

# Lifetime Income Inequality: quantile treatment effect of retirement on the distribution of lifetime income.

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### Abstract

This study attempts to estimate the causal effect of staying longer in the labor force on the distribution of lifetime income and to assess its consequences for the overall inequality in lifetime resources. Results in a cross-national setting are estimated through Local Quantile Treatment Effect estimator by Abadie, Angrist and Imbens (2002), and are confronted with the Instrumental Variables Quantile Regression by Chernozukov and Hansen (2005). These results clearly suggest heterogenous effects across the distribution, negative at the bottom tail, increasing in magnitude across the quantiles. Such a picture points towards a conclusion that postponing retirement to older ages exacerbates the overall income inequality.

## Introduction

One of the implications of the Permanent Income Hypothesis (PIH) is that reducing the share of income that is transferred through Social Security Systems increases life cycle inequality. As explained by Deaton et al. (2002) the mechanism of redistribution in income caused by changes in social security settings relies on the fact that any entitlement program acts as an insurance instrument which pools the earnings risk, limiting evolution of economic inequality over the life-cycle and consequently reducing inequality in lifetime resources. Human Capital Earnings Function (HCEF) evidences fanning out of earnings profiles across education groups as the cohort ages, suggesting that extending working lives is supposed to impact differently individual earnings paths at different income levels. Deaton and Paxon (1994) states explicitly that within the PIH framework "disparities in earnings between groups with different schooling levels grow in retirement age".

Public pension systems are typical examples of social insurance arrangements which provide substantial risk sharing over life cycle. Any changes in pension schemes affecting shares of annuities in total income are supposed to affect individual lifetime resources, altering redistribution and inequality.

Recent reforms in pension systems, enacted in most European countries, aim to extend working lives, shortening years spent in retirement, consequently reducing the period of withdrawing retirement benefits. As can be motivated from both theoretical and empirical standpoint, these changes are by far going to reshape individual income profiles, and consequently affect inequality in lifetime income. This study attempts to estimate the distributional causal effect of staying longer in the labor force on lifetime income and assess its consequences for overall inequality in lifetime resources.

## Research Questions

- What is the impact of staying longer in labor force on distribution of lifetime income ?
- What is the impact of postponing retirement age on lifetime income inequality ?

## Data and Methods

The study utilizes the data coming from the Survey of Health, Ageing and Retirement in Europe (SHARE). It focuses on 11 countries from the North (Sweden and Denmark), Central West (Austria, Belgium, France, Germany, The Netherlands, Sweden, Switzerland) and South (Spain and Italy) of Europe. Primarily used sample in this study is the second wave and SHARELIFE. The main advantage of using SHARE data in this study is richness of information about lifetime employment histories and labor force transitions allowing estimating individual lifetime income profiles.

The measure of lifetime income adopted in this study includes lifetime earnings from work and work-related retirement pensions from the public pension systems. It is represented by the formula:

$$Y_i = \sum_{t=1}^{R_i} s_{t+1} \omega_t W_{it} + \sum_{R_i+1}^{110} s_{t+1} \omega_t P_{it}$$

where:  $Y_i$  - total lifetime income,  $W_{it}$  - lifetime earnings from work at age  $t$ ,  $P_{it}$  - lifetime retirement pension at age  $t$ ,  $R_i$  - retirement age,  $s_{t+1}$  - probability of surviving to age  $t+1$ ,  $\omega_t$  - discount/capitalization rate.

### Model specification

Specification of the model in a cross-country setting is as follows:

$$Y_i = \alpha_0 + \alpha_1 R_i + \beta^\top X + \varepsilon_i \quad (1)$$

$$Q_\tau(Y_i) = \alpha_{0\tau} + \alpha_{1\tau} R_i + \beta_\tau^\top X_i \quad (2)$$

where  $Y_i$  is personal lifetime income,  $R_i$  is a binary variable taking value 1 if an individual retired exactly at age 63 or later, and 0 if an individual retired by age 62, and  $X$  contains set of country dummies.

A fundamental problem in estimating the effect of retirement age on the distribution of lifetime income casting doubt on causal interpretation of ordinary quantile regression is endogeneity, which can be motivated by *selection bias*, *omitted variable bias* and *reverse causality* concerns.

### Identification

Identification strategy adopted relies on instrumental variables techniques, embeded in quantile regression framework presented by Abadie, Angrist & Imbens (2002) (LQTE) and Chernozukov & Hansen (2005) (QIV-ChH).

It exploits as instruments cohort specific legislated early and normal retirement ages differenced with the actual age of respondents in the year of the interview. Specifically,

$$\begin{cases} Z=1, & \text{if } A_i - \text{leg}_{ER} \geq 3 \\ Z=0, & \text{if } A_i - \text{leg}_{ER} < 3, \end{cases}$$

where  $A_i$  is the actual age as of the year of the interview, and  $\text{leg}_{ER}$  is the earliest legal retirement age in force in the year of retirement. The instrument adopted is supposed to be a good instrument, successfully satisfying exclusion restriction and first-stage condition.

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## Results

The starting point of the discussion is ordinary least squares (OLS) followed by the ordinary quantile regression model (QR). Then there are depicted results obtained through two quantile instrumental variable techniques, representing causal effects of interest.



Figure 1: Ordinary Least Squares Estimates vs. Quantile Regression.

Coefficient of interest from OLS suggests positive association between staying longer in the workforce and lifetime income. However, decomposing this effect to specific quantiles of the distribution there is clearly visible location-scale association between working longer and lifetime income. Shifting down the bottom quantile of the distribution while raising the top suggests that postponing retirement to higher age exacerbate the overall lifetime income inequality.

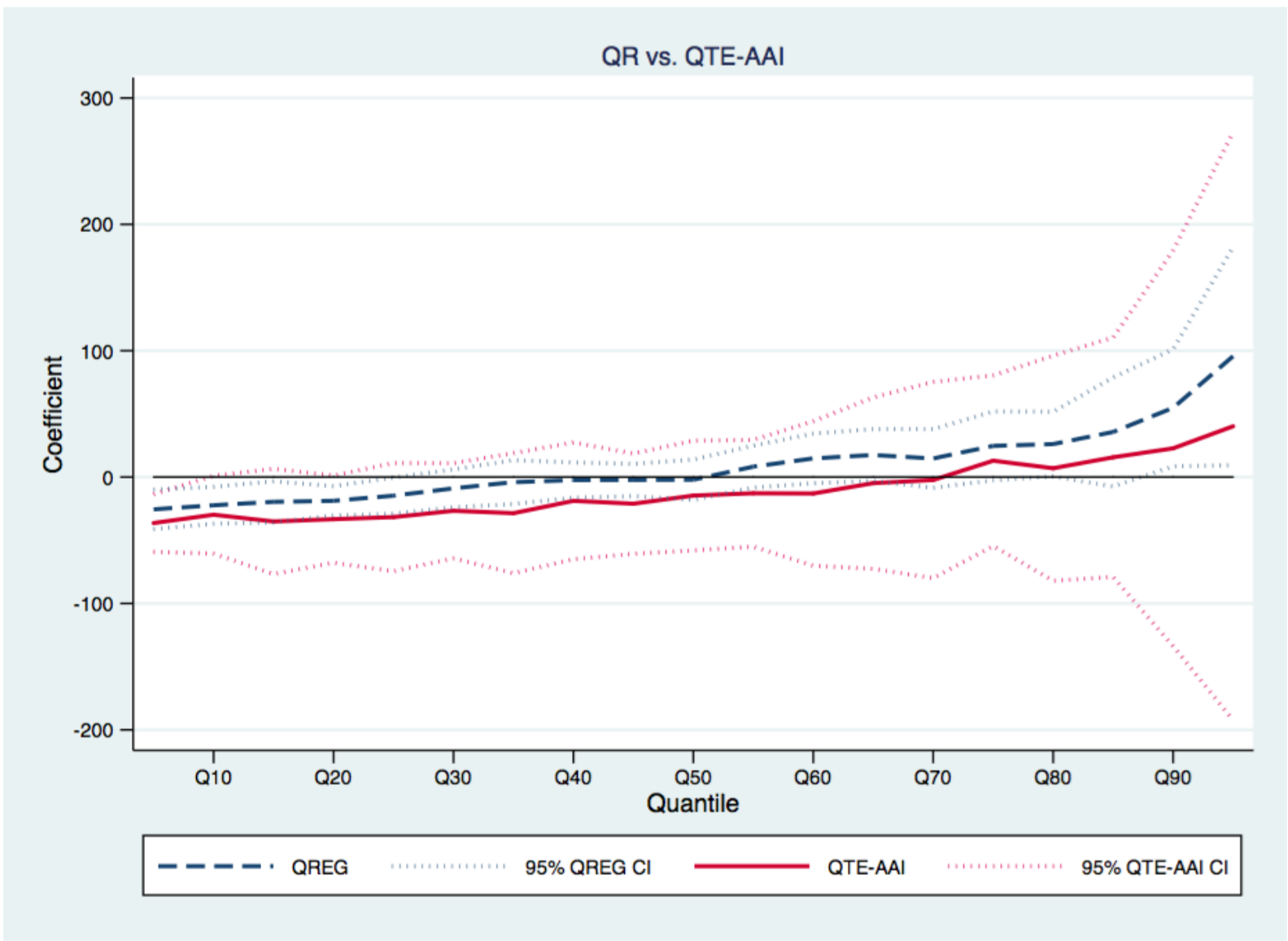


Figure 2: Quantile Regression vs. Quantile Treatment Effect (AAI).

Likewise the previously reported QR estimates, LQTE coefficient are negative at the lower tail, increasing throughout the distribution, revealing clearly upward trend. The upward sloping curve implies a conclusion that, (in the population of compliers), staying longer in the workforce has

redistributive effect on lifetime income, which in turn suggests increase in the overall inequality of lifetime income.

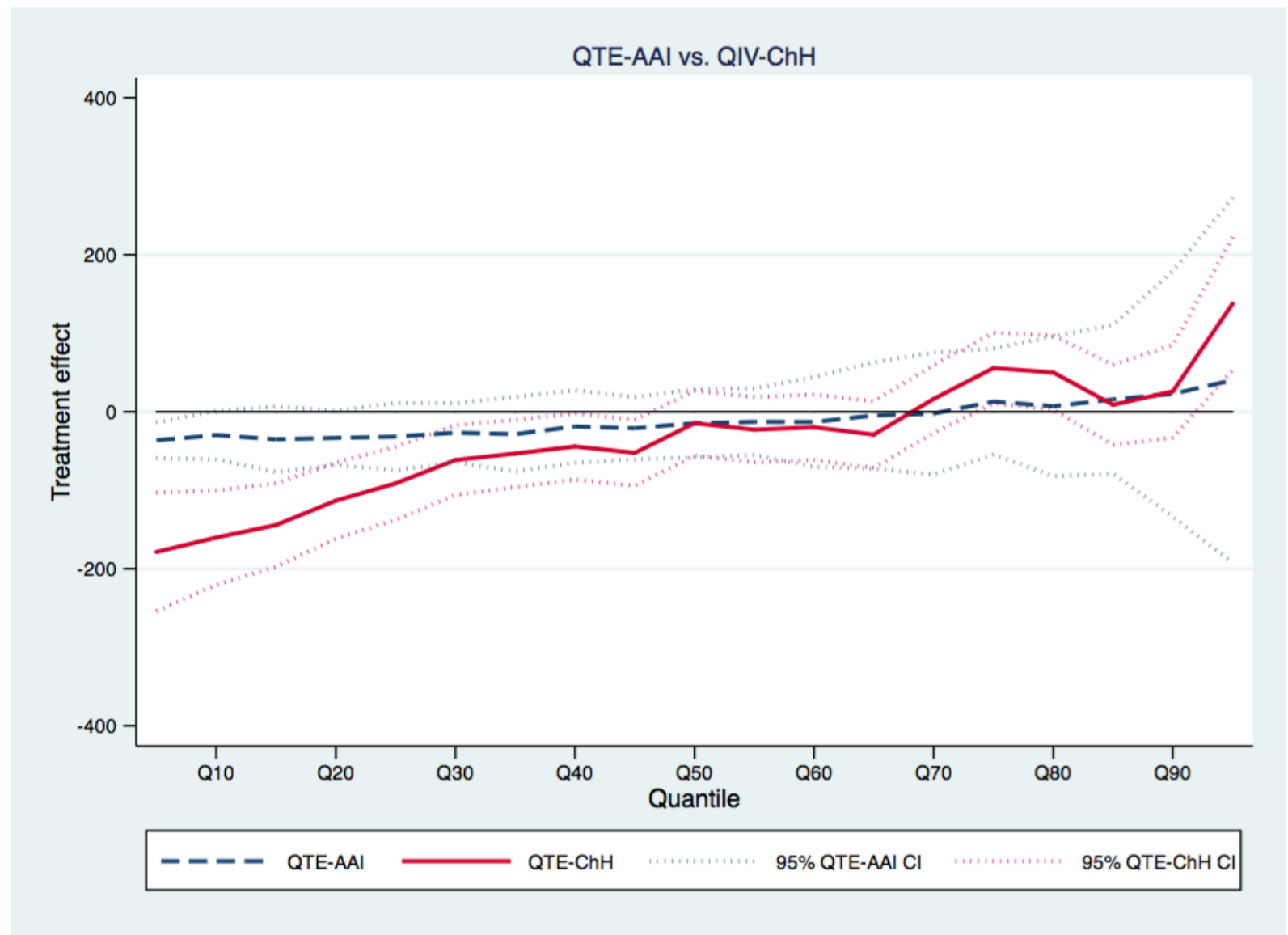


Figure 3: Quantile Treatment effect by the two estimators QTE-AAI and QIV-ChH.

Confronting the estimates from LQTE with QIV-ChH reinforces the previous conclusions. The results of QIV-ChH support the upward trend of the effect throughout of the distribution. However there can be noted a difference in the magnitude of the effects with respect to LQTE. Overall, QIV-ChH lead to essentially the same conclusion as ordinary QR and LQTE that staying longer at workforce deepens the divide between individuals with the highest and the lowest lifetime resources, consequently increasing inequality in lifetime income.

Similarity of the results of LQTE and QIV-ChH yields the support for the results, reinforces the view that assumptions underlying both models are plausible, and advocates that subpopulation of compliers is a fair representation of the overall population. Several robustness checks confirm reliability of the results obtained.

## Conclusions

- Clearly heterogenous, redistributive effect of postponing retirement to later ages across the quantiles of lifetime income in the overall sample.
- Similarity of results of the two estimators (QTE-AAI and QTE-ChH) suggest that assumptions underlying both estimators are plausible.
- Subpopulation of compliers is a fair representation of the overall population.

## References

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