

# Demographic change, migration and labor mobility

## Challenges for taxes, pensions and transfers

based on a paper with  
Peter Haan (DIW Berlin and Free University Berlin)  
Daniel Kemptner (DIW Berlin) and  
Victoria Prowse (Department of Economics, Cornell)

# Introduction: Motivation

- The demographic change, migration and labor mobility poses numerous challenges for taxes, pensions and transfers
  - Sustainability of social security and transfer programmes.
  - The redistributive and the insurance function of taxes, pensions and transfers becomes more important.
- In general the design of taxes, pensions and transfers is analyzed with a focus on the redistributive and the insurance effects on *annual income*.
- In this paper we argue that is important to focus as well on the redistributive and the insurance effects of *lifetime income* to analyze the role of taxes, pensions and transfers.

# Why is lifetime analysis important?

- Redistributive function of taxes, pensions, transfers:
  - Focus on the effect on *between-endowment-group* inequalities in lifetime income
  - *Between-endowment-group* inequality of annual income includes additional sources of inequality not relevant for the redistribution function.
- Insurance function of taxes, pensions, transfers:
  - Focus on the effect of *within-endowment-group* inequalities in lifetime income
  - Individuals can not self-insure against these lifetime risks by savings and borrowing

# Empirical Strategy

- Requirements for the empirical analysis.
  - We need information about earnings, taxes, pensions and transfers in each year over the life-cycle.
  - In order to separate the insurance and redistributive functions of taxes, pensions and transfers we need information about the endowments that drive lifetime outcomes.
  - To explore how well taxes, pensions and transfer programs insure lifetime income risk we need to separate inequality due to frictions and health shocks from inequality due to preferences,
- We obtain the required information from a dynamic life-cycle model of individual behavior building on Eckstein and Wolpin (1989) which is estimated based on the data of the SOEP.

# Literature

- Lifetime inequality
  - Inequality in lifetime earnings is markedly lower than inequality in annual earnings (Kopczuk et al. (2010), Bönke et al. (2015), Bowlus and Robin (2012))
  - A large share of life time inequality is due to differences in endowments (e.g. Flinn (2002) and Huggett et al. (2011))
- Role of taxes, pensions and transfers on inequality
  - Large effects of taxes, pension and transfers on annual income (e.g. Piketty and Saez (2007) and Heathcote et al. (2010).)
  - Brewer et al. (2012) analyse the effects of taxes and family-related benefits on the inequality of lifetime income without distinguishing between redistributive and insurance effects.
- Evaluation of pensions and specific transfer programs using life-cycle models, e.g. (Conessa and Krueger (1999), Low et al, (2010), Low and Pistaferri (2014) or Haan and Prowse (2015))

# Outline

- Model, institutions and data
- Redistributive effects of taxes, pensions and transfers on lifetime inequality
- Insurance effects of taxes, pensions and transfers on lifetime inequality
- Insurance effects of taxes, pensions and transfers on lifetime inequality induced by labor market shocks

# Model: Structural versus descriptive analysis

- **Data:** Cannot study lifetime income because no individual followed for entire lifetime
  - Some admin. data sets have information on complete working lifetimes for selected cohorts
  - Individuals face different tax and transfer systems from current ones
- **Methodological:** Cannot separate inequality due to preference from inequality due to labor market frictions
  - Does not show how inequality of lifetime income is affected by frictions
  - Cannot determine how well tax and transfer programs mitigate inequality due to frictions

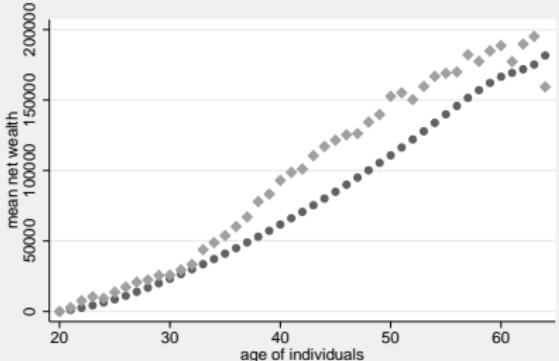
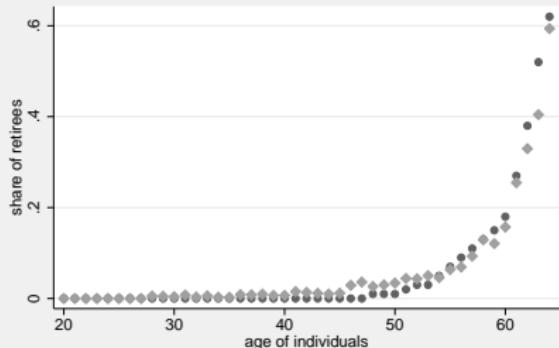
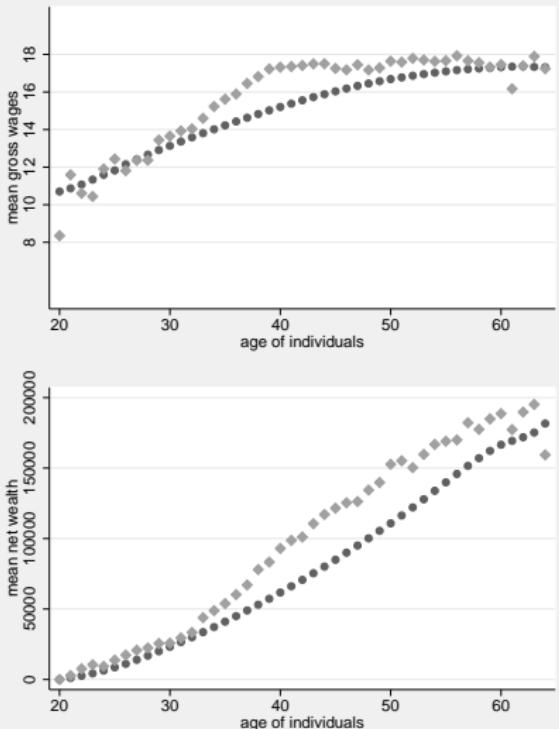
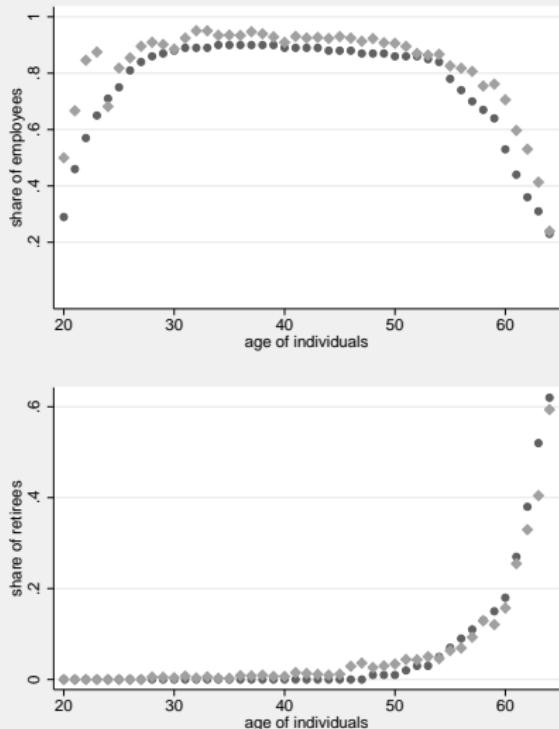
# Life-cycle model: Overview

- Labor force status and consumption of individuals
  - Labor force status: employed, retired, disability benefit claimant or nonemployed
- Four key sources of heterogeneity:
  - Individuals are endowed with human capital (education) and innate ability
  - Health status evolves stochastically over the life cycle
  - Job offers and separations arrive stochastically over the life cycle - employment shocks depends on skills and health status.
  - Stochastic preference shocks.
- Dynamic wages process with endogenous human capital accumulation
- Employment outcomes and consumption reflect individual choice subject to employment and health shocks
- Wealth reflects the accumulated effects of the individual's previous savings choices

# Overview: Taxation and Public policy programmes

- Income taxation and four different public policy programmes affect income
  - Unemployment insurance benefits (UI)
  - Social assistance benefits
  - Pension benefits
  - Disability benefits
  - Progressive income taxation and Social Security contributions
- We base our models of these programs on the public benefits system in Germany; however, the social safety net most countries contains elements of some or all of these four programs.

# Fit of the model: Employment and Wealth by age



● simulated outcome      ◆ observed outcome

# Inequality in annual and lifetime income

Table: Annual and Lifetime Inequality

	Annual - Gini	Lifetime - Gini
Earned income	0,50	0,19
Earned income plus pension income	0,39	0,19
Post-tax income	0,33	0,17
Post-tax-and-transfer income	0,26	0,15

# Policy Simulations

- Based on the estimated model we simulate lifetime incomes and decompose inequality to derive *between-endowment-group* and *within-endowment-group* inequalities.
- ① What is the redistributive function of taxes, pension and transfers?
    - Focus on *between-endowment-group* inequality
  - ② What is the insurance function of taxes, pension and transfers?
    - Focus on *within-endowment-group* inequality
  - ③ How do taxes, pension and transfers insure persistent labor market shocks
    - Focus on *within-endowment-group* inequality in different labor market scenarios

# Redistribution and Insurance functions

Table: Decomposition based on Theil Index (times 100)

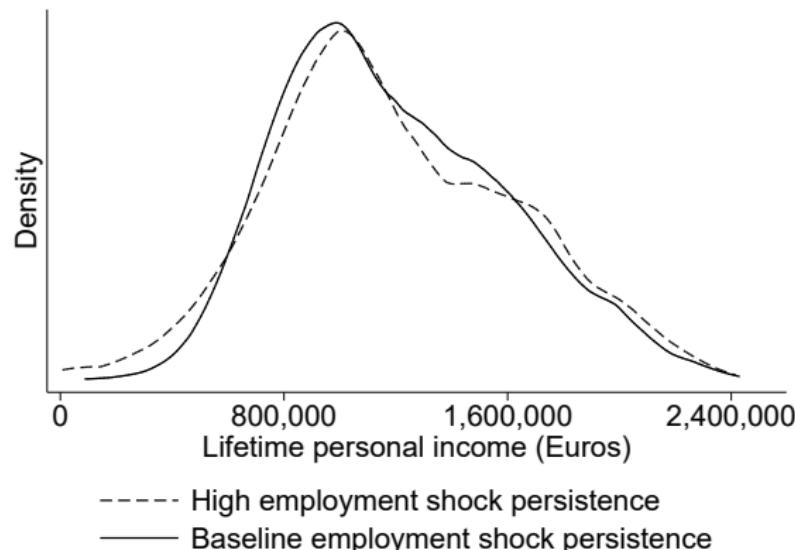
	Total inequality	Between endowment	Within endowment
Inequality of earned income	5.70	3.17	2.53
Inequality of earned income plus pension income	5.61	3.16	2.45
Inequality of post-tax income	4.40	2.12	2.29
Inequality of post-tax and transfer income	3.27	1.99	1.28
	Proportional effects		
Taxation, pensions and transfers	-0.43	-0.37	-0.49
Pensions	-0.02	0.00	-0.03
Taxation	-0.21	-0.33	-0.07
Transfers	-0.20	-0.04	-0.40
Unemployment insurance	-0.04	-0.01	-0.07
Social assistance	-0.14	-0.07	-0.24
Disability benefits	-0.02	0.04	-0.09

# Frictions and the Inequality of Lifetime Income

- How do taxes, pension and transfers insure persistent labor market shocks?
- Compare *within-endowment-group* inequality of lifetime income under:
  - ① **Baseline employment shock persistence**
    - As given by our parameter estimates
  - ② **High employment shock persistence**
    - Decreasing offer rate by 50% & decrease separation rate to keep employment rate at baseline level

# Frictions and the Inequality of Lifetime Income

- Inequality of lifetime personal income increases as labor market frictions increase



# Insurance of persistent labor market shocks

Table: Within-group inequality - Theil index (times 100)

	High persistence	Baseline persistence	Difference (high-baseline)
Earned income	4.36	2.53	1.83
Earned income plus pension income	4.30	2.45	1.85
Post-tax income	4.04	2.29	1.76
Post-tax and transfer income	1.81	1.28	0.53
	Proportional effects		
Taxation, pensions and transfers	-0.58	-0.49	-0.09
Pensions	-0.02	-0.03	0.02
Taxation	-0.06	-0.07	0.01
Transfers	-0.51	-0.40	-0.11
Unemployment insurance	-0.04	-0.07	0.03
Social assistance	-0.43	-0.24	-0.19
Disability benefits	-0.04	-0.09	0.05

# Summary

- *Between-endowment-group* and *within-endowment-group* inequalities of lifetime income are both relevant.
- Redistributive function of taxes, pension and transfers
  - Income taxation and social assistance are effective
  - Pension has no effect on redistribution of lifetime income and disability benefits poorly targeted for redistribution of lifetime income
- Insurance function of taxes, pension and transfers
  - Social assistance is most effective and to a lesser extent unemployment and disability benefits
  - Income taxation and pensions have only moderate insurance effect
- Insurance function of taxes, pension and transfers for persistent labor market shocks
  - Only social assistance provides insurance for persistent labor market shocks

# Conclusions

- For policy design it is important to consider the effects of taxes, pensions and transfers on lifetime inequality
  - Effects on annual inequality is very different
- Transfers
  - Social assistance benefits are effective for both redistribution and insurance
- Pensions:
  - Progressive pension schedule would improve redistributive and insurance function
- Taxes:
  - Redistributive and insurance function of taxes could be improved based on longer period (lifetime income) and not annual income

# Model and specification

## Utility function:

$$U(c, l, r) = (\alpha_1 + \alpha_{2\eta} \text{work}(l, r)) \times \frac{c^{(1-\rho_\eta)} - 1}{(1 - \rho_\eta)} + \varepsilon(c, l, r)$$

- $c$  is the level of consumption
- $l$  and  $r$  indicate labor supply and retirement choices
- $\rho_\eta$  is the coefficient of relative risk aversion of type  $\eta_i \in \{0, 1\}$
- $\alpha_{2\eta}$  reflects disutility of work of type  $\eta$
- $\varepsilon(c, l, r)$  follows a type 1 extreme value distribution

# Model and specification

## Value function:

$$V_t = \max_{\{c,l,r\} \in \mathbb{D}(\mathbf{s}_t)} U(c, l, r) + \beta \int_{\varepsilon} \left[ \sum_{\mathbf{s}_{t+1}} V_{t+1}(\mathbf{s}_{t+1}) q(\mathbf{s}_{t+1} | \mathbf{s}_t, c, l, r) \right] g(\boldsymbol{\varepsilon}_{t+1})$$

- $\mathbb{D}(\mathbf{s}_t)$  is the choice set available to individual n in period t. This is restricted by
  - ① eligibility rules for early retirement related to health and age
  - ② job offer and separation rates
- Beliefs about future states are captured by Markov probability function  $q(\mathbf{s}_{nt+1} | \mathbf{s}_{nt}, d_{nt})$

# Employment and health risk

## Job offer and separation rates:

$$\Gamma_{i,t}^1 = \Lambda(\phi_1 + \phi_2 \text{Educ}_i^{high} + \phi_3 \text{Health}_{i,t} + \phi_4 \text{Age}_{i,t}^{50+} + \phi_5 \text{Age}_{i,t}^{60+})$$

$$\Gamma_{i,t}^0 = \Lambda(\phi_6 + \phi_7 \text{Educ}_i^{high} + \phi_8 \text{Health}_{i,t} + \phi_9 \text{Age}_{i,t}^{50+} + \phi_{10} \text{Age}_{i,t}^{60+})$$

- Employment is restricted by job offer and separation rates
- Captures persistence in the employment status

## Health transitions:

- Age-specific transition probabilities estimated in a first stage
- Non-parametric estimates that differ by education (low/high)

# Wage process

$$\log(W_{i,t}) = \delta_1 \text{Educ}_i + (\delta_2 \text{Exper}_{i,t} + \delta_3 \text{Exper}_{i,t}^2) \times (\text{Educ}_i < 12) + \\ (\delta_4 \text{Exper}_{i,t} + \delta_5 \text{Exper}_{i,t}^2) \times (\text{Educ}_i \geq 12) + \kappa_\eta + \mu_{i,t}$$

- Work experience is an endogenous variable and individuals take into account human capital accumulation
- Correlation between  $\kappa_\eta$  and type-specific parameters of the utility function captures selection into the labor market
- $\mu_{i,t}$  is i.i.d.  $N(0, \sigma_\mu)$  and is interpreted as measurement error

# Intertemporal budget constraint

$$c = \text{Government}(\mathbf{s}_t, l, r) - \text{Savings}_t$$

$$\text{Wealth}_{t+1} = (1 + r_t)(\text{Wealth}_t + \text{Savings}_t)$$

$$\text{Wealth}_t > 0$$

- $\text{Government}(\cdot)$  is a tax-benefit function including the pension system
- $r_t$  is the real interest rate that is set to be 0.02
- Fair annuity value of net wealth is dissaved after retirement

# Institutions I

- Unemployment insurance benefits (UI)
  - UI are paid to individuals in their first year of unemployment after employment.
  - UI benefits have a value of 60% of the individual's previous post tax wage and are not means-tested.
- Social Assistance benefits (SA)
  - SA guarantees wealth-poor individuals a minimum level of income,  $\mu$ .
  - SA is means-tested against all other sources of income including unemployment benefits, pension and disability benefits.

# Institutions II

- Pension benefits
  - Pension benefits are paid to retired individuals, and are based on the age of retirement (60-65 years) and on prior earnings over the whole working life. Annual pension benefits for an individual retiring at age  $R$  are given by:

$$\text{Annual pension benefits (OAP)} = \alpha \times \text{Penalty}(R) \times \text{Exp}_R \times \overline{W}_R,$$

- There exists a guaranteed minimum pension which is similar to SA.
- Disability benefits (DB)
  - DB are paid to individuals who permanently leave the labor force due to poor health before retirement age.

## Institutions III

- The model includes three annual taxes
  - A progressive tax on earnings and pension benefits;
  - A progressive tax on capital income;
  - A Social Security tax which comprises a flat rate tax for unemployment and pension benefits and health benefits that is levied on earnings (up to a maximum amount)

# Data

- The model is estimated based on data from the SOEP, covering the years 2004 to 2012
- Sample is restricted to
  - ① males aged 20-64 years in West Germany
  - ② excluding self-employed, civil servants and people in institutions
- Final sample: 3,175 individuals and, in total, 15,968 observations
- Variables used in the analysis:
  - ① employment (full-time or non-employment) and retirement status
  - ② gross wages, work experience, years of education
  - ③ binary health status (neither assessing health as bad nor disabled)
  - ④ wealth information for years 2002, 2007, 2012 (imputation for other years based on savings information)
  - ⑤ total savings = financial savings plus real savings (left-censored)

# Fit of labor market characteristics I

fraction	Employment		Unemployment	
	simulated	observed	simulated	observed
0	10.6%	11.9%	72.1%	80.8%
<=0.25	13.2%	13.0%	81.9%	87.0%
<=0.5	19.2%	16.8%	89.8%	92.9%
<=0.75	27.5%	21.5%	94.4%	94.2%
<=1	100.0%	100.0%	100.0%	100.0%
mean	80.3%	82.8%	13.9%	10.1%
observations	9,462	3,154	9,462	3,154

# Fit of labor market characteristics II

percentiles	Gross wages		Work experience	
	simulated	observed	simulated	observed
1	€ 13,817	€ 12,962	0 years	2 years
5	€ 17,073	€ 17,302	5 years	5 years
10	€ 19,293	€ 20,250	8 years	8 years
25	€ 23,939	€ 25,583	13 years	14 years
50	€ 31,225	€ 32,377	19 years	21 years
75	€ 40,518	€ 41,890	26 years	29 years
90	€ 50,801	€ 53,388	32 years	36 years
95	€ 57,831	€ 60,789	35 years	39 years
99	€ 73,000	€ 73,846	39 years	43 years
mean	€ 33,491	€ 34,847	19.5 years	21.6 years
observations	39,189	13,812	45,509	15,048

# Validation of inequality measures

Table: Ginis of gross earnings

Sample	Own calculations		Bönke et al. (2015)
	Simulated data	Estimation sample (SOEP)	Admin. data (VSKT)
	Survey years 2005 to 2011	Cohorts 1935 to 1949	
Cross-section (no retirees)	0.286	0.272	0.262–0.336
Cross-section (with retirees)	0.323	0.31	–
Lifetime	0.186	–	0.156–0.212