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INCOME DISTRIBUTION DYNAMICS IN THE NETHERLANDS IN THE 20TH CENTURY

LONG-RUN DEVELOPMENTS AND CYCLICAL PROPERTIES

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ABSTRACT

This paper contributes to the evidence on the distribution of income in the Netherlands by constructing *decile* and *quintile income shares* for gross- and for disposable income covering almost the entire twentieth century. It suggests some interpretations of the general trends, while the cyclical properties of the Dutch income distribution are empirically investigated through time-series analysis.

It shows that income inequality experienced a marked decrease over the period 1914 –1975, but remained stable ever since. Since the observed dynamics are notably different between gross and disposable income, taxation and redistribution played an influential role in determining the income distribution. More unemployment is associated with more income inequality in gross income, but this association vanishes when the distribution of disposable income is concerned. Actual inflation does not have a strong effect on the size distribution of gross or disposable income, but speculation that a transitory increase in inflation reduces the income inequality seems justified (cyclical economic prosperity being *pro-poor*). On the other hand, regression on moving averages of unemployment and inflation showed that longer periods of high inflation and high unemployment increase the income inequality.

CONTENTS

1. INTRODUCTION AND MOTIVATION

> *Enfin, si la répartition de la richesse varie peu pour des contrées, des époques, des organisations différentes, il nous faudra conclure que, sans vouloir négliger les autres causes, nous devons chercher dans la nature de l'homme la cause principale qui détermine le phénomène.* -Vilfredo F. S. Pareto (1896, p. 304)

Vilfredo Pareto's idea outlined above -- '… *since the distribution of income appeared remarkably stable - over space, over time and across different organisations – we should seek the determining cause of the phenomenon in the nature of mankind*' -- was long held to be true. It might still be true to the extent that we should not pursue an overall explanation of income inequality based on solely economic variables. Obviously 'la nature de l'homme' is not the only cause of inequality, and the question of whether or not it is an important one is highly debatable. In fact, this is something democrats and republicans have been doing for years, when disputing whether redistribution should be in place as a safety net against market failure, or that it should be minimized since man itself is the only one responsible for his lack of resources.

In contrast with Pareto's law, we notice today that income inequality does vary with time and place. Much cited is the recent rise of inequality in the United Kingdom or the United States. Less clear are the Dutch developments over the past decennia. There are not many studies on the dynamics in the Dutch distribution of income, while summary statistics on income inequality render differing views for the Netherlands[1]. Even the simple question of whether income inequality increased or declined in the Netherlands over the last thirty years is not easily answered. Given the numerous newspaper articles on the subject, income inequality appears to be the subject of strong held opinions. For that reason alone it is already worthwhile to inquire into the subject.

But also more in general: inequality matters. Not from a social viewpoint per-se, but also as a determinant in economic processes. Piketty (2005, p.9) for instance points at the two sides of the coin: High inequality could be good for growth if surplus income is used actively for investing in profitable projects, but high inequality could hamper growth if the production factors belong to a small group of risk averse 'rentiers' who reinvest in low-yield bonds.

Stiglitz and Furham (1998, p.254) explain how representative agent models could be misleading, and why we should take inequality into account (thus assuming heterogeneity among agents). As an example they point to the possibility of multiple macro-economic equilibria, since business fluctuations may increase inequality and inequality may increase business fluctuations. If this is indeed the case, governments that pursue macro-economic stabilization and redistribution simultaneously,

[1] Conform Luxemburg Income Study (LIS)-data, inequality in disposable household income in the Netherlands has risen since the mid-eighties (Gottschalk and Smeeding 1997, p.687), while data from Statistics Netherlands (CBS) sketch a different picture. See also Atkinson and Brandolini (2001, pp. 779-780) who show that the Netherlands is a case apart if you consider the Gini coefficient. They make clear that differences in methodology may not only affect the level, but also the trend in inequality.

could push the economy into a better state, with lower unemployment, lower inequality and more stability.

A good understanding of the present state of (and influences on) the distribution of income, as well as historical developments is thus desirable. Knowledge about the historical developments of inequality could also help to explain other economic observations, while a clear picture of the present state helps the policymaker to anticipate the consequences of his macro-economic policy-measures.

In this paper I will investigate the developments in the Dutch income distribution over the twentieth century. I will first derive time series covering the time-period 1914 – 2000. Secondly, I will relate these time-series to macro-economic conditions, in order to investigate the cyclical properties through time-series analysis.

The paper is organised as follows. Chapter 2 approaches the distribution of income by constructing quintile and decile income shares (the share of in total income of 20% and 10% groups in the population ranked by income level) that cover almost the entire 20th century. This disaggregated approach allows us to better stress developments in different parts of the distribution, as compared with the use of summary statistics as for example the Gini-coefficient. Given the presumably important role of taxation and redistribution, I will separately construct income shares for gross and for disposable income. This chapter builds to a large extent on the recent studies of Atkinson and Salverda (2005a, 2005b) on top-income shares, since I use the same data-sources and apply a similar methodology. My contribution to the existing evidence, however, is taking explicitly also the lower and middle parts of the income distribution into account. This chapter updates the work of Hartog and Veenbergen (1978) who have constructed decile income shares in total gross income up to 1972.

In Chapter 3 I present the evidence and briefly suggest some interpretations for the secular movements in the distribution of income.

Chapter 4 will investigate the cyclical properties empirically. Following Schultz (1968) and Blinder and Esaki (1978), I will regress the constructed income shares on inflation, unemployment and include a linear trend. This is an important part since so far little empirical research has been done on the influence of macro-economic conditions on income inequality. In this perspective, I place special emphasis on the role of inflation since the international literature has generated an 'inflation-inequality'-puzzle (Galli and Van der Hoeven, 2001). Increasing inflation is associated with increasing income inequality in most cross-country studies, while in most single-country studies inflation comes out as insignificant, or is associated with decreasing inequality. Also from a more theoretical point of view the distributive effects of inflation are not easily defined: it is possible to define a number of relevant, but counteracting channels. In general, the effects of inflation still are quite mysterious since

not much is known about the possible different effects of an inflation rate of 1 or 2% per annum, compared with annual inflation of say 5% per annum. This case study of the distributional effects of the economic cycle in a low inflation country such as the Netherlands could shed important light on this issue. Chapter 5 concludes.

In summary, the main goal of this paper is to bring new evidence on the distribution of income in the Netherlands by decile and quintile income shares, to propose interpretations for the secular movements and to investigate the cyclical effects. It contributes to the present knowledge about the distribution of income in the Netherlands, since it

i. extends the existing evidence on top-income shares (the top 10% and higher) to the whole distribution (the lower parts of the distribution are taken explicitly into account),

ii. analyses the movements in different parts of the distribution separately (facilitated by the use of income shares instead of summary statistics), as such it generates insight in structural developments in the Dutch economy,

iii. analyses simultaneously the dynamics in gross- as well as in disposable income in order to better stress the effects of taxation and redistribution, and

iv. investigates the cyclical properties through a previously used regression framework on a larger and more homogenous sample of observations.

2. DATA AND METHODOLOGY FOR DERIVING INCOME SHARES

> *'… It used to be the case that courses on economic statistics taught both data construction and data analysis, but the balance has shifted almost totally to the latter. This reflects of course the priorities of the profession, but these priorities should in my view be revised…'* - Sir Anthony B. Atkinson (2002, p.18)

As set out in the introduction I approach the distribution of income by constructing time-series of quintile and decile income shares, since this disaggregate view permits us to distinguish different movements in different parts of the distribution. Summary statistics that reduce the complete distribution to a single scalar incorporate an unwanted loss of information. Information on income shares is not easily available. Statistics Netherlands (CBS) has published for some recent years quartile (25% groups) income shares, but these statistics are not strictly comparable over time due to changes in the income definitions, while the sample would be too small for regression purposes. Recently Salverda and Atkinson (2005a, 2005b) have constructed so called *top-income shares* that measure the importance of small top-income groups in total income. In this paper I extend the work on top-income shares to the rest of the distribution, while using the same data-sources but a slightly different estimation procedure[2].

This chapter introduces the data, discusses the main drawbacks in use, and presents the applied methodology for estimating income shares. The basic materials are income statistics collected by the CBS that are based on annual income tax returns. The personal income tax was introduced in the Netherlands on May 1 1915 and ever since that year the CBS has drawn samples and published statistics. These statistics have great detail at the top of the distribution since the CBS samples all taxpayers that earn an income in surplus of a certain level. Income tax data were used extensively in economic analysis during the nineteenth and first half of the twentieth century, but were neglected in more recent years. In 1998 Thomas Piketty gave fresh impetus to the use of this kind of data with his work on French top incomes. Today the income distribution analyses based on tax-data are strongly developing[3].

[2] Atkinson and Salverda formulate a *non-increasing density* assumption – the presumption that the frequency of income earners does not increase with income – in order to interpolate from narrow bounds. Such an assumption is applicable to high incomes, but it does not hold for very low and low parts of the distribution since until a certain level of income the frequency may rise.
[3] See for an overview the forthcoming volume of Oxford University Press: Atkinson and Piketty (eds) 'Top incomes over the twentieth century – A contrast between continental European and English speaking countries'.

2.1 INTRODUCTION OF DATA FOR THE NETHERLANDS

Data on the income distribution

For the early years, I use the tabulations of Atkinson and Salverda (2005), partly gathered from the dossier of Hartog[4] that he constructed for his 1978 study with Veenbergen on income inequality and from the CBS publications 'Jaarcijfers voor het Koninkrijk der Nederlanden' (1915-1925), 'Jaarcijfers voor Nederland' (1925-1930) and (from 1931) 'Statistiek der Rijksfinanciën' that classify the number of taxpayers, *total gross income* and taxes paid into income brackets (columns *a* to *c* of Appendix table B1 give the date of 1916 as an example).

From 1946 onwards, I use the irregularly published CBS-publication 'Inkomens- en Vermogensverdeling (I&V)' (discontinued in 1979) that provides the same tabulations. In a number of issues the tabulations are given for *total net- or fiscal income* (after tax-deductibles, but before tax), so revisions had to be made in order to increase the consistency over the years. Unfortunately, these revisions were not possible for a small number of years so we lost some observations.

For data on disposable income, I use the homogeneous tabulations prepared by De Kleijn and Van de Stadt (1987) for 1959 to 1984, which classify the number of taxpayers (or 'tax units') and their total disposable income in ranges of disposable income.

For data from 1977 onwards, I will use the Dutch Income Panel or *'Inkomenspanelonderzoek (IPO)'* both gross market income, as well as for disposable income and detailed compositional information on incomes. IPO is a longitudinal micro data set created by the CBS that consists of circa 215 000 respondents. This high quality dataset first covered the years 1977, 1981 and 1985. Later, the dataset includes all the years from 1989 to 2000 with improved observation.

All these income statistics include much detailed information on the income sources, such as wages, salaries, pensions, profit from own enterprise or transfers, but not much descriptive data on the income earners are available, notably not on education or work-experience.

2.2 THE POPULATION– AND INCOME CONCEPT: INEQUALITY OF WHAT AMONG WHOM?

The tax unit as concept of population

Today, we are accustomed to income statistics in terms of households, equivalent households (where the households are weighted by size and composition), head of households, families or natural persons. This is possible since Statistics Netherlands draws its samples on addresses. Before 1977 no such analysis of households was possible since the CBS randomly selected the income tax returns of respondents based on birthday (all those born on the 4th of the month – some 3.3 % of

total population), while up to 1967 samples were constructed based on the first letter of their family name: all individuals with a family name starting with an A or N (De Kleijn and Van de Stadt 1987, p.12). The basic data from which the samples for the bureau's income statistics are drawn are the yearly income tax returns. In order to perform a long-term analysis, we are stuck with the tax-unit or '*belastingbetaler*' as population concept. In the Netherlands the tax-unit concept consists of husband and wife (including 'fiscal partnerships'), single living individuals and children above the age of 15 with independent income. There have been slight changes in tax law and the statistical treatment at Statistics Netherlands that affected the definition[5] (see Salverda and Atkinson (2005b) for a detailed overview). However, on average we could be comfortable with the definition: the developments in number of tax units mirror natural population growth smoothly. With the IPO microdata we have reconstructed the historical tax-unit concept for the later years. De Kleijn and Van de Stadt also reconstructed the historical tax-unit for their analysis on disposable income.

Different concepts of income: gross income and disposable income

Most of the basic CBS-tabulations are given in '*totaal onzuiver inkomen*' that includes labour-income, pensions (incl. elderly state pensions), rent (on land, money or real estate), dividend, profit from (unincorporated) enterprise, and some (but not all) transfers. It does not include transfer payments made by employers and it does not deduct social security premiums made by employees. I refer to this concept as 'gross income'.

For some years the tabulations were given in '*totaal zuiver inkomen*' that is closer to the concept of fiscal income: it deducts voluntary premiums and tax-deductibles (but it does not deduct taxes). In order to arrive at a homogeneous series of income, the tables given in *totaal zuiver inkomen* are revised by augmenting the total income with the tax-deductibles and adjust the income classes equi-proportionately. For the defiscalizations (the process of making some income components no longer liable to income tax, such as rent-subsidy or scholarships) has been corrected by reconstructing the original total income concept with the IPO-micro data.

When assessing the income distribution, we are interested in the distribution of gross income, since this represents the closest link with the market forces, but we could also be interested in the distribution of disposable income since this incorporates the redistributive role of the state and because disposable income represents the closest link with the distribution of spending power.

[4] Hartog's data file is to be published as an annex to Salverda and Atkinson (2005b)

[5] Since 1972 working wives have been allowed to fill separate returns in order to lower marginal tariffs and stimulate female employment while all other income had to be declared with first the husband and later the highest income, only after 2001 (outside the period under focus) full tax optimization is allowed between partners. This important change did however not affect our series: the labour participation of women was still very low at the time of change, and since 1977 we have reconstructed the historical concept with the IPO micro data.

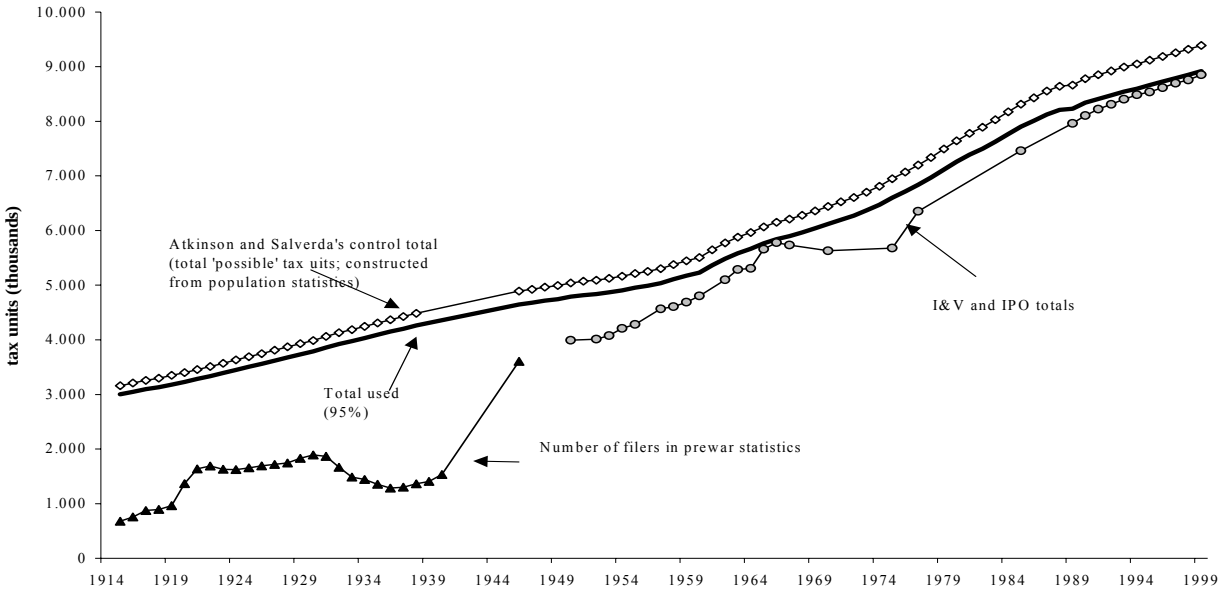
Information on disposable income is available since 1959. The CBS-definition of disposable income did not change over the years.

2.3 DRAWBACKS IN THE USE OF INCOME TAX DATA

Despite a rich history going back to pioneering exercises of Vilfredo Pareto in the late nineteenth century or Simon Kuznets in the nineteen-fifties, income tax data have been the subject of considerable disbelief. The Dutch published statistics are extremely rich in terms of the number of years, the post-war coverage and the high detail at the top of the distribution, but we should note the main drawbacks of its use.

Limited coverage - It is important to note that while income tax was imposed in 1914 not everybody was (and is) obliged to file a return and pay the taxes: the exemption levels were quite high. We therefore cannot take the total of the statistics as representing the aggregate totals for the Dutch economy. In order to calculate quintile and decile income shares we need to be able to express the share in *total income* of 20 or 10% of *total tax-units.* In order to calculate total tax units Atkinson and Salverda (2005a) have constructed a total of 'possible' income tax-unit filers based on population statistics. In the very final years of the 20th century, the total tax-unit estimates from the IPO micro data were stable around 95% of this constructed 'total possible tax-units'. Since the IPO data is now believed to possess complete coverage, 95% of this constructed 'total possible tax-units' is taken as representing the total tax units in the Netherlands. See Figure 2.1 for the coverage of the tax data over the twentieth century.

Figure 2.1 Coverage of tax-units in the Netherlands, 1914-2000

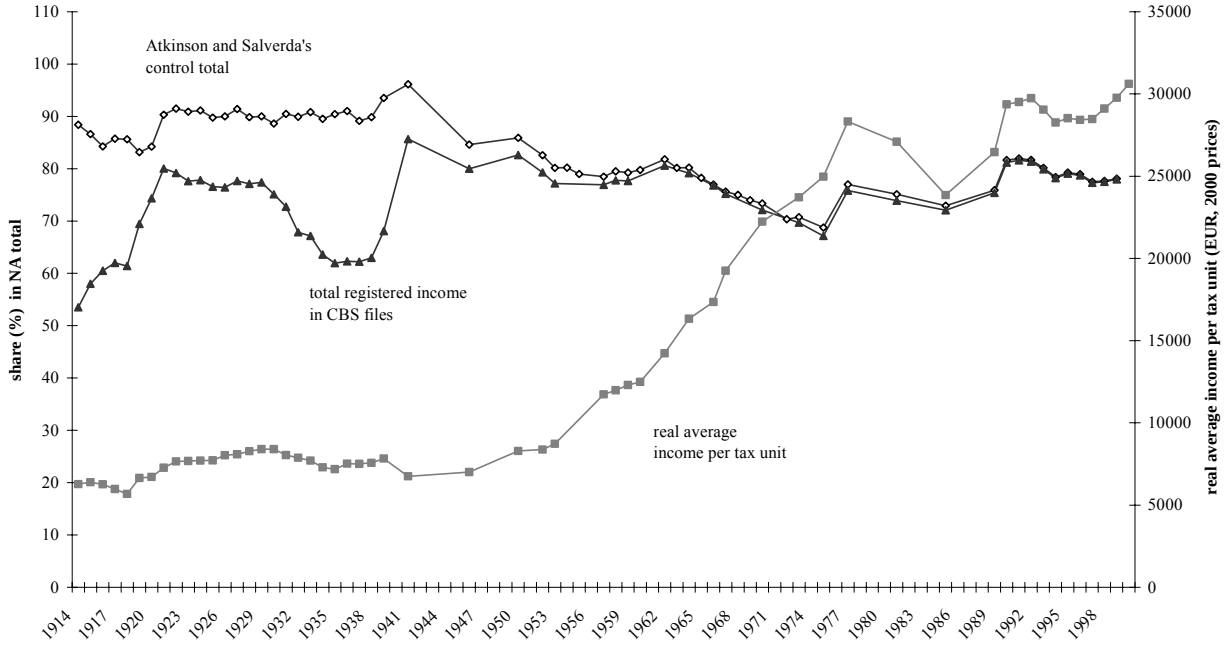


Source data: Atkinson and Salverda (2005a)

Since we cannot take the income total of the published tabulations either as representing the total income in the household sector, I have also used the external series for the national total income of the household sector created by Atkinson and Salverda (2005a). See Figure 2.2 on the next page for a comparison of this constructed income total with the National Accounts (NA) total and the total income administrated in the CBS-files. In the figure I have also plotted the real average income per tax unit over the twentieth century, where especially the enormous post-war boom is striking. The effects of the recession in the thirties are less visible than those of the recession in the eighties (although the decreased coverage of registered income in the CBS files possibly has to do with the 1929- recession). The boom in the latest years of the twentieth century is clearly visible.

With the use of external control totals we are well able to account for the limited coverage, but we still cannot say anything about those not covered. In 1916 for instance we have some 1.3 million registered taxpayers, where the estimated control total is around 3 million. For this year we can thus only measure the income share of the upper part of the population, or the inequality within these high-income earners (as Schultz 1968 did). The coverage in the Netherlands however was much more extensive than in other countries. Around 1920 some 20% of the Dutch paid income tax compared with – for example - only some 2% of all Canadians (Saez and Veall 2005, table B). After the Second World War the coverage is almost complete. By lumping the missing tax units and the missing income (the difference between the estimated control totals and the in the statistics registered totals) into a lower quintile it is possible to distinguish the five quintiles in population from 1950 onwards.

Figure 2.2 income coverage and real income in the Netherlands, 1914-2000



Source data: Atkinson and Salverda (2005a)

The series for disposable income start in 1959, while De Kleijn and Van de Stadt included only tax-units with full-year incomes[6]. The coverage of full-year incomes is believed to be complete and for the later period, I restricted myself to the same selection with the IPO micro data. There thus is no problem of limited coverage in disposable income.

Discrete observation (missing years) – The *Inkomens- en Vermogensverdeling* – series of Statistics Netherlands are not published every single year, while the IPO micro-data only have annual coverage since 1989. We therefore have gaps between the observations. See also the Figures 2.1 and 2.2 where the observations are marked. Since income inequality is not a very volatile variable, we are well able to track the secular changes. However, investigation of the cyclical properties with the time-series analysis in Chapter 4 shows that missing observations confront us with limitations in estimation.

Tax law – Another factor that could be of influence on the statistics is tax-law. In the Netherlands this underwent important revisions after the Income Tax Act of 1941 and 1964, and less important changes in 1990 (after commission Oort) and 1994 where social security premiums were integrated in the collection process of national income taxes. However, as we will see later: we do not find large jumps in the outcomes (the estimated income shares), nor in the raw data around these years - the data appear to be quite homogeneous.

Statistical treatment - Changes in statistical treatment by the CBS could also be of influence. In 1964 for instance the CBS changed its way of classifying part-year incomes into income brackets: where previously allocation was done on an annual equivalent basis, but with only actual income added, an assessment based on time-proportion was now introduced – see for more detail Salverda and Atkinson (2005b). These changes in statistical treatment could in theory be material, but in practice they are not that large: again we do not see sudden spikes in the graphs presented in the next section. Salverda and Atkinson (2005b) have calculated that this particular statistical change reduced the share of the top 10% income earners with 0.56 percent point (34.26 versus 33.70 with the new allocation method).

[6] Considered *full-year incomes* are those tax-units who earn an income during the full year (52 weeks). Their counterparts, part-year incomes, arise for instance when people reach the age of 15, die, marry or stop working over the year and cease to be separate tax-units. *Part-time* incomes (of people not working full time) are considered full-year incomes if they work the full year.

Tax- or income shifting - Another point of interest is the effect of marginal tariffs on tax- or income shifting. One could for example imagine that when the marginal rate of taxation in the personal sector rises, self-employed with a high profit income have more incentives to incorporate their activities and vice versa. The effects of tax-tariffs on reported income and tax-shifting are subject of important separate research falling outside the scope of the present study (see for instance Gordon and Slemrod (2000) for the mechanics or Piketty and Saez (2005) for the consequences for distributional analyses).

Savings could also be subject of tax-arbitrage. When private savings and investments are taxed and collective savings (pension funds, life insurances, annuities) are not, then a strong tendency towards the latter could explain a fall in investment, or capital income. In light of the findings in the top-share literature, these issues are extremely important. They are however outside the scope of the present work since we are here primarily interested in the inequality of earned money income.

Capital income and price-increases of assets - Income from assets is seldom taxed as income. Bonuses in stock options are not administered in the period under focus, while realized capital gains are also left out. However, in order to understand the income structure exclusion of capital income/gains also has some pros. As Piketty and Saez (2005) explain: heritages or big capital realizations come in a 'bumpy' way that distorts the observation of earned income. Nevertheless, since we might suppose a link with the economic cycle, inclusion would be desirable in light of the research in Chapter 4. More detailed investigation of the composition of top-incomes could be a way forward: the tendency of more accounting disclosure within listed companies gives reason to be optimistic about the future of compensation and wage structure research.

Fraud and tax evasion – We are limited in our view in the sense that these statistics that result from tax-data only give an image of what is happening in the taxed income streams, and taxed economic processes. We do not observe what is happening in the shadow-side of the economy. The exact quantity (and role) of fraud or tax evasion is by its very characteristics unknown. Dell, Piketty and Saez (2005) explore the channel of tax evasion in Switzerland, and conclude that the foreign wealth in Swiss bank accounts is relatively minor: both in terms of Swiss-domestic wealth and as a percentage of the foreign wealth (say the 'basin' available for evasion). However, given its very characteristics the role of fraud or tax evasion is difficult to measure. Nevertheless, the only relevant question is whether there have been important changes in the incentives, possibilities to or engagement in fraudulent activities in order to hide income for the fiscal authority. Estimations for the size of the shadow economy in the Netherlands differ in trend and scale. Gërxhani and Schram (2002, p.4) summarize three studies on the Netherlands, where only one (Boeschoten and Fase

1984) suggests a rising trend up to about 20% over the period 1965 - 1981. The other studies have considerable smaller estimates: 10 – 14% of GDP for the period 1977 – 2002. Personally I believe tax evasive behaviour to be fairly constant over time[7], but more research on this issue is necessary.

Above, I have discussed a number of drawbacks of the use of income-tax data. I invite the reader to form his own opinion on these matters and take the data for what they are worth. As Atkinson has already pointed out: although these income statistics based on income tax returns are not tailored for the analysis of distribution dynamics, they are constructed with care. The Dutch fiscal system is highly developed and tries to measure the economic activity that is liable to tax as good as possible and as such, these data do not differ from other economic data.

2.4 METHODOLOGY FOR DERIVING INCOME SHARES: INTERPOLATION

Here I explain the method used to derive income shares of population. As an example I take the year 1916 and in this paragraph we will derive the income share for the Top 20% of recipients for this year.

Appendix table B1 gives in columns (a) to (d) the basic tabulations provided by Statistics Netherlands. For most early years the number of income classes is typically around 30, from 1952 to 1957 it is reduced to 15, but afterwards it increases to 44. In order to derive the Lorenz-curve (that plots the cumulative share of income on the cumulative proportion of population) we first take the population and income shares relative to the external control totals (3 048 329 tax units and 2 875,8 million Dutch Florins (DFL)). Later we cumulated them in columns (f) and (g). Since the tax-data only cover the top of the distribution we cumulate downwards. The black squares in Figure 2.3, points A and B, represent the limits of income class numbers 2 and 3 (represented in bold in columns (a) through (g) in Appendix B1). These limits are points on the Lorenz-curve, and we know their exact values. In point A 17.24% of the tax-units earn 61.98% of the total income, and in point B 24.28% of the tax-units earn 68.47% of the total income. It is obvious that these points rarely coincide with the share we want to have: here we need to interpolate for the income share of the top 20%.

If everyone would earn the same income within the relevant income class (and thus the mean income m), then we could interpolate linearly to find the exact value. In Figure 2.3 this is represented as the flat line connecting A and B. This situation does not allow for income-inequality inside the income class: it underestimates the real income inequality and it thus gives us a lower bound for the income share of the top 20%: here 64.52%. The highest within-class inequality is obtained if we locate all the

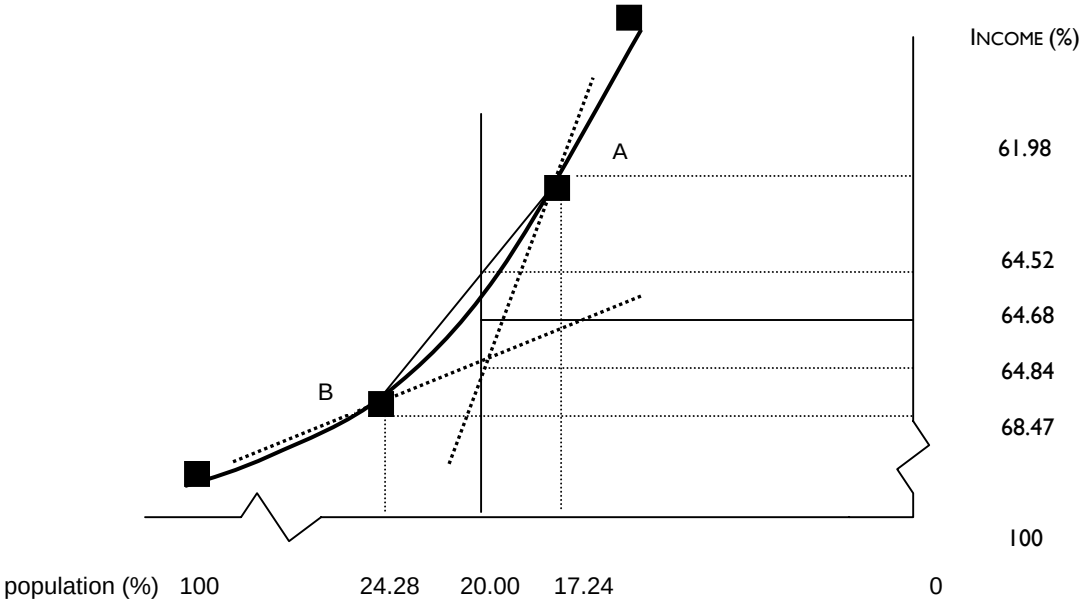
[7] This feeling is caused by the fact that more recent studies on tax-evasion do not show varying results over time, and by the observation that authors of contributions written a long time ago (for example Schendstok 1941) speak the same way about tax-arbitrage in the Netherlands as authors of recent studies.

income-units on the end-points in such a fraction that the mean income does not change. When λ represents the share of the population at the lower limit, then (1- λ) is the share of the population at the upper limit. Then, if a1 represents the income at the lower limit of the income class, and a2 the lower limit of the next income class and thus the upper limit of the class within which we need to interpolate, then λ is found by λ = (a2-m)/(a2-a1). In this situation λ * the number of tax units (214 602) earn an income of DFL 800 and (1- λ) * 214 602 earn DFL 1000. These incomes correspond to the directional coefficient[8] of the dashed lines in Figure 2.3 that – given the underlying assumption of maximal inequality within the class – form an upper bound for the income share of the Top 20%: here 64.84%.

We have to fit the Lorenz-curve (here represented by the thick curve) somewhere in between these bounds. Since there is no consensus on the exact form of the income distribution[9], while the window is quite small,[10] I estimated the income shares to be the average of the upper and lower bound: here 64.68%.

Figure 2.3 Interpolation on Lorenz-curve from grouped data

Example: income share top 20% in 1916



The strength of this procedure is that we do not need to assume a form for the distribution of income. Its weakness is that the accuracy of the estimation strongly depends on the number of income classes and the size of the income class within which we interpolate. The basic data in the

[8] Actually, the directional coefficient of the dashed lines gives the ratio of the income in point A or B over the average income.
[9] Vilfredo Pareto introduced the Pareto-law and -form, while later Aitichon and Brown and others advanced the lognormal form. Nowadays, there is only some consensus on the fact that the top of the distribution, say the top 10%, follows a Pareto-form, while the form of the rest of the distribution can differ across countries.

Netherlands are quite detailed and the ranges between the upper and lower bound small enough to let the average be an accurate estimation. This interpolation-procedure worked fluently for disposable income, but in gross market income the gross bounds could not always be deducted since the revisions from 'zuiver inkomen' to gross market income were made without re-ranking, such that the average income fell in few cases outside the income classes (also after adaptation of the brackets). In those cases I interpolated linearly.

For the later years, 1977-2000, micro data are available, and there is no need for interpolation. I derived income shares onsite at the CBS in Voorburg (The Hague). See appendix B 2 for the SPSS command syntax.

[10] The difference between all the calculated gross upper and lower bounds is on average 0,23 % of total income with a standard deviation of 0,25%.

3 LONG-RUN TRENDS IN INCOME INEQUALITY IN THE NETHERLANDS

> *"… Voor de Nederlanders zelf kwam er steeds meer geld en vrije tijd. Vanaf 1961 hoefde er meestal niet meer op zaterdag gewerkt te worden. Na de sobere jaren vijftig barstten de loonsverhogingen los, de ene golf na de andere…"* - Geert Mak (1999, p.441-442)

In this chapter, I present and briefly discuss the new evidence on the distribution of gross and disposable income in the Netherlands over the twentieth century for both population quintiles and deciles. The constructed quintile and decile income shares are given in full in Appendix A.

Over the course of the twentieth century times were changing, as for example expressed by Geert Mak in the phrase above, paraphrased as '… *the Dutch had increasingly more resources and leisure time. From 1961 onwards working on Saturday was usually not necessary anymore. After the sober 1950s, the wage-increases were numerous, flow after flow….*' It is interesting to see how these changing macro-economic conditions had their impact on the distribution of income.

3.1 GROSS INCOME

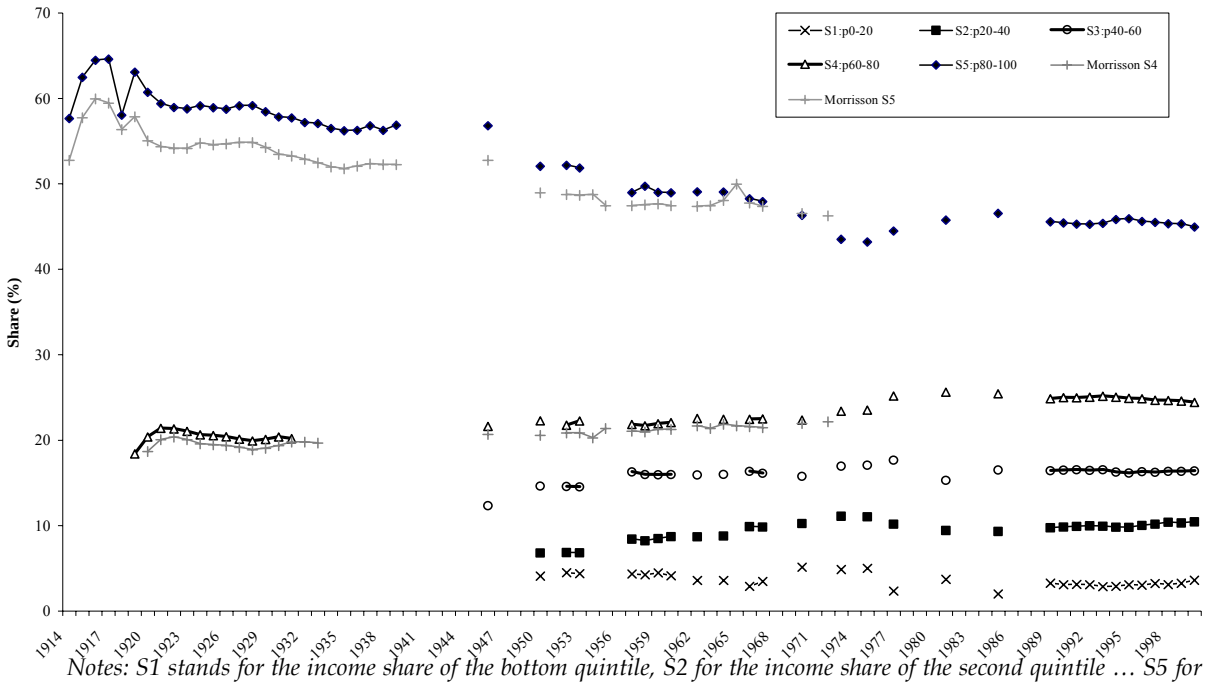
Figure 3.1 presents income shares for the five quintiles of tax-units (S1, S2, .. , S5; S1 being the lowest '20% of population'- group, S5 being the upper quintile) for the Netherlands over the period 1914-2000. For the period 1914-1972, these results are highly comparable with the values presented in Morrisson (2000, the lines marked by +'s) resulting from Hartog and Veenbergen's 1978-study over the period 1914-1972[11]. Apart from a jump during World War I[12], Figure 3.1 shows a marked decrease for the upper quintile from 1920 towards 1975. The richest 20% of tax-units earned around 1920 more than 65% of the total income in the household sector in the Netherlands, while in 1977 this had come down to some 35% and remained stable for the rest of the century. The decrease in income is at the top of the distribution even more marked: the income share of the top 1% comes down from 17% around 1920 to some 6% in 1977 and remained stable afterwards (Atkinson and Salverda, 2005a). Hartog and Veenbergen (1978, p. 547) note over the period 1914-1972 that virtually every decile profited at the expense of the top-decile. In the figure, we also see that the fourth quintile increased its share in national income slightly during WW I, remained stable throughout the *interbellum*, and during the seventies increased slightly further to remain stable for the rest of the century. Also the third and second quintile improved their income shares since the nineteen fifties where the observation starts. The lowest quintile was not able to improve its position

[11] The differences in level are due to the use of differently derived external control totals.

[12] Morrisson (2000, p. 249) writes on this spike: "…During the First World War, profits, notably in trade, experienced a real expansion in the Netherlands which was a neutral country while unemployment increased in the industrial sector due to supply difficulties. It resulted in a strong widening of inequality, which was immediately cancelled by the return to peace in Europe…" It thus is not a data-artifact from bad statistical observations but represents real economic movements. Moreover, Lubbers (1926, p.177) writes that in the months after the breakout of WW I, unemployment soared, but that by 1916 the economy had adapted itself and unemployment returned to normal levels. The later spike could be the effect of some very high 'war-profits' since the rise in income share is strongly concentrated at the very top.

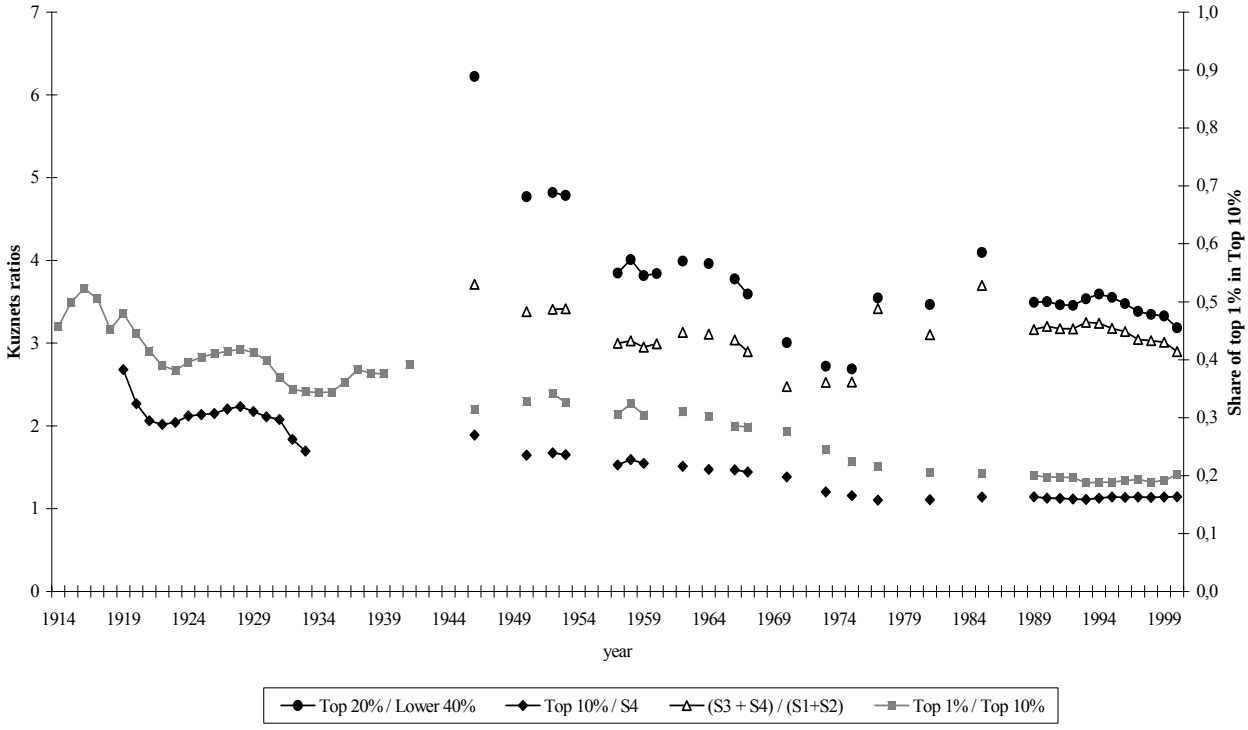
drastically, but fluctuated with the business cycle. It always earned a minor 3 to 5% of the total income[13].

Figure 3.1 Quintile shares in total gross income of the household sector, 1914 – 2000



Notes: S1 stands for the income share of the bottom quintile, S2 for the income share of the second quintile … S5 for the income share of the upper quintile. Source: Author's calculation on published income statistics and IPO micro data.

Figure 3.2 Kuznets ratios and share of top 1% in top 10% in gross income, 1914-2000



Notes: Top 1% stands for the income share of the top 1% highest income earners in total household income, Top 10% stands for the top 10% highest income earners, Top 20% for the top 20% highest income earners, SX indicates the income share of the Xth quintile in population. Source: Author's calculation on published income statistics and IPO-micro data.

[13] The share of the bottom quintile shows in Figure 3.1 a sudden fall in 1977 when the IPO series start. It is difficult to say whether this is a real economic finding, or that it is a data-artifact.

Figure 3.2 presents a number of alternative inequality measures: several Kuznets-ratios that measure the income or income share of the x^{th} group in population over the income share or income of the y^{th} group (y being lower than x). I also included the share of the top 1% in the top 10% that describes the development at the super-top of the distribution (see Atkinson and Salverda 2005a). These measures have the advantage of being independent of the choice of control totals (a ratio of income shares being identical to the corresponding ratio of incomes). Indeed, we see a marked decline in inequality starting after WW II up to 1975, measured by the Kuznets indicator that takes the ratio of the income share of the upper 20% over the lower 40% in the population. In the next ten years, the inequality appears to be rising during the recession of the eighties while in the second half of the nineties economic prosperity was being translated into a falling inequality. The income share ratio that measures the income of the middle two quintiles over the income of the lowest two quintiles exhibits more or less the same pattern, although the level of inequality between these groups was much lower in 1946. The fact that between roughly 1975 – 1990 this ratio has been rising just as fast as the ratio of the top 20% over the lower 40%, while the other series in the figure did not increase, could make us believe that the lower income groups seriously fell behind in the eighties. Since both the lower two lines drawn in the graph - representing the share of the Top 1% in the Top 10% and the income of the Top 10% over the income of the fourth quintile (p60-80) - show a smooth and stable decline towards more equality, we could conclude that the upper forty percent of population was isolated from cyclical shocks whereas the income of the lower forty percent could be highly sensitive. Another important picture that emerges is the striking stability in the upper part of the distribution during the nineties. The inequality among (super) high incomes did not rise over the twentieth century as shown by the income share of the top 1% in the top 10%. Apparently, today's discussion on top-incomes is not mirrored by increasing inequality among the top performers in the private and public sector if measured by salaries and tax-declared bonuses. However, stock-based compensation falls outside the scope of the statistics, and among CEO's of large companies this form of compensation has gained increasing importance over the last decades[14].

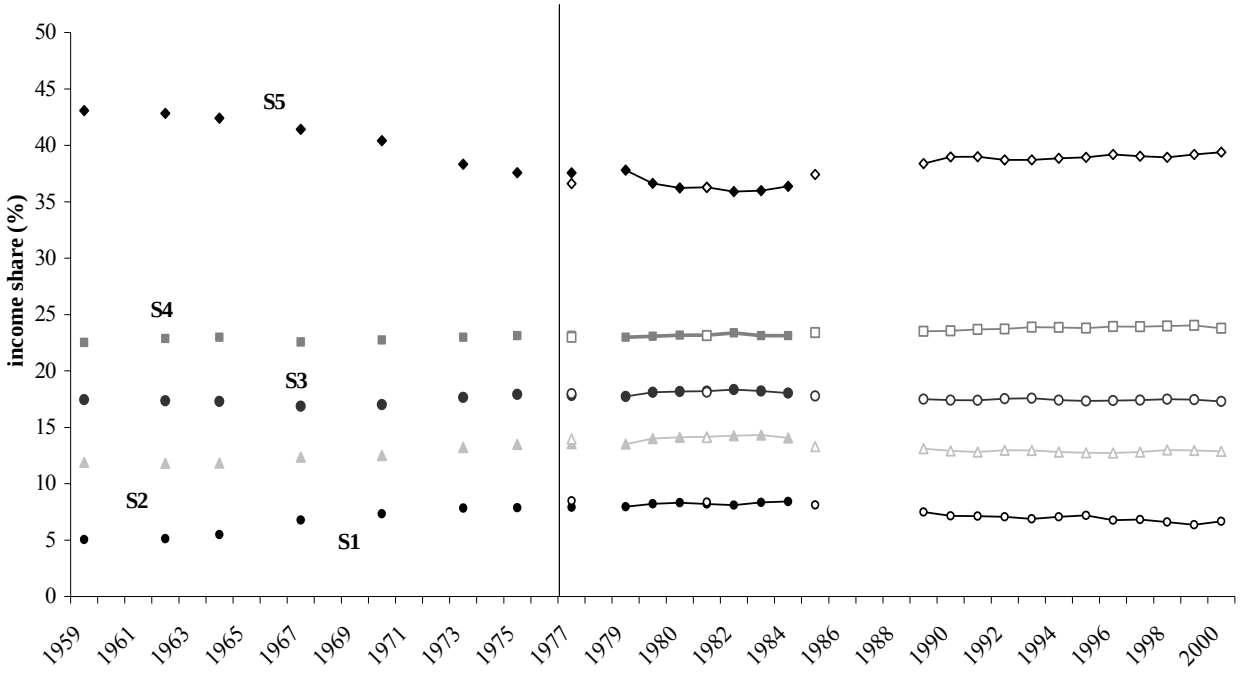
3.2 DISPOSABLE INCOME

Figure 3.3 plots the quintile income shares in disposable income for the period 1959 – 2000, with the calculations on De Kleijn and Van de Stadt (KS) -tabulations in closed, and on IPO in open markers. We again find a decline for the upper quintile, followed by a very small increase. The other quintiles have remained quite stable over the years. Only the lowest quintile shows some movement, where it first increases, but after 1984 decreases a little. Note that there is no strong visible difference between the results of the calculations done on the tabulations of KS and those on the IPO micro-data, whereas it does show some movement in gross income around 1977. This could be a testimony

[14] For an up to date and detailed picture of the compensation of CEO's in the Netherlands: visit www.bestuursvoorzitter.nl

on the level of redistribution around that time, assuming that the sudden fall of the lowest quintile in gross income is a real economic phenomenon.

Figure 3.3 Quintile shares in total disposable income of the household sector, 1959 - 2000



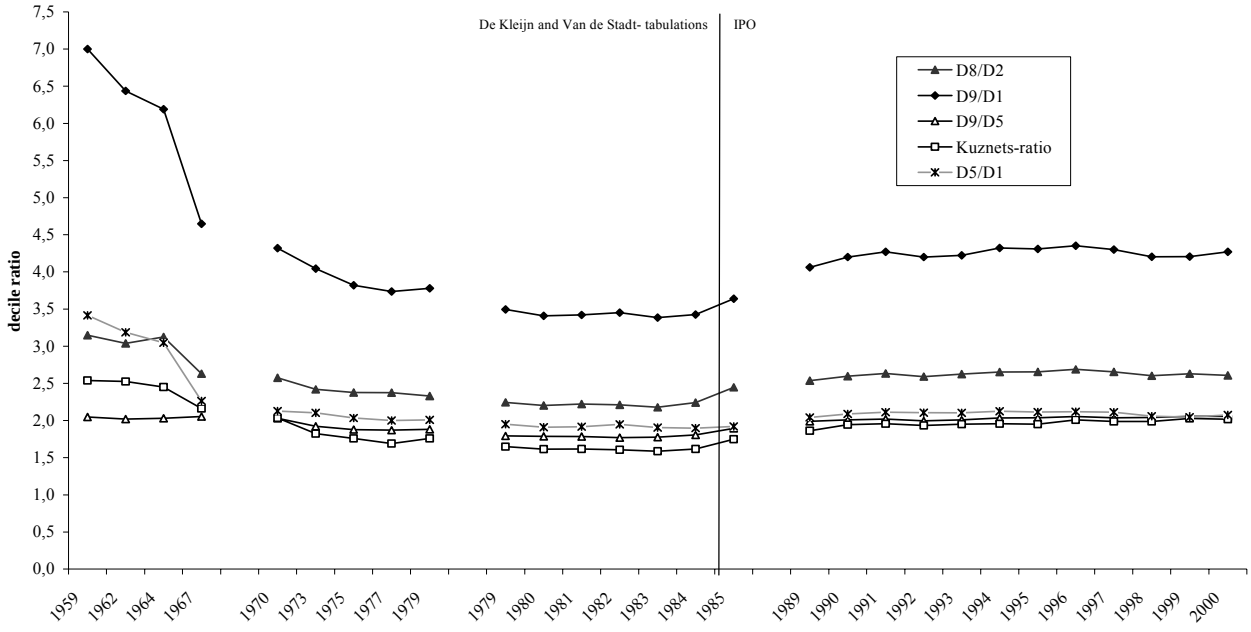
Notes: S1 stands for the share of the bottom 20% in total disposable income, S2 stands for the share of the second quintile in total disposable income…S5 stands for the share of the upper quintile in total disposable income. For the years 1970-1979 no information is included for housing income (imputed rent minus tax-deductible interest on mortgage).

In order to obtain a more complete picture of the developments in inequality, several measures of inequality are plotted in Figure 3.4 on the next page. Here, we see more movement. Especially in the sixties and early seventies inequality seems to have declined, while we could distinguish an episode with rising inequality in the second half of the eighties. Also inequality in disposable income in the Netherlands behaved in an impressive stable manner in the nineties. But finally we should note that while the Kuznets-ratio in gross market income showed a large increase in the eighties (from 2.69 in 1975 to 4.10 in 1985), the increase in the Kuznets-ratio in disposable income is much smaller indicating extensive redistribution.

Let me finally stress that these figures just represent of the level of (and changes in) inequality over time. It does not take income mobility of the tax-units into account. Over the life-cycle people may start in S1, and depending on their different careers move up to S2, S3, S4 or S5 and fall somewhat back after retirement (since I measure actual nominal money income). However, where a recent CPB study on lifetime redistribution concludes that the government is very active in dampening income disparities of primary income (CPB, Ter Rele, 2005) this comparison shows that also from a dynamic aspect adverse changes in the macro-economic landscape are not passed on to the lower income tax-units. Nevertheless, we have to bear in mind that we cannot fully compare these income groups

since the series on disposable income are based on a selection of full-year income-earners while gross market income includes all incomes. The distribution within only full-year income tax-units is logically more equal than the distribution of all tax-units. Presumably this is a fixed effect, so we can compare changes in both distributions.

Figure 3.4 Decile ratios in disposable income, 1959 - 2000



Notes: D1 stands for the income share of the lowest decile in total disposable income; D2 stands for the income share of the second decile in total disposable income … D9 stands for the income share of the ninth decile in total disposable income. The Kuznets ratio plotted is the ratio of the Top 20% income earners in disposable income over the lower 40% of income earners. 1970 – 1979 refers to the distribution of income without imputed rent and deducted interest on mortgages. The first year of IPO micro data used is 1985.

The recent stability of the income distribution is a rather remarkable outcome in light of what is presently believed about income inequality in the Netherlands. Gottschalk and Smeeding (1997) include the Netherlands in the group of industrialized countries facing increasing earnings-inequality between 1979 and 1997, while emeritus professor Jan Pen (2004) also experienced the income inequality as rising. Many newspaper articles write about 'the rich getting richer' in the Netherlands. Research journalist Peter Giesen for instance wrote not long ago in '*de Volkskrant*' of April 2, 2005 that inequality has gone up with some 25% since the eighties (referring to a calculation of Caminada and Goudswaard dating from 2001). Given these different ideas while knowing that the methodology plays an important role (see Atkinson and Brandolini 2001), we naturally wonder whether the stability in the level of income inequality is due to our tax-unit or income definition, or other data-matters.

However, also when one forgets about the tax-unit concept and takes a look at individuals there is no evidence of increasing inequality in the Netherlands. Table 3.1 shows some historical Gini-

coefficients for the Netherlands provided by the CBS (Statline). These Gini-coefficients are extremely flat after 1974 and confirm the declining inequality for the pre-1974 period. The recent stability seems to be a real economic phenomenon.

Table 3.1 Gini-coefficients of disposable income for individuals in the Netherlands, 1946-1999

Year	Gini	Year	Gini
1946	0.46	1974	0.31
1950	0.40	1976	0.30
1955	0.39	1978	0.30
1958	0.39	1984	0.30
1960	0.39	1989	0.31
1963	0.44	1994	0.31
1965	0.43	1995	0.32*
1969	0.37	1999	0.32*

*Source: Statistics Netherlands (Statline) 2005-01-19. *- The values for 1995 and 1999 (respectively 0.324 and 0.321) are the result of an own calculation on the IPO micro-data, necessitated by a change in definition.(see appendix B3 for the SPSS syntax). The income concept may still not be fully comparable with the one underlying the other values, but again no increase between 1995 and 1999 is found.*

3.3 INTERPRETING THE OBSERVED TRENDS

Let us start with two theoretical propositions that sketch the difficulty of explaining developments in income inequality.

First, it is commonly believed that over the course of the twentieth century the Dutch economy became more skill-intensive and services oriented. If we decompose the total labour force in to those working in agriculture, industry, and services, we arguably could assume the latter to have a more unequal distribution of earnings than the former two. An increase in the share of the labour force working in services would then be translated into more income inequality.

Secondly, we could also decompose the population by socio-economic category and distinguish self-employed, workers, pensioners and other transfer-recipients. Self-employed have on average a higher within-group income inequality, than workers, pensioners or other transfer-recipients (De Kleijn and Van de Stadt 1987). Overall there has been a decline in self-employment and an increase in pensioners and other transfer-receiving tax-units (see Salverda and Atkinson 2005b). This would mean a declining inequality.

Inequality could be a synthesis between these two long-run trends, but off-course there are many other active forces. Without presuming to be exhaustive, I here discuss what I believe to be the most important mechanisms that capture the observed dynamics in the Netherlands. The goal of this section is to get acquainted with the underlying trends that determine the general long-run developments in income inequality.

The decline in income inequality up to the mid-nineteen seventies

The secular downward trend in the top quintile or in top shares during the period 1920-1975 has previously been documented for the Netherlands and also for a number of other industrialized countries. For the Netherlands, Pen and Tinbergen (1977, pp. 52-55) offer six causal mechanisms that could have induced the decline of inequality in the Netherlands without further proof.

1. Less regional disparities in income: the end of geographical poverty.
2. Less inequality in the wage structure: more equality in educational levels
3. Convergence between wages and profits
4. Popularization of investment–income
5. Increasing social security
6. Progressive income tax and social premiums

Below I briefly summarize some general trends that possibly explain the long-run movements in the level of income inequality

Demographics and regional disparities – The last century not only meant 'the end of geographical poverty', it also meant the end of high scale poverty in general. Even though the *size* of the income share of the lowest decile did not change much, the *composition* changed strongly. The lowest decile nowadays consists of young holiday-, or part-time workers, while in the olden days they were poor head-of-households. This permitted Prof. Stephen Nickell (LSE) to conclude decidedly "Poverty? The Netherlands? No, you really have no poverty over there!"[15] Over the twentieth century, life expectancy increased and fewer children were born. Youngsters and children above the age of 15 were poor in the olden days *and* quantitatively important. Nowadays, they form a lesser part of the population, so relatively more people have substantial incomes.

Educational level – Table 3.3 presents information on the level of education in the Netherlands on a cohort basis. We find evidence of a strong overall rising level of inequality. This gives downward pressure on the skill-premium, and thus lowering income inequality.

[15] Personal communication, Antwerp, 28 may 2004.

Table 3.2 Educational levels in the Netherlands on a cohort basis

Cohort	Primary education	Low secondary education	High secondary education	Professional tertiary education	university	total
1925-'29	34.8	27	25	9.2	4	100
1930-'34	28.6	29.7	27.3	11.1	3.3	100
1935-'39	24.6	28.6	31.1	11	4.7	100
1940-'44	18.5	28.9	33.3	13.6	5.6	100
1945-'49	16.4	25.8	35.8	15.1	6.8	100
1950-'54	13.9	23.1	37.4	17.8	7.8	100
1955-'59	10.8	22	40.4	18.4	8.4	100
1960-'64	9.5	20.9	43.2	17.3	9.1	100
1965-'69	7.1	19.5	45.3	17.4	10.7	100
1970-'74	6.7	17	46.7	20.5	9.1	100

Source: Sociaal Cultureel Planbureau (2001). *Notes : Cohort represents the year of birth. Low secondary education comprises of LBO and MAVO, High secondary education comprises HAVO, VWO and MBO. Professional tertiary education consists of HBO.*

On the demand side of the labour market, the commonly held view is that increasing earnings inequality in the US and high unemployment in the EU are due to a technology driven labour-demand that is biased to high skilled labour (Krugman 1994). The low skilled accept a low wage in the US, but are put into unemployment in Europe (either 'voluntary' because the low wage falls below their 'reservation wages' and there is the alternative of social security income, or involuntary since the minimum wages are in excess of the marginal productivity of low skilled labour). Tinbergen (1975) called the distribution of income the result of '*a race between technology and education*'. He took a position in-between the economists of the human capital school and the supply-side economists. The idea behind his *race* is that an increasing level of technology demands higher skills and therefore increases the skill premium. More educated workers, on the other hand, would decrease the skill premium and decrease income inequality. We just saw that - as presumably the overall level of technology - also the overall level of education has increased over the years. Depending on the speed-differential of the movements, we would expect positive pressure on the skill premium or downward pressure on the skill premium and inequality. However, this idea of an increased skill-biased demand for labour is only to a limited extent applicable in the Netherlands. Not withstanding a strong welfare state – in the argument synonym for 'labour market rigidities' – the Dutch official unemployment rate has been closer to that of the US than to EU-average (it would however be interesting to recalculate employment to population ratios). There is a number of other criticisms vis-à-vis this 'transatlantic consensus'. Atkinson (1998, p. 19) mentions the so-called 'fractal' inequality: within small defined groups (sex, occupation, age, work experience) increasing income inequality is found in the US and UK.

Taxation, Redistribution and the Welfare State - For the period after the Second World War, especially the creation process of the welfare state is much discussed, both in literature as well as in practice in political debates. From the figures presented in this Section and the statistical analysis of De Kleijn and Van de Stadt, we are tempted to believe that redistribution has increased the share of the bottom half of the distribution over time[16]. Given the interesting differences between disposable and gross income, as we have observed in Figure 3.2 and 3.4, we could conclude that the government has played an important role. Redistribution seems to have increased the income share of the lower groups in the population, and possibly conserved these shares during economic-downturns.

Trade-union activity and wage moderation – An important characteristic in the end of the twentieth century of the Dutch economy is the dialogue between the social partners and the government, and the collective wage setting processes. Dutch trade-unions have a fairly high bargaining power, and are to a certain extent endowed with egalitarian norms. Also the massive wage moderation that took place under the name of the '*polder model*' is likely to have effects on the income and wage inequality.

Popularization of investment income - Simon Kuznets (1955) found deconcentration of savings to play an important role in the levelling process he first noticed in the US. Indeed, the proposed interpretation of the secular decline in income inequality in OECD countries refers to a decline in the concentration of capital income. However, Piketty and Saez (2003, 2005) and Piketty (2005) suggest incidental *shocks* during the inter-war period as the main cause underlying the declining capital incomes. Whether this decline in the inequality of capital income is due to a natural diffusion process of family capital (and large inheritance taxes), increasing wealth portfolios of middle, and high middle incomes (popularisation of the stock market) or shocks is a question for separate research.

Female labour market participation - The number of two-earner families has increased substantially over the last twenty years. The conventional suggestion is that this trend increases the gap between one-income and two-income families – also since there could be a tendency of assortative mating (see for example Visco 1998, pp.53-55). It is of course possible that more female labour participation increases the number of above-average family or tax-unit labour incomes, and that it would therefore mean an income inequality increasing development. On the other hand, the fact that this would make the capital incomes of those possessing fortunes less prevalent in the upper part of the distribution could make the top shares decline. What female labour market participation does to overall

[16] Nevertheless, the regression analysis of Hartog and Veenbergen (1978) on comparable data showed the share of transfers in GDP to be associated with increasing income inequality. This unexpected finding could be caused by increased observation of low-incomes correlating with increased transfers, or by increased transfers correlating with economic downturns that possibly involve more inequality.

inequality of incomes is another story that necessitates further research. The number of hours worked by the second (mostly female) income earner is in the Netherlands quite limited, while there is a big gender wage gap. Preliminary calculations on the IPO micro data show the strongest increase in second earner families in the ninth decile, while there has been stability in income inequality among individuals. Top-income shares of individuals have been – just as top income shares for tax-units - stable over the last 25 years, so we might infer that an increasing number of two-earner families does not have any clear-cut distributional effect in one direction. Saez and Veall 2005 investigate this effect for Canada. They find the top-income shares for individuals and for households to rise with the same speed, so the conclusion that increased female labour market participation does not have a strong effect on income inequality is upheld in the Canadian context.

Although the effect on income inequality is not clear-cut, increased female labour participation does cause an increase in wage-income for sure. Both in growth over time, as well as with respect to total income and other income sources.

Globalisation – One dimension of 'globalisation' is an enormous increase in international trade flows. It is however a myth that off-shoring or increased imports from newly industrialized countries are causing unemployment or income inequality in OECD countries. Even a small country like the Netherlands has constantly had a trade-surplus over the latest decennia, while the bulk of international trade is intra-industry (see Krugman 1994, pp. 34-35 for a more extensive elaboration on this subject). Another dimension of globalisation is labour-market mobility. Lydall (1968) introduced the so-called 'power'-theories for explaining income differences by hierarchical differences. This has been linked with an increasing world market for English speaking top managers. Milanovic (2002) wonders whether talented soccer players lead the way in explaining inequality in an integrating world. If we, for example, consider the 25 Dutch AEX-listed companies today, then 11 CEO's are foreigners. In 1996, only one CEO was not Dutch. This trend could possibly explain some of the developments in top-shares, but it is difficult to extend the phenomenon to the rest of the population since top managers are quantitatively important only in one dimension: income.

Social norms and organisational architecture - Income inequality is too complex to be reduced to a simple supply-demand framework. Atkinson (2001) therefore calls for other theories that have more to do with the 'egalitarian norms' of a society directed to the pay-structure. In today's top income discussion we find supportive incidents for this view: In the US it is rather unthinkable that politicians interfere with top executive compensation, as Prime Minister Balkenende recently did.

Another appealing idea comes from Dennis Snower (1998, pp. 103-110) who spoke about 'organizational revolutions'[17] where the use of bonuses as compensation leads to increased within-job earnings inequality as a result.

Tax shifting – I introduced this phenomenon in the paragraph where I discussed the drawbacks of income tax-data. We have to bear in mind that both the decline in self-employment and the changing income sources could indicate the incidence of income shifting and tax-arbitrage, through shifting the legal status of the activities or by taking a fixed salary from the own-enterprise to arbitrate between the (corporate) profit-tax and personal income tax. It is difficult to analyse the importance of this phenomenon since there is almost no historical research.

3.4 SHORT DISCUSSION

In this chapter I have brought new evidence on the Dutch distribution of income through the construction of quintile- and decile income shares. We saw a marked decline in income inequality over the period 1914-1975 followed by twenty-five years of stability. This stability -also found for the top-shares by Atkinson and Salverda 2005a - is a remarkable outcome that contrasts with other studies (and some strong held opinion). In an international perspective this stability is also interesting since unemployment rates remained quite low in the Netherlands over this time-period, this contradicts the commonly held view that the US low employment is some sort of a 'devil's bargain' at the cost of high income inequality and high poverty due to the absence of welfare-promoting institutions (Krugman 1994). One can have both low unemployment and low inequality at the same time.

Further evidence on top-shares shows that in the Netherlands self-employment and capital income have decreased, while wages have increased. Today, wage-income is the foremost important source of income at the top of the distribution (Salverda and Atkinson 2005b, Afman and Salverda 2005). Piketty and Saez (2005) find the same patterns in the US, but then combined with an increased level of inequality. It seems that in the Netherlands: the old *coupon-clippers* are replaced by the *working rich* in the top of the distribution, but in the US by the *working richest*: especially CEO—pay is much higher at the other side of the Atlantic.

There thus is an international consensus developing that the decline in income inequality in industrialized countries between 1914 and 1975 is caused by a deconcentration of capital income. Yet unclear are the forces explaining the recent developments, and notably the divergence between

[17] As an example Dennis Snower elaborates on how his local garage has changed over the last thirty years. Even 'blue-collar' workers in today's small-town garages need to be representative and have to acquire selling skills. These are to large extent individual capabilities, and – at least in the U.S. – are compensated increasingly at an individual level resulting in larger differences in earnings among employees with basically the same job.

Anglo-Saxon countries and continental European countries Further research on these themes is needed, just as on the potential tax shifting. The ultimate theoretical step that has to be made is placing the mechanisms into a model with testable restrictions.

The next chapter involves a testable model: I will investigate the effect of the economic cycle by regressing the constructed income shares on inflation, unemployment and a linear trend. I will place special emphasis on the role of inflation, given the frequent outcries against inflation and the 'inflation-inequality'-puzzle generated by the literature (see Galli and Van der Hoeven 2001).

4. THE CYCLICAL PROPERTIES OF INCOME INEQUALITY IN THE NETHERLANDS

> *"The world economy today is vastly different from the 1930s….But there are some notable constants. Unemployment and inflation still preoccupy and perplex economists, statesmen, journalist, housewives, and every one else…"* – James Tobin (1972, p.1)

In this chapter, I will look at the cyclical properties of the income distribution by a regression analysis. The framework – that has become known as the BES-model after T. Paul Schultz, Allan Blinder and Howard Esaki who originally came up with it - regresses income shares on inflation, unemployment and a trend function[18]. A number of authors have estimated this model, mostly on US data.

The phrase of James Tobin outlined above does perhaps not express the Dutch macro-economy in the year 2005 in the best way. Today, we are possibly more perplexed by the complete absence of inflation. However, analysing the distributional aspects of inflation certainly remains relevant: with uncertainty about the future of fossil resources, sky-rocketing energy-prizes and an instable[19] price-war being fought in the supermarkets, inflation may come back this century. On the other hand there are also strong downside forces: the digital revolution led to increased competition and monetary finance of budget deficits is with the Stability- and Growth pact and the independent ECB out of the question in Europe. But let us also rephrase the scientific curiosity: left aside many theories, there is not much known about the different consequences of an inflation level of say <2%, or around 5% per annum. And above all, unemployment and inflation are fascinating timeless phenomena.

This chapter is organized as follows. Section 4.1 shortly formulates some theoretical expectations one could have on the effects of unemployment and inflation on the distribution of income, Section 4.2 discusses the most important previous regression analyses of inequality, while I place special focus on inflation in light of the so-called inflation-inequality puzzle. Section 4.3 gives an overview of the econometric critiques of the basic model. Section 4.4 presents the estimation results for gross income, with an important distinction between pre- and post-war years, and disposable income. A discussion of the results follows in Section 4.5.

[18] Most studies up to the seventies/early eighties include a linear time trend, but more recent contributions have replaced the linear trend by a polynomial in order to account for the U-pattern in inequality that is found in the US and UK.

[19] Many products are sold below production prices: note for example the case of Peijnenburg 600g. Breakfast –cake (*Het Financieele Dagblad,* February 6th 2005). On May 17th 2005 a number of producers filed complaints collectively against resellers, who sell below cost-price for marketing purposes.

4.1 THE POSSIBLE DISTRIBUTIONAL EFFECTS OF UNEMPLOYMENT AND INFLATION

Unemployment

Wondering about how the income inequality in gross income is affected by unemployment, is effectively the same as asking 'who looses his job in economic downturns?' Arguably, it are the young, the low skilled - and more general: the lower incomes – who face the highest risk to loose employment. We therefore would expect unemployment to have a regressive effect on the distribution of gross income. Hartog and Veenbergen (1978, p.538) pose that this asymmetric impact 'strengthens the classical argument that high unemployment is supposed to widen wage differentials, while excess demand in the labour market compresses these differentials'. What unemployment does to disposable income is a different question, given the extensive unemployment legislation and social security schemes in the Netherlands.

Inflation

The distributional effects of inflation are less clear. Overall, the current view of the IMF or World Bank is that inflation tends to increase the inequality of incomes[20]. This may not come as a surprise when we consider the economic developments in different parts of the world. While Latin American Countries have had to deal with high levels of inflation combined with high inequality, Continental European and South-East Asian countries have had on average very low levels of inflation, and not much inequality in income.

The view that inflation worsens the income dispersion goes hand in hand with the old saying that inflation is 'the cruellest tax of them all'. Inflation works as a seignorage-tax, since the monetary authority is able to push down the real value of the government's liabilities by augmenting the money quantity and initiating inflation. This causes redistribution from private households to the government. However, theory nor empirics are straightforward about the (a)symmetry of the effect of inflation on wealth holdings and income-streams. Some authors refer here with the 'cruel'-aspect of the inflation-tax to the idea that inflation hurts the poor more than the rich since the poor hold a larger fraction of their portfolio in liquid, non-interest bearing, assets[21]. Others specifically target the elderly who receive their pension-income without any form of indexation[22]. On the other hand, it is also often argued that the low-income families have relatively large debts, and profit from unexpected inflation since it lowers the real value of their debt, while one could also assume that only the wealthy possess bonds of which the real value is eroded by inflation. None of these views is entirely

[20] See for example World Bank's online contents at http://econ.worldbank.org/research, and then their online 'inequality course'.
[21] We can find evidence for this view in the work of Fisher, Keynes and Marshall or more recently in Albanesi (2002).
[22] See for example Gärtner's exposition in his textbook 'Macro-economics' (2000, p.364).

false. When assessing the distributive impact of inflation, it is clear that there are many forces at work.

Contemporary theory often postulates 'lead-lag' positions with upward price flexibility as main criterion to understand the short run effects of inflation on income[23]. In this view profits and self-employment rise first when prices increase, while the reaction of wages lags behind. Transfers, rent or other income from capital are assumed to be even less sensitive to increases in the general price-level. When we then take a look at the functional or categorical distribution of income (and generalize somewhat), the self-employed with high profit-incomes are dominant in the very top of the distribution. Wage-earners are found in the middle and upper classes, while those receiving income out of transfers are mostly located in the lower parts. Since income out of rent or capital makes only a small part of total national income, we thus would expect inflation to widen the dispersion of incomes in the short run. However, in the previous chapter we saw that the income composition has blurred over the course of the 20th century. Today, self-employed do not only earn 'profit form enterprise', but increasingly take a salary from their enterprise, or work part-time for a fixed fee. Wage-income earners do have increasingly wealth portfolios that generate capital income. Moreover, the bulk of the income in the household sector is made up from wages and salaries nowadays, while self-employment income is less important in determining the overall income inequality than it was a decade ago.

But not only on the left hand-side of the effect we have to deal with heterogeneity among the tax-units. On the right hand side, we could – at least conceptually - distinguish cost-push from demand-pull inflation. The rationale relating to 'upward price-flexibility' would apply best for inflation of the demand-pull type. Cost-push inflation could erode business profits, while making those with predetermined wages better off.

Also, given the hypothesized short-run trade-off between (demand-pull) inflation and unemployment, employment may rise as a result of a lower real wage and as such narrow the income inequality. There thus is no clear-cut theoretical effect of inflation on the size distribution of income.

4.2 THE INFLATION – INEQUALITY PUZZLE: PREVIOUS REGRESSION ANALYSIS

The *a-priori* adverse effects of unemployment on the distribution of income reflect a consensus in the economic science, which has also found empirical support. The possible effects of inflation are more mysterious, notably since the literature has generated an 'inflation-inequality' –puzzle. Therefore I here discuss the role of inflation only.

[23] See Bach and Ando (1957) for one of the first contributions in this field.

Initial single-country evidence

Schultz (1968) is the first to investigate the cyclical properties of the distribution of income by time-series analysis. He regresses the income concentration among different strata of the population on a lagged structure of prices (t, t-1 and t-2), unemployment, output and a linear trend. Current inflation is significant on a 5% value and increases the income inequality within the top 20%, but he does not find any important significant coefficients for current or lagged inflation rates for broader groups (table 2, p. 264). Blinder and Esaki (1978) estimate quintile income shares and leave output out. They find unemployment to have a quantitatively large regressive effect, while the overall impact of inflation appears to be low but positive significant for the bottom quintile (table 1, p. 605). They speculate on inflation being a progressive income tax, since the signs for the bottom quintiles are positive and the sign for the top quintile is negative. Nolan (1987) estimates the BES-model on blue-book data of the United Kingdom with a very limited number of observations, and confirms the earlier findings: unemployment regressive and inflation insignificant. There have been ten other studies on the relationship between inflation and inequality on US-data, and three on data from other countries - see for an overview Galli and Van der Hoeven (2001, table 1A p. 21[24]).

The conclusion of this single-country evidence is that inflation does not have a regressive, i.e. inequality increasing effect. In most cases inflation comes out as a progressive income tax, whereas in other cases it comes out as insignificant.

Cross-country evidence

In more recent decades especially *cross-country* analyses of inequality have been numerous, thanks to the Deininger and Squire World Bank database that is made available in 1996. Gulde and Bulíř (1995) find an overwhelming *positive* significant coefficient of inflation for the Gini-coefficients of 18 countries between 1962 and 1992 with the use of World Bank data. However, Gustafsson and Johansson (1999) find a 10%-significant *negative* effect of inflation in explaining income inequality in a sample of 16 OECD countries with the use of LIS-data. Apparently the choice of data matter.

David and Christina Romer (1999) explicitly study the relationship between monetary policy (inflation) and inequality. They find average inflation to have a strong positive correlation with income inequality in industrialized countries. However, Atkinson and Brandolini (2001) again show the importance of the choice of data: when the World Bank data used by Romer and Romer are replaced by Luxemburg Income Study (LIS)-data the coefficient of inflation looses significance. Atkinson and Brandolini and Piketty (2005) point out that studies in the field of income inequality are plagued by a serious lack of homogeneous data and looseness of definitions. The World Bank data-

[24] This table does not include the most recent contributions of Jantti and Jenkins (2001) and Heer and Sussmuth (2003) that apply a technically more advanced way of modeling the effect of inflation on inequality.

set includes both measures of inequality among individuals, households, or tax-units, both gross income and disposable income, and completely different concepts like inequality in expenditure. Mixing up these different concepts has strong effects on the results. For instance, the inclusion of a gross income dummy in the Romer and Romer exercise reduces the significance-levels of the outcomes greatly.

Left aside the data-matters for the moment, Aleš Bulíř (2001) establishes an interesting property with World Bank data: disinflation has a non-linear effect on the income distribution. He classifies the countries in his sample as having on average hyper, high, low and super-low inflation and estimates Milanovic' (1994) 'augmented Kuznets-curve'-model that includes GDP, GPD squared, State employment and share of transfers in GDP as explaining variables. He adds inflation with 'speed dummies'. Now it appears that reduction from hyper- and high inflation to low inflation significantly reduces inequality, while he finds a negligible effect on the Gini-coefficient of further reduction from low (>5% and < 15% per year) to super low (<5%) inflation. On a world scale inflation is important. As Bulíř writes (p.143): '*It is not a coincidence that high inequality countries, such as many in South America, have generally suffered from high inflation or hyperinflaion, and that low-inequality Asian countries have had lower-than-average inflation rates*.' Galli and Van der Hoeven (2001) propose a non-monotonic relationship. As they state: 'Though in high inflation countries restrictive monetary policy is often beneficial for inequality, reducing inflation in economies with initially low inflation might increase inequality'. In their view, the distributive effect of inflation is not non-linear per-se, but rather non-monotonic depending on the initial rate of inflation. Summarizing the cross-country evidence, we learn that more inflation is strongly associated with increasing income inequality if World Bank data are used. Left open for further research is cross-country analysis on for example LIS-data, or top shares.

We thus have contradicting cross-country (inflation having a significant regressive effect on income inequality) and single country evidence (non-significant or progressive). Galli and Van der Hoeven propose taking the initial rate of inflation into account in order to solve the puzzle, while Heer and Sussmuth (2003) explicitly model a non-linear relationship, where income inequality first declines if the inflation rate rises up to a certain level, after which the income inequality starts rising again. Moreover, Heer and Sussmuth (2003) are the only ones to model a non-linear relationship for a single country as they use US-data over the time-period 1951 - 1991. This brings us back to the BES-model and a single country case study. How has inflation affected the income distribution in the Netherlands over the 20th century? What was the role of unemployment?

4.3 THE BES MODEL AND ITS CRITIQUES

In this section I first introduce the BES-model in its simplest form. As a basic model I use the original specification of Blinder and Esaki (1978):

$$S_i(t) = \alpha_i + \beta_i \cdot \pi(t) + \gamma_i \cdot U(t) + \delta_i \cdot T + \varepsilon_i(t)$$

Here $S_i(t)$ represents the share of quintile i at time t, $\pi(t)$ the inflation rate in year t, $U(t)$ the unemployment rate in year t and T a linear trend with 1 in 1914, 2 in 1915 etcetera; $\varepsilon_i(t)$ represents the error term. Despite its simplicity and straightforwardness in use – as it is easy to understand and interpret - the model has some limitations. The most important ones are described below[25].

Non-stationarity in the variables – Many macro-economical variables are non-stationary: cointegrations might be called for. However, Jantti and Jenkins (2003, p.3) point out: it is inappropriate to represent the dynamic properties of the hypnotised relationship by a cointegration vector since both income shares and inflation and unemployment are logically bounded. They continue with a technically more advanced way of modelling the impact of the macro-economic conditions on income inequality. However, I will – as Heer and Sussmuth (2003) and many other authors in the past - stick to the original estimation framework: there is no evidence of a unit root in the annual rate of inflation in the Netherlands, while unemployment is indeed logically bounded – the unit root, of course, still being a warning against spurious results. The OLS regression framework has the advantage of being very straightforward in use and easy to understand and interpret. It therefore could be very instructive to take as a starting point for further research. Warned by the shortcomings we should interpret the resulting outcomes with care.

Number of observations - Another important critique of BES-type regressions deals with the number of observations. Parker (2000, p.223) noted that the single-country BES studies have on average 28 observations. This is quite low, and the power of OLS-regressions is in these cases not strong. But, as we saw in the previous sections, the Dutch tabulations cover a very large time span – virtually the complete twentieth century. We therefore have more observations: for the top quintile 26 pre-war, and 29 post war observations.

[25] This section draws to a certain extent on Parker (2000), who referred to time-series regression analysis of income inequality as 'Opening a can of worms'.

Auto-correlation - When applied to the Dutch data another problem arises, without any preambles in the international literature: it suffers from strong positive autocorrelation. Since we have gaps in the series for the post-war time period (due to the irregularly published I&V-volumes), controlling for autocorrelation by the inclusion of an AR(1)-process or a lagged dependent variable will cost many observations (for the upper decile for instance, we go from more than 54 observations to 40 when we estimate the original observations without error correction and with an AR(1) included). This is thus perhaps not the best way to proceed. A better option is to control for auto-correlation and heteroskedasticity by replacing the normal standard errors by Newey-West standard errors. Also, following Hartog and Veenbergen (1978), I have constructed series of 'weighted first differences', where in case of a gap, the difference is divided over the number of missing observations. When we then estimate the model in first differences, we are doing effectively the same as if we were to apply a weighted least squares methodology, where the weight is given by time. This leaves us a continuous series, but interpolation is of course a very crude way of dealing with the problem. I therefore finally took another route: linear interpolation of only the final missing year in case of a gap (missing years) between two observations, in order to construct an "anchor value" that saves the first 'true' observation when we estimate the first differences. Suppose for instance that we have observations for 1977, 1981, 1985 and 1989. The approach described above interpolates values for 1976, 1980, 1984 and 1988. These interpolations form then a sort of anchor values, such that if the first differences are estimated, the observations in 1977, 1981, 1985 and 1989 are rescued. In the next section I report only the estimations of the levels of the original observations with Newey-West standard errors, and the estimation of these 'rescued' first differences constructed. We need to keep in mind that the results for the original observations are influenced by auto-correlation.

Omitted variables - The omitted variables case is important, but there is not much we can do about it. In his text book on Development Economics Debraj Ray (2000) sees a resemblance between the study of inequality (with reference to the Kuznets-curve debate) and '… the search for the Holy Grail…' Many researchers are still looking for 'smoking guns' (see Gustafsson and Johansson, 1999). Hartog and Veenbergen (1978) included seven explanatory variables without much success[26]. As stated in the introduction there is no agreement upon a specific model, despite very important seminal contributions as for example the Stiglitz 1969-model of capital accumulation. With the inclusion of a constant to pick up fixed effects, and a time-trend to pick up the effect of structural and institutional forces, our model is in my view capable of explaining the short run cyclical effects,

[26] Hartog and Veenbergen (1978) followed an in their words 'ad hoc approach: collect as many relevant variables as possible, try to formulate expectations about the sign and magnitude of the coefficients and then run the regressions' (p.537). Almost none of their explaining variables (output growth, inflation, unemployment, age distribution, share of transfers in gdp, share of wages and data-coverage) obtained significance: only the share of transfers in gdp was significantly positive.

which is our objective. (Perhaps proof of this position is that no author has referred to these obvious but important critiques in the context of BES-regression analysis.)

Reversed causation between inequality and inflation - There is a bulk of recent political economic literature that investigates the influence of inequality on inflation. Alberto Alesina and Allen Drazen (1991) explained why stabilizations could be delayed in democracies by the median voter theorem. Beetsma and Van der Ploeg (1996) documented an important strong positive correlation between inequality levels around 1960 and subsequent inflation levels for democracies, while the association was non-existent in non-democracies. They pose that in democracies where a small fraction is rich and a big fraction of the income earners is poor, the government is more likely to act in the interest of the low-income and imposes an expansionary fiscal policy that is monetarily financed and creates inflation. This inflation is expected to erode the high incomes of the wealthy and lessen the nominal debts of the poor. Or, as they phrase it: '*Inequality and high levels of government debt sow the seeds for inflation'*.

Desai, Olofsgård and Yousef (forthcoming) update this relationship. They regress average inflation on the 'usual' variables (fiscal balance, growth, financial depth, central bank turnover rate), and include the annual Gini: They found the correlation to vanish when a larger time-span is taken into account. It still exists over the period 1965-1990, but when the analysis is extended up to 2000, the Gini-coefficient is not significant anymore in explaining the inflation in 120 countries[27]. However, if what they call 'political structure' is taken into account by the Polity- (Pol) and Gastil (Gas) indices, that measure the degree of 'political openness' and competition respectively, the variables Gini*Gas and Gini*Pol are significant in explaining inflation with a large coefficients of 0.995 (s.e. 0.293) and 0.545 (s.e. 0.238) respectively. When the Polity and Gastil indices alone were entered into the equation, the coefficients did not obtain significance. Thus, a higher inequality combined with a more 'democratical' political structure does correlate with higher inflation.

I personally feel that the case for reversed causation in the Netherlands is not that strong with respect to an international group of countries for two reasons. Firstly, the effect of inflation is not a-priori pro-poor or pro-large-groups in population: the empirical and theoretical ideas underlying the analysis are weak. Secondly, the monetary policy has always been quite independent from politics in the Netherlands, while the Dutch Central Bank has always had an important objective of price stability according to the Bank Law of 1949 (article 9, sub 1). This position did not leave much room for a political business cycle or delayed stabilizations.

Nevertheless, there is important evidence for a positive reversed causation in an international context and we have to deal with it. Luckily it is easy to control for this by a two-stage least squares

[27] This might be a result of the current monetary policy consensus on inflation targeting.

estimation procedure with the lagged explaining variables as instruments (postulating that inequality at time t does not influence inflation at time t-1[28]). Employing this instrumental variable estimation procedure did not change the OLS results qualitatively, nor were the quantitative effects large. I therefore report only the OLS estimations in Section 4.4. But, if estimation with instrumental variables led to a coefficient loosing its significance, we have to conclude that the finding is not robust.

4.4 ESTIMATION RESULTS

Gross income

The macro-economic data used in this section are defined as follows. Inflation is the percentage annual rise in the Consumer Price Index for low income families (provided on request by the CBS)[29], while unemployment measures the percentage of registered unemployed in the labour-force. Annual pre-war data on unemployment is not easily available, and I have made estimations for the years 1914-1921 along the lines of the procedure used by Schultz (1968). See Appendix C for the details and resulting data.

Table 4.1 represents the estimations of the quintile income shares in gross income. The left hand side of the table presents the results of the original levels; the right hand side gives the result when the 'rescued' first differences are estimated. Tables 4.2 and 4.3 represents the estimation for deciles and top shares, while Table 4.4 shows a breakdown for the top of the distribution and separately estimates the period before WW II and after WW II. As explained, controlling for auto-correlation by interpolation with the inclusion of AR-terms changed the outcomes in the Tables 4.1 – 4.4 to a certain extent: especially the findings for the estimation of levels appeared not to be robust in many cases. However, overall the results were not strongly changed qualitatively: the tables in this section permit us to draw a broad picture of the impact of inflation and unemployment on the distribution of income. Note that S1 represents the lowest quintile, S2 the second quintile, etc… and S5 the upper quintile. Note furthermore that we only have post-war observations for S1 to S3, while S4 and S5 cover a larger time-span – see the raw observations in Appendix A.

Quintile income shares - After inspection of Table 4.1 a number of things come to mind. First, income is rather unequally distributed among the deciles: the top 20% of income earners earns more than half the total income in the household sector, while the lowest 20% earn together not more than some 3.5%. But we should keep in mind that this is only a static picture - it does not take mobility

[28] One could argue that inequality is a static variable, and that level of inequality at t thus influences inflation at t, inflation at t+1, and given the high correlation of inequality at t with the level of inequality at t-1, also the inflation at t-1. If this is true, then the lagged variables are not good instruments. However, this reasoning does not apply for estimation of 'rescued' first differences with lagged variables as instruments. All results obtained with this TSLS-procedure are available upon request.

into account, that over the life-cycle off-course is high. The average size of the quintile income share alone does not say anything about the level of inequality in a country, but changes in the size of the quintile income shares, occurring within a sufficiently short time period – say, a shorter than the time needed to move to another fraction - do have consequences for the level of inequality a society is facing.

What can we infer from the Table 4.1? First of all, we confirm the idea that the incidence of unemployment has a strong regressive impact (when the model is estimated in all possible forms the coefficients of S1 and S2 are negative and significant), while over time both the top quintile and lowest quintile have lost income share to the middle quintiles. Especially the fourth quintile has increased its share, both over time as with the incidence of unemployment. When differences are estimated unemployment remains significantly regressive (although the positive effect for S4 disappears), and also structural influences remained important: now represented by significant constants.

However, the effects of inflation are difficult to catch: the large positive effect found for S2 disappears (and almost reverses) when first differences are estimated, but remains significant positive if we include AR –processes while estimating interpolated series, when however we include an AR(1) and estimate the original observations we loose such an amount of observations that no significance is obtained. The positive impact of the incidence of inflation on the share of the second quintile is thus not robust, but speculation that inflation is not a bad thing per-se for those inside the second quintile seems to be justified – the coefficient twinkles between being positive or insignificant.

Decile income shares and the top of the distribution - Note first that the lowest quintile, S1, is created by lumping the missing tax-units and missing income together with the registered income below the 20th percentile. Since the total of missing tax-units for most of the years after 1950 was around 15% of the constructed tax-unit total we cannot make a breakdown of S1 into two deciles. Hence, the first separate decile income share we can distinguish is the third one, D3, which aggregates the income of the 20th to 30th percentile, and represents their share in total gross income. Note secondly, that - since the CBS-statistics included all the taxpayers above a certain income level - the raw tables provide great detail at the top. This makes the distinction of small top fractions possible. Table 4.2 gives the results of the BES-model regressions for deciles and top-shares up to the income share of the top 0.5% income earners. I have used the top shares derived by Atkinson and Salverda (2005a) for gross income[30].

If we take a close look at the table, then it appears that actually every decile has increased its income share over time at the expense of the top-decile. Given the size of the coefficient, the core of the

[29] This is the only consumer price index available over a long period of time with sufficient detail.
[30] Atkinson and Salverda also calculate the 0.10 and 0.05%, but year to year volatility is then higher since individual settlements with the fiscal authorities gain weight (Salverda and Atkinson 2005b).

decrease in income share was located at the very top per cent of the distribution. We further see again a regressive impact of unemployment: D3 and D4 loose income share when unemployment increases, while the 80th to 95th percentile increases its income share (the ninth decile, D9, and the second vintile).

Inflation, on the other hand, has a less clear impact: D3 to D5 gain income share – indicating the possibility of a progressive impact, but also the top 5% gains weight with the incidence of higher inflation. The upper middle class seems to get hurt. However, these relations appear not to be robust. As explained, the model suffers from strong positive autocorrelation, and when the 'rescued' first differences are estimated, the coefficients for inflation loose significance – see Table 4.3. When linear interpolated series were estimated (so that we have a continuous series), the inclusion of AR-terms invoked insignificant coefficients for inflation as well.

However, in Table 4.3 we do see unemployment having a significant regressive effect again: higher unemployment is translated into a decrease of the third and fourth decile. Remarkably, the top sees its relative share growing in times of increasing unemployment – this could explain the reciprocity also found in the quintile income shares-estimation, but it is in contrast with the other tables that do not find such an effect. Note finally the significant negative constants in the super top indicating falling top shares over the period under focus.

Different impact of inflation before and after World War II

Table 4.4 gives a breakdown of the twentieth century where the period before WW II and the period after WW II are separately estimated. We see some remarkable constants between the left-hand side (representing the relationships before the war) and the right hand side of the table (after WW II). There was a levelling tendency in both the pre-war and the post-war time period. High unemployment, associated with economic downturns, was in both periods translated into smaller top shares. However, inflation has a strikingly different impact: Before WW II high inflation was associated with increasing top income shares, while after WW II the incidence of high inflation eroded the top-incomes. This could make sense in theory, if we would be able to take the sort of inflation into the analysis. It is possible that before WW II inflation was more of the demand-pull type, where after the war we had some important periods of high cost-push type inflation (the oil shocks). It is possible that these different types of inflation had a different impact on the distribution of income. It is however difficult to test such a hypothesis. In recent times we have detailed inflation decompositions (see for example the Quarterly Bulletin of the Dutch Central Bank March 2005), but for early years this kind of information is difficult to asses.

A turning point around the time of the Second World War is also found by Hartog and Veenbergen (1978, p. 533), who note the relation between the movement of the top 10% income share and the

unemployment rate (u). Before the war they moved in opposite-directions, while after the war they moved in parallel. Hartog and Veenbergen concluded (p.533) *'…Hence, before the war, prosperity meant high inequality, while after the war inequality occurred during the recessions... '*. This is at-least for the pre-war period in line with the proposed inflation dynamics, that the bulk of the inflation in the Netherlands before WW II was demand-driven. Conclusions over the situation after the war are more difficult since the current regression analysis does not pick-up the change in the effect of unemployment, while the trade-off between inflation and unemployment could possibly have weakened. If we just take the post-war findings together: economic prosperity (indicated by low unemployment) is associated with low inequality, while high inflation is also related to lower inequality. Then, we see that the macro-economic cycle has changed for the better if we are in a positive state of nature and care about inequality.

Unfortunately, testing for robustness brings us in an unwanted split: the pre-war estimations do in most cases not suffer from autocorrelation, but the post-war observations do. Correcting by estimating 'rescued' first differences leaves not much of an effect: inflation ceases to be significant in all but one cases[31]. For the post-war period, we find in this case only a negative significant correlation between the rate of inflation and the income share of the 'next 4%'. This is remarkable since from table 4.3.4 we might get the idea that especially the top 1 % is affected by inflation in the post-war time period (having a coefficient of -0.244 whereas the next 4% has a coefficient of -0.131)

Summarizing the cyclical properties of the distribution of gross income, we find a quite consistent image. The incidence of unemployment has a strong regressive effect, while the influences of inflation are rather weak. Speculation of inflation being a progressive income tax, rather than a regressive tax seems to be justified in light of the mixed findings where inflation jumps between being significantly progressive or insignificant and the noticeable turning point around WW II: afterwards inflation could have operated as a progressive income tax on top shares.

[31] Given the already large number of tables in this section and the limited significant findings I do not present the table where I estimated the 'rescued' first differences – it is available upon request.

Table 4.1 Quintile income shares in gross income estimation results

	Original Values – estimation of levels						'Rescued' first differences				
Dependent variable	S1 Bottom 20%	S2 Second 20%	S3 Third 20%	S4 Fourth 20%	S5 Upper 20%		S1 Bottom 20%	S2 Second 20%	S3 Third 20%	S4 Fourth 20%	S5 Upper 20%
Sample period	1950-2000	1950-2000	1950-2000	1919-2000	1915-2000		1951-2000	1951-2000	1950-2000	1920-2000	1915-2000
Constant (standard error)	4.60*** (0.39)	4.90*** (0.75)	14.0*** (0.49)	19.0*** (0.28)	61.1*** (0.75)		-0.243 (0.168)	0.278*** (0.082)	0.029 (0.086)	0.169 (0.213)	-0.363*** (0.113)
Inflation	0.017 (0.048)	0.186*** (0.072)	0.097 (0.066)	0.001 (0.046)	0.028 (0.071)		-0.047 (0.028)	-0.021 (0.013)	0.019 (0.011)	0.001 (0.013)	0.037 (0.039)
Unemployment	-0.128* (0.068)	-0.151** (0.074)	-0.021 (0.059)	0.237*** (0.046)	0.079 (0.063)		-0.028 (0.025)	-0.038*** (0.014)	-0.012 (0.019)	0.80 (0.058)	0.036* (0.019)
Time	-0.010* (0.005)	0.070*** (0.14)	0.029*** (0.009)	0.058*** (0.005)	-0.217*** (0.016)						
Mean dependent variable	3.50	9.50	16.18	22.78	52.82		-0.054	0.045	0.063	0.161	-0.084
Number of observations	28	28	28	43	54		32	32	33	47	58
R^2	0.43	0.75	0.46	0.91	0.92		0.17	0.17	0.11	0.15	0.05

*Notes: *, **, and *** indicate significance at 10, 5 or 1% -level; Estimation of levels suffers from strong positive auto-correlation; No AR(q)- terms included - see text for analysis of robustness.*

Table 4.2 Decile and Top income shares in gross income estimation results (original values - levels)

Dependent variable	D3 Third 10%	D4 Fourth 10%	D5 Fifth 10%	D6 Sixth 10%	D7 Seventh 10%	D8 Eight 10%	D9 Ninth 10%	Top 10%	Second Vintile	Top 5%	Next 4%	Top 1%	Top 0.5%
Sample period	1950-2000	1950-2000	1950-2000	1920-2000	1919-2000	1917-2000	1914-2000	1914-2000	1914-2000	1914-2000	1914-2000	1914-2000	1914-2000
Constant	1.44 (0.40)	3.45 (0.36)	6.12*** (0.29)	6.91*** (0.18)	8.53*** (0.15)	10.6*** (0.27)	13.6*** (0.37)	46.5*** (0.82)	10.1*** (0.16)	37.3*** (0.88)	15.9*** (0.13)	21.4*** (0.82)	16.7*** (0.75)
Inflation	0.079** (0.040)	0.107*** (0.033)	0.069* (0.038)	0.022 (0.025)	0.008 (0.025)	-0.068*** (0.015)	-0.101 (0.024)	0.129 (0.080)	-0.046*** (0.013)	0.176** (0.083)	0.002 (0.017)	0.174 (0.071)	0.156 (0.063)
Unemployment	-0.096** (0.045)	-0.056* (0.030)	-0.022 (0.027)	0.067 (0.051)	0.032 (0.037)	-0.027** (0.021)	0.062*** (0.021)	0.019 (0.061)	0.048*** (0.011)	-0.029 (0.063)	0.057*** (0.010)	-0.085** (0.062)	-0.088 (0.059)
Time	0.041*** (0.008)	0.029*** (0.006)	0.015*** (0.006)	0.033*** (0.005)	0.032*** (0.004)	0.042*** (0.004)	0.045*** (0.006)	-0.262*** (0.018)	0.007*** (0.002)	-0.270*** (0.019)	-0.057*** (0.003)	-0.212*** (0.017)	-0.179*** (0.015)
Mean of dependent variable	4.00	5.51	7.24	8.31	10.22	12.15	15.5	37.3	10.6	26.7	13.9	12.8	9.4
Number of observations	28	28	28	40	41	51	54	54	54	54	54	54	54
R^2	0.74	0.75	0.45	0.85	0.89	0.84	0.82	0.93	0.61	0.93	0.95	0.92	0.91

*Notes: *, **, and *** indicate significance at 10, 5 or 1% -level; Estimation of levels suffers from strong positive auto-correlation; No AR(q)- terms included - see text for analysis of robustness.*

Table 4.3 Decile and Top income shares in gross income estimation results ('rescued' first differences)

Dependent variable	D3 Third 10%	D4 Fourth 10%	D5 Fifth 10%	D6 Sixth 10%	D7 Seventh 10%	D8 Eight 10%	D9 Ninth 10%	Top 10%	Second Vintile	Top 5%	Next 4%	Top 1%	Top 0.5%
Sample period	1951-2000	1950-2000	1950-2000	1921-2000	1920-2000	1918-2000	1915-2000	1915-2000	1915-2000	1915-2000	1915-2000	1915-2000	1915-2000
Constant	0.166*** (0.56)	0.107*** (0.35)	0.051 (0.039)	0.023 (0.052)	0.049 (0.079)	0.105 (0.101)	0.165 (0.106)	-0.529*** (0.180)	0.083 (0.054)	-0.612*** (0.223)	0.054 (0.044)	-0.557*** (0.216)	-0.501*** (0.196)
Inflation	-0.015* (0.008)	0.000 (0.0007)	0.010 (0.005)	-0.002 (0.006)	0.011** (0.006)	0.0012 (0.012)	-0.001 (0.014)	0.038 (0.048)	-0.005 (0.008)	0.044 (0.054)	0.004 (0.007)	0.047 (0.051)	0.046 (0.045)
Unemployment	-0.020** (0.009)	-0.020*** (0.006)	-0.014 (0.006)	0.004 (0.017)	-0.012 (0.012)	-0.013 (0.009)	-0.017* (0.010)	0.054** (0.022)	-0.008 (0.006)	0.062*** (0.025)	0.006 (0.008)	0.056*** (0.024)	0.050*** (0.022)
Durbin-Watson	1.69	1.92	1.85	0.69	0.70	0.41	0.74	1.51	1.21	1.51	1.49	1.74	1.86
Number of observations	32	33	33	44	45	55	58	58	58	58	58	61	61
R^2	0.19	0.13	0.23	0.01	0.12	0.11	0.04	0.05	0.04	0.05	0.03	0.06	0.06

*Notes: *, **, and *** indicate significance at 10, 5 or 1% -level; estimations do not include AR(q) terms - see text for analysis of robustness.*

Table 4.4 Top -decile and Top income shares in gross income estimation results (original values –levels) Before and Post World War II

	Before World War II							After World War II						
Dependent variable	D9 Ninth 10%	Top 10%	Second Vintile	Top 5%	Next 4%	Top 1%	Top 0.5%	D9 Ninth 10%	Top 10%	Second Vintile	Top 5%	Next 4%	Top 1%	Top 0.5%
Sample period	1914-1939	1914-1939	1914-1939	1914-1939	1914-1939	1914-1939	1914-1939	1950-2000	1950-2000	1950-2000	1950-2000	1950-2000	1950-2000	1950-2000
Constant	13.36*** (0.55)	48.59*** (0.86)	9.86*** (0.26)	38.6*** (0.98)	15.7*** (0.13)	22.9*** (0.91)	18.2*** (0.80)	13.0 (0.23)	44.2*** (0.82)	9.9*** (0.153)	34.3*** (0.68)	16.1*** (0.24)	18.2*** (0.50)	13.4*** (0.438)
Inflation	-0.095*** (0.027)	0.223*** (0.052)	-0.036*** (0.014)	0.260*** (0.063)	0.029*** (0.007)	0.230*** (0.058)	0.201*** (0.051)	0.010 (0.030)	-0.411*** (0.118)	-0.037*** (0.022)	-0.374*** (0.098)	-0.131*** (0.045)	-0.244*** (0.054)	-0.191*** (0.042)
Unemployment	-0.050 (0.056)	-0.091 (0.059)	-0.008 (0.027)	-0.083 (0.063)	0.032*** (0.012)	-0.115* (0.063)	-0.115** (0.057)	0.191 (0.028)	-0.156*** (0.085)	0.079*** (0.018)	-0.235*** (0.072)	-0.044 (0.026)	-0.191 (0.050)	-0.151*** (0.044)
Time	0.119*** (0.052)	-0.264*** (0.063)	0.049 (0.025)	-0.313*** (0.067)	-0.030*** (0.008)	-0.283*** (0.061)	-0.252*** (0.053)	0.040*** (0.004)	-0.177*** (0.017)	0.007*** (0.003)	-0.185*** (0.014)	-0.047*** (0.005)	-0.138*** (0.010)	-0.109*** (0.009)
Durbin-Watson	0.78	1.79	0.76	1.67	1.00	1.72	1.76	0.39	0.37	0.36	0.46	0.36	0.90	1.08
Mean of dependent variable	14.6	44.5	10.6	34.0	15.5	18.4	14.1	16.4	30.6	10.6	20.0	12.4	7.6	5.0
Number of observations	26	26	26	26	26	26	26	28	28	28	28	28	28	28
R^2	0.72	0.84	0.65	0.83	0.62	0.83	0.83	0.95	0.93	0.81	0.95	0.88	0.96	0.96

*Notes: *, **, and *** indicate significance at 10, 5 or 1% -level; estimations do not include AR(q) terms - see text for analysis of robustness.*

Disposable income

It is interesting to ask whether the strong regressive effects of unemployment are also present when the focus is on the distribution of disposable income, or whether social security prevents the lowest income shares from falling. And what about the relationship between inflation and the distribution of disposable income? Just as with gross income, the estimation of income share levels suffered from strong positive autocorrelation and (just as with gross income) controlling by the inclusion of AR-terms is impossible since we do not have a series of continuous observations for disposable income either: there are missing years. Table 4.5 presents the results for the quintile income shares in disposable income. The left-hand side reports the estimation of levels with Newey-West standard errors, while the right hand-side of the table shows the results of an estimation of the 'rescued' first differences. We see a striking picture: the coefficients for inflation and unemployment are for the lower and middle quintiles significantly positive and quantitatively large where the original values are estimated (left-hand side). This indicates a large progressive effect of inflation, and also an increased income share of the lower quintiles when the level of unemployment is high. The latter could possibly be explained by unemployment-benefits and extensive social security-schemes, while the former underlines theoretical arguments for accommodating monetary policy. Estimation with a two-stage least squares procedure does not change these results. But how robust are these findings? When the 'rescued' first differences are estimated in Table 4.5 we still see inflation having a progressive effect: the second quintile increases its share and the upper quintile looses income share when inflation rises. However, the significant effect of unemployment disappears. In a more crude way to deal with the autocorrelation, I also estimated linear interpolated series with AR-terms. The significant positive coefficient of inflation in S2 is now reduced strongly: it looses significance. The coefficient of unemployment, on the other hand, becomes again positively significant for S1. If we were to draw conclusions based on these tables, then - from an inequality viewpoint - we should not worry about a little surplus inflation in the Dutch low-inflation economy. Secondly, it is striking that the robust regressive effect of unemployment found in gross income has completely vanished, if we estimates quintile income shares in disposable income.

How do these preliminary conclusions change if we focus on smaller groups of the population? Table 4.6 gives the estimations of the original observations for the deciles and top-fractiles, while Table 4.7 reports the findings of the 'rescued' first differences. Again, for the levels concerned we find both inflation and unemployment to have a strong progressive effect. But let's turn to the estimations in 'rescued' first differences in Table 4.7. In this table we see that also in disposable income inflation eroded the top-incomes in the last forty years of the twentieth century. What we previously saw in gross income is thus also confirmed for disposable income. We see the middle incomes profiting a bit, while the standard errors for the lower deciles are too high. The conclusion that inflation works as a progressive income tax has become more than a speculation.

Table 4.5 Quintile income shares in disposable income estimation results

	Original Values – estimation of levels						'Rescued' first differences				
Dependent variable Sample period 1959-2000	S1 Bottom 20%	S2 Second 20%	S3 Third 20%	S4 Fourth 20%	S5 Upper 20%		S1 Bottom 20%	S2 Second 20%	S3 Third 20%	S4 Fourth 20%	S5 Upper 20%
Constant (standard error)	4.40*** (0.97)	10.93*** (0.50)	17.05*** (0.44)	20.93*** (0.27)	46.68*** (1.10)		0.019 (0.122)	-0.016 (0.116)	-0.072 (0.087)	-0.020 (0.059)	-0.015 (0.192)
Inflation	0.252*** (0.049)	0.183*** (0.041)	0.089*** (0.027)	-0.004 (0.010)	-0.521*** (0.091)		0.025 (0.017)	0.039* (0.020)	0.032* (0.017)	0.010 (0.007)	-0.081*** (0.039)
Unemployment	0.212*** (0.031)	0.164*** (0.028)	0.091*** (0.015)	-0.019* (0.011)	-0.448*** (0.043)		-0.017 (0.014)	-0.022 (0.016)	-0.009 (0.009)	0.002 (0.007)	0.054*** (0.022)
Time	0.011 (0.010)	0.009 (0.008)	-0.003 (0.005)	0.038*** (0.003)	-0.053*** (0.014)						
Mean dependent variable	7.20	13.09	17.61	23.38	38.72		0.038	0.036	0.017	0.032	-0.079
Number of observations	27	27	27	27	27		30	30	30	30	30
R^2	0.67	0.68	0.62	0.90	0.79		0.17	0.28	0.30	0.04	0.45

*Notes: *, **, and *** indicate significance at 10, 5 or 1% -level; estimations do not include AR(q) terms. Only Full-year incomes included. See text for analysis of robustness.*

Table 4.6 Decile and Top income shares in disposable income estimation results (original values - levels)

Dependent variable Sample period 1959-2000	D1 First 10%	D2 Second 10%	D3 Third 10%	D4 Fourth 10%	D5 Fifth 10%	D6 Sixth 10%	D7 Seventh 10%	D8 Eight 10%	D9 Ninth 10%	Top 10%	Second Vintile	Top 5%	Next 4%	Top 1%	Top 0.5%
Constant	2.28*** (0.602)	2.12*** (0.41)	4.47*** (0.35)	6.46*** (0.20)	8.05**** (0.25)	9.00*** (0.20)	9.86*** (0.11)	11.1*** (0.17)	13.8*** (0.28)	32.8*** (0.92)	10.2*** (0.22)	22.7*** (0.76)	14.0*** (0.395)	8.72*** (0.40)	5.54*** (0.278)
Inflation	0.127*** (0.031)	0.126*** (0.023)	0.111*** (0.023)	0.072*** (0.018)	0.052*** (0.016)	0.038*** (0.012)	0.013** (0.005)	-0.017** (0.008)	-0.075*** (0.024)	-0.446*** (0.070)	-0.097*** (0.024)	-0.348*** (0.050)	-0.197 (0.031)	-0.151*** (0.023)	-0.099*** (0.016)
Unemployment	0.128 (0.023)	0.084*** (0.015)	0.091*** (0.016)	0.073*** (0.013)	-0.055*** (0.009)	0.036*** (0.006)	0.008* (0.004)	-0.028*** (0.008)	-0.086*** (0.016)	-0.362 (0.032)	-0.092*** (0.011)	-0.269*** (0.024)	-0.146*** (0.014)	-0.123*** (0.013)	-0.085** (0.009)
Time	-0.014 (0.007)	0.025*** (0.005)	0.009*** (0.005)	-0.000 (0.003)	-0.005* (0.003)	0.001 (0.002)	0.012*** (0.001)	0.024*** (0.002)	0.029*** (0.004)	-0.082*** (0.011)	0.001*** (0.003)	-0.0083*** (0.009)	-0.038*** (0.005)	-0.046*** (0.005)	-0.030*** (0.003)
Mean of dependent variable	2.41	4.79	6.00	7.09	8.19	9.41	10.82	12.56	15.17	23.5	9.4	14.2	9.85	4.31	2.58
Number of observations	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
R^2	0.64	0.76	0.68	0.67	0.63	0.60	0.88	0.88	0.78	0.85	0.70	0.88	0.84	0.91	0.90

*Notes: *, **, and *** indicate significance at 10, 5 or 1% -level; estimations do not include AR(q) terms.Only Full-year incomes included. See text for analysis of robustness.*

Table 4.7 Decile and Top income shares in disposable income estimation results ('rescued' first differences)

Dependent variable Sample period 1959-2000	D1 First 10%	D2 Second 10%	D3 Third 10%	D4 Fourth 10%	D5 Fifth 10%	D6 Sixth 10%	D7 Seventh 10%	D8 Eight 10%	D9 Ninth 10%	Top 10%	Second Vintile	Top 5%	Next 4%	Top 1%	Top 0.5%
Constant	-0.046 (0.099)	0.064 (0.054)	0.011 (0.062)	-0.28 (0.056)	-0.045 (0.50)	-0.028 (0.39)	-0.016 (0.028)	-0.009 (0.038)	-0.014 (0.058)	-0.001 (0.168)	-0.021 (0.034)	0.011 (0.145)	-0.053 (0.056)	0.059 (0.096)	0.059 (0.075)
Inflation	0.014 (0.013)	0.011 (0.009)	0.019* (0.010)	0.020* (0.011)	0.020* (0.010)	0.013* (0.007)	0.006 (0.004)	0.005 (0.005)	-0.003 (0.006)	-0.078*** (0.036)	-0.010*** (0.003)	-0.067** (0.034)	-0.026*** (0.012)	-0.039* (0.022)	-0.029* (0.017)
Unemployment	-0.003 (0.012)	-0.014 (0.007)	-0.013 (0.009)	-0.008 (0.007)	-0.006 (0.005)	-0.003 (0.004)	0.000 (0.004)	0.002 (0.005)	0.009 (0.008)	0.045 (0.017)	0.012** (0.005)	-0.034*** (0.013)	0.023 (0.006)	0.011 (0.009)	0.006 (0.007)
Number of observations	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Durbin-Watson	2.64	3.28	1.27	1.21	1.17	1.26	2.04	1.69	1.54	1.17	1.49	1.19	1.44	1.39	1.53
R^2	0.03	0.11	0.28	0.27	0.32	0.23	0.06	0.03	0.07	0.47	0.31	0.43	0.84	0.27	0.22

*Notes: *, **, and *** indicate significance at 10, 5 or 1% -level; estimations do not include AR(q) terms. Only Full-year incomes included.*

4.5 DISCUSSION OF THE RESULTS

I have chosen to approach the income distribution by income shares of different groups in the population. This is of course not the only possible way. In order to better understand the way forces in the economy work simultaneously we could for example divide the share of the top 20% over the share of the lower 20% and get a resulting ratio that represents the income inequality by a scalar. When there now is a small move of both income shares in opposite directions we shall see a stronger rise in inequality, then when we measure the shares separately. These 'Kuznets' type ratios are more sensitive as I also showed in section three where I presented the evidence on the Dutch distribution of income in graphs (it has been proven by Beach, 1977). A more sensitive inequality 'barometer' would possibly lead to more significant results.

However, this alternative has also major drawbacks. A scalar index reduces the information of a whole distribution into one single number. This means a loss of information. If we then see a change, or note a significant relation, then it is difficult to find out where it comes from. One of the big advantages of the present approach is that we estimate simultaneously a set of equations that together build the Dutch income distribution. By using such a disaggregated approach we can inquire into each separate building stone in equal ways. Scalar income inequality measures *always* place different weights on different parts of the distribution. A related point is that not each scalar income inequality measure behaves the same way. The Gini-coefficient, that places relatively large weight on the middle incomes, moves for instance very slowly over time and does not respond at all at changing macro-economic conditions (see Pen and Tinbergen 1976 or Beach 1977).

The practice of estimation has not been easy. The word autocorrelation fell more than once (income shares being slow moving variables). By applying a number of different methodologies we tried to account for that. We have some robust outcomes. The first is the regressive, e.g. income inequality increasing impact of unemployment in year t on the distribution of *gross* income in year t. The second is the insignificance of unemployment for the distribution of *disposable* income. This is remarkable. Apparently the social-security systems have worked fairly well in stabilizing the macro-economic effects of high unemployment. Unfortunately, the case of inflation is less clear. Before WW II, inflation worked like a regressive income tax: inflation was associated with an asymmetric increase in the top incomes, given the rise in topincome shares. After the war, actual levels of inflation had a smaller impact on both the distribution of gross as well on the distribution of disposable income. However, there is support for a conclusion with a slightly speculative character: the impact of above-average inflation is not inequality increasing in a low inflation country as the Netherlands after World War II. A transitory increase in the rate of inflation is even likely to be associated with reduced income inequality in disposable income. From an inequality-averse viewpoint Keynesian employment policies might then be called for, even if they are monetary financed.

David and Christina Romer (1998) studied the relationship between monetary policy and the poor (the lowest 20% of population, more precisely they took the income share of the lowest quintile.) They argued that monetary policy is a powerful tool, possible of creating a short-term boom. They concluded that a short-term boom is inherently short term, and the creation of a short-term boom has averse effects for the long-run. The properties of the Phillips-curve are subject of a relating debate. Does a monetary boom create more employment, than the unemployment caused by a subsequent restriction or stabilization? The consensus on the importance of confidence, trust and expectations tells us that this is not the case (see also Barro and Gordon 1983) (otherwise we would be constantly be augmenting and restricting the quantity of money in order to stimulate employment).

This consensus contrasts with the estimation results presented in this paper, which hints upon the possibility that somewhat more inflation improves the position of the lower incomes with respect to the high incomes. There is, however, still some uneasiness with this conclusion that asks for more research and experimentation. For example, I also calculated 3- and 5-year moving averages of inflation and unemployment. These rendered inequality-increasing coefficients of the separate income shares. However, they were again not highly robust, taken the degree of autocorrelation into account. Nevertheless, they do warn us that if we speculate upon the positive – inequality decreasing – aspect of more inflation, then we should also take into account that a number of consecutive years of high inflation could be translated into more inequality, and a worse position of the lower income with the same speculative value.

Just as with the Blinder and Esaki 1978-study, this chapter gave not highly significant and robust answers and in this perspective we do not deliver important new findings. This does not mean that the present exercise is not useful. On the contrary: it could have been otherwise. In fact, the recent developments in the study of the relationship between inflation and inequality gave much reason to believe inflation would come out as highly significant, especially in view of our larger sample.

Having discussed autocorrelation extensively (as being the practical explanation of the lack of significant outcomes), the conceptual counterpart of the question 'why' brings us back to basic points in econometric analysis:

i) Imperfect and incomplete measurement – Not all economic activity is taxed, not all economic activity is included in our observations and therefore not all things we want to see is visible in the statistics.

ii) Omitted variables – The BES-model is attractive because of its simplicity, yet this simplicity is also a major drawback. Probably the model would perform better if we could substitute the trend variable by other variables representing the forces active on the distribution of income. Of course, this is not

easily done in the present analysis: theoretical arguments require specific data that often are not available over such a long time period. I have experimented with a number of other possibly relevant data, such as political or deflation dummies, but the results did not improve significantly.

In order to end this chapter, I address two final issues dealing with the approach. This chapter aimed at explaining the cyclical properties of the *size* distribution of income with special focus on the influence of inflation. First, this is not the only way to investigate the relationship between macro-economic conditions and the distribution of income. We could for instance break the size-distribution down into different groups as wage-earners, self-employed, pensioners, etc. and then assess the influence of the economic cycle. Secondly, we could decompose the right hand variable: if we have a theory of the effects of inflation that for example emphasizes the differences between demand-pull inflation and cost-push inflation, than we should go a level deeper into the explanatory variables and decompose the overall level in a sort of inflation gradient (energy prices, retail, foods etc.), or use proxies such as oil prices and apply a two-stage least squares procedure. It is very well possible that these two different approaches yield more instructive outcomes with clearer policy implications. However, this kind of decomposition-analysis demands more detailed micro data that are only available for more recent years. An overall idea on what a given rise in consumer prices does to the size distribution of income is an important prerequisite if we aim to understand the detailed relationship between price-changes and the income distribution.

5 CONCLUDING REMARKS

The main goal of this working paper was to contribute to the evidence on the distribution of income in the Netherlands and to investigate the cyclical properties with special focus on the role of inflation.

Chapter 2 introduced the income tax data and methodology. Atkinson and Salverda (2005a, 2005b) constructed so called top income shares, which measure the share of income of small top-groups in total income. I added to this evidence through the construction of quintile and decile income shares (the share in total income of 20% and 10% of population-groups) based on the same data and as far as possible, the basic data not covering the complete population. I constructed these series for gross income covering almost the complete 20th century and for disposable income from 1959 onwards.

In Chapter 3 I presented the new evidence. The main conclusion is that income inequality in the Netherlands experienced a marked decrease over the time-period 1914-1975 but remained stable ever since. This contrasts with other studies and some strong held opinions that experience income inequality as rising. Chapter 3 also discussed some underlying trends that could have provoked the observed pattern in income inequality. The most important are: deconcentration of capital income, a strong rise in educational level that reduces the skill-premium, progressive taxation and redistribution and strong held egalitarian norms vis-à-vis top incomes. Notably the effects of increased female labour participation and wage moderation demand further research.

Chapter 4 investigated the cyclical properties of the income distribution through a regression analysis. I applied the so called BES-model (after Schultz, Blinder and Esaki who originally came up with it) which regresses income shares on inflation, unemployment and a trend variable, to the constructed Dutch data. This analysis showed that unemployment had a strong regressive impact on the distribution of gross income: More unemployment was associated with smaller income shares of the lower quintiles and deciles, while the income share of notably the fourth quintile increased. However, this impact completely disappears if we regress the income shares in disposable income. This is a remarkable and new conclusion that underlines the power of redistribution. Apparently, progressive taxation and social security have prevented the lower income shares from falling in times of higher unemployment.

The effects of inflation are less clear-cut. Firstly, the empirical literature has generated an 'inflation-inequality' puzzle where most cross-country studies conclude that inflation has a significant regressive impact: it increases income inequality. Most single-country studies however concluded that the impact of inflation is insignificant or slightly progressive. Secondly, from a theoretical viewpoint as well, the effects of inflation are difficult to assess, since there are possibly many different aspects to model. This modelling is a task for further research, since it goes beyond my current capabilities.

With the BES-regression analysis, I took a naive empirical approach. A case study of the Netherlands is very interesting since firstly, the data are more detailed, more homogeneous and cover a much longer time-span than other studies (including some 25 pre-war observations). Secondly, given the (in a BES-context unprecedented) analysis of the distribution of both gross income and disposable income, we are able to distinguish possibly different impacts. A final reason that makes a case study of the Netherlands interesting is its absolute low level of average inflation. It is possible that the cross-country evidence is biased since there are a number of Latin-American countries that combine very high levels of inflation with very high inequality, while Galli and Van der Hoeven (2001) emphasize the importance of the initial rate of inflation. They solve the inflation-inequality puzzle by proposing a non-monotonic relationship, i.e. more inflation is associated with more income inequality in countries that have a high initial rate of inflation, while more inflation could be associated with reduced income inequality in countries that have a low initial rate of inflation.

The results for the Netherlands show that actual inflation is of limited importance in the determination of the overall size distribution of income. Speculation that one single year with somewhat higher inflation (possibly associated with an economic boom) reduces the income dispersion seems to be justified, notably if we consider the distribution of disposable income. On the other hand, experimentation with 3- and 5 year moving averages of inflation and unemployment warned us that a number of consecutive years of high inflation could worsen the income distribution: a short-term boom being inherently short-term.

However, we do observe an interesting and robust structural change occurring during the Second World War. Before WW II more inflation was associated with more income inequality in gross income, while after the War inflation had a less strong impact, and possibly could be associated with decreasing income inequality as explained above.

Policy implications and future research

What policy implications could we infer from this research? First it is fair to conclude from the long-run patterns, and from the differences between gross- and disposable income, that redistribution and taxation matter. The current dismantling of the welfare state could have serious consequences for the income distribution. It is clear that research on the determinants and on the present state of income inequality is important, while the policy-maker has to take income inequality into account since he appears to be able to influence it strongly.

When we then focus on the macro-economic conditions, we are tempted to conclude that employment-policies are called for, given the strong impact of unemployment on the distribution of gross income. Since this paper was strongly motivated by the 'mysterious' and to a large extent

unknown distributive effects of inflation, I permit myself to spend somewhat more time on the policy implications concerning inflation.

The idea that changes in the price-level redistribute income or wealth is not new. Duisenberg[32] once said that *'…a sufficiently stable price level also acts as a guarantee against arbitrary redistributions of income and wealth, which often threaten to destabilize whole societies…'*. The seminal paper of Blinder and Esaki (1978, p.604) was motivated by *'the frequent outcries against inflation on the grounds of its adverse effects on the distribution of income'*. These outcries are still present in contemporary newspapers, and from time to time also among policy makers. Nevertheless there is only limited empirical support of inflation having strong adverse effects on income inequality.

But Duisenberg could be right if he were to compare stable prices with high inflation. Every recent financial crisis is driven by uncertainty and almost naturally associated with high inflation (whether it has to do with the exchange rate, corporate governance, or macro-economic fundamentals does not seem to matter). With 0% inflation, there would not be much reason for a crisis, since there exists complete certainty of future prices. It is a stylised fact that high levels of inflation go together with high variances in inflation, and macro-economic instability. The incidence of especially high inflation thus brings uncertainty over future prices and could theoretically still involve large redistributions, possibly arbitrary but arguably from those possessing financial wealth to the have-nots, while on the other hand those possessing real assets could be isolated and the have-nots might become marginalized by hyperinflation.

This paper concerned a low inflation country and pointed at the possibility of a transitory increase in inflation having an equalizing effect on the distribution of income. Does this mean that inflation is a good from an inequality-adverse viewpoint and that if a compassionate policymaker would like to equalize the level of income inequality, he should try to get the central banker to press the money-button? Certainly not, in doing so discretionary, the policymaker creates macro-economic variances and uncertainty. This could result in completely different outcomes. Moreover, the stability in the level of inequality during the nineties (remember the completely flat curves in the figures of Chapter three) is possibly symptomatic for macro-economic stability that in turn is initiated by a stable level of inflation.

Apart from the stability issue, welfare macro-economic theory also engages in another debate: the optimal level of inflation. Friedman argued for an inflation of 0% since this means optimal certainty, and no absorption of resources by uncertainty. Others claim higher levels of inflation as optimal (among others Fortin (2003) or Wyplosz (2001)) referring to labour market rigidities and using Phillips-curve style arguments: more inflation reduces real wages and lowers unemployment. Unemployment has a strong impact on the distribution of gross income, thus from an inequality

viewpoint, stabilization around a higher level of inflation of say, above 2 or 3% could result in a more equal distribution of income in the Netherlands if the employment argument holds: it will at least not affect the distribution of income negatively. However, this remains a matter of fine tuning, since a too high level of inflation could have adverse effects on the distribution of income.

For future research I see a number of ways forward in order to better understand the true relationship between macro-economic conditions and income inequality. The first is to estimate the BES-model for a sample of countries, but then not on World Bank or LIS data, but on the uniformly derived series on top income shares that are to be published in the forthcoming volume Atkinson and Piketty (eds) 'Top incomes in the 20th Century – a contrast between continental European and English speaking countries". The second way forward is the use of co-integration methods, or error correction models instead of simple OLS-regressions. Finally, decomposition analyses could be fruitful. Both the left hand variables could be broken down (wage-earners, capital-income earners, entrepreneurs etc.) as well as the right hand side variables (type of inflation: energy, foods etc.) in order to come closer to the 'true' mechanics. This however does not easily facilitate long-run time series analysis, given the major demands that this type of analyses poses on data-availability.

Shiller (1996, p.21) surveyed why people dislike inflation. He concluded that there is a noticeable difference between economists and non-economists (an overwhelming majority - 77% - thinks his real income would fall if inflation rises, while only 11% of the economists say so). He wrote that it just seemed that the general public does not see the connection between inflation and the rise in income that might be associated with it, whereas economists do see this connection.

This way of thinking – economists being optimistic, non-economists being less faithful - could reflect the above-average labour-market position and income-capacity of graduated economists. In order to explain this difference in belief we have to take inequality in labour market positions in to account - with income inequality being a good proxy for 'future income capacity in inflationary times'. I just showed that the 'educated' view is indeed more in accordance with the Dutch data. Just being graduated, I felt the obligation to spread the word.

[32] In his opening speech at an International Conference organized by De Nederlandsche Bank and the CentER for Economic Research 'A Framework for Monetary Stability' on October 21, 1993

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Appendices

APPENDIX A1 – QUINTILE INCOME SHARES IN TOTAL GROSS INCOME, 1914-2000

year	S1 Bottom 20%	S2 Second 20%	S3 Third 20%	S4 Fourth 20%	S5 Upper 20%
1912	NA	NA	NA	NA	NA
1913	NA	NA	NA	NA	NA
1914	NA	NA	NA	NA	57.80
1915	NA	NA	NA	NA	62.55
1916	NA	NA	NA	NA	64.68
1917	NA	NA	NA	NA	64.69
1918	NA	NA	NA	NA	61.79
1919	NA	NA	NA	18.47	63.12
1920	NA	NA	NA	20.37	60.81
1921	NA	NA	NA	21.37	59.48
1922	NA	NA	NA	21.39	59.02
1923	NA	NA	NA	21.10	58.84
1924	NA	NA	NA	20.67	59.21
1925	NA	NA	NA	20.54	59.03
1926	NA	NA	NA	20.40	58.84
1927	NA	NA	NA	20.10	59.24
1928	NA	NA	NA	19.95	59.26
1929	NA	NA	NA	20.16	58.55
1930	NA	NA	NA	20.38	57.96
1931	NA	NA	NA	20.31	57.79
1932	NA	NA	NA	22.49	57.28
1933	NA	NA	NA	24.31	57.11
1934	NA	NA	NA	NA	56.63
1935	NA	NA	NA	NA	56.32
1936	NA	NA	NA	NA	56.37
1937	NA	NA	NA	NA	56.93
1938	NA	NA	NA	NA	56.64
1939	NA	NA	NA	NA	56.98
1940	NA	NA	NA	NA	NA
1941	NA	NA	NA	NA	NA
1942	NA	NA	NA	NA	NA
1943	NA	NA	NA	NA	NA
1944	NA	NA	NA	NA	NA
1945	NA	NA	NA	NA	NA
1946	NA	NA	12.35	21.60	56.91
1947	NA	NA	NA	NA	NA
1948	NA	NA	NA	NA	NA
1949	NA	NA	NA	NA	NA
1950	4.19	6.99	14.55	22.19	52.08
1951	NA	NA	NA	NA	NA
1952	4.22	6.61	14.86	22.09	52.22
1953	4.06	6.81	14.87	22.26	52.01
1954	NA	NA	NA	NA	NA
1955	NA	NA	NA	NA	NA
1956	NA	NA	NA	NA	NA
1957	3.99	8.74	15.93	22.31	49.03
1958	3.91	8.51	15.68	22.00	49.90
1959	4.16	8.67	15.88	22.06	49.24
1960	NA	NA	NA	NA	NA
1961	NA	NA	NA	NA	NA
1962	3.56	8.76	15.96	22.58	49.13
1963	NA	NA	NA	NA	NA
1964	3.55	8.86	15.97	22.50	49.12
1965	NA	NA	NA	NA	NA
1966	2.90	9.87	16.34	22.56	48.34
1967	3.43	9.87	16.23	22.52	47.95

1968	NA	NA	NA	NA	NA
1969	NA	NA	NA	NA	NA
1970	4.98	10.35	15.90	22.34	46.44
1971	NA	NA	NA	NA	NA
1972	NA	NA	NA	NA	NA
1973	4.84	11.13	16.93	23.30	43.79
1974	NA	NA	NA	NA	NA
1975	4.15	11.18	17.27	23.80	43.60
1976	NA	NA	NA	NA	NA
1977	2.35	10.20	17.71	25.21	44.53
1978	NA	NA	NA	NA	NA
1979	NA	NA	NA	NA	NA
1980	NA	NA	NA	NA	NA
1981	3.74	9.47	15.34	25.65	45.80
1982	NA	NA	NA	NA	NA
1983	NA	NA	NA	NA	NA
1984	NA	NA	NA	NA	NA
1985	2.03	9.34	16.56	25.48	46.59
1986	NA	NA	NA	NA	NA
1987	NA	NA	NA	NA	NA
1988	NA	NA	NA	NA	NA
1989	3.28	9.78	16.46	24.88	45.60
1990	3.11	9.87	16.53	25.03	45.46
1991	3.15	9.95	16.58	24.99	45.34
1992	3.10	10.01	16.52	25.07	45.30
1993	2.89	9.96	16.57	25.18	45.42
1994	2.91	9.86	16.30	25.07	45.86
1995	3.11	9.82	16.19	24.93	45.95
1996	3.07	10.06	16.34	24.88	45.65
1997	3.25	10.21	16.28	24.71	45.54
1998	3.12	10.44	16.39	24.69	45.37
1999	3.29	10.33	16.40	24.63	45.35
2000	3.64	10.47	16.45	24.46	44.98

Source:Author's calculations on published income statistics and IPO micro data

APPENDIX A2 – DECILE INCOME SHARES IN TOTAL GROSS INCOME, 1914 – 2000

year	D3 Third 10%	D4 Fourth 10%	D5 Fifth 10%	D6 Sixth 10%	D7 Seventh 10%	D8 Eight 10%	D9 Ninth 10%	D10 Top 10%
1912	NA	NA	NA	NA	NA	NA	NA	NA
1913	NA	NA	NA	NA	NA	NA	NA	NA
1914	NA	NA	NA	NA	NA	NA	11.93	45.87
1915	NA	NA	NA	NA	NA	NA	11.34	51.21
1916	NA	NA	NA	NA	NA	NA	11.37	53.31
1917	NA	NA	NA	NA	NA	8.38	12.22	52.47
1918	NA	NA	NA	NA	NA	9.26	13.29	48.50
1919	NA	NA	NA	NA	8.10	10.37	13.64	49.48
1920	NA	NA	NA	6.69	9.07	11.30	14.58	46.23
1921	NA	NA	NA	6.89	9.41	11.96	15.45	44.03
1922	NA	NA	NA	6.82	9.27	12.13	15.83	43.19
1923	NA	NA	NA	6.86	9.11	11.99	15.76	43.08
1924	NA	NA	NA	6.81	8.98	11.69	15.37	43.84
1925	NA	NA	NA	6.84	8.96	11.58	15.16	43.87
1926	NA	NA	NA	6.85	8.90	11.50	14.97	43.87
1927	NA	NA	NA	6.78	8.77	11.34	14.91	44.33
1928	NA	NA	NA	6.73	8.75	11.20	14.68	44.58
1929	NA	NA	NA	6.82	8.86	11.29	14.70	43.85
1930	NA	NA	NA	6.91	8.93	11.45	14.94	43.02
1931	NA	NA	NA	7.31	8.65	11.65	15.61	42.18
1932	NA	NA	NA	NA	NA	11.49	15.95	41.33
1933	NA	NA	NA	NA	NA	11.39	15.92	41.19
1934	NA	NA	NA	NA	NA	11.26	15.81	40.82
1935	NA	NA	NA	NA	NA	10.97	15.63	40.69
1936	NA	NA	NA	NA	NA	10.83	15.27	41.10
1937	NA	NA	NA	NA	NA	10.79	15.01	41.92
1938	NA	NA	NA	NA	NA	10.86	15.04	41.60
1939	NA	NA	NA	NA	NA	11.02	14.96	42.02
1940	NA	NA	NA	NA	NA	NA	NA	NA
1941	NA	NA	NA	NA	NA	NA	NA	45.07
1942	NA	NA	NA	NA	NA	NA	NA	NA
1943	NA	NA	NA	NA	NA	NA	NA	NA
1944	NA	NA	NA	NA	NA	NA	NA	NA
1945	NA	NA	NA	NA	NA	NA	NA	NA
1946	NA	2.87	4.93	7.41	9.67	11.93	16.10	40.82
1947	NA	NA	NA	NA	NA	NA	NA	NA
1948	NA	NA	NA	NA	NA	NA	NA	NA
1949	NA	NA	NA	NA	NA	NA	NA	NA
1950	2.49	4.50	6.09	8.46	10.12	12.08	15.39	36.74
1951	NA	NA	NA	NA	NA	NA	NA	NA
1952	2.42	4.19	6.54	8.32	10.21	11.88	15.30	36.95
1953	2.59	4.22	6.56	8.31	10.20	12.05	15.28	36.76
1954	NA	NA	NA	NA	NA	NA	NA	NA
1955	NA	NA	NA	NA	NA	NA	NA	NA
1956	NA	NA	NA	NA	NA	NA	NA	NA
1957	3.56	5.19	7.19	8.74	10.30	12.01	15.07	33.98
1958	3.45	5.06	7.00	8.68	10.14	11.86	15.02	34.88
1959	3.49	5.18	7.10	8.78	10.12	11.94	15.05	34.20
1960	NA	NA	NA	NA	NA	NA	NA	NA
1961	NA	NA	NA	NA	NA	NA	NA	NA
1962	3.56	5.20	7.17	8.79	10.41	12.17	15.03	34.12
1963	NA	NA	NA	NA	NA	NA	NA	NA
1964	3.59	5.27	7.20	8.77	10.26	12.24	15.35	33.25
1965	NA	NA	NA	NA	NA	NA	NA	NA
1966	4.18	5.69	7.41	8.92	10.40	12.16	15.29	33.05
1967	4.24	5.63	7.39	8.84	10.39	12.13	15.30	32.64

1968	NA	NA	NA	NA	NA	NA	NA	NA
1969	NA	NA	NA	NA	NA	NA	NA	NA
1970	4.55	5.80	7.24	8.66	10.22	12.12	15.11	31.34
1971	NA	NA	NA	NA	NA	NA	NA	NA
1972	NA	NA	NA	NA	NA	NA	NA	NA
1973	4.87	6.26	7.75	9.18	10.69	12.62	15.41	28.41
1974	NA	NA	NA	NA	NA	NA	NA	NA
1975	4.77	6.41	7.92	9.35	10.89	12.91	15.91	27.70
1976	NA	NA	NA	NA	NA	NA	NA	NA
1977	4.23	5.98	7.88	9.82	11.58	13.62	16.72	27.81
1978	NA	NA	NA	NA	NA	NA	NA	NA
1979	NA	NA	NA	NA	NA	NA	NA	NA
1980	NA	NA	NA	NA	NA	NA	NA	NA
1981	3.72	5.75	7.67	7.67	11.70	13.96	17.33	28.46
1982	NA	NA	NA	NA	NA	NA	NA	NA
1983	NA	NA	NA	NA	NA	NA	NA	NA
1984	NA	NA	NA	NA	NA	NA	NA	NA
1985	3.89	5.45	7.26	9.30	11.53	13.95	17.49	29.10
1986	NA	NA	NA	NA	NA	NA	NA	NA
1987	NA	NA	NA	NA	NA	NA	NA	NA
1988	NA	NA	NA	NA	NA	NA	NA	NA
1989	4.18	5.60	7.27	9.19	11.26	13.62	17.12	28.48
1990	4.24	5.63	7.30	9.23	11.30	13.73	17.26	28.20
1991	4.28	5.66	7.35	9.23	11.28	13.71	17.23	28.11
1992	4.31	5.70	7.31	9.21	11.29	13.78	17.32	27.99
1993	4.28	5.68	7.32	9.25	11.33	13.84	17.46	27.96
1994	4.27	5.59	7.17	9.12	11.26	13.81	17.58	28.28
1995	4.26	5.56	7.14	9.05	11.18	13.75	17.50	28.45
1996	4.38	5.68	7.23	9.11	11.19	13.69	17.41	28.24
1997	4.46	5.75	7.23	9.05	11.08	13.63	17.34	28.21
1998	4.62	5.82	7.31	9.08	11.07	13.62	17.34	28.03
1999	4.50	5.83	7.33	9.07	11.04	13.59	17.26	28.09
2000	4.56	5.91	7.38	9.07	10.99	13.47	17.01	27.97

Source:Author's calculations on published income statistics and IPO micro data

APPENDIX A3 – QUINTILE INCOME SHARES IN TOTAL DISPOSABLE INCOME, 1959-2000

year	S1DISP Lowest 20%	S2DISP Second 20%	S3DISP Third 20%	S4DISP Fourth 20%	S5DISP Fifth 20%
1959	5.05	11.91	17.45	22.66	42.93
1960	NA	NA	NA	NA	NA
1961	NA	NA	NA	NA	NA
1962	5.14	11.82	17.34	22.88	42.82
1963	NA	NA	NA	NA	NA
1964	5.49	11.83	17.28	23.00	42.40
1965	NA	NA	NA	NA	NA
1966	NA	NA	NA	NA	NA
1967	6.78	12.37	16.87	22.57	41.41
1968	NA	NA	NA	NA	NA
1969	NA	NA	NA	NA	NA
1970	7.34	12.51	17.00	22.74	40.40
1971	NA	NA	NA	NA	NA
1972	7.83	13.21	17.65	22.98	38.33
1973	NA	NA	NA	NA	NA
1974	NA	NA	NA	NA	NA
1975	7.89	13.49	17.91	23.13	37.58
1976	NA	NA	NA	NA	NA
1977	7.92	13.55	17.81	23.14	37.57
1978	NA	NA	NA	NA	NA
1979	8.22	13.99	18.10	23.06	36.63
1980	8.32	14.12	18.17	23.16	36.22
1981	8.19	14.15	18.21	23.17	36.27
1982	8.10	14.26	18.35	23.38	35.91
1983	8.34	14.32	18.23	23.13	35.99
1984	8.42	14.06	18.03	23.12	36.37
1985	8.11	13.29	17.78	23.40	37.41
1986	NA	NA	NA	NA	NA
1987	NA	NA	NA	NA	NA
1988	NA	NA	NA	NA	NA
1989	7.49	13.12	17.50	23.51	38.38
1990	7.15	12.90	17.41	23.56	38.98
1991	7.13	12.81	17.39	23.67	38.99
1992	7.06	12.97	17.54	23.72	38.71
1993	6.88	12.95	17.58	23.88	38.70
1994	7.07	12.80	17.42	23.86	38.85
1995	7.20	12.75	17.33	23.79	38.92
1996	6.78	12.73	17.37	23.93	39.18
1997	6.82	12.82	17.41	23.93	39.02
1998	6.61	13.00	17.49	23.97	38.94
1999	6.36	12.95	17.45	24.04	39.19
2000	6.67	12.86	17.30	23.78	39.38

Source:Author's calculations on published income statistics and IPO micro data

APPENDIX A4 – DECILE INCOME SHARES IN TOTAL DISPOSABLE INCOME, 1959 - 2000

Year	D1DISP Lowest 10%	D2DISP Second 10%	D3DISP Third 10%	D4DISP Fourth 10%	D5DISP Fifth 10%	D6DISP Sixth 10%	D7DISP Seventh 10%	D8DISP Eight 10%	D9DISP Ninth 10%	TOP10DISP Top 10%
1959	1.61	3.44	5.20	6.71	8.16	9.29	10.49	12.17	15.09	27.85
1960	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1961	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1962	1.64	3.50	5.09	6.73	8.06	9.29	10.61	12.26	14.97	27.85
1963	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1964	1.84	3.65	5.15	6.68	8.04	9.24	10.58	12.42	15.24	27.16
1965	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1966	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1967	2.47	4.31	5.63	6.74	7.86	9.01	10.43	12.14	14.96	26.45
1968	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1969	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1970	2.79	4.55	5.76	6.75	7.82	9.18	10.59	12.15	14.85	25.56
1971	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1972	3.03	4.80	6.07	7.14	8.26	9.39	10.66	12.32	14.78	23.55
1973	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1974	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1975	2.92	4.97	6.24	7.25	8.37	9.54	10.77	12.36	14.86	22.72
1976	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1977	2.93	4.99	6.28	7.27	8.34	9.47	10.76	12.39	14.91	22.66
1978	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1979	3.00	5.22	6.52	7.47	8.50	9.60	10.78	12.28	14.57	22.05
1980	2.97	5.35	6.60	7.52	8.54	9.64	10.83	12.34	14.59	21.63
1981	2.90	5.29	6.60	7.55	8.56	9.65	10.84	12.33	14.62	21.65
1982	2.80	5.30	6.64	7.62	8.61	9.74	10.96	12.41	14.58	21.33
1983	2.95	5.38	6.68	7.64	8.57	9.65	10.84	12.30	14.54	21.45
1984	3.15	5.27	6.53	7.52	8.49	9.54	10.77	12.35	14.56	21.81
1985	3.10	5.01	6.12	7.18	8.27	9.51	10.87	12.52	14.99	22.43
1986	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1987	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1988	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1989	2.67	4.82	6.04	7.08	8.13	9.37	10.85	12.66	15.37	23.01
1990	2.43	4.72	5.92	6.98	8.07	9.34	10.86	12.70	15.44	23.54
1991	1.98	5.15	5.88	6.93	8.05	9.35	10.91	12.76	15.52	23.47
1992	2.29	4.78	5.96	7.01	8.12	9.42	10.93	12.79	15.52	23.20

1993	1.85	5.03	5.95	7.00	8.14	9.44	11.00	12.88	15.64	23.06
1994	2.34	4.73	5.88	6.92	8.05	9.37	10.95	12.91	15.69	23.16
1995	2.48	4.72	5.86	6.89	8.01	9.32	10.91	12.88	15.67	23.25
1996	1.99	4.79	5.83	6.90	8.02	9.36	10.97	12.96	15.80	23.38
1997	1.93	4.89	5.88	6.94	8.05	9.37	10.98	12.95	15.72	23.30
1998	1.66	4.95	5.99	7.01	8.08	9.40	11.00	12.97	15.78	23.16
1999	1.52	4.84	5.96	7.00	8.06	9.39	11.02	13.03	15.85	23.34
2000	1.73	4.94	5.92	6.94	7.99	9.32	10.90	12.88	15.68	23.71

Source:Author's calculations on published income statistics and IPO micro data

1916	*all incomes in DFL (current prices)*			**Appendix B1**													***Final estimation***
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)		(p)	(q)	(r)
	lower limit income class	number of taxpayers	total income	mean of income class	cumulative population share	cumulative income share	labda	1-labda	population at lower limit	population at upper limit	income at lower limit	income at upper limit	cumulative population share on upper limit	cumulative income share on upper limit		linear interpolation incomeshare Top 20%, 10%,5% en 1%	Upper bound	average of lower and upper bound
1	650	135.827	96.500.403	710	28,74%	71,83%	0,60	0,40	81.075	54.752	52.698.520	43.801.883	0,2608	0,70				
2	**800**	**214.602**	**186.489.885**	**869**	**24,28%**	**68,47%**	0,65	0,35	140.561	74.041	112.448.460	74.041.425	0,1967	0,65				
3	**1000**	**138.266**	**145.621.702**	**1.053**	**17,24%**	**61,98%**	0,73	0,27	101.487	36.779	101.487.490	44.134.212	0,1391	0,58	Top 20%	64,52%	64,84%	64,68%
4	1200	83.144	104.355.198	1.255	12,71%	56,92%	0,72	0,28	60.232	22.912	72.278.412	32.076.786	0,1073	0,54				
5	1400	57.262	84.273.696	1.472	9,98%	53,29%	0,64	0,36	36.728	20.534	51.418.528	32.855.168	0,0877	0,51	Top 10%	53,31%	53,32%	53,32%
6	1600	33.054	54.880.981	1.660	8,10%	50,35%	0,70	0,30	23.081	9.973	36.929.752	17.951.229	0,0734	0,49				
7	1800	25.497	47.273.435	1.854	7,02%	48,45%	0,73	0,27	18.603	6.894	33.485.085	13.788.350	0,0641	0,47				
8	2000	48.850	105.578.090	2.161	6,18%	46,80%	0,68	0,32	33.094	15.756	66.187.640	39.390.450	0,0509	0,44				
9	2500	28.339	75.375.502	2.660	4,58%	43,13%	0,68	0,32	19.283	9.056	48.207.490	27.168.012	0,0394	0,41	Top 5%	44,10%	44,25%	44,17%
10	3000	21.552	67.833.801	3.147	3,65%	40,51%	0,71	0,29	15.196	6.356	45.589.194	22.244.607	0,0315	0,39				
11	3500	13.370	48.952.276	3.661	2,94%	38,15%	0,68	0,32	9.055	4.315	31.694.068	17.258.208	0,0264	0,37				
12	4000	11.752	48.806.128	4.153	2,50%	36,44%	0,69	0,31	8.156	3.596	32.622.976	16.183.152	0,0223	0,35				
13	4500	7.539	35.243.859	4.675	2,12%	34,75%	0,65	0,35	4.902	2.637	22.060.269	13.183.590	0,0196	0,34				
14	5000	12.144	65.130.700	5.363	1,87%	33,52%	0,64	0,36	7.733	4.411	38.666.500	26.464.200	0,0161	0,32				
15	6000	8.652	55.094.168	6.368	1,47%	31,25%	0,63	0,37	5.470	3.182	32.818.992	22.275.176	0,0129	0,30				
16	7000	5.909	43.721.797	7.399	1,19%	29,34%	0,60	0,40	3.550	2.359	24.851.421	18.870.376	0,0107	0,28				
17	8000	4.491	37.667.471	8.387	0,99%	27,82%	0,61	0,39	2.752	1.739	22.012.232	15.655.239	0,0090	0,27	Top 1%	27,88%	27,88%	27,88%
18	9000	3.142	29.571.044	9.412	0,85%	26,51%	0,59	0,41	1.849	1.293	16.640.604	12.930.440	0,0078	0,26				
19	10000	13.548	182.928.474	13.502	0,74%	25,48%	0,65	0,35	8.803	4.745	88.031.526	94.896.948	0,0045	0,22				
20	20000	3.651	87.302.554	23.912	0,30%	19,12%	0,61	0,39	2.223	1.428	44.454.892	42.847.662	0,0022	0,18				
21	30000	1.676	57.617.553	34.378	0,18%	16,08%	0,56	0,44	942	734	28.267.341	29.350.212	0,0015	0,15				
22	40000	900	40.021.094	44.468	0,12%	14,07%	0,55	0,45	498	402	19.915.624	20.105.470	0,0011	0,13				
23	50000	621	33.861.056	54.527	0,09%	12,68%	0,55	0,45	340	281	16.994.720	16.866.336	0,0008	0,12				
24	60000	448	29.131.558	65.026	0,07%	11,50%	0,50	0,50	223	225	13.370.652	15.760.906	0,0007	0,11				
25	70000	292	21.750.375	74.488	0,06%	10,49%	0,55	0,45	161	131	11.267.375	10.483.000	0,0005	0,10				
26	80000	212	17.958.752	84.711	0,05%	9,73%	0,53	0,47	112	100	8.969.984	8.988.768	0,0005	0,09				
27	90000	159	15.031.202	94.536	0,04%	9,11%	0,55	0,45	87	72	7.819.182	7.212.020	0,0004	0,09				
28	100000	1.114	246.855.705	221.594	0,04%	8,59%	2,22	-1,22										
total		876.013	2.064.828.459															
external control totals		3.048.329	2.874.800.000	943														
coverage		*28,7%*	*71,8%*															

APPENDIX B2 - SPSS SYNTAX FOR DERIVING TAX- UNIT INCOME SHARES ON IPO MICRO DATA (EXAMPLE 1999)

```
set mxmemory 200000.
set workspace 200000.
show mxmemory.

GET FILE='G:\Aia1\Data\Ipo\siv2\ext99.sav'.

Select if (lft>15).
execute.

compute primink = ybln + ydyn + ywuo + yfrl + yren + ydiv + yong + yovi + yplu - ppel + yspl.

compute somy = ybln + ydyn + ywuo + yfrl + yren + ydiv + yong + yovi + yplu  + yzwu + yaou + yabi + yaww + ywac +  yasu + ystb + yspl + ykb_ + yhrs + ypew + ygbb + ygbo  + yaow + ytsk.

compute inkprem = ybln + ydyn + ywuo + yfrl + yren + ydiv + yong + yovi + yplu  + yzwu + yaou + yabi + yaww + ywac +  yasu + ystb + yspl + ykb_ + yhrs + ypew + ygbb + ygbo  + yaow + ytsk
- ppel - pwvg - pzfg - pipb - pwvw - apvv.

compute capink = yren + ydiv + ywuo + yong + yovi.
execute.

weight by faktor.

WEIGHT
  OFF.

if (poshh=3) primink2 = primink .
if (poshh=3) somy2= somy .
if (poshh=3) inkprem2 = inkprem.
if (poshh=3) capink2 = capink.
execute.

if (ppos_etv=2) primink3 = primink .
if (ppos_etv=2) somy3= somy .
if (ppos_etv=2) inkprem3 = inkprem.
if (ppos_etv=2) capink3 = capink.
execute.

if (poshh=3) ybln2 = ybln .
if (ppos_etv=2) ybln3 = ybln .

if (poshh>=4) aggr_id=1.
if (poshh<=3) aggr_id=0.
execute.

AGGREGATE
/OUTFILE=*
```

```
/BREAK= hhnummer aggr_id
/bestin_1 = SUM(bestink)
/faktor_1 = MEAN(faktor)
/ybln_1 = sum (ybln)
/ydyn_1 = sum (ydyn)
/ywuo_1 = sum (ywuo)
/yfrl_1 = sum (yfrl)
/yren_1 = sum (yren)
/ydiv_1 = sum (ydiv)
/yong_1 = sum (yong)
/yovi_1 = sum (yovi)
/yplu_1 = sum (yplu)
/yzwu_1 = sum (yzwu)
/yaou_1 = sum (yaou)
/yabi_1 = sum (yabi)
/yaww_1 = sum (yaww)
/ywac_1 = sum (ywac)
/yasu_1 = sum (yasu)
/ystb_1 = sum (ystb)
/yspl_1 = sum (yspl)
/ykb__1 = sum (ykb_)
/yhrs_1 = sum (yhrs)
/ypew_1 = sum (ypew)
/ygbb_1 = sum (ygbb)
/ygbo_1 = sum (ygbo)
/yaow_1 = sum (yaow)
/ytsk_1 = sum (ytsk)
/alib_1 = sum (alib)
/apvv_1 = sum (apvv)
/avb_1 = sum (avb_)
/primin_1 = sum (primink)
/primin_2 = sum(primink2)
/primin_3 = sum (primink3)
/somy_1 = sum (somy)
/somy_2 = sum (somy2)
/inkprm_1 = sum (inkprem)
/inkprm_2 = sum (inkprem2)
/primi_3 = sum (primink3)
/somy_3 = sum (somy3)
/inkprm_3 = sum (inkprem3)
/ybln_2 = sum(ybln2)
/ybln_3 = sum (ybln3)
/capink_2 = sum (capink2)
/capink_3 = sum (capink3)
/capink_1 = sum (capink).
execute.

weight by faktor_1.

FREQUENCIES
VARIABLES= somy_1 bestin_1 ybln_1  primin_1 inkprm_1 / format=notable
 /NTILES= 10
```

```
 /PERCENTILES= 89.926161 94.963080 98.992616 99.496308 99.899262 99.949631
/statistics = sum mean
/ORDER=  ANALYSIS .

if (somy_1 < 11784) D10=1.
if (somy_1 >= 11784) AND (somy_1 < 25282) d20=1.
if (somy_1 >= 25282) AND (somy_1 < 33125) d30=1.
if (somy_1 >= 33125) AND (somy_1 < 41855) d40=1.
if (somy_1 >= 41855) AND (somy_1 < 52342) d50=1.
if (somy_1 >= 52342) AND (somy_1 < 64011) d60=1.
if (somy_1 >= 64011) AND (somy_1 < 77851) d70=1.
If (somy_1 >= 77851) AND (somy_1 < 96676) d80=1.
if (somy_1 >= 96676) AND (somy_1 < 126148) d90=1.
execute.

if (somy_1 >= 125856) d100=1.
if (somy_1 >= 125856) AND (somy_1 <156798) p9095=1.
if (somY_1 >= 156798 ) d95=1.
if (somy_1 >= 156798 ) AND (somy_1 < 244366) p9599=1.
if (somy_1 >= 244366) d99=1.
if (somy_1 >=296934) d995=1.
if (somy_1 >= 453923) d999=1.
if (somy_1 >= 567646) d9995=1.
execute.
```

These values are the decile limits DFL, resulting from the previous command.

```
DESCRIPTIVES
  VARIABLES= bestin_1 primin_1 primin_2 primin_3 somy_1 somy_2  inkprm_1 inkprm_2 primi_3 somy_3 inkprm_3 ybln_2 ybln_3
capink_2 capink_3  capink_1 ybln_1 ydyn_1 ywuo_1 yfrl_1 yren_1 ydiv_1 yong_1 yovi_1  yplu_1 yzwu_1 yaou_1 yabi_1 yaww_1
ywac_1 yasu_1 ystb_1 yspl_1 ykb__1 yhrs_1
  ypew_1 ygbb_1 ygbo_1 yaow_1 ytsk_1 alib_1 apvv_1 avb_1
 /STATISTICS= SUM MEAN STDDEV RANGE MIN MAX.
execute.

temp.
select if (d X=1) .
DESCRIPTIVES
  VARIABLES= bestin_1 primin_1 primin_2 primin_3 somy_1 somy_2  inkprm_1 inkprm_2 primi_3 somy_3 inkprm_3 ybln_2 ybln_3
capink_2 capink_3  capink_1 ybln_1 ydyn_1 ywuo_1 yfrl_1 yren_1 ydiv_1 yong_1 yovi_1 yplu_1 yzwu_1 yaou_1 yabi_1 yaww_1
ywac_1 yasu_1 ystb_1 yspl_1 ykb__1 yhrs_1
  ypew_1 ygbb_1 ygbo_1 yaow_1 ytsk_1 alib_1 apvv_1 avb_1
 /STATISTICS= SUM MEAN STDDEV RANGE MIN MAX.
execute.
```

*Where **X** indicates the decile.*

APPENDIX B3 - SPSS SYNTAX FOR CALCULATION GINI-COEFFICIENT

```
Select if (lft>15).
execute.

weight by faktor.

SORT CASES By bestink (A).
execute.

DESCRIPTIVES VARIABLES = bestink
/STATISTICS = SUM MEAN.

COMPUTE pbestin = faktor* bestink/ [total bestink] * 100.
execute.

RANK VARIABLES = bestink (A)
/RFRACTION into pcpers
/PRINT=YES
/TIES=HIGH.

Compute pcpersn = pcpers *100.
execute.

CREATE
/cpbestin=CSUM(pbestin).
execute.

COMPUTE d1 = ($casenum = 1).
COMPUTE d2 = ($casenum = 1).
execute.

DO IF ($casenum = 1).
+ COMPUTE larea = 0.
ELSE.
+ COMPUTE larea = LAG (larea) + (pcpersn - LAG(pcpersn))*(cpbestin + LAG(cpbestin))/2.
END IF.
IF (pcpers >= 100) gini = (5000 - larea)/5000.
execute.

REPORT
/VARIABLES gini (VALUES)
/BREAK (TOTAL) " (SKIP(1))
/SUMMARY MAX (gini) SKIP(1) ".
execute.
```

APPENDIX C – DERIVING DATA ON THE MACRO-ECONOMY

The yearly inflation is calculated from the Consumer Price Index for low-income families (since this is the only aggregate consumer price index with sufficient detail available for the complete time span 1900-2000). For the overlapping years, it is fairly consistent with the consumer price index for all households that starts in 1968.

The unemployment is calculated as registered unemployed divided by the labour force. Pre-war data was not easily available, and for the period 1914-1921, I have applied the same method as Schultz (1968). In short, we should know that pre-war data on unemployment come from two sources: the trade unions who recorded the unemployment of their members and the municipal/governmental labour-market intermediation institutions ('arbeidsbemiddeling') who registered unemployed nation wide (see Rodenburg 2004). These institutions were installed provisionally in 1914, but officially in 1917 by the Unemployment Act ('werkloosheidsbesluit'). They penetrated the Dutch society smoothly in the following years (CBS 1941, pp. 241-244). By now, these institutions form the "*Centrum voor Werk en Inkomen"* and "*Arbeidsbureaus*" and they are the only source for data on unemployment. For the period until 1930 however, the trade-union statistics were a better cyclical indicator (Rodenburg 2004). In order to calculate the unemployment rate for 1914-1920 (and arrive at a basis roughly comparable to the later years) I applied the same procedure as Schultz (1968), i.e. I divided the trade-union's '*Index voor werkloosheidsdagen'* that the CBS renamed '*Index der werkloosheid'* by a constant factor of 2.5. This number is an extrapolation of the factor that is found for the overlapping years 1930-1939 for which we have both accurate numbers of total unemployed registered by the labour market institutions as well as the trade-union's *werkloosheidsindex.* Hartog and Veenbergen (1978) just took the same data as Schultz. There are very minor differences between both series.

For the period 1921-1951 I used the numbers of registered unemployed and labour force reported in the CBS publication '*1899 – 1979 Tachtig Jaren Statistiek in Tijdreeksen*'. For the period 1952-2000 I calculated annual averages of registered unemployed from monthly CBS (Statline)-data.

For few years the CBS statistics gave no information about the total size of the labour-force. However, it turned out to be easy to fill in control totals for the labour-force for those missing years. Atkinson and Salverda (2005) have calculated a number of total tax-units from population statistics (made especially available on request from the CBS-archive). The total labour force was constantly between 79% and 81% of this number, taking 4/5 of Atkinson and Salverda's tax-unit total seems to be justified. See Appendix Table C for the resulting time-series. Appendix Figure C shows the annual inflation, the unemployment rate and the percentage changes in real GDP per capita over the twentieth century. Such a figure always bears a lot of history. We can clearly distinguish the roaring twenties, the high unemployment during the recession of the thirties, the post-war boom

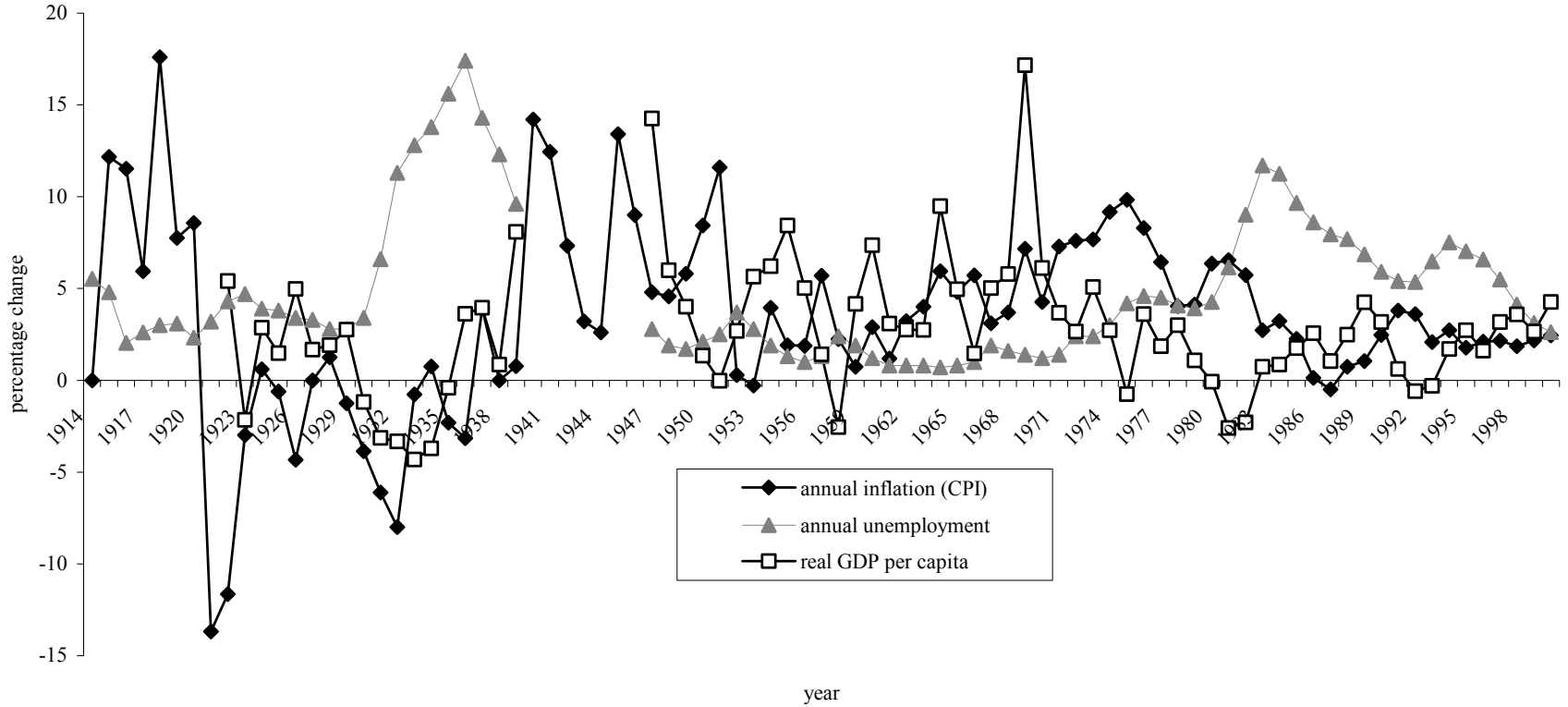
and other events such as the oil shocks in 1973 and 1978 – leading to cost-push inflations. We also see the effects of the recession in the 1980s and the economical boom in the late nineties.

APPENDIX TABLE C – INFLATION AND UNEMPLOYMENT IN THE NETHERLANDS, 1912-2000

year	Inflation % change in CPI	Unemployment % of labour force
1912	0.88	1.60
1913	1.74	2.00
1914	0.00	5.52
1915	12.16	4.80
1916	11.52	2.04
1917	5.94	2.60
1918	17.59	3.00
1919	7.76	3.08
1920	8.58	2.32
1921	-13.68	3.20
1922	-11.65	4.30
1923	-2.99	4.70
1924	0.60	3.90
1925	-0.60	3.80
1926	-4.34	3.40
1927	0.00	3.30
1928	1.26	2.80
1929	-1.26	2.80
1930	-3.87	3.40
1931	-6.10	6.60
1932	-8.00	11.30
1933	-0.76	12.80
1934	0.76	13.80
1935	-2.30	15.60
1936	-3.15	17.40
1937	3.92	14.30
1938	0.00	12.30
1939	0.77	9.60
1940	14.21	NA
1941	12.44	NA
1942	7.33	NA
1943	3.21	NA
1944	2.60	NA
1945	13.42	NA
1946	9.00	NA
1947	4.80	2.80
1948	4.58	1.90
1949	5.80	1.70
1950	8.44	2.10
1951	11.60	2.50
1952	0.29	3.70
1953	-0.29	2.80
1954	3.96	1.90
1955	1.92	1.30
1956	1.88	1.00
1957	5.70	1.30
1958	2.24	2.40
1959	0.74	1.90
1960	2.89	1.20
1961	1.18	0.80
1962	3.23	0.80
1963	4.01	0.80
1964	5.93	0.70
1965	4.82	0.80
1966	5.72	1.00
1967	3.10	1.90
1968	3.70	1.60
1969	7.18	1.40
1970	4.26	1.20
1971	7.29	1.40
1972	7.60	2.40
1973	7.68	2.40
1974	9.17	3.00
1975	9.84	4.20
1976	8.30	4.60
1977	6.44	4.50
1978	4.05	4.07
1979	4.13	3.91
1980	6.35	4.27
1981	6.54	6.15
1982	5.74	9.03
1983	2.72	11.70
1984	3.22	11.25
1985	2.25	9.66
1986	0.12	8.60
1987	-0.50	7.95
1988	0.74	7.69
1989	1.04	6.86
1990	2.47	5.90
1991	3.80	5.40
1992	3.60	5.34
1993	2.08	6.47
1994	2.73	7.52
1995	1.78	7.03
1996	2.10	6.58
1997	2.16	5.49
1998	1.87	4.13
1999	2.17	3.12
2000	2.45	2.62

Source: Author's calculations on macro-economic data

Figure 2.4
Output, Inflation and Unemployment in the Netherlands, 1914-2000



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