Understanding Inequality Trends: Microsimulation Decomposition for Italy

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Abstract

This paper suggests overcoming some limitations of traditional inequality decomposition methods by developing a combination of Burtless (1999) and DiNardo et al. (1996), two different microsimulation methods for decomposing inequality. By using this combination it is possible to take into consideration the dispersion of income sources as well as the socio-demographic evolution of the population under study, in a single framework and across many years. This methodology maximizes clarity of results and allows one to easily perform tests on results. An application to Italian household inequality is provided to analyze marginal and joint effects of demographic trends and changed dispersion of different income factors between 1977 and 2002.

Keywords*:* Microsimulation, counterfactual analysis, household inequality trend, inequality decomposition.

JEL codes*:* D31, D63, C51

Contents

1 Introduction

According to recent comparative studies on OECD countries, the highest income inequality is found in the US, followed by the UK and Italy, the latter two presenting similar figures using standard inequality measures (Atkinson et al., 1995; Smeeding, 2000). However, while the US and the UK present a roughly increasing trend of income inequality since the 1970s, Italian household income distribution exhibits substantial fluctuations but no clear trend (Brandolini and D'Alessio, 2001; D'Alessio and Signorini, 2000). Brandolini and D'Alessio (2001) find that demographic characteristics are able to explain only a limited amount of overall Italian household inequality but do not investigate the issue further. They reach this conclusion by using decomposition of income inequality by population groups (Bourguignon, 1979; Cowell, 1980; Shorrocks, 1980, 1984). This decomposition begins with dividing the population into discrete groups and then computes and combines inequality indices within each group and between the means of different groups. Although a powerful descriptive tool, it presents various limitations, including the fact that the decomposition can be carried out only over discrete groups, that there is no optimal rule for partitioning non-discrete variables and decomposition depends on the groups considered, that handling interactions among groups or multiple factors can be overwhelming, that decomposition by population groups does not depict a causal relationship between variables used to explain inequality and inequality itself as no control for endogeneity is available.

An alternative way of decomposing inequality is by income sources, which aims at assessing the importance of the dispersion of different sources of incomes on overall income inequality. Shorrocks (1982) proposed a decomposition rule which is invariant to inequality indices and that put a stop to the discussion on which is the best decomposition by income components (see for instance, Fei et al., 1978; Pyatt et al., 1980). However, the invariance to inequality index, besides being one of the strong points of this decomposition rule can also be seen as a drawback when different inequality indices provide different answers regarding direction and amount of the overall change.

A general limitation of traditional decompositions is that decompositions by population subgroup and by factor source address different problems and cannot be combined into a single framework. Recently some authors have attempted to put together the two techniques into a unifying framework. Shorrocks (1999) suggests starting from the definition of an inequality index as some function of different factor contributions. He then suggests computing the marginal effect of each of these factors as they are eliminated in succession, and then averaging these marginal effects over all possible elimination sequences. Formally the resulting formula is identical to the Shapley value in cooperative game theory, henceforth it has been referred to as the Shapley decomposition (see also Chantreuil and Trannoy, 1999). However, application of this methodology (which potentially allows one to study levels as well as trends of inequality) has been quite disappointing. The main reason for its unsatisfactory performance lies in the high sensitivity of results to the level of disaggregation of factors that account for inequality. To overcome some of its limitations Sastre and Trannoy (2000) suggested developing a tree of causality and to use Shapley value only when no clear priority of causes can be declared. However, this solution makes the method more cumbersome and less convincing.

Other authors suggested using regression techniques to decompose inequality studying the data generating process (DGP) that lead to a particular distribution of income. Fields (2002); Morduch and Sicular (2002) specify a single equation model where (equivalent) household income is a linear function of individual, household characteristics and a residual. However, this model oversimplifies the complexity of the household income DGP and this is reflected in the high variability of results using different inequality indices. Bourguignon et al. (2001) specify a multiple equation model that includes a standard wage equation for each of the member in the household, and labor participation decisions within a household. Their approach however, involves a large modelling effort which becomes very heavy for the analysis of inequality across time.

This paper contributes to the empirical analysis of Italian household inequality and its determinants by assessing the role of the changed dispersion of different income factors and of the demographic evolution. It also contributes to the literature on household income inequality decomposition by proposing a unifying framework for two different microsimulation methods for decomposing inequality. This combination allows one to take into consideration the dispersion of income sources as well as the socio-demographic evolution of the population under study, in a single framework and across many years. The methodology suggested here maximizes clarity of results and allows a straightforward study of estimates reliability. For robustness of conclusions, three inequality indices are considered in the empirical application, although this methodology can be applied to any inequality measure.

Section 2 reviews the available evidence about Italian household inequality. Section 3 discusses the data, hypotheses and aims of the investigation. Section 4 describes the methodology adopted and Section 5 presents results, which are discussed in Section 6.

2 Analysis of Italian household income distribution: available evidence

Since the end of 1970s, Italy has experienced important demographic and social changes. The population has grown older, the family structure has changed, female labor force participation has steadily increased. The impact of some of these demographic changes have been studied in some detail in recent papers, mainly using the Bank of Italy SHIW-HA data set, and their findings are relevant to this paper.

D'Alessio and Signorini (2000), by using a decomposition of the Gini index, explained the decrease of inequality among income receivers in terms of increased number of people receiving income from work, mostly because of an increased female labor force participation and of the augmented number pensioners. Brandolini and D'Alessio (2001), using the Luxembourg Income Study (LIS) data set, pointed out that elderly Italian households (where the head is over 65) have a higher income than analogous households in other OECD countries. Their decomposition of the mean logarithmic deviation index trend by population subgroups, such as household size, sex of household head, age class of household head and household type, shows that the greatest change is found in the classification by sex of the household head. However, the effect found is very small: had the composition of the household heads in 1977 been as it was in 1995, overall inequality would have been 3.3% higher, mainly due to the greater weight attributed to women, among whom, they say, dispersion was higher. Neither has regional dualism been found to provide useful insights for inequality dynamics. Baldini (1996) analyzed the changes in household inequality in the period 1987-1993 using the decomposition by factor components, finding evidence that the increase in Gini and half the squared coefficient of variation for household income was mainly driven by increased relevance of pension and capital income in household income[1].

In contrast to household inequality, there is evidence that wage income distribution presents a clear trend: decreasing from the 1970s to the end of the 1980s and sharply increasing afterwards. Erickson and Ichino (1995); Manacorda (2004); Devicienti (2003) found evidence that the gradual abolition of the automatic wage indexation between late 1980s and 1991 increased wage inequality in early 1990s. According to this explanation, at the end of the 1980s Italy presented a compressed wage structure which had not experienced the decompression seen elsewhere during the 1980s. Moreover it could be that the spread of part-time and fixed-term employment contracts and the effect of institutional changes had unleashed a decompression of the wage structure, resulting in a larger dispersion of incomes already at work in other countries.

3 Data, hypothesis and aims

3.1 The data set: pros and cons

The SHIW data set collects detailed information on income, wealth, consumption and individual characteristics relative to a representative sample of resident Italian households. Since 1998 the Bank of Italy gathered all SHIWs starting from 1977 and made them consistent in a Historic Archive (SHIW-HA). The latest version of the SHIW-HA covers the period 1977-2002 (Banca d'Italia, 2004).

As any survey-based data set obtained though voluntary interviews, the SHIWs might present problems of non-response or under-reporting (especially for sensitive data such as income and wealth) or of misreporting (especially for capital income). The SHIW-HA is a collection of data sets: besides recording the same variables and being developed by the same institution, in some cases sample designs and dimensions were not constant through time[2]. Some of these shortfalls have been corrected with various sets of sampling weights but the data should still be analyzed with caution (for a comprehensive discussion of the data set quality, see Brandolini, 1999).

Despite these problems, the SHIW-HA is the only data set that allows for measurement of the changes in the Italian household income distribution through time and relate it to individual, household characteristics and income components.

3.2 Preliminary hypothesis for inequality analysis

This paper focuses only on disposable income per equivalent adult, using LIS equivalence scale[3]. It involves assigning to each individual the total income[4] of her household divided by the number of components to the power $\epsilon = 0.5$. Using the LIS equivalence scale it is assumed that intra-household allocation is egalitarian, i.e. that all members of the household receive the same share of income, regardless of their individual income, role in the household or needs. The individual equivalent income (also referred to as household equivalent income) is considered as the elementary unit of analysis.

Three different inequality indices are considered: the Generalized Entropy (GE) indices, with $a = 0, 1, 2$, also known as mean logarithmic deviation, Theil index and half the squared coefficient of variation, respectively.

These indices are chosen because they provide a broad picture of the distribution. In fact, these inequality indices differ in their sensitivity to differences in various parts of the distribution: the more positive the parameter a of the GE class is the more $GE(a)$ is sensitive to income differences at the top of the distribution, the smaller a is the more $GE(a)$ is sensitive to differences at the bottom of the distribution (see Appendix in Section 7). Moreover, the use of GE indices allows one to compute their confidence intervals using asymptotic distributions (Cowell, 1989).

3.3 Analysis of inequality estimates and of demographic trends

Looking at inequality measures, it can be noticed that inequality of individual monthly incomes is consistently higher among self-employed workers, and it is generally higher for pensioners than for employees (Figure 1). Trends appear decreasing up to the end of the 1980s (with large fluctuations for self-employment), increasing between the 1991 and 1993 (especially for employment and self-employment), and fairly stable during 1990s. The larger relative increase in the $GE(2)$ index after 1980s confirms other researchers' findings that major changes in employment income happened in top incomes[5]. The share of employment income on household income decreased constantly; pension income share increased at least since mid 1980s, while self-employment fluctuated (Figure 2). Household inequality indices show a slight (and fluctuating) decrease up to 1991, when the minimum was reached, and an increase afterwards (Figure 3).

Figures 1-3 about here.

During the period considered, Italian demography has changed. The age groups decomposition shows a decrease by over 20% of cohorts younger than 30 and an increase by about 50% of the over 65 during the 25-year period considered. The former group was about 43% and the latter about 12% of total population in 1977; at the end of the period they were 33% and 18%, respectively. There was some increase also in the cohort 31-65, mainly due to the sons of the 1960s Italian "baby boom" (Figure 4).

Figure 4 about here.

The proportion of single-person households more than doubled, so that in 2002 nearly one out of four households had this structure. The proportion of single-parent households with children increased by 27%, while that of couples with kids decreased by 24%. Female-headed households became markedly more frequent in the last decades as well as the average dimension of households showed a clear downward trend (Figure 5). The importance of the male householder income became less relevant, partly because of the increased number of female-headed households and partly because of the increased labor force participation of the other members of the household (Figure 6).

Figures 5-6 about here.

According to the SHIW-HA data, total labor force participation (LFP)[6] had a slightly increasing path across the period, however, while male LFP has been fairly stable throughout the period, the increase has been marked for female LFP. This dynamics reduced the differential of male-female LFP by about 10%. It should also be noted that the very high variability of LFP figures up to mid 1980s was probably due to the small sample size[7] (Figure 7).

Figure 7 about here.

Over the period considered, on average about 35% of the household members received work income and this percentage remained fairly stable for the whole period. On the other hand, pension income was received on average by an increasing proportion of individuals in the household and, in particular since 1993, the proportion of individuals receiving pension income was higher than the proportion of individuals receiving work income, regardless of their respective amounts (Figure 8).

Figure 8 about here.

4 Description of the methodology

In this section, two different microsimulation methods are combined: that of DiNardo et al. (1996) and that of Burtless (1999) (henceforth DFL and B, respectively). They are both based on counterfactuals aimed at answering "what if..." questions using microeconomic data. The re-weighting method introduced by DFL can be used to disentangle the impact of demographic changes on equivalent household income inequality. The B method allows one to determine the relative importance of the variation in the distribution of income sources (e.g. self-employment income, employment income, or pension income) on total inequality.

The $N \times 1$ vector of weighted equivalent household income, y, for a sample of N individuals and H households is obtained as follows. Let z be the $N \times 1$ vector of individual incomes ordered by household, w be the $N \times 1$ vector of corresponding sampling weights, E be the $N \times N$ matrix of equivalence scale and $DIAG(w)$ the diagonal matrix whose diagonal elements are the elements of w, then

$$y = DIAG(w) \cdot E \cdot z$$

where E is a block diagonal matrix, with H blocks on the diagonal. The blocks have dimension $N_h \times N_h$, $(h = 1, 2..., H)$, all the elements of each block are the same and equal to $1/N_h^{\epsilon}$, where N_h is the dimension of household h and $\epsilon = 0.5$ as in the LIS scale.

As in any microsimulation analysis a base year had to be picked and 1991 was chosen for two reasons: (i) as the sample size in SHIW data sets was enlarged since 1989, post-1989 data sets represent a more reliable picture of the underlying population; (ii) in 1991 equivalent income inequality reached its lowest point according to all inequality indices and results are easily interpretable using 1991 as the reference year[8].

4.1 Effects of individual and household characteristics on household inequality

The DFL methodology can be described as follows. Let us interpret each observation as a vector (y, x, t) coming from the CDF $G(y, x, t)$, where y records equivalent household income, x is a vector of individual and household characteristics (some of which are discrete variables), and t is a date. The CDF of income and attributes at time t is the conditional distribution $G(y, x|t_{y,x} = t)$. The density of income at a point in time, $g(y|t_y = t)$, can be seen as the integral of the density of equivalent household incomes conditional on a set of individual and household characteristics and on a date $t_y = t$, $g(y|x, t_y = t)$ over the distribution of individual and household characteristics, $G(x|t_x = t)$, at date $t_x = t$:

$$g(y|t_y = t, t_x = t) \quad = \quad \int_{x \in \Omega_x} g(y|x, t_y = t) dG(x|t_x = t) \qquad (1)$$

where Ω_x is the space of all possible values of the individual and household characteristics. For example, $g(y|t_y = 00, t_x = 00)$ represents the actual density of equivalent household income in 2000; $g(y|t_y = 00, t_x = 91)$ represents the density of equivalent household income that would have prevailed in 2000 had the distribution of individual and household characteristic been as in 1991.

Hence the counterfactual density $g(y|t_y = 00, t_x = 91)$ is:

$$\begin{aligned} g(y|t_y = 00, t_x = 91) &= \int g(y|x, t_y = 00) dG(x|t_x = 91) \\ &= \int g(y|x, t_y = 00) \psi_x dG(x|t_x = 00) \end{aligned} \tag{2}$$

Clearly, (2) differs from (1) only by the factor ψ_x, where:

$$\psi_x = \frac{dG(x|t_x = 91)}{dG(x|t_x = 00)} \tag{3}$$

Hence, following DFL, the counterfactual density can be estimated as a weighted version of the actual one, once an estimated weight, $\widehat{\psi}_x$, is computed.

The DFL method can be developed further. For instance, assume that $x = \{x_1, x_2, x_3\}$. Hence, the counterfactual density of household income, had x_1 remained as in 1991 and all other characteristics as in 2000, can be written as:

$$\begin{aligned} g(y|t_y &= 00, t_{x_1|x_2,x_3} = 91, t_{x_2,x_3} = 00) \\ &= \int\int g(y|x_1, x_2, x_3, t_y = 00) \psi_{x_1|x_2,x_3} \\ &\times dG(x_1|x_2, x_3, t_{x_1|x_2,x_3} = 00) dG(x_2, x_3|t_{x_2,x_3} = 00) \end{aligned} \tag{4}$$

Moreover, the counterfactual density of household income, had x_1 and x_2 remained as in 1991 and all other characteristics as in 2000, can be written as:

$$\begin{aligned} g(y|t_y &= 00, t_{x_1|x_2,x_3} = 91, t_{x_2|x_3} = 91, t_{x_3} = 00) \\ &= \int\int\int g(y|x_1, x_2, x_3, t_y = 00) \psi_{x_1|x_2,x_3} dG(x_1|x_2, x_3, t_{x_1|x_2,x_3} = 00) \\ &\times \psi_{x_2|x_3} dG(x_2|x_3, t_{x_2|x_3} = 00) dG(x_3|t_{x_3} = 00) \end{aligned} \tag{5}$$

where:

$$\psi_{x_1|x_2,x_3} = \frac{dG(x_1|x_2, x_3, t_{x_1|x_2,x_3} = 91)}{dG(x_1|x_2, x_3, t_{x_1|x_2,x_3} = 00)} \tag{6}$$

$$\psi_{x_2|x_3} = \frac{dG(x_2|x_3, t_{x_2|x_3} = 91)}{dG(x_2|x_3, t_{x_2|x_3} = 00)} \tag{7}$$

The application of the DFL methodology allows the estimation of counterfactuals with easy interpretation. Here it is aimed at assessing the effects on Italian household income distribution of changes across time of (a) number of income receivers, (b) number of members in the household, (c) number of pension receivers in the household, (d) female labor force participation.

Hence, the vector x is a set of individual and household characteristics, which comprises:

(a) the number R ($R = 0, 1, 2, 3+$) of income receivers in the household;

(b) the number N (N=1,2-4,5+) of members in the household;

(c) a variable that takes value 1 if individual receives a pension income, and 0 otherwise;

(d) a variable that takes value 1 if a working age (15-65) woman is in the labor force and 0 if she is not.

(e) many other individual and household characteristics, including area of residence (if either North, Center or South), size of the town of residence, individual age, education, sex and role in the household.

The probabilities in (6) and (7) are estimated either using standard logit (when the outcome is binary, as in cases (c) and (d)) or ordered logit models (when possible outcomes of the dependent variables are ordered, as in cases (a) and (b)), and then used to simulate counterfactual distributions and compute inequality indices.

4.2 Effects of changing dispersion of individual incomes on household incomes

The B methodology allows one to investigate the importance of changes in income sources inequality for household inequality. Analysis can focus on employment income, but also be extended to self-employment and pension income.

Let us assume that individual incomes, z, is equal to the sum of individual employment (z_i^{empl}), self-employment (z_i^{self}) and pension income (z_i^{pen}), i.e. $z_i = z_i^{empl} + z_i^{self} + z_i^{pen}$. The B methodology is a rank-dependent transformation that is based on holding the distribution of certain sources of income constant through time and then calculating how much household inequality would change under this assumption.

For instance, assuming that (monthly) wage inequality changed between year 1991 and 2000, the basic idea is to assign to each 2000 employee the wage the employee at her rank would have received according to the 1991 wage distribution, updated using CPI. This procedure is straightforward if the number of employees is the same in the two years but this can happen only by pure coincidence, and it never happens in our data set. Hence, the empirical distribution function using the same number of quantiles is computed, properly weighted to take into account sampling weights. Then the median within each quantile is calculated. For each individual in the 2000 data set the median income of the wage quantile distribution she belongs to is subtracted and replaced by the median income of the same quantile in the updated 1991 quantile wage distribution. Obviously, a zero wage in 2000 remains zero in the counterfactual distribution. Focussing on monthly incomes allows one to properly deal with observations with less than 12 months on work. The individual wages are then summed up to other incomes of the same individual. All individual incomes of each household are then summed together and equivalized using the LIS equivalence scale, as described in Section 3.2. In the empirical application a distribution by centiles is used (i.e. a quantile distribution with 100 quantiles), but even with 500 quantiles the results do not change significantly. An analogous analysis was performed for self-employment and pension incomes.

4.3 Testing the change of inequality

All inequality estimates for the GE class are accompanied with their asymptotic standard errors, as in Cowell (1989); Cowell and Jenkins (2003); Biewen and Jenkins (2003). A relatively large standard error with respect to the the inequality estimate would mean that the inequality index is not significantly different from zero and that the data set is unsuitable for inequality analysis. This is never an issue for our data set. Asymptotic standard errors are then used to perform a test for the significance of the difference between inequality indices in different years. Given an inequality index belonging to the $GE(a)$ class with $a = 0, 1, 2$, computed on two different independent data set, say I^a_{91} and I^a_{00}, the asymptotically normal statistic,

$$\tau^a = \frac{I^a_{91} - I^a_{00}}{\sqrt{var I^a_{91} + var I^a_{00}}} \tag{8}$$

tests the hypothesis "H_0 : there is no difference in inequality according to index $GE(a)$ between year 1991 and year 2000".

The test is performed on differences between actual figures, to test whether there is a statistically significant change in inequality in different years. Whenever the difference in inequality is significantly different from zero, and a counterfactual distribution is computed, it is tested whether the difference between the counterfactual and actual distribution is still statistically different from zero. If not, this is prima facie evidence that the simulation exercise explains most of the change in inequality that actually occurred.

5 Results of the analysis

In the traditional analysis of income decomposition the effects of socio-demographic changes are assessed by population subgroup decomposition, and the effects of income sources dispersion by factor source decomposition. However, these two approaches cannot be easily integrated. The combination of the DFL and B methodology allows one to put into a single framework the analysis of the effects on inequality of socio-demographic and income factors dispersion trends. This combination can be applied to any inequality index: here main results are presented using actual and counterfactual inequality measures. Results of the significance tests on the changes for the most interesting cases are also presented.

To analyze the marginal effect of demographic changes on household inequality, the DFL methodology is applied simulating (4) by estimating $\widehat{\psi}_{x_1|x_2,x_3}$ as in (6), where x_1 is defined as one of variables (a) - (d) in Section 4.1. Results are depicted in Figures 9 - 12 (abbreviations are explained in Table 1). It shows that demographic changes had a limited effect for the trend of overall inequality, as other researchers had found using traditional decomposition analysis (recall Section 2).

Summing up, using the DFL methodology for the effects of changes in a single socio-economic factor, it may be concluded that:

- The decrease of the average household size has about zero effect on household income distribution (Figure 9).

- The increasing trend of number of income receivers per household also had a negligible effect on changes of inequality indices, apart from a small dampening of household inequality variability during the 1970s (Figure 10).

- The increased number of pensioners had a slightly more relevant role in changing household income inequality. Had the probability of being pensioners - conditional to other individual and household characteristics - been as in 1991, inequality would have been slightly larger at the end of 1990s (Figure 11).

- Female labor force participation dynamics would have reduced household income differences during 1980s, especially for lower income levels - as shown by $GE(0)$ and $GE(1)$ - but it was a cause of increasing inequality during 1990s (Figure 12).

Table 1 and figures 9-12 about here.

The following step was to combine some of the most relevant variables to assess their joint role for inequality changes. This analysis was performed by simulating (5) and estimating (6) and (7), where x_1 is equal to the probability of being a female in the labor force, x_2 is equal to the probability of being a pensioner and x_3 includes all other relevant individual and household variables. Results show a similar trend as with conditioning on female labor force participation, though slightly more accentuated in mid 1980s and mid 1990s (Figure 13).

Figures 13 about here.

The test for the difference in inequality indices of this last simulation are reported in Table 2. For each year, the actual inequality figures and tests of the difference are presented, with 1991 as the base year. These tests show that inequality in 1991 is smaller than in all other years according to all inequality indices considered at 5% significance level, except for $GE(2)$ in 1989 (see column 5). The test of the change of inequality indices after conditioning on female labor force and, cumulatively, on the probability of being a pensioner shows that counterfactual inequality figures are no longer significantly different from the base year during most of 1980s and using different inequality indices. As for the 1990s, holding pensioners and female labor force participation at 1991 levels, the inequality indices considered would have in some cases largely reduced the difference in inequality indices, although all 1990s difference would still be significantly different from zero.

Table 2 about here.

The B methodology is first applied to one source of income at a time to assess the effects of its changed dispersion on household distribution. It shows that much of the dynamics in inequality is due to the changed distribution of income sources. In particular, changed dispersion of employment and self-employment individual income had each about the same marginal effect on household inequality. If the distribution of work (employment and self-employment) income is kept constant at 1991, there would be a much smaller decreasing trend before 1991 and a smaller increase in post-1991 period (Figure 14). These figures also show the importance of the change in dispersion of self-employment, which are at least as important as the change in dispersion of employment income, besides the self-employed workers being only a quarter of the labor force. Holding only the distribution of individual pension income as in 1991 instead had a much smaller effect, especially for the period 1987-2002 (Figure 15). Holding pension as well as work income dispersion constant would make no substantial difference for the post 1991 period, while it would induce an undershooting of the decomposition, causing the counterfactual inequality before 1991 to be even lower than in the base year (Figure 16). Tests on inequality changes depicted in Figure 16 are found in Table 3, where in Counterfactual 1 work income distribution and in Counterfactual 2 both work and pension distribution are kept constant. The last column shows that the counterfactual inequality index holding work and pension income constant is not significantly different from the base year in 1993 although this does not apply to the following years.

Figures 14-16 and Table 3 about here.

The combination of both DFL and B methodologies allows one to assess the joint effect of holding dispersion of employment and self-employment income, female participation in the labor force and number of pensioners constant at 1991 levels. This combination explains most of the change in household inequality during the late 1970s and 1980s. However, there is still much to explain in all inequality measures during 1990s (Figure 17 and Table 4).

Figure 17 and Table 4 about here.

6 Conclusions and discussion

In this paper the DiNardo et al. (1996) and Burtless (1999) microsimulation methodologies for decomposing income inequality indices are combined. The purpose of this combination is to provide a unifying framework for inequality decomposition analysis that corresponds to decomposition by population subgroups and by factor sources.

The combination of the DFL and B methodologies was applied to Italian household income distribution across the period 1977-2002 and the clear evidence about wage inequality trend was fitted into household inequality analysis. Results showed that socio-demographic factors are less relevant in determining inequality dynamics than changed dispersion of income sources. Results also suggest that the concern about pension income is often misplaced. While the pension income trend is often regarded as a major cause of increasing inequality in the 1990s, it actually had only a limited effect during those years. By contrast, household inequality during the 1980s would have been lower had pension income been distributed as in 1991. Finally, results show that no matter what concern we may have about the reliability of self-employment income data, if we are interested in household equivalent income we cannot neglect the role of self-employment dynamics and should instead think of possible improvements in survey data collection.

The approach taken in this paper is similar to the one that Daly and Valletta (2002) used to analyze inequality and poverty in the US, but it is different in three main respects. First, the concern of Jenkins (1995) that analysis often changes because different years are compared is taken seriously: this microsimulation study is extended to each and every year available in the data set and then the overall trend is discussed. Second, the B methodology is extended to all work income receivers, regardless of their sex and their role in the family, while Daly and Valletta (2002) applied it to male household heads only. Basically, this extension is motivated by the assumption that income distribution is independent from the role in the household of income receivers and by the fact that male householders' income is relatively less important across time (recall Section 3.1 and Figure 6). Third, the B methodology is extended to pension income and the effect of work income is divided into employment and self-employment. The different propensity to work or receive a pension are considered holding constant the number of months of income each individual received and then replacing only the monthly income vector rather than the yearly income.

Although this method allows one to account for a much larger proportion of household inequality trend than similar studies on Italy, part of the household inequality remains unexplained. In fact, it is not an exact decomposition of inequality. A residual is expected to come mainly from the covariance between different incomes accruing to the same individual or between different individuals in the same household. Structural changes in the economy, that would induce a change in income distribution, are also not considered here. For instance, an increasing importance of specialized and skill-intensive industries that pay high skill premia might be a direct cause of increased dispersion of income; structural changes in the labor market are likely to affect employment probabilities at various levels of income. Other factors that are not considered here and might be possible explanations for the residual found are the effect of the economic cycle, the role of income taxation, the changed opportunity of irregular occupations. They are left for future research.

7 Appendix 1: The Generalized Entropy class of inequality indices

In this paper three different inequality indices are considered: the Generalized Entropy (GE) indices, with $a = 0, 1, 2$. They are known as the mean logarithmic deviation ($GE(0)$), the Theil index ($GE(1)$) and half the square of the coefficient of variation ($GE(2)$). GE indices with sample weights can be formalized as follows. Given a vector of incomes y of dimension N, its arithmetic mean, $\overline{y}$, and a vector of weights, w, of the same dimension as y, and such that $\sum_{i=1}^{N} w_i = N$, the GE class of inequality indices is given by

$$GE(a) \equiv I_a = \frac{1}{a(a-1)} \left[\left[\sum_{i=1}^{N} \frac{w_i}{N} \left(\frac{y_i}{\overline{y}} \right)^a \right] - 1 \right], a \neq 1, a \neq 0 \tag{9}$$

$$GE(0) \equiv I_0 = \sum_{i=1}^{N} \frac{w_i}{N} \log \left(\frac{\overline{y}}{y_i} \right) \tag{10}$$

$$GE(1) \equiv I_1 = \sum_{i=1}^{N} \frac{w_i}{N} \frac{y_i}{\overline{y}} \log \left(\frac{y_i}{\overline{y}} \right) \tag{11}$$

These indices are chosen because they should provide a broad picture of the distribution. In fact, these inequality indices differ in their sensitivity to difference in various parts of the distribution: the more positive the parameter a of the GE class is the more $GE(a)$ is sensitive to income differences at the top of the distribution, the smaller a is the more $GE(a)$ is sensitive to differences at the bottom of the distribution (Cowell, 1995).

8 Appendix 2: additional tables

Tables 5-10 complement the figures in Section 3.3.

Tables 5-10 about here.

Notes

[1]Baldini (1996) reaches this conclusion by comparing the share of inequality explained by different sources in different years, without developing a factor components decomposition for inequality trend as Jenkins (1995) did using counterfactuals. His results should then be taken with some caution.

[2]For instance, a first important change in the sample selection was introduced in 1984, with units no longer from electoral lists, but from registry office records. In 1986 the sample design was revised and the sample size was more than doubled. In 1987 there was an over-sampling of high-income households. Since 1989, instead, the sampling methodology and the sample size remained about the same.

[3]The LIS equivalence scale was also used by Brandolini and D'Alessio (2001) and D'Alessio and Signorini (2000). However, it was verified that the conclusion of the present paper are not strongly dependent of the type of equivalence scale used, changing the value of the parameter ϵ to 0, 0.25, 0.75 and 1. All results from this sensitivity analysis are not presented here for reasons of space but they can be obtained from the author.

[4]Total household income is defined as the sum of employment income, self-employment income (income of members of the arts or professions, of sole proprietors, of freelances, of owners of business with less than 20 employees), pension and other transfers received by each member of the household. All incomes are net of taxes and social contributions. As in D'Alessio and Signorini (2000) income from capital is excluded as it presents serious measurement problems (Cannari and D'Alessio, 1992; Brandolini, 1999) and is not uniformly available for all years considered.

[5]The $GE(2)$ for self-employment and pension was included in a separate panel of Figure 1 as its large variability would have hidden dynamics of the other indices.

[6]Total LFP is computed as percentage of working age individuals - i.e. between 15 and 65 years - who declare to be either working or actively looking for a job.

[7]Individual sample size was about 10,000 before 1980, about 13,500 between 1981 and 1984, not less than 20,900 in the rest of the period.

[8]For economy of space the analysis with 1991 as base year will only be presented, without reverse order decomposition. However, the analysis has been performed also using different base years after 1989 and using reverse order decomposition: results do not change conclusions.

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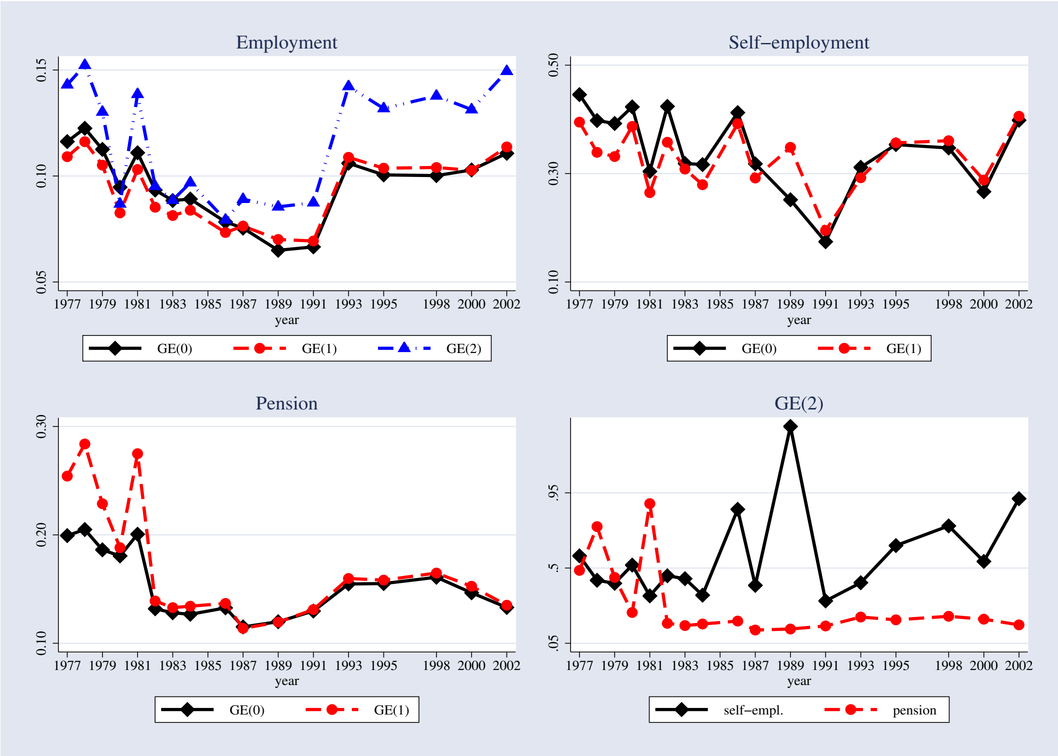

Figure 1: Inequality indices, individual (monthly) incomes

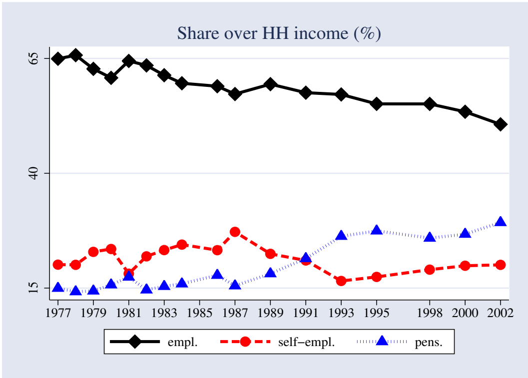

Figure 2: Share of income types over total household (HH) income

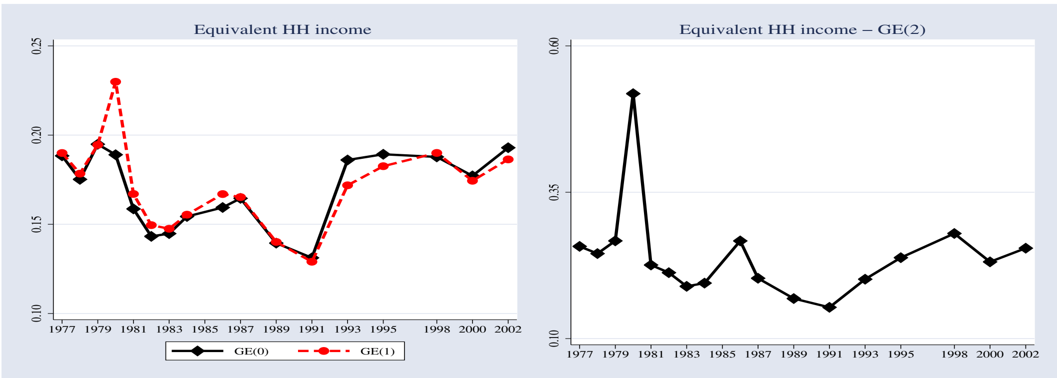

Figure 3: Inequality indices for equivalent household (HH) income

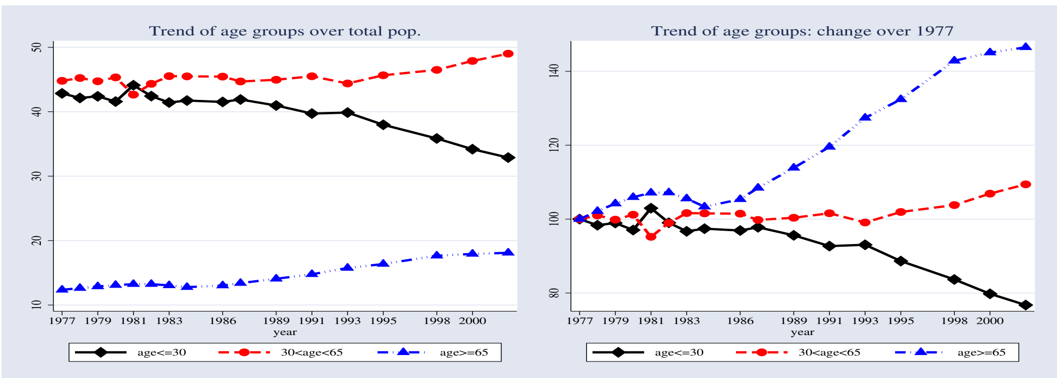

Figure 4: Decomposition of the population by age groups

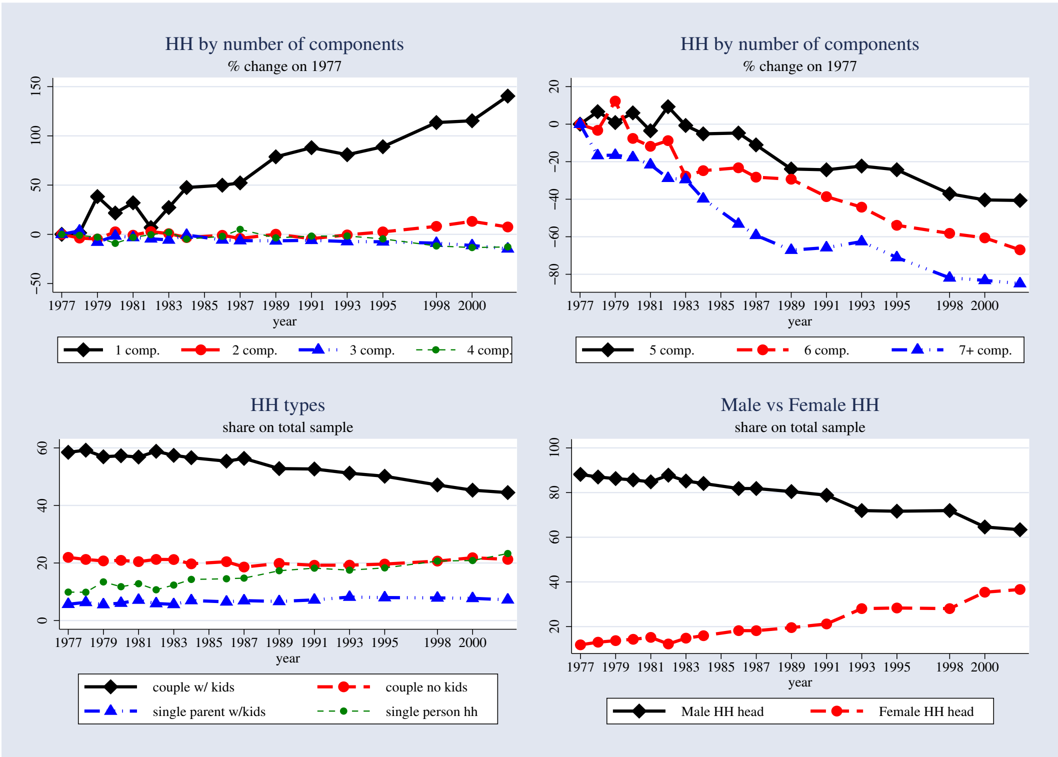

Figure 5: Decomposition of the population by household (HH) type

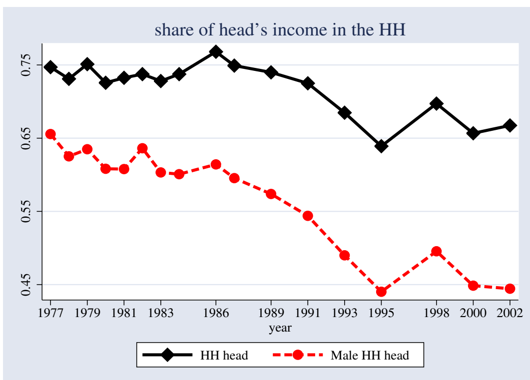

Figure 6: Share of householder's income

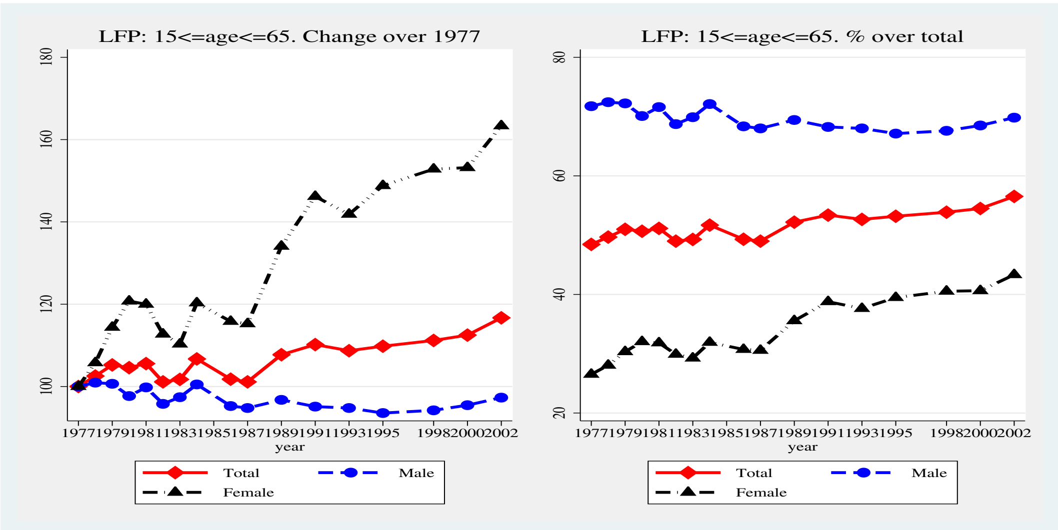

Figure 7: Labor force participation in the population: Total, by sex

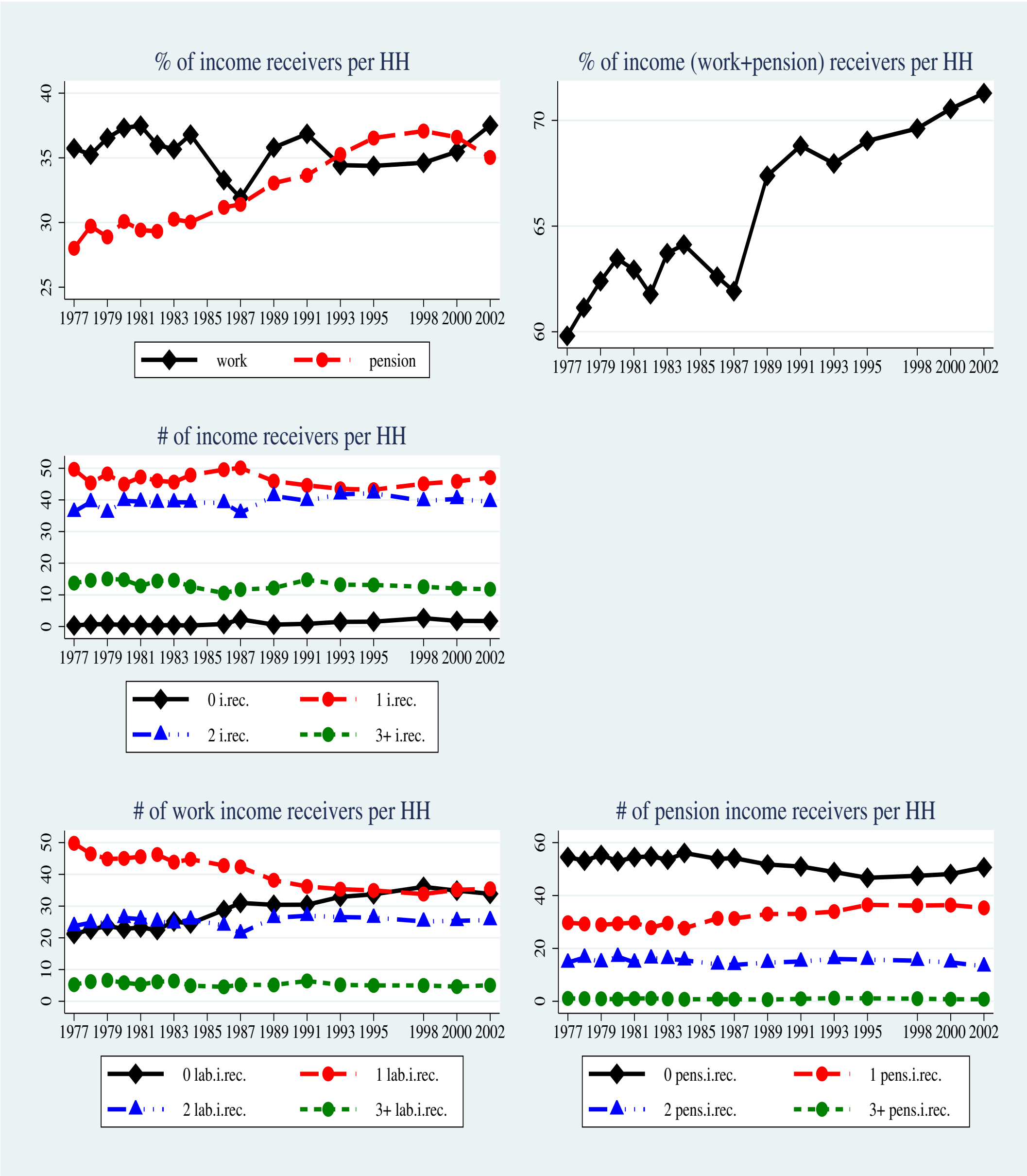

Figure 8: Income receivers per average household (HH)

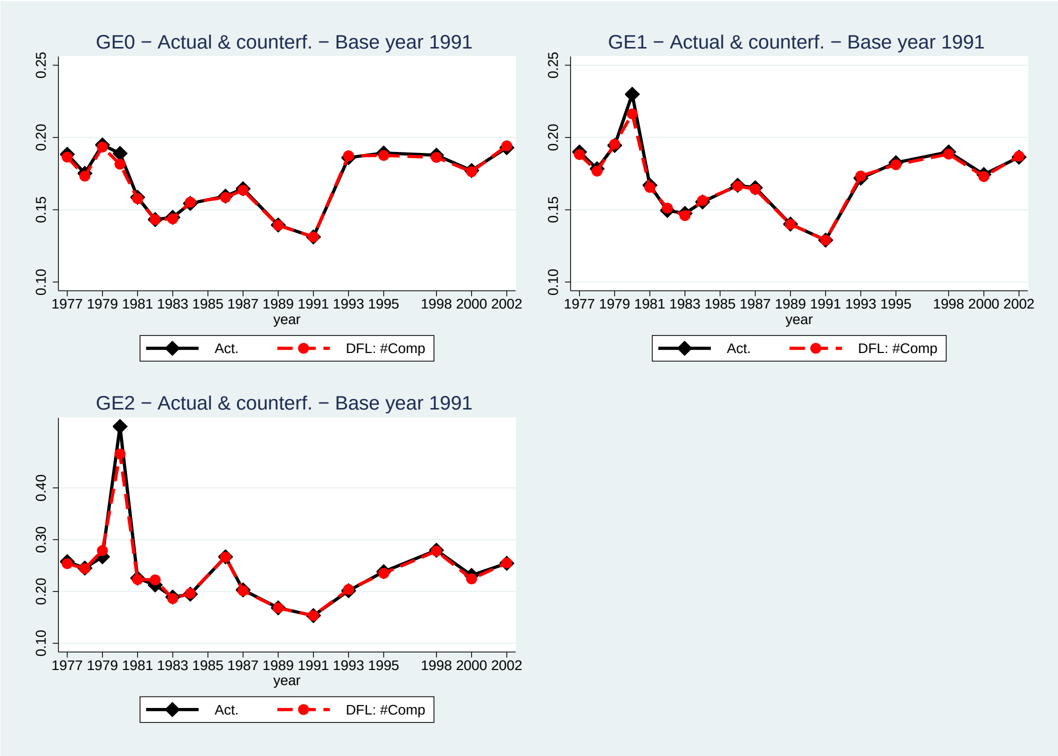

Figure 9: Using DiNardo et al. (1996): effects of variation of number of components of household (HH).

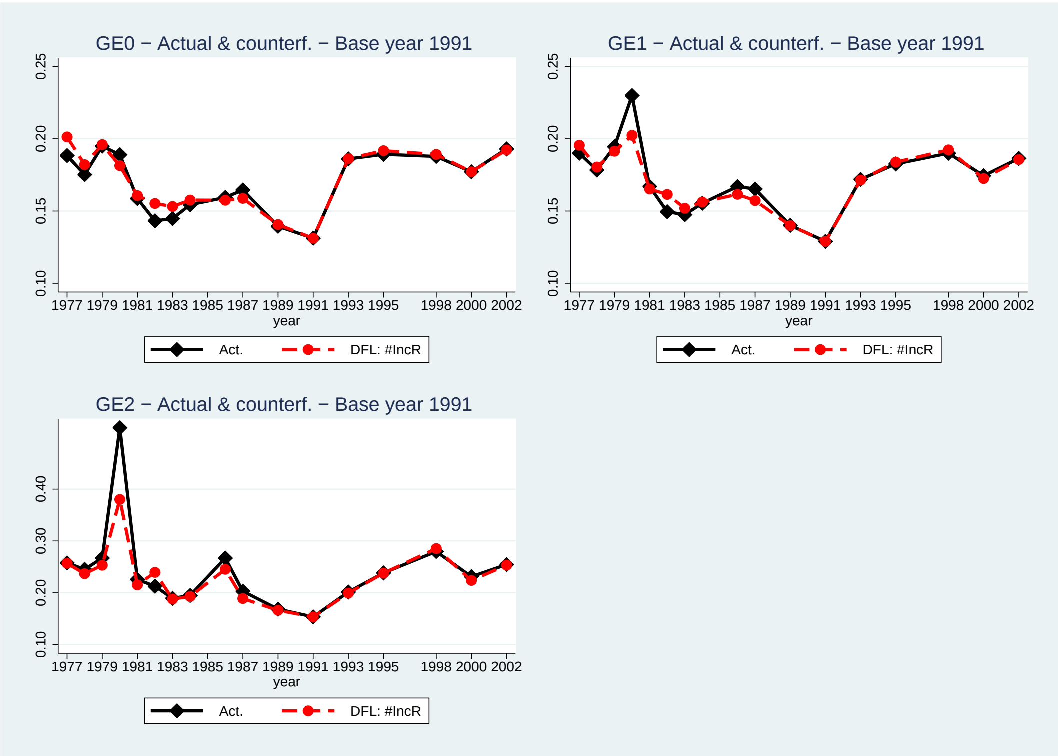

Figure 10: Using DiNardo et al. (1996): effects of variation of number of income receivers in HH.

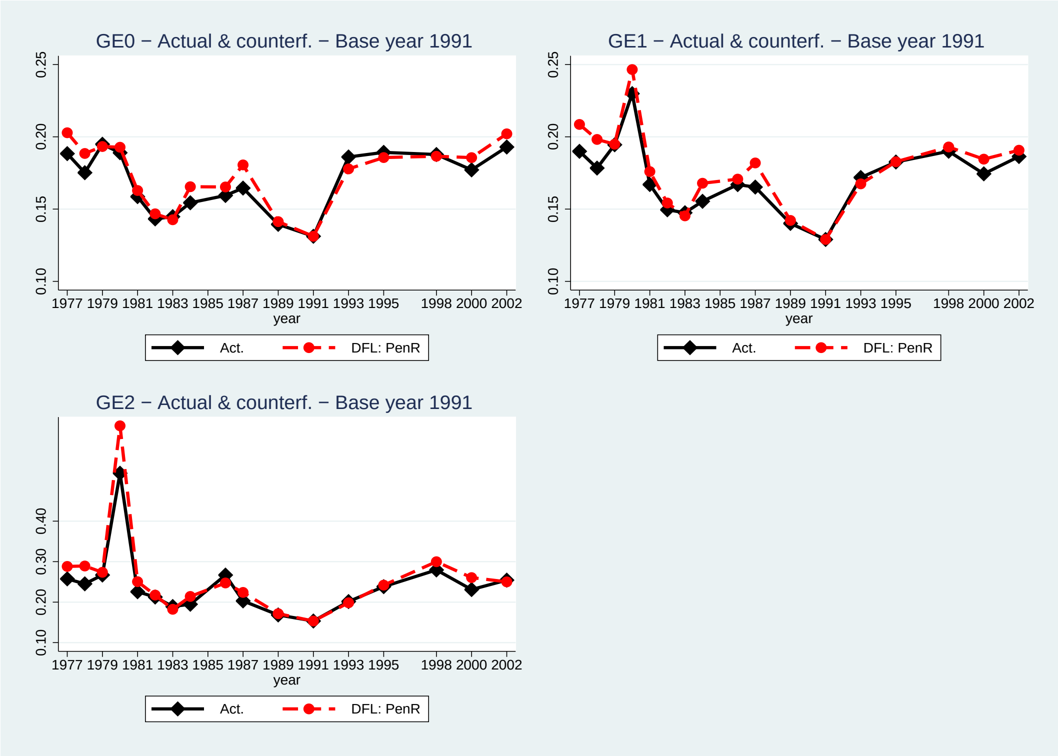

Figure 11: Using DiNardo et al. (1996): effects of variation of probability of being a pensioner.

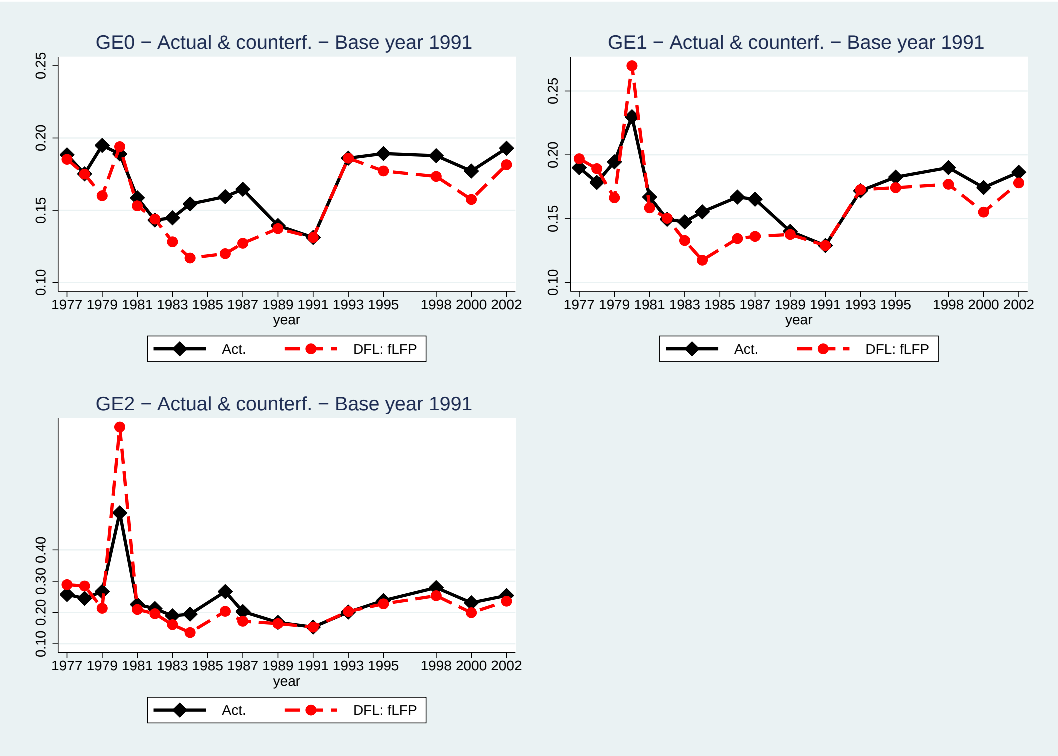

Figure 12: Using DiNardo et al. (1996): effects of variation of female LFP.

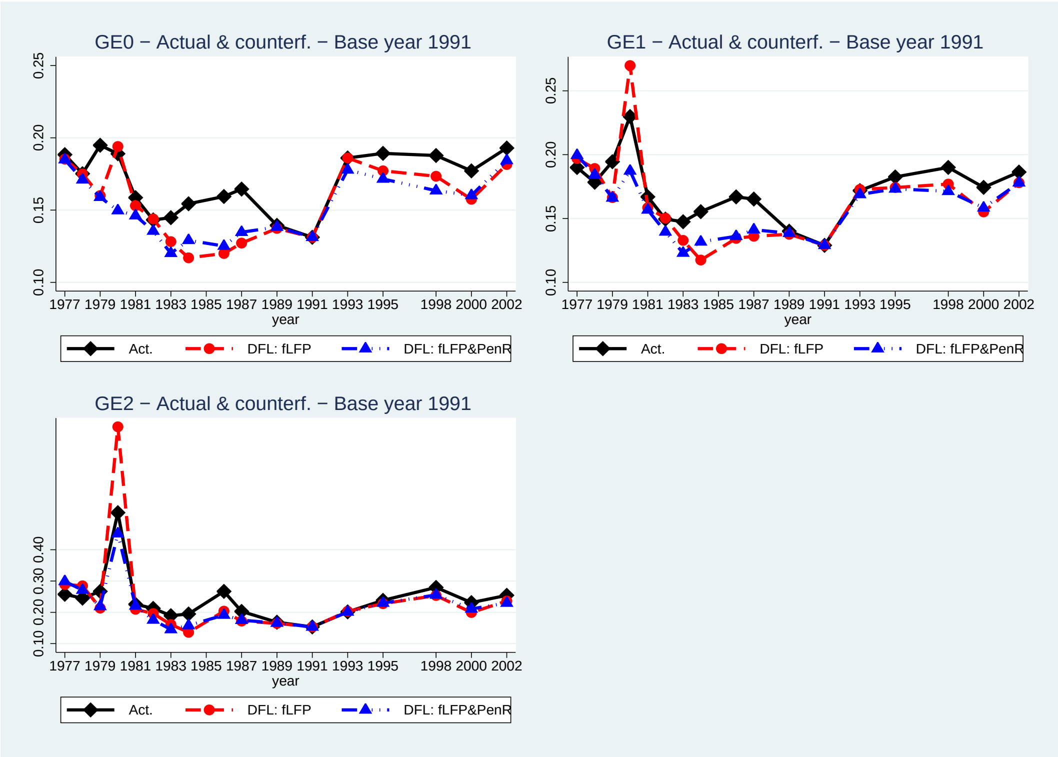

Figure 13: Using DiNardo et al. (1996): effects of variation of female LFP & probability of being a pensioner.

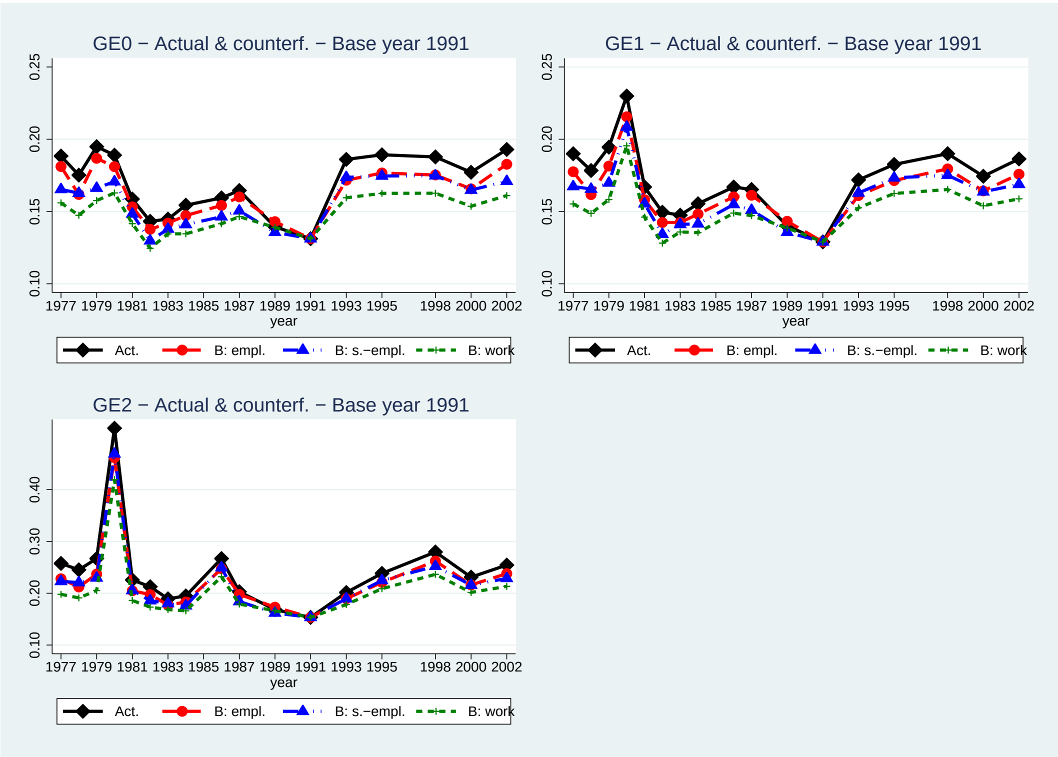

Figure 14: Using Burtless (1999): effect of changed work incomes dispersion

Act.	Actual figures
DFL: #Comp	conditioning on number of household components
DFL: #IncR	conditioning on number of income receivers in the household
DFL: PenR	conditioning on probability of being a pensioner
DFL: fLFP	conditioning on female in the labor force
DFL: fLFP&PenR	conditioning on female LFP and probability of being a pensioner
B: s.-empl.	holding self-employment income dispersion constant at base year
B: empl.	holding employment income dispersion constant at base year
B: work	holding employment and self-employment (work income) dispersion constant at base year
B: pens.	holding pension dispersion constant at base year
DFL & B:	conditioning on female LFP and probability of being a pensioner holding work and pension dispersion constant at base year

Table 1: Abbreviations used in tables and figures

GE(0)

	Actual figure (A)		Actual - base year		Condit. on female LFP (B)		**Counterfactual** also condit. on prob. pension income (C)		**Difference** Counterf. (C) - base year	
Year	index	s.e.	diff	p-val	index	*s.e.*	index	*s.e.*	diff	p-val
1977	0.188	0.004	0.057	0.000	0.185	0.009	0.185	0.011	0.054	0.000
1978	0.175	0.004	0.044	0.000	0.175	0.008	0.171	0.008	0.040	0.000
1979	0.195	0.005	0.064	0.000	0.160	0.008	0.159	0.008	0.028	0.002
1980	0.189	0.009	0.058	0.000	0.194	0.022	0.150	0.011	0.018	0.101
1981	0.159	0.004	0.027	0.000	0.153	0.008	0.146	0.010	0.015	0.143
1982	0.143	0.003	0.012	0.008	0.144	0.007	0.136	0.007	0.004	0.582
1983	0.145	0.003	0.014	0.001	0.128	0.008	0.120	0.008	-0.011	0.204
1984	0.154	0.003	0.023	0.000	0.117	0.005	0.129	0.008	-0.002	0.806
1986	0.159	0.003	0.028	0.000	0.120	0.007	0.125	0.006	-0.006	0.360
1987	0.165	0.003	0.033	0.000	0.127	0.007	0.135	0.008	0.004	0.676
1989	0.139	0.002	0.008	0.024	0.137	0.002	0.138	0.003	0.007	0.078
1991	0.131	0.003	-	-	-	-	-	-	-	-
1993	0.186	0.003	0.055	0.000	0.186	0.004	0.178	0.005	0.047	0.000
1995	0.189	0.003	0.058	0.000	0.177	0.004	0.172	0.005	0.040	0.000
1998	0.188	0.005	0.057	0.000	0.173	0.005	0.163	0.006	0.032	0.000
2000	0.177	0.003	0.046	0.000	0.158	0.004	0.160	0.005	0.029	0.000
2002	0.193	0.005	0.062	0.000	0.182	0.006	0.184	0.007	0.053	0.000

GE(1)

	Actual figure (A)		Actual - base year		Condit. on female LFP (B)		**Counterfactual** also condit. on prob. pension income (C)		**Difference 1** Counterf. (C) - base year	
Year	index	s.e.	diff	p-val	index	*s.e.*	index	*s.e.*	diff	p-val
1977	0.190	0.007	0.061	0.000	0.197	0.015	0.200	0.018	0.071	0.000
1978	0.178	0.007	0.049	0.000	0.189	0.013	0.184	0.014	0.055	0.000
1979	0.195	0.009	0.066	0.000	0.166	0.009	0.166	0.011	0.037	0.002
1980	0.230	0.021	0.101	0.000	0.270	0.051	0.187	0.023	0.058	0.013
1981	0.167	0.006	0.038	0.000	0.158	0.009	0.157	0.014	0.028	0.054
1982	0.150	0.006	0.021	0.010	0.150	0.007	0.140	0.008	0.011	0.259
1983	0.147	0.004	0.018	0.002	0.133	0.009	0.123	0.009	-0.006	0.556
1984	0.155	0.004	0.026	0.000	0.117	0.006	0.132	0.009	0.003	0.780
1986	0.167	0.005	0.038	0.000	0.134	0.008	0.136	0.007	0.007	0.403
1987	0.165	0.003	0.036	0.000	0.136	0.007	0.141	0.009	0.012	0.223
1989	0.140	0.003	0.011	0.045	0.138	0.003	0.138	0.003	0.009	0.105
1991	0.129	0.005	-	-	-	-	-	-	-	-
1993	0.172	0.003	0.043	0.000	0.173	0.003	0.169	0.004	0.040	0.000
1995	0.183	0.004	0.054	0.000	0.174	0.004	0.173	0.006	0.044	0.000
1998	0.190	0.008	0.061	0.000	0.177	0.007	0.171	0.008	0.042	0.000
2000	0.174	0.004	0.045	0.000	0.155	0.004	0.158	0.006	0.029	0.000
2002	0.186	0.005	0.057	0.000	0.178	0.007	0.178	0.007	0.049	0.000

GE(2)

	Actual figure (A)		Actual - base year		Condit. on female LFP (B)		**Counterfactual** also condit. on prob. pension income (C)		**Difference 1** Counterf. (C) - base year	
Year	index	s.e.	diff	p-val	index	*s.e.*	index	*s.e.*	diff	p-val
1977	0.258	0.021	0.104	0.000	0.289	0.040	0.299	0.052	0.145	0.007
1978	0.245	0.020	0.092	0.000	0.285	0.039	0.271	0.039	0.118	0.004
1979	0.267	0.030	0.114	0.001	0.214	0.016	0.219	0.024	0.066	0.018
1980	0.518	0.094	0.365	0.000	0.793	0.249	0.451	0.109	0.298	0.007
1981	0.226	0.015	0.072	0.000	0.210	0.019	0.221	0.033	0.067	0.061
1982	0.213	0.026	0.059	0.045	0.196	0.014	0.176	0.015	0.022	0.271
1983	0.189	0.009	0.036	0.026	0.161	0.014	0.145	0.013	-0.008	0.655
1984	0.195	0.008	0.041	0.009	0.136	0.008	0.158	0.013	0.004	0.808
1986	0.267	0.022	0.113	0.000	0.204	0.018	0.191	0.017	0.038	0.075
1987	0.203	0.006	0.050	0.001	0.172	0.010	0.175	0.013	0.022	0.240
1989	0.168	0.006	0.015	0.305	0.165	0.006	0.166	0.007	0.012	0.412
1991	0.153	0.013	-	-	-	-	-	-	-	-
1993	0.201	0.006	0.048	0.001	0.203	0.006	0.201	0.007	0.048	0.002
1995	0.238	0.009	0.085	0.000	0.228	0.010	0.230	0.013	0.076	0.000
1998	0.280	0.027	0.126	0.000	0.254	0.022	0.256	0.027	0.102	0.001
2000	0.231	0.014	0.078	0.000	0.199	0.011	0.211	0.016	0.058	0.006
2002	0.254	0.016	0.101	0.000	0.236	0.014	0.230	0.012	0.076	0.000

Source: own calculation on SHIW-HA data

Table 2: Using DiNardo et al. (1996): significance tests - Base year is 1991

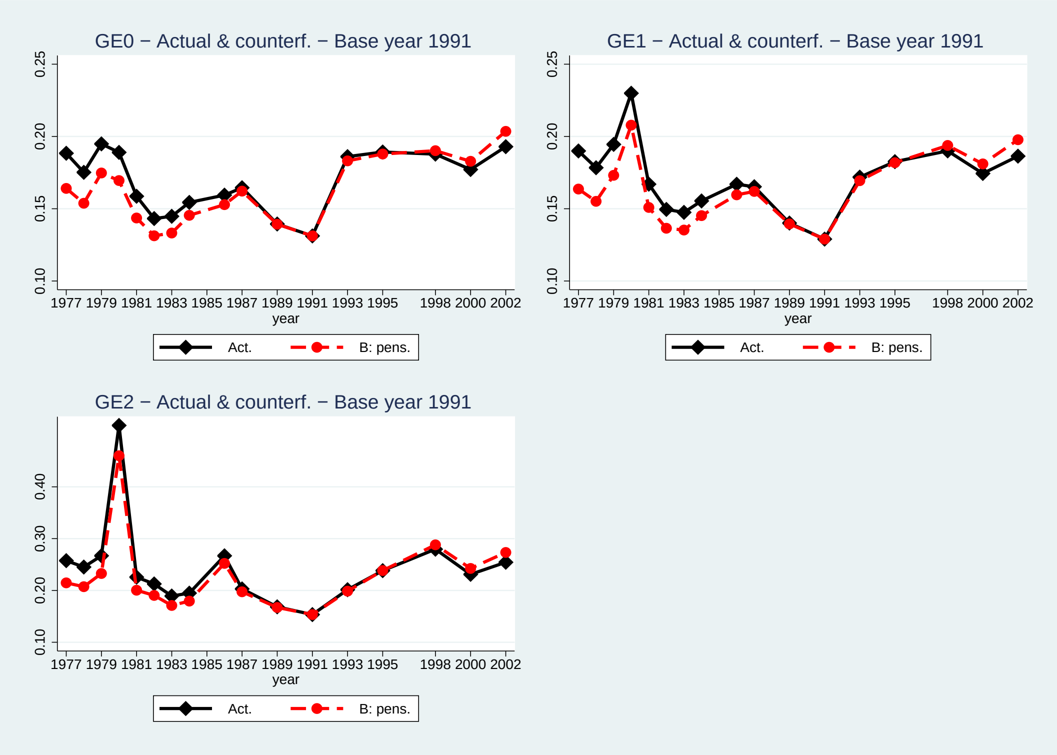

Figure 15: Using Burtless (1999): effect of changed pension incomes dispersion

GE0									Counterf. 1		Counterf. 2		Diff. 1		Diff. 2
	Actual figure (A)		empl. income dispersion constant (B)		self-employ. income disp. constant (C)		work income dispersion constant (D)		work & pension income constant (E)		Counterf. 1 (D) - base year		Counterf. 2 (E) - base year	
Year	index	s.e.	index	s.e.	index	s.e.	index	s.e.	index	s.e.	diff	p-val	diff	p-val
1977	0.188	0.004	0.181	0.004	0.165	0.004	0.156	0.004	0.129	0.003	0.025	0.000	-0.003	0.545
1978	0.175	0.004	0.162	0.004	0.163	0.004	0.147	0.004	0.124	0.003	0.016	0.000	-0.007	0.084
1979	0.195	0.005	0.187	0.005	0.166	0.005	0.158	0.004	0.136	0.004	0.026	0.000	0.005	0.330
1980	0.189	0.009	0.181	0.009	0.171	0.009	0.163	0.008	0.144	0.008	0.032	0.000	0.012	0.131
1981	0.159	0.004	0.153	0.004	0.148	0.004	0.142	0.004	0.125	0.003	0.010	0.023	-0.007	0.126
1982	0.143	0.003	0.138	0.003	0.130	0.003	0.125	0.003	0.112	0.003	-0.007	0.109	-0.019	0.000
1983	0.145	0.003	0.142	0.003	0.138	0.003	0.135	0.002	0.121	0.002	0.003	0.371	-0.010	0.006
1984	0.154	0.003	0.147	0.003	0.141	0.003	0.135	0.003	0.125	0.002	0.003	0.387	-0.006	0.129
1986	0.159	0.003	0.154	0.003	0.146	0.003	0.142	0.003	0.134	0.003	0.010	0.009	0.003	0.430
1987	0.165	0.003	0.160	0.003	0.151	0.002	0.146	0.002	0.145	0.002	0.015	0.000	0.014	0.000
1989	0.139	0.002	0.143	0.002	0.136	0.002	0.139	0.002	0.139	0.002	0.008	0.029	0.008	0.029
1991	0.131	0.003	-	-	-	-	-	-	-	-	-	-	-	-
1993	0.186	0.003	0.172	0.003	0.174	0.003	0.160	0.003	0.157	0.002	0.028	0.000	0.025	0.000
1995	0.189	0.003	0.177	0.003	0.175	0.003	0.163	0.003	0.162	0.003	0.031	0.000	0.030	0.000
1998	0.188	0.005	0.175	0.004	0.175	0.004	0.163	0.004	0.165	0.004	0.031	0.000	0.034	0.000
2000	0.177	0.003	0.166	0.003	0.165	0.003	0.154	0.003	0.160	0.003	0.022	0.000	0.028	0.000
2002	0.193	0.005	0.183	0.004	0.171	0.004	0.161	0.003	0.171	0.004	0.030	0.000	0.040	0.000

GE1									Counterf. 1		Counterf. 2		Diff. 1		Diff. 2
	Actual figure (A)		empl. income dispersion constant (B)		self-employ. income disp. constant (C)		work income dispersion constant (D)		work & pension income constant (E)		Counterf. 1 (D) - base year		Counterf. 2 (E) - base year	
Year	index	s.e.	index	s.e.	index	s.e.	index	s.e.	index	s.e.	diff	p-val	diff	p-val
1977	0.190	0.007	0.178	0.006	0.167	0.006	0.155	0.005	0.131	0.005	0.026	0.000	0.002	0.722
1978	0.178	0.007	0.162	0.006	0.166	0.006	0.149	0.005	0.128	0.005	0.020	0.006	-0.001	0.832
1979	0.195	0.009	0.181	0.008	0.170	0.008	0.158	0.007	0.139	0.007	0.029	0.001	0.010	0.212
1980	0.230	0.021	0.216	0.019	0.208	0.020	0.195	0.018	0.176	0.017	0.066	0.000	0.047	0.007
1981	0.167	0.006	0.158	0.006	0.155	0.006	0.146	0.005	0.130	0.005	0.017	0.014	0.001	0.827
1982	0.150	0.006	0.142	0.006	0.134	0.006	0.128	0.005	0.116	0.005	-0.001	0.903	-0.013	0.062
1983	0.147	0.004	0.142	0.003	0.141	0.003	0.136	0.003	0.123	0.003	0.007	0.231	-0.006	0.309
1984	0.155	0.004	0.148	0.004	0.141	0.004	0.135	0.004	0.126	0.003	0.006	0.282	-0.003	0.605
1986	0.167	0.005	0.160	0.005	0.155	0.005	0.149	0.005	0.142	0.005	0.020	0.003	0.013	0.057
1987	0.165	0.003	0.161	0.003	0.151	0.003	0.147	0.003	0.145	0.003	0.018	0.001	0.016	0.004
1989	0.140	0.003	0.143	0.003	0.136	0.003	0.139	0.003	0.138	0.003	0.010	0.080	0.009	0.095
1991	0.129	0.005	-	-	-	-	-	-	-	-	-	-	-	-
1993	0.172	0.003	0.161	0.003	0.163	0.003	0.153	0.003	0.150	0.003	0.024	0.000	0.021	0.000
1995	0.183	0.004	0.171	0.004	0.173	0.004	0.162	0.003	0.162	0.003	0.033	0.000	0.033	0.000
1998	0.190	0.008	0.180	0.008	0.175	0.007	0.165	0.007	0.169	0.007	0.036	0.000	0.040	0.000
2000	0.174	0.004	0.164	0.004	0.164	0.004	0.154	0.004	0.160	0.004	0.025	0.000	0.031	0.000
2002	0.186	0.005	0.176	0.005	0.169	0.005	0.159	0.005	0.169	0.005	0.030	0.000	0.040	0.000

GE2									Counterf. 1		Counterf. 2		Diff. 1		Diff. 2
	Actual figure (A)		empl. income dispersion constant (B)		self-employ. income disp. constant (C)		work income dispersion constant (D)		work & pension income constant (E)		Counterf. 1 (D) - base year		Counterf. 2 (E) - base year	
Year	index	s.e.	index	s.e.	index	s.e.	index	s.e.	%	p-val	%	p-val	%	p-val
1977	0.258	0.021	0.228	0.017	0.223	0.018	0.198	0.015	0.166	0.013	0.045	0.027	0.013	0.479
1978	0.245	0.020	0.212	0.016	0.221	0.017	0.191	0.014	0.163	0.012	0.038	0.050	0.009	0.600
1979	0.267	0.030	0.237	0.025	0.230	0.027	0.205	0.022	0.180	0.020	0.052	0.047	0.026	0.268
1980	0.518	0.094	0.462	0.082	0.469	0.088	0.419	0.077	0.375	0.069	0.266	0.001	0.222	0.002
1981	0.226	0.015	0.205	0.012	0.205	0.013	0.186	0.011	0.165	0.010	0.033	0.059	0.012	0.472
1982	0.213	0.026	0.197	0.024	0.186	0.023	0.173	0.020	0.156	0.018	0.020	0.418	0.002	0.924
1983	0.189	0.009	0.177	0.008	0.180	0.008	0.169	0.007	0.152	0.007	0.015	0.323	-0.001	0.922
1984	0.195	0.008	0.183	0.008	0.176	0.008	0.166	0.008	0.153	0.007	0.013	0.413	0.000	0.977
1986	0.267	0.022	0.247	0.020	0.249	0.022	0.232	0.019	0.219	0.018	0.078	0.001	0.066	0.004
1987	0.203	0.006	0.198	0.006	0.184	0.006	0.179	0.006	0.175	0.005	0.026	0.078	0.021	0.142
1989	0.168	0.006	0.173	0.006	0.162	0.006	0.166	0.006	0.165	0.006	0.013	0.384	0.012	0.427
1991	0.153	0.013	-	-	-	-	-	-	-	-	-	-	-	-
1993	0.201	0.006	0.189	0.006	0.189	0.005	0.178	0.005	0.176	0.005	0.025	0.083	0.022	0.117
1995	0.238	0.009	0.221	0.008	0.225	0.008	0.209	0.008	0.209	0.008	0.055	0.000	0.056	0.000
1998	0.280	0.027	0.262	0.026	0.252	0.026	0.236	0.024	0.243	0.025	0.083	0.003	0.090	0.002
2000	0.231	0.014	0.216	0.013	0.216	0.013	0.202	0.013	0.211	0.013	0.048	0.009	0.058	0.002
2002	0.254	0.016	0.238	0.016	0.229	0.017	0.213	0.016	0.229	0.017	0.060	0.004	0.076	0.001

Source: own calculation on SHIW-HA data

Table 3: Using Burtless (1999): significance tests - Base year is 1991

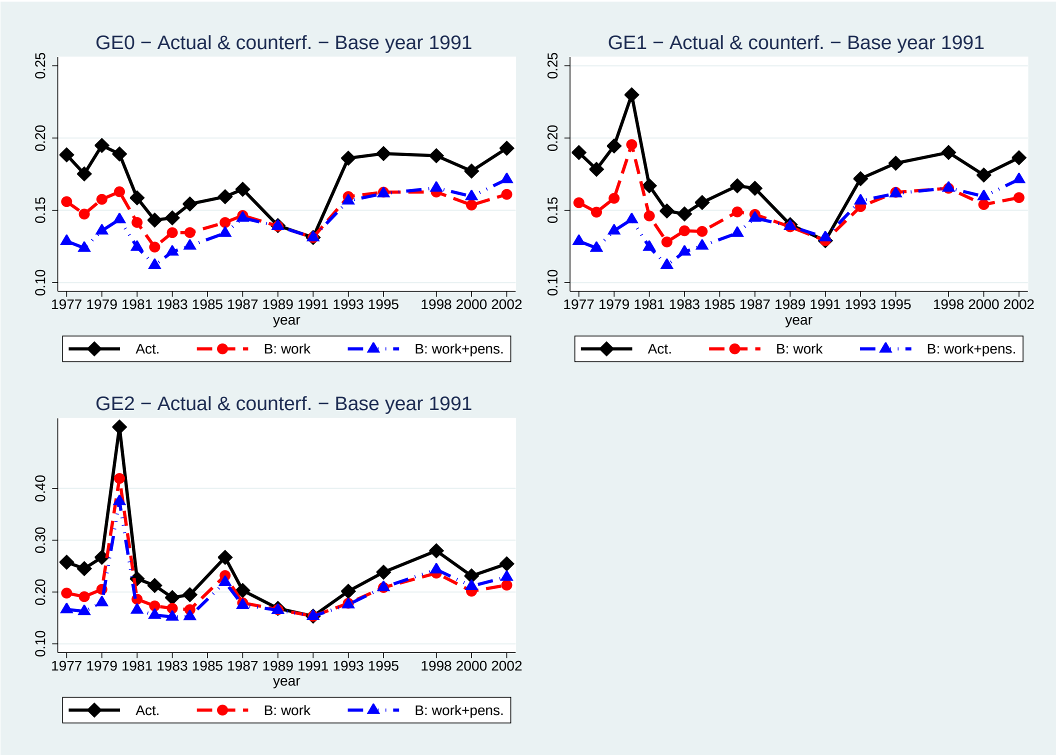

Figure 16: Using Burtless (1999): combining effects of changed work and pension incomes dispersion

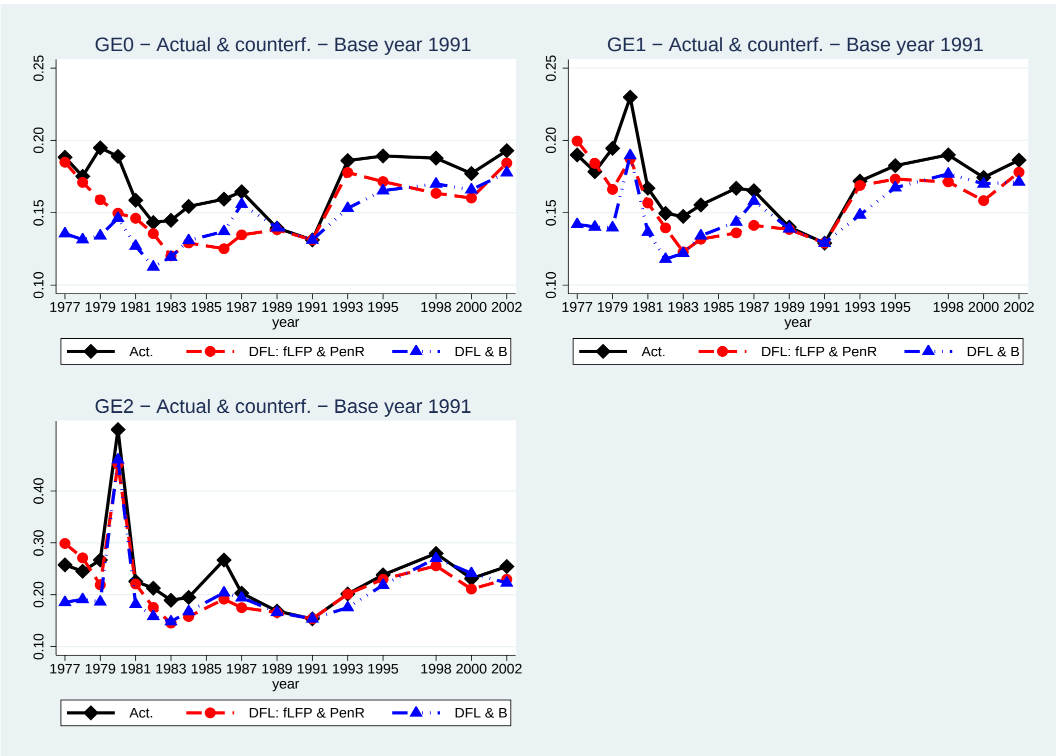

Figure 17: Combining DiNardo et al. (1996) and Burtless (1999): joint effect of demographic characteristics and changed income source dispersion

GE0									**Counterf. 1**		**Counterf. 2**		**Diff. 1**		**Diff. 2**
	Actual figure (A)		DFL & empl. income held constant (B)		DFL & self-empl. income held constant (C)		DFL & work income held constant (D)		DFL & work & pension income held constant (E)		Counterf. 1 (D) - base year		Counterf. 2 (E) - base year	
Year	index	s.e.	index	*s.e.*	index	*s.e.*	index	*s.e.*	index	p-val	diff	p-val	diff	p-val
1977	0.188	0.004	0.182	0.011	0.169	0.010	0.165	0.009	0.120	0.007	0.034	0.001	-0.012	0.144
1978	0.175	0.004	0.163	0.008	0.165	0.008	0.155	0.007	0.118	0.006	0.024	0.003	-0.013	0.056
1979	0.195	0.005	0.169	0.009	0.155	0.009	0.165	0.009	0.105	0.007	0.034	0.000	-0.026	0.000
1980	0.189	0.009	0.150	0.010	0.140	0.011	0.140	0.010	0.107	0.009	0.009	0.398	-0.024	0.008
1981	0.159	0.004	0.149	0.011	0.147	0.010	0.148	0.011	0.114	0.008	0.017	0.119	-0.018	0.047
1982	0.143	0.003	0.136	0.008	0.130	0.007	0.131	0.008	0.104	0.006	-0.001	0.948	-0.027	0.000
1983	0.145	0.003	0.127	0.009	0.121	0.008	0.128	0.009	0.095	0.007	-0.003	0.700	-0.036	0.000
1984	0.154	0.003	0.128	0.008	0.117	0.007	0.117	0.007	0.100	0.006	-0.014	0.079	-0.031	0.000
1986	0.159	0.003	0.130	0.006	0.121	0.006	0.126	0.006	0.109	0.005	-0.005	0.423	-0.022	0.000
1987	0.165	0.003	0.133	0.008	0.119	0.007	0.118	0.007	0.115	0.006	-0.014	0.062	-0.016	0.021
1989	0.139	0.002	0.141	0.003	0.134	0.003	0.137	0.003	0.137	0.003	0.005	0.161	0.005	0.172
1991	0.131	0.003	-	-	-	-	-	-	-	-	-	-	-	-
1993	0.186	0.003	0.168	0.005	0.171	0.005	0.161	0.004	0.156	0.004	0.030	0.000	0.025	0.000
1995	0.189	0.003	0.166	0.004	0.169	0.005	0.165	0.004	0.162	0.004	0.033	0.000	0.031	0.000
1998	0.188	0.005	0.160	0.006	0.159	0.006	0.155	0.006	0.159	0.006	0.024	0.000	0.028	0.000
2000	0.177	0.003	0.153	0.005	0.154	0.005	0.147	0.004	0.156	0.005	0.016	0.003	0.025	0.000
2002	0.193	0.005	0.177	0.007	0.169	0.007	0.162	0.006	0.180	0.007	0.031	0.000	0.048	0.000

GE1									**Counterf. 1**		**Counterf. 2**		**Diff. 1**		**Diff. 2**
	Actual figure (A)		DFL+empl. income held constant (B)		DFL+self-empl. income held constant (C)		DFL+work income held constant (D)		DFL+work + pension income held constant (E)		Counterf. 1 - base year (D-A)		Counterf. 2 - base year (E-A)	
Year	index	s.e.	index	*s.e.*	index	*s.e.*	index	*s.e.*	index	p-val	diff	p-val	diff	p-val
1977	0.190	0.007	0.190	0.016	0.179	0.016	0.169	0.015	0.128	0.012	0.040	0.009	-0.001	0.923
1978	0.178	0.007	0.171	0.012	0.175	0.012	0.161	0.011	0.128	0.010	0.032	0.009	-0.001	0.937
1979	0.195	0.009	0.173	0.010	0.160	0.011	0.166	0.010	0.108	0.008	0.037	0.001	-0.021	0.019
1980	0.230	0.021	0.182	0.021	0.174	0.022	0.169	0.020	0.135	0.018	0.040	0.056	0.006	0.753
1981	0.167	0.006	0.155	0.013	0.154	0.013	0.152	0.013	0.118	0.010	0.023	0.090	-0.011	0.353
1982	0.150	0.006	0.139	0.008	0.130	0.008	0.129	0.008	0.104	0.006	0.000	0.994	-0.025	0.001
1983	0.147	0.004	0.129	0.009	0.123	0.009	0.129	0.009	0.095	0.007	-0.001	0.961	-0.034	0.000
1984	0.155	0.004	0.130	0.008	0.119	0.008	0.118	0.008	0.100	0.007	-0.011	0.216	-0.029	0.001
1986	0.167	0.005	0.140	0.007	0.131	0.007	0.134	0.007	0.115	0.006	0.005	0.514	-0.014	0.074
1987	0.165	0.003	0.139	0.009	0.124	0.008	0.122	0.008	0.119	0.007	-0.007	0.464	-0.010	0.247
1989	0.140	0.003	0.141	0.003	0.134	0.003	0.136	0.003	0.135	0.003	0.007	0.222	0.006	0.269
1991	0.129	0.005	-	-	-	-	-	-	-	-	-	-	-	-
1993	0.172	0.003	0.161	0.004	0.164	0.004	0.156	0.004	0.152	0.004	0.027	0.000	0.023	0.000
1995	0.183	0.004	0.168	0.006	0.173	0.006	0.168	0.006	0.166	0.006	0.039	0.000	0.037	0.000
1998	0.190	0.008	0.168	0.008	0.165	0.008	0.162	0.008	0.168	0.008	0.033	0.000	0.039	0.000
2000	0.174	0.004	0.152	0.005	0.153	0.005	0.147	0.005	0.157	0.006	0.018	0.013	0.028	0.000
2002	0.186	0.005	0.170	0.007	0.165	0.007	0.158	0.006	0.176	0.007	0.029	0.000	0.047	0.000

GE2									**Counterf. 1**		**Counterf. 2**		**Diff. 1**		**Diff. 2**
	Actual figure (A)		DFL+empl. income held constant (B)		DFL+self-empl. income held constant (C)		DFL+work income held constant (D)		DFL+work + pension income held constant (E)		Counterf. 1 - base year (D-A)		Counterf. 2 - base year (E-A)	
Year	index	s.e.	index	*s.e.*	index	*s.e.*	index	*s.e.*	index	p-val	diff	p-val	diff	p-val
1977	0.258	0.021	0.268	0.045	0.260	0.047	0.234	0.040	0.174	0.030	0.080	0.057	0.021	0.530
1978	0.245	0.020	0.239	0.033	0.247	0.033	0.219	0.029	0.175	0.024	0.065	0.040	0.022	0.425
1979	0.267	0.030	0.218	0.022	0.204	0.023	0.204	0.020	0.132	0.014	0.051	0.038	-0.022	0.256
1980	0.518	0.094	0.411	0.096	0.415	0.102	0.379	0.090	0.305	0.075	0.226	0.013	0.151	0.046
1981	0.226	0.015	0.209	0.029	0.210	0.030	0.198	0.027	0.152	0.021	0.045	0.130	-0.001	0.966
1982	0.213	0.026	0.171	0.014	0.156	0.013	0.152	0.013	0.121	0.010	-0.001	0.956	-0.033	0.051
1983	0.189	0.009	0.150	0.012	0.144	0.012	0.148	0.012	0.107	0.009	-0.005	0.763	-0.046	0.005
1984	0.195	0.008	0.154	0.012	0.139	0.012	0.137	0.011	0.115	0.009	-0.017	0.339	-0.039	0.018
1986	0.267	0.022	0.192	0.016	0.181	0.016	0.182	0.015	0.153	0.013	0.028	0.158	0.000	0.984
1987	0.203	0.006	0.172	0.012	0.152	0.012	0.149	0.012	0.143	0.011	-0.004	0.824	-0.010	0.556
1989	0.168	0.006	0.169	0.007	0.159	0.006	0.162	0.007	0.161	0.007	0.009	0.561	0.007	0.631
1991	0.153	0.013	-	-	-	-	-	-	-	-	-	-	-	-
1993	0.201	0.006	0.192	0.007	0.193	0.006	0.184	0.006	0.180	0.006	0.031	0.039	0.026	0.074
1995	0.238	0.009	0.220	0.012	0.228	0.012	0.218	0.012	0.218	0.012	0.065	0.000	0.064	0.000
1998	0.280	0.027	0.248	0.026	0.241	0.026	0.234	0.025	0.249	0.027	0.081	0.004	0.095	0.002
2000	0.231	0.014	0.201	0.015	0.202	0.015	0.192	0.015	0.209	0.016	0.039	0.052	0.056	0.009
2002	0.254	0.016	0.217	0.012	0.209	0.012	0.198	0.011	0.224	0.013	0.044	0.011	0.070	0.000

Source: own calculation on SHIW-HA data

Table 4: Combining DiNardo et al. (1996) and Burtless (1999): Significance tests - Base year is 1991

Monthly employment income

Year	N	GE0	GE1	GE2	95/50	90/50	75/50	25/50	10/50	5/50
1977	2822	0.116	0.109	0.143	1.795	1.538	1.267	0.769	0.513	0.333
1978	3285	0.123	0.116	0.152	1.778	1.556	1.213	0.800	0.533	0.333
1979	3005	0.113	0.105	0.130	1.800	1.500	1.240	0.800	0.500	0.360
1980	3030	0.095	0.083	0.087	1.754	1.462	1.231	0.769	0.554	0.385
1981	4169	0.111	0.103	0.139	1.667	1.449	1.192	0.769	0.513	0.359
1982	4125	0.093	0.085	0.095	1.833	1.556	1.222	0.833	0.600	0.429
1983	4152	0.088	0.081	0.089	1.786	1.488	1.257	0.796	0.595	0.425
1984	3866	0.089	0.084	0.097	1.682	1.500	1.167	0.800	0.600	0.417
1986	7023	0.078	0.073	0.079	1.714	1.429	1.143	0.786	0.571	0.429
1987	7216	0.075	0.076	0.089	1.800	1.567	1.200	0.800	0.667	0.500
1989	7066	0.065	0.070	0.085	1.667	1.444	1.167	0.783	0.667	0.556
1991	6802	0.067	0.069	0.087	1.737	1.526	1.263	0.821	0.632	0.541
1993	6441	0.106	0.109	0.142	1.905	1.571	1.238	0.774	0.571	0.433
1995	6468	0.101	0.104	0.132	1.909	1.636	1.250	0.818	0.591	0.455
1998	5766	0.100	0.104	0.138	1.875	1.583	1.250	0.813	0.583	0.417
2000	6272	0.103	0.103	0.131	2.000	1.600	1.200	0.800	0.576	0.440
2002	5862	0.111	0.114	0.149	2.089	1.667	1.252	0.800	0.591	0.444

Monthly self-employment income

Year	N	GE0	GE1	GE2	95/50	90/50	75/50	25/50	10/50	5/50
1977	263	0.435	0.390	0.571	3.429	2.857	1.714	0.514	0.171	0.114
1978	360	0.374	0.324	0.411	2.857	2.381	1.429	0.429	0.226	0.143
1979	396	0.376	0.322	0.398	3.750	2.500	1.667	0.500	0.250	0.125
1980	314	0.421	0.382	0.506	4.320	3.200	1.920	0.480	0.240	0.192
1981	361	0.294	0.263	0.334	3.333	2.361	1.500	0.639	0.333	0.133
1982	351	0.401	0.326	0.387	3.125	2.589	1.563	0.438	0.208	0.156
1983	386	0.291	0.293	0.418	2.963	2.315	1.389	0.556	0.296	0.278
1984	369	0.315	0.282	0.343	3.333	2.500	2.000	0.600	0.400	0.200
1986	2102	0.404	0.372	0.703	3.333	2.500	1.667	0.500	0.250	0.167
1987	2032	0.307	0.280	0.379	3.030	2.424	1.515	0.606	0.364	0.218
1989	2147	0.252	0.348	1.347	2.804	2.138	1.521	0.667	0.481	0.389
1991	1490	0.173	0.193	0.301	2.500	2.000	1.500	0.720	0.500	0.400
1993	1370	0.298	0.283	0.403	2.778	2.222	1.444	0.580	0.333	0.194
1995	1535	0.345	0.350	0.610	3.125	2.323	1.484	0.521	0.313	0.196
1998	1303	0.329	0.344	0.741	2.955	2.273	1.500	0.636	0.318	0.227
2000	1519	0.261	0.282	0.535	2.885	2.231	1.462	0.659	0.385	0.300
2002	1384	0.368	0.342	0.571	3.200	2.333	1.533	0.600	0.320	0.200

Monthly pension income

Year	N	GE0	GE1	GE2	95/50	90/50	75/50	25/50	10/50	5/50
1977	1804	0.199	0.254	0.486	3.448	2.759	1.667	0.874	0.743	0.632
1978	1716	0.205	0.284	0.748	3.321	2.847	1.708	0.939	0.769	0.617
1979	1595	0.186	0.229	0.444	3.462	2.698	1.769	0.862	0.769	0.615
1980	1773	0.181	0.188	0.234	3.432	2.790	1.775	0.832	0.692	0.592
1981	2441	0.201	0.275	0.886	3.062	2.591	1.790	0.871	0.707	0.565
1982	2254	0.132	0.139	0.169	2.800	2.400	1.600	0.880	0.720	0.600
1983	2385	0.128	0.133	0.156	2.700	2.333	1.667	0.833	0.667	0.593
1984	2337	0.127	0.134	0.165	2.571	2.286	1.714	0.814	0.714	0.571
1986	4537	0.133	0.137	0.183	2.467	2.189	1.667	0.778	0.667	0.533
1987	4239	0.115	0.114	0.129	2.166	1.805	1.444	0.722	0.614	0.505
1989	4558	0.120	0.120	0.135	2.176	1.838	1.357	0.679	0.588	0.441
1991	5030	0.130	0.131	0.154	2.400	2.000	1.477	0.733	0.613	0.492
1993	5717	0.155	0.160	0.207	2.632	2.237	1.579	0.787	0.632	0.431
1995	5773	0.155	0.158	0.190	2.636	2.221	1.604	0.719	0.630	0.424
1998	4705	0.161	0.165	0.211	2.338	2.014	1.496	0.655	0.561	0.388
2000	5444	0.147	0.153	0.194	2.320	1.976	1.460	0.644	0.571	0.476
2002	5713	0.133	0.135	0.160	2.239	1.940	1.463	0.716	0.572	0.500

Source: own calculation on SHIW-HA

Table 5: Inequality by different types of income

year	N	GE0	GE1	GE2	95/50	90/50	75/50	25/50	10/50	5/50
1977	2915	0.206	0.201	0.268	2.506	2.102	1.489	0.658	0.425	0.296
1978	3044	0.196	0.185	0.233	2.499	2.051	1.491	0.709	0.444	0.286
1979	2886	0.200	0.199	0.270	2.523	2.041	1.502	0.686	0.407	0.298
1980	2980	0.213	0.248	0.559	2.443	1.993	1.461	0.689	0.453	0.304
1981	4091	0.175	0.174	0.230	2.336	1.961	1.436	0.704	0.478	0.349
1982	3967	0.150	0.145	0.169	2.309	1.929	1.429	0.703	0.496	0.371
1983	4107	0.164	0.160	0.202	2.336	1.944	1.452	0.697	0.492	0.359
1984	4172	0.179	0.171	0.211	2.395	1.963	1.444	0.681	0.472	0.321
1986	8022	0.154	0.160	0.236	2.285	1.929	1.458	0.687	0.486	0.391
1987	8027	0.175	0.169	0.201	2.485	2.043	1.484	0.673	0.477	0.348
1989	8274	0.138	0.139	0.167	2.269	1.895	1.434	0.691	0.505	0.435
1991	8188	0.132	0.129	0.151	2.140	1.817	1.396	0.670	0.494	0.423
1993	8089	0.203	0.176	0.193	2.379	2.034	1.500	0.659	0.419	0.251
1995	8135	0.206	0.190	0.235	2.351	1.971	1.471	0.649	0.404	0.257
1998	7147	0.176	0.170	0.234	2.309	1.909	1.438	0.675	0.450	0.322
2000	8001	0.202	0.185	0.235	2.377	1.925	1.456	0.657	0.423	0.252
2002	8011	0.219	0.197	0.256	2.445	1.977	1.458	0.651	0.424	0.286

Source: own calculation on SHIW-HA

Table 6: Inequality of equivalent household income

year	<=30 yrs		30<years<65		>=65	
	share of population	% change over 1977	share of population	% change over 1977	share of population	% change over 1977
1977	42.84	100.00	44.79	100.00	12.36	100.00
1978	42.14	98.35	45.24	100.99	12.63	102.16
1979	42.39	98.94	44.73	99.85	12.88	104.20
1980	41.58	97.04	45.33	101.19	13.09	105.93
1981	44.11	102.95	42.65	95.21	13.24	107.13
1982	42.42	99.01	44.33	98.96	13.25	107.18
1983	41.43	96.69	45.52	101.63	13.05	105.56
1984	41.74	97.41	45.49	101.55	12.78	103.35
1986	41.52	96.92	45.45	101.47	13.03	105.37
1987	41.90	97.79	44.70	99.78	13.41	108.45
1989	40.96	95.61	44.96	100.37	14.08	113.87
1991	39.72	92.70	45.50	101.59	14.78	119.54
1993	39.87	93.05	44.39	99.09	15.75	127.39
1995	37.98	88.64	45.65	101.92	16.37	132.41
1998	35.85	83.67	46.50	103.80	17.66	142.83
2000	34.19	79.79	47.88	106.89	17.93	145.07
2002	32.88	76.75	49.01	109.41	18.11	146.49

Source: own calculation on SHIW-HA data

Table 7: Decomposition of the population by age groups

Year	cpl. w/ kids	cpl. no kids	sng w/ kids	sng no kids	single only	Male HH head	Female HH head
1977	58.47	21.96	5.67	4.02	9.88	11.85	88.15
1978	59.20	21.24	6.31	3.42	9.83	13.03	86.97
1979	56.92	20.72	5.57	3.37	13.42	13.72	86.28
1980	57.27	20.92	6.07	3.97	11.76	14.32	85.68
1981	56.82	20.48	7.13	2.77	12.80	15.18	84.82
1982	58.82	21.25	5.92	3.31	10.70	12.22	87.78
1983	57.41	21.20	5.61	3.45	12.33	14.83	85.17
1984	56.60	19.71	6.97	2.43	14.29	15.93	84.07
1986	55.40	20.45	6.50	3.13	14.52	18.19	81.81
1987	56.35	18.60	6.93	3.38	14.75	18.18	81.82
1989	52.80	19.87	6.65	3.36	17.32	19.55	80.45
1991	52.68	19.22	7.17	2.72	18.21	21.19	78.81
1993	51.22	19.25	8.15	3.85	17.53	28.06	71.94
1995	50.15	19.64	7.98	3.93	18.31	28.33	71.67
1998	47.13	20.66	7.87	3.66	20.69	28.06	71.94
2000	45.31	21.84	7.72	4.27	20.87	35.39	64.61
2002	44.47	21.25	7.22	3.76	23.29	36.62	63.38

Source: own calculation on SHIW-HA data

Table 8: Decomposition of the population by household type

year	1 comp.	2 comp.	3 comp.	4 comp.	5 comp.	6 comp.	+6 comp
1977	9.69	24.79	25.39	24.00	9.79	3.92	2.42
1978	9.83	23.85	26.30	23.76	10.44	3.79	2.02
1979	13.41	23.61	23.39	23.30	9.88	4.40	2.02
1980	11.79	25.43	24.98	21.81	10.38	3.62	1.99
1981	12.79	24.57	24.58	23.26	9.45	3.46	1.90
1982	10.36	25.49	24.24	23.91	10.70	3.58	1.72
1983	12.33	24.96	23.94	24.50	9.72	2.84	1.71
1984	14.29	23.97	25.19	22.85	9.29	2.95	1.46
1986	14.52	24.54	23.95	23.51	9.33	3.01	1.13
1987	14.75	23.76	23.78	25.20	8.71	2.81	0.99
1989	17.32	24.82	23.71	23.14	7.45	2.77	0.80
1991	18.21	23.70	23.86	23.57	7.41	2.41	0.83
1993	17.53	24.64	23.53	23.60	7.61	2.19	0.91
1995	18.31	25.41	23.47	22.89	7.41	1.81	0.70
1998	20.69	26.79	23.12	21.17	6.16	1.64	0.44
2000	20.87	28.05	22.52	20.78	5.84	1.55	0.41
2002	23.29	26.64	21.65	20.94	5.81	1.30	0.36

Source: own calculation on SHIW-HA data

Table 9: Decomposition of the population by number of components

	Total LFP (15<=age<=65)		Male LFP (15<=age<=65)		Female LFP (15<=age<=65)	
year	**total**	**%**	**total**	**%**	**total**	**%**
1977	19,001,926	47.96	13,632,467	71.00	5,369,459	26.29
1978	19,320,148	48.81	13,734,539	71.22	5,585,609	27.52
1979	20,001,780	50.40	13,977,113	71.45	6,024,667	29.94
1980	19,982,596	49.92	13,550,073	69.16	6,432,524	31.48
1981	19,785,052	50.41	13,498,501	70.83	6,286,551	31.14
1982	19,596,790	48.05	13,536,734	67.51	6,060,056	29.23
1983	20,033,704	48.47	13,994,871	68.72	6,038,833	28.80
1984	19,943,482	50.22	13,771,345	70.49	6,172,137	30.60
1986	19,515,058	49.29	13,358,236	68.32	6,156,822	30.72
1987	19,457,800	48.95	13,300,863	68.01	6,156,937	30.50
1989	20,833,356	52.15	13,610,119	69.39	7,223,236	35.52
1991	21,253,860	53.04	13,471,090	67.85	7,782,770	38.49
1993	20,384,560	51.95	13,053,577	67.23	7,330,983	36.98
1995	20,823,546	52.61	13,058,148	66.53	7,765,398	38.92
1998	20,750,084	53.03	12,879,276	66.84	7,870,809	39.64
2000	21,183,196	54.00	13,248,912	67.90	7,934,283	40.24
2002	21,863,676	55.96	13,476,601	69.21	8,387,076	42.80

Source: own calculation on SHIW-HA data

Table 10: Labor force participation: Total, by sex, by age