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Labor income inequalities in Tunisia: an application of Pareto interpolations to labor income in Tunisia over the period 2003-2016

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*Author:*

Roxane ZIGHED

roxane.zighed@gmail.com

*Supervisor:*

Thomas PIKETTY

*Referee:*

Facundo ALVAREDO

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PARIS SCHOOL OF ECONOMICS  
ÉCOLE D'ÉCONOMIE DE PARIS

## Abstract

In this paper, we provide new estimates for the level of economic inequalities in Tunisia over the period 2003-2016. Using expenditure data for the years 2005 and 2010, we produce expenditure inequality estimates and confirm the existing literature, which finds low and decreasing levels of inequalities over the years 2000. Then, using completely new tabulated data on gross labor income declared to the Social Security between 2003 and 2016, we resort to generalized Pareto interpolations to recover the distribution of gross labor income by trimester, regime and gender. We find three main results. Firstly, the level of labor income inequalities substantially increased in pre-revolutionary Tunisia and decreased in post-revolutionary Tunisia. This goes against the existing literature that documented decreasing level of economic inequalities over that pre-revolutionary period. Secondly, the disaggregation of our results by regime highlights very different trends of inequalities in the private and in the public sector. The private sector was the main driver of this increase and decrease in inequalities. In contrast to that, inequalities steadily decreased all over the period in the public sector. Finally, the gender disaggregation of our results also highlights different trends for men and women. It reveals that the labor income distribution of men has a higher level of inequalities than the one of women, but that these levels have been converging due to the increase of inequalities for women over the period.

**JEL classification:** D63, H20, J31, N37

**Keywords:** Inequality, top shares, labor income, Tunisia

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## Acronyms

**CNSS:** National Fund of Social Security (Caisse Nationale de Sécurité Sociale)

**CNRPS:** National Fund for Retirement and Social Benefits (Caisse Nationale de Retraite et de Prévoyance Sociale)

**CRÉS:** Centre for Research and Social Studies (Centre des Recherches et des Etudes Sociales)

**RSNA:** Regime for non agricultural wage-earners (Régime des Salariés non Agricoles)

**RTNS\_A:** Regime for agricultural independents (Régime des Travailleurs Non Salariés Agricoles)

**RTNS\_NA:** Regime for non agricultural independents (Régime des Travailleurs Non Salariés Non Agricoles)

**RSA:** Regime for agricultural wage-earners (Régime des Salariés Agricoles)

**RSAA:** Improved regime for agricultural wage-earners (Régime des Salariés Agricoles Amélioré)

**LOI32\_NS:** Regime for low income independents (Régime des travailleurs à faibles revenus non salariés)

**LOI32\_S:** Regime for low income wage-earners (Régime des travailleurs à faibles revenus salariés)

**RACI:** Regime for artists, creators and intellectual professions (Régime des artistes, créateurs et professions intellectuelles)

**RTTE:** Regime for Tunisian workers abroad (Régime des Travailleurs Tunisiens à l'Etranger)

**UGTT:** General Union of Tunisian Workers (Union Générale des Travailleurs Tunisiens)

**ILO:** International Labor Organization

**INS:** National institute for Statistics (Institut National de la Statistique)

**ERF:** Economic Research Forum

**MENA:** Middle-East and North-Africa



# 1 Introduction

## 1.1 Motivation

In late december 2010, a wave of uprisings started in Tunisia, after a young street-vendor imolated himself. This event triggered a national wide movement of demonstrations against the regime in place, the socio-economic situation of the country and inequalities. The protest rapidly reached other Arab countries, shaking the foundations of post-independence autocratic powers, from Morocco to Yemen, and sparking what is commonly referred to as "the Arab Spring".

As stated by Ianchovichina et al. (2015), this series of revolutions caught the world by surprise. Indeed, the region exhibited low level of inequalities at that time, and had experienced a steady trend of decreasing inequalities since the years 1990. On the other hand, many commentators have presented the high level of inequalities in the region as one of the roots of this uprising. This paradoxical conjunction of the outspring of the revolution with the low reported level of inequalities in the region has led some authors to refer to the "Arab inequality puzzle" (Ianchovichina et al., 2015).

However, most approaches to estimate the level of inequalities in the Arab region rely on household expenditure data approach which is undermined by numerous limitations, such as sensitivity to survey design, large time span between two surveys that makes it difficult to see patterns of evolution, under declaration at the top, under representation of the top earners, etc. Consequently, this article is an attempt to provide new estimates of inequalities in Tunisia. We do not investigate the role inequalities played in the revolution. However, our findings contradict the common argument that inequalities could not be one of the causes of the revolution because they were low and decreasing. Therefore, this study could pave the way for further research trying to investigate this link.

The choice of studying Tunisia was motivated by two main reasons. Firstly, Tunisia is the country were the Arab spring started and it is considered as a country with moderate and decreasing level of inequalities. Therefore, it is a good starting point to re-assess the level of economic inequalities in the Arab countries and possibly to fuel new reflection on the role inequalities could have played in the Arab Spring. Secondly, existing studies on economic inequalities in Tunisia have all focused on expenditure approach, hence the need for complementary approaches.

## 1.2 Literature review

Since the Arab Spring, economic literature about inequalities in the Middle East and North Africa (MENA) region has been increasing a lot. However, this literature is often limited by availability of data. Indeed, for most countries, tax data is not available to estimate income inequalities, and household surveys provide expenditure data instead of income data<sup>1</sup>. Therefore, most studies that try to account for the level and evolution of inequalities in the region rely on national household surveys, mostly on expenditure. They generally find moderate and stable or decreasing inequalities over the years 1970-2010.

Before the Arab Spring, a first set of pioneering cross-country studies on inequalities produced moderate inequality estimates. Using national household surveys, Deininger and Squire (1996) followed by Milanovic (2002 and 2005) built new datasets to estimate inequalities in the world, and find moderate levels of inequalities in the Arab region by international standards. Indeed, Deininger and Squire (1996) find ginis spanning from 41.9% in the years 1970 to 38.1% in the

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<sup>1</sup>For a complete review of existing household data in the MENA region, see Bibi and Nabli (2010), for the most recent and exhaustive study.

years 1990, while Milanovic (2002) finds a pan-arab gini of 38.1% in 1988 and 36.7% in 2002. By investigating expenditure inequalities in MENA over the years 1980 and 1990 and using World Bank data, Adams and Page (2003) find similar results. Studying the impact of remittances and public employment on measures of inequalities, they conclude that international migration and public employment explain the region's success at maintaining low rates of poverty and inequality in the context of stagnant economic growth .

More recently and especially in the wake of the Arab Spring, the issue of inequalities in the MENA region has gone under deeper scrutiny. However, despite new attempts to overcome some of the data limitations, these studies confirm previous research and find moderate level of inequality in the MENA region.

Using World Bank data, Ncube and Anyanwu (2012) confirm that the level of income inequality in the MENA region is low and substantially lower than in most other developing countries over the period 1981-2008. Using harmonized household surveys, Belhaj Hassine (2014) finds similar results over the period 1990-2010. Reviewing existing literature Verme et al. (2014) confirm that inequality is decreasing in Egypt between 1958 and 2009, while Ianchovichina et al. (2015) conduct a meta-analysis for the whole region and draw similar conclusions for the MENA region over the period 1980-2010.

Some papers have also tried to overcome the limitations of consumption based approaches and the limitations of household survey data, without any major change in conclusions. By correcting for unit non-response in household survey data, Hlasny and Verme (2013) find an increased measure of income inequality in Egypt over the period 2000-2011. However, they still confirm the existing literature on moderate level of inequalities. Similarly, by mapping household surveys with labor surveys, Krafft et al. (2016) try to account for some of the limitations of household data for Egypt, Jordan and Tunisia, but they find results that are similar to those found with expenditure data only.

Aside from these regional studies, little work has been conducted on economic inequalities in Tunisia specifically. Most papers that try to estimate inequalities in this country are based on non monetarist approaches and focus on inequalities of opportunities (Trabelsi, 2013) or on welfare indices (Kriaa et al., 2011 ; Ayadi et al., 2008). Some also focus on inequalities between privileged and unprivileged regions (Jemmali, 2017).

Finally, in line with the literature on economic inequalities in the region, the World Bank interface Povcalnet documents decreasing and moderate levels of inequalities since 1985. This is also consistent with reports by the Tunisian statistical institute (INS), which carries out the national household surveys (INS, 2012).

However, there are several limitations to these works, mainly due to the nature of the data used. Firstly, the measures of economic inequalities are almost always consumption based, which raises several issues such as international comparability issues. Indeed, as Bibi and Nabli (2010) underline, the level of expenditure inequality in the MENA region is often compared with income based levels of inequalities, such as for Latin America. However, this difference in measurement can induce great divergence in estimators. As a case in point, Bibi and Nabli (2010) highlight that for Jordan, authors report a Gini index of 35% for household expenditures and 40% for income in 1986. Secondly, household surveys are notoriously flawed with under-declaration and top coding issues. Finally, Gini indicators which are commonly used in this literature do not allow to see how inequality has really been changing as they can hide very different situations.

Therefore, a considerable breakthrough was achieved with the works of Assouad (2017) and Alvaredo et al. (2017). Combining household survey data and tax data, they showed that the level of inequality is considerably higher than expected in Lebanon (Assouad, 2017), and among

the highest in the world for the MENA region as a whole (Alvaredo et al., 2017). This suggests that the level of inequality in Tunisia could be considerably higher than it has been estimated so far.

Indeed, in the wake of the work of Piketty (2001, 2003) a new methodological approach of inequality has been taken by several researchers, investigating the evolution of top shares and combining household surveys with macroeconomic data and tax data, which generally leads to revision of existing inequality estimates (Alvaredo et al., 2016). Pareto interpolations and generalized Pareto interpolations (Blanchet et al., 2017) also allow to recover distributions from tabulations and have been of considerable value to build these new series. This has led to numerous country studies, which allowed revising historical series of inequalities, both for developed and developing countries<sup>2</sup>. However, this has not been done in Tunisia or in any other North African country yet.

This paper is therefore an attempt to bridge the gap between the existing literature on inequalities in the MENA region, that most probably underestimates inequality, and between the literature that tries to overcome the limitations of household surveys and of consumption data.

### 1.3 Methodology and results

In this paper, we provide new inequality estimates for Tunisia over the period 2003-2016 based on consumption and gross labor income. We proceed in two steps. First, we use household survey microdata on expenditure for the years 2005 and 2010 and confirm what is commonly found in the literature: moderate level of inequalities by international standards, and decreasing trend between the years 2005 and 2010.

Secondly, using completely new data on gross pre-tax labor income declared to the Social Security by regime, trimester and year, we resort to generalized Pareto interpolations to infer the whole distribution of labor income for each regime. We also aggregate the distributions by regime in order to build the total distribution of labor income in Tunisia. Finally, for the two largest regimes, that make up about 75% of the formal working population, we use similar tabulations disaggregated by gender to infer the distributions of labor income for men and women.

Three main facts stand out from our analysis of labor income distributions. Firstly, we find that labor income inequalities increased over the period 2003-2010 and decreased over the period 2010-2016. Secondly, we find that inequalities for wage-earners in the private sector followed a similar pattern. In contrast to that, inequalities decreased all over the period in the public sector and decreased all over the period for independents in the private sector. Thirdly, we find that the distribution of labor income for wage-earners in the public and private sector is more unequal for men than for women all over the period, but that the levels of inequalities are converging due to the increase in the level of inequalities for women.

Overall, our findings therefore go against the economic consensus according to which economic inequality was moderate and decreasing in pre-revolutionary Tunisia.

### 1.4 Contributions

This paper is a threefold contribution. Firstly, it contributes to the growing literature on inequalities in the MENA region and in Tunisia by using completely new data on labor income

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<sup>2</sup>Alvaredo et al. (2017) for countries of the Middle-East, Assouad (2017) for Lebanon, Garbinti et al. (2017) for France since 1800, Piketty et al. (2017) for China, etc. For more detail, see website: <https://wid.world/>

since 2003 and by building new series of labor income inequalities. Secondly, it contributes to the literature that investigates the role of economic inequalities in the bursting of the Arab revolutions of 2010-2011. Indeed, it undermines the idea developed by several authors (Ianchovichina, 2015; Ncube and Anyanwu, 2012) that the reason why the 2010 revolution could not be related to an increase in economic inequality is the low level of inequalities. Thirdly, it contributes to the literature on top income shares that has already been conducted for several countries but for which no estimate existed for any North-African country. To our best knowledge, it is the first time that series on labor income inequalities are released for Tunisia.

The paper is organized as follows. Section 1 presents the data and methodology used in this paper. Section 2 briefly reviews Tunisian economic, social and political history since independence and the Tunisian Social Security system. Section 3 gives an overview of the Tunisian working population and discusses the problem of informal work. Section 4 presents our main results. Section 5 concludes.

## 2 Data and methodology

### 2.1 Data

Before presenting the data we use, we start by reviewing existing data that has been used so far in Tunisia to estimate inequalities.

#### 2.1.1 Review of existing data to estimate inequalities in Tunisia

In Tunisia as in many countries from the MENA region, no household survey has been conducted on income. Moreover, income tax data has, to our best knowledge, never been made available to researchers. Therefore, studies on inequalities generally rely on consumption data from household surveys. The two main sources of inequality estimates that have been used in the literature are the estimates provided by Povcalnet, and the household survey data produced by the National Institute for Statistics.

The Povcalnet interface of the World Bank provides several indices of poverty and inequality in Tunisia for years 1985, 1990, 1995, 2000, 2005 and 2010 based on expenditure data, including gini and shares of expenditure per quantile. Until 2005, they use grouped data and provide distributional data with relatively low number of quantiles<sup>3</sup>. Only for the years 2005 and 2010 do they use unit record data and provide percentiles of the distribution, suggesting that they got access to INS microdata which we also use in this study.

The National Institute for Statistics undertook several household surveys since independence: in 1968, 1975, 1980, 1985, 1990, 1995, 2000, 2005, 2010 and 2015. However, these surveys only concern expenditure data. This is very common in the MENA region, as expenditure data is believed to be a better proxy of the conditions of living than income (Bibi and Nabli, 2010). Concerning availability of this data, the Economic Research Forum (ERF) provides access to harmonized micro-data for the surveys of 2005 and 2010. The INS itself also provides access to microdata for the years 1995 and 2000, but these datasets are difficult to exploit due to lack of metadata material, so that this microdata has not, to our best knowledge, been used in the literature on inequalities in Tunisia. Table A.1 in appendix presents a review of existing household survey data for Tunisia.

#### 2.1.2 Consumption data

In this paper, we use two existing datasets for years 2005 and 2010 built from household surveys that were conducted by the INS in 2005 and 2010. We use ERF harmonized database instead of INS raw data due to lack of metadata information.

The ERF databases provide a large series of household characteristics, as well as aggregate expenditure for various categories : food and non-alcoholic beverages ; alcoholic beverages, tobacco, and narcotics ; clothing and footwear; housing (including actual and imputed rentals and maintenance and repair of the dwelling, water, electricity, gas) ; furnishings and household equipment ; health ; transportation ; communication ; recreation and culture ; education ; restaurants and hotels ; other miscellaneous goods and services (such as personal care, personal effects, etc.).

Both surveys focus on a sample of 13 392 households. Samples were obtained through a two-stage stratification procedure and the sample is representative of the Tunisian population at the

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<sup>3</sup>Seven quantiles in 1985 and 1990, 12 for 1995, 10 for 2000.

national level.

However, these datasets have several limitations. Firstly, the sampling was stratified at two levels: the governorate (24 governorates in Tunisia) and the urbanization level. However, the governorate variable is not available in the database, so that computation of valid standard errors is not allowed. Secondly, only aggregates are provided by this dataset and they were copied from the INS database. This does not allow us to know precisely what kind of expenses were included in each category as INS aggregates might not perfectly fit ERF aggregates. This raises two main issues. The first one is that it cannot be ensured that the aggregates are homogenous across time. More specifically, INS differently computes imputed rents in 2005 and 2010<sup>4</sup>, and there is no way to assess how it actually changes the individual aggregates. The second one is that it cannot be ensured that all kinds of expenses are included in these aggregates. More specifically, it cannot be checked whether exceptional expenditure or home production are included.

### 2.1.3 Labor income data

The main contribution of this paper is to use completely new data on gross labor incomes that were declared to the Tunisian Social Security over the period 2000-2016 for the public sector and 2003-2016 for the private sector. Access to this data was granted thanks to a partnership with the Centre for Research and Social Studies (Centre des Recherches et des Etudes sociales, CRES). The CRES is the research organ of the Social Security in Tunis and therefore receives all labor income declarations from employers and independents. It is the first time this data is used for economic research purposes.

The raw data consists in detailed trimestrial tabulations by regime of gross labor income that were declared by employers and independents to the Social Security regime of affiliation. These tabulations include population size and average trimestrial labor income within the bracket. These tabulations were also completed by annual descriptive statistics with annual population size and total mass of declared gross labor incomes by regime. The period covered is 2000-2016 for the public sector (CNRPS) and 2003-2016 for the private sector. These tabulations and descriptive statistics have also been disaggregated by gender for the first trimester of the period 2003-2016 for the two largest regimes, that is the regime for the public sector (CNRPS) and the regime for non agricultural wage earners (RSNA) for the private sector.

The main strength of this data is its exhaustivity. Indeed, tabulations cover all formal workers of the private sector, including independents, and a very large part of formal workers of the public sector. For the workers in the public sector (CNRPS), only a part of affiliates have their wages individually declared to the Social Security (80% of CNRPS affiliates in 2016). This concerns the bulk of all workers who are employed by the State, local authorities or administrative, industrial and commercial institutions, except the ones working in the government or in private companies with special status. On the contrary, another part of CNRPS affiliates is not individually declared to the Social Security (20% in 2016). These affiliates are the ones who work in public companies with special status or in the government. For these people, only the population size and the total mass of wages are declared to the Social Security and to the CRES.

Overall, our tabulations still cover a very large part of the formal population. For instance, in 2016, 93.8% of the formal active population was covered by our data. The remaining 6.2% are the affiliates of the CNRPS who were not individually declared to CRES. We stress that in our study, we will also exclude workers abroad (RTTE) as they do not belong to the domestic population.

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<sup>4</sup>In 2005 and for households who do not pay a rent, imputed rent is computed by taking the average rent for the strata. In 2010, it is computed by resorting to hedonist evaluation.

There are two main limitations to this data, however: informal work and biased income declaration. Indeed, informality is an important phenomenon in Tunisia and our data only covers the formal population. Biased declaration can come from two features of the declaration system: (i) the self declaration of independent workers who can under-declare their income in order to limit the amount of social contributions they pay (ii) the fixed contribution base for a small number of regimes, which implies that declared income is fixed and disconnected from actual earnings.

## 2.1.4 Coverage of labor income data

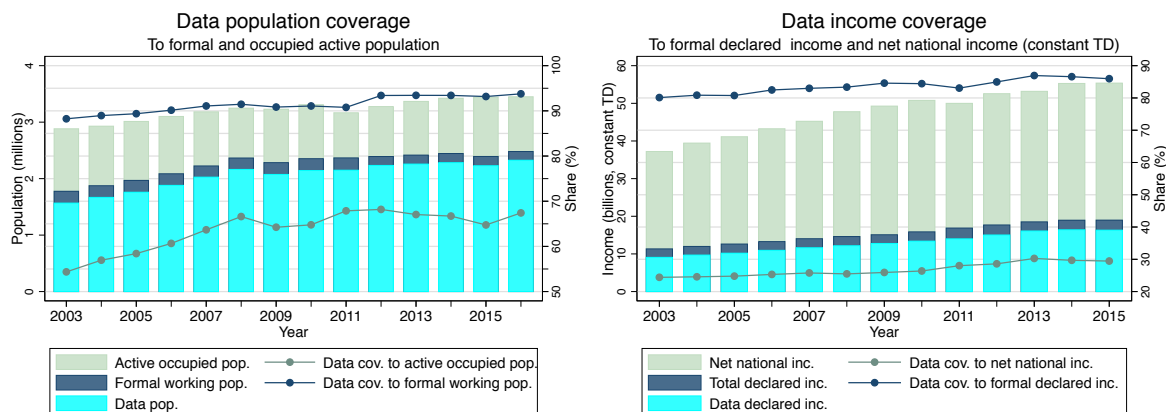


Figure 2.1: Evolution of data coverage

Source: author's computations using CRES descriptive statistics, ILO series and INS series

Our data covers all formal workers except two kinds of workers: (i) Tunisian workers abroad (RTTE), which we chose to exclude from our analysis, and (ii) the part of workers in the public service for which wages were not individually declared. This guarantees very large coverage of the Tunisian population. Figure 2.1 presents the coverage of our data population to the formal working population and to the occupied active population on the one hand. It presents the coverage of our data declared income to total declared income and to the net national income on the other hand.

The coverage ratio of the data population to formal working population is high and increasing. Indeed, it spans between 88% and 94% of the total formal working population. Similarly, the coverage ratio of our data to total declared income is also high and increasing. It spans between 80% and 86%. The coverage is slightly under that of the population coverage due to the high average labor income of the missing individuals in our data, as we will present in section 4.1. Overall, this high level of coverage ensures the quality of our estimates.

## 2.2 Methodology

### 2.2.1 Main indicators of interest: the shares of the top 1%, top 10%, middle 40% and bottom 50%

In order to study the evolution of the level of inequalities in the Tunisian labor income distribution, we consider the share of labor income that is received by four distinct groups. The "bottom 50%" are the half of the working population who earn the lowest income. The "top 10%" represent the 10% of workers who earn the higher income. The "middle 40%" are the

intermediary group, between the bottom 50% and the top 10%. They could be considered as representing the middle class. Finally, the top 1% represent the 1% of workers who earn the highest income. Therefore, the more unequal the distribution of labor income, the highest the shares of the top 10% and top 1% and the lowest the share the bottom 50% and middle 40%. Conversely, perfect equality would imply that the top 1% receive 1% of total labor income, that the top 10% would receive 10%, etc. This approach has been widely adopted within the frame of the studies on economic inequalities and in the WID.world literature. It allows comparability of series between countries and a higher degree of precision than indicators such as the Gini, while remaining intuitive and easy to interpret.

### 2.2.2 Consumption analysis

We start by estimating expenditure inequalities relying on existing household survey data and we study the distribution of total expenditure per adult. Total expenditure includes food, clothing, housing, transport, communication, health, education and recreation expenditure. Following DINA guidelines (Alvaredo et al., 2016), we define adult population as population over 20 and we proceed to equal split within household. This is a conservative stance because it does not take into account intra household inequalities. In order to recover the number of adults within the household, we use available information on the number of people within the household and household composition. Then, we study the evolution of consumption inequalities taking into account two kinds of indicators.

Firstly, we compute gini coefficients in order to compare our findings with the literature that mainly uses this index. Secondly, we compute the shares of total expenditure of the top 1%, top 10%, bottom 50% and the middle 40% who make up for the rest of the population and the middle class.

### 2.2.3 Labor income analysis

As the tabulations we use do not necessarily coincide with the percentiles of the groups of interest (for instance the top 10% or the top 1%), we recover the shares of each percentile by recovering the total distribution of declared labor income thanks to generalized Pareto interpolations. These interpolations also allow us to aggregate several populations, because we are able to aggregate their respective distributions. This is very useful, as raw data tabulations are disaggregated by regime and we also want to present the level inequalities for the whole working population, once all regimes have been aggregated.

As documented by Pareto in his seminal work on top incomes (1896) and by an abundant literature (Pareto, 1896; Atkinson et al., 2011, Blanchet et al., 2017), the top tail of the income distribution is well approximated by a Pareto distribution and the distribution of top incomes can be recovered using Pareto interpolations. The Pareto law has the following cumulative distribution function :

$$F(y) = 1 - \left(\frac{k}{y}\right)^\alpha, k > 0, \alpha > 1 \quad (1)$$

The corresponding density function is :

$$f(y) = \frac{\alpha k^\alpha}{y^{1+\alpha}} \quad (2)$$



This distribution is characterized by a constant ratio  $\beta$  between a certain level of revenue and the average of all superior revenues.  $\beta$  is called the inverted Pareto coefficient:

$$E(z|z > y) = \frac{\alpha}{\alpha - 1}y = \beta y \quad (3)$$

The interpretation for Pareto inverted coefficients is the following: for a Pareto inverted coefficient of 3, people with an income above 10,000\$ a month earn in average  $10,000 \times 3 = 30,000$ \$ a month. Similarly, people with an income above 20,000\$ a month earn in average 60,000\$ a month.

However, as shown in Blanchet et al. (2017), the empirical study of these coefficients highlights that they are not constant over time and at different points of the distribution. We therefore conduct generalized Pareto interpolations to recover the whole distribution of income by allowing for different Pareto coefficients along the distribution of income. Within this frame, we allow  $\beta$  to vary from one percentile to another. Generalized Pareto curves refer to the curve of inverted Pareto coefficients  $\beta(p)$ , where  $p$  corresponds to the different percentiles of the income distribution. Then, the methodology developed by Blanchet et al. (2017) allows to recover the entire distribution of income thanks to non parametric estimations, producing smooth generalized Pareto curves.

In order to build the annual shares of the different, we proceeded in three steps. First, we clean the tabulations for each trimester, year and regime in order to ensure that each bracket is defined by its bottom threshold and by a bracket average in bracket  $b$  that is strictly between the bottom threshold in  $b$  and the bottom threshold in  $b + 1$ . Secondly, we interpolate the distribution of labor income for each regime using generalized Pareto interpolation and the `gpinter` interface of the website of the WID.world. We also aggregate these distributions by regime to recover the trimestrial distribution of declared income for the whole working population in our data. We thereby get the percentiles and shares of each groups for all trimesters and years for the different regimes and the aggregation of these regimes. Thirdly, in order to produce estimators that are more easily interpretable and to smooth trimestrial variation, we compute annual shares by taking the unweighted average of trimestrial shares.

For the study of income distribution by gender, we do not need to compute such average as we only have data for the first trimester of each year. Therefore, we only conduct the first two steps and we present the shares for the first trimester.

## 2.3 Concepts

We use several income concepts in this paper, which we briefly review for clarity purposes.

### 2.3.1 Declared gross pre-tax labor income

In this study, we investigate the distribution of gross pre-tax income that is declared to the social security. This declared data therefore includes two kinds of income :

- Gross pre-tax income declared for wage earners (gross labor income, *stricto sensu*)
- Gross pre-tax income declared by independents (gross mixed income).

Mixed income is composed of a labor component and of a capital component. Consequently, the declared gross pre-tax labor income that we consider all along this paper is not strictly speaking labor income : in order to strictly be labor income, one should remove the capital component

of independents' mixed income. However, we chose to keep this mixed income as a whole. This choice is motivated by two reasons. Firstly, the capital component of independents' mixed income represents a very small amount of the total declared gross pre-tax income<sup>5</sup>. Secondly this 70%-30% ratio is likely to vary a lot from one independent to another and especially from one regime of independents to another. For instance, it is likely that the capital component of mixed income will be very different for artists and intellectual professions (RACI) and for agricultural independents (RTNS\_A). This is why, in order to limit the number of assumptions that we make, we chose not to remove the capital component of mixed income. All along that study, we therefore include mixed income as a whole in our "declared labor income" concept. For simplicity, we sometimes refer to declared gross pre-tax labor income as "declared income". When we want to distinguish between the different kinds of declared income, we refer to "wages" (for wage-earners) as opposed to "mixed income" (for independents).

$$\begin{aligned} \text{Declared gross pre-tax labor income} &= \text{Declared gross pre-tax wages} \\ &+ \text{Declared gross pre-tax mixed income} \end{aligned} \quad (4)$$

$$\begin{aligned} \text{Declared gross pre-tax labor income} &= \text{Declared gross pre-tax wages} \\ &+ \text{Labor component of gross pre-tax mixed income} \\ &+ \text{Capital component of gross pre-tax mixed income} \end{aligned} \quad (5)$$

### 2.3.2 Total gross pre-tax labor income

The declared gross pre-tax labor income that we consider in this paper differs from the total pre-tax labor income in two ways. Firstly, it does not include workers who are affiliated to the regime of Tunisian workers abroad. Secondly, it does not include workers who are affiliated to the CNRPS but whose wages were not individually declared to the Social Security. Note also that once again, we include mixed income in this concept of labor income. For simplicity, we sometimes refer to formal gross pre-tax labor income as "total declared income" or "formal declared income".

$$\begin{aligned} \text{Total gross pre-tax labor income} &= \text{Declared gross pre-tax labor income} \\ &+ \text{Gross pre-tax labor income of Tunisian workers abroad} \\ &+ \text{Gross pre-tax labor income of CNRPS affiliates who are not individually declared} \end{aligned} \quad (6)$$

### 2.3.3 Net national income

In order to link the income concepts that we use to the net national income concept, we follow DINA guidelines (Alvaredo et al., 2016 ) and 2008 UN System of National Accounts (SNA) and remind this :

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<sup>5</sup>The capital component of mixed income is generally considered to be around 30% of mixed income and mixed income in Tunisia represents between 5% and 10% of considered declared labor income over the period 2003-2016 (6.2% in 2016)

$$\text{Net National Income} = \text{Pre-tax factor labor income} + \text{Pre-tax factor capital income} \quad (7)$$

$$\begin{aligned} \text{Pre-tax factor labor income} = & \text{Compensation of employees} + \text{labor component of net mixed income} \\ & + \text{Net labor component of imputed taxes on production} \quad (8) \end{aligned}$$

$$\text{Compensation of employees} = \text{Wages and salaries} + \text{Employer's social contributions} \quad (9)$$

Therefore, our declared gross pre-tax labor income series are close to pre-tax factor labor income, with two differences: they include the capital component of net mixed income, and they do not include the labor component of imputed taxes on production.

$$\begin{aligned} \text{Declared gross pre-tax labor income} = & \text{Pre-tax factor labor income} \\ & + \text{Capital component of net mixed income} \\ & - \text{Labor component of imputed taxes on production} \quad (10) \end{aligned}$$

## 3 Context

### 3.1 Political, social and economic history of Tunisia

In this section, we briefly present the political, social and economic history of Tunisia since independence in order to highlight its main features. This analysis highlights the central role played by the State in post-independence Tunisia. Indeed, Tunisia was characterized by a corporatist organization of the labor market and by the predominant position of the State in the political, social and economic life of the country. In this context, the social policy implemented by the government was one of the features of an "accommodement négocié" (negotiated accommodation) (Hibou, 2006), in which social peace was ensured through social programs within the frame of an "authoritarian bargain" (Ianchovichina et al., 2015).

#### 3.1.1 Habib Bourguiba's leadership: the construction of a modern interventionist State and the first crises (1956-1987)

After Tunisia got its independence in 1956, the first years of the Republic of Tunisia were characterized by the construction of a modern, secular and interventionist State that regulated the political, social and economic life of the country. This modernization and secularization started just a few months after the declaration of independence with the Code of Personal Status (march 1956), which fixed a minimum age for marriage, prohibited polygamy and repudiation, and granted women with the right to divorce. A large movement of nationalizations was undertaken in the fields of energy and transportation in order to promote the rapid development of those sectors. Concerning the social policy, the wage policy was characterized by austerity. The nominal minimum wage was blocked by the government for five years, and other nominal wages stagnated, despite substantial increases in prices (Ben Romdhane, 2011, p.184). However, those years also laid the foundation for the Tunisian social State, with the extension of Social Security insurance to occupational diseases (law of december 11th, 1957) and to health, maternity and death (law of december 14th, 1960). Very important efforts were also made concerning education, with an increase of real public spending in education by 40% between 1956 and 1961 (Ben Romdhane, 2011, p.185).

The years 1960 went further in this trend to place the State at the core of economic, industrial and social change. The Ministry of planning was created, with Ahmed Ben Salah at its head. Ben Salah was a former General Secretary of the main Tunisian trade union, the General Union of Tunisian Workers (Union Générale des Travailleurs Tunisiens, UGTT) and a fervent advocate of planning. Over the decade, he introduced a ten-year based development program, the "Decennial Perspectives (1962-1971)", which aimed at increasing the standards of living, creating an internal market and decreasing dependency to foreign capital flows. A set of reforms was implemented, which included nationalizations in the trade sector, nationalization of European settlers' land and the promotion of the creation of agricultural cooperatives. Even though the wage policy remained characterized by austerity, real public spending kept increasing in the field of education and the level of social security benefits doubled over the period (Ben Romdhane, 2011, p.188). A policy of price compensations to cap the price of basic consumption products was also implemented.

The eviction of Ben Salah and the appointment of Hédi Nouira as Prime Minister at the beginning of the years 1970 did not really change that trend. Hédi Nouira was a former director of Tunisian Central Bank and was known for his advocacy of free-market economy. However, economic policy remained interventionist over the years 1970 and public social programs were further developed. Very strikingly, the budget for the compensation of price caps for basic products was multiplied by more than 16% over the decade, according to Ben Romdhane (2011,

p.195). The coverage of the Social Security was also extended to new categories of workers such as fishermen, leading to increased Social Security spending. Finally, as highlighted by Chouikha and Gobe (2015, p.26), at the end of the years 1970, the public sector was the main employer. It distributed one third of the aggregate payroll and employed one out of four wage earners in the non agricultural sector. However, despite this consolidation of the social action of the State and despite increasing real wages over the period (Ben Romdhane, 2011, p. 192), the decade was also characterized by social and political conflicts. The first major one was the "Black Thursday" of January 1978 and the killing of at least 51 demonstrators after the UGTT called for a strike that degenerated into riots. The second was the "coup of Gafsa" of January 1980, during which the mining city of Gafsa was occupied for several days by opponents to Bourguiba, with the aid of Libya.

Finally, the last years of Bourguiba's presidency (1980-1987) were also characterized by a rise in crises. After the "Black Thursday" and the "Gafsa coup" and in the context of the rise of islamists, a movement of democratization was temporarily initiated by Mohamed Mzali, the new Prime Minister. The ban on the Communist Party was lifted, numerous political prisoners were released, and free, open elections were planned. However, these elections were tarnished by fraud and the country entered a period of deep political trouble in the context of internal divisions at the head of the State and political intrigues to succeed Bourguiba. Within the frame of this political paralysis, compensations to price caps kept increasing. Wages also increased a lot, driven by minimum wage increases. In December 1983, under pressure of international donors, the government announced a decrease in price compensations, which should have entailed an increase in prices of elementary products by very large amounts, such as an increase of 50% for bread, according to Chouikha and Gobe (2015 , p. 38). This led to the "bread riots" in December 1983 and January 1984, consisting in major demonstrations all over the country. This movement highlighted the limitations of the Tunisian redistribution system in the context of a more and more constrained financial situation, which led to the adoption of an International Monetary Fund (IMF) structural adjustment plan in 1986.

### **3.1.2 Ben Ali's era: liberalization of the economy, nepotism and the increase of social dissatisfaction (1987-2010)**

In November 1987, Prime Minister Zine el Abidine Ben Ali delivered a radiophonic speech in which he announced destitution of Habib Bourguiba due to medical condition, which *de jure* made him the interim president. A wind of democratization blowed in the first months of this presidency with a constitutional revision that limited the number of presidential terms, with the release of political prisoners and with the liberalization of the press code. However, this trend was short-lived. Electoral process remained tightly controlled and Ben Ali rapidly engaged in the repression of the islamist movement and of Moncef Marzouki's Tunisian League for Human Rights (Ligue Tunisienne des Droits de l'Homme). His presidential reign relied on a technocratic and neopatrimonial approach, based on three pillars (Chouikha and Gobe, 2015): the presidential services, characterized by a technocratic administration structured around himself, the security apparatus based on the police, and his family environment based on his and his second wife Leila Trabelsi's families. This family network owned a large part of the largest domestic companies and benefited from corruption and nepotism.

Economic and social policy remained characterized by the central role of the State, in which the social policy was still considered as a major tool to ensure social peace. The policy of compensations to cap price of elementary products was limited but replaced by the rise of presidential programs targeting to specific kinds of population in need and relying on individual donors, such as the National Solidarity Fund. Wage policy remained organized as a corporatist system under supervision of the State and in 1990, the government imposed triennial wage

negotiations instead of annual negotiations. These discussions occurred in the frame of tripartite discussions with the UGTT and the patronal trade-union, under supervision of the State. Over that period, wage increases were based on productivity increases, which considerably limited wage increases over that that period (Ben Romdhane, 2011).

The trend of liberalization that was initiated at the end of Bourguiba's presidency in the context of the IMF structural adjustment was also further followed. Privatizations were conducted, within a context characterized by nepotism and corruption. Tunisia also embraced globalization: the country entered the General Agreement on Tariffs and Trade (GATT) in 1990 and signed a free-trade agreement with the European Union in 1995.

However, unemployment remained high and increasing, especially for educated young people (Ben Romdhane, 2011) and social dissatisfaction rose in the years 2010. To this extent, the protest movement in Gafsa in 2008 and demonstrators' rejection of the social and economic situation could be seen as a harbinger of the claims of the impending revolution.

### **3.1.3 Post-revolution Tunisia and the search for a new economic consensus (2010-2018)**

After the large demonstrations that started in the end of 2010 in the centre of the country and rapidly spread to the rest of the country, Ben Ali finally fell in January 2011 and Tunisia started building more democratic institutions. Elections were organized in October 2011 to elect the constituent assembly and a new Constitution was adopted in 2014. Presidential and parliamentary elections were also organized the same year (October 2011).

Several interpretations have tried to account for the popular uprising of the revolution, around three main approaches (Gana and Van Hamme, 2016). The first one presents the revolution as a legitimacy crisis of the regime. The second one focuses on economic determinants and underlines the role of social inequalities. A third one insists on the specificity of the dynamics of political cleavages, such as cultural cleavages, in order to understand how they could determine recent political evolutions.

The revolution had a considerable impact on the economy, with a drop in GDP and a surge in unemployment, as figure 3.1 highlights. Despite the rapid change of governments after the elections of October 2011, the economic and social policies that were promoted remained similar from one government to another (OCDE, 2018) and revolved around the desire to fight against terrorism, increase growth and employment, implement an efficient social policy and promote regional development. Until now, their implementation has been limited by complicated economic situation (OCDE, 2018), especially in the context of the Libyan crisis (Libya was one of the main trade partners of the country) and the decrease in tourism associated with the revolution and the terrorist attacks in 2015.

## **3.2 The Tunisian Social Security**

The Tunisian Social Security has progressively extended since independence. Since 2002 and the law that created the regime for workers with low revenues (law 32, 2002), all workers are theoretically covered by the Social Security. It delivers four kinds of social benefits: i) family benefits, ii) occupational injury and occupational disease benefits, iii) health insurance, maternity insurance and death insurance and iv) retirement benefits, pensions and death benefit. It does not deliver any unemployment benefits. We briefly present the different regimes and how workers are declared.

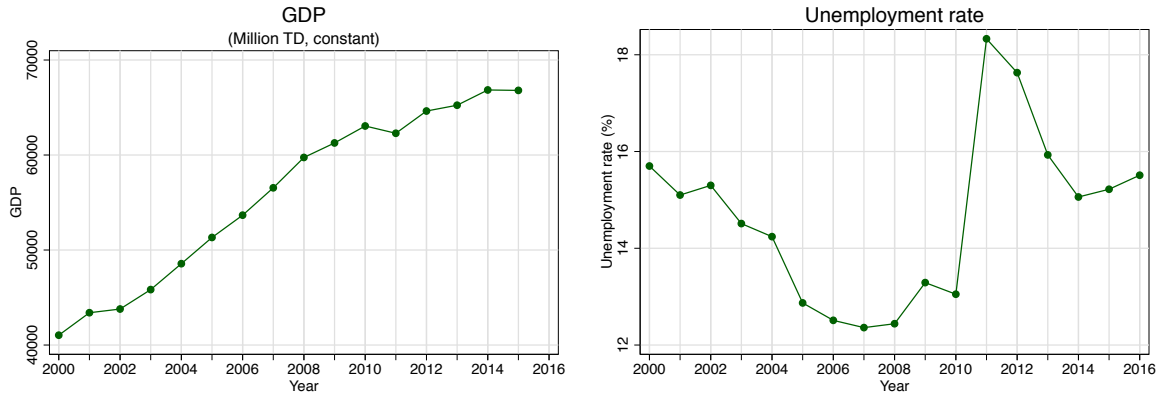


Figure 3.1: Recent evolutions of GDP and unemployment

Source: INS for GDP and ILO for unemployment rate

### 3.2.1 The different regimes

Since 2002, all workers have to be declared to the social security. They are affiliated to one of the ten regimes that cover the public sector and the private sector. These regimes all depend of one of these two funds: the *Caisse Nationale de Retraite et de Prévoyance Sociale* (national fund for retirement and social prevision, CNRPS) for the public sector, and the *Caisse Nationale de Sécurité Sociale* (national fund of social security, CNSS) for the private sector. The CNRPS only comprises one regime for all kind of public workers while the CNSS comprises nine regimes depending on whether the worker is employed or independent, whether she works in the agricultural sector or not, and whether she exerts an activity registered as generating low revenues or not. Table 3.1 lists all regimes, which allows drawing a typology of workers according to sector, status and activity.

The two regimes that cover the highest number of workers are the CNRPS (31% of workers in 2016) and the RSNA (48% of workers in 2016). In total, the private sector<sup>6</sup> represents 69% of workers, 22% of which are independents<sup>7</sup> and 7% of which work in the agricultural sector<sup>8</sup>.

### 3.2.2 The way income is declared

Gross pre-tax labor income is declared to the Social Security in different ways, depending on the regime. There are three ways to declare revenues based on the contribution base. Firstly, the exact earnings can be declared. This is the case for workers in the non agricultural private sector (RSNA), for workers of the agricultural sector who are affiliated to the improved regime (RSAA)<sup>9</sup>, and for workers in the public sector whose wages are individually declared.

Secondly, earnings can also be declared as belonging to a certain range of earnings, based on an application of pre-definite coefficients to the minimum wage. This is the case for independent workers (RTNS\_A, RTNS\_NA, RACI) and for Tunisian workers abroad (RTTE). Independent workers chose a class of 1 to 18 times de minimum wage that corresponds to their income and Tunisian workers abroad chose a class of 2 to 9 times the minimum wage.

<sup>6</sup>All regimes but CNRPS.

<sup>7</sup>LOI32\_NS, RTNS\_NA, RTNS\_A, RACI.

<sup>8</sup>RSAA, RSA, RTNS\_A.

<sup>9</sup>As presented earlier, there are two kinds of wage earners in the agricultural sector: those affiliated to the "improved" regime (RSAA) and who work on large farms and those who are affiliated to the regular regime (RSA).

Fund	Regime	Sector	Status	Description
CNRPS		Public	Wage earners	i) Agents working in ministries and administrative institutions ii) Agents working in public local and regional authorities iii) Agents working in non administrative institutions and public firms
CNSS	RSNA	Private	Wage earners	Non agricultural wage earners of the private sector
CNSS	LOI32_S	Private	Wage earners	Workers with low income: i) Domestic workers (house servant, nanny, ...) ii) Fishermen working on small ships (gross tonnage under 5) iii) Agricultural workers working on surfaces less than 5 hectares (or 1 irrigated hectare)
CNSS	RSAA	Private	Wage earners	Workers in the agricultural sector: i) Working in farms that hire at least 30 workers ii) Working on ships with gross tonnage between 5 and 30
CNSS	RSA	Private	Wage earners	Workers in the agricultural sector with a minimum of 45 working days per trimester
CNSS	RTNS_NA	Private	Independents	Independent workers in the non agricultural sector: Business owners, liberal professions, craftsmen
CNSS	RTNS_A	Private	Independents	Independent workers in the agricultural sector: Farm owners, tenants
CNSS	LOI32_NS	Private	Independents	Workers with low income: i) Domestic workers (house servant, nanny, ...) ii) Fishermen working on small ships (gross tonnage under 5) iii) Agricultural workers working on surfaces less than 5 hectares (or 1 irrigated hectare) iv) Craftsmen engaged in piece work
CNSS	RACI	Private	Independents	Artists and intellectual professions
CNSS	RTTE	Private	Mixed	Optional affiliation - Tunisian workers abroad, either independent or employed

Table 3.1: The different regimes of the Social Security in Tunisia

Source: author's compilation

Finally, for poor workers (LOI32\_NS, LOI32\_S) and for agricultural wage-earners who are affiliated to the regular regime (RSA), the contribution base is fixed. Therefore, so is declared income. This fixed contribution base represents two thirds of the minimum wage for poor income workers. For agricultural wage earners, it represents 1 time the minimum wage for regular workers, 1.5 times for specialized workers, and 2 times for qualified workers.

This has a major consequence. Indeed, due to this declaration system, not only is under-declaration likely to affect self declared income, but for three regimes, (independent poor workers, employed poor workers and employed agricultural workers of the regular regime) declared income is also disconnected from actual earnings. Biased declaration of income therefore potentially concerns all regimes, except the CNRPS (for its individually declared component), the RSNA, and the RSAA. However, these three regimes represent a major part of the population, spanning between 66% and 78% of the formal population over the period 2003-2016 (and 75% of the formal population in 2016).

## 4 Overview of the working population in Tunisia

### 4.1 Description of the formal working population

#### 4.1.1 General characteristics

The working population has very different characteristics from one regime to another one. Table 4.1 provides population size, monthly declared income average and thresholds of the different regimes in 2016.



Type of workers	Regime	Population size	Average monthly income (Current Tunisian Dinars)	Bottom income threshold, first trimester (current Tunisian Dinars)		
				Middle 40%	Top 10 %	Top 1%
Wage earners in the public service	CNRPS	626438	1277	1200	1657	3558
Wage earners in the public service	Total CNRPS	779742	1426			
Non agricultural wage earners	RSNA	1181353	862.5	609.0	1902	5691
Wage earners with low revenues	LOI32_S	82785	157.0	216.5	216.8	434.4
Agricultural wage earners	RSAA	42049	323.3	353.7	724.4	1685
Agricultural wage earners	RSA	9316	341.4	336.6	518.1	862.4
Non agricultural independents	RTNS_NA	251639	413.5	325.0	975.0	2982
Agricultural independents	RTNS_A	71085	270.0	325.0	473.6	951.8
Independents with low revenues	LOI32_NS	60723	172.7	216.7	219.0	325.9
Artists and intellectual professions	RACI	164	559.6	680.4	919.2	1641
Tunisian wage earners abroad	RTTE	1220	1071	649.0	2853	2957
Formal population	All regimes	2480076	925			

Table 4.1: Population size, labor income averages and thresholds of the different regimes in 2016

Source: author's computations using gross labor income tabulations and descriptive statistics

Three important facts stand out from this table. Firstly, the difference in monthly declared income average for "CNRPS" and "Total CNRPS" is striking<sup>10</sup>. The difference in monthly declared income average reflects very high wages for workers of the CNRPS whose income was not individually declared. This has a main implication: the absence of the wealthiest part of this regime is likely to bias downward our estimates.

Secondly, there are large differences between the regimes in the level of average monthly declared income. Workers in the public sector have very high labor income compared to the rest of the population. In 2016, the monthly average labor income in the public sector (total CNRPS) was superior to the national average by more than 54%. The monthly average remained substantially higher in the public sector over the whole period, superior to the national average by 50% to 75%. This is in line with the characteristics of what has commonly been presented as the social contract in the MENA region and constitutes an "authoritarian bargain" (World Bank, 2004). According to the authors who use this concept, the social contract in the MENA region is characterized by a bargain that trades restrictions on political participation in exchange for economic security and the public provision of social services, welfare and other benefits. The very large level of employment provided by the State and the high distributed wages can therefore be understood as one of the pillars of this public provision of economic security through public employment. In addition to these very high wages in the public sector, there are also substantial differences within the private sector between independents and wage earners, and between agricultural workers and non agricultural workers. For instance in 2016, the average monthly work of independents<sup>11</sup> was 349 Tunisian Dinars (TD)<sup>12</sup> while it was 797 TD for wage earners<sup>13</sup> and the average monthly work

<sup>10</sup>As we explained in section 2.1, we distinguish between CNRPS (income is individually declared) and total CNRPS (aggregate income is declared). Our data population includes the CNRPS.

<sup>11</sup>Independent workers with low income (LOI32\_NS) ; Artists (RACI) ; Non agricultural independent workers (RTNS\_NA) ; Agricultural independent workers (RTNS\_A).

<sup>12</sup>Official exchange rate of the Tunisian Dinar in 2016 : 2.148 TD per US\$ (period average, World Bank series)

<sup>13</sup>Wage-earners with low income (LOI32\_S) ; Agricultural wage-earners (RSA) ; Agricultural wage earners of

in the agricultural sector<sup>14</sup> was 294 TD while it was 727 in the non agricultural sector<sup>15</sup>.

Thirdly, there are large differences between the regimes in the way revenues are distributed within them. For instance, for the first trimester of 2016, a worker in the public service (CNRPS) had to earn 1.3 times the average monthly income in his regime to be among the top 10% of this regime. A wage earner in the non agricultural sector (RSNA) had to earn 2.2 times the average monthly income in his regime to be among the top 10% of this regime.

#### 4.1.2 Evolution

The formal working population has been increasing over the period by 40%, as figure 4.1 highlights.

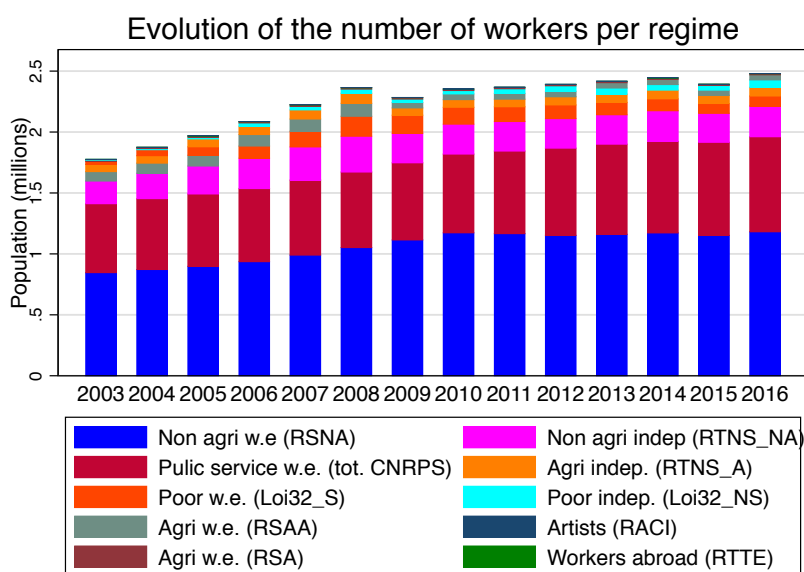


Figure 4.1: Evolution of formal working population by regime

Source: author's computations

This increase was mainly driven by the increase in the number of non agricultural wage earners (RSNA; 40% increase), of workers in the public sector (tot. CNRPS; 38% increase) and independent workers with low income (Loi21\_NS; 850% increase). The only population that has been stagnating or decreasing is that of employed agricultural workers (RSA, RSAA). This increase in the working population reflects both an increase in the occupied active population and an increase in the coverage rate by the Social Security.

#### 4.1.3 The gender gap

The working population in Tunisia is characterized by a two-fold gender gap. Firstly, women are underrepresented in the employed population of the public sector and of the non agricultural private sector (CNRPS and RSNA). Figure 4.2 presents the evolution of the share and number

the improved regime (RSAA) ; Non agricultural wage-earners (RSNA).

<sup>14</sup>Agricultural wage-earners (RSA) ; Agricultural wage earners of the improved regime (RSAA) ; Independent agricultural workers (RTNS\_A).

<sup>15</sup>Independent workers with low income (LOI32\_NS) ; wage-earners with low income (LOI32\_S) ; Artists (RACI) ; Non agricultural wage-earners (RSNA) ; Non agricultural independent workers (RTNS\_NA).

of women for the RSNA and CNRPS for the first trimesters of years 2003 to 2016. For these two regimes, the share of women is around 38% of workers. For the RSNA, this share steadily increased over the period. For the CNRPS, the increase over the period 2000-2012 was partially offset by a very large drop between 2012 and 2013 so that in 2016, the share of women in the public sector was of 37.5%, while it was of 41.2% in 2013. This drop was driven by a surge in male population between 2012 and 2013 that was not coupled with a surge in female population. Overall and despite this increase of the share of women in the working population of these two regimes, the proportion of women is still away from perfect equality by almost 10 percentage points.

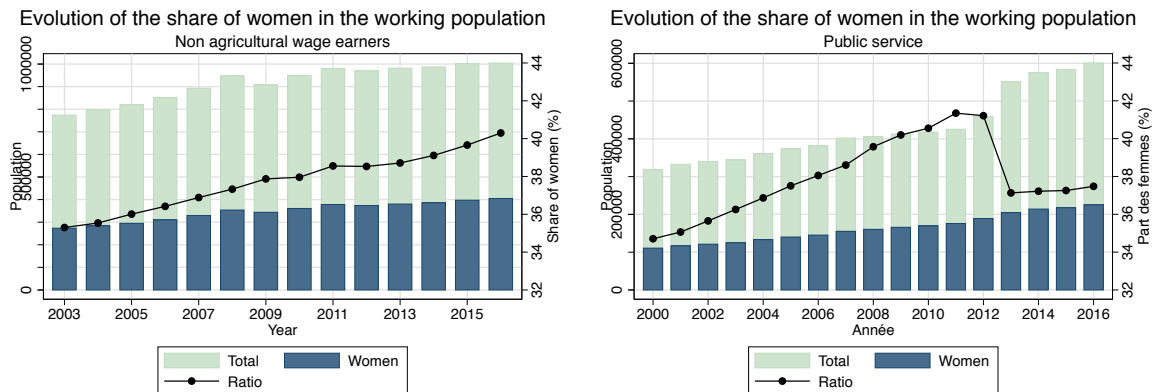


Figure 4.2: Evolution of the share of women in the working population

Source: author's computations using CRES descriptive statistics

Secondly, the gender gap also lies in the wage gap between men and women. Table 4.2 presents the average wage for men and women for the public sector (CNRPS) and non agricultural private sector (RSNA) for the first trimester of 2016. The situation greatly varies between these two regimes. In the public sector, the average monthly wage is very close between men and women and it is slightly higher for women. However, for employees of the non agricultural private sector, men earned 1.4 times the average wage of women for the first trimester of 2016. Despite the masculinization of the public sector in 2013, it remains more egalitarian concerning the wage gender gap.

Regime	Gender	Population size	Average monthly income (current tunisian dinars)	Bottom income threshold (current Tunisian Dinars)		
				Middle 40%	Top 10 %	Top 1%
CNRPS	Male	375640	1252	1165	1660	3621
CNRPS	Female	225171	1297	1299	1655	3541
CNRPS	Total	600811	1269	1200	1657	3558
RSNA	Male	599852	1093	706.2	2165	6366
RSNA	Female	404890	756.5	504.6	1375	4599
RSNA	Total	1004742	957.5	609.0	1902	5691

Table 4.2: Population size, labor income averages and thresholds for males and females for the first trimester of 2016

Source: author's computations using gross labor income tabulations and descriptive statistics

## 4.2 Informality in the occupied active population

Taking as the definition of formal employment the fact that a worker is declared to the Social Security at least once during a year, the share of informal work has been overall decreasing over the period as the corollary to the increase of the Social Security coverage rate. As shown in table 4.3, there was a steady increase in Social Security coverage rate of occupied active population over the period 2003-2008, in line with the progressive and continuous extension of the Social Security since independence (Charmes et al., 2016). Between 2008 and 2016, this coverage stagnated around a coverage of 73%, except a high and temporary increase between 2010 and 2011 that was mainly due to a decrease in the informal working population. This suggests that post-revolutionary Tunisia failed to maintain this increase in formalization of the economy. However, the level of coverage remains high, especially considering other countries in the region. Indeed, according to Dupuis et al. (2010), 57.1% of the active population was covered by the Social Security in Algeria in 2004, and only 26.1% in Morocco (against 64.0% in Tunisia in 2004).

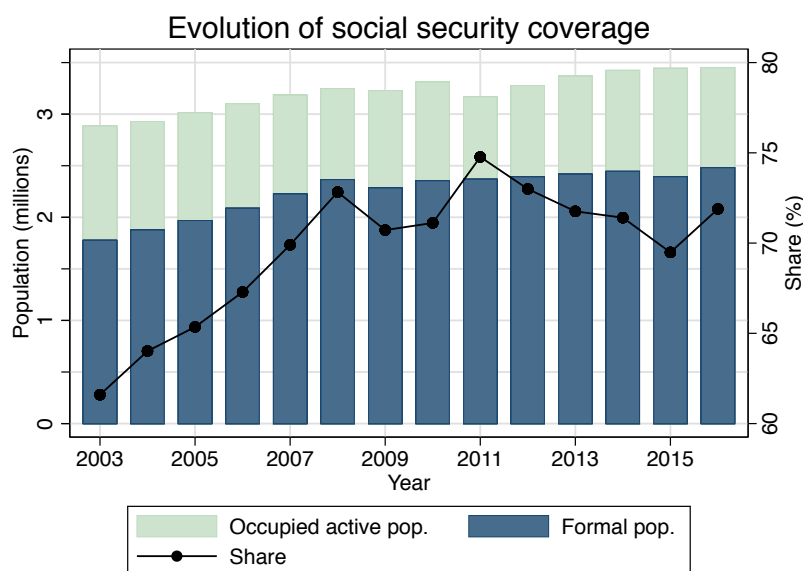


Figure 4.3: Coverage of the working population by the Social Security

Source: author's computations using CRES descriptive statistics and ILO series

## 4.3 Total declared income in net national income

The share of total declared income in net national income has been increasing over the period as well, as figure 4.4 highlights. It could be driven by different trends:

1. An increase of individual compensation of employees that is relatively larger than the increase in capital remuneration. This interpretation is supported by the fact that average monthly incomes increased a lot in constant Tunisian Dinars. Over the period 2003-2016, average monthly income increased by 28% in the public service and by 43% in the non agricultural private sector (for wage earners). See B.2 in appendix for more detail.
2. An increase of individual net mixed income of independents that is relatively larger than the increase in capital remuneration. This could be due either to higher remuneration of the capital share or of the labor share in mixed income. However, this effect is not really

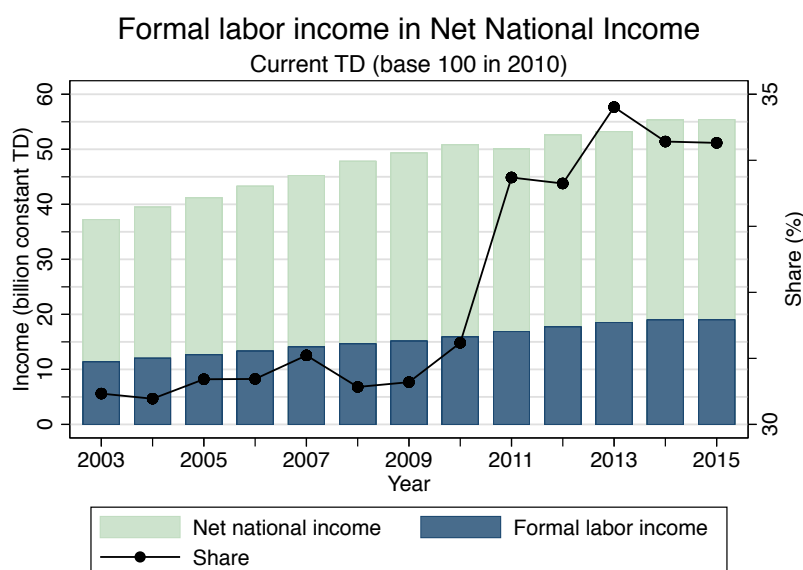


Figure 4.4: Share of formal declared income in the net national income

Source: author's computations using CRES descriptive statistics and INS series

supported by the data due to the stagnation of mixed income over the period. Indeed, for non agricultural independents who constitute the main part of independent workers, average monthly income has increased only by 9% between 2003 and 2016.

3. An increase in formal work compared to informal work: this increased share of declared income in net national income is also likely to reflect the surge in Social Security coverage. This could be the case if the net national income captures a share of the value added that is produced in the informal sector.

This could also be interpreted as an increase in the labor share in the economy<sup>16</sup>. However, this interpretation should remain very cautious as this increase in the labor share is also likely to reflect the increase in the coverage of the working population. Indeed, if the value added created by informal workers is captured by the measure of GDP but cannot be imputed to factor capital income, an increase in coverage can result in an increase of the labor share without any change in income sharing in the real economy.

Another striking fact is the low share of declared income in net national income with regards to international standards. Indeed, using a similar definition of the labor share<sup>17</sup>, Guerriero (2012) finds labor shares of 72% for Africa region and of 70% for Asia region over the period 1970-2009. This suggests that capital income is high in Tunisia. However, this phenomenon could also be explained by the high level of informality remaining in the country.

<sup>16</sup>Even if it is not the most common, this conception of the labor share as including both employee compensation and mixed revenue is sometimes used in the literature, as stressed in Guerriero (2012).

<sup>17</sup>Guerriero (2012) computes several labor shares for several world regions using different definitions of the labor share. One of these definitions is the ratio of compensations of employees and mixed income over value added net of indirect taxes and consumption of fixed capital, which is close to our ratio (compensation of employees and mixed income over net national income).

## 5 Results

### 5.1 Consumption inequalities

	Our estimates		Povcalnet estimates	
	2005	2010	2005	2010
Top 1%	7.80	6.22	5.96	5.01
Top 10%	34.06	31.45	30.86	28.82
Middle 40%	42.82	44.44	44.34	45.41
Bottom 50%	23.12	24.11	24.80	25.76
Gini	41.00	38.72	37.73	35.81

Table 5.1: Estimators of inequality from consumption household data

Source: author's estimations and Povcalnet estimates

Table 5.1 presents top, middle and bottom shares as well as Gini coefficients in 2005 and 2010. Two important facts stand out.

Firstly, we find moderate levels of inequalities with top shares between 6% and 8% for the top 1% and between 31% and 34% for the top 10%. Similar conclusions can be drawn from the ginis we find: 41% in 2005 and 38.72% in 2010. To put it in an international perspective, Povcalnet displays a Gini index of 40.72% for Morocco in 2006, 27.2% for Algeria in 2011, 35.69% for Mauritania in 2008. Our results are very close to those of Belhaj Hassine (2014), who finds ginis for total expenditure amounting 40.55% in 2005 and 38.33% in 2010. However, the ginis we compute are higher than the ones presented by Povcalnet, while original data is theoretically the same. This could be linked to different measures of expenditure, since it has been shown that measurement greatly influences inequality measures of expenditure (Belhaj Hassine, 2014).

Secondly, we find that expenditure inequality decreased between 2005 and 2010, both considering different shares or ginis. This is also in line with the existing literature (Belhaj Hassine, 2014 ; Bibi and Nabli, 2010). However, as stressed earlier, consumption approach of inequality has several limitations, and we therefore complement this study with labor income inequalities to address these concerns.

### 5.2 Labor income inequalities

#### 5.2.1 Evolution of the top 1% shares

Figure 5.1 presents the evolution of the top 1% share between 2003 and 2016 for Tunisia. The sharp increase of the Tunisian 1% top share over the years 2003 to 2010 is very striking, with an increase from 7.0% in 2003 to 8.3% in 2010. This implies that labor income inequalities had been increasing for at least seven years before the revolution burst in 2010. After 2010, inequalities progressively declined but at a lower rate and the top 1% share is still significantly higher in 2016 than it was in 2003, remaining at 7.6%.

In order to put this in perspective, we add the series of individual labor factor income for France since 1970. Of course, Tunisian and French economies differ a lot. However, the comparison remains very informative. Indeed, as presented on figure 5.2, the 1% top income share in Tunisia reached substantially higher levels over the period 2003 - 2016 than they did in France between 1970 and 2014. Overall, this documents a high level of top income shares for Tunisia over our period of interest and therefore a high level of labor income inequalities.

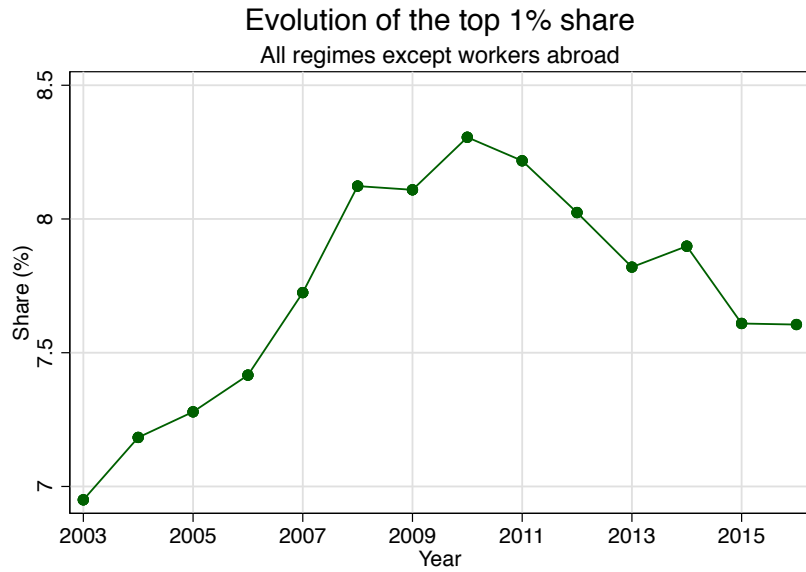


Figure 5.1: Evolution of the top 1% share in Tunisia

Source: author's estimations

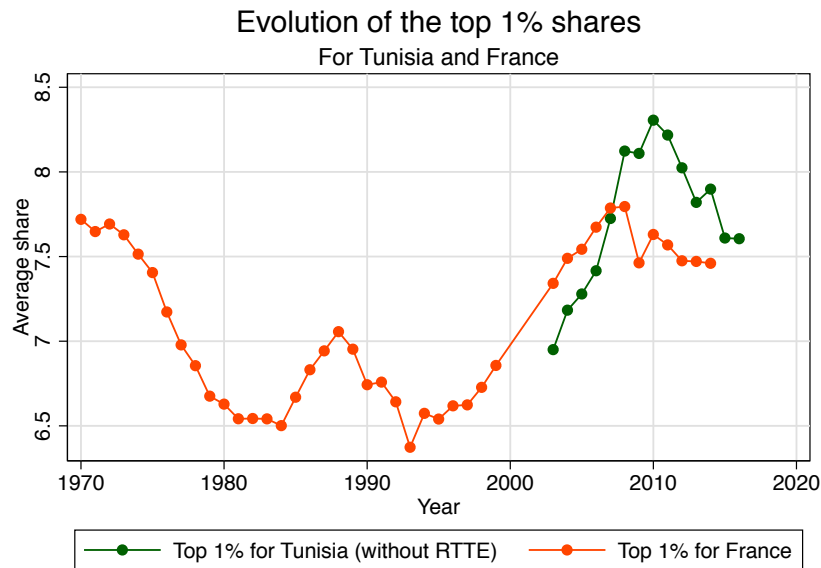


Figure 5.2: Evolution of the top 1% shares in Tunisia and France

Source: author's estimations, WID series for France

### 5.2.2 Evolution of the top 10% share

Figure 5.3 presents the evolution of the 10% labor incomes share. Findings are similar for this measure, characterized by (i) an increase of the top 10% income share over the period 2003 - 2010, going from 30.7% to 33.4 and (ii) a decrease of this share from 2011 to 2015. However, the share in 2016 remains higher than in 2003 at 31.1%.

By comparing these series with those of France over the period 1970 - 2014 on figure 5.4, two

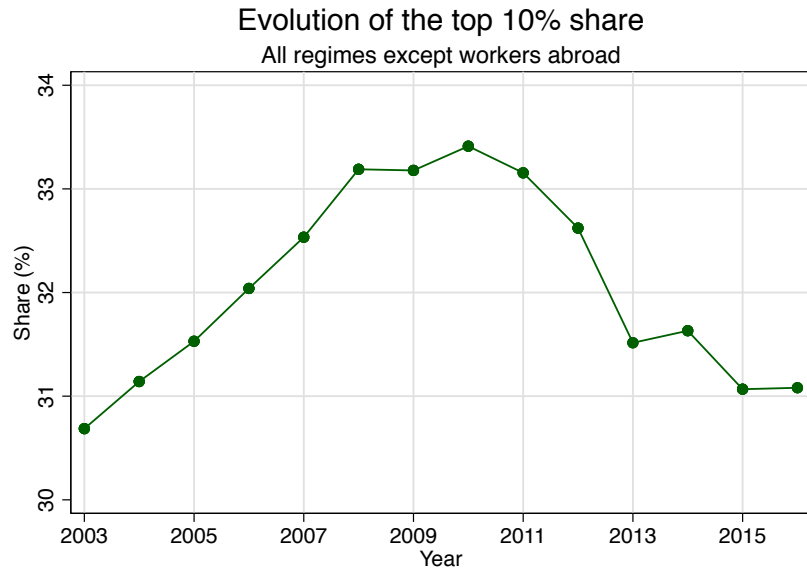


Figure 5.3: Evolution of the top 10% share

Source: author's estimations

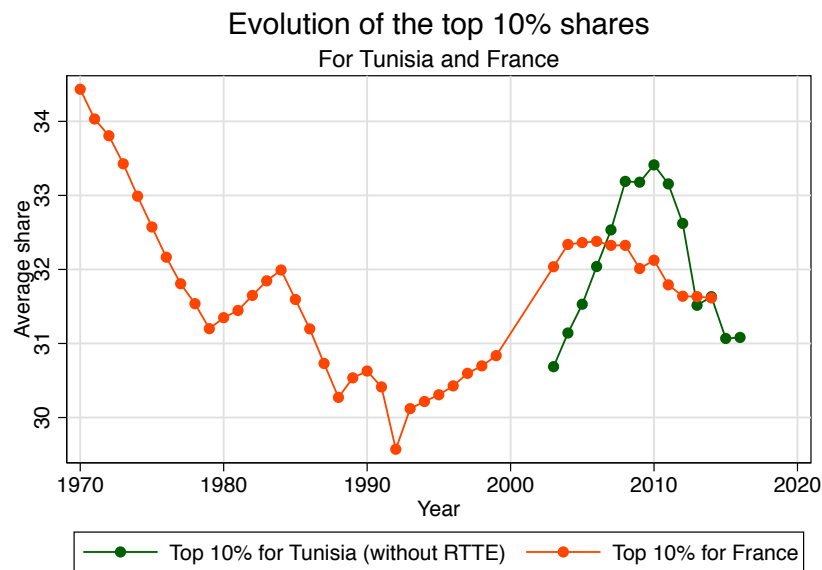


Figure 5.4: Evolution of the top 10% shares in Tunisia and France

Source: author's estimations, WID series for France

main facts stand out. Firstly, Tunisia no longer systematically has higher shares than France over that period, suggesting that labor income revenues are more concentrated to the top 1% in Tunisia. Secondly, this longer-term scale confirms that the increase and decrease in top shares over the period 2003 - 2016 was both very substantial and rapid.



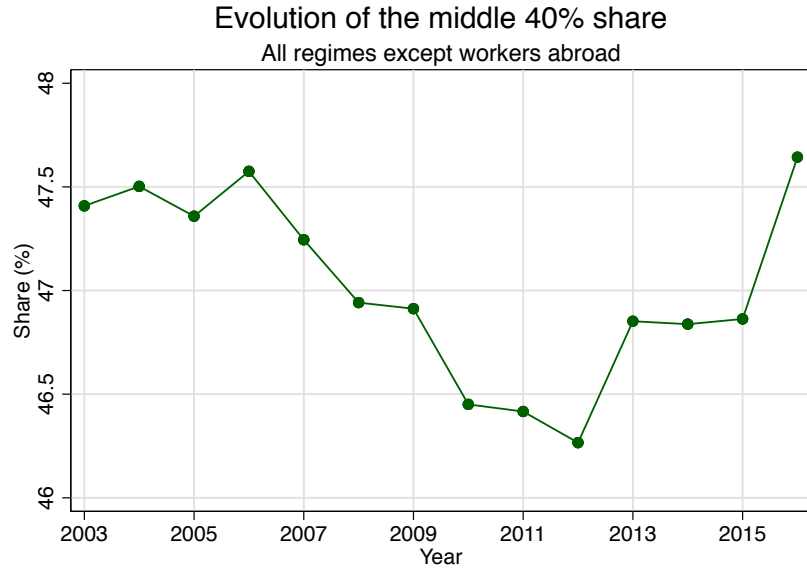


Figure 5.5: Evolution of the middle 40% share

Source: author's estimations

### 5.2.3 Evolution of the middle 40% share

Conversely, the evolution of the middle 40% share follows a U-shaped pattern. It remained stable around 47.5% during the period 2003 - 2006 before decreasing over the period 2012 - 2016 to 46.3% in 2012. From 2012 to 2016, it increased to levels close to those of 2003 (47.6%). Overall, the share of the middle 40% has therefore been more stable than that of the top income groups with less than 1.5 percentage point change between 2012 and 2016 (compared to 2.3 percentage points for the top 10% shares between 2010 and 2016).

### 5.2.4 Evolution of the bottom 50% share

Figure 5.6 presents the evolution of the bottom 50% share. Similarly, to the middle 40% shares, the evolution of the 50% bottom share over the period follows a U-shaped curve. However, this share stopped decreasing earlier than for the middle 40%, diminishing from 21.9% to 19.9% over the period 2003 - 2008 before increasing and reaching 21.3% in 2016. This suggests that after an increase in labor income inequality over the period 2003 - 2008, the reallocation of labor income from top earners to other parts of the population started at the bottom of the distribution, before benefitting the middle-class from 2012 on.

Overall, the joint evolution of these shares suggests that labor income inequalities has been increasing over the period 2003-2010, in pre-revolutionary Tunisia, and decreasing over the period 2010-2016, in post-revolutionary Tunisia. These findings are interesting in two ways. Firstly, they go against the general idea according to which inequalities reduced over the 2000-2010 period (Ianchovichina et al., 2015). Moreover, they go against the expenditure analysis that we have conducted. We therefore present decomposition of labor income inequalities by regime and gender in order to understand what could drive this tendency.

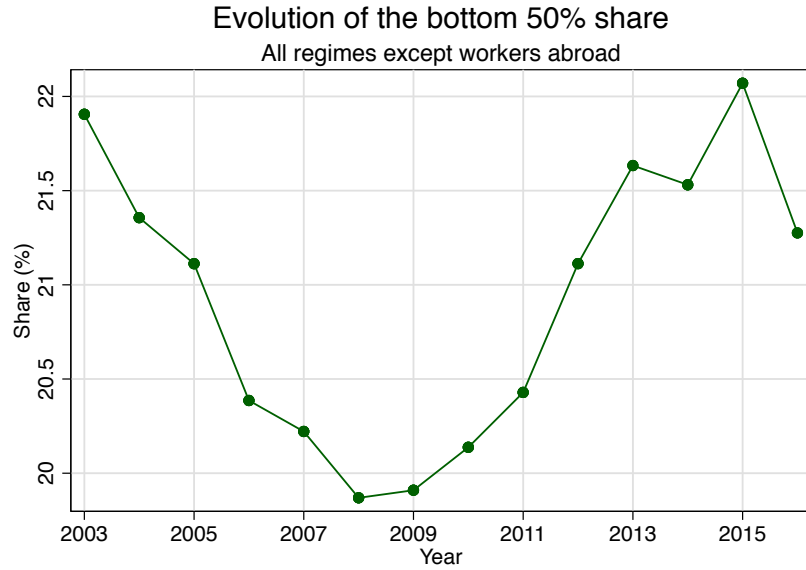


Figure 5.6: Evolution of the bottom 50% share

Source: author's estimations

### 5.3 Decomposition of labor income inequalities by regime

In this subsection, we present the evolution of shares for the three largest regimes: the regime of non agricultural workers (RSNA), the regime of workers in the public sector (CNRPS) and the regime of non agricultural independents (RTNS\_NA). Together, they make up for 83% of the formal working population in 2016. This decomposition highlights two important features. Firstly, the level of inequality varies a lot between regimes. Secondly and most importantly, the evolution of inequality has been very different from one regime to another one.

#### 5.3.1 Non agricultural wage-earners

The regime of non agricultural wage-earners is the largest one over the period and it accounted for 48% of the formal working population in 2016. It is also the most unequal regime with top 1% shares spanning from 8.6% to 10.2% over the period and top 10% shares spanning from 35.6% to 38% over the period. As a comparison, we remind that for the pool of all regimes (except workers abroad), those shares spanned from 7.0% to 8.3% for the top 1% shares and from 30.7% to 33.4% for the top 10% share.

Figure 5.7 presents the evolution of different shares over the period and highlights a specific pattern: an increase in inequalities in pre-revolutionary Tunisia and a decrease in post-revolutionary Tunisia. Indeed, top shares increased over the period 2003-2010 and decreased over the period 2010-2016. The opposite trend occurred for the middle 40% with decreasing share over the period 2003-2010 and increasing share between 2010 and 2016. Finally, the shares of the bottom 50% declined over the period 2003-2010 and stagnated afterwards. This suggests that the decrease in inequality after the revolution did not benefit poorest workers, but rather workers of the middle class.

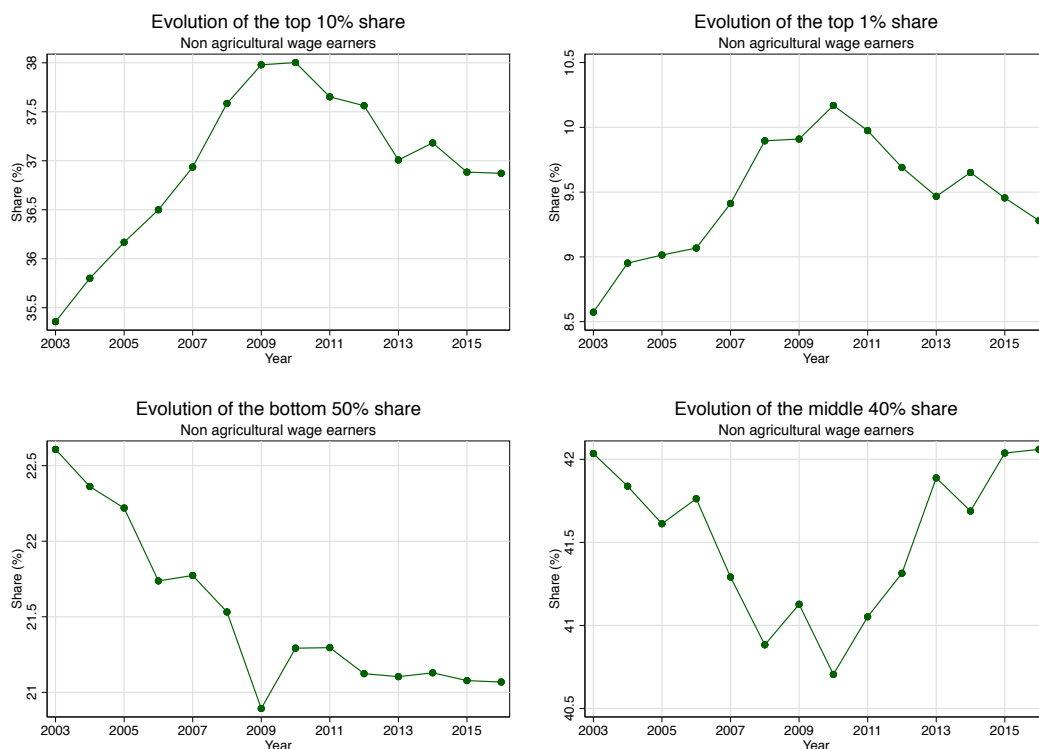


Figure 5.7: Evolution of the shares for non agricultural wage-earners (RSNA)

Source: author's estimations

### 5.3.2 Workers in the public sector

The regime of workers in the public sector is the second largest one. The workers of this sector for which we have individual data accounted for 25% of the formal working population in 2016. The distribution of their wages is less unequal than that of non agricultural wage-earners and independents, with top 1% shares spanning from 3.3% to 4.0% and top 10% shares spanning from 18.9% to 21.3%.

Figure 5.8 presents the different trend in the evolution of inequalities for this regime and highlights the large decline in inequality all over the period in the public sector, mainly at the benefit of the bottom 50%. Indeed, the top shares decreased from 2002 to the end of the period, at the benefit of the shares of the middle 40%, which increase over the years 2002-2009, and then at the benefit of the shares of the bottom 50%, which increase over the years 2012-2016. The large pike in the share of the bottom 50% in 2013 at the expense of the shares of other groups suggest that a larger share of distributed wages was reallocated to the poorest workers in 2013. This pike occurred in a very specific context. Indeed, it followed an increase in the working population of the public sector over the period 2011-2013 and in the population working in the public sector that is individually declared in 2012 (figure 5.9). This suggests a reorganization of the public sector in this period, in the frame of which more resources were reallocated to the bottom of the distribution.

### 5.3.3 Non agricultural independent workers

The regime of non agricultural independents is the third largest one. It accounted for 10% of the formal working population in 2016. The distribution of declared income within this regime is

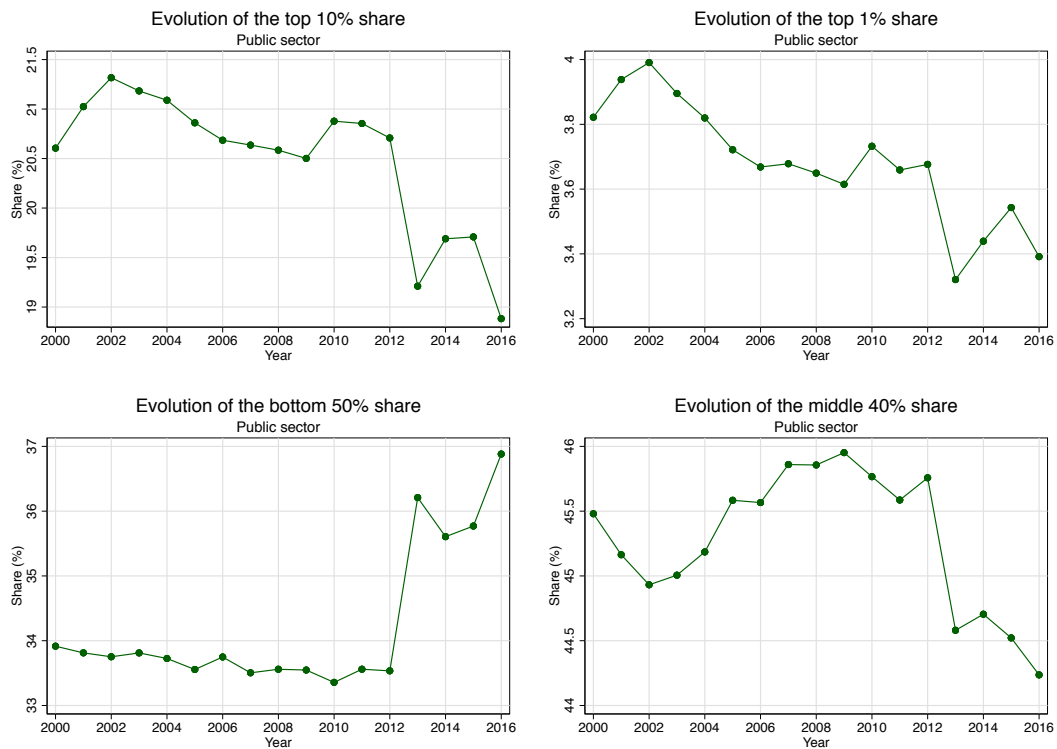


Figure 5.8: Evolution of the shares for workers in the public sector (CNRPS)

Source: author's estimations

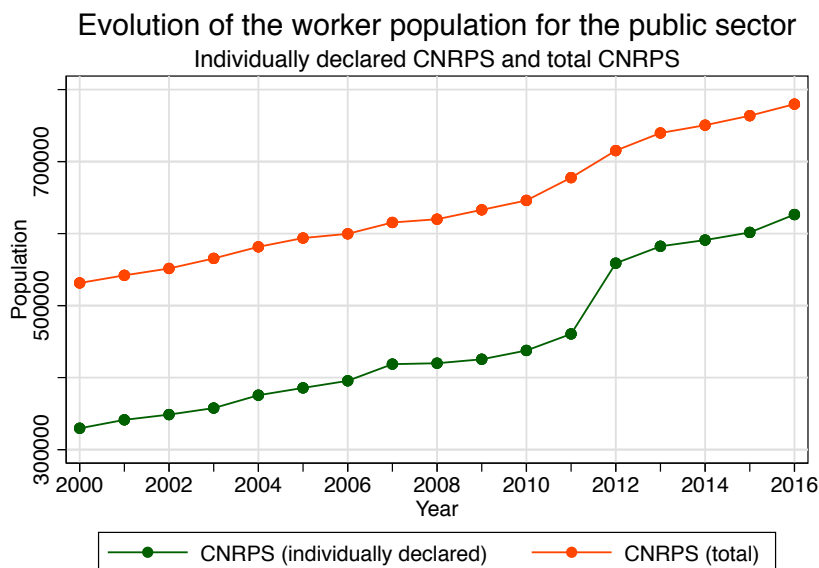


Figure 5.9: Evolution of the population size in the public sector (CNRPS)

Source: author's computations

more unequal than in the public service but less unequal than for non agricultural wage-earners. However, as income of independents is self-declared, it is likely to be under-declared and these series should therefore be interpreted with caution.

Figure 5.10 presents the evolution of shares for these workers. It highlights a large increase in top shares over the period and a decrease of middle and bottom shares. Indeed, shares of the top 10% increased by 4.6 percentage points and shares of the top 1% increase by 1.1 percentage points. This suggests an increase in inequality, but it could also be driven by an increase in declared income for the top earners of this group due to a reduction in under-declaration at the top.

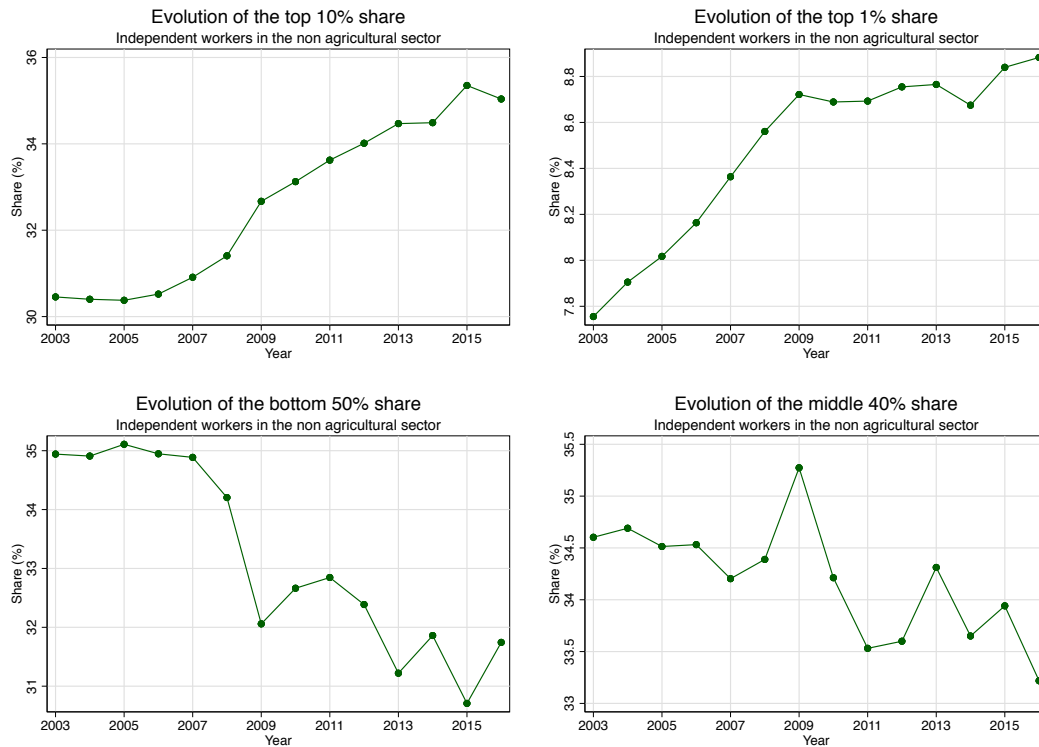


Figure 5.10: Evolution of the shares for non agricultural independent workers (RTNS\_NA)

Source: author's estimations

Overall, the decomposition by regime allows to draw one main conclusion: the trend for the total population that we highlighted in section 5.2 and that was characterized by an increase of inequalities in pre-revolutionary Tunisia and a decrease in post-revolutionary Tunisia did not concern all kinds of workers. On the contrary, it was mainly driven by non agricultural wage-earners in the private sector. In contrast, inequalities increased for non agricultural independents and decreased for workers in the public service all along the period.

#### 5.4 Decomposition of labor income inequalities by gender

In this section, we present the decomposition of labor income inequalities by gender for two regimes: the regime of workers in the public service (CNRPS) and the regime of wage earners in the non agricultural private sector (RSNA). Three facts stand out of this decomposition. Firstly, the level of inequalities is higher for men than for women. Secondly, the decrease in inequalities in post-revolutionary Tunisia that we highlighted in section 5.2 appears to be partly driven by a reduction in inequalities for men. Contrary to that, inequalities increase over the period for women. Thirdly, the conjunction of the decreasing trend for men and this increasing trend for women results in a convergence of the level of inequalities between men and women.

Figure 5.11 presents the evolution of the shares of the top, middle and bottom groups for men

and for women and highlights the higher level of inequalities for men. Indeed, the shares of the top 1% and top 10% are substantially higher for men than for women. Conversely, they are lower for the bottom 50% and the middle 40%. This difference between the level of inequalities for men and women is moderately large put in an international perspective. Figure 5.12 presents the evolution of shares of the top 10% for Tunisia and France<sup>18</sup>. The difference in the level of inequality between men and women is much larger in Tunisia over the 2003-2016 period but it was higher for France all along the years 1970's and the early 1980's.

The evolution of the shares of the top, bottom and middle groups is also very interesting. As presented on figure 5.11, labor income inequalities increased for men over the period 2003-2010, with the increase of the top shares combined with the decrease of the bottom and middle shares. Between 2010 and 2016, this tendency changes: the shares of the top 1% and top 10% decreases, and the share of the bottom 50% increases. This is consistent with the evolution we highlighted in section 5.2, that is: the increase of inequalities in pre-revolutionary Tunisia and the increase in post-revolutionary Tunisia. In contrast to that, the evolution of the distribution for women is characterized by a steady increase of inequalities over the period. Indeed, as highlighted on figure 5.11, top shares increased, while the increase in the bottom 50% is just the counterpart of the decrease in the share of the middle 40%.

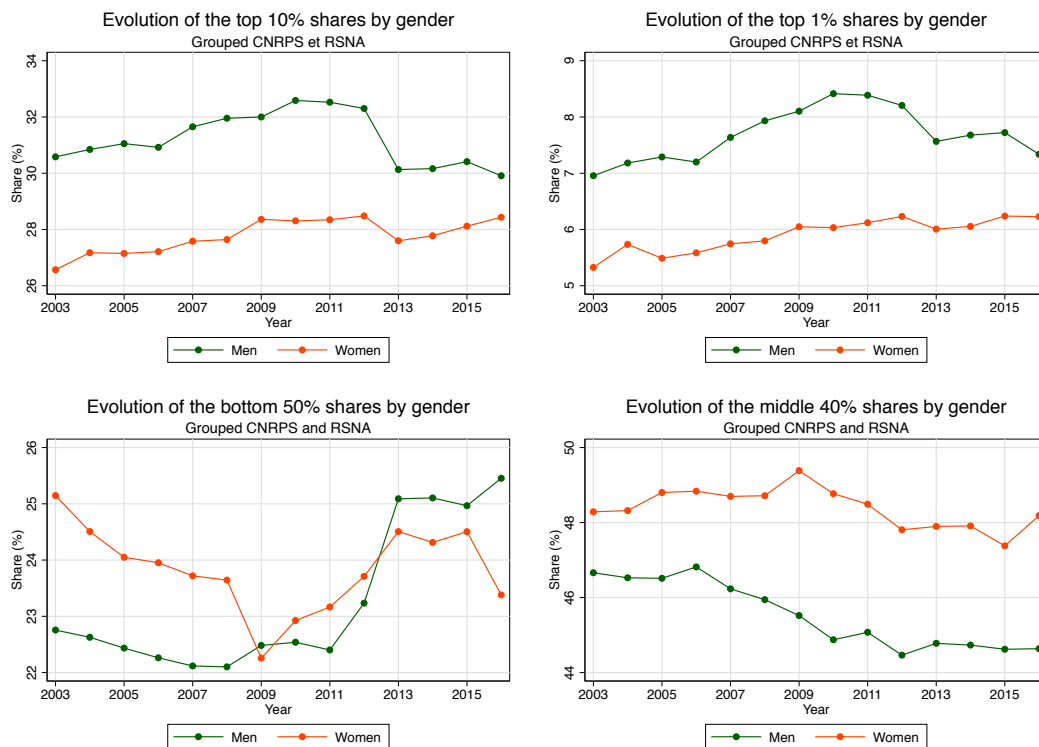


Figure 5.11: Evolution of the shares by gender for the public sector (CNRPS) and of the non agricultural private sector (RSNA)

Source: author's estimations

Moreover, we find similar results by disaggregating the distributions between the two regimes. Figure 5.13 presents the evolution of the different shares for these two regimes. For the non agricultural private sector (RSNA), inequalities for men increase over the period 2003-2010. Indeed, the distribution is characterized by an increase of the top 1% and top 10% shares, a stagnation of the 50% share and a decline in the middle 40% share. Then they decreased over

<sup>18</sup>Series for France are based on factor labor income and taken from WID.world).

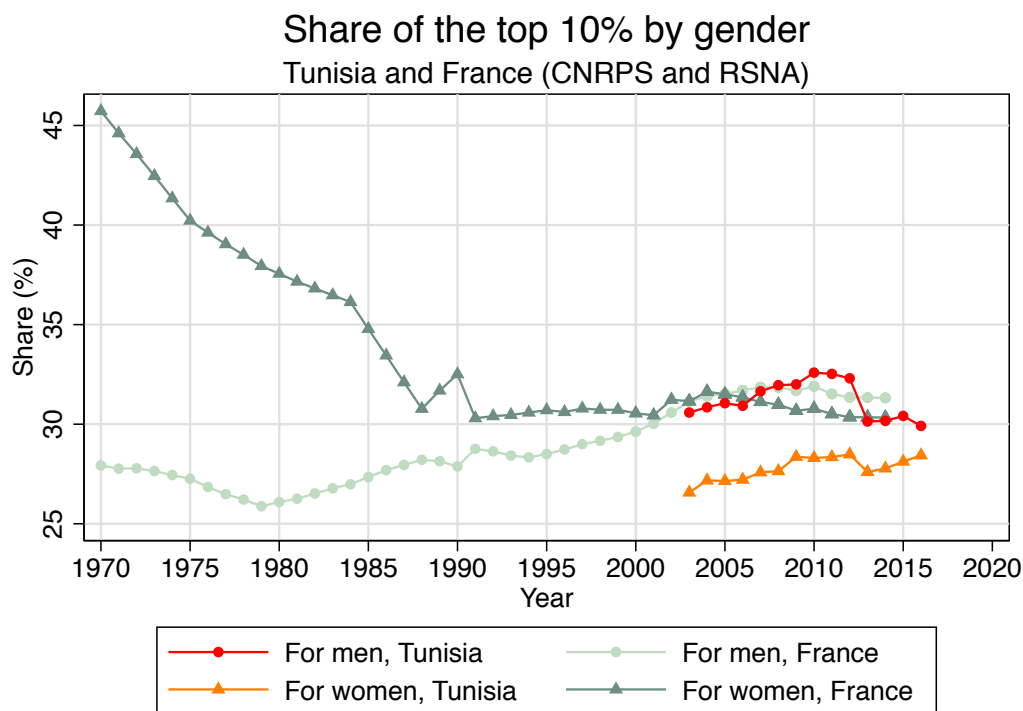


Figure 5.12: International comparison of gender shares with France

Source: author's estimations and WID.world series

the period 2010-2016, with the decrease in the share of the top 10% and top 1% and an increase in the shares of the bottom 50% and middle 40%. Contrary to that, for women, inequalities steadily increased over the period. Indeed, the distribution is characterized by an increase in the top shares and a decrease in the bottom and middle shares all over the period 2003-2016.

Similarly in the public sector (CNRPS), we observe a convergence of the level of inequality for men and women, with the conjunction of a slight increase of inequalities for women and a stagnation of inequalities for men.

This convergence of the level of inequalities for the distributions of labor income for men and women is likely to reflect the feminization of the working population.

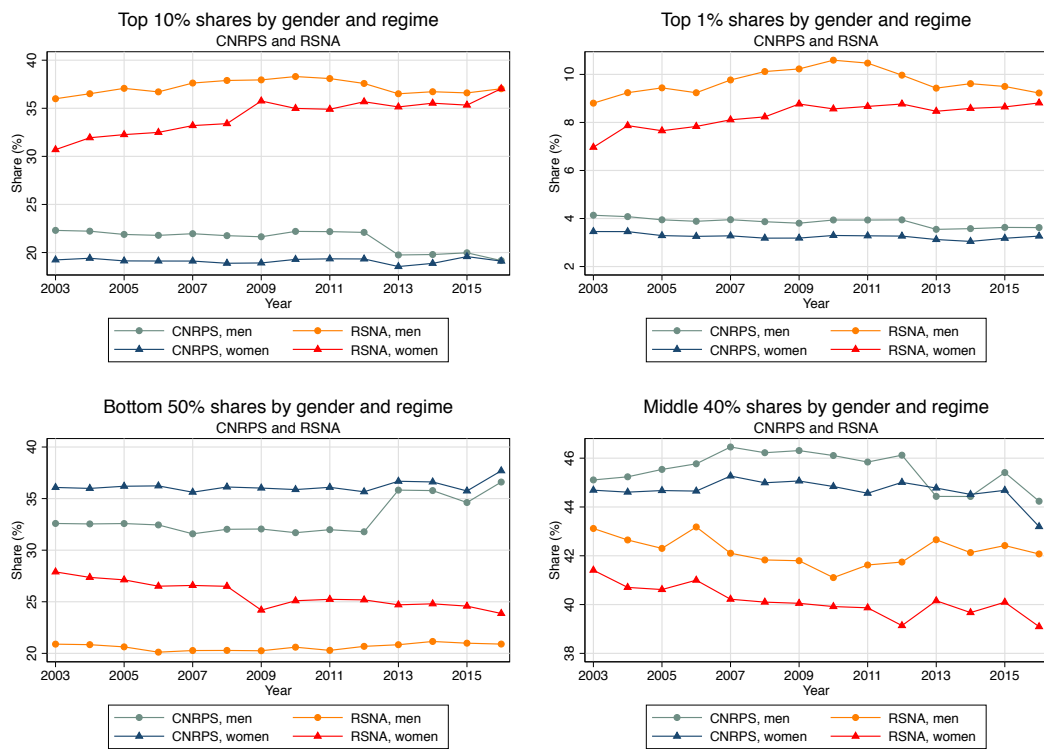


Figure 5.13: Evolution of the shares by gender and regime for the public sector (CNRPS) and the non agricultural private sector (RSNA)

Source: author's estimations



## 6 Conclusion

This paper constitutes a first effort to estimate labor income inequalities in Tunisia over the period 2003-2016, based on tabulations of gross labor income declared to the Social Security. This data was used to assess the dynamics of inequalities over that period for the Tunisian working population as a whole and for different subgroups: workers in the public sector and in the private sector; wage earners and independents; men and women. Our findings suggest that the level of labor income inequality was rather high in Tunisia over that period, and that inequalities followed a very specific pattern, characterized by the following dynamic: labor income inequalities increased in pre-revolutionary Tunisia, and decreased in post-revolutionary Tunisia. This finding is very interesting as it contradicts the common idea in the literature that economic inequalities decreased in pre-revolutionary Tunisia. It also contradicts our expenditure analysis, in which we found decreasing level of inequalities over the period 2005-2010.

The decomposition by regime and gender also allows us to draw two very interesting conclusions. Firstly, the trends in inequalities varied a lot between regimes. The increase in pre-revolutionary Tunisia appears to be driven by the trend for wage-earners in the agricultural private sector. On the contrary, inequalities decreased in the public sector and increased for independents of the private sector. Secondly, the trends in inequalities varied a lot between men and women. For men, the evolution of inequalities was characterized by an increase over the pre-revolutionary period and decrease afterwards. However, for women, inequalities increased over the period, leading to a convergence in the level of inequality between men and women.

This paper, however, only focuses on the formal working population and our findings should therefore be considered in the light of a remaining important informal sector in Tunisia, which our data fails to capture. Despite this, this paper shows the richness of tabulated income data and raises several questions for future research. Indeed, the discrepancy between the analysis we conducted on consumption and labor income inequalities suggests a point of interest in further investigating the role of redistribution in the Tunisian economy. The role inequalities could have played in social unrest over the period of interest and in the 2010 revolution would also be another topic to investigate.

Finally, this study should also be seen as a preliminary step for further studies on inequalities in Tunisia that would include capital income analysis. Therefore, we wish that similar data will continue to be made available for research in the future, and that this transparency effort will be consolidated by more open data on capital income.

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## A Data

### A.1 Available consumption data

		1985	1990	1995	2000	2005	2010	2015
Povcalnet	Provided data	7 Quantiles	7 Quantiles	12 quantiles	Deciles	Percentiles	Percentiles	
	Data source	Grouped	Grouped	Grouped	Grouped	Unit record	Unit record	
INS	Provided data			Microdata	Microdata	Microdata	Microdata	Decile tabulations
ERF	Provided data					Microdata	Microdata	

Table A.1: Available expenditure data in Tunisia

Source: Author's synthesis

### A.2 Used labor income data

Type of tabulations	Regimes covered	Frequency	Period covered
By regime	All regimes	Trimestrial	CNRPS: 2000-2016 Other regimes: 2003-2016
By gender	CNRPS RSNA	First trimester	2003-2016

Table A.2: Characteristics of declared labor income tabulations used in this paper

Source: Author's synthesis

## B General statistics

### B.1 Macro-economic indicators

Year	CPI	Unemployment rate (%)	Labor force (million)	Occupied active pop. (million)	GDP (million TD, const.)	NNI (million TD, const.)
2000	71.73	15.70	3.241	2.732	41033	32927
2001	73.15	15.10	3.286	2.790	43399	35173
2002	75.14	15.30	3.330	2.820	43787	35293
2003	77.18	14.51	3.372	2.883	45832	37210
2004	79.98	14.24	3.415	2.929	48560	39442
2005	81.59	12.87	3.458	3.013	51319	41134
2006	85.26	12.51	3.544	3.101	53667	43250
2007	88.17	12.36	3.632	3.183	56547	45232
2008	92.51	12.44	3.709	3.248	59743	47786
2009	95.77	13.29	3.724	3.229	61269	49268
2010	100	13.05	3.806	3.310	63055	50786
2011	103.5	18.33	3.877	3.166	62287	49996
2012	108.9	17.63	3.977	3.276	64628	52569
2013	115.2	15.93	4.006	3.367	65241	53188
2014	120.9	15.06	4.030	3.423	66846	55278
2015	126.7	15.22	4.061	3.443	66800	55373
2016	131.4	15.51	4.083	3.450	.	.

Table B.1: Macro-economic indicators

Source: INS for CPI, GDP and NNI ; ILO for unemployment rate, labor force, occupied active population

## B.2 Descriptive statistics by regimes

Regime	Year	Population size (Year)	Average monthly inc. (constant TD)
Formal population	2003	1.776e+06	532.0
Formal population	2004	1.875e+06	532.7
Formal population	2005	1.969e+06	534.2
Formal population	2006	2.086e+06	530.1
Formal population	2007	2.225e+06	526.0
Formal population	2008	2.365e+06	514.7
Formal population	2009	2.284e+06	550.9
Formal population	2010	2.354e+06	561.7
Formal population	2011	2.368e+06	593.7
Formal population	2012	2.391e+06	616.4
Formal population	2013	2.416e+06	638.4
Formal population	2014	2.444e+06	646.1
Formal population	2015	2.392e+06	660.9
Formal population	2016	2.480e+06	704.2

Table B.2: Descriptive statistics by regime - Formal working population

Source: Author's computations using CRES descriptive statistics

Regime	Year	Population size (Year)	Average monthly inc. (constant TD)
CNRPS	2000	329586	692.9
CNRPS	2001	341319	783.1
CNRPS	2002	348632	795.5
CNRPS	2003	357653	818.8
CNRPS	2004	375530	832.0
CNRPS	2005	385689	833.9
CNRPS	2006	395532	858.1
CNRPS	2007	418693	843.0
CNRPS	2008	419944	848.9
CNRPS	2009	425434	876.8
CNRPS	2010	437654	880.1
CNRPS	2011	460613	871.8
CNRPS	2012	558841	818.2
CNRPS	2013	582329	872.4
CNRPS	2014	591007	874.5
CNRPS	2015	601584	894.5
CNRPS	2016	626438	971.6
CNRPS (tot)	2000	531449	.
CNRPS (tot)	2001	541992	.
CNRPS (tot)	2002	551519	823.7
CNRPS (tot)	2003	565496	849.0
CNRPS (tot)	2004	581594	865.0
CNRPS (tot)	2005	593802	881.3
CNRPS (tot)	2006	599697	887.9
CNRPS (tot)	2007	615418	895.3
CNRPS (tot)	2008	619928	899.6
CNRPS (tot)	2009	632986	893.4
CNRPS (tot)	2010	646033	912.9
CNRPS (tot)	2011	677692	942.4
CNRPS (tot)	2012	715274	947.6
CNRPS (tot)	2013	739678	957.8
CNRPS (tot)	2014	750514	969.6
CNRPS (tot)	2015	763724	994.1
CNRPS (tot)	2016	779742	1085

Table B.3: Descriptive statistics by regime - Public sector

Source: Author's computations using CRES descriptive statistics

Regime	Year	Population size (Year)	Average monthly inc. (constant TD)
RSNA	2003	846171	457.6
RSNA	2004	871715	465.4
RSNA	2005	897843	476.1
RSNA	2006	936028	494.4
RSNA	2007	989987	500.7
RSNA	2008	1.052e+06	501.1
RSNA	2009	1.114e+06	511.0
RSNA	2010	1.173e+06	520.2
RSNA	2011	1.166e+06	554.7
RSNA	2012	1.152e+06	587.3
RSNA	2013	1.160e+06	614.7
RSNA	2014	1.172e+06	620.4
RSNA	2015	1.152e+06	621.7
RSNA	2016	1.181e+06	656.2

Table B.4: Descriptive statistics by regime - Non agricultural wage-earners

Source: Author's computations using CRES descriptive statistics

Regime	Year	Population size (Year)	Average monthly inc. (constant TD)
RSA	2003	9395	267.1
RSA	2004	9499	269.9
RSA	2005	9878	268.9
RSA	2006	10249	270.5
RSA	2007	10644	271.4
RSA	2008	11144	266.5
RSA	2009	11688	261.3
RSA	2010	11644	261.6
RSA	2011	11001	263.6
RSA	2012	10737	263.2
RSA	2013	10209	254.6
RSA	2014	10026	252.0
RSA	2015	9348	231.8
RSA	2016	9316	259.7
RSAA	2003	77603	113.0
RSAA	2004	83196	113.5
RSAA	2005	88445	113.5
RSAA	2006	94285	109.5
RSAA	2007	99941	109.5
RSAA	2008	106524	108.2
RSAA	2009	44226	173.3
RSAA	2010	46872	173.4
RSAA	2011	47916	190.8
RSAA	2012	45172	211.2
RSAA	2013	44018	231.3
RSAA	2014	43596	232.8
RSAA	2015	42723	229.2
RSAA	2016	42049	246.0

Table B.5: Descriptive statistics by regime - Agricultural wage-earners

Source: Author's computations using CRES descriptive statistics



Regime	Year	Population size (Year)	Average monthly inc. (constant TD)
LOI32_S	2003	25090	71.32
LOI32_S	2004	48896	108.5
LOI32_S	2005	69380	112.9
LOI32_S	2006	99915	113.0
LOI32_S	2007	129257	122.5
LOI32_S	2008	163638	100.2
LOI32_S	2009	148776	109.2
LOI32_S	2010	138377	111.1
LOI32_S	2011	121191	111.4
LOI32_S	2012	112427	107.6
LOI32_S	2013	101637	121.6
LOI32_S	2014	97700	121.0
LOI32_S	2015	80928	102.3
LOI32_S	2016	82785	119.4

Table B.6: Descriptive statistics by regime - Low income wage-earners

Source: Author's computations using CRES descriptive statistics

Regime	Year	Population size (Year)	Average monthly inc. (constant TD)
RTNS_A	2003	58872	158.1
RTNS_A	2004	61240	159.6
RTNS_A	2005	64649	162.8
RTNS_A	2006	68952	162.0
RTNS_A	2007	74631	159.6
RTNS_A	2008	82045	161.3
RTNS_A	2009	59931	203.5
RTNS_A	2010	62987	191.2
RTNS_A	2011	62041	190.5
RTNS_A	2012	66674	188.9
RTNS_A	2013	67788	207.8
RTNS_A	2014	71465	208.0
RTNS_A	2015	67284	179.0
RTNS_A	2016	71085	205.4

Table B.7: Descriptive statistics by regime - Agricultural independents

Source: Author's computations using CRES descriptive statistics

Regime	Year	Population size (Year)	Average monthly inc. (constant TD)
RTNS_NA	2003	185959	289.2
RTNS_NA	2004	208080	294.7
RTNS_NA	2005	229194	294.9
RTNS_NA	2006	249375	288.5
RTNS_NA	2007	272163	284.2
RTNS_NA	2008	293498	282.5
RTNS_NA	2009	241844	326.4
RTNS_NA	2010	245323	320.7
RTNS_NA	2011	242328	321.2
RTNS_NA	2012	242406	315.1
RTNS_NA	2013	241364	307.4
RTNS_NA	2014	251800	308.1
RTNS_NA	2015	237602	287.8
RTNS_NA	2016	251639	314.6

Table B.8: Descriptive statistics by regime - Non agricultural independents

Source: Author's computations using CRES descriptive statistics

Regime	Year	Population size (Year)	Average monthly inc. (constant TD)
LOI32_NS	2003	6384	101.3
LOI32_NS	2004	9569	109.4
LOI32_NS	2005	14323	108.5
LOI32_NS	2006	26325	94.88
LOI32_NS	2007	30813	113.7
LOI32_NS	2008	34311	112.7
LOI32_NS	2009	27886	123.0
LOI32_NS	2010	27602	121.0
LOI32_NS	2011	37716	101.6
LOI32_NS	2012	44974	109.6
LOI32_NS	2013	49880	128.4
LOI32_NS	2014	45611	138.0
LOI32_NS	2015	37801	114.1
LOI32_NS	2016	60723	131.4

Table B.9: Descriptive statistics by regime - Low income independents

Source: Author's computations using CRES descriptive statistics

Regime	Year	Population size (Year)	Average monthly inc. (constant TD)
RACI	2003	16	280.7
RACI	2004	25	347.8
RACI	2005	39	411.2
RACI	2006	58	342.7
RACI	2007	76	373.4
RACI	2008	87	375.1
RACI	2009	104	387.1
RACI	2010	132	409.1
RACI	2011	130	398.1
RACI	2012	124	424.9
RACI	2013	134	402.6
RACI	2014	149	373.7
RACI	2015	142	374.1
RACI	2016	164	425.7

Table B.10: Descriptive statistics by regime - Artists

Source: Author's computations using CRES descriptive statistics

### B.3 Descriptive statistics by gender

Regime	Year	Gender	Population size	Average monthly income (TD)
CNRPS	Men	2000	208187	498.0
CNRPS	Women	2000	110658	500.6
CNRPS	Total	2000	318845	498.9
CNRPS	Men	2001	215927	777.7
CNRPS	Women	2001	116584	779.1
CNRPS	Total	2001	332511	778.2
CNRPS	Men	2002	218523	804.6
CNRPS	Women	2002	121068	806.8
CNRPS	Total	2002	339591	805.3
CNRPS	Men	2003	219544	820.8
CNRPS	Women	2003	124859	823.8
CNRPS	Total	2003	344403	821.9
CNRPS	Men	2004	227937	832.5
CNRPS	Women	2004	133097	835.4
CNRPS	Total	2004	361034	833.5
CNRPS	Men	2005	233397	860.7
CNRPS	Women	2005	140064	870.1
CNRPS	Total	2005	373461	864.2
CNRPS	Men	2006	236350	862.7
CNRPS	Women	2006	145178	877.7
CNRPS	Total	2006	381528	868.4
CNRPS	Men	2007	246874	843.6
CNRPS	Women	2007	155215	866.9
CNRPS	Total	2007	402089	852.6
CNRPS	Men	2008	244938	856.3
CNRPS	Women	2008	160389	877.1
CNRPS	Total	2008	405327	864.6
CNRPS	Men	2009	246709	869.2
CNRPS	Women	2009	165805	892.7
CNRPS	Total	2009	412514	878.6
CNRPS	Men	2010	248385	879.7
CNRPS	Women	2010	169417	905.8
CNRPS	Total	2010	417802	890.3
CNRPS	Men	2011	249434	903.3
CNRPS	Women	2011	175835	926.8
CNRPS	Total	2011	425269	913.1
CNRPS	Men	2012	269731	884.9
CNRPS	Women	2012	189091	910.6
CNRPS	Total	2012	458823	895.5
CNRPS	Men	2013	346386	891.4
CNRPS	Women	2013	204578	917.3
CNRPS	Total	2013	550966	901.0
CNRPS	Men	2014	361036	884.4
CNRPS	Women	2014	214043	897.7
CNRPS	Total	2014	575081	889.3
CNRPS	Men	2015	366324	873.1
CNRPS	Women	2015	217524	893.6
CNRPS	Total	2015	583851	880.7
CNRPS	Men	2016	375640	952.9
CNRPS	Women	2016	225171	987.0
CNRPS	Total	2016	600811	965.6

Table B.11: Descriptive statistics by gender (first trimester) - Public sector

Source: author's computations using CRES descriptive statistics

Regime	Year	Gender	Population size	Average monthly income (TD)
RSNA	Men	2003	500722	541.4
RSNA	Women	2003	273193	407.3
RSNA	Total	2003	773915	494.1
RSNA	Men	2004	513944	549.2
RSNA	Women	2004	283375	407.9
RSNA	Total	2004	797319	499.0
RSNA	Men	2005	524472	570.1
RSNA	Women	2005	295139	416.2
RSNA	Total	2005	819611	514.7
RSNA	Men	2006	541397	585.3
RSNA	Women	2006	310112	425.5
RSNA	Total	2006	851509	527.1
RSNA	Men	2007	563617	595.3
RSNA	Women	2007	329393	425.8
RSNA	Total	2007	893010	532.8
RSNA	Men	2008	593821	604.0
RSNA	Women	2008	353684	427.2
RSNA	Total	2008	947505	538.0
RSNA	Men	2009	563813	661.7
RSNA	Women	2009	343673	443.7
RSNA	Total	2009	907486	579.1
RSNA	Men	2010	589362	673.8
RSNA	Women	2010	360591	457.8
RSNA	Total	2010	949953	591.8
RSNA	Men	2011	602529	695.6
RSNA	Women	2011	378067	476.8
RSNA	Total	2011	980596	611.2
RSNA	Men	2012	596374	759.7
RSNA	Women	2012	373800	510.9
RSNA	Total	2012	970174	663.8
RSNA	Men	2013	601721	788.0
RSNA	Women	2013	380084	540.4
RSNA	Total	2013	981805	692.1
RSNA	Men	2014	600963	788.1
RSNA	Women	2014	386009	534.0
RSNA	Total	2014	986972	688.7
RSNA	Men	2015	604782	813.4
RSNA	Women	2015	397508	560.8
RSNA	Total	2015	1.002e+06	713.2
RSNA	Men	2016	599852	831.8
RSNA	Women	2016	404890	575.5
RSNA	Total	2016	1.005e+06	728.5

Table B.12: Descriptive statistics by gender (first trimester) - Non agricultural wage-earners

Source: author's computations using CRES descriptive statistics

## C Annual and trimestrial shares

### C.1 By regime

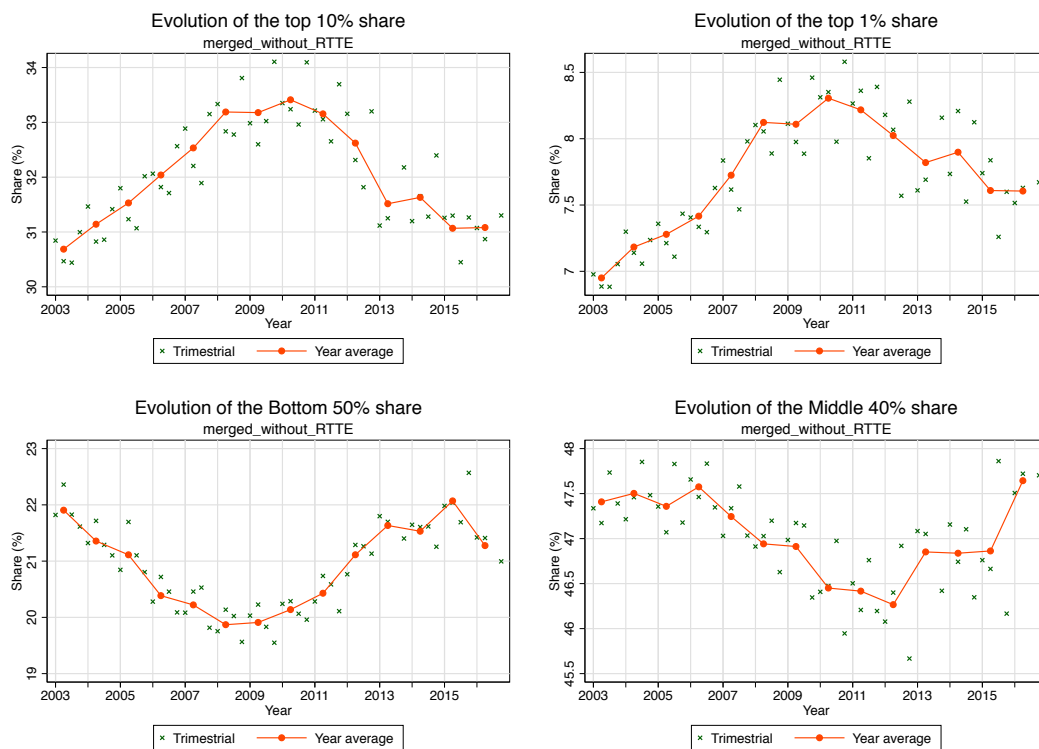


Figure C.1: Evolution of the shares for the aggregation of regimes (without workers abroad)

Source: author's estimations

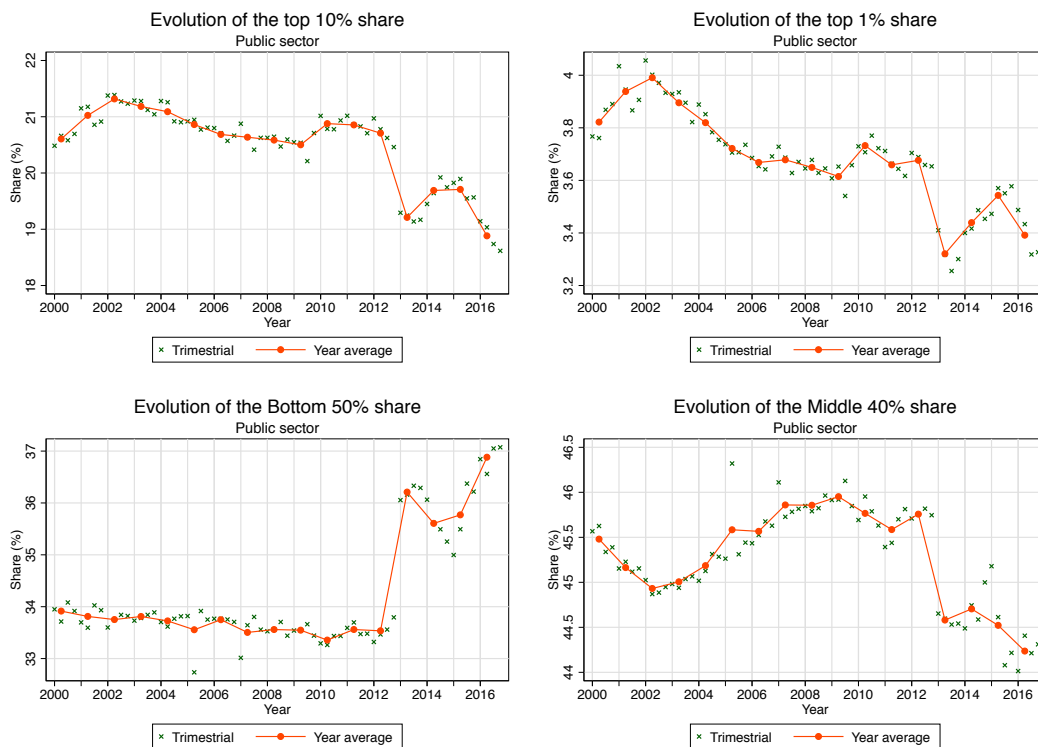


Figure C.2: Evolution of the shares for the public sector (CNRPS)

Source: author's estimations

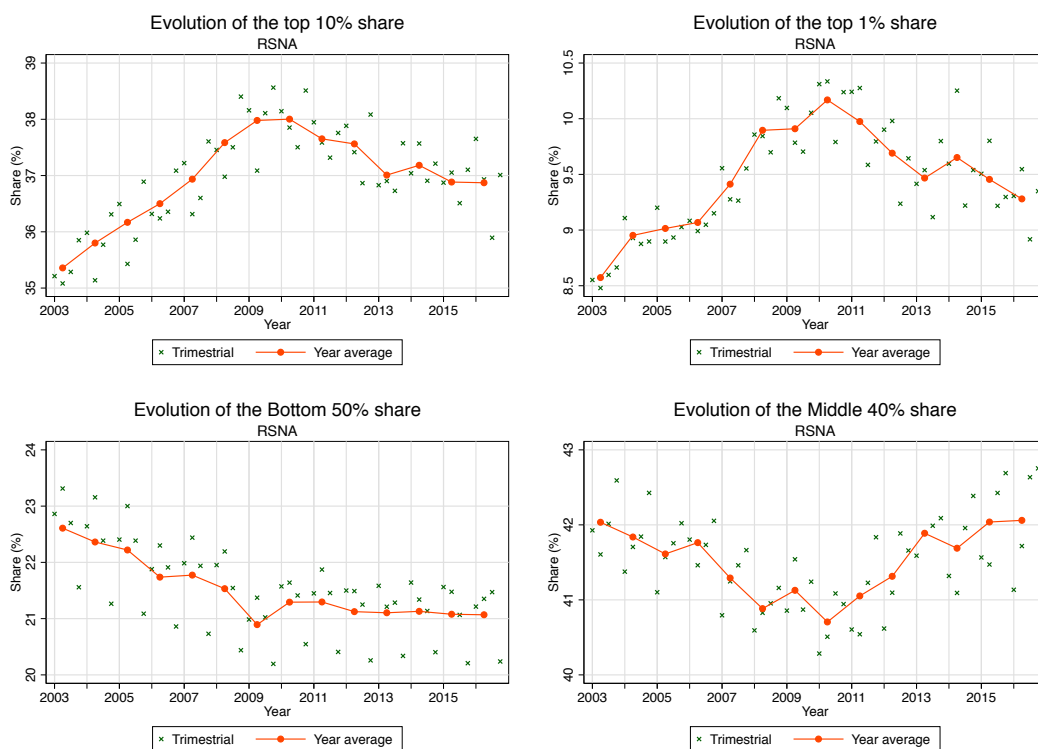


Figure C.3: Evolution of the shares for non agricultural wage-earners (RSNA)

Source: author's estimations

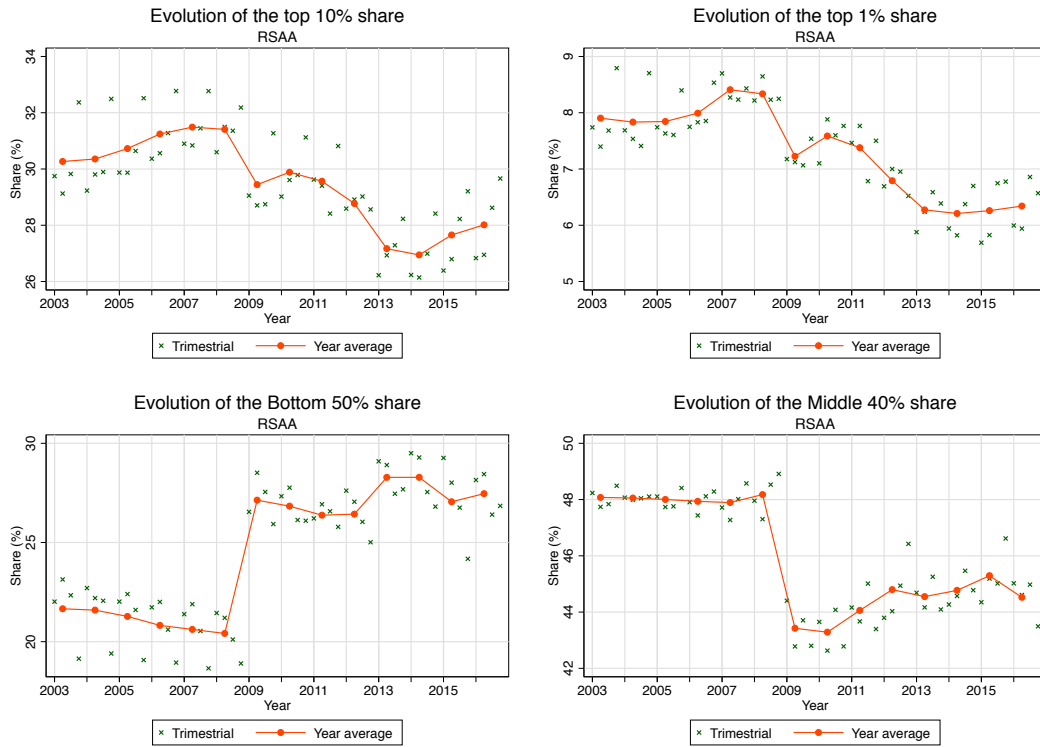


Figure C.4: Evolution of the shares for agricultural wage-earners of the improved regime (RSAA)

Source: author's estimations

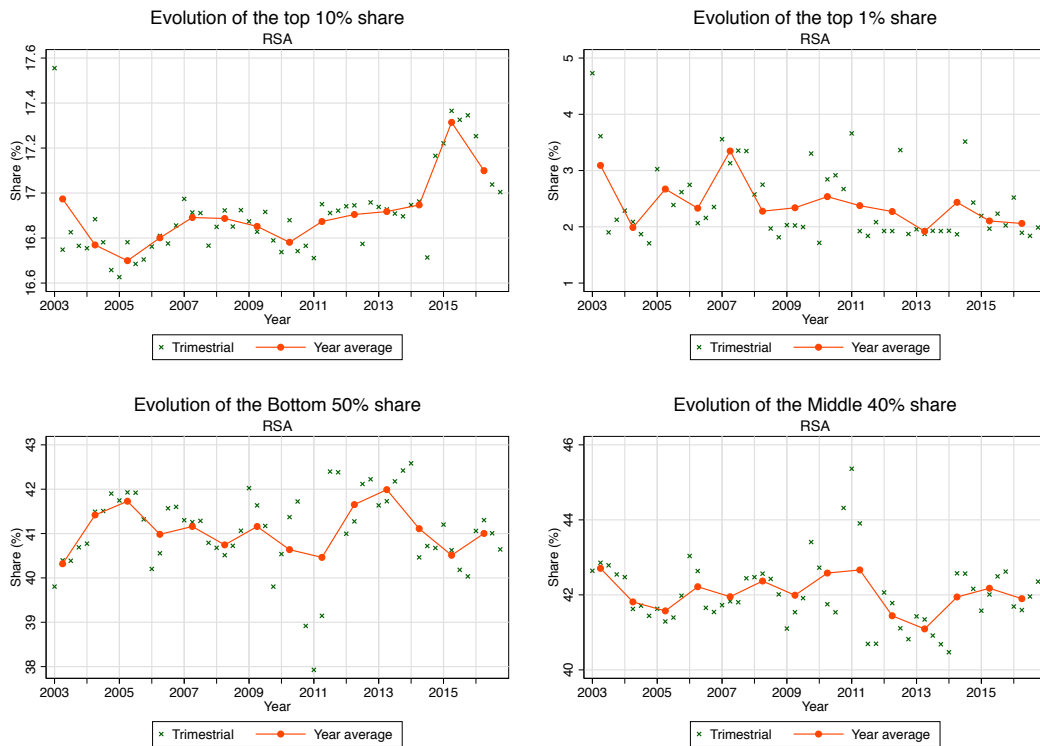


Figure C.5: Evolution of the shares for agricultural wage-earners of the regular regime (RSA)

Source: author's estimations



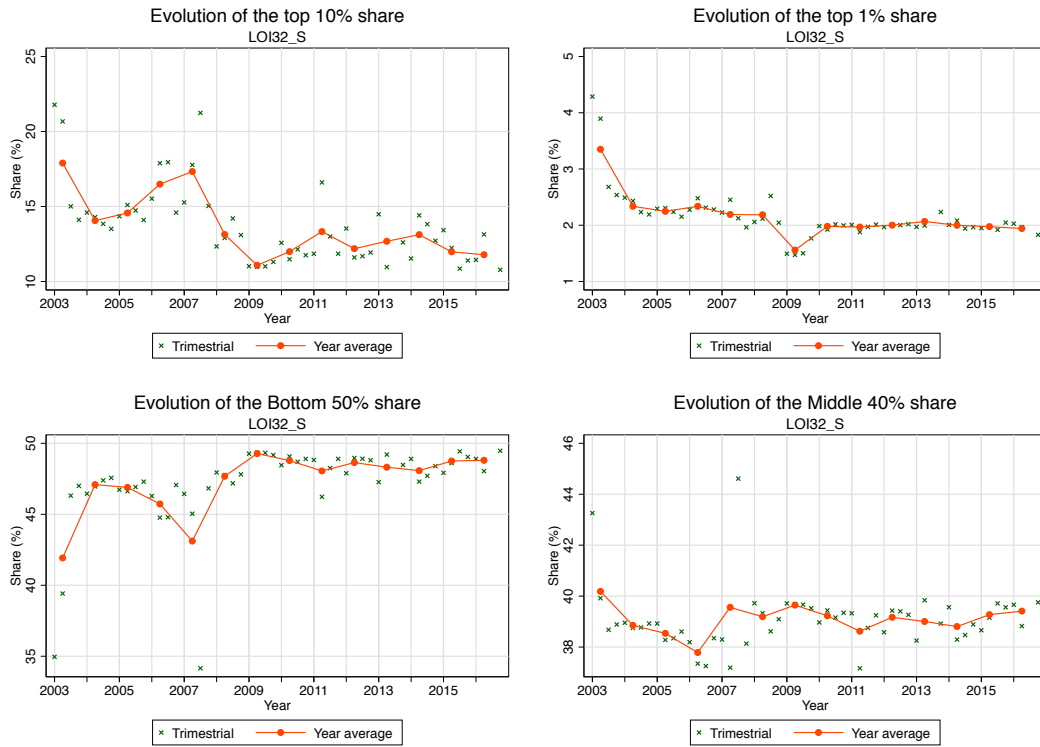


Figure C.6: Evolution of the shares for wage-earners with low income (LOI32\_S)

Source: author's estimations

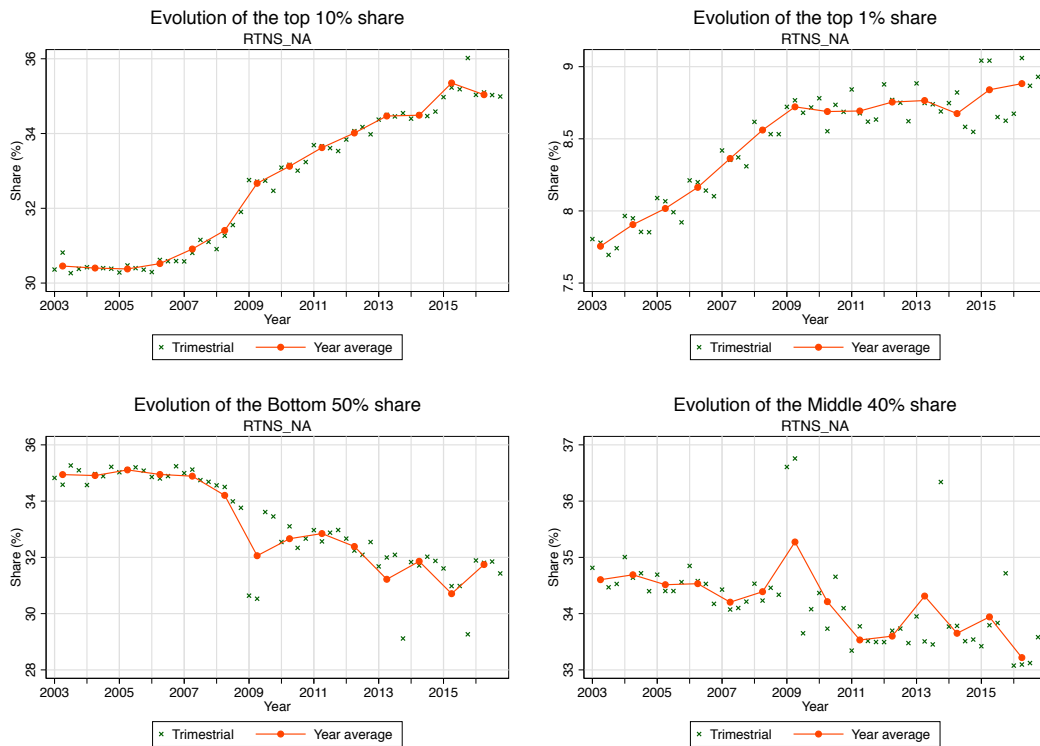


Figure C.7: Evolution of the shares for non agricultural independents (RTNS\_NA)

Source: author's estimations

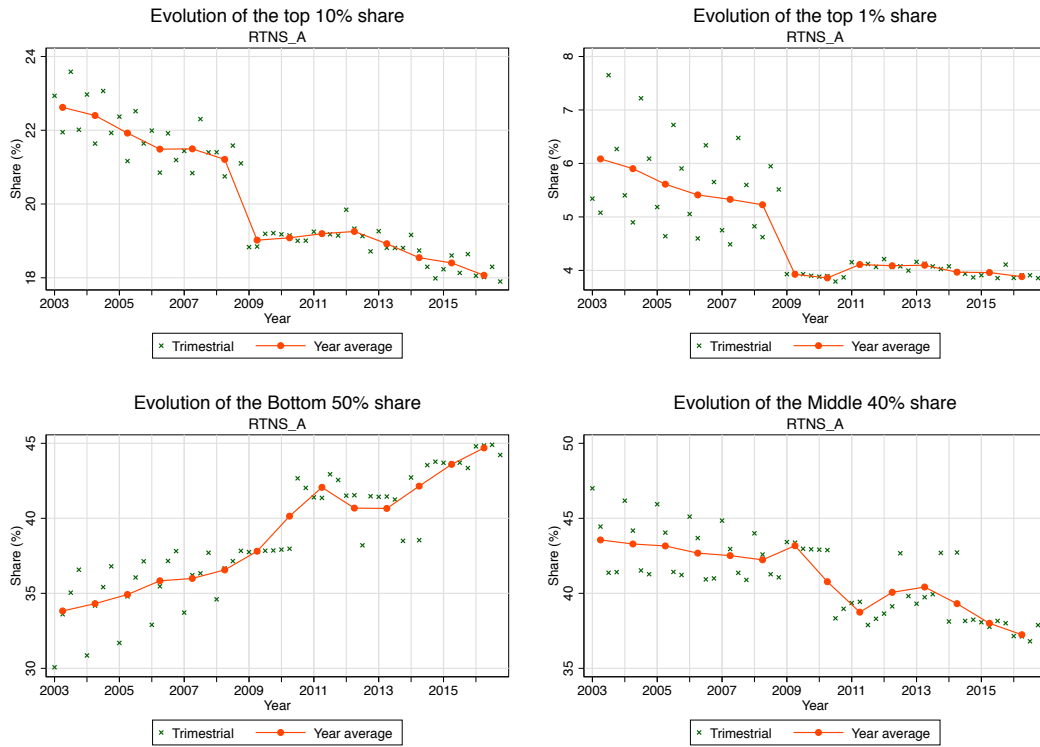


Figure C.8: Evolution of the shares for agricultural independents (RTNS\_A)

Source: author's estimations

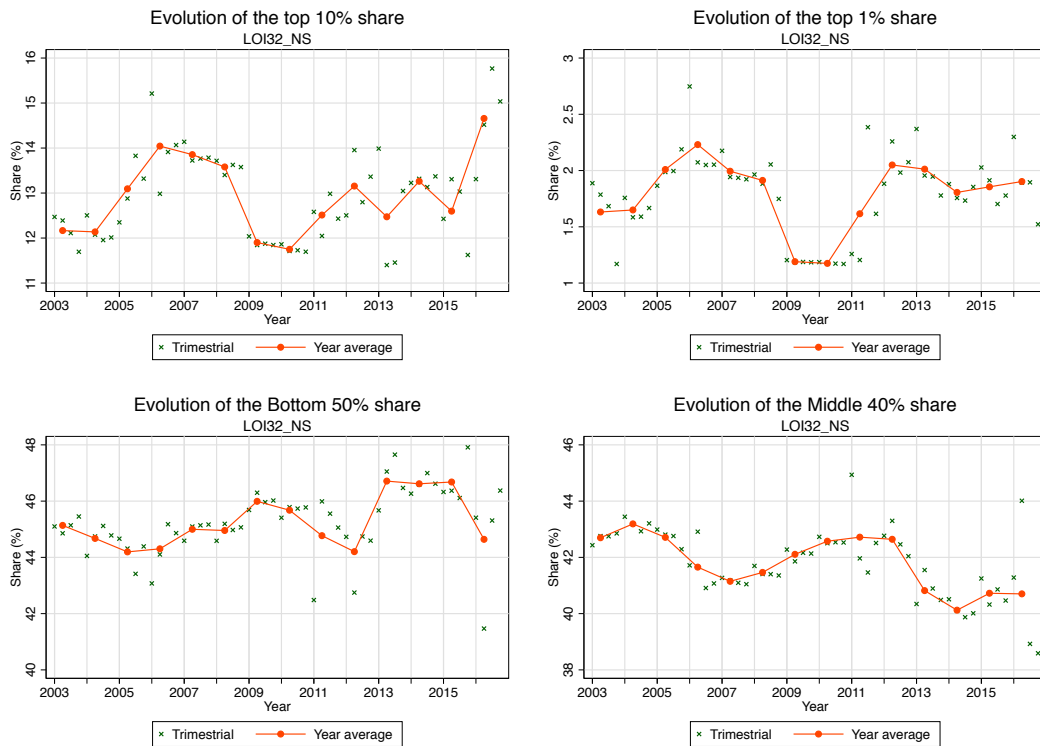


Figure C.9: Evolution of the shares for independents with low income (LOI32\_NS)

Source: author's estimations

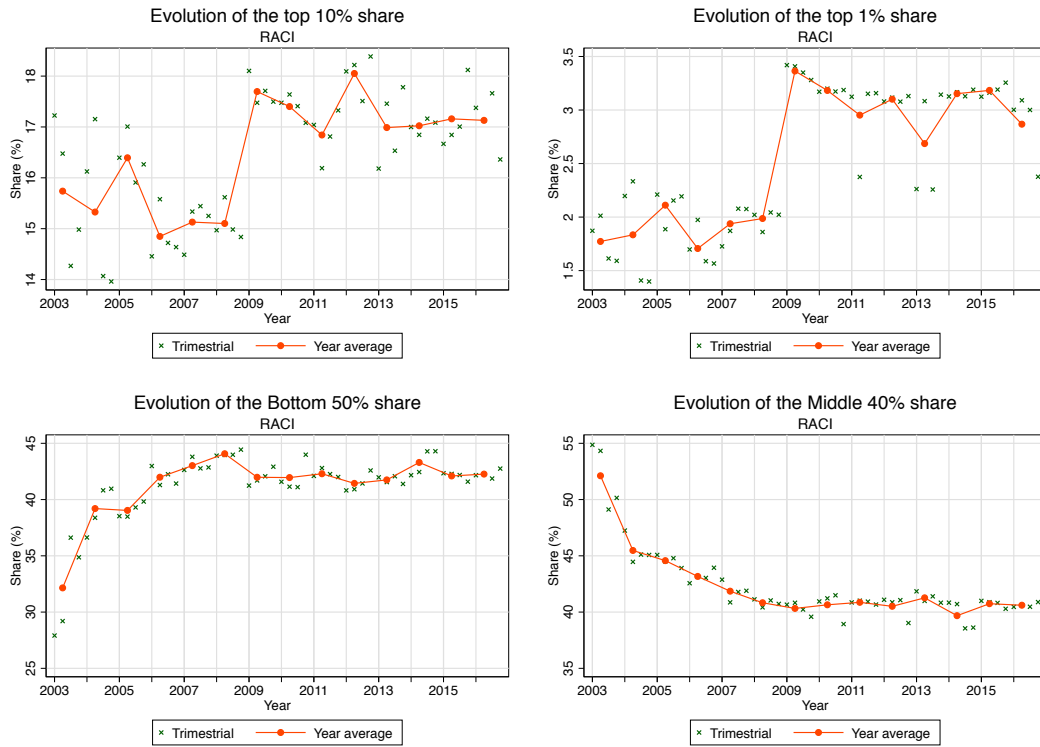


Figure C.10: Evolution of the shares for artists and intellectual professions (RACI)

Source: author's estimations

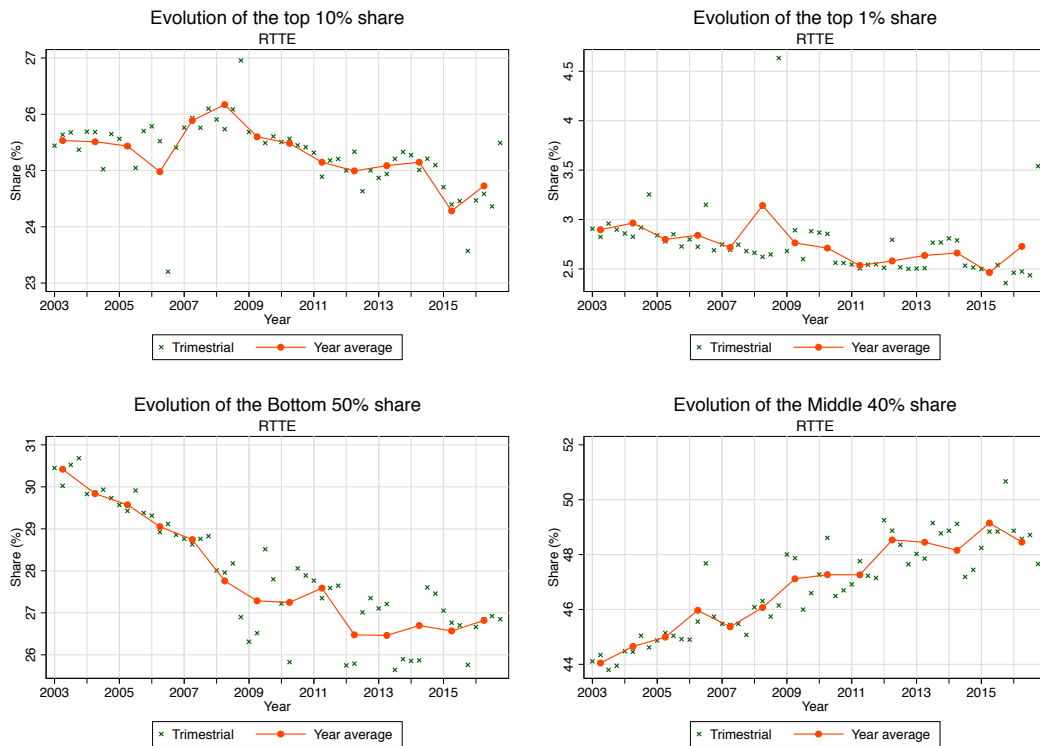


Figure C.11: Evolution of the shares for workers abroad (RTTE)

Source: author's estimations

## C.2 By gender

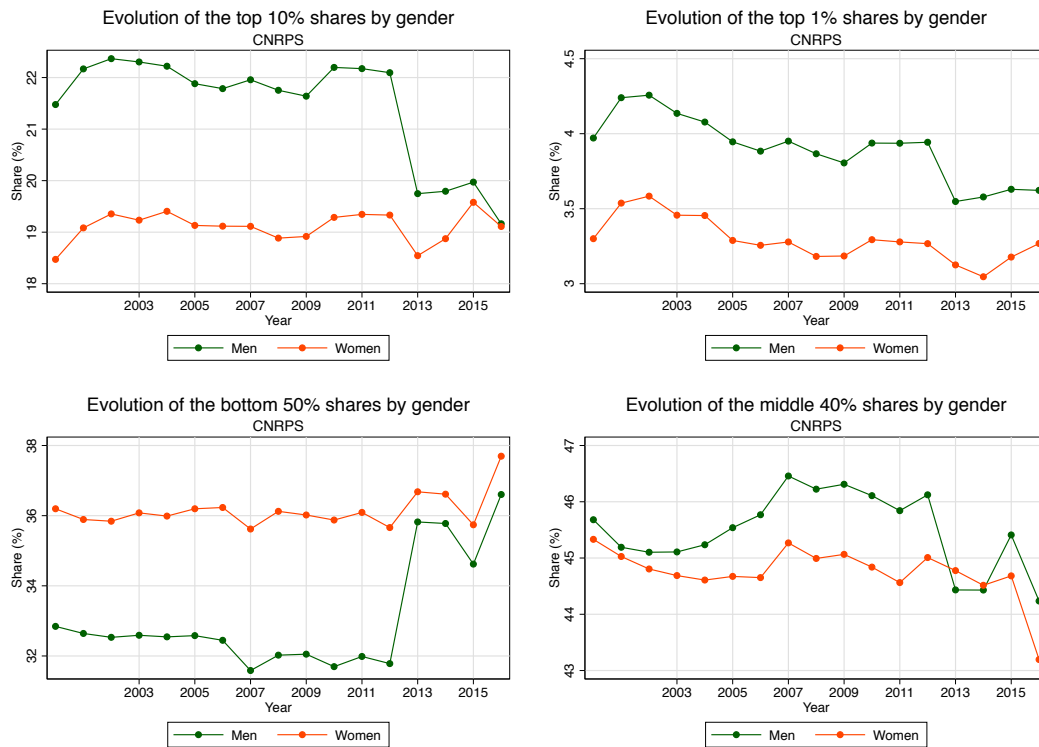


Figure C.12: Evolution of the shares for men and women in the public sector (CNRPS)

Source: author's estimations



Figure C.13: Evolution of the shares for men and women in the non agricultural private sector as wage-earners (RSNA)

Source: author's estimations

## D Inverted Pareto coefficients for the main regimes of interest

Regime	Year	Middle 40%	Top 10%	Top 1%	Top 0.1%
All regimes without RTTE	2003	2.158	1.609	1.489	1.542
All regimes without RTTE	2004	2.220	1.625	1.537	1.709
All regimes without RTTE	2005	2.286	1.619	1.537	1.620
All regimes without RTTE	2006	2.302	1.623	1.530	1.643
All regimes without RTTE	2007	2.374	1.646	1.565	1.665
All regimes without RTTE	2008	2.399	1.654	1.588	1.660
All regimes without RTTE	2009	2.372	1.733	1.601	1.671
All regimes without RTTE	2010	2.356	1.766	1.612	1.643
All regimes without RTTE	2011	2.344	1.773	1.621	1.616
All regimes without RTTE	2012	2.277	1.764	1.629	1.555
All regimes without RTTE	2013	2.115	1.717	1.598	1.481
All regimes without RTTE	2014	2.136	1.749	1.593	1.505
All regimes without RTTE	2015	2.162	1.805	1.587	1.507
All regimes without RTTE	2016	2.054	1.809	1.509	1.457

Table D.1: Inverted Pareto coefficients for the aggregate distribution (first trimester) - All regimes (without RTTE)

Source: Author's estimations using gross labor income tabulations

Regime	Year	Middle 40%	Top 10%	Top 1%	Top 0.1%
CNRPS	2000	1.448	1.452	1.355	1.101
CNRPS	2001	1.466	1.520	1.283	1.212
CNRPS	2002	1.452	1.533	1.293	1.183
CNRPS	2003	1.436	1.513	1.275	1.159
CNRPS	2004	1.423	1.454	1.278	1.166
CNRPS	2005	1.406	1.425	1.267	1.154
CNRPS	2006	1.396	1.411	1.265	1.144
CNRPS	2007	1.398	1.404	1.264	1.162
CNRPS	2008	1.391	1.403	1.248	1.170
CNRPS	2009	1.384	1.404	1.239	1.188
CNRPS	2010	1.406	1.439	1.237	1.196
CNRPS	2011	1.390	1.457	1.230	1.238
CNRPS	2012	1.395	1.433	1.274	1.217
CNRPS	2013	1.363	1.368	1.191	1.155
CNRPS	2014	1.345	1.418	1.240	1.197
CNRPS	2015	1.362	1.456	1.210	1.206
CNRPS	2016	1.336	1.466	1.244	1.190

Table D.2: Inverted Pareto coefficients for the aggregate distribution (first trimester) - Public sector

Source: Author's estimations using gross labor income tabulations

Regime	Year	Middle 40%	Top 10%	Top 1%	Top 0.1%
RSNA	2003	2.168	1.814	1.567	1.540
RSNA	2004	2.210	1.851	1.658	1.676
RSNA	2005	2.256	1.881	1.631	1.558
RSNA	2006	2.278	1.842	1.620	1.566
RSNA	2007	2.318	1.892	1.654	1.560
RSNA	2008	2.329	1.904	1.699	1.576
RSNA	2009	2.467	1.927	1.675	1.563
RSNA	2010	2.434	1.941	1.736	1.563
RSNA	2011	2.426	1.920	1.731	1.483
RSNA	2012	2.464	1.895	1.679	1.479
RSNA	2013	2.387	1.855	1.632	1.404
RSNA	2014	2.416	1.888	1.634	1.415
RSNA	2015	2.404	1.887	1.625	1.409
RSNA	2016	2.477	1.896	1.566	1.382

Table D.3: Inverted Pareto coefficients for the aggregate distribution (first trimester) - Non agricultural wage-earners

Source: Author's estimations using gross labor income tabulations

Regime	Year	Middle 40%	Top 10%	Top 1%	Top 0.1%
RTNS_NA	2003	1.780	2.079	1.231	1.031
RTNS_NA	2004	1.791	2.065	1.260	1.036
RTNS_NA	2005	1.754	2.040	1.295	1.018
RTNS_NA	2006	1.763	2.025	1.261	1.002
RTNS_NA	2007	1.750	2.047	1.263	1.001
RTNS_NA	2008	1.781	2.089	1.333	1
RTNS_NA	2009	1.822	2.161	1.392	1.000
RTNS_NA	2010	1.911	2.155	1.420	1.000
RTNS_NA	2011	2.013	2.111	1.420	1.000
RTNS_NA	2012	1.997	2.119	1.401	1.000
RTNS_NA	2013	2.115	2.094	1.377	1.000
RTNS_NA	2014	2.009	2.185	1.402	1.000
RTNS_NA	2015	2.134	2.123	1.437	1
RTNS_NA	2016	2.136	1.831	1.482	1

Table D.4: Inverted Pareto coefficients for the aggregate distribution (first trimester) - Non agricultural independents

Source: Author's estimations using gross labor income tabulations

## E Thresholds for the main regimes of interest

Regime	Year	Middle 40%	Top 10%	Top 1%	Top 0.1%
All regimes without RTTE	2003	382.4	1012	2473	5106
All regimes without RTTE	2004	371.7	1015	2490	5312
All regimes without RTTE	2005	369.5	1048	2555	5490
All regimes without RTTE	2006	367.3	1048	2567	5433
All regimes without RTTE	2007	350.6	1041	2608	5741
All regimes without RTTE	2008	345.0	1039	2631	6100
All regimes without RTTE	2009	385.3	1088	2896	6886
All regimes without RTTE	2010	392.5	1095	2989	7434
All regimes without RTTE	2011	411.1	1132	3081	7713
All regimes without RTTE	2012	441.9	1194	3189	8012
All regimes without RTTE	2013	494.5	1212	3184	7920
All regimes without RTTE	2014	485.7	1181	3213	7968
All regimes without RTTE	2015	493.2	1183	3332	8232
All regimes without RTTE	2016	547.4	1229	3562	8168

Table E.1: Bottom thresholds for the aggregate distribution in constant TD (first trimester) - All regimes (without RTTE)

Source: Author's estimations using gross labor income tabulations and CPI series from INS

Regime	Year	Middle 40%	Top 10%	Top 1%	Top 0.1%
CNRPS	2000	455.2	704.0	1387	2728
CNRPS	2001	703.7	1083	2447	4017
CNRPS	2002	736.7	1123	2526	4132
CNRPS	2003	758.7	1157	2532	4128
CNRPS	2004	776.6	1220	2536	4102
CNRPS	2005	813.8	1269	2549	4123
CNRPS	2006	824.1	1280	2530	4064
CNRPS	2007	816.8	1268	2515	3986
CNRPS	2008	826.2	1271	2526	3880
CNRPS	2009	843.6	1285	2558	3861
CNRPS	2010	844.6	1300	2685	3966
CNRPS	2011	872.5	1317	2755	4047
CNRPS	2012	855.8	1310	2604	4038
CNRPS	2013	845.5	1270	2579	3685
CNRPS	2014	845.7	1220	2439	3516
CNRPS	2015	841.0	1199	2527	3394
CNRPS	2016	912.8	1261	2707	3969

Table E.2: Bottom thresholds for the aggregate distribution in constant TD (first trimester) - Public sector

Source: Author's estimations using gross labor income tabulations and CPI series from INS



Regime	Year	Middle 40%	Top 10%	Top 1%	Top 0.1%
RSNA	2003	351.6	959.1	2695	6270
RSNA	2004	349.4	970.1	2741	7063
RSNA	2005	354.1	998.8	2904	7319
RSNA	2006	361.5	1039	2956	7409
RSNA	2007	358.5	1048	3079	8000
RSNA	2008	360.5	1058	3122	8460
RSNA	2009	371.0	1147	3490	9499
RSNA	2010	381.4	1163	3514	10000
RSNA	2011	395.8	1208	3616	10440
RSNA	2012	423.0	1327	3915	10488
RSNA	2013	454.8	1374	3994	10285
RSNA	2014	446.7	1351	4044	10541
RSNA	2015	465.4	1394	4171	10831
RSNA	2016	463.4	1447	4330	10570

Table E.3: Bottom thresholds for the aggregate distribution in constant TD (first trimester) - Non agricultural wage-earners

Source: Author's estimations using gross labor income tabulations and CPI series from INS

Regime	Year	Middle 40%	Top 10%	Top 1%	Top 0.1%
RTNS_NA	2003	252.4	503.2	2184	4192
RTNS_NA	2004	252.2	508.6	2182	4419
RTNS_NA	2005	256.8	514.6	2165	4563
RTNS_NA	2006	251.4	509.0	2215	4557
RTNS_NA	2007	252.4	507.4	2264	4572
RTNS_NA	2008	247.4	498.0	2176	4500
RTNS_NA	2009	281.9	561.3	2319	4616
RTNS_NA	2010	261.2	568.0	2287	4571
RTNS_NA	2011	252.6	605.1	2361	4623
RTNS_NA	2012	255.8	605.8	2405	4597
RTNS_NA	2013	248.4	631.1	2480	4583
RTNS_NA	2014	249.2	578.1	2291	4369
RTNS_NA	2015	242.6	623.4	2382	4404
RTNS_NA	2016	247.3	741.8	2269	4464

Table E.4: Bottom thresholds for the aggregate distribution in constant TD (first trimester) - Non agricultural independents

Source: Author's estimations using gross labor income tabulations and CPI series from INS