fabricaçao de artigos de pasta de papel

Table A.3.1.1 (cont)

1953-1970

Chemicals
Alcool industrial
Destilaçao de materias celulósicas, Celulose regenerada, resinas
sintéticas e outras materias plásticas
Pigmentos e corantes
Resinosos
Fibras artificiais e sintéticas
Explosivos e pirotecnia
Adubos
Oleos de sementes
Oleo de bagaço
Tintas preparadas e produtos afins
Fósforos
Preparados para conservaçao e limpesa
Derivados de cera e parafina
Saboes, sabonetes e óleos sulfonados
Detergentes
Colas, grudas e gelatinas
Fabricaçao de especialidades farmaceuticas
Perfumes e produtos de toucador e higene
Refinarias da petroleo bruto
Fabricaçao de emulsoes de asfalto
Briquetes e aglomerados combustíveis
Pneus e camaras
Articulos de borracha
Recauchutagem, rechapagem e vulcanizaçao
Fabrico do artigos de materias plásticas
Non- metalic mineral products
Materiais de barro para construcçao
Olaria, porcelana e falança
Vidro
Industrias fundamentais ou de fusao de vidro
Industrias annexas ou complemetares de vidro
Cimento
Lousa
Artigos de Fibrocimento
Artigos de cimento…
Fabricaçao de cal hidráulica

1953-1970
Basic metals & electrical and transport equipment
Obtençao de ferro e aço
Trefilados de ferro e aço e tubos de aço
Tubos de aço
Metalurgia do chumbo
Artigos de arame, parafusos, pregaria
Louça metálica
Cutelaria
Aluminio e aço inoxidável
Limas
Artigos doFerro esmaltado
Máquinas-ferramentas para trabalhar metais e carbonetos metálicos
Balanças, básculas e medidoras
Fabricaçao de motores, geradores e transformadores
Fios e cabos isolados
Pilhas e Acumuladores eléctricos
Lámpadas eléctricas
Fabricaçao e montagem de aparelhos eléctricos
Construcçoes e reparaçoes navais
Construcçao e montagem de material de caminho de ferro
Construcçao e montagem da vhiculos a motor
Construcçao de carroçarias
Motociclos e bicicletas
Other manufacturing
Botoes
Artigos de escritorio
Reclamos luminosos

Table A.3.1.1 (cont)

1971-1974

Mining and quarrying
Industrias extractivas
Extracçao de carvao
Extracçao de mineiros de ferro
Extracçao de minerais metalíferos
Extracçao de pèdra, argila, saibro e arena
outros minerais
Food, drink & tobacco
Industrias alimentaçao
Industrias das bebidas
Tabaco
Textiles and clothing & leather and footwear
Textil de la
Textil de algodao, fibras sinteticas e artificiais
Textil das fibras brandas e mistas
Tapeçaria
Passamanarias
Rendas
Malhas
Cordoaria
Redes
Telas impermeáveis, oleados e encerados
Corte e preparaçao do pelo
Chapelaria
Artigos de vestuario por corte e costura de tecidos, coiro, peles e
outroas materiais
Fab. Chapeus de chuva
Artigos de lona e similares
Confecçao de saccaria
Industria de curtumes e dos articulos de coiro, e pole com exepçao
calçado e vestuário
Fabricaçao de calçado
Wood and products of wood and cork & furniture
Indústria da madeira e cortiça
Industria de mobiliário

Table A.3.1.1 (cont)

1971-1974
Pulp, paper, paper products, printing & publishing
Indústrias do papel e dos artigol do papel
Tipografía, editoriais e indústrias conexas
Chemicals
Indústrias químicas
Refinarias da petroleo bruto
Briquetes e aglomerados combustíveis
Indústria da borracha
Fabrico do artigos de materias plásticas
Non- metalic mineral products
Materiais de barro para construcçao
Olaria, porcelana e falança
Industrias fundamentais ou de fusao de vidro
Industrias annexas ou complemetares de vidro
Cimento
Lousa
Artigos de Fibrocimento
Artigos de cimento…
Fabricaçao de cal hidráulica
Gesso
Abrassivos
Cantarias e outros produtos de pedra
Basic metals & electrical and transport equipment
Indústrias metalúrgicas de base
Obtençao de metáis nao ferrosos e ligas, sua afinaçao e refinaçao
Fabricaçao de produtos metálicos, exc. máq. e mat. Transp.
Construçao de máquinas com excepçao das eléctricas
Construçao de máquinas, aparelhos, utensiliose outro material
Consrtuçao de material de transporte
Material médico-cirúrgico, dentário e ortopédico
Other manufacturing
Botoes
Artículos de escritorio
Brinquedos e artículos de desporto
Tabuletas e outro material publicitario

1975-1989

Mining and quarrying
Industrias extractivas
Extracçao de carvao
Extracçao do minerais metálicos
Extracçao de minerais nao metálicos e rochas industriais
Food, drink & tobacco
Industrias alimentaçao
Bebidas
Tabaco
Textiles and clothing & leather and footwear
Téxteis
Artigos do vestuario com excepçao calçado
Curtumes e dos artigos de couro e de seus substitutos e de pele,

exc calçado e vestuario
Calçado, exc claçado vulcanizado, de borracha moldada ou de

plástico e feto interamente de madeira
Wood and products of wood and cork & furniture
Madeira, artefactos de madeira e cortiça, com exc. Mob
Mobiliario com exc. Mob metalico e de plástico
Pulp, paper, paper products, printing & publishing
Papel
Artes gáficas e ediçao de publicaçoes
Chemicals
Produtos químicos industriais
Outros prod. Químicos
Refinarias petróleo
Derivados petróleo e carvao
Borracha
Artigos de matérias plásticas
Non- metalic mineral products
Porcelana, falança, grés fino e olaria de barro
Vidro e artigos de vidro
Outros produtos mineráis nao metálicos
Basic metals & electrical and transport equipment
Ind. Básicas ferro e aço
Ind. Básicas metáis nao ferrosos
Produtos metálicos, com exc. De máquinas, equipamento e

material de transporte
Maáquinas nao eléctricas
Máquinas, aparelhos, utensilios e outro material eléctrico
Construçao de material de transporte
Instrumentos profissionais e científicos e de aparelhos de medida,

de verificaçao, fotográficos e de instrumentos de óptica.
Other manufacturing
Outras indústrias transformadoras

Services

Services wages are taken from the *Estatísticas das Sociedades* conducted by the Portuguese Statistics Office (INE). This source starts in 1950. The information is fairly homogeneous for the whole period. The source provides information on the number of workers and the total amount of wages paid per year in each sector. The source identifies 15 sectors up to 1952 and 21 sectors between 1952 and 1984. Daily wages for services are estimated by dividing the total wages paid per year by the number of workers in each sector, and by dividing the outcome by 304 working days between 1950 and 1975 and 248 between 1976 and 1984. The number of service sectors considered in the source has been aggregated to fit the CAErev1 breakdown (see Pinheiro, 1997). The process of aggregation takes into account the relative importance of employment in each subsector.

b) 1985-2005

Wage data are taken from the *Quadros de pessoal*, which is a yearly statistical colection published by the *Ministério da Solidaridade e Segurança Social*. This source covers workers in all sectors of activity. Within each sector, workers are classified into eight skill categories. As for the breakdown by sector, from 1985 to 1994, workers are classified into 17 sectors (only one sector for manufacturing), while from 1995 to 2005 there are 30 sectors (14 in manufacturing). To obtain homogenous data, the sectoral structure used by Pinheiro (1997) is used as a reference, and the information is aggregated to fit that sectoral breakdown (CAErev1). In order to aggregate the different sub-sectors into these reference sectors, sectoral wages are weighted according to the number of workers in each sub-sector.

A.3.1.2.- Employment

1921-34

Employment data are taken from Nunes (1989). This source provides active population statistics for each Portuguese district, classified in 16 economic

sectors: Agriculture; Fishing; Mining; Manufacture of food, beverages and tobacco; Textiles and clothes; Manufacture of wood; Manufacture of paper; Manufacture of non-metallic minerals; Manufacture of chemical products; Manufacture of basic metals; Other manufacturing; Construction; Electricity and gas; Transport and communication; Trade; and Other services.

1944-84

Employment data for the period after 1953 are taken from Pinheiro (1997), *Parte V, Trabalhadores por conta de outrem,* which were extrapolated backwards on the basis of the growth rate of the labour force by sectors provided by Valério (2001, Tables 4.6 and 4.7), which are in turn taken from Nunes (1989).

1985-2005

Employment data are taken from the *Quadros de pessoal.*

Appendix 3.2. The extended Kuznets's curve hypothesis: wage dispersion predictions

Table A.3.2.1 – Wage inequality: first scenario												
W Agriculture=40, W unskilled=60, W skilled=90; Wage dispersion inside: Equal												
Period	1	2	3	4	5	6	7	8	9	10	11	12	13
Lagr/L	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Lsk/Lnagr	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.55	0.6	0.65
Lunsk/L	0.19	0.27	0.34	0.4	0.45	0.49	0.52	0.54	0.5	0.45	0.41	0.36	0.32
Lsk/L	0.01	0.03	0.06	0.1	0.15	0.21	0.28	0.36	0.41	0.45	0.5	0.54	0.59
Wage A	40	40	40	40	40	40	40	40	40	40	40	40	40
Wage Unsk	60	60	60	60	60	60	60	60	60	60	60	60	60
Wage Sk	90	90	90	90	90	90	90	90	90	90	90	90	90
Av wage	44.3	46.9	49.8	53	56.5	60.3	64.4	68.8	70.2	71.5	72.9	74.2	75.6
GE (0)	0.008	0.012	0.015	0.018	0.021	0.022	0.021	0.020	0.021	0.022	0.023	0.023	0.024

Table A.3.2.2 – Wage inequality: second scenario												
W Agriculture=40, W unskilled=60, W skilled=90; Wage dispersion inside: Normal												
Period	1	2	3	4	5	6	7	8	9	10	11	12	13
Lagr/L	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Lsk/Lnagr	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.55	0.6	0.65
Lunsk/L	0.19	0.27	0.34	0.4	0.45	0.49	0.52	0.54	0.5	0.45	0.41	0.36	0.32
Lsk/L	0.01	0.03	0.06	0.1	0.15	0.21	0.28	0.36	0.41	0.45	0.5	0.54	0.59
Wage A	40	40	40	40	40	40	40	40	40	40	40	40	40
Wage Unsk	60	60	60	60	60	60	60	60	60	60	60	60	60
Wage Sk	90	90	90	90	90	90	90	90	90	90	90	90	90
Av wage	44.3	46.9	49.8	53	56.5	60.3	64.4	68.8	70.2	71.5	72.9	74.2	75.6
GE (0)	0.009	0.013	0.017	0.021	0.024	0.025	0.026	0.024	0.026	0.027	0.028	0.029	0.030

Table A.3.2.3 – Wage inequality: third scenario													
W Agriculture=40, W unskilled=60, W skilled=90; Wage dispersion inside: Unequal													
Period	1	2	3	4	5	6	7	8	9	10	11	12	13
Lagr/L	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Lsk/Lnagr	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.55	0.6	0.65
Lunsk/L	0.19	0.27	0.34	0.4	0.45	0.49	0.52	0.54	0.5	0.45	0.41	0.36	0.32
Lsk/L	0.01	0.03	0.06	0.1	0.15	0.21	0.28	0.36	0.41	0.45	0.5	0.54	0.59
Wage A	40	40	40	40	40	40	40	40	40	40	40	40	40
Wage Unsk	60	60	60	60	60	60	60	60	60	60	60	60	60
Wage Sk	90	90	90	90	90	90	90	90	90	90	90	90	90
Av wage	44.3	46.9	49.8	53	56.5	60.3	64.4	68.8	70.2	71.5	72.9	74.2	75.6
GE (0)	0.012	0.017	0.021	0.025	0.029	0.031	0.032	0.032	0.034	0.035	0.037	0.038	0.039

Table A.3.2.4 – Wage inequality: fourth scenario													
W Agriculture=40, W unskilled=80, W skilled=160; Wage dispersion inside: Equal													
Period	1	2	3	4	5	6	7	8	9	10	11	12	13
Lagr/L	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Lsk/Lnagr	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.55	0.6	0.65
Lunsk/L	0.19	0.27	0.34	0.4	0.45	0.49	0.52	0.54	0.5	0.45	0.41	0.36	0.32
Lsk/L	0.01	0.03	0.06	0.1	0.15	0.21	0.28	0.36	0.41	0.45	0.5	0.54	0.59
Wage A	40	40	40	40	40	40	40	40	40	40	40	40	40
Wage Unsk	80	80	80	80	80	80	80	80	80	80	80	80	80
Wage Sk	160	160	160	160	160	160	160	160	160	160	160	160	160
Av wage	48.8	54.4	60.8	68	76	84.8	94.4	105	108	112	116	119	123
GE (0)	0.023	0.035	0.045	0.052	0.056	0.056	0.052	0.045	0.047	0.048	0.049	0.049	0.049

Table A.3.2.5 – Wage inequality: fifth scenario

W Agriculture=40, W unskilled=80, W skilled=160; Wage dispersion inside: Normal

Period	1	2	3	4	5	6	7	8	9	10	11	12	13
Lagr/L	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Lsk/Lnagr	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.55	0.6	0.65
Lunsk/L	0.19	0.27	0.34	0.4	0.45	0.49	0.52	0.54	0.5	0.45	0.41	0.36	0.32
Lsk/L	0.01	0.03	0.06	0.1	0.15	0.21	0.28	0.36	0.41	0.45	0.5	0.54	0.59
Wage A	40	40	40	40	40	40	40	40	40	40	40	40	40
Wage Unsk	80	80	80	80	80	80	80	80	80	80	80	80	80
Wage Sk	160	160	160	160	160	160	160	160	160	160	160	160	160
Av wage	48.8	54.4	60.8	68	76	84.8	94.4	105	108	112	116	119	123
GE (0)	0.025	0.037	0.047	0.054	0.059	0.060	0.057	0.050	0.052	0.053	0.055	0.055	0.056

Table A.3.2.6 – Wage inequality: sixth scenario

W Agriculture=40, W unskilled=80, W skilled=160; Wage dispersion inside: Unequal

Period	1	2	3	4	5	6	7	8	9	10	11	12	13
Lagr/L	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Lsk/Lnagr	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.55	0.6	0.65
Lunsk/L	0.19	0.27	0.34	0.4	0.45	0.49	0.52	0.54	0.5	0.45	0.41	0.36	0.32
Lsk/L	0.01	0.03	0.06	0.1	0.15	0.21	0.28	0.36	0.41	0.45	0.5	0.54	0.59
Wage A	40	40	40	40	40	40	40	40	40	40	40	40	40
Wage Unsk	80	80	80	80	80	80	80	80	80	80	80	80	80
Wage Sk	160	160	160	160	160	160	160	160	160	160	160	160	160
Av wage	48.8	54.4	60.8	68	76	84.8	94.4	105	108	112	116	119	123
GE (0)	0.028	0.040	0.051	0.059	0.064	0.065	0.063	0.057	0.060	0.062	0.063	0.064	0.065

CHAPTER 4

Income inequality, polarization, welfare and the extraction ratio in Portugal (1921-2006).

4.1.- Introduction

As was indicated in the introductory chapter, there is a large diversity of methodological approaches to measure inequality in history and , specifically, for those periods before household budget surveys were conducted on a regular basis. Some of the alternatives to estimate inequality are the use of social tables, functional income distribution, wage inequality estimates, the Williamson index and top income shares. These indicators have hugely widened the available historical knowledge on the evolution of inequality. However, all of them are partial approaches, because either do not cover the whole population or divide it into artificially-assumed homogeneous groups. These shortcomings prevent from using these indices as proxies of personal income inequality, something which is often forgotten. Despite the fact that all these indices measure concepts that are related to personal income inequality, they are not equivalent to it and in some circumstances may evolve in opposite directions, as will be seen below.

An exception to this is Bértola's (2005) approach to personal income inequality in Uruguay in the long term. His starting point is functional income distribution, but combines it with an estimation of income dispersion inside each social group on the basis of different sources, such as census, wage data, taxes, etc. This allows him to avoid the introduction of constraining assumptions on the distribution of incomes inside each social group, and provides a more reliable picture of actual income inequality in Uruguay. After this, several similar studies have been carried out for other countries which allow having more or less comparable international estimates of overall income distribution. [1]

This chapter, which is largely inspired in Bértola (2005), presents a similar estimate for Portugal from the early 1920s to 1980, when official data started

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[1] See Bértola, Castelnovo, Rodríguez and Willebald (2010) for Brazil and Chile and Prados de la Escosura (2008) for Spain.

being available. This series constitutes the first attempt to illustrate the long-term evolution of Portuguese personal income inequality. Besides, the comparison of this index with estimates of functional income distribution and top income shares for Portugal gives an interesting result: those indices often evolve in opposite directions. This finding reinforces the interest of this comprehensive approach to estimate personal income inequality and to avoid relying on partial alternatives that may lead to mistaken conclusions.

Portugal is today one of the most unequal countries in Europe.[2] Has it always been so? This paper shows that the current high inequality is a twentieth century phenomenon, because in the early 1920s Portugal, despite being a poor country, was not particularly unequal. The new series show that the process of economic growth that has transformed Portugal in a modern and advanced economy has done so at the expense of the increase in income inequality.

Income inequality boomed during the first half of Salazar's dictatorship and remained high until the end of the regime. This is not an unexpected finding and gives support to Alarcao (1948), Matoso (1994), Pinto (2005) and Patriarca's (1991) assessments on the regressive character of the Portuguese dictatorship. Then, during the *Revoluçao dos Cravos* of 1974 inequality fell sharply, but recovered thereafter during the democratic period. As a result, inequality series achieve its maximum levels in the early twenty-first century.

Similarly, the Extraction Ratio, which measures the capacity of the elites to capture the surplus of an economy, also boomed during the first half of Salazar's regime. Then, it fell during the golden age of capitalism due to rapid economic growth, as might be expected. By contrast, this ratio increased again from the 1980s onwards, and also achieved very high levels in the early twenty-first century. This surprising result illustrates the success of Portuguese economic elites, not only in preserving, but also in fostering their extractive capacity in the long term and under changing conditions.

In the last part of this chapter I suggest some hypotheses on the potential influence that income distribution may have had on some of the political events that took place in Portugal during the twentieth century. Esteban and Ray (1999) relate income polarization to social unrest and political instability.

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[2] See EU-SILC (2010).

In this sense, our series show that income polarization peaked during the early 1940s and 1970s, which were the scenario of intensive social mobilizations. These failed in the 1940s, but prevailed in the 1970s leading to the democratization of the country. By contrast, the relatively low polarization levels of the early 1920s would be consistent with the weak opposition to the 1926 military coup. Although these hypotheses are just based on simple correlations with no explanatory power, the new evidence on inequality and polarization that is provided in this chapter may constitute a useful instrument for the research on the explanations for those episodes of Portuguese history.

The remaining of this chapter is structured as follows. The next section describes the methodology and sources that have been used to carry out the estimations. Section 3 discusses our index of inequality and compares it with the alternative available inequality indicators, such as the top income shares, the Williamson index and the functional income distribution estimates. The fourth section presents complementary distributional indicators, such as the Polarization Index, the ER and the Welfare Index. Section 5 provides a broad picture of the evolution of inequality, polarization, ER and welfare in Portugal. Finally, the last section concludes.

4.2.- Methodology.

There is a wide set of approaches to estimate historical income inequality in the absence of household budget surveys: the functional income distribution, wage inequality, top income shares, skill premium, the Williamson index, etc. The scarcity of historical data has induced researchers to use some of them, despite their partial character, as proxies of personal income inequality. By contrast, as has been indicated, this chapter aims at providing a comprehensive long-term estimate of Portuguese income inequality that considers the whole income distribution. This section presents the methodology that has been applied to carry out those estimates.

The optimal characteristics of a complete inequality estimate were outlined in the well-known Deninger and Squire's (1996) world income inequality data set. According to these authors, the estimates must be based on household surveys, and they must cover all population and income sources.

More than frequently, historical studies could be defined as a race against renouncing. And this chapter is not an exception. Inequality estimations are highly data demanding, and those demands are often impossible to satisfy in long term studies. More concretely, in the case of Portugal the first household budget surveys were only implemented in the 1970s. Therefore, it has been necessary to look for alternative sources and methods in order to estimate the best inequality figures given the data constraints. My series cover the period between 1921 and 1980. The first Portuguese Household budget surveys were carried out in 1973 and 1980, which allows to compare my series with the official estimates and to track the evolution of inequality until the early twenty-first century.

My inequality figures do not relay on household budget surveys and do not comprehensively cover either the whole population or all income sources. These are serious shortcomings that would invalidate inequality indices of current economies. However, in the context of a historical analysis, they may be considered as a reasonably accurate picture of reality and represent a significant step further in the knowledge on the evolution of income inequality for twentieth century Portugal.

The database constructed tries to cover all active population and monetary incomes (wages, benefits and agrarian rents), using information from a wide variety of sources. The final estimates suffer from several potential biases. The first is related with the reliability of the sources. This is discussed in more detail below but, in all cases, the sources and their treatment have been chosen according to the criterion of minimizing distortions. The second problem is related with the omission of non-monetary incomes. These may be significant in developing countries, especially, among the poor. Accordingly, if they are not accounted for, the incomes of the poor may be underestimated, which would artificially increase inequality. Thirdly, my estimates measure inequality among active population, which tends to be higher than among total population.[3] Thus, the exclusion of non-active population might have introduced another source of overestimation of total inequality. Fourthly, my estimates cannot properly capture the fact that an individual could receive incomes from different sources, which would again bias the estimation. This problem may have been especially relevant in the case of those small landowners that participated in the labour market in order to complement

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[3] See Deninger and Squire (1996) database.

their incomes. While I have tried to correct this specific distortion, no adjustment has been implemented for other social groups, which might have resulted in an overestimation of inequality. And, finally, I have estimated income dispersion among land and capital owners through taxes paid. Given that tax avoidance and tax evasion would have been more intensive among richer taxpayers,[4] this would result in an underestimation of inequality (that could partially compensate for the former sources of overestimation).

This is the list of my renounces, which may have biased the final estimates, but are unavoidable if the objective is shedding new light on the history of Portuguese income distribution. The remaining of this section thoroughly discusses the methods and sources used in the estimation.

The strategy to estimate global income inequality in Portugal has consisted of dividing active population into different groups and allocating to each of them the number of people, their aggregate income and their internal income dispersion. More concretely, the active population has been split into two different groups: agricultural (Agr) and Non-agricultural (NAgr) and, within these groups, among wage-earners and non-wage earners (proprietors). Agr and NAgr GDP have been taken from the National Accounts,[5] and the active population of the country has been distributed among these four groups (Agr and NAgr wage earners, and Agr and NAgr proprietors) according to the information available in the Portuguese Population Censuses (1930-1980), which provide the number of proprietors and wage earners for different economic sectors. Years between censuses have been interpolated. The Census of 1920 does not distribute active population between wage earners and proprietors. Therefore, in order to extrapolate backwards the series, I have assumed that the proportion of wage earners and proprietors remained constant between 1920 and 1930. This may be a reasonable assumption given that the 1920s were affected by the post WWI crises and the structure of the economic activity remained largely unaltered. The sectoral distribution of labour force barely changed between 1910 and 1930 and the structural composition of GDP did not change much during the 1920s.[6]

The next step is the estimation of wage inequality in the Agr and NAgr sectors. Wage sources provide the number of workers and wage levels for

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[4] See Atkinson, Piketty and Saez (2011), p.19.
[5] Valerio (2001) and Pinheiro (1997).
[6] See Valerio (2001) and Lains (2003a).

different skill-groups and economic sectors, as has been thoroughly described in Chapter 3. Those sources present four different discontinuities: five and three new economic sectors are incorporated in 1950 and 1953 respectively; there is no information between 1934 and 1944; and before 1934 there is only information on the average wage per sector (without skill differentials).

In Chapter 3, the break of 1950 has been dealt with by linking the successive GE(0) series estimated for each subperiod, but the gap of 1934-44 has not been filled.[7] Here, in order to get a homogeneous wage database for the whole period under analysis (that might be merged with the data on Agr and NAgr propietors' income), I have re-estimated the missing income groups before 1953 and 1950, and between 1934 and 1944 (when there was no wage data). In order to do that, the size of each missing sector has been extrapolated backwards assuming that it evolved at the same rate as changes in the total labour force.[8] Between 1944 and 1953, to estimate wages of the missing sectors I have also assumed that they evolved at the same rate as the average wage of the included sectors. Finally, wages between 1938 and 1944 have been estimated by extrapolating backwards the 1944 figures on the basis of Pimenta (1985) wage series,[9] and between 1934 and 1938 wages have been linearly interpolated.

The estimation of the missing income groups between 1944 and 1953 involve an increase in wage inequality, given that the sectors incorporated in the database had wages above the average. The GE(0) index of wage inequality increases between 0.001 and 0.015 points when the missing economic sectors are incorporated in the database. However, this increase in wage dispersion had a minor effect on global income inequality between 1944 and 1953. More concretely, the estimation of the missing sectors increased the global income inequality GE(0) index between 0.11% and 1.66%.

Finally, before 1934 the sources provide information (wages and number of workers) for all economic sectors considered, but it is not disaggregated between skilled and unskilled categories. In order to preserve the database

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[7] Changes in 1953 did not generate distortions; see more details in Chapter 3.

[8] The absence of significant changes in the Portuguese economy during those years, due to modest economic growth and the lack of structural change before the 1950s, makes this assumption quite reasonable.

[9] This series is a weighted average of wage indices for twenty-five occupations in Lisbon, published in the *Boletim Mensal* of the National Statistical Institute. The annual index consists of the simple mathematical average of quarterly indices.

homogeneity, economic sectors have been divided into two categories: skilled and unskilled. The proportion of skilled workers in each sector in 1944 has been taken as the reference to allocate the number of workers in each skill category. Similarly, to estimate the wages of each skill-group, I have assumed that the ratio skilled/unskilled wage of 1944 remained constant before 1934. This assumption may be quite reasonable given the lack of significant transformations in the industrial sector during these decades. Moreover, any deviation from this scenario would have a minor effect on global income inequality. Indeed, only 1.12% of total inequality in 1944 was due to the skill premium of the industrial sector, which means that, if the skill premium were twice as high as my estimate before 1934, this would have increased total inequality by only one percentage point. After these transformations I obtained a homogeneous wage database ready to be merged with data from capital and land owners.

After estimating the wage database, the total wage income of the Agr and NAgr sectors can be obtained by multiplying the number of workers by the average wage of each sector. We then define the Agr proprietors' income as the difference between the Agr GDP and the Agr total wage income. The same applies for the NAgr sector

Given the lack of direct information, income dispersion among proprietors of the Agr and NAgr sectors had to rely on indirect proxies. More concretely, I use the tax payment dispersion to estimate income inequality among proprietors in the Agr and NAgr sectors respectively, given that the Land and Industrial taxes were proportional to incomes.

Income dispersion among Agr proprietors has been approached through the Land Tax (*Contribuiçao Predial*). This tax suffered significant changes during the period under study. After the 1929 fiscal reform, which was aimed at establishing a simpler (and easier to apply) tax system to help balancing public finances,[10] Portuguese land tax burdened the "normal" or presumed returns of landowners. After some decades, the 1963 fiscal reform introduced the real income assessment in Portuguese taxes. In the case of the land tax the new system began in 1964. This radical change in the way incomes were assessed had a substantial effect on the level of the declared incomes (which were significantly higher than the presumed incomes declared with the previous

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[10] See Leitao (1997) and Valerio (1994).

system), but not on the internal distribution of taxes paid among taxpayers, which remained fairly constant before and after the reform. More concretely, the GE(0) index of taxes paid was 1.64 in 1963 and 1.65 in 1964. The continuity of the series suggests therefore that the introduction of the real income assessment does not introduce a significant break in the estimated series of income dispersion among Agr proprietors.

Land tax statistics provide the number of taxpayers grouped in different brackets (14 to 18) according to the taxes paid from 1936 to 1982. The amount of total taxes paid by each bracket (which allows estimating the average tax paid by each bracket's taxpayers) has been estimated through Pareto interpolation techniques. The number of taxpayers of the Land tax is significantly higher than the number of agrarian proprietors from the Censuses (on average the number of agrarian taxpayers is twice as high as the number of agrarian proprietors registered in the Portuguese Censuses). This may be due to the fact that the Land tax affected all proprieties, regardless of the owner's main status, while a large share of very small proprietors may be considered as basically wage earners.

I have only considered a number of taxpayers (beginning with the richest one) equal to the number of agrarian proprietors in the census, excluding therefore the poorer taxpayers from the estimation. Then, their taxed income has been linearly converted into their total income, which is estimated from the national accounts. After this transformation, the bottom income groups turn out to have incomes below agrarian wage earners. This might be explained by the fact that the Portuguese Land Tax statistics gathered information on very small proprietors that received modest incomes from their lands, and that had to resort to alternative sources of revenue in order to complement their incomes. Here I assume that poor proprietors complemented their incomes working as wage earners, and ended up having comparable incomes to the agricultural wage earners. In other words, I assume that the wage-earners' average income is the lower bound for proprietors' income. This additional income attributed to the poor proprietors has been subtracted from other agricultural proprietors' incomes, because total proprietors' income is obtained as a residual between agrarian GDP and agrarian wage income, and this only includes the income of wage-earners, and not small proprietors. After this

subtraction, the remaining proprietors' income has been distributed again according to the information on taxed income dispersion.[11]

Before 1936 no land tax statistics were published, and I have projected backwards the figures for that year to 1921. Therefore, I have assumed that the number of agrarian proprietors in each bracket grew at the same rate as the total number of agrarian proprietors (taken from the census), and that the incomes of each bracket grew at the same rate as the average income of agrarian proprietors. Finally, I also take the agrarian average wage as a lower income bound for agrarian proprietors. As may be seen in Figure 4.1, the final estimate of income dispersion among agrarian owners increased until the late 1950s to decrease afterwards. Although, given the estimation method, it could be expected that inequality among land proprietors was stagnant before 1936, the decreasing ratio between the minimum income assigned to small landowners (the agrarian wage) and the average income of landowners explains the increasing dispersion.

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[11] The exclusion of the information on the poorest taxpayers from the estimation of agricultural proprietors' income dispersion has a very low incidence on the estimates of Portuguese total inequality. If, instead, I consider the whole taxpayer population and linearly transform the total number of taxpayers and the total taxes paid into the number of proprietors, taken from the Portuguese Population Censuses, and their total income, estimated from the national accounts (agrarian income minus agrarian wage income), total inequality (measured through the GE(0) index) would be, on average, just 2.5% higher than in my baseline estimation, with a maximum difference of 6.1% and no difference in trends (this alternative estimation also consider the average agricultural wage earners' income as the lower income bound for agricultural proprietors).

Figure 4.1 - GE(0) index of income inequality among agrarian proprietors
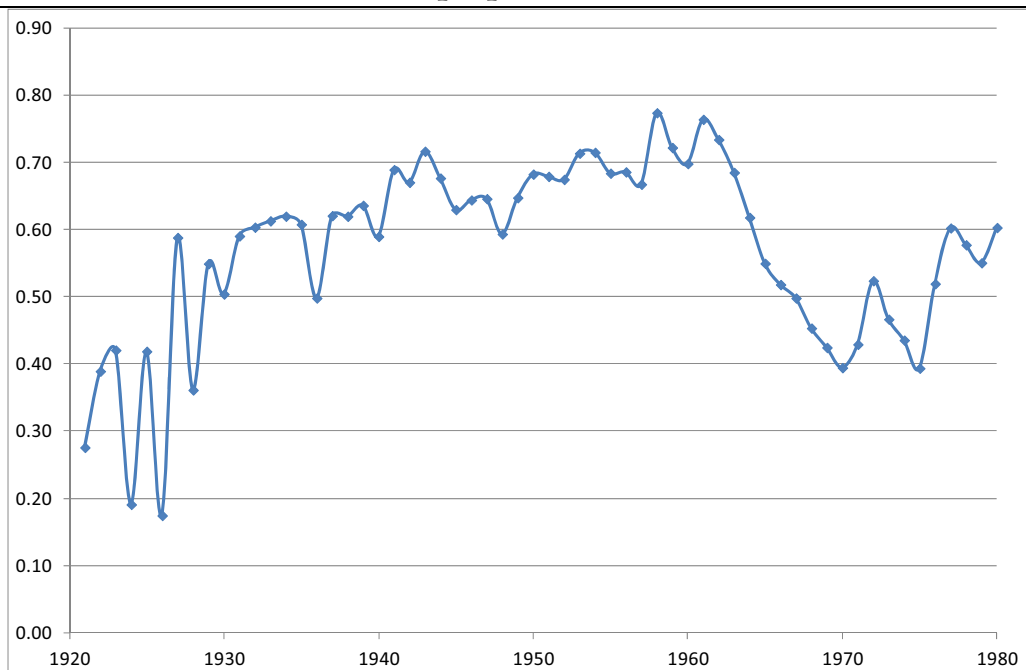
Source: see text

In order to proxy NAgr proprietors' incomes, I use the Industrial Tax (*Contribuiçao industrial*), which initially divided taxpayers into three groups. Group A taxed small businessmen with a fixed payment determined by the type of activity and its location. Group B taxed limited liability companies and limited partnerships. Given that these companies were not owned by a single individual, they have been excluded from the database. Finally, Group C taxed the remaining companies. In this group, income assessment was done under the normal or presumed system depending on the volume of transactions recorded. The 1963 reform also affected this tax, which again divided taxpayers into three groups (A, B and C). After the reform, Group A included limited liability companies, limited partnerships, cooperatives and corporations or individuals whose fiscal base was in other countries or in the Portuguese colonies,[12] and the tax reform subjected this group to real income assessment. For the same reason as in the previous period, this group has been excluded from our database. As for Group B and Group C, after the reform they

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[12] In the case of resident individuals it would have been convenient to include them in the database but the aggregation of statistical information did not allowed to do that. In spite of that, this group probably had a minor importance among the taxpayers of group A.

included medium-size companies and small companies, respectively. A commission made up by taxpayers and members of the finance ministry assessed the presumed income of each company. In all cases taxpayers had to pay a proportional tax of 15%.[13]

The exclusion of big companies[14] could generate biases in our database. In fact taxes paid by big companies amounted to 22% of the Industrial taxes paid before 1963, and to 45% after 1964 (on average). The increasing importance of the taxes paid by this group is related to the improvement in income assessment by tax authorities. The decision to exclude big companies from the estimation is due to the lack of information on these companies' ownership. With this decision I implicitly assume that the property of big companies was proportionally distributed among industrial taxpayers according to their incomes. This decision may be troublesome for different reasons. On the one hand, the property of big companies could be specially concentrated in the highest income taxpayers. On the other hand, other social groups could also be shareholders of these companies, which may be especially likely in the case of large landowners. In both cases, my assumption would be understating inequality. In order to test the potential distortions of this assumption I have estimated a counterfactual GE(0) index considering that each company is owned by a single individual. This alternative scenario would overstate inequality and would provide an upper bound. The results of this exercise show that the GE(0) index of Portuguese inequality would be higher under this alternative scenario. The average difference with my baseline estimation would be 0.03 GE(0) points or 4% of total inequality (with maximum differences of 0.11 points or 15% of total inequality). However, as may be seen in Figure 4.2, the evolution of income inequality would be the same under both scenarios. Thus, my simplifying assumption would not affect the global picture on the evolution of Portuguese income inequality.

On the other hand, I assume that each company of Groups A and C (Groups B and C after the reform) was owned by a single individual. In order to test the sensitivity of my series to this assumption I have estimated a counterfactual scenario in which companies in the four top brackets of the Industrial tax were owned by two individuals. This alternative estimate is only

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[13] See Leitao (1997), Valério (1994) and Ministerio das Finanças (1965).

[14] Big companies include all taxpayers of Group B before 1963 and those of Group A after the 1963 fiscal reform.

slightly lower than the original one, the maximum deviation between both GE(0) series being 0.33%.

Figure 4.2 – GE(0) index and GE(0) counterfactual including big corporations as individuals.

Source: see text.
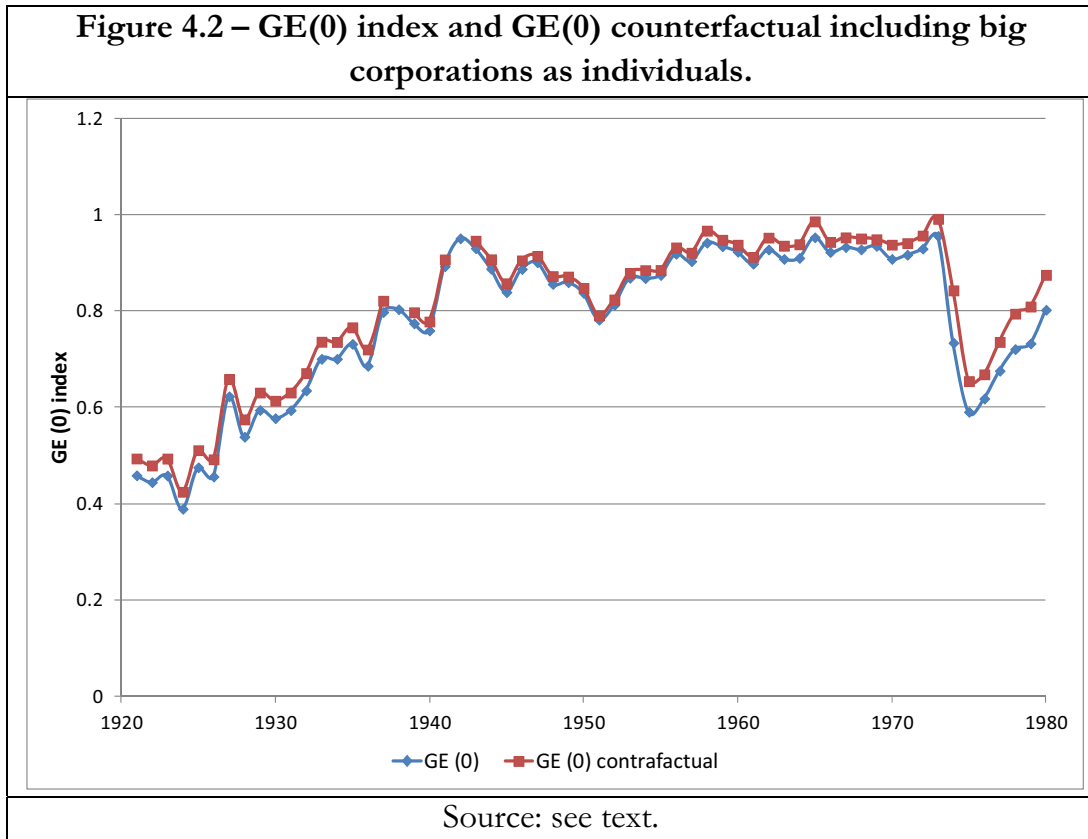
In fact, during the period under consideration, the number of industrial taxpayers was on average 20% higher than the number of industrial owners in the Censuses, which would indicate that some individuals owned more than one business. In order to test the potential distortions introduced by this fact, I have carried out another sensitivity analysis in which I assume that 20% of Portuguese businessmen owned two companies. In order to measure the maximum potential bias, I assume that the richest industrial businessman owned the two biggest companies (which paid the highest taxes), the second businessman the third and fourth companies and so on. This scenario is obviously exaggerated and provides an upper bound of maximum inequality. The results of this analysis indicates that the GE(0) index of global inequality would be, on average, 8% higher than my baseline estimation and it also shows that the evolution of global inequality would be exactly the same under both assumptions.

To sum up, my final series might be underestimating personal inequality due to its inability to capture the whole income dispersion among businessmen. However the size of the bias may not be significant enough to affect the reliability of the series and would not affect the trends detected in the evolution of the series. On the other hand, this could partially compensate for the overestimation bias provoked by the omission of non-monetary incomes and the exclusion of non-active population that were mentioned above.

The Portuguese Industrial tax classified taxpayers into 15 brackets until 1963, and 14 from 1964 onwards, according to the taxes paid. The amount of income pertaining to each bracket has been estimated through Pareto interpolation techniques. Finally, the number of taxpayers and the taxes paid by them have been linearly transformed into the number of NAgr proprietors (from the Portuguese Censuses) and their incomes (from National Accounts).

Most of the changes involved in the 1963 reform affected the large limited liability corporation group that I have excluded from the estimation. As a result, the reform does not provoke a significant discontinuity in the series. The average assessed income increased by 9.2% in 1964, which is consistent with its annual average growth rate between 1936 and 1980 (10.3%). Besides, as may be seen in Figure 4.3, there is no significant change in the level or the trend of income dispersion among taxpayers in 1963.

Industrial tax statistics are only available from 1936 to 1980. With the purpose of preserving the intertemporal homogeneity of the database I have assumed that income dispersion among NAgr proprietors remained constant during the period before 1936. This is a conservative assumption, and any (likely) deviation towards increasing income dispersion during the interwar period would reinforce the growing trend of my estimate of Portuguese income inequality. I have therefore assumed that the number of industrial proprietors of each bracket evolved at the same rate as the total number of industrial proprietors (taken from the census), and that the incomes of each bracket grew at the same rate as the average income of NAgr proprietors. As may be seen in Figure 4.3, income dispersion between industrial owners remained constant before 1936 (by construction), rapidly increased until the late 1940s, stagnated during the 1950s and increased again during the 1960s and early 1970s. Finally, the GE(0) index collapsed during the Portuguese revolution and increased again afterwards.

Figure 4.3 - GE(0) index of income inequality among Non-Agrarian proprietors
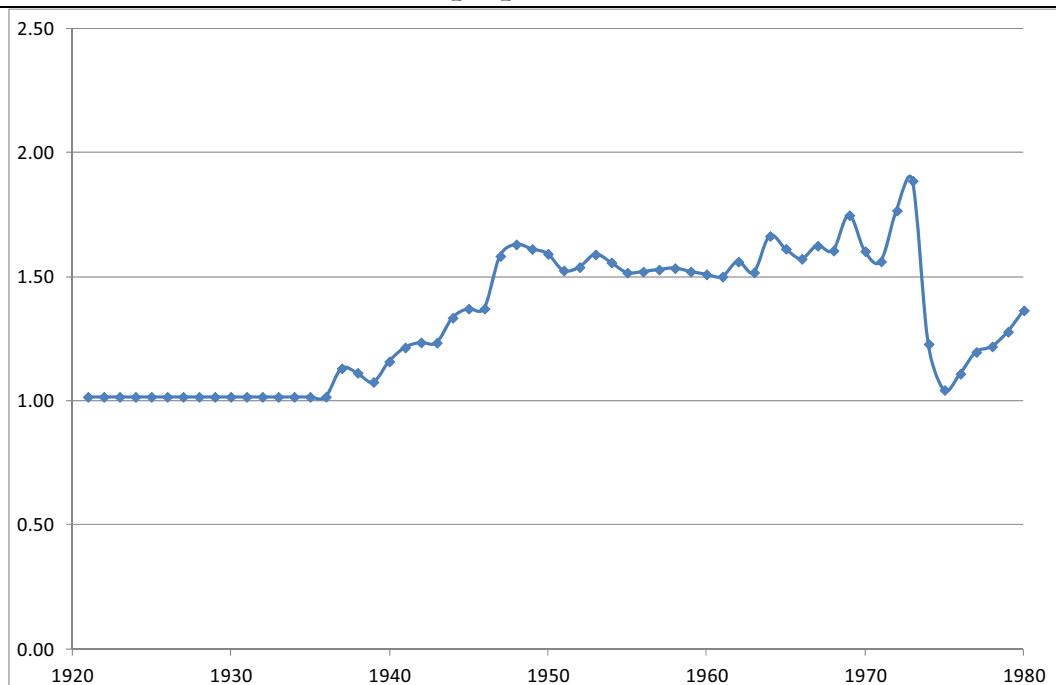
Source: see text

The result of the previous calculations is a database, which may be seen in Appendix 1, and which contains the number of people (N) and their income (Y) for each one of groups described above. The number of income groups changes over time, but these changes do not affect the final results. More concretely, the number of income groups range from 51 to 57: 24 to 25 wage groups (for 16 economic sectors, 9 of which are disaggregated in two skill groups), and 26 to 33 proprietor groups (14 to 18 in the agrarian sector and 12 to 15 in the rest of the economy). All this information has been put together and ranked from low to high income groups.

On the basis of this database, I estimate Portuguese income inequality by calculating the GE(0) and the Gini indices: [15]

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[15] More detailed information on those indices can be found in Mookherjee and Shorrocks (1988).

$$GE(0) = \frac{1}{n} \cdot \sum_i \ \log\left(\frac{\mu}{y_i}\right) \tag{1}$$

$$Gini = \frac{1}{2 \cdot n^2 \cdot \mu} \cdot \sum_i \ \sum_j \ \left| y_i - y_j \right| \tag{2}$$

where n is the number of individuals of the sample, μ the average income, and y_i and y_j are individual incomes. Given that I do not have information on the internal income distribution within the 51-57 groups of the database, I assume that income inside each group was equally distributed, that is, all individuals of each group had exactly the same income, which would underestimate overall income inequality. However, income dispersion among wage earners was probably modest and its impact on income inequality negligible.[16] Regarding landowners and businessmen, I have calculated a counterfactual GE(0) index in which I assume that the internal inequality of each of the 26 to 33 groups was maximum, that is, one individual received an income equal to the upper income bracket of his group and all the others shared the remaining income. The results of this exercise show that inequality would increase by a maximum of 0.0045% for landowners and 0.0046% for capital owners between 1936 and 1980. Thus, the assumption of equal incomes inside each group does not significantly affect the final results.

Whereas the GE(0) index has the advantage of being decomposable, the Gini index is the most common inequality index, and allows comparing our series with the official estimations of Portuguese income inequality for the last few decades, and also with the available estimates for other countries. Figure 4.4 shows the evolution of the GE(0) and Gini indices of Portuguese income inequality since 1921, and also presents the Gini estimates obtained from household budget surveys that are available since the 1970s. The latter have been taken from the World Income Inequality Database (WIID) elaborated by UN.

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[16] As mentioned above, the skill premium in 1944 only accounted for 1.12% of total inequality. For similar reasons, an increase in income dispersion inside each wage earner group would have a modest effect on total income inequality.

Figure 4.4 – The long-term evolution of Portuguese income inequality.

Source: see text
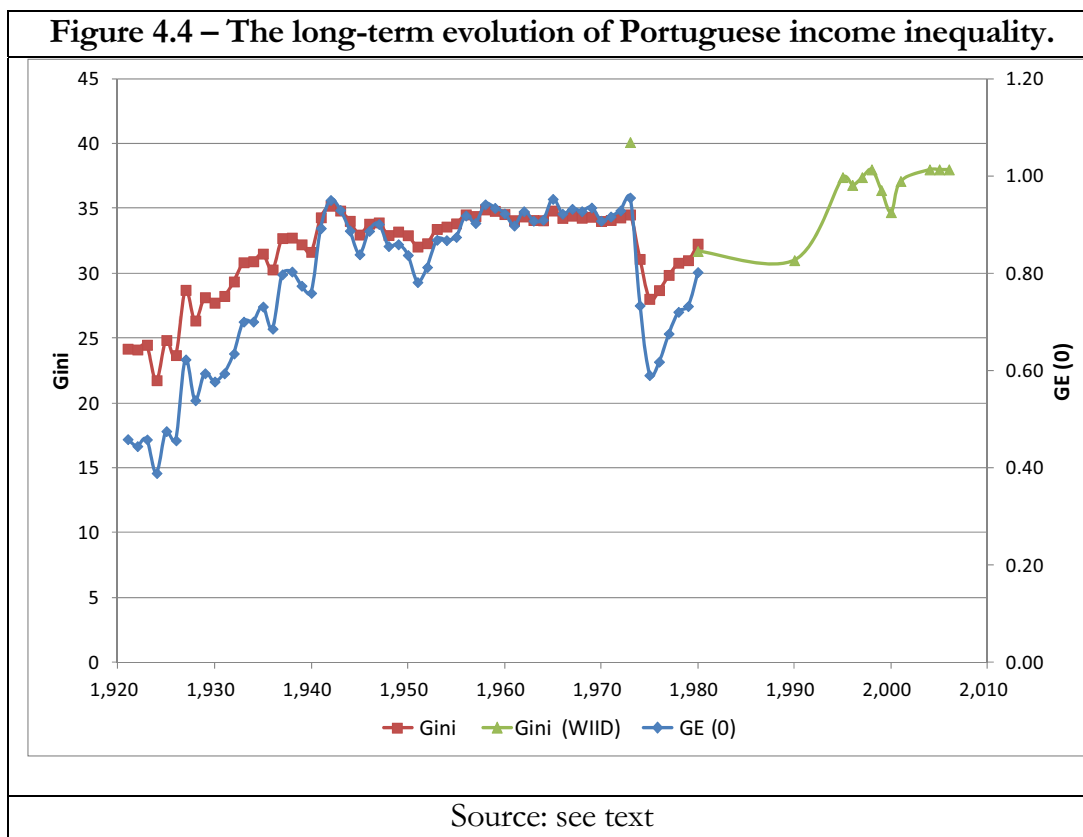
As may be seen in this figure, the evolution of the GE(0) and Gini indices is very similar, although fluctuations are more marked in the case of the GE(0) index, which may be due to the fact that it is more sensitive to changes at the bottom of the distribution, whereas the Gini index gives more weight to changes in its central part. Accordingly, this would mean that the increase in inequality during the interwar period (much more intense according to the GE(0) index) affected specially to the worst off fraction of the population and, similarly, the decrease in inequality after the 1974 revolution specially benefited the poorer individuals.

As has been indicated, my Gini estimates can be compared with the contemporary WIID income inequality figures. Interestingly enough, despite the great disparities in sources and estimation methods, both figures are almost identical for 1980: 31.70 according to WIID and 32.26 according to my estimation. And, in addition, as may be seen in Figure 4.4, between 1973 and 1980 income inequality declined according to both the WIID and my

estimates. This might be taken as evidence in favour of the relative consistency and reliability of the series that is presented here.

It is true, however, that the intensity of the decline between 1973 and 1980 was different. Inequality declined 8.4 Gini points (21%) according to the WIID and just 2.3 Gini points (7%) according to my estimation. This disparity, however, should not necessarily be taken as evidence against our estimates, since the WIID itself recognises that its 1973 estimate is of lower quality than the rest. And, besides, there are reasons that suggest that the 1973 WIID figure might be overestimated. More specifically, whereas the 1973 WIID estimate is based on non-adjusted gross income and the unit of analysis is the household, in 1980 the WIID inequality figure is based on disposable income (adjusted to an equivalent income on the basis of the household structure) and takes the person as the unit of analysis. Estimates provided by Gouveia and Tavarés (1995) for 1980 and 1990 in Portugal clearly show that inequality is higher when the unit of analysis is the household instead of the individual, and when total income instead of equivalent income is used. This may partially explain the relatively high value of the 1973 WIID estimate compared both to our own estimate and also to the 1980 WIID figure.

In summary, despite the huge differences in sources and estimation methods between my estimates and the official ones, both register a decline in inequality during the 1970s, and an almost identical level in 1980 (when the official data is of higher quality). Thus, the comparison of both estimates provides some evidence on the relative reliability and consistency of my results. Despite this, however, my series should be used with caution since it is based on some simplifying assumptions and more limited empirical information than the current estimates, specially for the first years of the period under study, when the available information is scarcer.

4.3.- How do the alternative indices behave?

This section compares the evolution of my GE(0) index[17] with other alternative indicators that have often been used by economic historians to approach personal income inequality, such as the functional distribution, the

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[17] For clarity of exposition we perform the comparison with the GE (0) index, whose global trends present no significant differences with the Gini index, as may be seen in Figure 4.4.

Williamson index and the top income shares. I have estimated the functional income distribution and the Williamson index on the basis of the same income databaseas the GE(0) index, and the top income shares come from Chapter 2. Unlike what might be expected, there are some significant differences between the evolution of the GE(0) index and these alternative indicators, which stress the importance of using them with caution to study long-term inequality.

Figure 4.5 compares my GE(0) index of personal income inequality with the functional income distribution (non-wage income share over GDP). Both indices have the same tendency, but show some short-term differences. Firstly, although both increased during the first half of the twentieth century, the growth rate of the GE(0) index is much faster: whereas the GE(0) index more than doubles, the non-wage income share increases by 39%. This deviation until 1936 is due to the increasing income dispersion among landowners which was depicted in Figure 4.1. From the mid 1930s to the early 1940s the increasing income dispersion among businessmen also contributed to the deviation between both indices (see Figure 4.3). Thereafter, during the 1950s, whereas the GE(0) index increases significantly, the functional distribution remains stable, which is again due to the increasing income dispersion among landowners and businessmen. Finally, from the 1960s to the mid 1970s both indices evolve together, although this is partially a coincidence because the evolution of the GE(0) during those years is the result of the compensation of the increasing income dispersion among businessmen by the decreasing inequality among landowners.

Figure 4.5 - Personal Income Inequality and Functional Income distribution in Portugal (1921-1980)

Source: see text
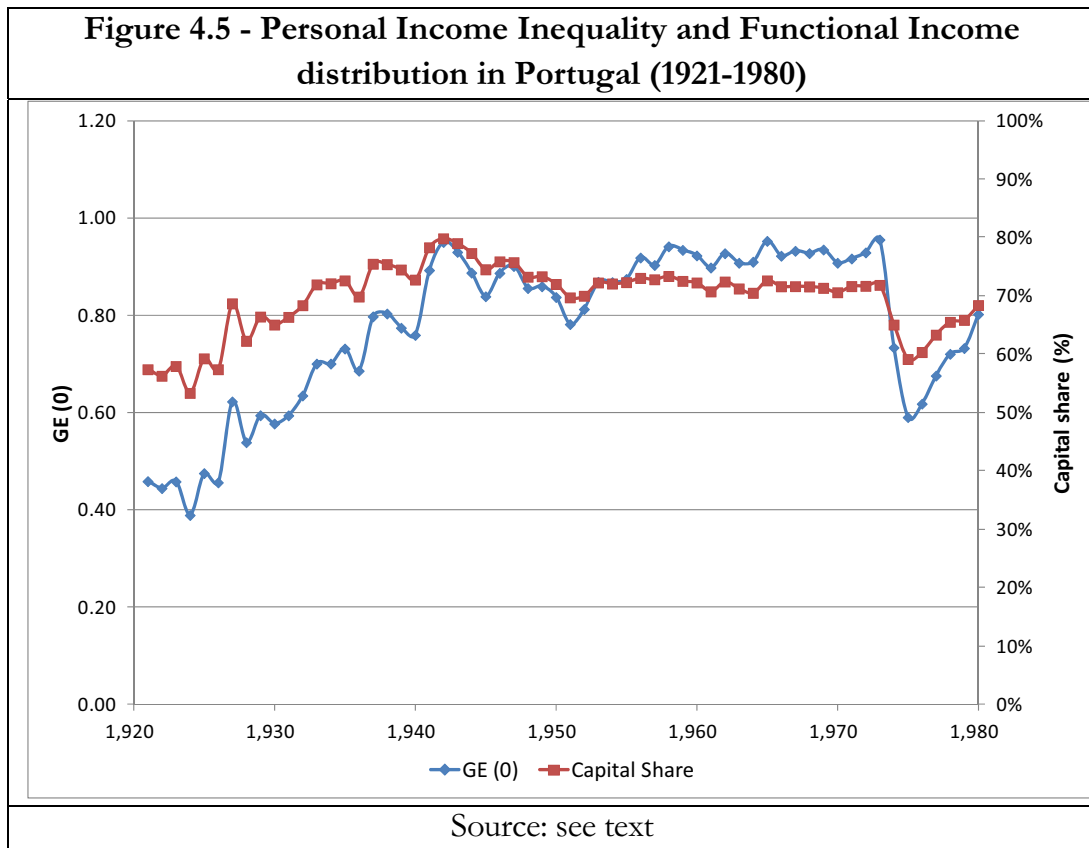
The rationale of the functional approach is that, given that wage earners are among the poorer members of a society, an increase in the wage share in total GDP should be interpreted as a decrease in inequality. The baseline assumption behind that conclusion is that incomes are more or less homogeneous inside each group (capital owners and wage earners), but they are significantly different between groups. This view, that may be relatively accurate for backward economies, gets less likely as an economy grows. Industrialization is usually characterized by stories of success and failure among capital owners that may easily increase income dispersion among them. This is, indeed, what happened in Portugal during the period under analysis, as the Industrial Tax statistics clearly show. On the other hand, when industrialization advances, there is an increasing demand for skilled workers that earn high wages, which tend to wear down the traditionally assumed income homogeneity among wage earners. In addition, the dramatic rise in business executives' wages in post-industrial societies has put some wage

earners in the top of the income distribution. These phenomena erode the ability of the functional approach to show an accurate picture of the evolution of income inequality in modern economies and require alternative indices to do so.

Figure 4.6 compares the GE(0) index with the Williamson index (i.e. the ratio of pc GDP to the wage of unskilled workers). The Williamson index is very easy to compute because it is just the ratio between two commonly available variables. An increase in this index would indicate an increase in inequality, because it would mean that average incomes grow more than those of unskilled workers, which are usually at the bottom of the income distribution. As Figure 4.6 shows, the evolution of both indices is quite similar. However, between the early 1960s and the mid 1970s they diverge significantly: while the GE(0) index is more or less stable, the Williamson index first goes on increasing (prolonging the previous growth trend that was common to the GE(0) index) to decline thereafter, even before the Revolution. This is directly related to the fact that unskilled wages ceased to be representative of the working class average incomes since the mid 20th century. Between 1950 and 1974, as is shown in Figures 4.5 and 4.6, while the Williamson index was undertaking significant changes, the wage share (the inverse of the capital share) remained stagnant. That is, neither the decrease nor the increase of unskilled wage had any impact on the wage share during this period. This reflects one of the main weaknesses of the Williamson index as a proxy for inequality in advanced societies, i.e. that the wages of unskilled workers are no longer representative of an increasingly skilled labour force, as was described in more detail in chapter 3.

Finally, as is described in Chapter 2, some recent literature has often taken top income shares as an alternative way to approach the long-term evolution of historical inequality.[18] Top incomes series indicate the share of income pertaining to the richest percentiles of the population and are, therefore, a partial measure of inequality, because they exclude the dispersion of incomes among the remaining 90% (or 95%, etc.) of society. However, Atkinson, Piketty and Saez (2010) show that changes in top income shares may have a sizeable effect on the level of inequality among the whole population. In the same vein, Leigh (2007) illustrates how top income shares tend to be positively correlated with complete measures of inequality, and concludes that they may

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[18] See Atkinson and Piketty (2007).

be used as a proxy of nation-wide inequality when other data sources are limited. However, Leigh's analysis only covers the second half of the twentieth century and, for some countries, only its last decades. But have top incomes and income inequality always evolved similarly?

Figure 4.6- Personal Income Inequality and the Williamson Index in Portugal (1921-1980)

Source: see text
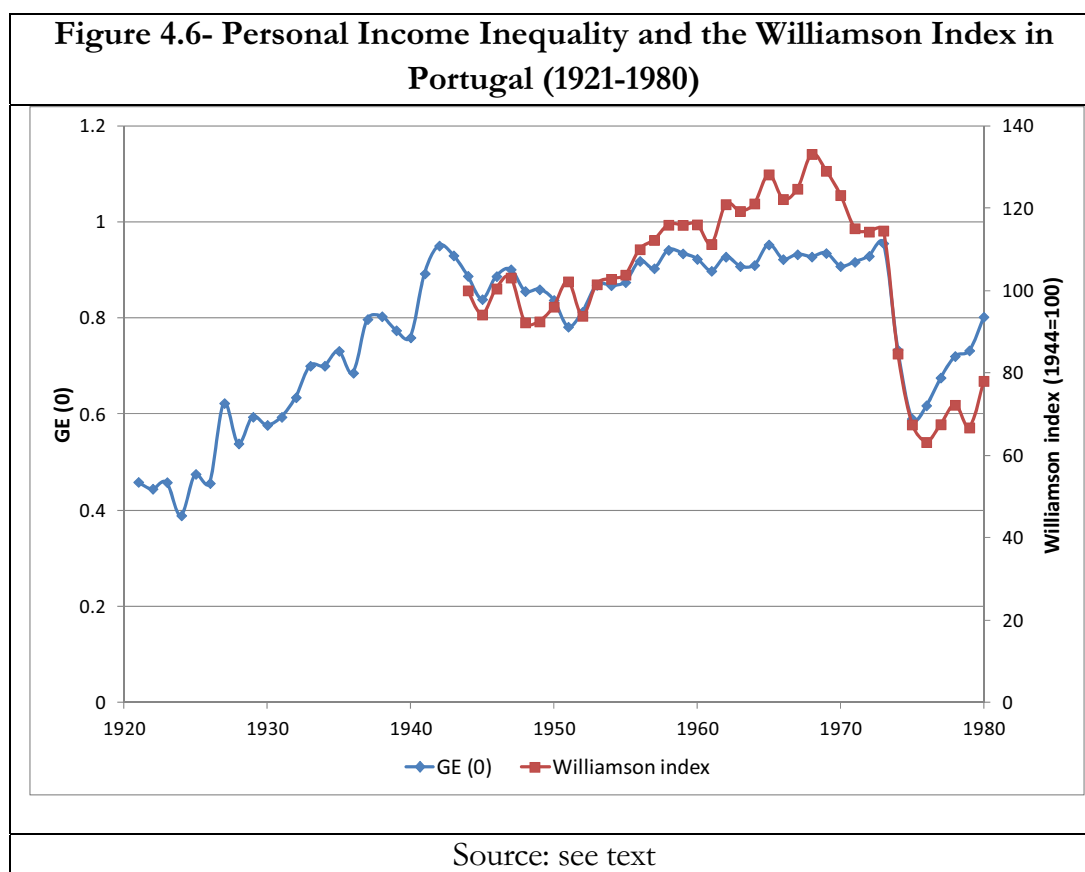
Figure 4.7 compares the GE(0) index with the top 0.05% income share in Portugal and shows that, opposite to what is suggested in Leigh (2007), both indices evolve in different directions during the majority of the period under analysis. Actually, Figure 4.8 shows that the mismatch between top income shares and personal income inequality is not a Portuguese exception. As may be seen in this figure, in Switzerland both indexes show no clear relationship, in Finland top incomes and the Gini indexes have a changing relationship (first positive and then negative), and in Spain they hold a strong negative correlation.

Figure 4.7 - Personal Income Inequality and Top Income Shares in Portugal (1921-1980)

$y = -0.1273x + 257.96$
$R^2 = 0.7349$

$y = -0.0004x^2 + 1.6037x - 1568.5$
$R^2 = 0.8371$
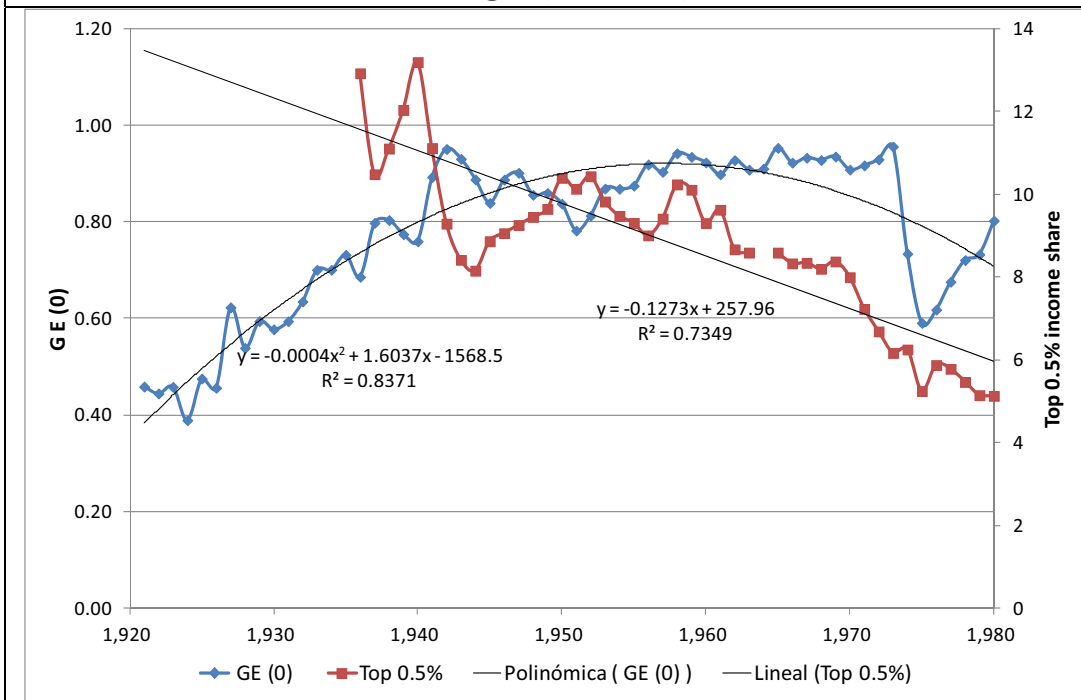
Source: Top income shares from chapter 2; for GE(0) see text.

Figure 4.8 – Income inequality and top income shares in several countries (1936-2006)
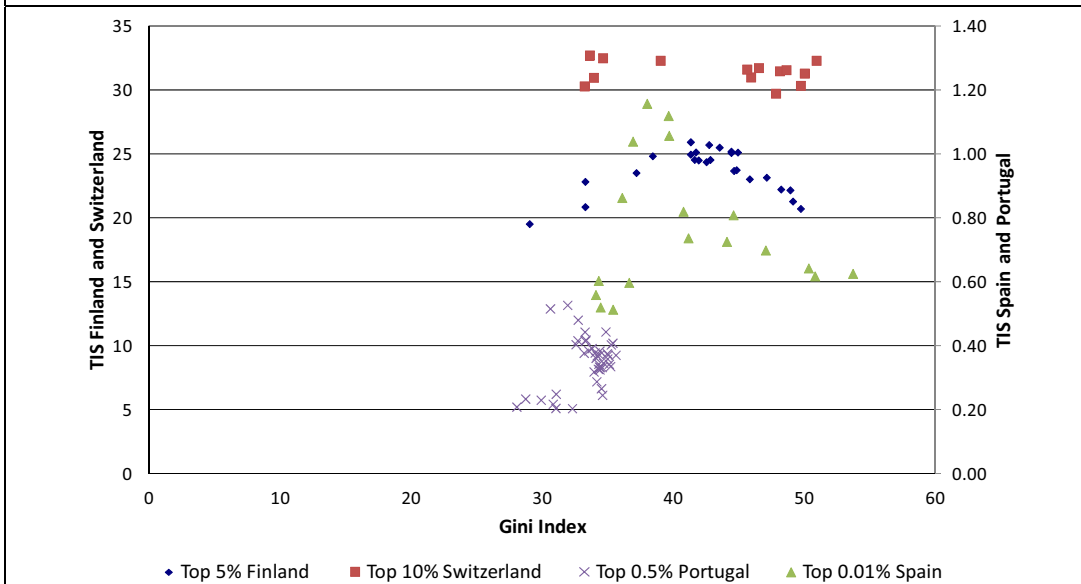
Sources: Jäntti, M. et al. (2010) and Flora (1987) for Finland; Dell et al. (2007) and Flora (1987) for Switzerland; Alvaredo and Saez (2009) and Prados (2008) for Spain; and my own estimates for Portugal.

This divergence actually indicates that top income shares are not always a good proxy of general income inequality, because they capture different dimensions of the same historical process. Against this background, the well-known and commonly misread Kuznets' (1955) paper predicts that top quintile income share would fall continuously from the start of the transition from an agricultural to an industrial economy, while income inequality would follow the well known inverted-U curve.[19] In this regard, Figure 4.9 re-calculates the evolution of income inequality under exactly the same six different scenarios used by Kuznets to launch the popular inverted U-curve, together with the evolution of the top 10% income share.[20] The picture that emerges from Figure 4.9 is clear: as an economy grows income inequality follows an inverted-U curve while top income shares tend to fall during the process. These Kuznets' predictions would contribute to explain the lack of coincidence between the trends of the two series depicted in Figure 4.7 for Portugal. Although in this country the decrease in the GE(0) index is almost missing (apart from the revolutionary episode of 1974), for reasons that are suggested below, the coincidence between a predominantly decreasing top income indicator and a predominantly increasing overall inequality measure would be consistent with some of the Kuznets' scenarios (such as the fifth one in Figure 4.9) . Therefore, the Kuznet's framework would contribute to sort out the apparent contradiction of the dissimilar evolution of top income shares and the GE (0) index.

To sum up, partial measures of inequality may be a good proxy of general inequality only under the assumption of stability of the income dispersion within the reference groups (e.g. capital owners and workers in the case of the functional distribution, or top and bottom income groups in the case of TIS). However, when these assumptions do not hold, partial indices may show a biased picture. In general terms, the functional approach and the Williamson index reflect quite closely the changes in the Portuguese GE(0) index, and their deviations from the latter are the result of income distributional changes that those indexes fail to capture. By contrast, the evolution of top income shares, an indicator that is usually taken as a proxy of income inequality, is completely at odds with the evolution of the Portuguese GE (0) index and cannot be taken as a good proxy of income inequality in Portugal. The Salazar

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[19] Kuznets (1955), p. 15.
[20] See Appendix 2 for the detailed calculations behind Figure 4.9.

regime, for instance, would be considered as an extremely egalitarian period according to the evolution of top income shares, when it really was a deeply regressive regime.

Figure 4.9 – The original Kuznets Curve

Source: own calculation on the basis of Kuznets (1955).
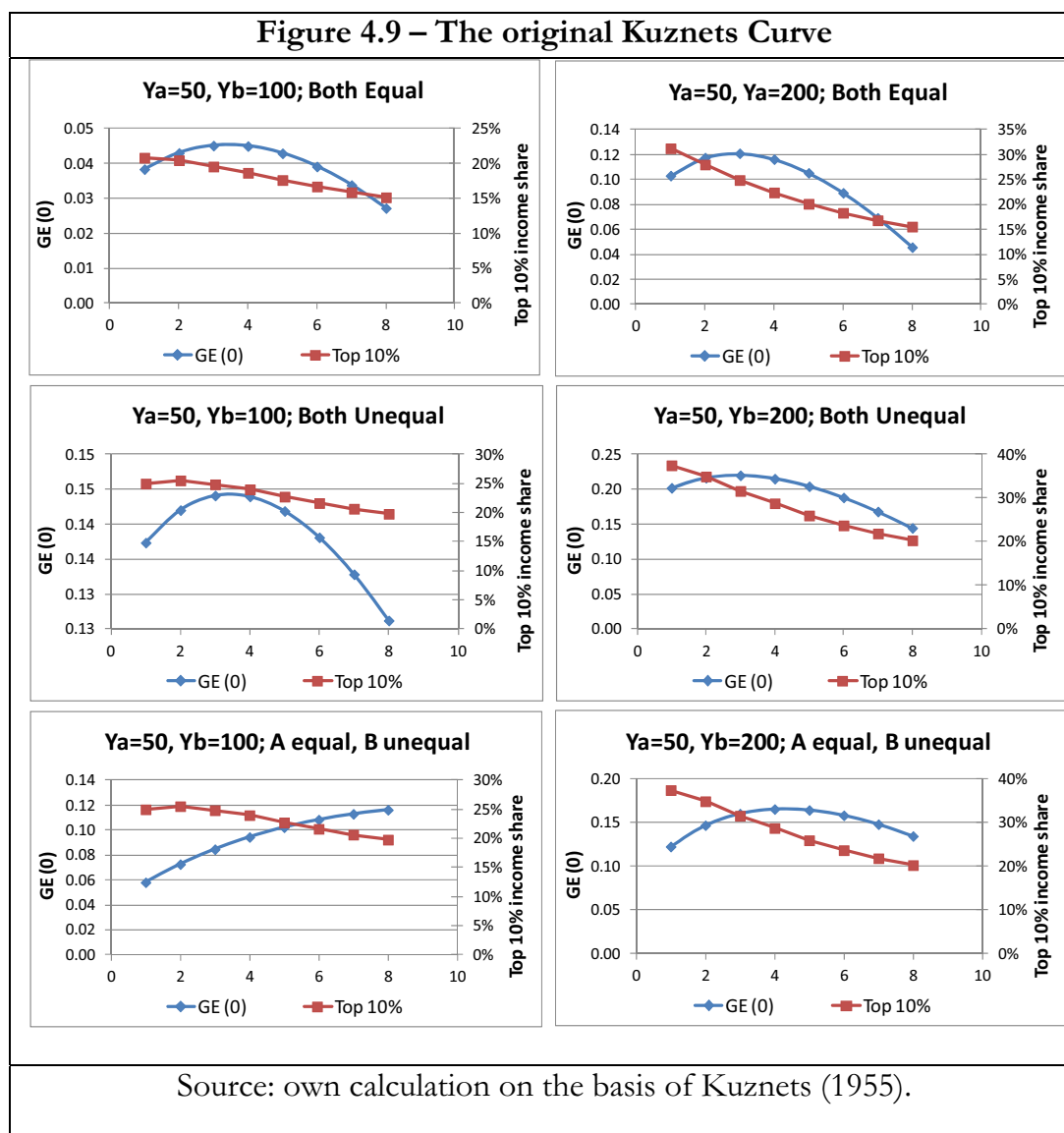
Some of these partial measures were created to make up for the lack of a good personal income inequality index, due to the absence of household budget surveys. However, as this section shows, they must be used with caution and cannot replace exhaustive research efforts that allow obtaining comprehensive estimates of inequality among the whole population of each country.

4.4.- Complementary distributional indices: polarization, extraction ratio and welfare.

Besides the standard inequality measures introduced above, the distributional dynamics of the Portuguese society can be analysed through other complementary indicators, such as the polarization index, the Extraction Ration (Milanovic, Lindert and Williamson, 2011) and the Welfare Index (Sen, 1996). To start with, the concept of polarization measures the extent to which a society is divided into two groups (rich and poor) that are increasingly far away from the other in terms of their incomes and also increasingly homogeneous internally. Polarization and inequality are two different concepts that may run in opposite directions. The estimation of polarization is based on the decomposition of the GE(0) index, as:

$$GE(0) = \sum_k \frac{n_k}{n} \cdot GE(0)_0^{\,k} + \sum_k \frac{n_k}{n} \cdot \log\left(\frac{\mu}{\mu_k}\right) \qquad (3)$$

where n_k is the number of individuals in group k and μ_k the average income of group k. The first term of the equation is a measure of inequality within each group and the second term measures inequality between groups. If we divide the total population between rich (i.e. those people whose incomes are above the average) and poor (i.e. those with incomes below the average), polarization can be easily computed as the ratio between the two components of the GE(0) index:[21]

$$Polarization = \frac{Between\,coefficient}{Within\,coefficient} \qquad (4)$$

Following Milanovic, Lindert and Williamson (2011), I have also estimated the Inequality Possibility Frontier (IPF) and the Extraction Ratio (ER) for Portugal. The IPF is the curve of maximum feasible inequality given the per capita income of a society. It can be drawn on the basis of both the GE(0) and

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[21] See Zhang and Kanbur (2000).

the Gini indices, by simulating a situation in which the majority of the population earns the subsistence income whereas the elite retain all surplus.

In the case of the GE(0) index, introducing the elite share within the population and the subsistence income, equation (3) takes the following form:

$$GE(0)_{max} = \frac{1}{n} \cdot \left[(1-\varepsilon) \cdot n \cdot \log\left(\frac{\mu}{s}\right) + \varepsilon \cdot n \cdot \log\left(\frac{\mu}{\frac{n \cdot \mu - s \cdot n \cdot (1-\varepsilon)}{n \cdot \varepsilon}} \right) \right]. \qquad (5)$$

Where GE(0)max is the maximum feasible GE(0) given a pc GDP, n is the number of people in the sample, μ is the average income, ε is the share that the elite represents within total population, and s is the subsistence income. The first term within the brackets accounts for the population living with the subsistence income, and the second accounts for the elite.

Rearranging this equation and defining $\alpha = \dfrac{\mu}{s}$, we obtain:

$$GE(0)_{max} = \left[(1-\varepsilon) \cdot \log(\alpha) + \varepsilon \cdot \log\left(\frac{\varepsilon \cdot \alpha}{\alpha - (1-\varepsilon)} \right) \right] \qquad (6)$$

So, the maximum feasible inequality would be a function of only two variables: ε (the proportion of the population that pertains to the elite) and α (the ratio between the average income and the subsistence income of a society). In all calculations we assume a subsistence income of $PPP 300 per capita and $\varepsilon =$ 0.01 (see Milanovic, Lindert and Williamson, 2011).

The growth of income per capita increases the available surplus and, therefore, the maximum feasible inequality, and this is what the IPF captures. As for the Extraction Rartio (ER), it is the ratio of actual inequality to the maximum feasible inequality. It ranges from 0 to 1 and measures the capacity of the elites to extract the surplus of a society.

$$ER = \frac{\text{Actual inequality}}{\text{Maximum feasible inequality}} \qquad (7)$$

The ER may also be computed by taking the Gini coefficient as the reference inequality index, following Milanovic, Lindert and Williamson (2011).

Finally, the evolution of pc GDP and inequality can be combined to estimate a welfare measure according to the following equations (Sen, 1996):

$$Welfare = Y * e^{-GE(0)} \qquad (8)$$

$$Welfare = Y * (1 - Gini) \qquad (9)$$

where Y is per capita GDP. The rationale of this index is that, due to the decreasing marginal utility of income, higher income inequality implies lower welfare, keeping constant pc GDP.

The long-run evolution of the polarization index, the Extraction Ratio and the Welfare index in Portugal can be seen in Figures 4.10 to 4.12. On the basis of this evidence, the next section analyses the distributional history of Portugal over the 20th century.

Figure 4.10 – Inequality and Polarization in Portugal (1921-1980)
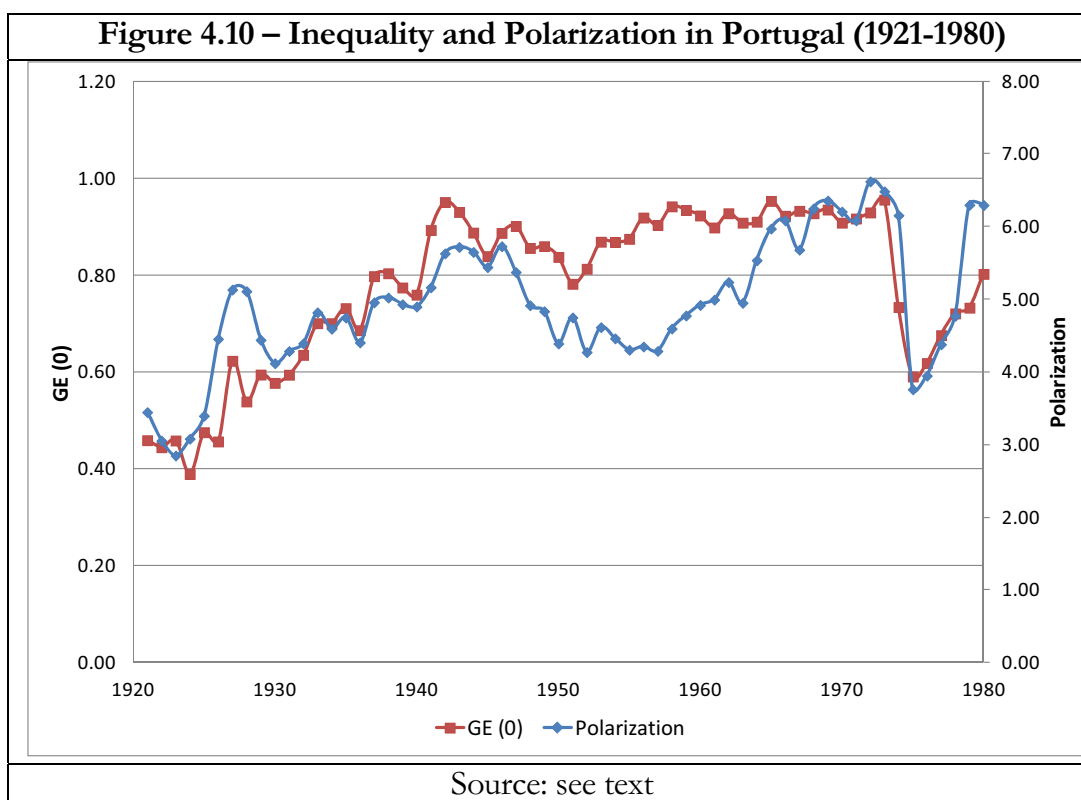
Source: see text

Figure 4.11 – The Extraction Ratio in Portugal (1921-2010)
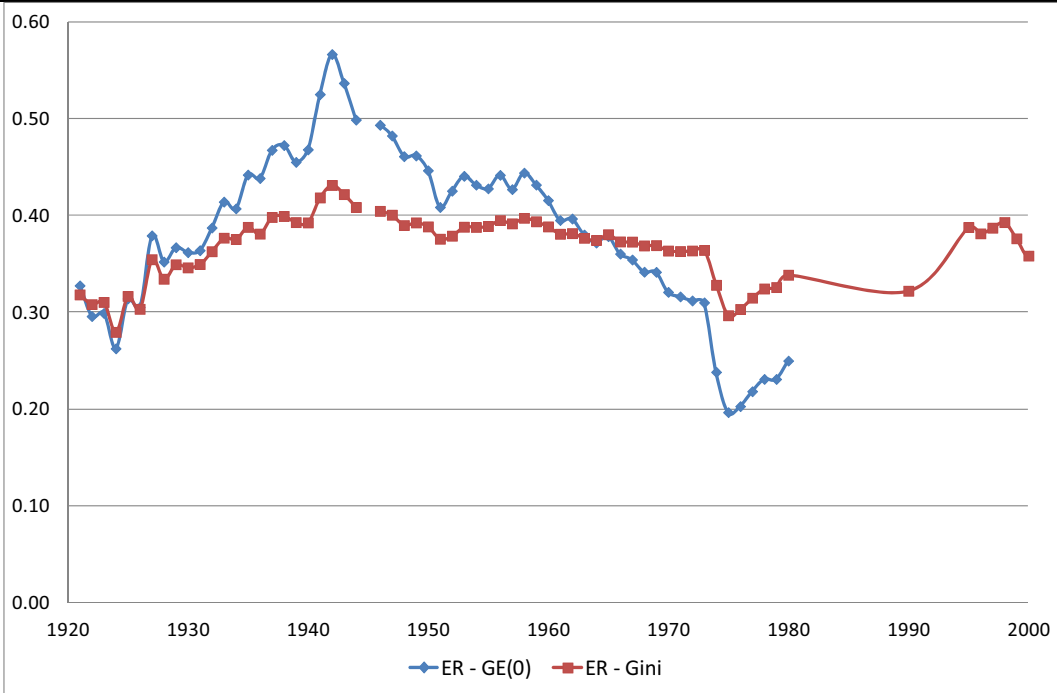
Source: see text

Figure 4.12 – The Portuguese Welfare Index (1921-2010)
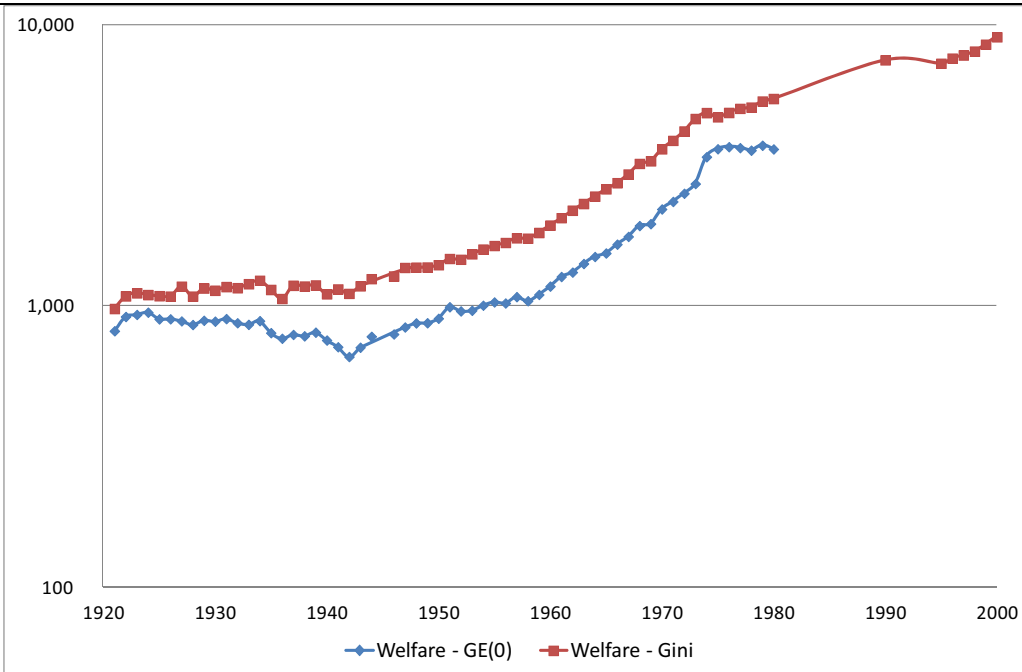
Source: Maddison (2010) for per capita GDP; see text for the details.

4.5.- The evolution of inequality, polarization, the extraction ratio and welfare in Portugal. What do data say?

As may be seen in Figure 4.4, the deep transformation of the Portuguese economy throughout the twentieth century that was documented in the introductory chapter has been accompanied by a long-term increase in income inequality. More concretely, inequality increased very rapidly during the first half of the Salazar regime and remained in high levels afterwards. Only during the 1940s, and especially during the transition to democracy, between 1973 and 1975, income inequality fell, although it increased again thereafter. Both periods are quite exceptional. During the former, although Portugal was a neutral country in WWII, this conflict severely affected the Portuguese economy due to its high external dependence. The government reinforced economic controls by fixing prices and wages, rationing food and introducing new taxes on corporations' extraordinary war benefits[22] in order to balance public budget and control inflation. The early 1940s were indeed one of the most unstable periods of the Salazar regime, characterized by high social instability and strikes both in rural and urban locations.[23] This phenomenon could have been associated both to the previous increase in inequality and to the explosion of economic polarization until the mid 1940s. In the absence of political voice, working classes may have recurred to social unrest to achieve better living conditions. As a result, wage earners' incomes increased faster than those of proprietors, especially in the industrial sector between 1942 and 1951, which explains the decrease in inequality. As for the revolutionary process that brought democracy to Portugal, it had a strong redistributive character and was accompanied by a huge decrease of income inequality. This was basically due to two different circumstances: on the one hand, instability in political and economic terms undermined confidence and some political decisions (such as nationalization of big banks and companies) created a hostile environment for businesses. On the other hand, political changes provided more bargaining power to the working classes, which achieved substantial wage gains.

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[22] Valerio (1994) shows that the share of taxes paid by corporations increased significantly during WWII, see also Matoso (1994).
[23] See Matoso (1994).

On the other hand, the strong distributive changes of the first decades of Salazar's regime also have to be highlighted, because they preceded the process of industrialization of the country. Income inequality more than doubled between 1926 and 1942, measured with the GE(0) index, and increased from 24 to 36 Gini points. This huge redistribution might be related to the political agenda of the *Estado Novo*, because this period was characterized by the lack of economic dynamism and the absence of structural changes.

As a consequence of its long-run increase in inequality, Portugal today is one the most unequal countries in the EU. Despite most of the increase in inequality took place during the dictatorship, democracy has not been able to reverse the situation and inequality has kept on growing, overcoming the redistributive effect of the revolutionary process of 1974. This secular increase in Portuguese income inequality is at odds with the distributional performance of most developed economies throughout the twentieth century. Figure 4.13 shows the evolution of inequality (measured through the Gini index) in 9 countries: Denmark, Finland, the Netherlands, Norway, Sweden, the UK, the US, Spain and Portugal. In most cases income inequality peaked between the 1910s and the 1930s to decline thereafter up to the 1980s, when it started increasing again. In Portugal, therefore, the golden age era of decreasing inequality did not take place. Redistribution in other countries was largely related to the construction of the welfare state, the introduction of direct and progressive taxes and the concessions made to the working class in order to engage them into parliamentary democracy and discourage them from supporting revolutionary solutions. Neither of these factors was present in Portugal during the post-war era, which could partially explain its completely divergent distributional evolution. As a result, Portugal only followed the distributional pattern of these countries after the 1980s, when inequality was increasing everywhere.

Income polarization is a key concept to analyse the social impact of income distribution. The emergence of a strong middle class is often considered as a crucial event that fosters social stability, hampers social conflict and favours democratization, and a lower income inequality is not necessarily related to middle classes' strength. In Portugal, as may be seen in Figure 4.10, polarization increased from very low levels in the 1920s to the late 1940s, to decline during the 1950s. It increased again during the 1960s and early 1970s, to fall sharply during the *revoluçao dos cravos* and grow again thereafter.

Figure 4.13 – The long-term evolution of inequality in several OECD countries during the 20th century (Gini index)
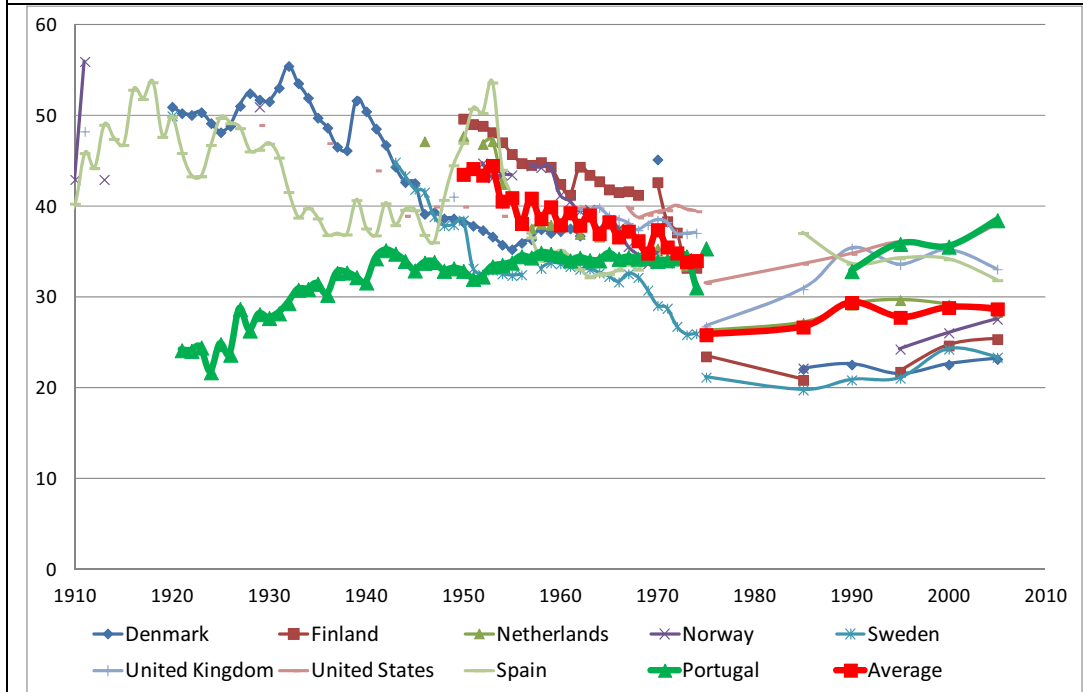

Source: Flora (1987) for Denmark, Finland, the Netherlands, Norway and Sweden; Lindert (2000) for the UK and the US; Prados de la Escosura (2008) for Spain; for Portugal, see text. From 1975 onwards all data come from the OECD dataset on Income distribution and Poverty available at: http://www.oecd.org/social/inequality.htm

Inequality and polarization can run in opposite directions, for example, if there are income transfers from the richest to the poorest among the rich. This would reduce inequality (progressive transfers) and increase polarization (more homogeneity inside and distance between groups). As may be seen in Figure 4.10, inequality and polarization in Portugal evolved in the same direction, except during the 1950s and the 1960s. During the 1950s inequality increased and polarization fell, whereas in the 1960s inequality remained stable while polarization increased. Therefore, whereas the 1950s were a period of increasing inequality but growing social cohesion, during the 1960s the distributional changes made the Portuguese society more unstable despite the fact that inequality stagnated.

Income polarization peaked in the early 1940s and in the early 1970s. Esteban and Ray (1999) have related high indexes of polarization, instead of inequality, with high social conflict and political violence. Highly polarized societies encourage the identification of individuals with their own social group and foster conflict between groups. Besides, if interests inside each social group are coincidental, this helps to overcome the problems of collective action that use to be more important among the poor than among the rich. The years of maximum polarization in Portugal were indeed characterized by serious social unrest, political instability and strikes. In the 1940s, political repression successfully reinstated the *status quo*. By contrast, the 1974 revolution overthrew the Estado Novo and led to the democratizacion of Portugal. Despite the different outcome of these two events, in both cases a process of income redistribution took place after those incidents, which was also accompanied by political redistribution during the 1970s. By contrast, the replacement of the Portuguese Republic by a dictatorial regime in 1926 was quite peaceful and did not face much opposition, which could again be related to the extremely low levels of income polarization (and the aversion to conflict of less polarized societies) during the early 1920s.

The former hypotheses are just based on simple correlations with no explanatory power, and the role of income polarization during the episodes of social instability and political transitions in Portugal should still be analysed in a more systematic way. But, apparently, the wider knowledge on the distributional variables that is provided in this thesis may shade additional light on some of the most important historical events of twentieth century Portugal.

The Extraction Ratio (ER) estimates the ability of the economic elites to extract the surplus of an economy. Normally, this ratio tends to decline as per capita income rises, because a poor society has a moderate available surplus to be extracted. So, countries with income per capita close to the subsistence minimum may have low inequality levels while being close to their maximum feasible inequality.

Figure 4.11 presents the ER calculated on the basis of the Gini and GE(0) indexes. Although the ER computed with the GE(0) has more intense fluctuations, both indexes follow similar trends. According to Figure 4.11, in Portugal the ER increased during the first half of the Salazar's regime, until 1942. It decreased thereafter until the mid 1970s, which was mainly due to the

high rates of economic growth during the golden age of capitalism. Then, it started increasing again during the democratic period.

The Portuguese series are quite exceptional because the ER does not fall in the long term, as might be expected.[24] Indeed, as may be seen in Figure 4.14, the Portuguese case stands out as an anomaly because the ER fell in all the other countries included in the graph during the twentieth century. This ratio mildly increased in some countries from the 1980s onwards but it never recovered its early twentieth century levels. Quite the opposite, in Portugal, the outcome of the last 90 years is negative because the ER (estimated through the Gini coefficient) was higher (and closer to its historical maximum) in 2006 than in 1921. In other words, despite the fact that pc GDP is at present 9 times as high as in the 1940s (when the ER reached its maximum), and that democracy has replaced dictatorship, the capacity of the elites to extract the surplus of the economy has barely changed. The evolution of the ER would be consistent with the hypothesis that the Portuguese growth model has been biased against the worst-off in the long term. Actually, democracy seems to have been a good ally of the economic elites because, from the mid 1970s onwards, the ER has increased substantially and has partially recovered from its reduction during the second half of the dictatorial regime.

This phenomenon can be related to the increase in the top income shares from 1989 onwards that was described in chapter 2. The top 10% income share increased from 25% in 1989 to 38% in 2006. An alternative way to look at the top income shares is to discern who has benefited from economic growth since 1989.[25] Those series show that the richest 10% of the Portuguese captured 66% of all the economic growth between 1989 and 2006. In other words, their real per capita incomes increased at an annual rate of 3.3%, whereas the real per capita incomes of the remaining 90% of citizens decreased at a yearly rate of 0.6%.

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[24] See Milanovic, Lindert and Williamson (2007), figure 4.

[25] This exercise has also been done for the US between 1976 and 2007. Top 1% of income earners captured 58% of total economic growth. Their real per capita incomes increased at a 4.4% yearly rates whereas the annual growth of incomes of the remaining 99% was just 0.6%, see Atkinson, Piketty and Saez (2011), p.8-9.

Figure 4.14 – The long-term evolution of the Extraction Ratio in several OECD countries during the 20th century
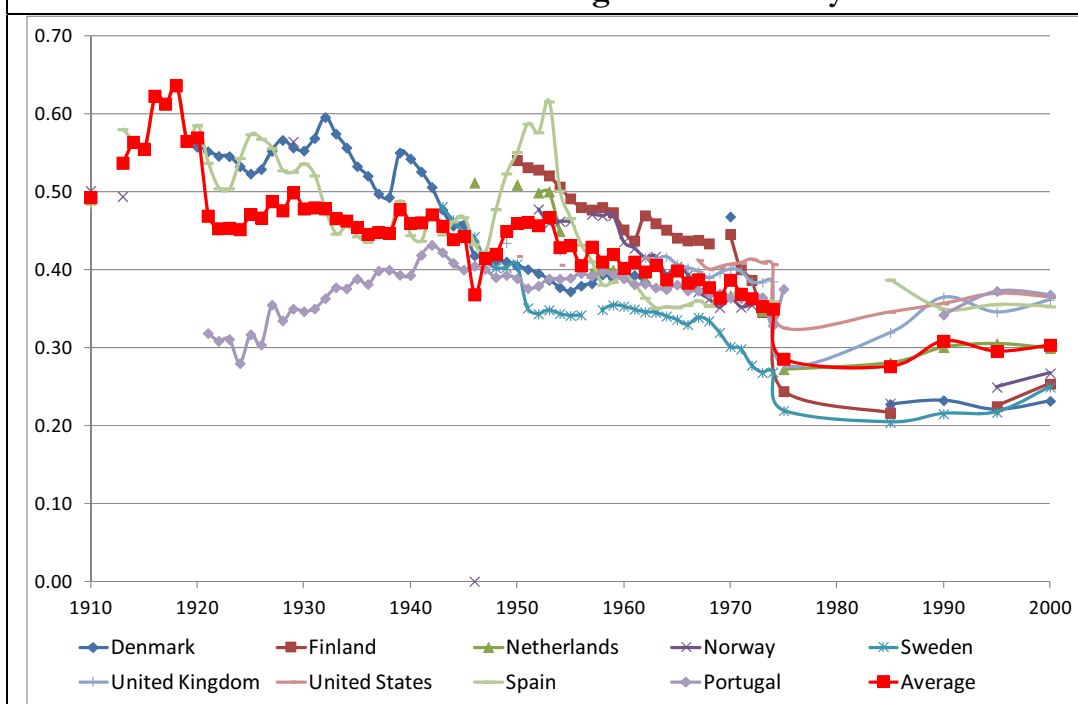
Source: Flora (1987) for Denmark, Finland, the Netherlands, Norway and Sweden; Lindert (2000) for the UK and the US; Prados de la Escosura (2008) for Spain; for Portugal, see text. From 1975 onwards all data come from the OECD dataset on Income distribution and Poverty available at: http://www.oecd.org/social/inequality.htm.

Finally, as may be seen in Figure 4.12, Portuguese Social Welfare (measured through both the GE(0) and the Gini indices) declined or remained stagnant until the early 1940s, when it began to increase, slowly until the late 1950s, and more rapidly afterwards. This growth slowed down (or was interrupted, depending on the indicator) since the second half of the 1970s.

Many factors may explain the Portuguese distributive pattern. To begin with, the process of industrialization is often related to the evolution of income inequality. A usual way to look at this issue is through the decomposition of inequality between its subcomponents, as is shown in Figure 4.15. Income differences between the Agr and NAgr sectors are captured by the between coefficient. On the other hand, within coefficients capture inequality due to income dispersion inside the Agr and NAgr sectors. As may be seen in this figure, most of the evolution of Portuguese inequality is explained by income

dispersion inside the two sectors considered, and specially within the NAgr sector. More concretely, inequality inside Agr and NAgr sectors account on average for 87% of total inequality and have a minimum contribution of 68%.

Figure 4.15 – GE(0) index decomposed

Source: See text
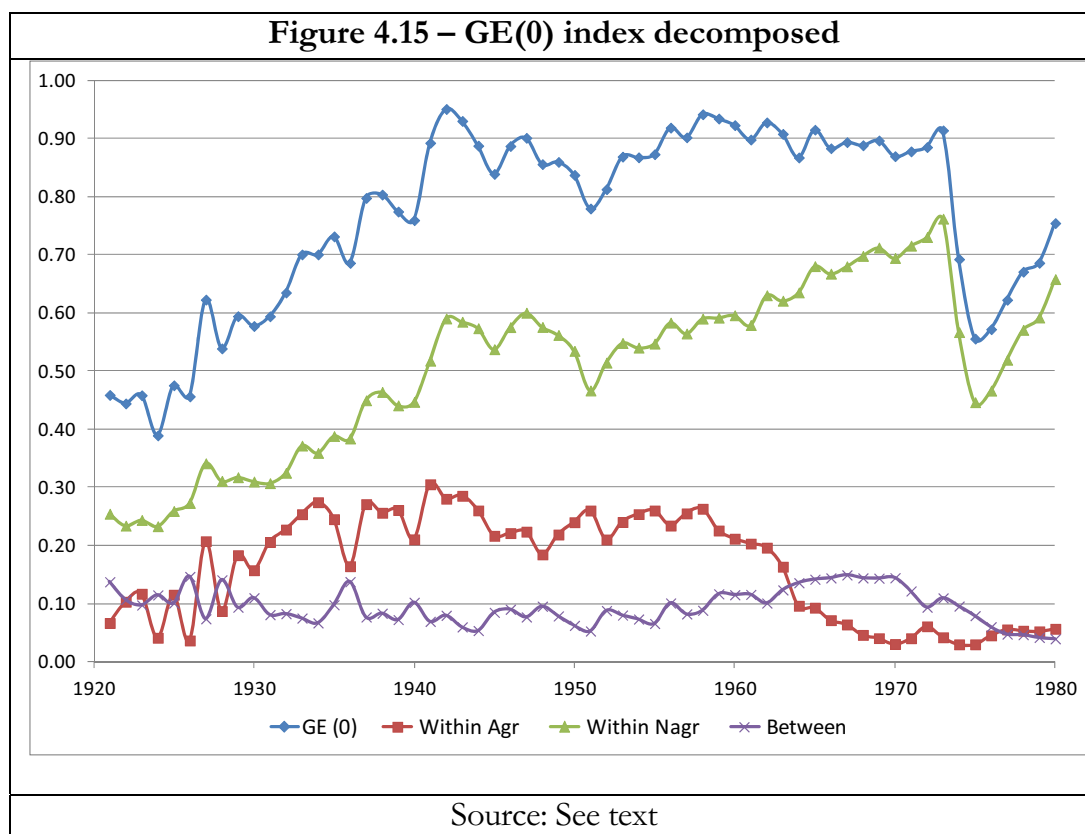
During the first decades of the period under study, until the early 1940s, income inequality increased due to the increase in the within coefficients, pointing to a process of income redistribution from wage earners to land and capital owners. Afterwards, income dispersion continued increasing in the NAgr sector but began to fell in the Agr sector. Finally, in 1973-75 inequality in the NAgr fell sharply, recovering the levels of the late 1930s, but it gradually recovered thereafter. On the other hand, the between coefficient was relatively stable until the 1950s, but it began to increase up to the 1970s when it started falling again.

Figure 4.15 may be divided into three different periods. Until the 1950s there was an intense regressive redistributive process (income transfers from wage earners to land and capital owners) without significant structural changes, which may be related to political factors. Thereafter, from the 1950s to the

early 1970s inequality went on growing in a period of rapid structural change and accelerated industrialization. The increase in inequality during this period was the result of the high growth of income dispersion within the NAgr sector (the most dynamic one) and also to the increase in the between coefficient, because Agr incomes fell behind NAgr incomes. This is the period in which the evolution of inequality was probably more closely associated to industrialization. Finally, inequality fell sharply in 1973-75 and partially recovered later on, which would be again related to political factors (the April 25th revolution and the subsequent democratization process).

Beyond structural change and political processes, globalization may also have had an impact on the evolution of income inequality. According to the Stapler-Samuelson theory, both trade and migrations have an impact on inequality, which depends on the relative endowments of land, capital and labour in each economy.[26] Until the 1960s, Portugal was a relatively closed economy, which was not highly exposed to globalization. Afterwards, the situation changed. Trade openness increased from 17% in the early 1960s to 30% in the mid 1970s, to arrive to 55% in the mid 1990s, after joining the EEC.[27] Democratisation in the 1970s and, specially, membership in the EEC since 1986, forced Portugal to converge in many aspects with the other members of the European club. From then on, European institutions and directives have conditioned Portuguese legislation in all government areas and trade, infrastructure, agricultural, industrial, fiscal and monetary policies are being progressively adapted to the European framework. As a result, Portugal is no longer a relatively isolated country and at the eve of the twenty-first century is fully exposed to the global economy.

In this context, the increasing trade openness from the 1960s onwards was basically due to the increase in exports of labour intensive goods (those in which Portugal was competitive due to its low labour costs).[28] Meanwhile, between 1950 and 1976, 1.8 million of people emigrated from Portugal (1.2 million between 1965 and 1974).[29] Those events provoked an increase in the demand for labour and a decrease in its supply which, in theory, should have increased its price and reduced income inequality. However, inequality did not

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[26] Williamson and Lindert (2003) provide a good summary of the effects of globalization on inequality in historical perspective.
[27] See Lopes (1996).
[28] See Alfonso and Aguiar (2005).
[29] See Valerio (2001), Table 2.10.

decrease between the 1950s and 1974, which suggests that without the exposure to globalization income inequality would have increased even more.

By contrast, the role of globalization from the 1980s onwards has substantially changed. Until then, Portugal trade partners were richer and Portuguese labour-intensive goods were competitive abroad. However, the increasing integration of low-income countries into the world economy has changed the situation radically. Portugal, which was a relatively poor country in the global arena before the 1980s, became a relatively rich one afterwards. The international context changed and Portugal ceased to receive an egalitarian push from globalization and started to suffer impacts in the opposite direction.

The final increase in income inequality since the 1980s in Portugal coincides with the experience of other OECD countries (see OECD, 2008 and 2011), and might have been driven by common factors: international trade and migrations, technology, liberalization policies, labour market institutions, social norms, etc. It seems therefore that some of the same forces that were behind the deepest and more persistent process of income redistribution during the golden age of capitalism have been reversing this trend and re-boosting income inequality during the last decades.

4.6.- Conclusions

Following Bértola (2005), this chapter provides a new estimate of personal income inequality for twentieth century Portugal. It tries to overcome the partial character of several indicators, such as the functional distribution, the Williamson index or the top incomes, and provide a comprehensive approach to Portuguese income distribution in the long term. My inequality estimates are based on the combination of an estimation of income dispersion among wage earners and capital and landowners with a functional income distribution measure, on the basis of census data, wage information and industrial and land taxes. These estimates may be more appropriate to approach overall income inequality than other partial measures that provide biased figures if the assumptions under which they are built do not correspond with the actual income distribution.

Besides income inequality, the new series allows calculating additional indices that measure polarization, the extraction ratio and welfare. These set of

indicators provide a wide perspective on the distributive pattern of Portugal throughout the 20th century.

During the period covered by the series, Portugal has been transformed from a backward agricultural economy into a post-industrial one. It has alternated democratic and non-democratic periods, has experienced rapid growth and stagnation and has moved from autarky to openness, but income inequality has increased almost continuously throughout all the period. Only during the 1940s and, specially, during the 1974 revolution that led Portugal to democracy, inequality sharply (and briefly) declined. As a result, Portugal is today one of the most unequal European countries.

The evolution of income inequality and also top income shares is partially consistent with the Kuznets' predictions on the effects of structural changes on income distribution, although the decreasing part of Kuznets' inverted-U is largely missing in the Portuguese case. In addition, political factors may help to understand the huge increase in inequality during the first decades of Salazar's regime and its sharp drop during the transition to democracy (1974-76). Later on, the increase in income inequality during the democratic period, when the internal conditions were more prone to push towards equalizing income distribution, might be partially explained by a number of factors shared with other industrialized economies.

In this regard, the increase in income inequality from the 1980s onwards follows the experience of most OECD countries. Portugal began to integrate in the global economy in the 1960s. Initially, globalization forces reinforced equality, but the integration of low income countries into the global economy from the 1980s onwards reversed this situation. In addition, the political and institutional integration within the EU has exposed Portugal to the same forces that have been fostering inequality in the most developed countries, such as international trade and migrations, technology, liberalization policies, changes in labour market institutions and social norms, etc.

Beyond inequality, Portuguese income polarization also varied widely over time, and its peaks clearly coincided with two episodes of social unrest in Portugal, during the 1940s and the 1970s. Finally, the Extraction Ratio shows that the power of the elites to extract the surplus of the economy quickly increased during the first decades of Salazar' regime, which would be consistent with the extractive nature of the regime. Later on, after a reduction

due to the acceleration of economic growth during the golden age of capitalism, the Extraction Ratio increased again and, at the eve of the twenty first century, was close to its historical maximums. This finding reinforces the notion that the Portuguese model of growth has been rather unbalanced against the worst-off in the long term.

To conclude, high inequality in contemporary Portugal is not a curse that has always afflicted the Portuguese society. In the early twentieth century, Portugal was a poor society but not especially unequal. The roots of current inequality may be found in the process of economic growth experienced during the last century. Economic growth has transformed Portugal into an advanced and modern economy. However, the fruits of this process have been very unevenly distributed.

Appendix 4.1. The Database

This appendix shows the database used to estimate all inequality indexes presented in this paper. This database has been constructed from a variety of sources as described in Section 2. The number of income groups of this database ranges from 51 to 57. There are 24 to 25 wage groups (Agriculture; Electricity, gas and water supply; Construction and public works; Wholesale and retail trade; Transport and communications; Banks, insurances and real estate and Other services), and two skill groups for the following economic sectors: Mining and quarrying; Food, drink and tobacco; Textiles and clothing and leather and footwear; Wood and products of wood and cork and furniture; Pulp, paper, paper products, printing and publishing; Chemicals; Non-metalic mineral products; Basic metals and electrical and transport equipment; and Other manufacturing. Finally, there are 26 to 33 proprietor groups (14 to 18 in the agrarian sector and 12 to 15 in the rest of the economy). The number of proprietors groups reported by the sources increased in 1964. All this information has been put together and ranked from low to high income groups. Table A.4.1.1 shows the number of individuals (N) and their average income (Y) in Portuguese escudos for each group of the database between 1921 and 1980. The umbers of individuals in Table A.4.1.1 have decimals due to the conversion done from wage and tax sources to the number of individuals of the Portuguese Census.

Table A.4.1.1 - Database detailing the number of individuals and the average incomes for the 51-57 groups (1921-1980)

1921		1922		1923		1924	
N	Y	N	Y	N	Y	N	Y
11,512.3	683	11,601.7	802	1,390.7	1,379	11,780.4	1,824
15,282.3	683	15,400.9	802	11,691.0	1,432	15,638.2	1,824
45,211.5	729	45,195.0	937	15,519.6	1,432	929.9	2,035
171,461.8	729	171,399.1	937	45,178.4	1,629	45,161.9	2,438
122,507.7	729	921,363.2	937	171,336.4	1,629	171,273.8	2,438
921,700.1	729	122,462.9	937	921,026.3	1,629	122,373.4	2,438
26,956.4	885	1,364.2	973	122,418.2	1,793	920,689.4	2,438
7,672.6	891	71,023.3	1,131	26,764.1	1,968	72,117.6	2,571
1,398.9	943	26,726.4	1,312	71,570.5	2,019	77,202.3	2,596
70,476.1	963	8,213.4	1,332	7,876.9	2,162	639.0	2,753
128,588.3	974	238,685.3	1,389	715.8	2,312	8,107.0	2,788
732.2	1,025	112,591.7	1,393	7,576.8	2,363	27,094.3	2,857
6,559.2	1,072	452.1	1,407	127,780.2	2,369	6,584.4	2,863
116,523.7	1,096	6,914.9	1,470	117,159.3	2,435	16,393.8	2,978
77,287.0	1,101	135,419.3	1,492	18,365.0	2,501	129,412.5	3,186
18,784.7	1,109	11,599.8	1,522	258,841.1	2,550	113,588.0	3,382
7,585.5	1,127	7,952.1	1,571	4,616.7	2,803	7,693.7	3,463
238,535.4	1,207	44,555.7	1,725	42,076.5	2,930	263,070.1	3,565
42,274.0	1,240	111,162.1	1,907	3,617.9	2,988	42,649.0	3,919
30,531.4	1,257	32,186.9	1,925	29,533.7	3,018	107,512.0	4,126
109,319.4	1,282	77,258.8	2,008	106,258.5	3,066	29,940.9	4,136
4,810.1	1,472	58,768.8	2,292	77,230.5	3,900	3,587.3	4,918
55,259.3	1,623	4,388.7	2,661	56,000.0	3,944	57,273.7	5,110
3,334.8	2,257	3,957.8	3,228	3,311.0	5,018	22,798.7	5,899
3,755.1	2,321	3,306.3	3,347	3,737.5	5,481	3,351.8	7,287
22,823.7	2,503	108,617.4	3,389	109,454.1	6,050	3,788.4	7,330
1,351.2	2,566	537.8	3,912	1,307.1	6,160	512.1	7,621
510.2	2,854	1,424.5	3,930	185.7	6,643	110,290.9	7,705
107,780.6	2,886	11,041.6	4,458	10,418.7	7,079	1,325.1	8,443
10,484.6	2,910	22,815.4	4,563	534.8	7,378	10,551.8	9,521
535.4	3,517	182.2	4,688	281.4	7,954	124.2	9,801
466.6	3,952	561.2	4,904	22,807.1	8,864	543.0	10,811
186.8	4,543	499.5	5,906	479.0	9,589	9,240.2	11,772
9,250.3	4,994	9,247.0	9,105	9,243.6	17,688	493.0	12,368
24,791.6	9,397	24,984.1	11,035	25,176.6	19,700	25,369.0	25,088
4,202.2	10,820	4,200.7	19,726	4,199.1	38,321	4,197.6	25,505
1,051.6	24,561	17,515.3	30,547	17,650.2	54,532	1,050.5	57,893
17,380.3	26,013	1,051.2	44,775	1,050.9	86,983	17,785.1	69,447
297.4	49,114	297.3	89,535	297.2	173,936	297.1	115,766
1,640.2	93,000	1,653.0	109,209	1,665.7	194,956	97.6	246,640
97.7	104,637	97.7	190,756	97.6	370,573	1,678.4	248,280
16.3	236,286	881.4	295,042	888.2	526,700	16.3	556,950
874.7	251,252	16.3	430,755	16.3	836,810	895.0	670,761
1.7	612,195	53.6	1,102,784	54.0	1,968,657	1.7	1,443,006
0.9	920,890	1.7	1,116,046	1.7	2,168,099	0.9	2,170,631
53.2	939,109	0.9	1,678,805	0.9	3,261,347	54.4	2,507,116
17.7	1,907,478	17.9	2,239,927	18.0	3,998,651	18.1	5,092,346
17.7	4,046,768	17.9	4,752,067	18.0	8,483,250	18.1	10,803,553
3.7	9,375,595	3.8	11,009,640	3.8	19,654,084	3.8	25,029,788
1.9	18,486,688	1.9	21,708,680	1.9	38,753,694	1.9	49,353,444
0.9	30,681,512	0.9	36,028,905	0.9	64,317,736	1.0	81,909,657

1925		1926		1927		1928	
N	Y	N	Y	N	Y	N	Y
1,763.1	1,378	11,959.2	2,062	45,112.3	2,397	122,194.3	2,048
11,869.8	2,171	15,875.5	2,062	171,085.8	2,397	45,095.8	2,397
15,756.9	2,171	77,145.8	2,206	919,678.8	2,397	171,023.1	2,397
45,145.4	2,363	989.2	2,254	9,043.9	2,525	919,341.9	2,397
171,211.1	2,363	45,128.9	2,260	713.0	2,707	12,137.9	2,585
920,352.6	2,363	171,148.4	2,260	31,801.9	2,777	16,112.8	2,585
122,328.6	2,582	122,283.8	2,260	6,917.9	2,819	8,558.3	2,663
10,070.4	2,713	920,015.7	2,260	12,048.6	2,871	1,458.8	2,744
31,158.7	2,838	28,256.3	2,542	15,994.1	2,871	30,126.1	2,884
5,967.7	3,010	731.9	2,605	1,013.5	2,894	5,892.9	2,977
72,664.8	3,060	8,952.6	2,703	18,291.0	2,928	245,820.5	2,984
439.4	3,183	18,777.3	2,818	140,226.4	3,069	139,074.9	3,064
161,363.6	3,315	73,211.9	2,907	256,220.6	3,114	631.2	3,503
11,273.3	3,443	6,536.7	2,937	102,918.7	3,177	74,306.2	3,645
8,974.3	3,501	138,427.2	2,982	7,794.2	3,216	8,081.9	3,729
76,497.9	3,544	8,216.2	3,066	45,812.8	3,409	16,194.3	3,790
50,443.0	3,759	254,923.5	3,146	62,961.5	3,723	117,984.2	3,824
215,373.9	3,813	104,787.4	3,303	116,679.3	3,831	65,441.5	3,870
130,891.7	4,026	41,672.9	3,525	27,442.8	3,957	44,305.9	3,955
70,351.9	4,202	31,845.8	3,704	73,759.1	4,047	36,524.8	4,091
37,370.6	4,343	114,775.8	3,771	3,911.4	4,248	112,987.9	4,154
4,470.1	4,636	62,473.8	3,885	122,239.1	4,613	77,089.3	4,453
77,174.0	5,615	4,812.7	4,479	4,069.4	6,378	5,064.6	5,012
235.5	6,637	22,782.0	5,013	3,934.2	7,083	3,726.9	7,356
4,480.7	7,033	3,495.6	6,483	538.1	7,503	3,935.6	7,398
3,854.7	7,238	3,701.7	6,594	1,214.5	8,077	458.3	7,924
464.2	8,012	1,409.4	7,561	11,433.6	9,172	1,616.4	8,351
1,653.9	8,866	508.4	7,817	77,117.6	10,033	11,339.7	9,157
111,127.7	9,169	111,964.5	8,710	550.1	10,040	22,765.3	10,120
13,157.0	9,906	11,286.9	8,910	550.0	11,200	113,638.0	10,922
633.4	10,930	579.9	9,571	112,801.2	12,128	570.4	11,640
612.4	12,036	9,233.4	10,004	135.4	13,942	520.4	11,815
22,790.4	12,761	132.1	10,859	22,773.7	22,802	194.8	13,219
9,236.8	25,464	544.4	11,990	25,946.4	39,491	9,226.7	20,194
25,561.5	29,858	4,194.5	21,673	9,230.1	45,501	26,138.9	35,564
4,196.1	55,169	25,754.0	28,363	4,193.0	98,580	4,191.5	43,752
17,920.1	82,650	1,049.7	49,196	18,189.9	109,318	18,324.9	98,446
1,050.1	125,227	18,055.0	78,513	1,049.3	223,762	1,048.9	99,310
297.0	250,410	296.9	98,375	1,716.6	390,822	296.6	198,585
1,691.2	295,481	97.5	209,588	296.8	447,447	1,729.4	351,951
97.6	533,502	1,703.9	280,690	97.5	953,292	97.5	423,088
901.8	798,283	16.3	473,281	915.4	1,055,857	922.2	950,843
16.3	1,204,728	908.6	758,321	16.2	2,152,675	16.2	955,396
54.8	2,983,758	1.7	1,226,229	55.6	3,946,499	1.7	2,475,345
1.7	3,121,340	0.9	1,844,546	1.7	5,577,384	56.0	3,553,985
0.9	4,695,253	55.2	2,834,390	18.5	8,015,957	0.9	3,723,520
18.3	6,060,481	18.4	5,757,090	0.9	8,389,741	18.7	7,218,700
18.3	12,857,478	18.4	12,213,827	18.5	17,006,075	18.7	15,314,674
3.8	29,788,345	3.9	28,297,127	3.9	39,399,858	3.9	35,481,202
1.9	58,736,310	1.9	55,795,944	2.0	77,688,181	2.0	69,961,420
1.0	97,481,971	1.0	92,601,980	1.0	128,935,525	1.0	116,111,773

1929		1930		1931		1932	
N	Y	N	Y	N	Y	N	Y
45,079.3	2,376	45,062.8	2,343	45,046.2	2,110	46,555.6	1,884
170,960.4	2,376	170,897.7	2,343	170,835.1	2,110	912,165.6	1,884
919,005.0	2,376	918,668.1	2,343	918,331.2	2,110	176,559.2	2,044
9,051.6	2,639	9,161.1	2,780	12,406.1	2,491	10,940.0	2,378
12,227.3	2,847	12,316.7	2,780	16,468.7	2,491	12,358.0	2,514
16,231.4	2,847	16,350.1	2,780	9,820.1	2,522	16,405.0	2,514
127,424.2	3,038	126,886.5	3,052	1,464.5	2,796	7,573.2	2,662
4,106.5	3,101	6,342.3	3,122	129,764.0	2,803	138,488.5	2,772
635.1	3,252	28,329.1	3,223	30,952.2	2,949	31,954.3	2,876
28,922.5	3,265	2,118.1	3,443	7,144.0	3,013	270,718.5	2,991
1,327.5	3,450	626.9	3,452	613.0	3,059	2,920.4	3,028
16,294.2	3,518	122,104.7	3,472	15,726.6	3,309	607.1	3,100
280,721.5	3,532	286,995.9	3,666	117,191.2	3,367	119,691.2	3,178
7,519.8	3,846	16,083.5	3,734	75,947.7	3,512	15,574.3	3,353
43,269.3	3,976	43,133.7	3,912	7,899.2	3,570	38,174.7	3,367
74,853.4	4,014	75,400.5	3,919	285,038.0	3,619	7,828.9	3,373
108,007.0	4,021	33,452.3	3,928	42,914.8	3,643	45,076.9	3,498
122,149.5	4,067	7,254.3	3,940	107,635.6	3,646	112,570.6	3,511
33,529.3	4,143	107,457.5	4,038	33,485.4	3,746	75,653.6	3,544
62,065.3	4,204	118,283.9	4,309	63,219.4	3,882	67,022.5	3,923
118,054.1	4,293	61,121.5	4,605	122,059.9	4,089	126,149.8	4,046
5,046.1	4,725	4,928.8	4,908	5,041.9	4,604	4,959.1	4,693
3,843.5	7,438	3,831.4	7,318	3,812.0	6,815	4,004.1	6,544
319.4	8,255	77,032.8	7,550	3,829.1	7,522	1,689.5	6,872
3,578.0	8,328	1,480.5	8,017	1,481.9	7,646	589.0	7,086
1,483.9	8,456	3,504.6	8,220	555.6	8,020	3,953.1	7,336
77,061.1	8,844	493.3	8,309	10,580.5	8,376	11,291.9	8,283
10,389.7	9,079	10,345.9	9,120	77,004.6	8,893	79,584.7	8,799
550.4	11,706	115,311.5	11,745	116,148.3	10,524	552.6	10,529
530.7	12,007	512.0	12,301	557.5	11,146	665.3	10,548
114,474.8	12,028	557.1	12,330	597.2	11,187	115,698.6	10,620
177.3	16,621	282.9	16,584	195.6	13,467	390.1	14,589
22,757.0	20,099	22,748.7	17,158	22,740.3	20,210	23,502.3	19,997
26,331.4	39,167	9,219.9	34,240	26,716.3	34,268	26,612.9	34,581
9,223.3	40,108	26,523.9	38,245	9,216.5	40,330	9,525.4	39,904
4,189.9	86,896	4,188.4	74,182	4,186.8	87,376	4,327.1	86,454
18,459.8	108,420	18,594.7	105,869	18,729.7	94,859	18,657.2	95,726
1,048.5	197,242	1,048.2	168,383	1,047.8	198,330	1,082.9	196,238
1,742.1	387,609	296.4	336,707	1,767.6	339,128	1,760.7	342,229
296.5	394,415	1,754.8	378,488	296.3	396,592	306.2	392,408
97.4	840,305	97.4	717,358	97.3	844,944	100.6	836,030
929.0	1,047,177	935.8	1,022,537	942.6	916,199	938.9	924,579
16.2	1,897,535	16.2	1,619,901	16.2	1,908,008	16.8	1,887,880
56.5	3,914,053	56.9	3,821,957	57.3	3,424,494	57.1	3,455,816
1.7	4,916,340	1.7	4,197,016	1.7	4,943,476	1.8	4,891,325
0.9	7,395,369	0.9	6,313,332	19.1	6,955,684	19.0	7,019,303
18.8	7,950,056	19.0	7,762,993	0.9	7,436,188	0.9	7,357,741
18.8	16,866,264	19.0	16,469,406	19.1	14,756,678	19.0	14,891,647
4.0	39,075,943	4.0	38,156,497	4.0	34,188,431	4.0	34,501,128
2.0	77,049,488	2.0	75,236,535	2.0	67,412,349	2.0	68,028,921
1.0	127,875,515	1.0	124,866,641	1.0	111,881,197	1.0	112,904,493

1933		1934		1935		1936	
N	Y	N	Y	N	Y	N	Y
48,080.8	1,897	49,621.8	1,908	51,178.6	1,871	52,751.3	1,904
905,840.9	1,897	899,357.2	1,908	892,714.4	1,871	200,056.0	1,904
182,343.4	2,334	12,987.5	2,441	194,091.8	2,150	885,912.7	1,904
268,612.7	2,419	188,187.5	2,568	124,944.5	2,517	124.5	2,352
11,926.7	2,521	152,427.0	2,613	122.1	2,576	127,345.9	2,420
145,149.0	2,759	9,683.5	2,718	19,820.7	2,745	3,193.8	2,544
33,531.8	2,775	563.7	2,800	3,133.6	2,786	359,213.5	2,550
8,922.2	2,846	3,785.2	2,882	13,687.0	2,805	18,256.7	2,732
12,303.5	2,871	37,392.6	2,909	17,912.4	2,807	142,938.0	2,765
16,332.5	2,871	12,242.4	2,993	352,439.7	2,820	13,950.0	2,892
128,812.6	2,928	16,251.4	2,993	40,577.4	2,948	12,069.5	2,941
552.4	3,373	14,460.8	3,029	12,174.7	3,265	41,357.3	2,988
2,535.2	3,420	251,521.6	3,090	16,161.7	3,265	20,201.6	3,050
108,181.3	3,441	131,751.9	3,365	11,841.9	3,273	12,100.6	3,092
44,826.4	3,459	45,765.1	3,424	80,444.7	3,320	16,063.2	3,092
40,824.6	3,482	119,162.7	3,431	46,874.9	3,324	47,775.8	3,224
8,581.1	3,516	43,341.6	3,454	49,375.2	3,378	81,990.9	3,275
14,171.3	3,649	8,877.4	3,606	84,031.5	3,467	50,324.2	3,303
69,154.7	3,716	70,422.7	3,876	71,942.3	4,047	85,646.5	3,502
75,319.6	4,048	74,945.6	4,220	138,676.6	4,255	73,325.0	4,217
5,176.0	4,592	5,236.8	4,592	74,531.6	4,603	74,077.7	4,358
130,282.5	4,620	134,458.1	5,083	7,031.2	4,838	7,166.3	5,083
3,981.8	6,471	4,065.2	6,406	4,163.8	6,218	90,176.0	6,014
4,148.2	7,077	1,918.1	7,050	2,185.2	6,896	4,243.8	6,031
1,806.7	7,107	753.2	7,236	1,064.6	7,467	2,227.2	6,742
694.0	7,575	4,625.9	7,418	5,019.9	7,519	10,383.3	7,233
11,834.9	8,246	12,428.4	7,810	10,187.5	7,521	5,116.3	7,620
82,192.0	10,048	789.8	10,826	87,487.6	9,253	1,085.0	7,699
605.6	10,976	84,826.2	11,054	835.8	10,219	851.8	9,181
725.3	11,181	626.6	11,258	1,205.3	12,178	113,288.5	13,060
115,187.7	12,130	114,615.7	12,645	2,392.4	13,524	2,438.4	13,163
338.6	16,476	505.6	13,884	113,982.7	13,793	1,228.5	13,529
24,272.2	22,835	25,050.2	25,123	25,836.1	21,030	26,630.0	13,668
26,495.4	39,497	26,363.8	41,175	10,471.2	41,965	10,793.0	27,275
9,837.4	45,569	10,152.7	50,134	26,218.2	44,915	26,058.5	42,526
4,468.9	98,726	4,612.1	108,616	4,756.8	90,919	4,903.0	59,093
18,574.8	109,334	18,482.5	113,979	18,380.5	124,330	18,268.5	117,719
1,118.4	224,093	1,154.2	246,543	1,190.4	206,373	1,227.0	134,133
1,752.9	390,876	1,744.2	407,484	336.7	412,675	347.0	268,219
316.3	448,109	326.4	493,001	1,734.6	444,491	1,724.0	420,854
103.9	954,701	107.2	1,050,344	110.6	879,210	114.0	571,444
934.8	1,056,004	930.1	1,100,872	925.0	1,200,852	919.4	1,136,994
17.3	2,155,857	17.9	2,371,834	18.4	1,985,386	19.0	1,290,406
56.8	3,947,047	56.5	4,114,750	56.2	4,488,447	2.0	3,343,325
1.8	5,585,628	1.9	6,145,206	1.9	5,143,955	55.9	4,249,767
18.9	8,017,070	18.8	8,357,702	1.0	7,737,757	1.0	5,029,173
0.9	8,402,142	0.9	9,243,883	18.7	9,116,740	18.6	8,631,942
18.9	17,008,438	18.8	17,731,097	18.7	19,341,417	18.6	18,312,906
4.0	39,405,333	4.0	41,079,597	3.9	44,810,404	3.9	42,427,537
2.0	77,698,975	2.0	81,000,270	2.0	88,356,632	2.0	83,658,123
1.0	128,953,439	1.0	134,432,449	1.0	146,641,466	1.0	138,843,565

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1937		1938		1939		1940	
N	Y	N	Y	N	Y	N	Y
58,095.9	1,963	129.2	1,904	131.6	1,904	134.1	1,923
878,951.9	1,963	86,828.4	1,976	112,175.0	1,941	117,747.6	1,997
126.9	2,128	871,832.2	1,976	864,553.4	1,941	205,128.0	1,997
366,039.9	2,280	372,918.7	2,010	379,850.0	2,010	857,115.6	1,997
3,254.5	2,302	3,315.7	2,060	3,377.3	2,060	386,833.7	2,030
129,765.9	2,324	132,204.6	2,227	134,661.8	2,227	3,439.4	2,080
207,520.0	2,523	12,530.0	2,275	12,762.9	2,275	137,137.6	2,249
12,298.9	2,608	199,901.0	2,410	201,825.0	2,468	12,997.5	2,298
18,603.6	2,658	18,953.2	2,583	19,305.5	2,583	19,660.4	2,609
14,215.1	2,979	10,529.3	2,875	12,691.8	2,875	13,716.5	2,904
10,764.2	2,983	17,036.7	2,875	17,096.6	2,875	18,370.7	2,904
16,498.5	2,983	49,598.6	3,023	50,520.5	3,023	51,449.4	3,054
42,143.3	3,027	14,482.3	3,066	14,751.5	3,066	15,022.7	3,097
48,683.8	3,124	42,935.2	3,067	43,733.3	3,067	44,537.3	3,098
51,280.6	3,227	52,244.3	3,152	53,215.3	3,152	54,193.7	3,183
83,549.0	3,230	85,119.1	3,185	86,701.1	3,185	88,295.2	3,216
20,585.5	3,355	88,914.2	3,574	90,566.9	3,574	92,232.0	3,609
87,274.1	3,538	20,972.4	3,659	21,362.2	3,659	21,755.0	3,696
74,718.4	4,388	76,122.6	4,559	77,537.4	4,559	143,305.0	3,739
72,653.8	4,500	142,303.0	4,770	76,066.9	4,774	74,531.0	4,329
143,501.0	4,998	76,784.8	4,784	138,295.0	4,887	78,963.0	4,605
7,302.5	5,329	7,439.8	5,574	7,578.0	5,574	7,717.4	5,630
4,324.4	5,843	4,405.7	5,656	4,487.6	5,656	4,570.1	5,712
2,269.5	6,588	2,312.1	6,433	2,355.1	6,433	2,398.4	6,498
10,580.7	6,944	10,779.5	6,655	10,979.8	6,655	11,181.7	6,722
5,213.6	7,721	884.3	7,104	900.8	7,104	917.3	7,175
1,105.6	7,930	5,311.5	7,822	5,410.3	7,822	5,509.7	7,900
868.0	8,142	1,126.4	8,162	1,147.3	8,162	87,909.0	8,120
91,534.0	10,872	89,783.0	10,367	85,904.0	10,613	1,168.4	8,243
2,484.7	12,803	2,531.4	12,443	2,578.5	12,443	2,625.9	12,568
111,322.5	13,567	105,415.6	14,508	103,579.7	14,459	98,881.3	13,208
1,251.9	14,880	1,275.4	16,231	1,299.1	16,231	1,323.0	16,394
27,695.0	24,668	26,273.0	23,567	24,188.0	24,180	24,548.0	18,507
26,622.8	43,988	27,087.3	46,761	26,646.2	46,616	9,613.0	37,051
10,648.0	49,377	10,311.0	47,131	9,687.0	48,323	26,748.9	42,364
5,167.0	106,603	4,884.0	102,086	4,454.0	105,285	4,561.0	80,836
19,914.4	121,865	18,962.3	130,761	17,938.1	130,209	18,897.3	120,137
1,232.0	243,044	1,226.0	232,132	1,197.0	239,227	1,316.0	182,842
1,942.3	434,165	384.0	461,346	1,741.8	463,715	436.0	364,025
384.0	483,021	1,938.2	463,378	415.0	475,213	2,147.5	420,674
121.0	1,016,737	114.0	995,351	146.0	1,001,234	147.0	783,101
1,014.2	1,181,019	1,055.8	1,283,640	1,030.4	1,269,455	1,281.0	1,158,093
15.0	2,355,402	23.0	2,207,461	20.0	2,305,925	27.0	1,794,991
69.2	4,367,068	93.0	4,623,408	89.3	4,580,995	7.0	3,478,694
2.0	5,888,506	2.0	5,858,261	3.0	5,124,278	123.9	4,125,336
21.5	8,883,632	1.0	8,692,756	21.7	9,381,768	21.8	8,571,716
1.0	9,020,784	29.8	9,352,890	16.5	19,722,816	24.3	17,223,734
16.8	19,302,774	19.9	19,592,561	1.0	28,824,066	1.0	20,292,383
3.7	62,561,442	1.8	66,620,817	1.7	47,458,814	1.7	64,576,896
4.7	143,312,055	1.8	152,611,032	1.7	91,791,652	1.7	151,360,084
0.9	345,402,178	0.9	183,907,009	0.9	152,342,412		

1941		1942		1943		1944	
N	Y	N	Y	N	Y	N	Y
136.5	1,980	140.4	2,056	144.4	2,304	148.4	2,571
393,870.0	2,090	405,204.1	2,170	416,629.6	2,432	428,146.6	2,713
125,101.2	2,094	3,602.7	2,225	3,704.3	2,492	3,806.7	2,781
849,518.8	2,094	143,650.2	2,405	147,700.7	2,695	151,783.6	3,007
3,502.0	2,142	13,614.8	2,458	13,998.7	2,753	14,385.6	3,072
139,632.1	2,316	119,963.1	2,657	21,174.8	3,125	21,760.1	3,487
13,233.9	2,366	870,836.1	2,657	101,884.4	3,247	90,429.9	3,739
20,018.0	2,686	20,594.1	2,790	892,374.0	3,247	914,132.7	3,739
14,358.4	2,990	13,541.4	3,105	13,181.9	3,479	14,130.4	3,882
209,551.0	3,094	53,892.6	3,265	55,412.3	3,658	18,012.2	4,068
52,385.2	3,144	15,736.1	3,311	16,179.8	3,710	56,944.0	4,082
17,938.6	3,160	46,652.4	3,312	47,967.8	3,711	16,627.1	4,139
15,295.9	3,189	56,767.3	3,404	58,368.0	3,814	49,293.8	4,140
45,347.4	3,190	92,488.3	3,439	95,096.1	3,853	59,981.4	4,255
55,179.4	3,278	209,193.0	3,572	212,308.0	3,994	97,724.9	4,299
89,901.2	3,312	96,612.0	3,860	99,336.2	4,324	212,592.0	4,399
93,909.6	3,717	22,788.1	3,952	23,430.6	4,428	102,082.1	4,824
22,150.7	3,806	18,653.3	4,117	17,508.8	4,548	24,078.3	4,940
80,399.3	4,741	82,712.9	4,924	85,045.1	5,516	87,396.1	6,155
76,309.4	5,700	8,083.9	6,020	8,311.8	6,745	73,526.2	7,347
7,857.7	5,797	4,787.1	6,108	4,922.1	6,844	8,541.6	7,525
4,653.2	5,882	2,512.3	6,948	2,583.1	7,784	5,058.2	7,635
145,241.0	6,033	141,710.0	7,077	142,812.0	7,916	2,654.6	8,685
2,442.0	6,691	11,712.7	7,188	12,043.0	8,053	143,415.0	8,718
11,385.1	6,921	76,820.4	7,426	79,466.8	8,195	12,375.9	8,985
934.0	7,388	960.9	7,672	988.0	8,595	1,015.3	9,590
5,610.0	8,135	5,771.4	8,448	5,934.1	9,465	6,098.2	10,560
1,189.7	8,488	1,223.9	8,814	1,258.4	9,875	1,293.2	11,018
2,673.7	12,941	2,750.6	13,439	2,828.2	15,056	2,906.3	16,798
88,892.0	13,122	87,766.0	15,388	88,955.0	17,232	89,590.0	18,952
1,347.0	16,881	1,385.8	17,530	1,424.9	19,640	1,464.3	21,912
96,225.5	17,398	95,787.5	22,710	96,439.0	25,002	98,263.9	22,446
25,455.0	29,880	25,153.0	35,043	26,046.0	39,212	25,489.0	43,186
25,947.2	55,824	10,050.0	70,147	10,460.0	78,549	25,906.1	72,085
10,062.0	59,840	26,385.2	72,734	24,973.6	80,465	10,355.0	86,413
4,886.0	130,663	4,880.0	153,042	5,278.0	171,342	5,029.0	188,715
18,274.3	157,826	18,453.2	206,092	18,145.6	230,431	19,534.1	207,377
1,432.0	295,723	1,439.0	345,685	1,451.0	390,444	1,449.0	427,996
1,957.1	555,742	483.0	686,198	577.0	777,404	2,432.8	717,743
516.0	585,993	1,962.4	725,653	2,230.1	799,696	529.0	851,526
160.0	1,273,714	159.0	1,449,170	235.0	1,686,066	198.0	1,826,084
1,232.3	1,545,626	1,318.2	2,011,221	1,412.7	2,211,086	1,699.0	1,984,754
32.0	2,923,798	22.0	3,324,762	65.0	3,719,728	42.0	4,051,731
128.9	5,464,474	131.8	7,147,336	132.5	7,912,357	154.8	7,120,012
10.0	5,694,936	2.0	11,253,041	8.0	9,420,089	3.0	14,181,057
40.5	10,916,851	46.3	14,204,529	48.2	15,747,744	53.6	14,364,549
1.0	21,810,620	1.0	25,664,504	3.0	19,119,759	2.0	23,824,176
13.0	24,036,422	15.7	30,624,711	18.1	33,819,971	35.7	30,103,987
1.0	35,593,349	1.0	40,635,980	1.0	45,619,300	1.0	47,270,191
1.6	127,673,034	1.6	138,638,275	2.3	110,403,913	3.7	118,880,285
1.6	170,230,712	1.6	259,960,477	2.3	110,403,913	3.7	136,005,888
1.6	199,499,638	0.8	332,731,859			0.7	260,439,522

1945		1946		1947		1948	
N	Y	N	Y	N	Y	N	Y
152.4	3,116	156.5	3,498	160.5	3,717	164.7	3,828
439,755.0	3,289	451,454.9	3,691	463,246.2	3,923	475,129.0	4,040
14,835.0	3,293	4,014.0	3,784	4,118.8	4,021	4,224.4	4,140
3,909.9	3,371	15,319.9	4,262	15,820.2	4,844	4,692.1	5,020
57,986.7	3,929	48,847.9	4,615	29,384.3	5,162	226,332.0	5,020
221,478.0	3,929	219,266.0	4,615	980,732.9	5,162	1,003,374.3	5,020
936,112.1	3,929	958,312.1	4,615	220,228.0	5,194	16,374.4	5,201
10,026.2	4,109	158,831.4	5,015	161,812.9	5,315	164,255.1	5,336
14,216.4	4,109	51,179.6	5,222	51,989.8	5,445	70,990.1	5,435
50,348.7	4,277	10,014.5	5,282	68,036.7	5,449	52,487.6	5,598
62,228.9	4,485	14,199.7	5,282	25,550.8	5,552	9,840.4	5,780
155,308.4	4,526	24,983.9	5,337	10,387.6	5,612	12,561.8	5,780
22,161.1	4,742	65,110.4	5,380	13,059.4	5,612	63,709.2	5,833
17,258.1	4,790	22,482.4	5,396	22,593.8	5,622	26,352.3	5,972
58,488.0	4,948	60,044.1	5,554	61,612.3	5,902	63,192.7	6,078
100,374.5	5,212	18,105.2	5,751	105,736.4	6,216	108,448.7	6,401
24,534.0	5,461	103,045.0	5,850	18,993.2	6,516	22,898.7	6,441
104,849.9	5,848	107,639.5	6,565	67,224.0	6,888	19,857.4	6,580
70,539.6	6,712	92,153.9	8,374	110,450.8	6,976	113,284.0	7,184
149,648.0	7,279	70,456.8	8,628	94,560.8	8,899	154,331.0	7,602
89,765.7	7,461	149,927.0	8,902	153,612.0	10,201	96,986.4	9,164
8,773.2	9,122	1,995.6	9,656	3,011.0	10,398	3,141.8	11,009
5,195.3	9,256	9,006.6	10,239	9,241.8	10,881	9,478.9	11,205
2,754.0	9,277	5,333.5	10,389	2,137.5	10,888	5,613.2	11,369
12,755.1	10,251	2,881.5	10,402	5,472.9	11,040	2,073.6	11,804
1,057.0	10,519	12,598.0	10,826	12,983.1	12,182	13,889.6	12,617
6,287.5	11,209	1,132.6	12,529	1,217.9	12,747	1,242.2	13,635
1,362.5	11,727	6,402.3	12,912	6,556.5	13,997	7,000.1	13,893
3,022.7	15,284	1,455.9	12,912	1,526.9	16,052	1,613.1	16,401
94,473.0	15,805	3,148.6	16,340	3,469.1	17,686	99,706.0	16,510
1,720.6	19,304	94,788.0	19,313	102,273.3	21,236	102,088.0	18,060
103,024.5	20,584	102,903.5	26,460	96,528.0	22,149	3,673.6	19,445
26,104.0	36,074	25,853.0	44,103	26,934.0	50,507	28,208.0	37,641
28,612.1	65,781	28,578.5	84,559	28,531.5	67,697	31,561.4	57,146
10,738.0	72,150	10,367.0	88,340	10,826.0	101,051	11,623.0	75,289
5,264.0	157,300	5,151.0	192,999	24,291.2	199,088	5,653.0	164,505
22,022.0	190,307	21,996.1	244,632	5,120.0	220,977	25,527.6	166,788
1,453.0	357,724	1,478.0	438,507	1,487.0	501,040	1,701.0	371,612
2,804.9	656,167	2,801.6	843,478	4,085.9	668,851	3,401.9	570,976
554.0	709,625	646.0	858,794	568.0	991,883	560.0	743,098
206.0	1,503,044	188.0	1,823,537	2,375.6	1,972,814	225.0	1,579,039
2,075.8	1,852,617	2,073.3	2,381,471	198.0	2,101,728	2,569.3	1,697,097
33.0	3,418,906	25.0	4,232,175	30.0	4,811,943	36.0	3,660,214
244.2	6,469,697	243.9	8,316,559	424.1	6,595,715	476.9	5,648,215
4.0	8,678,761	4.0	10,239,134	4.0	12,029,858	9.0	7,320,428
90.4	12,919,587	90.3	16,607,657	124.6	13,345,526	219.1	11,183,117
1.0	26,391,220	1.0	31,844,434	63.6	28,778,454	2.0	19,765,154
40.0	27,527,072	40.0	35,385,044	1.0	36,857,822	86.4	24,310,929
1.0	41,786,627	1.0	55,686,517	1.0	60,149,290	1.0	54,903,207
6.2	64,623,119	6.2	83,070,656	13.3	66,604,828	19.3	55,808,675
1.4	207,717,168	1.4	267,012,822	5.3	133,029,047	6.4	111,617,351
2.1	208,822,007	2.1	268,433,052	2.0	346,552,098	1.9	308,743,698
				1.3	1,202,991,229	1.3	922,674,852

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1949		1950		1951		1952	
N	Y	N	Y	N	Y	N	Y
168.8	4,043	170.5	4,169	1,072,622.8	4,969	18,839.0	4,422
487,103.2	4,267	491,880.8	4,400	174.6	5,057	177.6	4,727
4,330.9	4,373	4,373.4	4,510	17,794.4	5,184	173,287.0	5,031
214,798.1	4,917	1,049,319.3	4,877	174,230.2	5,417	1,066,385.9	5,031
1,026,236.5	4,917	193,014.5	4,928	4,479.9	5,471	4,555.8	5,114
16,802.4	5,105	17,029.8	5,151	179,421.2	5,644	499,406.0	5,527
168,269.5	5,542	169,096.8	5,367	53,023.5	5,904	53,246.6	5,714
52,902.6	5,822	52,269.7	5,738	28,281.8	6,442	176,184.2	5,976
73,967.8	5,966	27,473.3	6,147	77,256.8	6,481	28,818.3	6,014
9,925.4	6,105	10,415.3	6,524	22,329.4	6,574	31,763.7	6,894
12,173.3	6,105	13,099.0	6,524	498,275.2	6,619	23,624.4	6,993
59,843.7	6,105	57,619.9	6,524	27,442.6	7,392	11,011.9	7,398
27,172.8	6,321	65,420.8	6,619	10,598.9	7,915	12,725.8	7,398
64,785.3	6,419	75,175.5	6,728	12,951.7	7,915	53,179.0	7,398
23,141.0	6,670	112,272.3	6,972	54,956.1	7,915	127,183.5	7,488
111,181.8	6,762	21,163.4	7,016	67,014.1	8,030	68,149.6	7,506
20,624.6	6,816	24,349.5	7,129	121,491.2	8,503	78,539.0	7,917
116,139.0	7,588	117,278.1	7,824	114,941.1	9,101	159,847.0	8,023
156,632.0	9,197	160,198.0	9,772	160,332.0	11,300	117,623.1	8,487
99,430.7	9,680	100,405.9	9,981	102,487.5	11,654	104,245.0	11,107
3,273.5	10,406	9,813.1	12,204	1,789.6	13,528	10,222.4	13,839
9,717.8	11,835	1,644.1	12,326	3,843.4	14,714	6,053.5	14,042
5,754.7	12,009	5,811.1	12,383	10,052.1	14,805	1,478.4	14,171
13,246.1	13,930	3,338.3	14,771	5,952.7	15,022	3,564.8	14,605
1,989.8	14,265	12,564.6	14,905	11,754.0	15,725	11,549.0	16,230
1,426.8	14,682	1,855.4	15,415	8,004.1	16,096	7,676.7	16,590
7,525.5	14,799	7,861.0	16,030	101,536.2	16,307	1,870.2	17,155
1,795.1	16,922	102,765.7	16,603	1,947.9	16,349	105,060.0	17,434
102,903.4	17,780	1,971.8	17,863	2,225.3	19,130	102,936.3	18,335
101,301.0	19,966	105,814.0	21,189	105,957.0	24,518	2,199.3	20,507
3,940.1	22,408	19,670.3	22,018	5,197.7	26,431	20,422.4	24,844
28,361.0	45,542	4,365.4	24,370	20,078.1	27,976	6,059.8	26,470
33,278.0	56,080	28,960.0	48,399	34,064.5	51,275	30,127.0	39,730
11,729.0	91,067	32,855.6	52,406	29,761.0	55,911	35,060.1	57,600
25,847.7	164,301	12,154.0	96,756	12,228.0	111,823	12,754.0	79,374
5,665.0	198,997	25,716.0	154,017	26,753.3	150,266	26,953.6	168,523
1,712.0	449,196	5,869.0	211,757	5,851.0	244,671	5,966.0	174,212
3,601.5	560,324	1,788.0	478,682	3,777.4	511,919	1,814.0	394,788
558.0	897,536	3,730.4	523,225	1,756.0	553,551	3,690.7	575,742
2,624.1	1,668,439	639.0	953,018	628.0	1,102,356	707.0	786,241
221.0	1,889,467	2,657.6	1,565,824	2,710.0	1,525,648	292.0	1,693,016
33.0	4,315,587	240.0	2,039,554	240.0	2,353,266	2,690.1	1,714,022
488.7	5,550,502	41.0	4,721,131	505.4	5,074,406	61.0	3,872,988
4.0	10,954,953	523.1	5,181,517	41.0	5,426,916	481.9	5,719,431
228.7	10,977,718	13.0	9,100,089	231.5	10,064,228	251.6	11,250,724
83.0	24,177,054	243.5	10,239,568	10.0	10,828,906	11.0	11,385,651
1.0	33,312,885	82.6	22,696,144	85.7	22,324,839	9.0	16,817,007
1.0	52,746,069	1.0	35,522,624	29.8	50,067,816	79.1	25,135,359
21.7	55,242,276	26.1	51,113,700	1.0	59,419,324	30.3	55,804,327
10.2	107,622,089	1.0	53,773,251	2.0	77,349,328	2.0	60,577,505
1.9	326,119,436	9.3	100,795,812	11.5	97,659,334	10.1	107,911,020
1.3	751,011,153	1.9	302,387,436	1.8	302,922,956	1.2	250,544,573
		1.2	718,170,161	1.2	647,620,055	0.6	1,125,033,323

1953		1954		1955		1956	
N	Y	N	Y	N	Y	N	Y
180.5	4,765	4,716.2	4,900	304.2	4,455	132,461.2	5,273
167,696.3	5,073	1,053,799.6	5,137	4,695.0	4,970	1,041,063.3	5,273
1,060,111.5	5,073	21,241.8	5,333	1,047,450.2	5,205	4,629.3	5,359
4,632.0	5,155	159,349.1	5,369	22,220.3	5,311	22,681.3	6,048
55,009.8	5,515	206.3	5,555	496,063.0	5,819	488,720.3	6,148
19,883.4	5,805	176,716.5	5,973	149,157.4	5,900	60,437.4	6,365
501,953.3	5,845	501,236.8	6,224	59,455.4	5,996	172,342.0	6,525
176,130.6	6,026	81,186.9	6,804	173,701.9	6,487	85,575.5	7,100
79,313.2	6,677	57,333.9	6,900	30,792.6	7,023	29,023.7	7,523
34,670.1	6,904	28,274.0	7,106	28,293.1	7,341	33,707.6	7,571
25,344.4	7,014	71,156.6	7,398	36,045.2	7,356	80,438.2	7,694
28,675.8	7,353	27,819.3	7,420	75,407.5	7,381	35,971.9	7,725
11,529.0	7,458	36,042.3	7,730	11,638.8	8,295	11,150.8	8,623
12,923.9	7,458	11,534.9	8,038	13,147.9	8,295	12,553.2	8,623
52,880.7	7,458	13,282.9	8,038	50,748.0	8,295	50,055.3	8,623
69,289.2	7,567	52,089.7	8,038	83,292.2	8,926	165,303.0	9,785
132,012.2	7,800	137,887.0	8,944	132,210.9	9,067	138,259.4	9,902
120,736.8	8,448	126,367.3	9,114	148,604.7	9,157	161,760.0	10,013
157,368.0	9,570	159,620.0	10,672	161,017.0	11,792	340.8	12,878
107,023.5	10,752	7,301.6	11,681	6,735.7	14,338	107,333.0	15,442
7,567.8	13,598	108,120.6	12,901	108,018.4	15,021	2,719.1	15,756
10,393.3	13,950	1,900.9	13,295	7,394.5	15,944	7,540.5	15,999
6,154.8	14,155	6,377.0	14,559	11,989.2	16,314	2,036.1	16,616
11,484.6	15,290	10,711.1	14,789	2,345.5	16,625	9,206.0	16,933
3,071.5	15,775	2,306.9	15,035	10,549.8	17,113	12,464.1	17,350
1,958.5	18,090	10,979.7	16,274	7,334.4	18,082	7,277.5	17,390
1,425.9	19,475	1,329.2	17,155	1,484.0	18,732	8,123.7	18,761
102,413.8	19,644	7,134.7	19,542	2,062.1	19,805	1,497.6	20,895
2,231.3	19,857	2,265.0	20,064	2,509.4	21,065	108,168.0	21,354
6,660.3	20,034	103,517.4	21,029	103,819.4	22,533	2,715.0	21,566
105,146.0	20,811	104,645.0	23,231	106,299.0	25,666	104,013.2	26,065
21,117.7	24,663	21,859.7	28,533	22,595.7	29,231	23,020.3	29,211
30,839.0	47,386	31,138.0	52,855	31,833.0	58,368	33,960.0	48,467
34,881.2	61,688	34,718.2	66,109	35,543.6	70,723	36,316.7	81,669
13,427.0	94,557	13,592.0	105,415	13,678.0	116,505	14,983.0	96,672
27,510.3	181,224	27,969.7	193,178	28,765.0	206,314	7,115.0	211,308
6,172.0	207,763	6,171.0	231,468	6,321.0	255,527	29,368.3	239,954
1,946.0	469,443	1,880.0	524,081	1,955.0	577,248	2,081.0	478,559
3,939.5	616,176	3,863.8	659,597	4,129.3	703,148	4,345.5	813,958
726.0	935,006	714.0	1,043,235	700.0	1,149,522	730.0	954,003
2,912.7	1,831,834	2,771.8	1,964,454	2,617.8	2,108,073	290.0	2,017,632
283.0	2,017,139	278.0	2,252,644	277.0	2,425,436	3,142.2	2,395,158
56.0	4,647,605	59.0	5,146,901	40.0	5,625,346	40.0	4,738,743
511.6	6,122,971	525.4	6,526,058	503.6	6,991,048	575.7	7,988,024
13.0	12,012,272	13.0	12,263,481	10.0	10,767,927	14.0	9,072,091
264.1	12,079,328	231.2	12,944,751	232.0	13,841,427	185.8	16,081,509
11.0	15,973,281	8.0	18,327,144	1.0	21,415,607	2.0	17,781,298
90.4	26,928,092	75.3	29,059,548	80.4	30,785,269	87.1	34,812,459
36.0	59,609,645	38.2	62,902,966	33.2	67,309,093	24.8	77,283,410
8.9	120,819,397	7.1	128,230,900	5.8	138,138,359	4.6	155,046,405
4.7	197,308,045	2.4	276,645,312	2.9	229,261,926	1.2	290,321,842
		0.6	991,820,831				

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1957		1958		1959		1960	
N	Y	N	Y	N	Y	N	Y
4,597.7	5,251	4,693.1	5,202	4,839.9	5,344	5,401.4	5,535
1,034,638.9	5,369	113,437.2	5,628	102,234.5	5,943	88,925.2	6,464
22,444.9	6,094	1,028,177.1	5,628	1,021,677.7	5,943	1,015,140.9	6,464
133,113.5	6,146	22,227.6	6,521	166,159.7	6,745	167,080.8	7,158
169,071.5	6,569	166,820.8	6,637	22,218.6	6,799	22,459.8	7,253
61,166.7	6,600	61,666.1	6,656	61,205.1	6,878	60,492.8	7,402
379.6	7,164	369.4	7,383	475.4	7,829	84,783.0	8,131
484,668.9	7,215	484,169.8	7,408	82,417.9	8,232	480,839.9	8,864
36,447.1	7,763	83,580.2	8,054	483,794.1	8,280	22,608.6	8,885
28,895.5	7,805	37,810.6	8,133	24,872.3	8,335	38,479.6	8,890
84,751.4	7,948	27,204.9	8,166	38,699.4	8,530	46,470.7	9,377
36,524.7	8,161	39,662.6	8,180	43,476.3	8,905	173,931.0	9,507
85,302.8	8,457	87,610.3	9,296	169,541.0	9,329	631.2	9,601
10,667.2	9,301	188,284.6	9,387	10,027.6	10,506	203,155.1	10,696
13,309.2	9,301	9,983.1	9,586	12,521.4	10,506	9,632.4	10,993
48,475.0	9,301	12,912.1	9,586	46,926.9	10,506	12,117.6	10,993
142,792.8	10,007	47,656.1	9,586	197,314.9	10,797	44,846.0	10,993
176,991.4	10,853	168,089.0	10,432	90,083.9	11,816	93,120.9	12,575
163,436.0	12,279	147,473.3	11,010	153,076.5	12,037	158,884.1	12,664
108,032.9	15,316	109,893.4	16,071	111,556.1	16,508	114,145.4	16,722
8,385.9	16,186	3,049.6	16,530	3,100.5	16,647	3,516.2	18,058
2,899.6	16,273	8,734.1	17,263	9,324.0	18,210	9,899.3	18,720
13,271.2	16,920	7,641.4	18,709	8,084.1	19,378	2,414.4	20,292
2,035.5	17,033	14,176.3	18,895	115,048.0	20,300	8,640.3	20,518
7,440.3	17,945	10,047.4	21,974	14,506.9	20,480	116,212.0	20,711
8,660.4	18,867	111,716.0	22,735	2,139.0	21,184	15,145.5	21,256
8,868.1	20,795	3,326.3	23,566	11,227.7	22,911	12,099.0	22,303
2,970.1	23,108	1,502.0	23,874	1,602.2	24,662	1,539.6	25,298
1,540.4	23,139	9,331.5	26,154	3,932.5	26,776	4,464.0	25,551
104,810.9	25,239	107,326.1	27,979	10,291.5	27,015	11,284.9	27,070
107,086.0	26,735	2,014.6	29,088	107,294.9	30,697	106,996.0	31,569
23,479.5	31,679	24,210.6	32,613	25,065.6	35,003	25,954.4	36,777
32,513.0	60,739	33,761.0	51,718	34,164.0	46,212	35,058.0	47,115
36,668.4	79,064	36,725.9	87,806	15,071.0	92,272	15,977.0	93,860
13,784.0	121,219	15,078.0	103,224	37,445.9	96,189	39,088.5	98,574
29,757.8	232,615	7,068.0	227,489	7,112.0	203,163	7,131.0	206,909
6,251.0	265,708	29,753.0	257,556	30,177.7	282,664	31,506.7	289,837
1,906.0	600,092	2,286.0	514,932	2,265.0	460,149	2,230.0	469,068
4,442.5	788,155	4,335.1	875,084	956.0	915,924	966.0	931,394
668.0	1,193,051	993.0	1,022,698	4,504.3	958,287	4,772.6	981,465
3,249.6	2,320,509	428.0	2,198,181	434.0	1,965,244	412.0	2,001,465
240.0	2,531,977	3,134.6	2,571,287	3,183.8	2,829,162	3,315.3	2,897,914
30.0	6,015,042	81.0	5,092,229	77.0	4,583,693	74.0	4,659,588
591.6	7,744,449	546.9	8,618,232	39.0	8,730,721	33.0	9,015,836
13.0	11,630,073	31.0	9,970,780	578.2	9,444,120	596.6	9,682,238
203.5	15,538,890	189.0	17,329,781	206.7	18,942,124	7.0	19,360,954
3.0	21,969,137	6.0	27,481,532	6.0	19,675,771	219.2	19,385,039
92.1	33,600,694	91.7	37,662,555	98.2	40,890,520	97.6	42,132,344
23.3	75,789,354	3.0	70,248,680	1.0	53,202,831	1.0	59,504,519
4.5	155,580,972	27.8	83,997,399	24.5	92,422,375	28.9	93,498,722
2.3	330,638,011	5.6	171,439,589	6.0	185,500,301	5.5	188,596,058
0.6	1,185,393,906	2.2	367,289,850	2.2	329,031,655	1.6	344,948,674
		0.6	1,316,797,030				

1961		1962		1963		1964	
N	Y	N	Y	N	Y	N	Y
6,010.7	6,232	6,366.3	6,540	6,298.9	6,916	6,146.4	7,222
69,660.4	7,054	60,381.4	8,104	61,083.8	8,400	61,972.0	9,205
1,008,566.6	7,054	171,448.1	8,186	178,148.5	8,418	188,352.6	9,209
60,154.1	7,531	75,651.8	8,319	73,296.4	8,745	100,918.8	9,418
173,009.0	7,710	960,238.9	8,319	176,547.0	8,745	154,799.2	9,661
168,832.3	8,070	97,730.8	8,764	913,015.0	8,745	866,894.9	9,661
22,771.4	8,382	23,886.6	8,962	102,065.0	9,219	26,024.7	10,462
478,071.7	9,330	174,322.0	9,332	24,999.8	9,929	15,924.0	10,859
20,136.0	9,457	18,124.0	9,457	16,740.5	10,232	167,621.0	10,888
37,198.0	9,479	477,002.0	9,966	36,091.0	10,350	36,691.2	11,214
47,969.7	9,651	36,221.1	10,134	47,073.7	10,831	46,453.1	11,324
91,055.9	9,923	47,820.8	10,321	476,855.2	11,383	473,076.6	12,710
795.7	10,757	198,569.7	11,368	192,414.7	11,866	193,925.5	13,463
203,739.7	11,494	842.3	11,593	8,157.4	13,470	58,348.4	15,222
9,016.3	11,909	8,476.8	12,274	11,135.1	13,470	104,014.0	15,760
11,688.7	11,909	11,493.3	12,274	42,728.1	13,470	64,420.6	19,585
44,219.7	11,909	43,853.2	12,274	101,860.8	14,985	191,195.7	21,429
97,409.6	13,510	176,362.2	13,329	184,786.9	16,037	112,123.7	22,461
167,422.3	13,607	99,936.8	13,738	809.9	16,211	820.8	24,282
119,888.0	16,860	5,219.5	17,921	118,292.0	16,515	69,688.0	24,397
115,904.4	18,385	10,842.1	19,573	5,811.6	20,253	1,133.9	27,590
10,445.0	18,714	115,950.6	19,905	114,568.7	21,089	15,698.9	27,648
8,802.3	19,498	116,891.0	20,443	11,322.9	23,359	9,407.6	28,095
2,693.6	21,120	2,900.9	22,944	15,864.5	25,728	5,783.0	28,464
15,666.9	22,073	15,869.0	23,963	8,875.3	26,064	11,957.9	31,656
4,325.6	23,406	8,842.5	24,731	1,185.2	26,083	13,121.2	31,854
12,712.6	23,983	1,236.2	25,105	3,116.6	26,138	3,319.2	32,128
4,878.8	24,764	12,850.4	25,337	13,186.3	27,521	16,387.4	33,126
1,493.0	24,833	5,043.9	27,792	5,175.4	29,631	5,330.1	34,645
12,493.7	27,043	13,917.3	28,098	15,257.3	31,565	53,246.2	43,187
105,377.5	30,682	107,375.2	33,074	110,015.9	35,510	28,972.3	44,707
39,326.0	38,239	27,303.3	40,842	40,671.0	37,366	31,137.0	48,631
26,657.0	41,425	39,687.0	46,280	28,112.2	42,167	13,825.0	107,257
17,878.0	76,507	17,700.0	92,639	18,309.0	74,751	54,450.8	133,305
40,723.8	95,397	41,947.6	102,781	42,473.8	110,443	4,838.0	240,609
9,633.0	168,306	9,485.0	203,776	9,413.0	165,020	14,507.7	427,140
32,407.8	282,347	32,152.2	305,512	32,988.9	327,169	1,425.0	487,110
3,465.0	378,520	3,497.0	457,068	3,748.0	368,561	7,783.9	851,149
1,348.0	755,795	1,313.0	910,783	1,321.0	737,595	681.0	1,068,664
5,429.8	947,597	5,506.3	1,022,697	5,495.5	1,098,386	3,731.4	1,903,144
634.0	1,611,419	560.0	1,927,257	598.0	1,568,435	218.0	2,410,135
3,496.5	2,806,140	3,604.0	3,042,253	3,704.0	3,207,035	1,340.4	4,309,567
114.0	3,731,513	87.0	4,470,815	89.0	3,693,728	83.0	4,762,583
36.0	7,393,457	22.0	8,879,985	39.0	7,229,403	688.8	8,661,595
628.3	9,376,578	664.0	10,137,208	557.2	10,905,331	18.0	14,858,654
10.0	15,969,868	275.2	20,181,396	11.0	15,449,521	1,171.7	16,341,812
228.5	18,811,838	4.0	24,679,129	228.3	21,782,129	14.0	38,754,355
112.9	40,581,068	114.1	44,026,182	99.5	47,957,349	51.1	40,209,479
2.0	55,450,931	2.0	61,049,899	2.0	53,107,729	5.2	113,762,037
31.1	90,196,659	32.7	98,686,516	35.6	106,753,856	2.6	191,318,682
5.5	182,504,434	7.8	198,209,760	10.2	212,356,053	2.6	1,027,518,576
1.6	333,806,883	2.2	430,252,996	2.8	456,344,699		
		0.6	1,542,530,694	0.6	1,536,677,207		

1965		1966		1967		1968	
N	Y	N	Y	N	Y	N	Y
6,100.7	8,000	6,090.8	10,594	6,116.8	9,917	6,096.3	10,718
96,740.9	9,904	63,010.0	11,024	201,858.9	12,083	201,103.4	12,502
62,291.8	9,934	200,597.5	11,600	63,774.0	12,327	27,546.9	13,538
179,413.2	10,618	92,593.7	11,674	198,228.7	13,224	64,619.7	13,680
821,878.6	10,618	197,463.3	12,057	735,157.5	13,224	85,210.3	13,755
196,647.7	10,645	777,966.2	12,057	88,867.1	14,189	151,939.0	14,790
46,175.8	11,507	36,721.4	13,107	13,877.5	14,513	43,140.4	15,508
26,548.7	11,820	26,731.6	13,239	27,154.5	14,626	196,623.3	15,547
15,067.9	12,108	14,416.6	13,324	35,960.0	15,106	693,452.6	15,547
37,016.2	12,123	147,683.0	14,143	150,200.0	15,110	35,139.2	15,780
468,090.9	14,028	467,770.8	15,371	44,881.5	15,446	13,349.1	17,235
199,327.0	14,381	45,844.5	15,669	474,974.6	17,826	486,252.8	19,542
154,132.0	14,689	115,689.6	17,080	118,485.1	18,948	195,462.5	20,051
109,667.0	15,949	201,870.7	17,154	198,764.3	19,331	118,699.9	20,391
58,144.9	16,408	56,561.5	18,102	55,742.8	20,280	64,290.4	21,598
196,989.4	20,848	204,505.0	22,424	212,779.8	24,787	219,494.7	26,316
946.0	21,472	10,926.2	26,510	63,027.3	27,198	112,317.1	28,534
109,798.6	24,229	108,165.3	26,751	109,130.6	28,807	60,940.4	32,622
64,575.7	25,649	63,171.2	27,024	1,031.2	29,264	54,461.0	33,335
1,099.2	29,418	1,052.1	29,868	1,161.9	29,744	1,047.4	36,959
10,546.3	30,086	1,024.7	31,652	54,801.0	34,050	11,419.1	37,760
15,057.2	31,289	55,734.0	31,850	15,260.1	34,769	15,215.4	38,969
63,341.0	32,940	14,918.6	32,437	11,347.4	37,264	4,125.5	39,140
5,774.9	34,068	5,871.5	35,607	6,403.4	39,585	6,638.2	41,547
12,865.5	35,018	13,421.0	38,562	3,955.3	41,949	13,602.8	44,704
3,487.5	36,162	3,731.4	38,665	13,246.6	43,327	1,296.5	45,082
5,471.6	37,131	12,564.2	39,035	12,449.7	44,258	12,573.5	45,296
12,854.1	37,372	18,610.2	41,503	5,679.5	44,716	5,757.9	47,631
17,376.2	39,091	5,618.8	45,450	19,601.4	47,520	20,696.9	50,841
29,865.2	51,541	31,125.1	50,680	33,184.0	53,589	36,223.2	59,852
52,123.9	56,615	53,361.6	59,595	54,326.4	59,952	22,481.0	66,674
29,781.0	65,435	25,082.0	63,619	23,733.0	68,001	54,018.8	71,843
12,723.0	143,770	12,823.0	139,265	11,444.0	148,878	10,570.0	146,473
58,126.7	173,326	61,281.3	181,901	61,658.5	183,784	58,308.0	221,050
3,845.0	325,154	4,166.0	313,582	3,298.0	338,519	3,128.0	333,086
14,621.1	558,523	14,449.0	588,856	15,325.7	592,237	1,400.0	660,358
1,269.0	653,097	1,411.0	626,556	1,303.0	675,145	15,181.1	709,758
7,253.1	1,116,757	7,463.4	1,177,088	7,875.8	1,184,014	596.0	1,413,791
581.0	1,402,645	552.0	1,345,805	593.0	1,443,235	7,816.1	1,417,683
3,964.1	2,478,424	4,368.0	2,605,827	4,492.5	2,627,664	4,155.6	3,155,019
115.0	3,237,964	87.0	3,163,140	101.0	3,369,131	94.0	3,322,457
1,185.9	5,654,104	1,388.8	5,930,988	1,552.6	5,959,512	43.0	6,527,376
39.0	6,425,738	41.0	6,193,349	36.0	6,730,546	1,497.3	7,142,847
695.0	11,325,109	818.0	11,854,000	805.1	11,963,672	16.0	13,024,537
14.0	12,931,782	14.0	12,489,119	18.0	13,196,624	763.0	14,343,820
1,126.4	21,060,078	1,074.4	21,536,505	1,131.7	23,475,588	1,137.9	25,941,957
1.0	36,208,989	1.0	34,969,533	1.0	35,990,793	1.0	35,929,756
38.8	51,582,522	21.6	53,106,295	111.1	50,308,002	22.4	63,519,278
3.3	109,240,233	1.7	98,625,976	1.7	99,125,396	1.4	119,565,700
1.7	181,301,025						

1969		1970		1971		1972	
N	Y	N	Y	N	Y	N	Y
197,977.4	12,773	193,798.3	14,429	192,117.7	16,823	202,143.4	18,954
5,985.0	13,351	5,959.2	14,461	6,057.1	17,251	6,502.5	21,280
27,978.3	14,329	75,985.0	16,253	73,137.2	19,227	74,315.8	21,652
63,743.6	15,108	152,258.0	16,510	59,158.1	20,966	59,263.0	22,805
80,556.1	15,341	39,491.4	16,619	193,673.2	22,321	210,615.5	24,186
154,915.0	15,722	194,751.0	19,200	574,960.8	22,321	547,240.0	24,186
189,733.1	16,566	613,354.3	19,200	151,506.0	22,820	12,152.9	28,178
652,851.5	16,566	27,942.0	21,642	11,683.2	23,823	39,509.8	28,781
41,273.5	18,092	34,673.1	22,644	38,381.0	24,820	521,854.0	30,370
34,857.8	18,924	12,159.5	23,349	508,725.7	26,008	239,392.5	30,707
12,632.7	19,195	507,680.0	23,464	217,742.9	26,075	135,117.0	32,633
500,444.4	20,999	61,551.3	24,812	26,936.5	27,270	35,206.1	32,936
196,014.4	21,997	204,515.8	26,126	34,280.3	28,640	27,259.9	33,912
119,851.5	22,578	45,091.3	27,411	44,787.2	30,508	44,274.4	35,263
49,496.0	23,582	59,936.8	29,008	130,224.8	33,141	61,357.1	35,263
60,411.5	23,582	125,144.0	29,153	61,051.5	35,991	140,692.4	39,678
223,460.3	28,542	226,443.6	32,094	230,847.6	36,357	247,241.0	40,540
115,314.4	31,979	117,095.6	36,672	117,135.8	40,154	121,153.0	49,943
54,677.0	35,461	51,028.0	37,319	6,737.8	44,734	1,254.3	51,063
1,135.6	35,506	1,195.0	42,695	1,206.0	46,417	7,460.5	51,405
11,995.6	40,247	6,478.5	42,732	12,023.0	46,594	12,261.4	55,688
4,343.9	41,276	12,344.1	48,609	48,820.0	51,676	58,722.4	56,623
14,866.3	45,117	21,744.3	50,542	15,275.1	56,852	848.0	58,091
6,408.6	45,594	15,015.5	50,948	5,881.2	57,344	7,167.4	58,400
13,901.1	46,423	5,864.8	53,618	960.1	57,917	16,611.3	63,872
12,867.6	46,692	14,126.4	54,604	13,653.2	59,647	14,030.9	70,262
5,762.2	48,254	4,726.9	54,623	5,851.8	64,957	6,121.3	73,144
57,111.6	49,057	13,450.9	54,753	14,107.1	66,241	15,103.9	73,163
1,410.0	50,801	1,181.4	58,439	20,991.0	71,482	49,270.0	73,487
21,737.6	54,659	59,225.4	63,786	45,220.1	77,377	20,808.7	78,822
39,603.5	62,278	42,656.6	74,314	59,848.2	79,150	49,963.3	81,010
22,548.0	70,934	20,562.0	74,716	19,624.0	103,458	20,063.0	147,107
65,121.5	152,042	9,814.0	163,953	9,247.0	227,320	75,742.2	175,791
10,820.0	155,436	67,588.4	198,032	69,135.9	244,815	9,553.0	323,331
3,201.0	352,845	2,861.0	373,093	2,754.0	516,768	23,969.9	555,682
17,417.7	485,759	19,996.5	628,923	20,228.0	778,913	2,833.0	735,683
1,297.0	700,832	1,306.0	737,853	1,246.0	1,023,299	11,619.2	1,111,721
8,521.5	975,967	9,971.1	1,258,778	9,920.6	1,557,333	1,329.0	1,456,748
544.0	1,482,021	542.0	1,561,964	533.0	2,168,675	6,445.3	2,462,467
6,063.6	2,166,712	6,394.3	2,763,570	5,330.8	3,455,745	580.0	3,107,652
74.0	3,495,930	77.0	3,667,835	78.0	5,088,672	2,362.5	5,564,805
2,693.2	4,864,333	1,977.7	6,294,849	1,749.8	7,854,677	104.0	7,173,362
31.0	6,619,944	30.0	6,895,191	31.0	9,655,391	875.9	11,277,619
841.2	9,898,381	1,196.4	12,456,929	905.7	15,765,685	31.0	14,060,430
3.0	17,387,797	3.0	13,713,382	4.0	19,020,475	637.9	25,189,093
2,412.0	18,411,603	241.2	28,985,929	662.8	26,582,161	7.0	26,619,520
1.0	38,003,383	647.2	50,534,887	568.8	35,364,344	140.9	57,311,108
114.0	40,275,152	0.8	100,941,349	131.4	80,335,328	703.5	90,548,420
0.8	79,974,945					0.9	249,390,218
						0.9	1,339,404,390

1973		1974		1975		1976	
N	Y	N	Y	N	Y	N	Y
211,204.5	23,244	157,119.0	32,252	54,286.2	41,834	19,152.2	43,948
6,880.6	25,112	189,977.3	35,489	50,711.5	41,834	16,453.9	43,948
75,852.9	25,643	493,847.2	35,489	29,340.2	41,834	11,839.1	43,948
189,456.9	27,549	221,096.5	35,983	181,724.7	41,834	234,958.6	43,948
520,202.1	27,549	7,259.5	36,076	468,175.3	41,834	443,186.4	43,948
60,161.4	28,248	78,121.2	37,486	78,898.3	54,883	80,333.0	64,788
157,616.0	29,577	13,458.0	41,500	217,973.7	56,735	648,097.1	68,078
12,728.5	32,130	61,810.6	43,817	609,298.9	65,192	6,105.5	68,256
40,683.6	32,440	571,273.1	49,424	66,327.9	65,675	229,477.8	70,694
546,778.6	34,360	42,200.6	49,579	7,541.7	67,176	268,463.7	77,605
249,927.8	37,253	259,005.1	53,498	45,406.5	68,953	68,204.8	80,908
27,610.5	37,889	28,848.8	56,056	263,727.2	69,451	12,538.8	82,182
35,916.0	38,596	37,170.3	58,140	69,638.5	70,615	48,907.8	83,638
39,956.3	40,196	57,334.8	58,140	13,080.1	76,490	15,863.0	86,782
59,719.3	40,196	276,843.4	62,589	30,428.5	77,228	41,791.0	86,782
149,639.3	43,446	37,414.6	70,326	19,231.8	77,305	60,875.0	86,782
262,631.4	47,041	157,994.5	71,943	44,248.6	77,305	290,383.6	87,609
125,280.5	47,107	49,258.0	73,169	59,409.5	77,942	87,497.1	89,585
60,453.5	47,394	13,415.9	77,220	284,291.2	78,606	28,727.5	92,901
7,574.0	57,198	7,692.0	77,750	8,000.8	86,156	8,472.9	95,372
12,693.8	58,321	129,950.1	78,689	41,774.1	90,465	13,614.3	105,135
1,347.8	61,156	1,415.9	81,024	13,370.3	93,853	20,933.9	108,682
955.1	65,638	19,537.8	82,537	166,480.5	94,525	43,933.1	108,846
48,851.0	67,140	8,955.1	85,514	1,017.0	98,775	1,038.5	109,074
8,481.1	67,687	1,059.9	85,949	20,133.8	99,883	7,913.0	116,318
18,123.2	73,745	6,665.4	92,933	1,525.8	104,520	6,842.4	118,908
6,381.8	80,645	60,205.0	98,449	8,805.1	107,539	156,654.8	119,829
14,147.8	84,652	16,659.4	109,391	144,520.0	109,073	1,205.2	120,620
16,021.1	86,963	23,285.2	113,237	6,074.3	111,547	172,341.2	120,677
55,295.4	89,959	14,999.2	115,127	14,226.1	128,752	13,955.7	138,529
22,088.3	93,730	59,634.8	115,707	63,532.6	138,062	65,261.9	138,895
20,097.0	134,412	20,207.0	146,495	26,380.9	139,226	28,778.5	141,929
85,409.6	147,105	93,919.3	306,506	25,848.8	141,964	17,107.9	166,056
9,724.0	295,472	9,656.0	322,600	16,077.4	143,055	35,515.8	179,304
25,676.6	466,123	3,042.0	731,698	113,403.9	244,381	118,829.3	219,987
2,935.0	671,716	31,171.3	964,400	13,142.0	311,277	16,896.6	393,510
13,535.5	931,782	1,414.0	1,448,574	4,282.4	702,141	43,157.7	685,277
1,398.0	1,327,995	17,122.6	1,918,904	41,942.0	761,970	5,010.9	894,210
7,632.9	2,075,492	627.0	3,057,410	1,544.4	1,403,282	27,609.8	1,361,643
602.0	2,811,863	9,562.1	4,203,572	25,011.4	1,511,504	2,113.0	1,778,239
2,624.4	4,707,236	90.0	7,164,174	700.5	2,963,247	19,274.2	2,940,589
89.0	6,583,236	3,135.6	9,499,386	14,046.1	3,292,188	1,000.4	3,723,195
1,569.7	9,425,849	31.0	13,788,463	105.7	6,908,325	5,333.4	6,696,532
31.0	12,752,217	1,504.6	18,504,960	4,390.4	7,421,795	136.9	8,699,243
1,241.9	20,960,636	398.6	39,854,019	30.5	13,637,567	1,749.7	13,538,652
5.0	29,384,782	3.0	44,721,914	1,592.0	14,641,599	33.5	17,364,256
410.9	47,477,278	2.0	82,200,451	440.1	31,787,014	1,196.8	28,260,875
1,047.4	75,727,955	60.8	92,516,467	3.1	67,571,621	183.4	65,998,177
1.0	79,063,744	16.4	184,201,798	76.9	73,628,821	4.4	73,952,650
1.8	202,100,957	2.9	279,298,173	5.1	92,983,413	5.8	124,805,587
0.9	907,504,437			25.2	143,412,833	65.2	126,372,707
				5.3	273,363,974	8.2	278,390,573
						1.4	895,936,193

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1977		1978		1979		1980	
N	Y	N	Y	N	Y	N	Y
10,594.0	50,520	31.4	58,460	35.6	70,740	208.6	82,733
6,281.9	50,520	2,561.1	58,460	86.0	70,740	617.0	82,733
10,936.7	50,520	3,393.8	58,460	2,080.7	70,740	2,691.4	82,733
235,614.9	50,520	395,257.4	58,460	372,317.5	70,740	350,060.4	82,733
418,880.4	50,520	247,611.6	60,724	269,714.2	83,889	209,329.1	85,062
80,522.6	72,173	82,835.9	87,479	84,197.7	99,752	744,134.0	124,198
8,762.7	74,736	696,282.9	87,788	728,727.3	103,491	85,805.1	128,489
682,375.2	79,738	234,782.1	94,427	9,035.7	114,480	249,181.3	139,265
231,052.3	83,606	9,143.6	94,608	300,706.2	118,235	8,749.0	143,424
282,436.4	91,082	295,232.8	104,011	10,410.6	128,748	340,044.2	145,893
72,023.1	95,459	13,355.7	104,247	319,926.6	132,260	329,169.8	157,932
12,464.1	96,921	54,500.6	110,295	14,371.1	136,557	7,131.3	159,977
17,061.9	99,196	21,535.4	110,990	11,108.7	137,561	22,681.7	159,977
42,380.5	99,196	15,164.3	111,919	31,222.9	137,561	51,574.9	159,977
57,923.9	99,196	34,977.7	111,919	59,619.2	137,561	79,453.6	160,885
19,530.9	99,971	63,579.6	111,919	78,512.5	140,262	25,430.1	162,217
295,645.3	100,600	75,986.4	114,343	53,135.4	143,491	10,308.0	162,724
8,512.7	105,401	309,168.9	114,778	23,201.3	151,067	53,434.3	178,013
53,158.8	108,523	9,167.3	121,719	38,068.2	159,562	15,174.1	178,949
26,693.0	110,777	32,888.7	130,697	178,408.8	163,696	119,685.9	188,089
92,798.1	111,633	103,049.0	135,878	244,001.3	167,995	85,637.0	195,200
21,402.4	125,209	21,231.3	144,400	21,932.8	171,643	39,947.9	198,613
51,650.4	125,608	174,218.4	144,973	15,339.8	176,562	22,445.6	199,992
1,000.8	126,178	54,094.1	146,997	79,602.6	179,032	17,119.6	202,820
7,527.0	130,255	918.0	149,396	1,104.6	179,287	1,686.4	206,137
163,757.1	131,593	14,118.1	150,173	55,534.9	180,788	175,850.3	214,383
12,919.9	132,607	9,417.8	150,445	11,196.8	186,845	7,571.3	214,666
69,245.3	135,470	74,699.0	153,430	184,784.5	188,901	57,339.2	219,377
175,919.6	137,862	180,202.8	155,873	7,292.8	189,578	1,158.2	220,964
6,882.6	142,582	7,222.8	164,292	89,094.1	189,830	11,917.0	229,678
1,704.4	142,737	1,732.0	164,480	1,743.1	199,766	185,700.3	229,965
15,797.8	164,143	30,916.2	174,937	32,494.4	224,648	133,879.2	239,952
28,813.1	166,521	16,755.9	179,890	17,391.3	230,470	35,545.5	250,358
37,851.4	224,406	38,601.9	273,418	136,020.9	269,738	19,136.2	260,202
120,079.1	233,488	126,753.1	278,609	36,916.9	379,726	52,394.7	375,252
24,878.3	483,928	22,095.6	593,850	17,769.3	832,491	61,476.1	732,483
45,915.7	723,625	49,880.0	861,895	54,296.6	833,005	24,214.8	823,699
6,347.0	1,107,021	6,012.4	1,354,154	32,702.7	1,665,072	40,441.0	1,463,140
30,259.1	1,439,366	31,360.8	1,717,942	5,277.4	1,890,277	7,016.3	1,874,155
2,550.4	2,201,674	2,471.3	2,688,622	24,551.1	3,681,469	32,411.7	3,242,944
22,867.1	3,117,614	24,737.6	3,728,387	2,230.4	3,745,106	3,080.7	3,713,172
1,056.4	4,724,638	1,005.4	5,748,436	887.7	7,964,816	18,265.2	7,190,027
6,536.2	7,109,844	8,168.5	8,424,383	13,092.3	8,153,559	1,244.3	7,967,192
222.3	10,705,584	188.4	13,162,999	5,351.8	16,306,239	9,366.6	14,258,664
2,657.5	14,275,771	2,905.5	16,973,946	140.8	18,505,884	226.2	18,444,926
43.9	22,454,169	44.1	26,223,277	3,024.2	34,286,853	4,561.4	30,794,393
1,831.3	29,947,027	1,839.7	35,896,278	41.5	36,221,561	76.4	36,196,896
9.9	56,979,508	9.7	59,841,674	8.9	68,928,668	1,117.6	70,007,296
324.3	69,075,747	365.3	82,197,586	480.7	79,800,726	17.6	78,371,126
84.9	137,689,453	97.3	162,632,990	141.5	158,193,581	280.6	142,110,849
4.2	144,894,540	2.2	179,903,876	37.8	336,691,478	2.9	247,662,975
25.7	273,820,396	20.4	356,520,403	6.1	1,075,409,453	146.0	292,710,225
1.3	739,351,382	4.8	1,255,674,844			20.7	909,086,922

Appendix 4.2.- Estimation of GE (0) index and top 10% income share according to the Kuznets Curve hypothesis

Table A.4.2.1

Share of Income

	Equal	Unequal
Decile 1	5.5	1
Decile 2	6.5	3
Decile 3	7.5	5
Decile 4	8.5	7
Decile 5	9.5	9
Decile 6	10.5	11
Decile 7	11.5	13
Decile 8	12.5	15
Decile 9	13.5	17
Decile 10	14.5	19

Table A.4.2.2 – The Kuznets Curve. First scenario.

Ya=50, Yb=100; Both Equal

Period	1	2	3	4	5	6	7	8
La/L	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
Lb/L	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Ya	50	50	50	50	50	50	50	50
Yb	100	100	100	100	100	100	100	100
Average Y	60	65	70	75	80	85	90	95
GE (0)	**0.038**	**0.043**	**0.045**	**0.045**	**0.043**	**0.039**	**0.034**	**0.027**
Top 10%	**20.8%**	**20.5%**	**19.6%**	**18.7%**	**17.6%**	**16.7%**	**15.9%**	**15.2%**

Where La: labour sector A, Lb: labour sector B, L: total labour, Ya income sector A, Yb: income sector B

Table A.4.2.3 – The Kuznets Curve. Second scenario.

Ya=50, Yb=100; Both Unequal

Period	1	2	3	4	5	6	7	8
La/L	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
Lb/L	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Ya	50	50	50	50	50	50	50	50
Yb	100	100	100	100	100	100	100	100
Average Y	60	65	70	75	80	85	90	95
GE (0)	0.137	0.142	0.144	0.144	0.142	0.138	0.133	0.126
Top 10%	25.0%	25.5%	24.9%	24.0%	22.8%	21.6%	20.7%	19.8%

Table A.4.2.4 – The Kuznets Curve. Third scenario.

Ya=50, Yb=100; A equal, B unequal

Period	1	2	3	4	5	6	7	8
La/L	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
Lb/L	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Ya	50	50	50	50	50	50	50	50
Yb	100	100	100	100	100	100	100	100
Average Y	60	65	70	75	80	85	90	95
GE (0)	0.058	0.073	0.085	0.094	0.102	0.108	0.113	0.116
Top 10%	25.0%	25.5%	24.9%	24.0%	22.8%	21.6%	20.7%	19.8%

Table A.4.2.5 – The Kuznets Curve. Fourth scenario.

Ya=50, Ya=200; Both Equal

Period	1	2	3	4	5	6	7	8
La/L	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
Lb/L	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Ya	50	50	50	50	50	50	50	50
Yb	200	200	200	200	200	200	200	200
Average Y	80	95	110	125	140	155	170	185
GE (0)	0.103	0.118	0.121	0.116	0.105	0.089	0.069	0.046
Top 10%	31.3%	28.0%	24.9%	22.4%	20.1%	18.3%	16.8%	15.6%

Table A.4.2.6 – The Kuznets Curve. Fifth scenario.

Ya=50, Yb=200; Both Unequal

Period	1	2	3	4	5	6	7	8
La/L	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
Lb/L	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Ya	50	50	50	50	50	50	50	50
Yb	200	200	200	200	200	200	200	200
Average Y	80	95	110	125	140	155	170	185
GE (0)	**0.202**	**0.217**	**0.220**	**0.215**	**0.204**	**0.188**	**0.168**	**0.145**
Top 10%	**37.5%**	**34.9%**	**31.6%**	**28.8%**	**26.0%**	**23.7%**	**21.9%**	**20.3%**

Table A.4.2.7 – The Kuznets Curve. Sixth scenario.

Ya=50, Yb=200; A equal, B unequal

Period	1	2	3	4	5	6	7	8
La/L	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
Lb/L	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Ya	50	50	50	50	50	50	50	50
Yb	200	200	200	200	200	200	200	200
Average Y	80	95	110	125	140	155	170	185
GE (0)	**0.123**	**0.147**	**0.161**	**0.166**	**0.165**	**0.159**	**0.148**	**0.135**
Top 10%	**37.5%**	**34.9%**	**31.6%**	**28.8%**	**26.0%**	**23.7%**	**21.9%**	**20.3%**

CHAPTER 5

Regional incomes in Portugal: industrialization, integration and spatial inequality, 1890-1980[1]

5.1.- Introduction

As has been indicated throughout this thesis, in the period from 1890 to 1980 the transformation of the Portuguese economy from a highly protected and predominantly rural economy to a more industrialized one with a higher degree of openness to the outside world was considerable. Such economic transformation is well documented in the literature, in terms of the evolution of the main macroeconomic variables, but one field has remained largely unexploited; namely, the evolution of regional income distribution.[2] This lacuna is particularly relevant given the qualitative evidence regarding the displacement of economic activity to the urban regions on the coast and the relative decline of the interior regions. The country gained a dense urban area extending for several hundred kilometers along the coast, whereas the inland regions in the northeast and the south lost population in relative and absolute terms. This paper is a first attempt to measure the evolution of regional income levels in Portugal over most of the twentieth century. We provide decennial estimates of regional GDP per capita, from 1890 to 1960, using the method proposed by Geary and Stark (2002), based on data on wages and prices for the 18 administrative districts of the country. These estimates are then linked to the existing official data from 1960 to 1980. The new data show that regional inequality increased up to 1970 and declined thereafter.

The evolution of regional inequality in the inverted-U pattern in a context of rapid economic growth fits the predictions made by Williamson (1965), Krugman (1991) and the "new economic geography", according to which scale economies, the decrease in transport costs and openness to international

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[1] This Chapter is a joint work with Pedro Lains from the Instituto de Ciências Socias da Universidade da Lisboa and Marc Badia-Miró from Universitat de Barcelona. It has already been published in Revista de Historia Económica, Journal of Iberian and Latin American Economic History (2012), Volume 30(2). My main individual contribution to this article was the collection of statistical data needed to make the estimates, the estimation of the different indexes presented here and their interpretation.

[2] For the evolution of the Portuguese economy in the twentieth century, see Lopes (1996), Lains (2003a) and Costa et al. (2011).

markets favor the rise of regional inequality in the first stages of industrialization, which are then followed by a fall in inequality, due to the emergence of congestion costs.[3]

In comparison to other European economies, Portugal's regional inequality peaked at a rather late date.[4] Our analysis suggests that in a small country such as Portugal, the home market effect is strongly related to the degree of trade openness, whereas in countries with larger markets, the home market effect is more closely associated with the level of home market integration. If this is the case, the internationalization of the Portuguese economy appears to be the single most important cause for the increase in spatial inequality until 1970.[5]

The paper proceeds as follows: the next section presents an overview of Portuguese economic growth, openness and structural change; section three provides a description of our estimates for regional GDP; section four analyses the evolution of regional GDP and the impact of structural change and openness on the location of economic activity; and section five concludes.

5.2.- Economic growth, openness and structural change, 1890 – 1980

During the twentieth century, Portugal entered the convergence club and its level of income per capita caught up, albeit only partially, with the levels of the more advanced European nations. In contrast, the previous century had been marked by the divergence of Portugal's productivity and income levels as, despite industrialization, GDP per capita expanded at an annual rate below 1%.[6] Portugal's economic performance in the twentieth century occurred with different degrees of intensity. During the interwar period, convergence was relatively slower, whereas after World War II economic growth gained momentum and the rate of convergence was considerably faster. This pattern was common to other peripheral European countries such as Spain and Greece. Following the 1973 oil shock, the European economy entered a

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[3] See also Barro and Sala-i-Martín (1991); Fujita et al. (1999) and Combes et al. (2008) provide a useful background in economic geography.
[4] See Buyst (2010), Rosés et al. (2010), Combes et al. (2011), Felice (2011) and Henning et al. (2011).
[5] For the analysis of regional inequality since 1995, see Vieira et al. (2006), Soukiazis and Antunes (2006 and 2011), Soukiazis and Proença (2008), Fidalgo et al. (2010) and Pereira and Galego (2011).
[6] See Maddison (2010) and Lains (2003b; 2007).

period of slower growth and divergence of the less developed economies on the continent returned (see Table 5.1).

Table 5.1 - Growth of real income per capita (1870-1986)		
	Portugal	**European core**
1870-1890	0.66	1.07
1890-1913	0.40	1.32
1913-1929	1.35	1.39
1929-1938	1.28	1.16
1938-1950	1.56	1.00
1950-1973	5.47	3.55
1973-1986	1.52	2.01
European core: Belgium, Denmark, France, Germany (West Germany to 1991), Italy, Netherlands, Norway, Sweden and United Kingdom. Source: Lains (2007) and Pereira and Lains (2012).		

The evolution of the Portuguese economy over the twentieth century shows no clear relationship between convergence of incomes per capita with the rest of Europe, and levels of openness and deeper international economic integration. In fact, economic growth was fastest during the interwar years, which was a period of high trade barriers and autarky, as well as during the golden age of growth, from 1950 to 1973, which was a period of greater openness all over Europe. However, after 1973, the level of political and economic integration of the country with the rest of Europe increased, particularly after joining the European Union, in 1986, and the single currency in the late 1990s, but convergence of income per capita did not follow suit. Structural change was a major source of convergence up to 1973, as factors moved from agriculture to industry and, within each sector, from less to higher productivity industries, and after 1973, the scope for structural change was substantially reduced.[7]

The changes in the structure of the economy had very marked regional features, as Portugal suffered from the dislocation of economic activities

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[7] See Lains (2003a).

across its territory. In fact, the economic sectors that expanded fastest were concentrated in the main coastal cities, particularly in Lisbon, Porto and the vast region between them. Contrarily, the inland regions lagged behind and suffered from substantial population loss as people emigrated to the cities and to other destinations in Europe. By 1981, about 3.5 million people, out of a population of 10 million, lived in the area that stretches along the coast for about 400 kilometres, from Viana do Castelo in the north, to Setúbal, south of Lisbon, constituting one of the largest urban areas of Europe.[8] The main drivers of these internal migrations were, however, different, with more concentration of manufacturing activities in the north-western regions and of trade and other services in the central coastal regions, particularly in the capital city, Lisbon.

5.3.- Regional GDP, 1890 – 1980

Following Geary and Stark (2002), regional GDP per capita in current prices and at factor costs was estimated by taking first the regional gross value added (GVA) for a given number of sectors and, subsequently, these estimates were aggregated by using sectoral shares in aggregate national output.[9] For the period from 1890 to 1920, we provide estimates of regional sectoral gross value added for agriculture, industry and services; from 1920 to 1950, we add estimates for mining, construction and electricity; from 1930 to 1950 we also add data on electricity and gas; finally, from 1960 onwards we use official data on sectoral production at the regional level. Official data for regional GDP are available from Abreu (1969), with data for three sectors (agriculture, industry and services), for the years 1953 and 1963, Conceição (1975), with data for 1970 for eight sectors, and INE (1991), with data for 1980 and the broadest coverage.

Thus, total sectoral regional GDP per capita up to 1960 is estimated by taking,

$$GDP_{it} = GVAA_{it} + GVAM_{it} + GVAI_{it} + GVAC_{it} + GVAE_{it} + GVAS_{it} \qquad (1)$$

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[8] Valério (ed.) (2001, pp. 142-145).
[9] For further details see Badia-Miró et al. (2012). For other estimates using the same methodology, see Crafts and Mulatu (2005); Wolf (2007); Buyst (2010); Rosés et al. (2010); Henning et al. (2011); Combes et al. (2011) and Felice (2011).

where GVA is gross value added and A, M, I, C, E and S are agriculture, mining, industry, construction, electricity and services, respectively. Total GDP is distributed between the different regions, and is defined as:

$$GDP = \sum_i GDP_i \qquad (2)$$

GDP_i is the GDP of region i. In that sense, the GDP_i is defined as:

$$GDP_i = \sum_j gdp_{ij} \cdot L_{ij} \qquad (3)$$

and gdp_{ij} is the average value added per worker in region i in sector j and L_{ij} is the corresponding number of workers. If we consider that the differences in regional GDP are related with the differences between the productivity of an economic sector between regions and, at the same time, this is captured by the differences in nominal wages, we can transform (3) as:

$$GDP_i = \sum \left[gdp_j \cdot \beta_j \cdot \left(\frac{w_{ij}}{w_j} \right) \right] \cdot L_{ij} \qquad (4)$$

where w_{ij} is the wage paid in region i in sector j, w_j is the national average wage in that sector and β is a scalar which preserves the relative regional differences but scales the absolute levels. As a result, the addition of *GDP* estimates for each sector at the regional level is equal to the sector estimates at national level.

Our estimates for regional GDP per capita are presented in Table 5.2 and Map 5.1. As may be seen there, the top three regions remained unchanged throughout the period, namely, Lisbon, Porto and Setúbal. On the other hand, at the tail of the ranking, the mobility is higher although Viseu, Guarda and Castelo Branco have remained at the bottom. Some regions, such as Bragança and Vila Real, became worse off as they were among the richest in 1890 and ended up at the bottom by 1980. On the other hand, the position of Leiria and Aveiro improved significantly over the period.[10] Table 5.2 also shows that the range of levels of income per capita increased substantially between 1890 and 1970 and declined in the following decade. In 1890 the level of income per capita of the richest region was slightly more than twice that of the poorest; in

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[10] Rank size test shows stability throughout the period, and between each subgroup. This stability is also observed in the Spanish case as pointed out in Rosés et al (2011).

1970 the leading region was more than four times richer than the poorest region and, in 1980, this gap narrowed to 2.8. Map 5.1 clearly depicts the increase in the relative levels of income per capita in the coastal regions.[11]

Map 5.1 - Regional GDP per capita over country average, 1890 - 1980
We have defined the categories considering five groups equally, distributed for the range for all the values. This is the reason why, in 1980 no region had a very high value, and is also a sign of less inequality. Source: GDP per capita comes from Appendix 2.
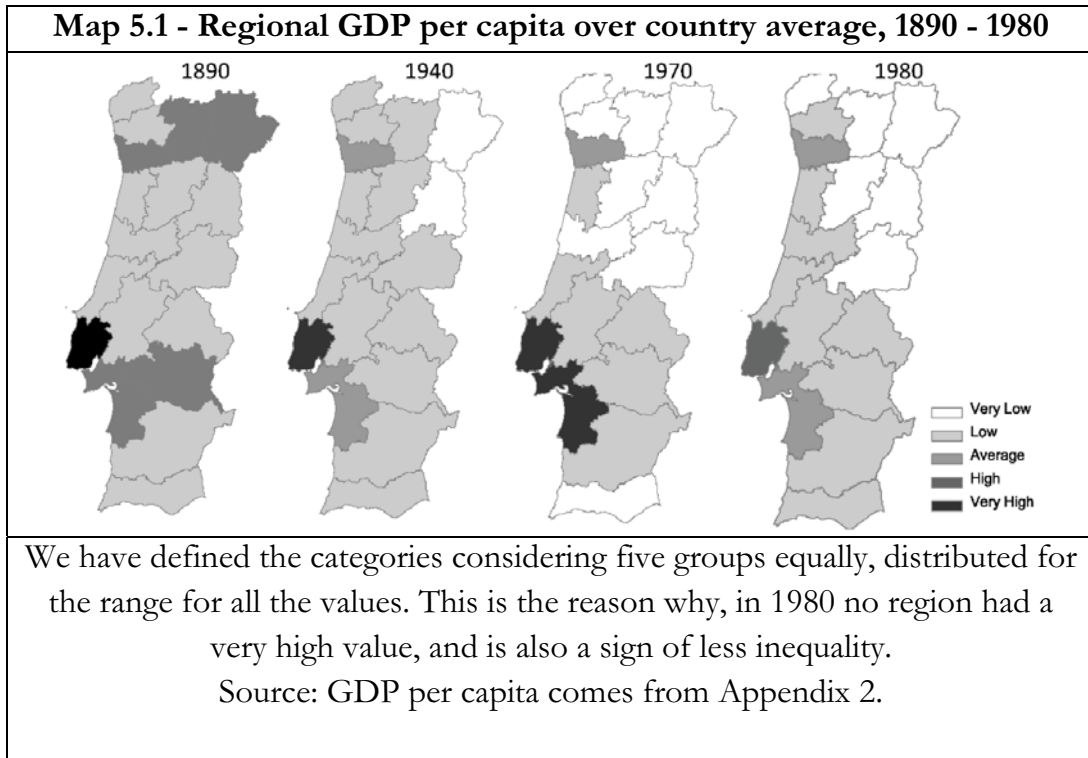
[11] For trends after 1980, see Soukiazis and Antunes (2006, 2011).

Table 5.2- Per capita GDP ranking of the Portuguese regions (1890-1980). Portugal=100															
1890		**1920**		**1930**		**1940**		**1953**		**1963**		**1970**		**1980**	
Lisboa	158	Lisboa	190	Lisboa	163	Lisboa	190	Lisboa	175	Lisboa	177	Lisboa	180	Lisboa	147
Porto	117	Setúbal	146	Setúbal	131	Porto	118	Setúbal	135	Setúbal	145	Setúbal	157	Setúbal	121
Setúbal	113	Porto	135	Porto	122	Setúbal	100	Porto	110	Porto	109	Porto	101	Porto	102
Évora	108	Coimbra	86	Coimbra	93	Portalegre	86	Évora	109	Aveiro	96	Aveiro	87	Aveiro	96
Vila Real	106	Santarém	82	VC	91	Évora	86	Portalegre	106	Évora	96	Santarém	79	Évora	94
Bragança	106	Bragança	82	Santarém	88	Santarém	85	Santarém	100	Portalegre	92	Évora	77	Faro	91
Santarém	94	Aveiro	81	Aveiro	87	VC	84	Beja	95	Santarém	80	Leiria	77	Santarém	89
Portalegre	93	Braga	80	Évora	86	Coimbra	83	Aveiro	87	Leiria	79	Portalegre	74	Portalegre	86
Braga	90	Évora	80	Bragança	86	Aveiro	80	Leiria	83	Beja	78	Beja	72	Coimbra	86
VC	90	Portalegre	79	Leiria	85	Braga	78	CB	79	Coimbra	75	Coimbra	70	Leiria	85
Beja	89	Leiria	78	Portalegre	84	Beja	77	Coimbra	77	Faro	71	Braga	70	Braga	78
Guarda	89	Vila Real	76	Vila Real	81	Leiria	77	Faro	75	CB	71	CB	70	Beja	73
Aveiro	88	VC	74	Guarda	79	Faro	74	Braga	70	Braga	67	Faro	64	CB	68
Leiria	88	Guarda	72	Braga	79	Vila Real	72	Bragança	63	Bragança	63	Bragança	63	Viseu	57
Coimbra	87	Faro	70	Faro	74	CB	72	Vila Real	63	Vila Real	59	Guarda	53	Guarda	56
Viseu	78	CB	70	Beja	73	Viseu	72	Viseu	60	Guarda	58	Viseu	45	VC	55
CB	76	Beja	66	CB	72	Bragança	69	VC	59	Viseu	56	Vila Real	44	Bragança	55
Faro	71	Viseu	57	Viseu	66	Guarda	65	Guarda	53	VC	52	VC	43	Vila Real	53
Source: See text.															
Note: VC is Viana do Castelo and CB Castelo Branco															

Figure 5.1 shows the Gini and Theil coefficients for regional per capita GDP inequality. As may be seen in the figure, the two indexes follow a very similar pattern, increasing until 1970 to decrease afterwards. The U-shaped evolution observed by Williamson (1965) is also observed in other case studies[12], but significant differences are noteworthy: the highest value of spatial inequality in Portugal appears in the 1970s and a strong decline is observed thereafter, more than fifty years later than the peak reached in Spain, France or the USA. We also observe a lower degree of inequality in Portugal at the beginning of the 20th century, due to the absence of economic structural changes and the delay in driving the industrial modernization.

Figure 5.1 - Per capita GDP inequality

Source: See Appendix 2.

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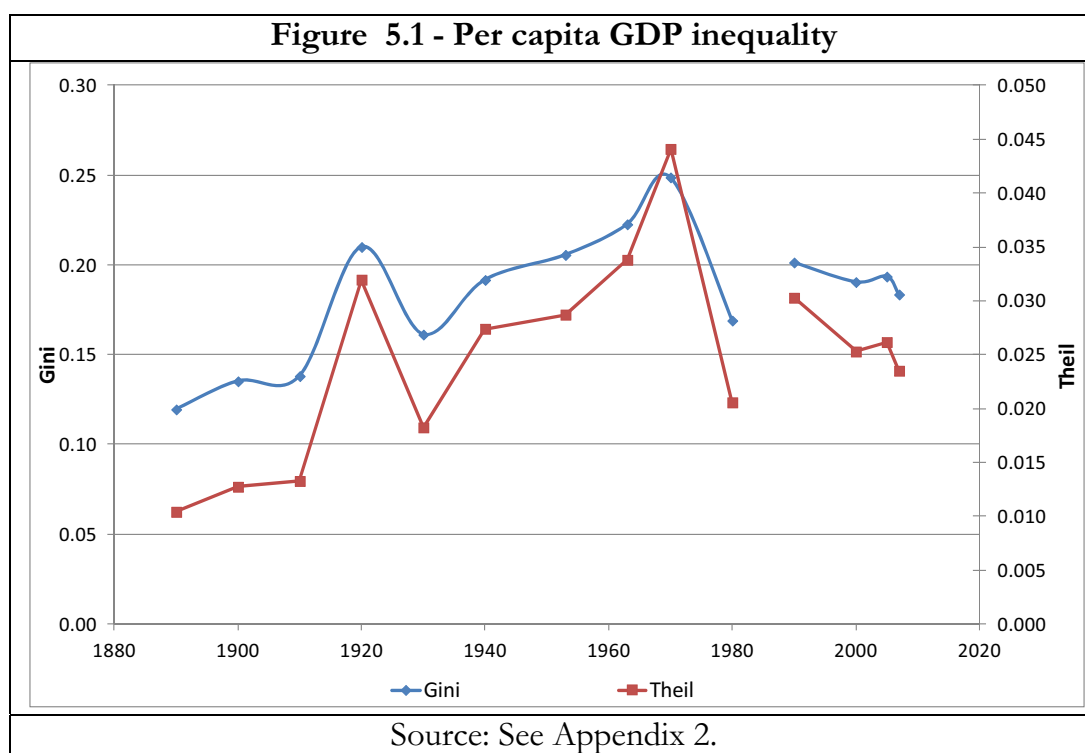
[12] For Spain see Rosés et al. (2010), for France see Combes et al. (2011) and for England see Crafts and Mulatu (2005), among others.

5.4.- Patterns of specialization

This section aims to identify the underlying forces that drove regional inequality in Portugal. Income differences between regions could be due to divergences in the structure of output, in sectoral productivity levels, or to the interaction of both factors. All these variables are closely related to structural change. The identification of the more relevant effects for each region is a key factor in the characterization of the regional pattern of development and of its impact on overall regional income inequality. Besides, the analysis of the interaction of the three factors may shed light on the existence of agglomeration economies, which can be a major driver of inequality, according to the new economic geography models, as discussed above. Additionally, the identification of the causes of regional backwardness may provide some insights regarding the kind of policies that should have been implemented in order for the poorer regions to converge with the richer ones.

Thus, in order to test the relation between regional per capita levels and regional productive structures we compute several measures of specialization. Firstly, we estimate the Krugman Index (SI), defined as:

$$SI_{jk} = \sum_{i=1}^{n} \left| \frac{E_{ij}}{E_j} - \frac{E_{ik}}{E_k} \right| \tag{5}$$

where E_{ij} is the level of employment in industry $i = 1,...,$ n for region j and E_j is the total industrial employment for region j, and similarly for region k. The index value ranges from 0, when the two regions have similar economic structures, to 2, when they are complementary. The index is estimated for each pair of regions and then regional specialization is given by the average of the 18-1 estimates for each region. Similarly, the national index is given by the average of the regional estimates.

According to our findings, the *SI* index for Portugal was relatively stable until 1930 and then increased significantly up to 1970 to decline in the decade to 1980 (see Table A.5.1.1). The trends in the specialization index from 1930 to 1970 follow closely that of regional inequality. In fact, as may be seen in Table 5.2 and Table A.5.1.1, the four regions at the top of the GDP per capita ranking (Lisbon, Setúbal, Porto and Aveiro) are also the regions with the highest values for the specialization index. This relation may be due to the fact that different economic sectors are associated with different productivity

levels, and thus, an increasing regional specialization would lead to increasing economic inequality. For similar reasons, the decline of the *SI* index from the 1970s onwards may be associated with the decline in regional inequality.

Our specialization index at national level remained stable until the 1930s, but changed significantly at the regional level before the 1920s, growing in some regions and decreasing in others. Therefore, it seems that the pattern of specialization may not be able to explain the variations in the evolution of regional inequality before the 1930s, which point to productivity changes between the different economic sectors as the main candidate to explain those variations.

In order to look more deeply at the process of regional specialization it may be interesting to focus specifically on the industrial sector, given that the emergence of this sector is often related with modern economic growth. We therefore estimate two other indexes, namely, the Location Quotients for Employment and for Gross Value Added defined as follows:

$$LQ_{EMP} = \frac{E_{ij}/E_j}{E_i/E} \tag{6}$$

$$LQ_{GVA} = \frac{GVA_{ij}/GVA_j}{GVA_i/GVA} \tag{7}$$

where E_{ij} is the level of employment in industry i for region j and E_j is the total employment for region j. The LQ_{GVA} is defined in the same way. Location quotients above 1 imply a level of industrialization above the national average and vice versa. As can be seen in Table A.5.1.2 and Table A.5.1.3, the results for *LQ* for employment and *GVA* are very similar. Lisbon, Porto, Setúbal, Braga and Aveiro have *LQs* above the average. It is also interesting to see that Porto and Lisbon lost ground, while other highly-ranked cities increased their *LQ*. Regarding the rest of the regions, although in some of them their *LQ* remained stable, in the vast majority, their *LQ* followed a U-shape, decreasing until 1970 and increasing thereafter, pointing to a process of deindustrialization at the regional level that would not reverse until the 1970s.

Besides the characterization of the productive structure of each region, these specialization indexes may have a clear relation with the regional levels of GDP per capita. In order to assess this hypothesis Table 5.3 presents the coefficients of correlation between GDP per capita of each region and the three different indexes. As may be expected, there is a positive relation between the three different indexes and GDP per capita. What perhaps may be counter-intuitive, to a certain extent, is the fact that the intensity of this relation until 1970 is very strong in the case of the Krugman Index but is much less evident for the Location Quotients. This could be due to two different causes. On the one hand, there may be significant productivity differences in the industrial sector of the different regions, which may counterbalance the potential impact of industrialization on economic growth. On the other hand, the closer relation of the *SI* index with GDP per capita levels may suggest that the emergence of the service sector may have also played a decisive role in the expansion of economic activity in the more dynamic regions. The evidence presented in the next exercise suggests that both explanations were significant.

Table 5.3 also shows that the correlation of the three indexes with regional GDP per capita decreases significantly during the last decade. This may be due to the convergence in the productive structure of the Portuguese regions during the last decades of the period. The fading relation between regional productive structures and GDP per capita may indicate that productivity changes are the main drivers of regional inequality during the 1970s.

Table 5.3 - Coefficient of correlation between GDP per capita and location quotients GVA									
	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980
SI index	0,872	0,796	0,854	0,876	0,840	0,913	0,702	0,750	0,733	0,494
p-valor	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.037
LQ Emp	0,501	0,611	0,540	0,745	0,640	0,510	0,410	0,521	0,489	0,433
p-valor	0.034	0.007	0.021	0.000	0.004	0.031	0.091	0.027	0.039	0.073
LQ GVA	0,477	0,593	0,529	0,433	0,538	0,690	0,368	0,529	0,501	0,367
p-valor	0.046	0.009	0.024	0.073	0.021	0.002	0.133	0.024	0.034	0.135
Source: See text									

Kim (1999) provides a useful exercise to identify the causes that may explain income differences at regional level. It consists of estimating two hypothetical GDP per worker values. The first is based on the assumption that all regions

have the same productivity levels for each sector, and also, that the distribution of the labour force among the different sectors (industry mix) is identical, which would provide an estimate of per worker GDP equal to the national average. The second hypothetical per worker GDP is estimated on the assumption that each region has the same productivity level at industry level but they have different industry mixes. The difference between the two hypothetical incomes provides a measure of income differences due to the divergence in regional industrial structures (*industry mix effect*). The difference between the actual and the hypothetical industry mix per worker GDP provides a measure of regional per worker GDP differences due to the divergence in productivity (*productivity effect*).

We also found a strong correlation between industry-mix effects and productivity effects, although the intensity of those effects varies in each region. This relation would imply that there may be economies of scale and agglomeration effects, because this exercise shows that when the productive structure tends to be specialized in industry or services those sectors tend to have higher productivity levels (see Table A.5.1.4).

Both industry mix and productivity effects have a sizeable impact on the divergence of regional incomes and their relative importance is very similar. Another regularity that should be mentioned is that the divergence of each region tends to be explained by the same force (productivity effects or industry mix) over time. The causes of success and failure of the different Portuguese regions, therefore, would be extremely stable in the long term, which may serve as a guide to the implementation of regional policies aimed at reducing regional inequality. In this sense, if regions diverge because of industry mix, they should promote structural change, whereas if the divergence is due to productivity levels, they should focus their attention on increasing their productivity at the sector level.

This exercise may also be useful to analyse the process of economic growth in Portugal at regional level. Not only are there remarkable differences between the different districts, but also the causes of their divergence differ significantly. It is interesting to focus on the case of Porto. Porto's relatively high per capita income is explained by the industry mix (with a large share of employment in the industrial sector) because productivity effects run in the opposite direction. This is due to the fact that Porto's industrial sector was very large but its productivity levels were below the national average. This

situation shows that Porto is specialized in relatively backward industries, such as the textile industry. Porto, until 1980, was the largest industrial region of Portugal both in absolute and in relative terms and it is particularly striking that scale economies and agglomeration effects did not, in fact, appear here.

The case of Lisbon is different, because both industry mix and productivity effects contributed to Lisbon's higher level of GDP per worker. Setúbal is the third region in terms of GDP per worker above the average until 1980. The process of structural change in this region advanced with a very similar timing to the situation at national level, whereas sector productivities were almost always above the national average. In contrast with the case of Porto, then, Setúbal's success would be explained by productivity effects alone.

The remaining regions are below the GDP per worker national average and can also be classified in three different groups according to their main driving divergence force. Aveiro, Braga, Coimbra and Faro's divergence is mainly explained by productivity effects. Beja, Bragança, Leiria, Portalegre, Santarém and Vila Real's divergence is mainly due to their industry mix. In the remaining regions, Castelo Branco, Évora, Guarda and Viana do Castelo and Viseu, both factors play a significant role.

5.5.- Conclusions

Regional inequality in Portugal followed an inverted U-curve with a turning point in 1970. The ranking of regional per capita income was quite stable over time, although the distance between the top and the bottom regions followed the trend in the evolution of regional inequality closely. In order to see the causes behind the evolution of regional inequality, some exercises were carried out. The evolution of the Krugman Index (SI) shows that regional specialization also increased until 1970 and decreased thereafter. In 1970, the Portuguese regions achieved maximum heterogeneity in terms of their productive structure. From another perspective, the location quotients (LQ) depicted the same process, showing that the majority of Portuguese regions de-industrialized up to 1970, in the period of highest degree of aggregate national industrialization. The strong correlation between the share of regional industrial and service sectors and relative productivity levels points to the existence of scale economies. This relation holds in most Portuguese regions,

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in the sense that both regional productivity and productive structure pushed regional per capita GDP in the same direction, above or below the mean per capita income.

The reasons behind the evolution of regional inequality also explain the delay in the peak of the inverted U-curve that we observed in the case of Portugal. First of all, a large part of the increase of the regional inequality is explained by the impact of agglomeration economies in the most developed regions, in a context of the intense productive specialization, accompanied by productivity gains, especially in the industry and the service sectors. This process was favored by the home market effect during the internationalization of the Portuguese economy, as Buyst (2011) showed for Belgium. Secondly, the observed inequality pattern can be explained by the differences of the industrial productivity among provinces, and the difficulties that the more traditional industrial and agricultural sectors experienced in their attempts to modernize. Thirdly, the expansion of the service sector, after 1970, led the reduction in regional inequality.

Portugal thus highlights a comparable case of the evolution of regional inequality in Europe. The major difference was in terms of the late peak of inequality levels registered up to 1980, which may be explained by the fact that it was a peripheral economy lagging behind the rest of Europe in many indicators, including the one analyzed in the present paper.[13]

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[13] For the analysis of regional inequality trends within the Iberian Peninsula, see Tirado and Badia-Miró (2012).

Appendix 5.1 –Indexes on regional specialization

Table A.5.1.1 - Krugman Index										
	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980
Aveiro	0.218	0.201	0.255	0.239	0.261	0.283	0.382	0.492	0.556	0.474
Beja	0.199	0.206	0.207	0.210	0.218	0.252	0.329	0.383	0.456	0.373
Braga	0.210	0.230	0.241	0.251	0.264	0.286	0.396	0.447	0.527	0.517
Bragança	0.298	0.260	0.243	0.254	0.268	0.298	0.332	0.447	0.556	0.469
Castel Branco	0.236	0.206	0.210	0.213	0.218	0.244	0.271	0.303	0.357	0.320
Coimbra	0.203	0.194	0.208	0.203	0.208	0.230	0.288	0.338	0.387	0.338
Évora	0.239	0.227	0.244	0.231	0.224	0.235	0.271	0.319	0.370	0.323
Faro	0.214	0.207	0.230	0.207	0.200	0.230	0.249	0.292	0.368	0.383
Guarda	0.205	0.208	0.225	0.230	0.231	0.245	0.290	0.341	0.396	0.366
Leiria	0.203	0.197	0.207	0.204	0.208	0.223	0.253	0.300	0.376	0.349
Lisboa	0.834	0.851	0.861	0.865	0.875	0.882	0.883	0.904	0.884	0.675
Portalegre	0.246	0.205	0.216	0.207	0.215	0.233	0.275	0.329	0.403	0.347
Porto	0.513	0.578	0.614	0.645	0.681	0.718	0.763	0.789	0.768	0.544
Santarém	0.200	0.192	0.208	0.203	0.201	0.221	0.248	0.302	0.365	0.323
Setúbal	0.293	0.290	0.340	0.318	0.297	0.394	0.432	0.520	0.620	0.515
Viana do Castelo	0.326	0.456	0.276	0.274	0.273	0.284	0.250	0.301	0.445	0.398
Vila Real	0.404	0.310	0.310	0.306	0.299	0.305	0.321	0.442	0.501	0.482
Viseu	0.259	0.246	0.257	0.260	0.259	0.272	0.289	0.363	0.438	0.432
Portugal	0.294	0.293	0.297	0.296	0.300	0.324	0.362	0.423	0.487	0.424
Source: Figures come from Appendix 2.										

Table A.5.1.2 - Location Quotients Employment										
	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980
Aveiro	0.909	1.000	1.084	1.073	1.154	1.206	1.327	1.464	1.442	1.372
Beja	0.882	0.734	0.874	0.808	0.711	0.584	0.436	0.436	0.372	0.579
Braga	0.984	1.154	1.096	1.134	1.183	1.214	1.413	1.368	1.419	1.440
Bragança	0.566	0.577	0.599	0.553	0.490	0.468	0.397	0.373	0.284	0.488
Castel Branco	1.170	1.045	0.949	0.960	0.979	1.013	0.940	0.884	0.851	0.929
Coimbra	0.908	0.893	0.839	0.804	0.762	0.755	0.750	0.768	0.792	0.858
Évora	0.749	0.775	0.706	0.689	0.671	0.666	0.525	0.558	0.600	0.709
Faro	0.688	0.746	0.749	0.763	0.778	0.932	0.782	0.765	0.740	0.710
Guarda	0.962	0.816	0.742	0.729	0.715	0.665	0.592	0.533	0.617	0.762
Leiria	0.709	0.755	0.723	0.739	0.759	0.768	0.828	0.868	0.993	1.079
Lisboa	1.604	1.579	1.503	1.442	1.363	1.208	1.121	1.095	0.946	0.831
Portalegre	0.806	0.790	0.814	0.744	0.649	0.631	0.502	0.504	0.456	0.629
Porto	1.888	1.843	1.720	1.730	1.747	1.769	1.761	1.652	1.524	1.322
Santarém	0.745	0.841	0.722	0.718	0.721	0.763	0.715	0.784	0.835	0.925
Setúbal	0.918	0.957	1.106	1.116	1.113	1.379	1.338	1.311	1.216	1.135
Viana do Castelo	0.505	0.062	0.580	0.579	0.570	0.518	0.685	0.713	0.561	0.739
Vila Real	0.417	0.464	0.463	0.432	0.392	0.427	0.406	0.362	0.350	0.500
Viseu	0.707	0.637	0.613	0.575	0.528	0.514	0.516	0.472	0.465	0.616
C.V.	0.405	0.45	0.366	0.38	0.407	0.428	0.48	0.479	0.484	0.339
Source: Figures come from Appendix 2.										

Table A.5.1.3 - Location Quotients GVA									
	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980
Aveiro	0.813	0.861	1.002	1.223	1.207	0.946	1.475	1.544	1.393	1.485
Beja	0.669	0.575	0.705	0.813	0.624	0.560	0.428	0.403	0.305	0.440
Braga	1.215	1.387	1.288	1.214	1.232	0.953	1.328	1.286	1.421	1.552
Bragança	0.605	0.607	0.628	0.767	0.600	0.434	0.489	0.290	0.996	0.734
Castel Branco	1.034	0.914	0.859	1.161	1.053	0.901	1.236	0.877	0.890	0.759
Coimbra	0.667	0.711	0.659	0.718	0.653	0.690	0.418	0.433	0.491	0.892
Évora	0.667	0.711	0.659	0.718	0.653	0.690	0.418	0.433	0.491	0.892
Faro	0.726	0.796	0.802	1.052	0.963	0.891	0.570	0.558	0.458	0.690
Guarda	0.856	0.750	0.705	0.875	0.786	0.637	0.489	0.406	0.697	0.689
Leiria	0.692	0.765	0.753	0.962	0.955	0.776	0.958	0.993	1.087	1.082
Lisboa	1.366	1.327	1.308	1.010	1.156	1.294	1.078	1.060	0.875	0.808
Portalegre	0.487	0.515	0.549	0.706	0.613	0.693	0.380	0.382	0.520	0.620
Porto	1.797	1.650	1.561	1.077	1.169	1.383	1.335	1.206	1.149	1.171
Santarém	0.677	0.799	0.723	0.869	0.783	0.712	0.664	0.872	0.830	0.865
Setúbal	0.995	1.054	1.207	1.530	1.597	1.101	1.519	1.425	1.598	1.295
Viana do Castelo	0.434	0.055	0.501	0.576	0.593	0.528	0.677	0.646	0.520	0.877
Vila Real	0.527	0.560	0.559	0.628	0.477	0.392	0.503	0.323	0.572	0.601
Viseu	0.666	0.597	0.586	0.783	0.623	0.531	0.574	0.515	0.422	0.734
Source: Figures come from Appendix 2.									

Table A.5.1.4 – Differences in regional incomes attributable to industry-mix and productivity																		
1890																		
	Aveiro	Beja	Braga	Brnça	CB	Coim	Évora	Faro	Guard	Leiria	Lisboa	Portal	Porto	Santar	Set	VC	VR	Viseu	Port
Distribution of labour (percentage)																		
Agriculture	70	67	68	78	65	64	62	65	67	67	25	60	43	67	56	80	84	75	62
Industry	17	16	18	10	21	17	14	13	18	13	29	15	35	14	17	9	8	13	18
Services	13	16	14	12	14	19	25	22	15	20	45	25	22	20	27	11	9	12	20
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
GDP per worker (Million PTE)																		
Agriculture	4.47	4.34	3.70	4.72	3.32	4.21	4.72	3.57	4.21	4.34	5.10	4.08	3.83	4.08	4.08	3.70	4.59	3.96	4.13
Industry	5.73	5.17	7.93	7.76	4.88	5.98	7.43	6.69	6.06	6.80	10.42	4.43	7.91	6.81	9.56	4.86	8.08	5.27	7.36
Services	10.35	12.56	10.82	14.50	10.82	10.26	12.90	10.04	12.69	10.69	13.46	12.60	12.12	13.90	13.46	12.77	11.43	9.31	12.08
Total	5.46	5.82	5.48	6.19	4.71	5.67	7.11	5.41	5.81	5.94	10.44	6.25	7.09	6.39	7.53	4.83	5.45	4.77	6.27
Industry mix	**5.73**	**5.96**	**5.85**	**5.41**	**5.94**	**6.20**	**6.54**	**6.31**	**5.89**	**6.15**	**8.67**	**6.58**	**7.02**	**6.14**	**6.81**	**5.32**	**5.07**	**5.51**	**6.27**
Percentage attributable to																		
Industry-mix	-10.0	-5.5	-7.8	-14.0	-7.1	-1.4	3.7	0.6	-6.6	-2.1	22.9	5.0	10.5	-2.1	7.2	-19.7	-22.1	-16.1	0.0
Productivity-effect	-4.9	-2.3	-6.7	12.7	-26.2	-9.3	8.1	-16.7	-1.4	-3.6	17.0	-5.3	1.0	4.0	9.5	-10.3	7.1	-15.4	0.0
Source: Figures come from Appendix 2.																		

Table A.5.1.4 – Differences in regional incomes attributable to industry-mix and productivity (cont.)																		
								1930										
	Aveiro	Beja	Braga	Brnça	CB	Coim	Évora	Faro	Guard	Leiria	Lisboa	Portal	Porto	Santar	Set	VC	VR	Viseu	Port
								Labour										
Agriculture	57	69	57	73	63	62	62	64	70	67	20	64	30	65	53	74	75	73	54
Industry	22	14	23	9	19	15	13	15	14	15	26	13	34	14	21	11	8	10	19
Services	21	17	21	17	18	23	25	21	16	18	54	24	36	21	25	15	18	17	27
	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
						GDP per worker (Million PTE)													
Agriculture	8.23	7.48	6.18	8.29	7.07	8.04	7.88	6.91	7.67	8.10	8.93	7.20	7.38	7.68	9.51	7.89	7.96	7.17	7.69
Industry	12.11	8.93	10.12	14.51	11.33	13.52	10.71	13.26	12.90	15.87	17.44	10.58	10.54	13.03	25.37	11.00	13.50	10.80	13.32
Services	11.44	12.77	11.61	14.75	12.77	14.82	12.01	12.48	16.97	15.84	20.46	14.90	20.88	15.87	17.50	12.34	13.55	8.24	16.82
Total	9.77	8.59	8.20	9.99	8.89	10.40	9.28	9.04	9.89	10.64	17.35	9.45	13.29	10.12	14.92	8.92	9.36	7.73	11.24
Industry mix	**10.88**	**10.03**	**10.86**	**9.79**	**10.38**	**10.61**	**10.70**	**10.45**	**9.94**	**10.17**	**14.06**	**10.56**	**12.87**	**10.37**	**11.20**	**9.72**	**9.71**	**9.82**	**11.24**
						Percentage attributable to													
Industry-mix	-3.7	-14.1	-4.7	-14.5	-9.7	-6.1	-5.8	-8.7	-13.2	-10.1	16.3	-7.2	12.2	-8.6	-0.3	-17.0	-16.3	-18.4	0.0
Productivity-effect	-11.3	-16.8	-32.4	2.0	-16.7	-2.0	-15.3	-15.7	-0.5	4.4	18.9	-11.7	3.2	-2.4	25.0	-8.9	-3.8	-27.2	0.0
Source: Figures come from Appendix 2.																		

Table A.5.1.4 – Differences in regional incomes attributable to industry-mix and productivity (cont.)																		
1970																		
	Aveiro	Beja	Braga	Brnça	CB	Coim	Évora	Faro	Guard	Leiria	Lisboa	Portal	Porto	Santar	Set	VC	VR	Viseu	Port
Labour																		
Agriculture	27	66	33	72	50	42	51	45	61	44	8	59	12	43	21	65	69	65	32
Industry	49	13	48	10	29	27	20	25	21	34	32	15	52	28	41	19	12	16	34
Services	24	21	19	18	22	32	28	30	19	23	60	26	37	28	38	16	19	19	34
	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
GDP per worker (Million PTE)																		
Agriculture	47.44	46.40	32.08	29.61	35.92	34.98	50.28	28.69	31.36	39.44	63.49	45.94	49.80	50.32	49.79	20.84	26.31	31.77	39.00
Industry	82.83	54.14	69.62	247.93	72.36	79.68	54.45	36.20	63.69	84.93	145.65	73.04	71.72	77.34	174.65	35.63	84.20	43.97	94.90
Services	54.50	63.54	51.40	52.97	68.80	61.34	51.65	78.00	61.05	63.31	117.16	43.82	83.66	58.52	54.39	58.43	61.99	52.01	84.58
Total	66.37	51.04	53.81	54.79	53.50	55.29	51.52	45.30	43.64	60.09	121.97	49.58	73.60	60.28	102.88	29.73	39.84	37.53	73.45
Industry mix	**77.12**	**55.79**	**74.59**	**52.57**	**64.92**	**68.38**	**63.32**	**66.60**	**59.15**	**68.03**	**84.23**	**59.34**	**84.64**	**67.71**	**79.34**	**56.98**	**54.16**	**56.44**	**73.45**
Percentage attributable to																		
Industry-mix	5.5	-34.6	2.1	-38.1	-15.9	-9.2	-19.7	-15.1	-32.8	-9.0	8.8	-28.5	15.2	-9.5	5.7	-55.4	-48.4	-45.3	0.0
Productivity-effect	-16.2	-9.3	-38.6	4.1	-21.3	-23.7	-22.9	-47.0	-35.6	-13.2	30.9	-19.7	-15.0	-12.3	22.9	-91.6	-35.9	-50.4	0.0
Source: Figures come from Appendix 2.																		

Table A.5.1.4 – Differences in regional incomes attributable to industry-mix and productivity (cont.)																		
1980																		
	Aveiro	Beja	Braga	Brnça	CB	Coim	Évora	Faro	Guard	Leiria	Lisboa	Portal	Porto	Santar	Set	VC	VR	Viseu	Port
Labour																		
Agriculture	19	42	19	52	32	25	35	25	44	27	4	36	8	27	10	47	53	50	19
Industry	54	23	56	19	36	34	28	28	30	42	33	25	52	36	45	29	20	24	39
Services	27	35	25	29	31	41	38	47	26	30	63	39	41	37	46	24	27	26	42
	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
GDP per worker (Million PTE)																		
Agriculture	166.08	278.64	102.69	126.47	206.57	157.90	240.62	231.98	141.37	198.14	299.72	323.35	153.27	332.78	380.59	78.34	128.57	109.21	185.57
Industry	335.79	223.69	291.47	350.63	211.37	332.41	407.72	319.69	192.15	298.98	443.78	323.26	298.28	298.48	463.48	228.37	255.58	252.27	340.54
Services	408.55	390.65	391.66	375.16	398.05	397.83	371.41	412.67	385.89	424.14	500.49	366.53	451.90	361.78	389.50	399.14	375.00	405.55	442.58
Total	322.11	305.31	280.78	241.72	268.61	315.55	336.35	341.51	220.48	309.39	473.58	340.34	349.43	331.08	421.58	199.71	220.98	219.64	353.47
Industry mix	**337.5**	**310.6**	**336.7**	**290.0**	**323.0**	**343.7**	**325.5**	**349.8**	**299.1**	**329.1**	**398.5**	**325.1**	**370.0**	**336.9**	**372.7**	**292.9**	**286.4**	**288.8**	**353.5**
Percentage attributable to																		
Industry-mix	-4.9	-14.0	-6.0	-26.3	-11.4	-3.1	-8.3	-1.1	-24.7	-7.9	9.5	-8.3	4.7	-5.0	4.6	-30.3	-30.4	-29.4	0.0
Productivity-effect	-4.8	-1.7	-19.9	-20.0	-20.2	-8.9	3.2	-2.4	-35.7	-6.4	15.8	4.5	-5.9	-1.8	11.6	-46.7	-29.6	-31.5	0.0
Source: Figures come from Appendix 2.																		

Reconstruction of the Regional GDP of Portugal, 1890 – 1980.[14]

A.5.2.1.- Introduction

This appendix presents new estimates of Portuguese regional GDP from 1890 to 1950 and includes the official data for the *Historical Division* of districts from 1963 to 1980. From 1990 onwards, official data are provided at the NUTS-3 and NUTS-2 levels. These new data series help to characterize the regional process of growth and its pattern of geographical inequality, while this incorporation of a spatial component provides a better understanding of Portuguese development in the long run. Additionally, these new series, in conjunction with similar reconstructions undertaken in other European countries, facilitate the study of economic growth and industrialization from a regional perspective, that is, one that has often been "buried" within the national history and which may be able to reveal interesting new findings.

Regional estimates of GDP are calculated for Portugal's 18 continental historical districts. This new series are then associated with the regions at the NUTS-2 level in accordance with the classification provided in Table A.5.2.1. We have preferred to maintain the *historical division* because the regions at the NUTS-2 level are very heterogeneous in economic terms and relevant information might have been lost by aggregating the regional units.

This appendix is structured as follows. The next section outlines the methodology used to estimate Portuguese regional GDP. The sources used for reconstructing the dataset are described in section 3. Section 4 discusses the spatial unit of analysis. In section 5 we report the results of the robustness test run on these new series. Finally, section 6 provides new homogenised spatial data and associates them with official estimates for 1960 onwards.

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[14] This appendix has been published as a working paper in Badia-Miró, Guilera and Lains (2012).

Table A.5.2.1 - Administrative division equivalences			
	NUTS-1	NUTS-2	Historical Division
	Portugal	Norte	Viana do Castelo
			Braga
			Porto
			Vila Real
			Bragança
			Viseu
			Guarda
		Centro	Aveiro
			Coimbra
			Leiria
			Santarém
			Castel Branco
		Lisboa	Lisboa
			Setúbal
		Alentejo	Évora
			Portalegre
			Beja
		Algarve	Faro

A.5.2.2.- Methodology

Two strategies are adopted in this reconstruction of Portuguese regional GDP. When regional production data are available, estimates are made directly. When they are not, we apply the Geary and Stark (2002) method used to calculate the regional GDP of the four countries of the United Kingdom before World War I.[15] For the Portuguese case, gross value added (GVA) figures are built for agriculture, industry and services from 1890 onwards.

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[15] This method has also been used for the historical reconstruction of regional GDP in a range of European countries. See, for example, Crafts (2005) for England, Buyst (2010) for Belgium, Rosés, Martínez-Galarraga and Tirado-Fabregat (2010) for Spain and Enflo, Henning and Schön (2010) for Sweden.

These are expanded to include the mining, construction and electricity sectors after 1920. From 1953 onwards official figures become available. Despite this, regional GDP for 1950 and 1960 is also estimated here to check the robustness of our approximation.

Regional GDP is constructed from the aggregation of the regional GDP of the sector estimates according to,

$$GDP_{it} = GVAA_{it} + GVAI_{it} + GVAS_{it} \qquad t = 1890 \qquad (1)$$

where GVA is the gross value added for each i region, and A, I and S are the Agricultural, Industrial and Services sectors and,

$$GDP_{it} = GVAA_{it} + GVAM_{it} + GVAI_{it} + GVAC_{it} + GVAE_{it} + GVAS_{it}$$

$$t \geq 1920 \qquad (2)$$

where M, C and E are the Mining, Construction and Electricity sectors.

This strategy ensures the use of the best basic information available in each case.

For the Portuguese case, regional mining production data (or a proxy thereof) are available after 1920 (paid regional taxes and production value). We also have data on Electricity and Gas production after 1930. In each case we assign the country GDP of these sectors to each region as a percentage of the country total for every variable or proxy used.

When no production data or other proxies are available, we follow the Geary and Stark (2002) method. In this case, National GDP (in current prices and at factor costs) is distributed between the different regions. National GDP is defined as:

$$GDP = \sum_i GDP_i \qquad (3)$$

where GDP_i is the GDP of region i which is in turn defined as

$$GDP_i = \sum_j ava_{ij} L_{ij} \qquad (4)$$

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where ava$_{ij}$ is the average value-added per worker in region *i* in sector *j* and L$_{ij}$ is the corresponding number of workers. If we assume that the differences in regional GDP are related to the differences in the productivity of economic sectors among regions and, at the same time, that this is captured by the differences in nominal wages, we can transform (4) as:

$$GDP_i = \sum_j \left[gdp_j \beta_j \left(\frac{w_{ij}}{w_j} \right) \right] L_{ij} \qquad (5)$$

where w$_{ij}$ is the wage paid in region *i* in sector *j*, w$_j$ is the national average wage in that sector and β is a scalar which preserves the relative regional differences but scales the absolute levels. As a result, the addition of GDP estimates for each sector at the regional level is equal to the sector estimates at the national level (from official sources).

A.5.2.3.- Sources and Data

In this section we describe in detail the sources used to estimate Portuguese regional GDP. These sources varied over time and from one year to the next. The choice of data and methodology were determined by the best available option. This section is structured chronologically, beginning with the first GDP estimate for 1890 and concluding with that for 1960. For each year and sector we provide detailed information on both the method chosen to estimate regional GDP and on the sources used. The information needed to estimate the series consists of GDP for different sectors at the national level, economic active population and nominal wages for different sectors and regions, and production data at the regional level. The rest of this section describes the origin of this data.

The final outcome comprises an estimate of Portuguese regional GDP for the years 1890, 1920, 1930, 1940, 1950 and 1960. For 1890, GDP for each district is broken down into three economic sectors, and from 1920 onwards into 15 sectors.

A.5.2.3.1.- 1890 estimates

The Portuguese GDP is obtained from Lains (2003). The reconstruction of regional GDP data is obtained using the Geary-Stark method. Economic Active Population (EAP) comes from Nunes (1989). This classifies Portuguese EAP into eight sectors. We take the EAP for the three main economic sectors: Agriculture, Industry and Services. Wages from Agriculture are for the year 1912 and come from *Salários dos trabalhadores rurais. Ano de 1935. Instituto Nacional de Estatística (INE)*. This source provides wages for each Portuguese district. Each district wage is the average of wages paid for a number of different farming tasks. We include only male wages. Industrial wages come from *Inquérito Industrial* of 1890 (*INE*). The industrial wage for each district is the non weighted wage for all the industrial sectors provided by the source for the main city in that district.[16] In the absence of direct and reliable data on services, civil construction was taken as reference.[17] These wages are taken from the chapter entitled *Indústria* in the *Anuário Estatístico* of 1884.

A.5.2.3.2.- 1920 estimates

From 1920 on, estimations improve notably. The Portuguese GDP is obtained from Batista, Martins and Reis (1997). The reconstruction of the regional GDP data is obtained using the Geary-Stark method.

Economic Active Population comes from Nunes (1989). This classifies Portuguese EAP into eight economic sectors: *Agriculture and fishing; Mining; Manufacture; Construction; Electricity and gas; Transport and communications; Trade; Public services*; and *Other services*. The EAP of the manufacturing sector is split into eight sectors according to the distribution of Industrial EAP in 1930. These eight industrial sectors are: *Food, beverages and tobacco; Textiles, clothing and footwear; Wood, cork and furniture; Paper and printing; Non-metallic mineral products; Chemicals; Metallurgy and electrical and transport equipment*; and *Other manufacturing*. In short, EAP is classified into 15 different sectors.

Wages for Agriculture are for the year 1921 and come from the chapter entitled *Indústria* in the *Anuário Estatístico (INE)* of 1921. This source provides wages for each Portuguese district. Each district wage is the average of wages

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[16] For Lisbon and Porto we consider just one district in each city.
[17] This proxy is also used by Rosés et al. (2010) in their reconstruction of the regional GDP for Spain. Geary and Stark (2002), however, consider a weighted average of the industry and agriculture wage series.

paid for a number of different farming tasks. We include only male wages. Wages for all other sectors[18] are for 1921 and come from the chapter entitled *Indústria* in the *Anuário Estatístico* of 1921. This source classifies workers into 28 economic sectors. These are aggregated to coincide with the sectors provided by Nunes (1989). This was carried out using the non-weighted average of the different EAP sectors contained in each of Nunes' sectors.

A.5.2.3.3.- 1930 estimates

The Portuguese GDP is obtained from Batista et al. (1997). The reconstruction of the regional GDP data is obtained using the Geary-Stark method.

Economic Active Population comes from Nunes (1989). This classifies Portuguese EAP into 15 economic sectors: *Agriculture and fishing; Mining; Food, beverages and tobacco; Textiles, clothing and footwear; Wood, cork and furniture; Paper and printing; Non-metallic mineral products; Chemicals; Metallurgy and electrical and transport equipment;* and *Other manufacturing, Construction; Electricity and gas; Transport and communications; Trade; Public services;* and *Other services.*

Wages from agriculture come from the chapter entitled *Produçao, consumo e custo da vida* in the *Anuário Estatístico (INE)* of 1930. This source provides wages for each Portuguese district. Each district wage is the average of wages paid for a number of different farming tasks. We include only male wages. For other sectors[19], wages used are from 1930 and come from the chapter entitled *Produçao, consumo e custo da vida* in the *Anuário Estatístico* of 1930. This source classifies workers into 28 economic sectors. These are aggregated to coincide with the sectors provided by Nunes (1989). This was carried out using the non-weighted average of the different EAP sectors contained in each of Nunes' sectors.

We completed these results by adopting the production strategy approach to Mining data. To do so, we use Mining Tax (*Imposto proporcional de minas*) statistics. This 2% proportional tax was charged on the extraction of

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[18] Except Mining
[19] Except Mining and Electricity and Gas

minerals,[20] and the statistics provide this information at the district level. Thus, we proxy mining production through the taxes paid at the district level. Mining tax statistics are taken from the chapter entitled *Produçao, consumo e custo da vida* in the *Anuário Estatístico (INE)* of 1930.

We also obtained production data for the *Electricity and Gas* sector. In the case of electricity we consider production in kW by district (the sum of thermoelectric and hydroelectric production) taken from the chapter entitled *Produçao, consumo e custo da vida* in the *Anuário Estatístico (INE)* of 1930.

A.5.2.3.4.- 1940 estimates

The Portuguese GDP is obtained from Batista et al. (1997). The reconstruction of the regional GDP data is obtained using the Geary-Stark method.

Economic Active Population comes from Nunes (1989). This classifies Portuguese EAP into 15 economic sectors: *Agriculture and fishing; Mining; Food, beverages and tobacco; Textiles, clothing and footwear; Wood, cork and furniture; Paper and printing; Non-metallic mineral products; Chemicals; Metallurgy and electrical and transport equipment;* and *Other manufacturing, Construction; Electricity and gas; Transport and communications; Trade; Public services;* and *Other services.*

Wages from agriculture come from the chapter entitled *Produçao e consumo* in the *Anuário Estatístico (INE)* of 1940. This source provides wages for each Portuguese district. Each district wage is the average of wages paid for a number of different farming tasks. We include only male wages. For the other sectors[21], wages used are from 1943 and come from *Estatísticas da produçao industrial* of 1943 (*INE*). This source classifies workers into 16 economic sectors. These are aggregated to coincide with the sectors provided by Nunes (1989). This was carried out using the non-weighted average of the different EAP sectors contained in each of Nunes' sectors.

We adopt the production approach to Mining data. The total mining production per district is taken from the chapter entitled *Produçao e consumo* in the *Anuário Estatístico (INE)* of 1940. For the *Electricity and Gas* sector we

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[20] See Nunes (2002)

[21] Except Mining and Electricity and Gas

consider electricity production (in kW) by district (the sum of thermoelectric and hydroelectric production) taken from the chapter entitled *Produçao e consumo* in the *Anuário Estatístico (INE) of* 1940.

A.5.2.3.5.- 1950 estimates

The Portuguese GDP is obtained from Batista et al. (1997). The reconstruction of the regional GDP data is obtained using the Geary-Stark method.

Economic Active Population comes from Nunes (1989). This classifies Portuguese EAP into 15 economic sectors: *Agriculture and fishing; Mining; Food, beverages and tobacco; Textiles, clothing and footwear; Wood, cork and furniture; Paper and printing; Non-metallic mineral products; Chemicals; Metallurgy and electrical and transport equipment;* and *Other manufacturing, Construction; Electricity and gas; Transport and communications; Trade; Public services;* and *Other services.*

Wages for all sectors[22] are from 1950 and come from *Estatística das Sociedades* of 1950 (*INE).* This source classifies workers into 29 economic sectors. These are aggregated to coincide with the sectors provided by Nunes (1989). However, in contrast with the previous ways of proceeding, we consider a weighted average based on the number of workers in each sector provided by *Estatística das Sociedades* to obtain the data for the GDP sectors.[23]

We adopt the production approach to Mining data. The total mining production per district is taken from the chapter entitled *Produçao e consumo* in the *Anuário Estatístico (INE)* of 1950. For the *Electricity and Gas* sector we consider electricity production (in kW) by district (the sum of thermoelectric and hydroelectric production) taken from the chapter entitled *Produçao e consumo* in the *Anuário Estatístico* (INE) of 1950.

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[22]Except Mining and Electricity and Gas

[23] For 1890, 1920, 1930 and 1940, wage data are only available for certain sectors and we do not have data regarding the number of workers for each sector. For this reason, we had to consider non-weighted wages in the earlier estimations.

A.5.2.3.6.- 1960 estimates

The Portuguese GDP is obtained from Pinheiro et al. (1997). The reconstruction of the regional GDP data is obtained using the Geary-Stark method.

Economic Active Population comes from Nunes (1989). This classifies Portuguese EAP into 15 economic sectors: *Agriculture and fishing; Mining; Food, beverages and tobacco; Textiles, clothing and footwear; Wood, cork and furniture; Paper and printing; Non-metallic mineral products; Chemicals; Metallurgy and electrical and transport equipment;* and *Other manufacturing, Construction; Electricity and gas; Transport and communications; Trade; Public services;* and *Other services.*

Wages for all sectors[24] come from *Estatística das Sociedades* of 1960 *(INE).* This source classifies workers into 39 economic sectors. These are aggregated to coincide with the sectors provided by Nunes (1989). This is carried out using a weighted average based on the number of workers in each sector provided by *Estatística das Sociedades.*

We adopt the production approach to Mining data. The total mining production per district is taken from the chapter entitled *Produçao e consumo* in the *Anuário Estatístico* (*INE*) of 1960. For the *Electricity and Gas* sector we consider electricity production (in kW) by district (the sum of thermoelectric and hydroelectric production) taken from the chapter entitled *Produçao e consumo* in the *Anuário Estatístico* (*INE*) of 1960.

A.5.2.3.7.- Official sources from 1950 to 1980

Official efforts to obtain regional GDP estimations in Portugal began at a very early date. Abreu (1969), an official INE publication, provides data for the historical districts for 1953 and 1963 in three sectors (agriculture, industry and services). For 1970, da Conceição (1975), likewise an INE publication, provides data for eight sectors in the historical districts. For 1980 and 1990 we use the data at the NUTS-2 level provided by INE (1991a, 1991b). Both publications offer disaggregated data for 38 sectors. For 1995 onwards, EUROSTAT provides regional data based at the NUTS-2 and NUTS-3 levels.

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[24] Except Mining and Electricity and Gas

A.5.2.3.8.- Official sources from 1990 onwards

To obtain homogenised data for estimates of Portuguese regional GDP between 1890 and 2000, we have to aggregate the data for the historical districts at the NUTS-2 level. As mentioned, EUROSTAT only provides data at the level of the NUTS regions. The problem arises when it is not possible to transform the data from the *Historical Division* to the equivalent NUTS-3 division, and the only possible solution is to aggregate regional data at a larger scale (NUTS-2).

A.5.2.4.- Unit of analysis

Our analysis of the evolution of regional GDP levels in Portugal could be biased as a result of the unit of analysis we select. Certainly, the reconstruction of the historical data must be comparable to those undertaken in other countries, but we also have to consider the economic sense of the selected spatial unit in each case study. EUROSTAT defines various levels of spatial analysis - NUTS-1, NUTS-2 and NUTS-3 - for all the regions of Europe. These divisions follow administrative, geographic and theoretical economic criteria and allow the realization of comparable studies.[25] However, in Portugal, administrative divisions have changed over time. The administrative division that we refer to here as the *Historical Division* was superseded by the NUTS division, but the correspondence between the two is not exact. This means that the reconstruction we attempt here is not as straightforward as those conducted in other states (Spain, France and the United Kingdom, for example) that present relatively stable administrative divisions in the long run

In Portugal, according to EUROSTAT, NUTS-1 corresponds to the whole of the country, while there are there are five NUTS-2 continental divisions. However, the latter make little economic sense as they are the sum of sub-regions with very different characteristics. Typically, large transversals regions fail to differentiate rich, developed regions from their poorer neighbours and, as such, ignore essential economic differences (which became more marked

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[25] For more information see:
http://ec.europa.eu/eurostat/ramon/nuts/home_regions_en.html

during the twentieth century). These disparities are particularly evident among coastal regions with an orientation towards the international market, and inland regions that are usually less developed and more dependent on the agrarian sector. NUTS-3 regions, on the other hand, are smaller, more recent, administrative divisions without any historical counterparts. The NUTS-3 units are smaller than the units in the historical division and, therefore, it is impossible to rebuild historical units from the sum of regions at the NUTS-3 level. For this reason, here, we have chosen the historical division for reconstructing the regional GDP (given that they make greater economic and political sense). At the same time, the historical division allows us to build aggregated data to the NUTS-2 level for the purpose of making international comparisons (see Table A.5.2.1).

It should be stressed that that we do not provide regional estimations for non continental regions because GDP data before 1953 only included continental Portugal. Given that the methodology used to estimate regional GDP requires an aggregate GDP figure, it has not been possible to provide estimates for the non continental regions.

A.5.2.5.- Robustness

To check the robustness of our figures we compare our estimates for 1950 with the official data for 1953. In order to do this, we consider the weight of each region in the GDP of the whole country. Despite the small number of observations, a simple, non-parametric rank correlation test between the two columns shows a high degree of similarity (ϱ - Spearman = 0.92). This test, therefore, points to the reliability of the new series described here. On the other hand, the result of the rank correlation test between our 1960 estimates and the official data for 1963 is weaker (ϱ - Spearman = 0.87). This may well reflect the problems encountered when applying the method of estimation to more recent periods. Indeed, Geary and Stark (2002) point out that the poorest estimations are obtained for current data because the link between regional differences in wages and in productivity became weak as the service sector increased its participation in the economy.

	1950	1953	1960	1963
Table A.5.2.2 – Robustness test				
Aveiro	5.40%	5.40%	4.3%	6.2%
Beja	3.27%	3.39%	0.6%	2.4%
Braga	4.86%	4.89%	2.9%	4.9%
Bragança	1.89%	1.80%	0.6%	1.6%
Castelo Branco	2.96%	3.18%	1.2%	2.6%
Coimbra	3.44%	4.18%	3.8%	3.9%
Évora	2.75%	3.01%	0.9%	2.4%
Faro	3.85%	3.01%	2.0%	2.6%
Guarda	2.51%	1.99%	2.0%	1.8%
Leiria	4.04%	4.14%	9.2%	3.8%
Lisboa	28.84%	27.68%	37.9%	31.0%
Portalegre	2.84%	2.61%	0.6%	1.9%
Porto	14.27%	15.03%	16.2%	16.3%
Santarém	5.44%	5.72%	5.5%	4.4%
Setúbal	4.56%	5.75%	5.9%	7.1%
Viana do Castelo	3.03%	2.04%	0.8%	1.7%
Vila Real	1.76%	2.50%	2.2%	2.2%
Viseu	4.30%	3.69%	3.2%	3.1%
Source: See text				

CONCLUSIONS

Income distribution is currently one of the most relevant topics both in the literature and in political and social terms. This thesis has aimed to answer how income has been distributed across space and among individuals in Portugal since the late nineteenth century onwards.

As has been indicated in the introductory chapter, two different factors have contributed to rescue income distribution from academic oblivion. On the one hand, the increase in income inequality in many countries since the 1980s has attracted a lot of public attention. On the other hand, new theoretical developments on the topic have contributed to change the dominant ideas on the impact of income inequality on economic growth. While this was traditionally considered as positive, during the last few decades a number of negative channels have been identified. As a result, income inequality has become an important issue in the economic research agenda.

This renewed interest in distributional issues has also challenged economic historians to extend the analysis of inequality to the past in order to allow longer-term studies. The scarcity of statistical information for the past has prompted researchers' creativity to develop new inequality indexes (such as top income shares, functional income distribution, the Extraction ratio, or the Wiliamson index), which allow tracing the evolution of inequality in the long term. In this thesis I have estimated a wide variety of inequality indices to track the evolution of Portuguese inequality from different perspectives, and thus obtain a complete characterization of the Portuguese distributive pattern.

The aforementioned indices are often used by historians as valid proxies of personal income inequality when household budget surveys are not available. However, this thesis has shown that, although all indices provide relevant information, they are not equivalent and may often evolve in opposite directions. In other words, the use of a partial inequality index as a proxy of personal income inequality may lead to biased conclusions. The Portuguese case clearly illustrates this problem, since the evolution of top income shares and overall personal income inequality clearly diverged in the long term. To be more precise, the Salazar regime would be an egalitarian period according to the evolution of top income shares, when it really was deeply regressive in distributional terms. This divergence does not reduce the value of partial

indices (such as top incomes). It instead shows that overall income inequality may increase due to income transfers which are not captured by those partial indicators.

Portugal constitutes an interesting study case for different reasons. Firstly, contemporary Portugal is one of the most unequal European countries. This thesis has shown that high inequality has not always been an intrinsic characteristic of the Portuguese society, but the outcome of the process of economic growth and modernization of the twentieth century. Secondly, Portugal has managed to evolve from a traditional agrarian economy to a modern and post-industrial one in a relatively brief period of time in comparative terms. This allows tracing the evolution of inequality during the whole process of structural change, something that is very rare in comparative terms. And, finally, the alternation of democratic and dictatorial regimes also allows analysing the distributional outcomes of different institutional settlements.

The introductory chapter briefly discusses the historical and economic literature on income distribution, focusing on the factors that may influence inequality, on the impact of inequality on economic growth and, finally, on the empirical sources and strategies that are usually applied in order to estimate long term income inequality. Chapter 1 also presents the main historical events that took place in Portugal over the twentieth century, and relates them to inequality, the object of study of this thesis. In this regard, although distributional issues have always been present in Portuguese historiography, considerations on this topic have often been based on qualitative evidence and very limited quantitative data, specially before the 1970s.

The main body of this thesis has analysed the evolution of inequality from different perspectives using a broad variety of approaches and indices. Chapters 2 to 4 focus on inequality among individuals and present estimates on top income and wealth shares, wage inequality and personal income inequality. Chapter 5, in turn (which is a joint work with Marc Badia-Miró from *Universitat de Barcelona* and Pedro Lains from the *Instituto de Ciências Sociais da Universidade de Lisboa*), focus on the regional perspective and present new estimates of Portuguese regional GDP that allow analysing the changes in the spatial distribution of economic activity over time.

To start with, Chapter 2 presents estimates of top income and wealth shares in Portugal from 1936 onwards. Top income shares literature has undoubtedly

represented a major breakthrough in the estimation of internationally comparable series on income distribution throughout the twentieth century. Those series have been estimated by using well-known fiscal sources. The novelty of this approach lies in the development of a new methodology to treat raw data and to produce robust and comparable series. In the Portuguese case, I have used the Portuguese Income and Estate Tax information, and have followed the standard methodology applied to estimate top income and wealth series. As was also common in other countries, the coverage of the Portuguese Income Tax was far from complete (only the richest individuals were subject to the tax). As a result, for the early years of the period under study I could only estimate the share of income of the top 1% of the total population, a percentage that increases to the top 10% from the 1970s onwards. On the other hand, the coverage of the estate tax was far more extensive and I have been able to estimate the top 10% wealth shares since 1936. Unfortunately, statistical information became too aggregated from 1982 onwards, which prevented the estimation of top wealth shares since the 1980s.

The series show that top income shares followed a U-curve with a turning point in the 1980s, whereas top wealth shares (which had very high levels: the top 10% wealth share amounted to between 63 and 91% of total wealth throughout the period) increased until the mid 1950s to decrease thereafter, until the early 1980s. The evolution of those indices would have been driven by the process of economic modernization and rapid economic growth of Portugal during the golden age of capitalism. In comparative perspective, the Portuguese experience seems to line up with the international pattern and, more concretely, with the Anglo-saxon countries, where top income shares declined until the 1980s to increase thereafter. As a consequence of this final increase of top income shares, the top 10% of the Portuguese population has captured most of the gains of economic growth from 1989 onwards, pointing to a strong regressive redistributive process that has been confirmed by the evolution of personal income inequality and the Extraction ratio in Chapter 4.

In Chapter 3 I redirect my focus to the bottom of the income distribution, by estimating an index on wage inequality that covers the period from the 1920s onwards. I estimate wage data for 16 economic sectors (9 of which are disaggregated into different categories). The estimation is based on a wide variety of Portuguese historical sources, whose original information has been adjusted in order to obtain homogeneous and time consistent series. The series show that wage inequality followed an N-curve that peaked in the early

1960s and reached its minimum in the mid 1980s. The series captures wage inequality either associated to wage differences between sectors or related to differences among skill categories, something that is not frequent in the international historical literature. According to the series, wage differences between sectors explain most of the evolution of wage inequality until the 1990s, when the skill premium became the main driving force of changes. The comparison of the Portuguese series of wage dispersion with other countries is problematic due to the partial character of most of the available series. Despite that, it seems that the right hand side of the Portuguese curve lines up to the international experience.

Literature discussing the causes of the recent upsurge of wage inequality in OECD countries is very abundant. The list of explanatory variables is wide and no consensus has been reached on the main causes of this phenomenon. In this context, Chapter 3 interprets the long-term evolution of Portuguese wage dispersion on the basis of an "Extended Kuznets' Curve" hypothesis, which is inspired by the classic Kuznets' Curve, but focusing on wage inequality and extending the analysis to embrace the post industrial period. This hypothesis, which would indicate (*caeteris paribus*) the likely evolution of wage inequality as an economy grows and modernizes, would predict that wage inequality would follow an N-curve during the transition from an agricultural economy to a post-industrial one. This prediction would be the result of a number of basic assumptions on the process of labour transition between sectors and skill levels, because relative wages are assumed to remain constant, as in the original Kuznets' framework. The "Extended Kuznets' Curve" hypothesis fits well with the Portuguese experience and also seems to fit with the recent upsurge of wage inequality during the post-industrial period in many developed countries. In fact, this hypothesis provides a rather simple answer to a complex phenomenon: wage inequality is increasing today because workers are becoming increasingly different. This same idea is behind the original formulation of the classic Kuznets Curve and may also be helpful to analyse the long term evolution of wage inequality.

After having looked at income inequality from the perspective of the top and the bottom of the distribution, Chapter 4 focuses on inequality among the whole Portuguese population. This chapter aims at presenting an estimate as close as possible to the concept of personal income inequality. In order to do it, I estimate Portuguese functional income distribution and, in a second stage, I introduce income dispersion among wage earners and capital and

landowners. Wage dispersion was based on the wage dataset presented in Chapter 3. As for income dispersion among businessmen and landowners, it was estimated on the basis of the amount of taxes paid by these individuals in the Land and Industrial taxes, which were proportional to incomes. This strategy, despite its limitations, would be the best alternative to approach personal income inequality in the long term, that is, since the 1920s onwards.

The results of this estimate are striking. Portuguese income inequality has increased in the long term, turning Portugal into one of the most unequal European countries today. Only during the 1940s and in the mid 1970s inequality decreased. In contrast with top income shares and wage inequality, the evolution of our estimate of personal income inequality is at odds with the distributional performance of most developed economies. Only after the 1980s, when inequality was increasing everywhere, Portugal followed the international pattern. However, it missed the strong egalitarian process that many countries experienced during the previous period.

In addition to inequality, my income dispersion database has allowed me to estimate various complementary indices. Income polarization fluctuated intensively during the period under study and peaked during some of the episodes of most serious social unrest in the history of twentieth century Portugal: the 1940s and the mid 1970s. The Extraction Ratio, which calculates the capacity of the economic elites to extract the economic surplus of an economy, increased very rapidly during the first half of the Salazar regime, to progressively decrease during the rest of the dictatorial period. Then, from the transition to democracy onwards the Extraction Ratio increased again, up to a level close to its historical maximums in the early twenty-first century. This final evolution, which is closely related to the boom of top income shares from the 1990s onwards, shows the magnitude of the regressive income transfers that define the Portuguese growth model as rather unbalanced against the worst-off.

One of the characteristics of the new Portuguese income inequality series is that it covers the whole process of transition from an agricultural to a post-industrial economy. In this context, the evolution of both income inequality and top income shares would be broadly consistent with the predictions of the Kuznets Curve hypothesis, although political factors and globalization forces are also essential to understand the Portuguese distributive pattern.

Finally, in Chapter 5 we analyse regional income inequality. In order to do it we estimate regional GDP for each one of the historical Portuguese districts from 1890 to 1960, when official data started being available. The methodology used to estimate regional GDP has consisted of collecting direct production data when it was possible and, in the remaining cases, using the indirect method proposed by Geary and Stark (2002). Our estimates follow therefore the same procedures as other series that have recently been produced for other European countries in historical perspective for comparative purposes. The results of this exercise shows that regional inequality increased up to 1970 and decreased thereafter, until 1980. This inverted-U curve has also been found in other countries. This evolution goes in the same line as the predictions anticipated by Williamson (1965) and also fits with the models of the New Economic Gerapphy. However, the Portuguese singularity lies in the relatively late turning point of the inverted U, which may be related to its relative economic backwardness compared with other European countries.

The new data also shows that, although regional pc GDP rankings were quite persistent, economic activity progressively shifted to the costal regions. The empirical exercises performed in the chapter indicate that a process of regional specialization and the de-industrialization of the most backward regions of the country are behind the rising regional inequality until the 1970s, when the situation was reversed. In the same vein, the existence of agglomeration economies seems to explain the relative success of the richest Portuguese regions.

To conclude, Portuguese fast economic growth over the twentieth century should be re-evaluated from the social point of view if we look inside the black box of income per capita. This thesis has enlightened this black box and the vision is rather negative. The fruits of economic growth have not trickled down to most of the population during most of the period studied. As a result most of the Portuguese have been largely excluded from the growing prosperity of the country.

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