Labour Income Dynamics and the Insurance from Taxes, Transfers, and the Family

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This paper:

- Explores the links between individual earnings dynamics, and individual/family disposable income dynamics over the life cycle.
- Examines the role of taxes and transfers, and spouse's labour income to smooth/attenuate shocks.

We use rich population panel data from Norway.

- Follow many birth cohorts across their working life-time

Full IFS working paper available on my webpage.

- Will also be used to model consumption and asset behaviour.

KEY QUESTIONS

The literature (references in paper) has pointed out (at least) three key ingredients in models of earnings and income dynamics:

- persistence of shocks
- age and time dependence in the variance of shocks
- heterogeneous age profiles

The paper addresses three questions:

1. How do these factors vary over the life-cycle and differ across education groups and birth cohorts?
2. To what extend does the tax and transfer system attenuate shocks to earnings?
3. What happens when we add in income sources of other family members?

WHAT WE FIND: LABOR INCOME DYNAMICS

The nature of labour income dynamics vary systematically by age, education and their interaction

More specifically:

- Variance of shocks are strongly age-dependent
  - Highly educated: high variance early in the working life
  - Low educated: high variance later in working life
- Heterogeneous trends important for high skilled at early ages
- Pooling across education groups gives the appearance of an inverse U-shaped age profile in variance of permanent shocks
- Age-independence gives the impression of less persistence
  - Especially for the high educated

WHAT WE FIND: SOURCES OF INSURANCE

The impact of taxes and transfers in Norway

- Remarkable flattening of life-cycle inequality
- Reduces persistence of shocks
- Reduces the variance of transitory and permanent shocks

After taking taxes and transfers into account:

- Spouse's income matters little for dynamics of inequality

INCOME DYNAMICS

For each birth cohort we write log-income of individual i of age a as

$$\log Y_{i,a} = \mathbb{X}'_{i,a}\varphi + \alpha_i + \beta_i(a) + v_{i,a} + \tau_{i,a}$$

$\mathbb{X}$ includes a polynomial in age and its interaction with education, dummies for region, marital status and family size and the interaction of the latter.

- $\beta_i(a)$ is an individual-specific experience profile (idiosyncratic trend)
  - Allow for correlation between α and β.
- $v_{i,a}$ is the persistent process,

$$v_{i,a} = \rho v_{i,a-1} + u_{i,a}$$

  where $u_{i,a}$ is a mean-zero shock with variance σ_a^2.
- $\tau_{i,a}$ is the transitory component assumed to follow an MA(1) process,

$$\tau_{i,a} = \varepsilon_{i,a} + \theta\varepsilon_{i,a-1}$$

  where $\varepsilon_{i,a}$ is a mean-zero shock with variance ω_a^2
- Variance components allowed to to vary with age, time and education
- Allow ρ to vary with birth cohort and education group.

Details

Note the first order autocorrelation at age a

$$\rho_a = \frac{cov(y_{i,a}, y_{i,a+1})}{\sqrt{var(y_{i,a})}\sqrt{var(y_{i,a+1})}}$$

can be expressed as

$$\rho_a \simeq \frac{var(\alpha_i) + \rho\Sigma_{s=0}^{a}\rho^{2s}var(u_{i,a-s}) + \theta var(\varepsilon_{i,a})}{var(\alpha_i) + \Sigma_{s=0}^{a}\rho^{2s}var(u_{i,a-s}) + var(\varepsilon_{i,a}) + \theta^2 var(\varepsilon_{i,a-1})}.$$

Therefore, by

- allowing the variances of each component to differ by age

  — we are in effect —

- allowing ρ_a to vary quite unrestrictedly over the life cycle.

DATA

Panel data covering the entire Norwegian population, 1967-2006

- Several linked registry databases, which gives
  - Individual demographic information (including gender, date of birth, and marital status)
  - Socioeconomic data (including years of education, market income, cash transfers)
- Family identifiers allow us to match spouses and parents to children

Income variables:

- *individual market income*: annual pre-tax earnings
- *individual disposable income*: annual earnings and cash transfers net of taxes
- *family disposable income*: pooled disposable income of spouses

▸ Household Income by Source

TAXES AND TRANSFERS

- Transfer system (including DI benefits, child benefits, etc.)
  - Since 1967, key program parameters are fairly stable over time

- Tax system (2006): Progressive through deductions and surtaxes
  - 7.8% social security contribution on labour income
  - (taxable income - deductions) is taxed at a flat rate of 28%
    - single persons/dual earner couples: 50% of standard deductions
    - two surtax brackets adding an additional 9 and 12 percent to the marginal tax rates

▸ Marginal Tax Rates 2006

  - Over time, the the Norwegian tax system has become less progressive through a series of policy changes

▸ Average Tax Rates over Time

SAMPLE SELECTION

We study income dynamics for the period 1967-2006. In each year we select males born between 1925 and 1964, who are

- between the ages of 25 and 60, and link them to their family members at any point during their working life
- non-immigrants and non-self-employed
- with non-zero earnings in at least four consecutive periods

▸ Non-participation

Applying these restrictions gives us an unbalanced panel with

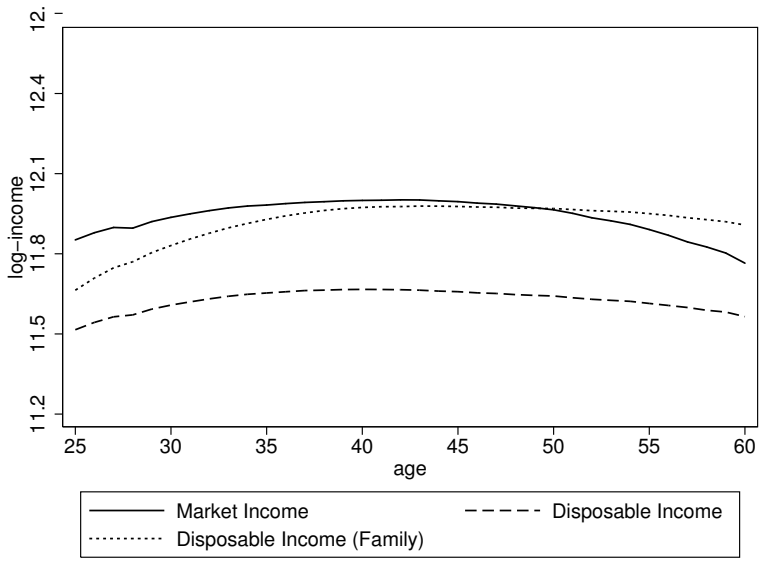
- 40 time periods
- 934,704 individuals (23,368 individuals on average per cohort)

This sample is then partitioned into three mutually exclusive groups according to educational levels

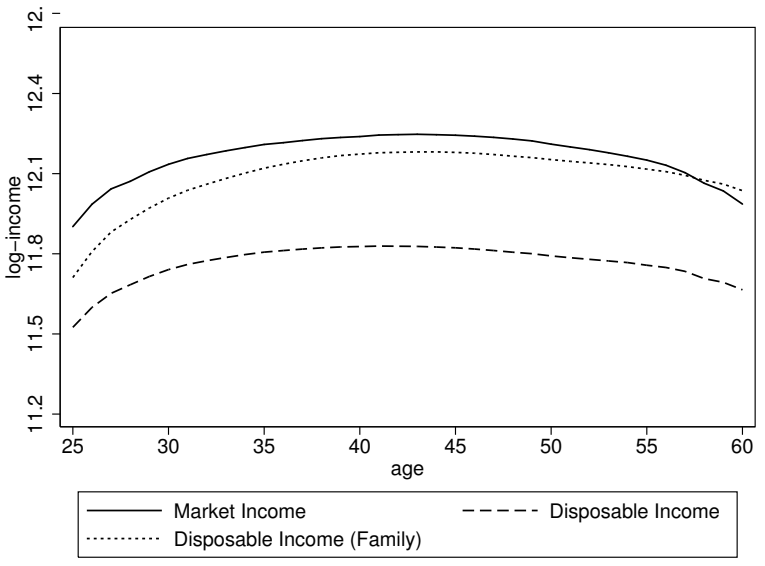
- low-skilled (32%): not having completed high school
- medium-skilled (48%): high school degree
- high - skilled (20%): attended college

▸ Participation of the Spouse ▸ Marriage Rates

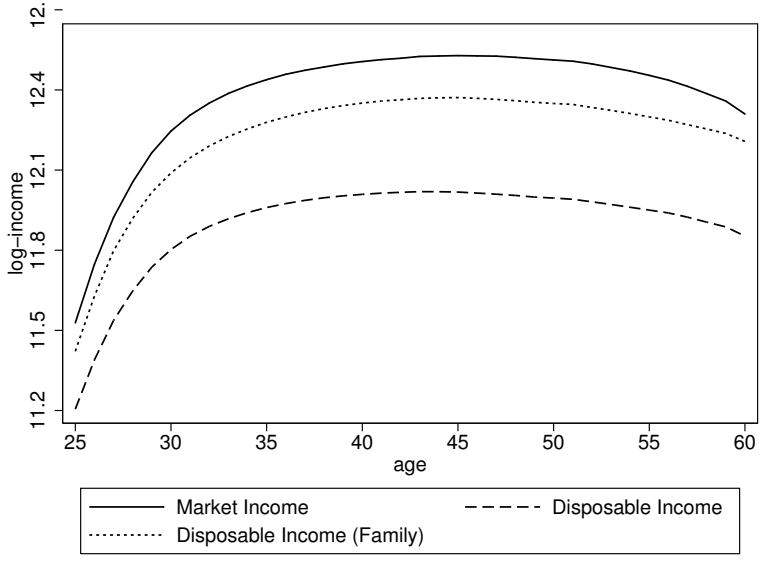
AGE PROFILES: LOG INCOME



Low-Skilled



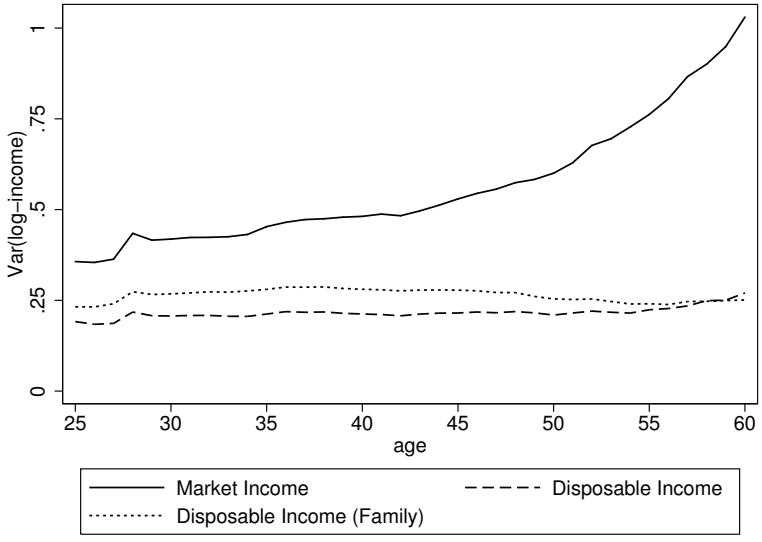
Medium-Skilled



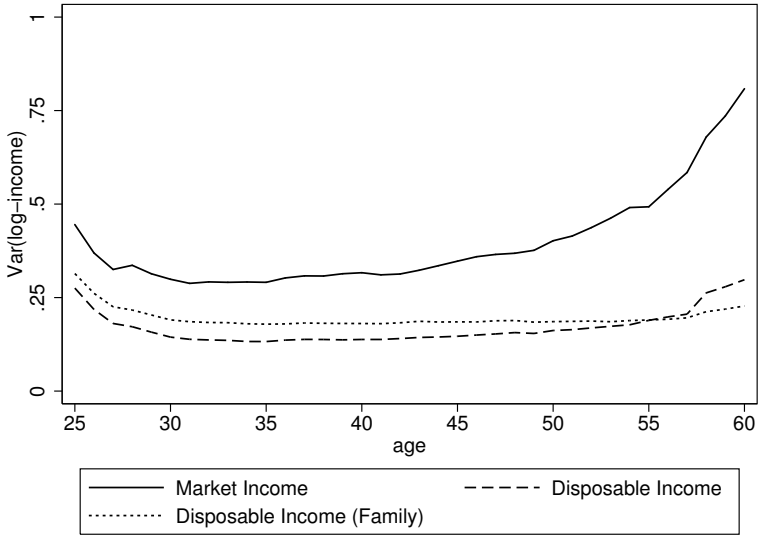
High-Skilled

- concave profile over the life-cycle
- very flat for the low-skilled, very steep for the high-skilled early in life
- progressive nature of the tax and transfer system dampens the income differentials between high skilled and low skilled after age 35.

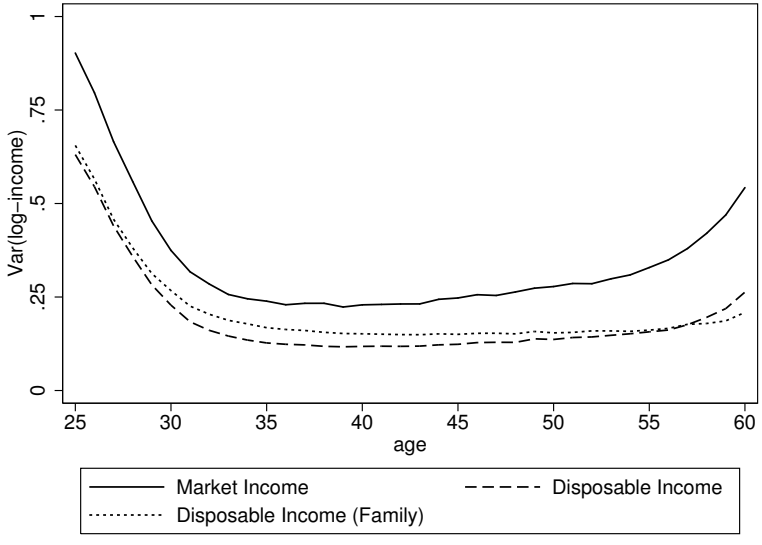
AGE PROFILES: VARIANCE OF LOG INCOME



Low-Skilled



Medium-Skilled



High-Skilled

- remarkable flattening of the increase in the variance of log-income due to the tax and transfer system especially for the low-skilled at the end of the life-cycle.

ESTIMATION RESULTS

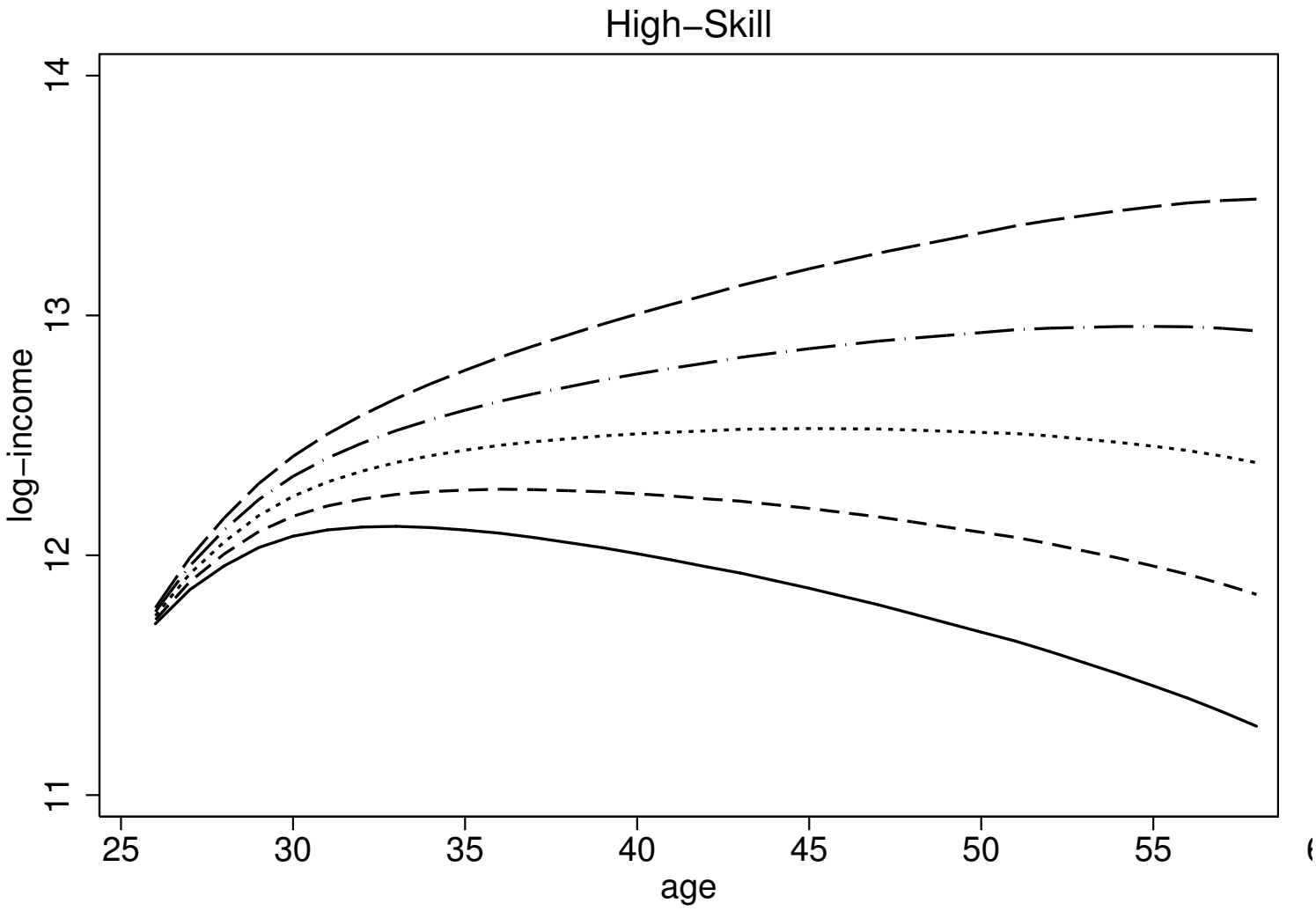
	Individual Market Income			Individual Disposable Income			Family Disposable Income		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
ρ	1.00	1.00	0.98	0.87	0.89	0.94	0.87	0.89	0.85
	(0.000000)	(0.000000)	(0.014782)	(0.005960)	(0.004498)	(0.029651)	(0.004498)	(0.004983)	(0.007761)
σ^2_α	-	-	0.000152	0.035360	0.030796	0.000447	0.034113	0.027141	0.030992
	-	-	(0.000053)	(0.001133)	(0.001172)	(0.015916)	(0.001152)	(0.000971)	(0.000783)
θ	0.238500	0.258840	0.294650	0.215220	0.238450	0.270220	0.207820	0.243650	0.278160
	(0.003749)	(0.002352)	(0.005684)	(0.005362)	(0.003666)	(0.006368)	(0.005530)	(0.003267)	(0.006856)

1. Unit root but with strong MA(1) for lower education groups - will be shown to be sensitive to restricting age-dependence in variances.
2. Taxes and transfers reduce the persistence of shocks - persistence only changes significantly for the high-skilled when move from individual disposable income to family disposable income.
3. Only find significant heterogenous profiles in labour market income for the high-skilled.

HETEROGENEOUS PROFILES

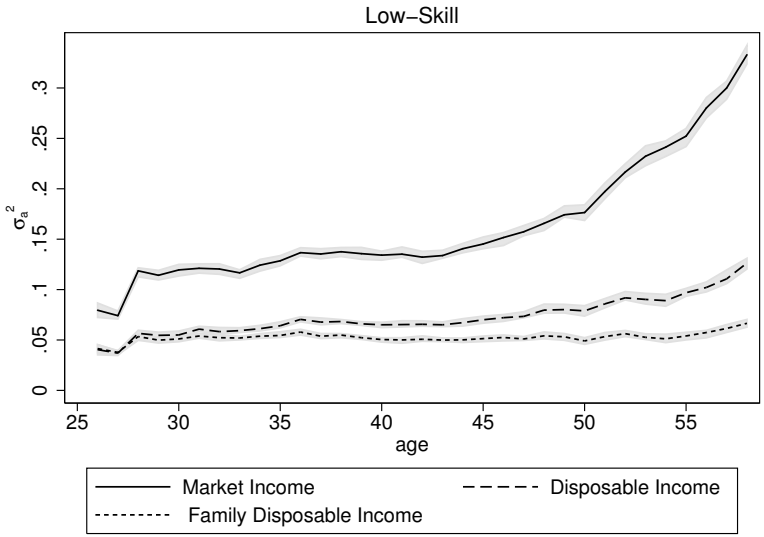
	Low-Skilled	Medium-Skilled	High-Skilled
ρ	1.00	1.00	0.90
	(0.000000)	(0.000000)	(0.047717)
σ^2_α	-	-	0.026887
	-	-	(0.049236)
σ^2_β	0.000000	0.000000	0.0002773
	(0.000000)	(0.000000)	(0.000102)
$\rho_{\alpha\beta}$	-	-	-0.998930
	-		(0.005172)
θ	0.238500	0.258830	0.293430
	(0.003749)	(0.002353)	(0.005608)

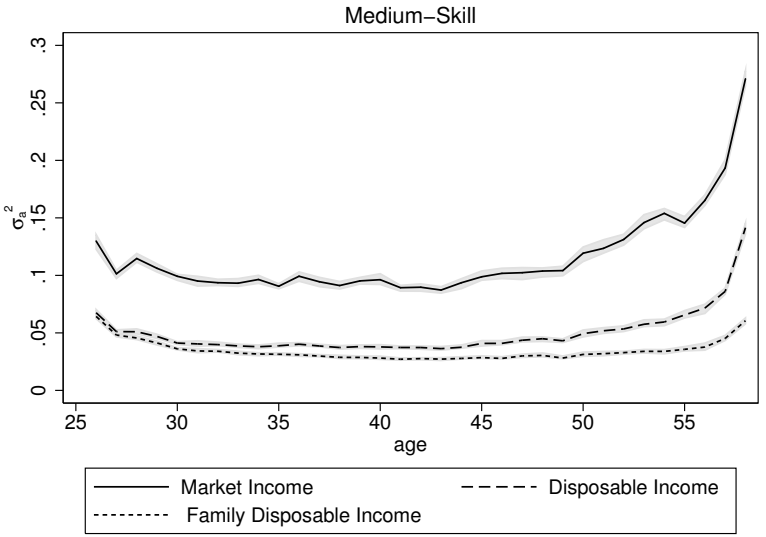
HETEROGENEOUS PROFILES

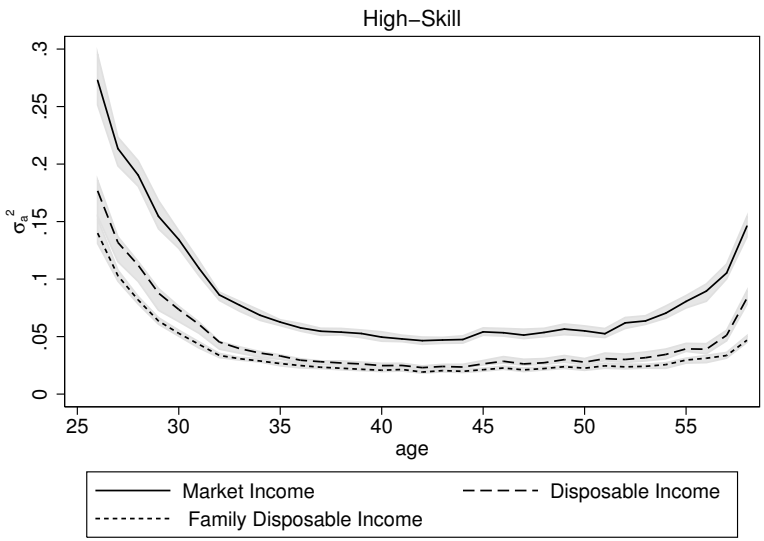


VARIANCE OF PERMANENT SHOCKS

Robustness

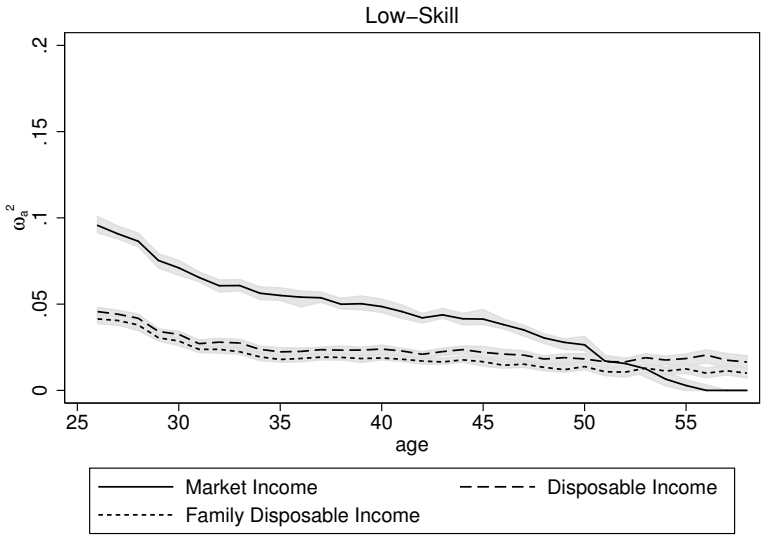


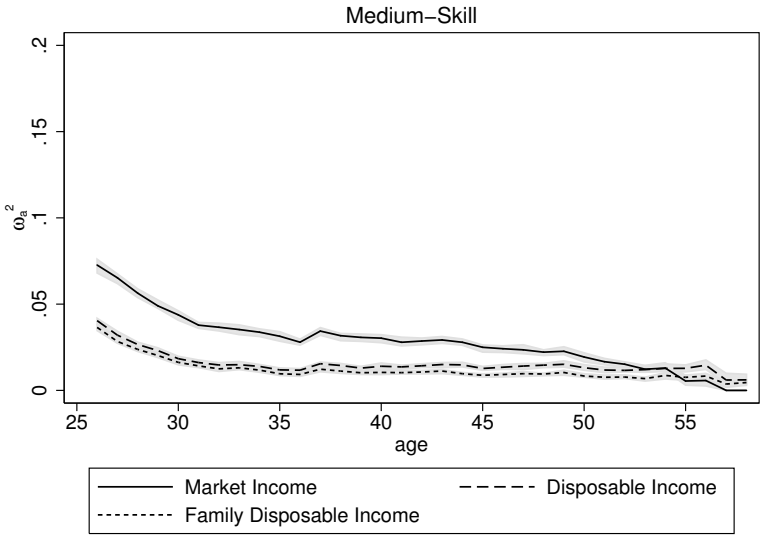


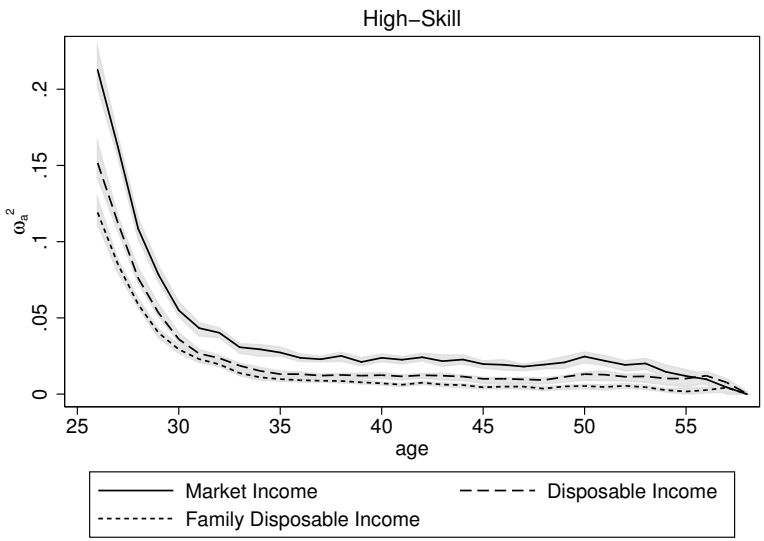


VARIANCE OF TRANSITORY SHOCKS

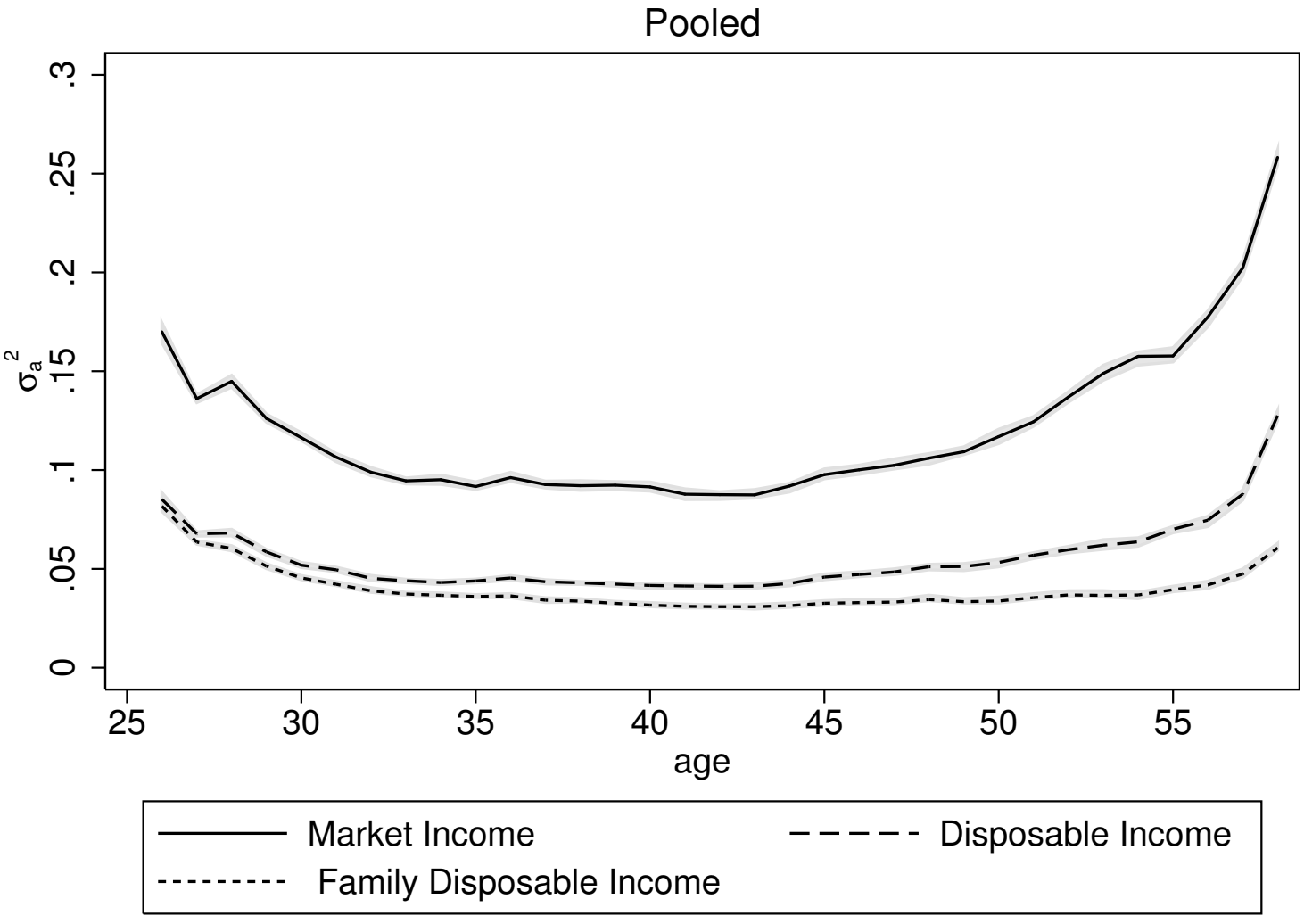
▸ Robustness



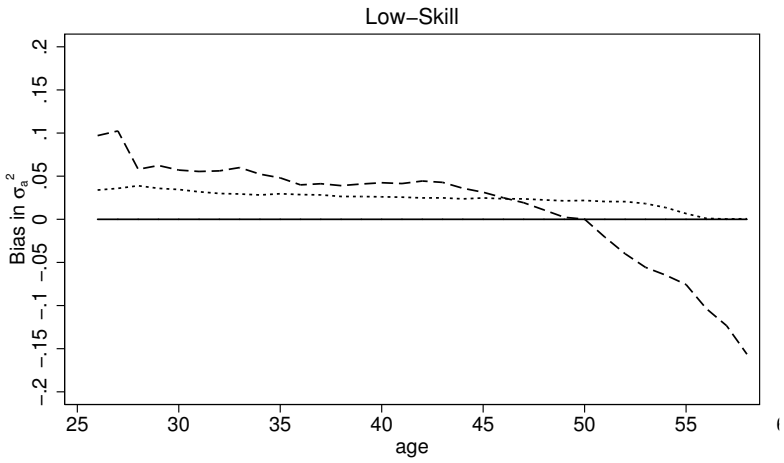


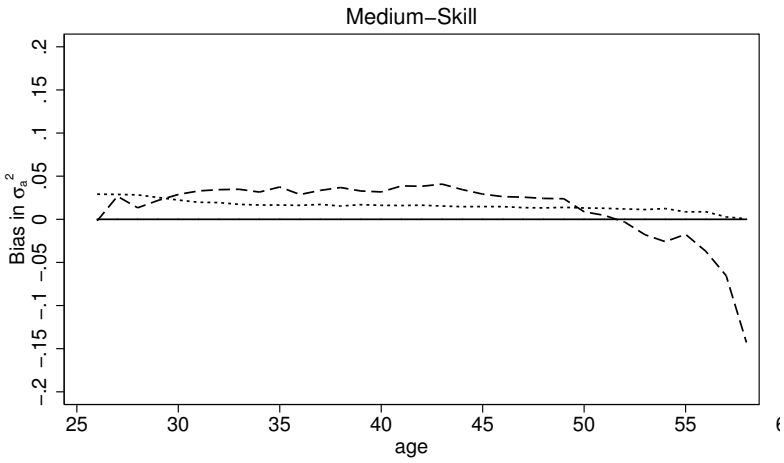


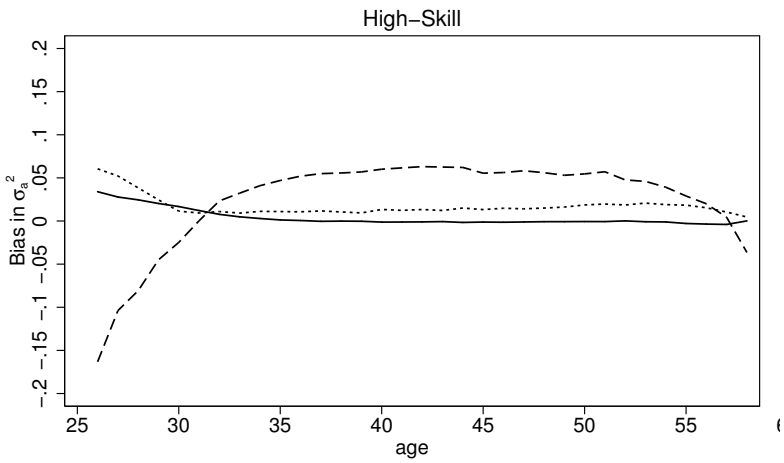
POOLING ACROSS EDUCATION GROUPS



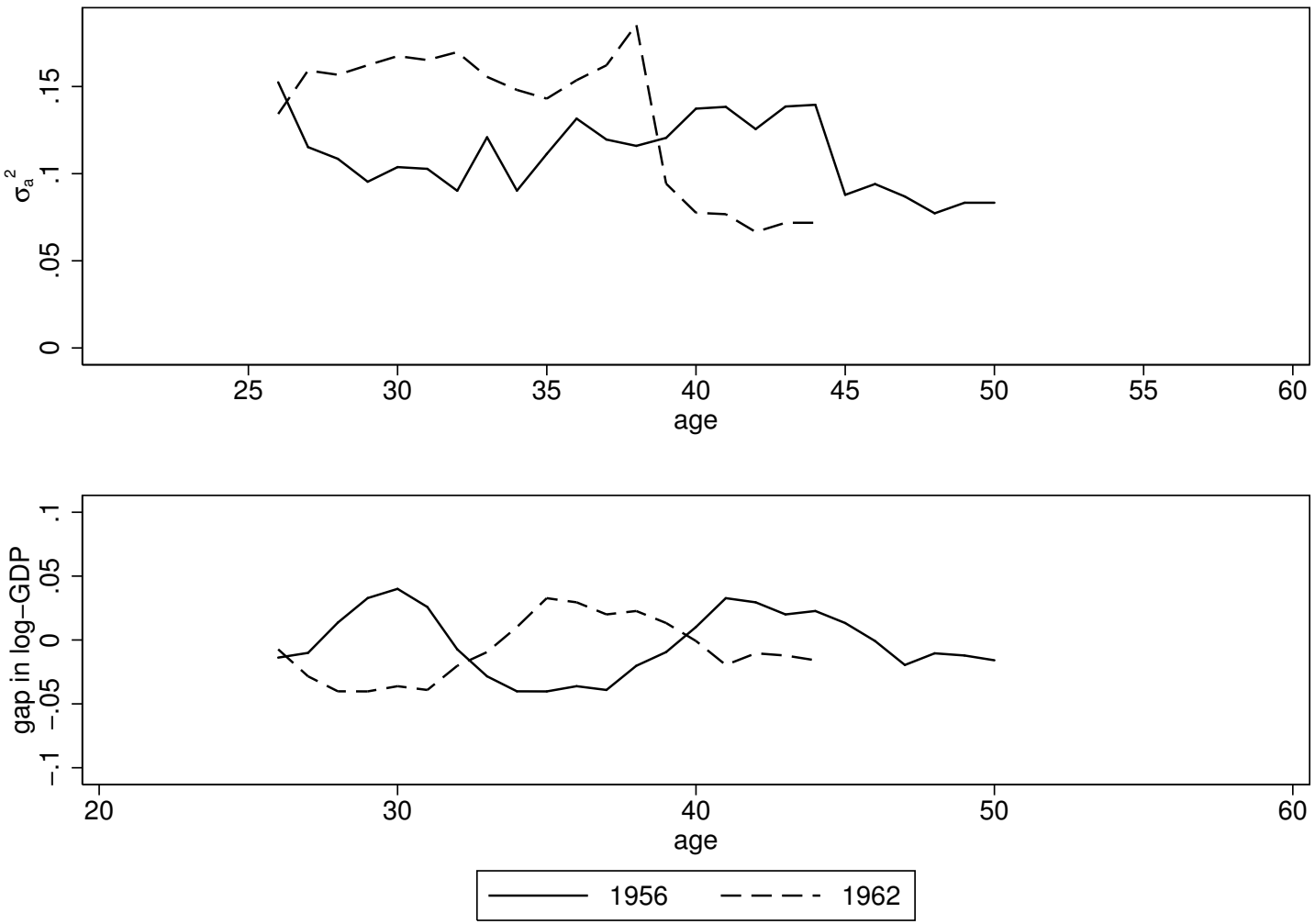
BIAS: VARIANCE OF PERMANENT SHOCKS







BUSINESS CYCLES AND AGE PROFILES



SUMMARY: LABOR INCOME DYNAMICS

The nature of labour income dynamics vary systematically by age, education and their interaction

More specifically:

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  - Highly educated: high variance early in the working life
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The impact of taxes and transfers in Norway

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Back

- The quasi-difference $\Delta^\rho y_{i,a} \equiv y_{i,a} - \rho y_{i,a-1}$ of our baseline specification (with $\beta_i = 0$) can be written as

$$\Delta^\rho y_{i,a} = \alpha_i(1-\rho) + u_{i,a} + \Delta^\rho \varepsilon_{i,a} + \theta \Delta^\rho \varepsilon_{i,a-1}, \quad a = a_{\min}+1, ..., a_{\max}, \tag{1}$$

so that the autocovariance $cov(\Delta^\rho y_{i,a}, \Delta^\rho y_{i,a+s})$ is

$$= (1-\rho)^2 \, var(\alpha_i) \begin{cases} +\sigma_a^2 + \omega_a^2 + (\theta-\rho)^2 \omega_{a-1}^2 + \theta^2\rho^2\omega_{a-2}^2 & \text{if } s=0 \\ +(\theta-\rho)\left(\omega_a^2 - \theta\rho\omega_{a-1}^2\right) & \text{if } s=1 \\ -\theta\rho\omega_a^2 & \text{if } s=2 \\ +0 & \text{if } s>2 \end{cases}.$$

- For a given ρ, we average these moments across cohorts at a given age
- We then minimize the equally weighted distance between the theoretical and empirical moments and pick the estimates associated with ρ that minimise the norm.

EXCLUDING LOW INCOMES

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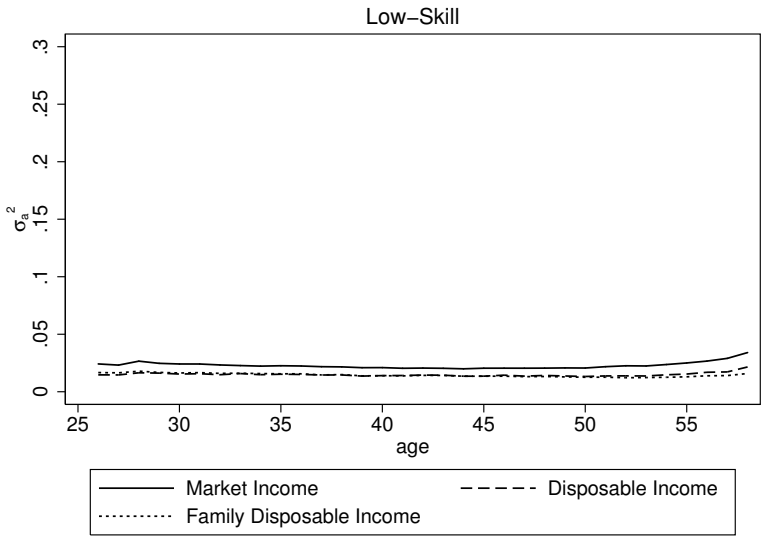

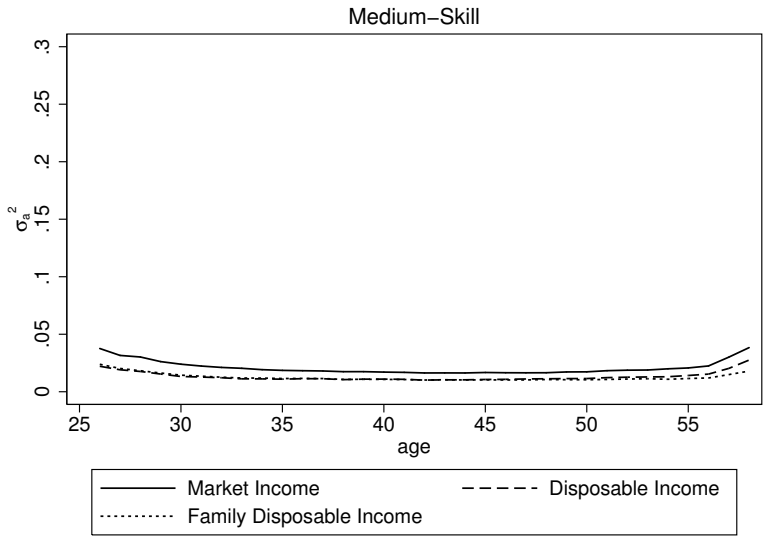

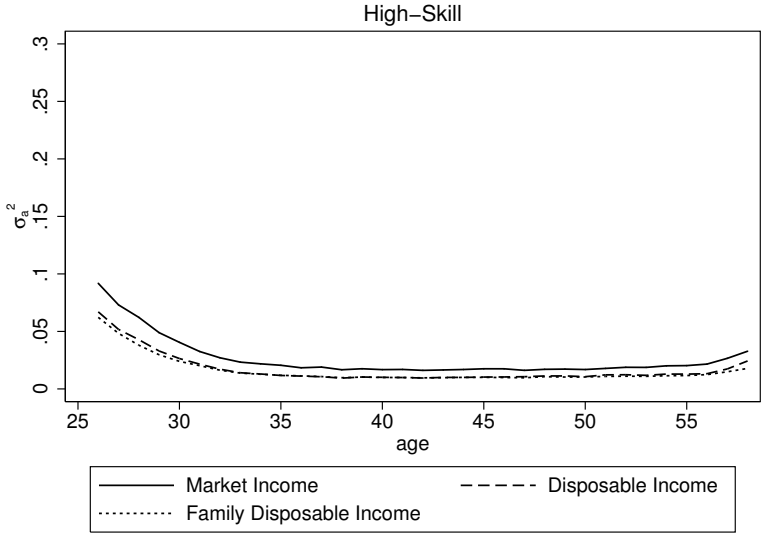

EXCLUDING LOW INCOMES

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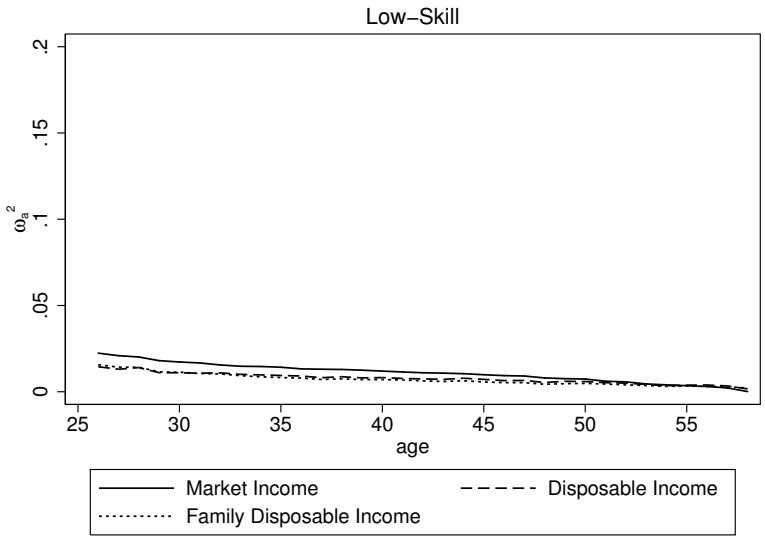

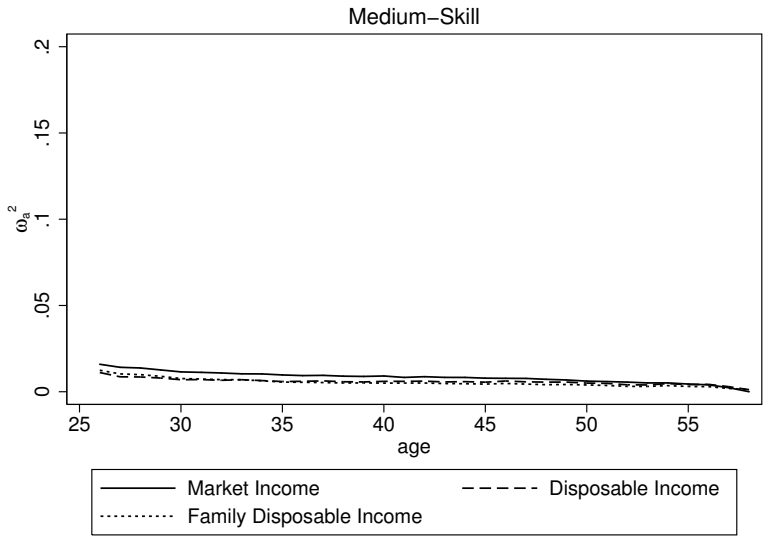

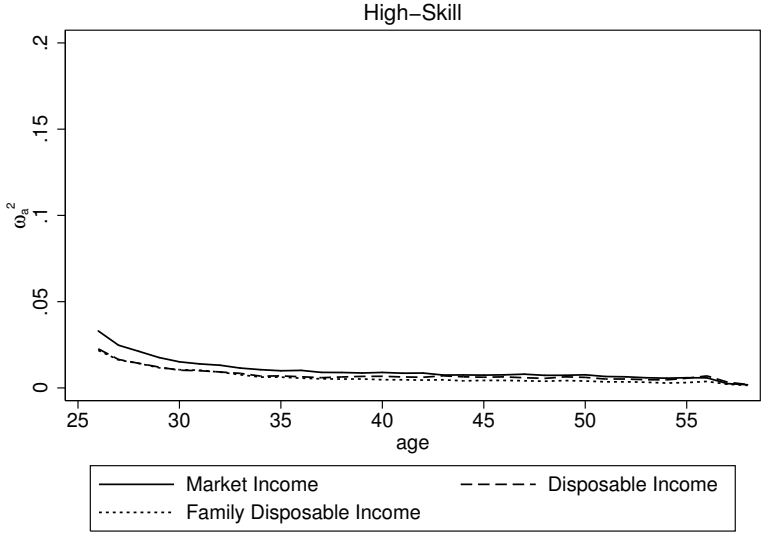

PARTICIPATION

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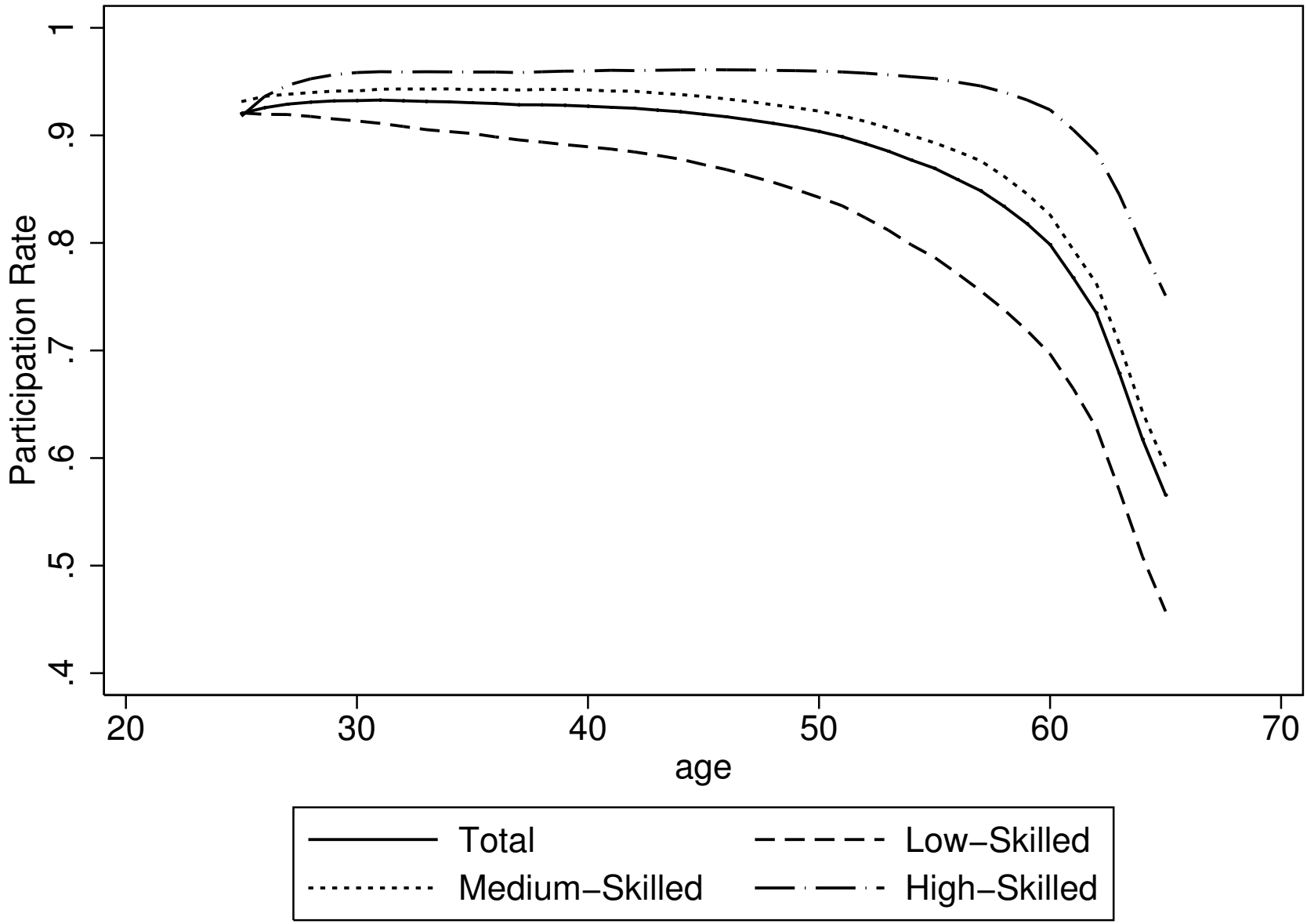
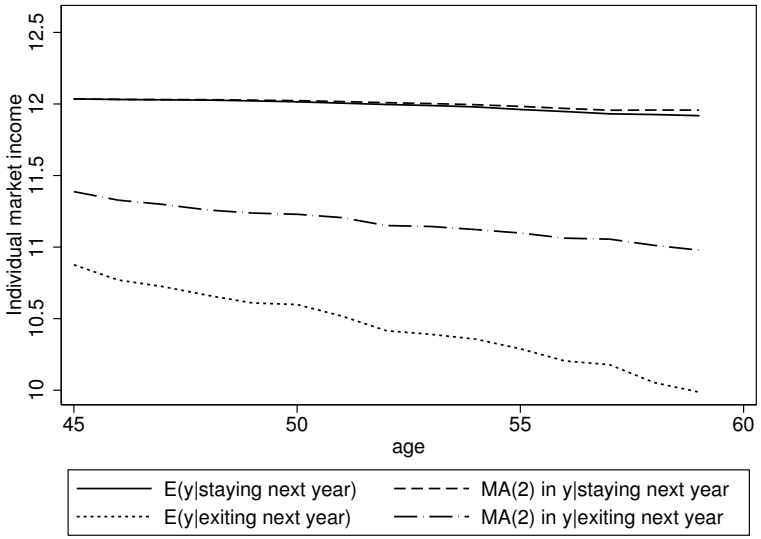
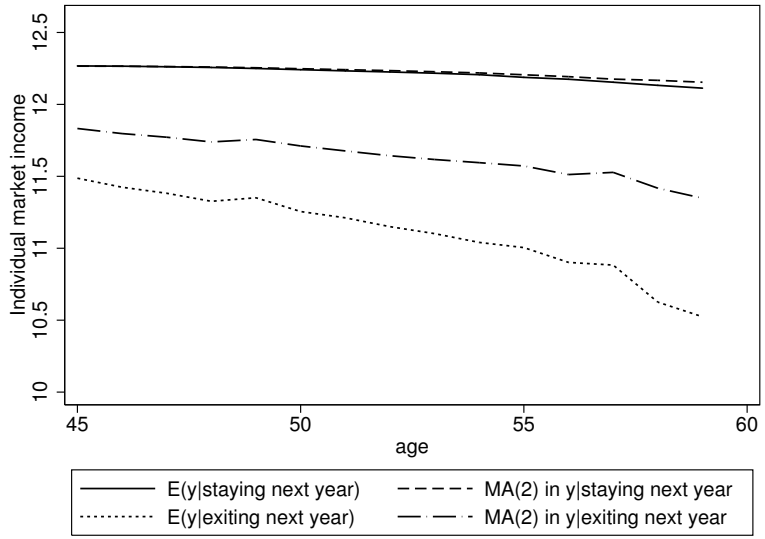


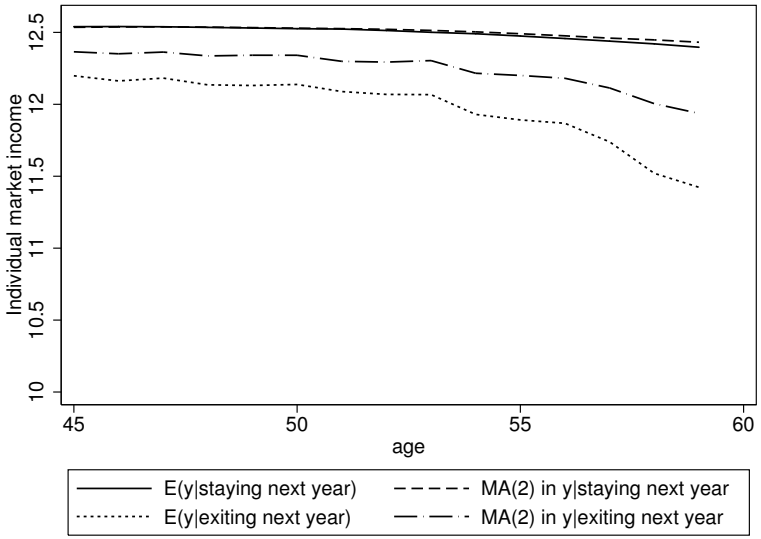
SELECTION



Low-Skilled



Medium-Skilled



High-Skilled

Participation Rates Spouse

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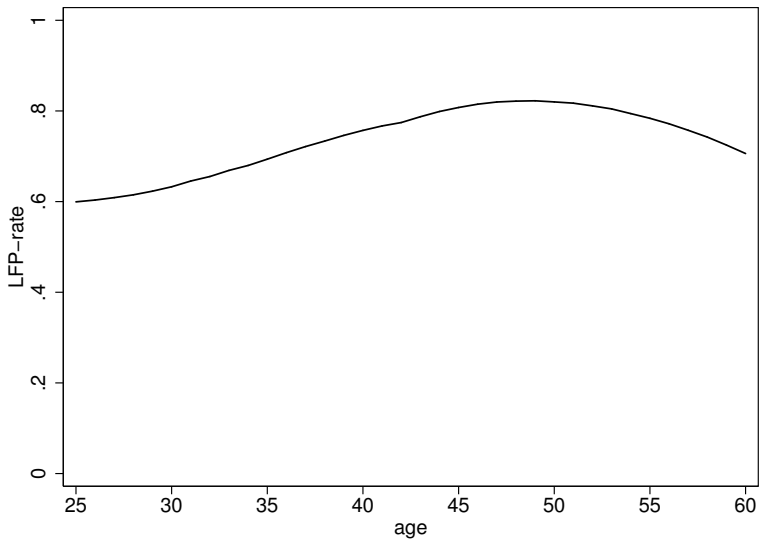
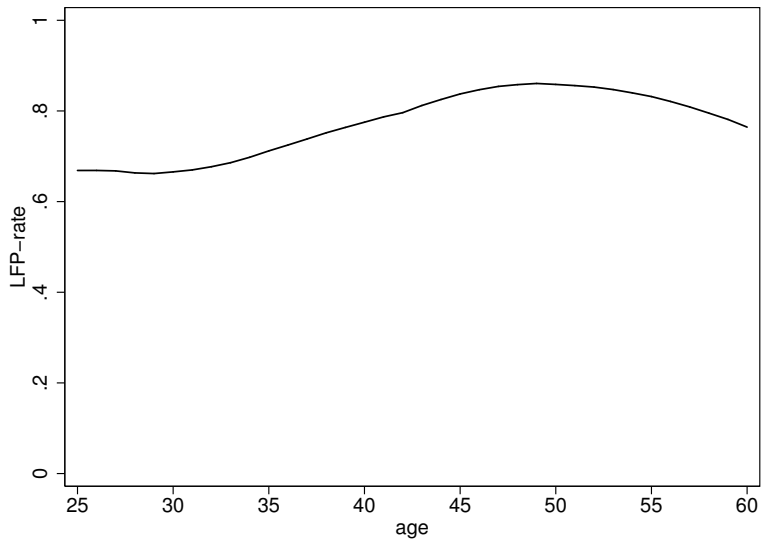
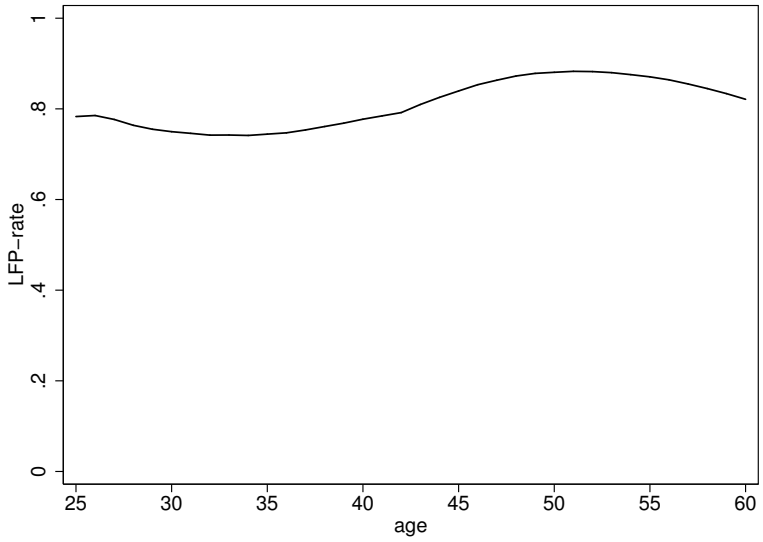


Low-Skilled



Medium-Skilled



Marriage Rates

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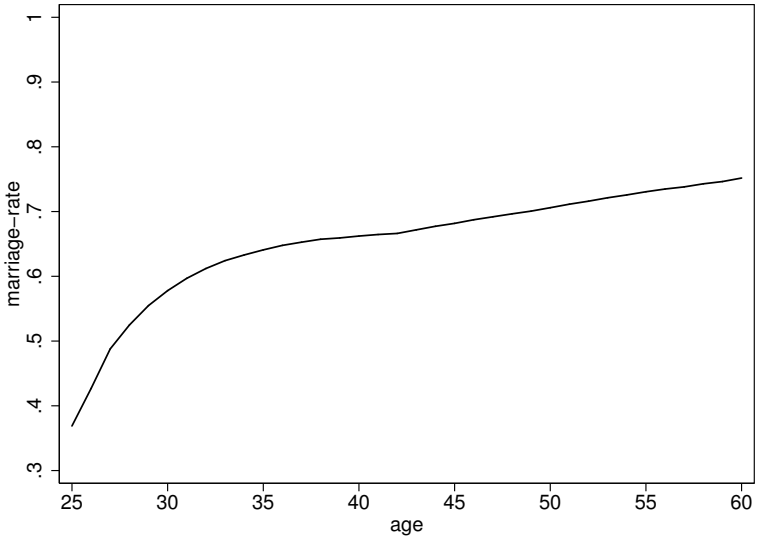
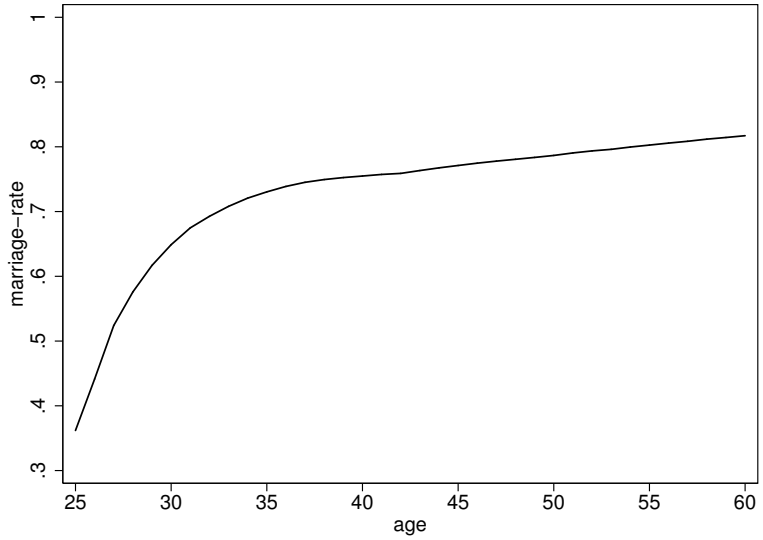
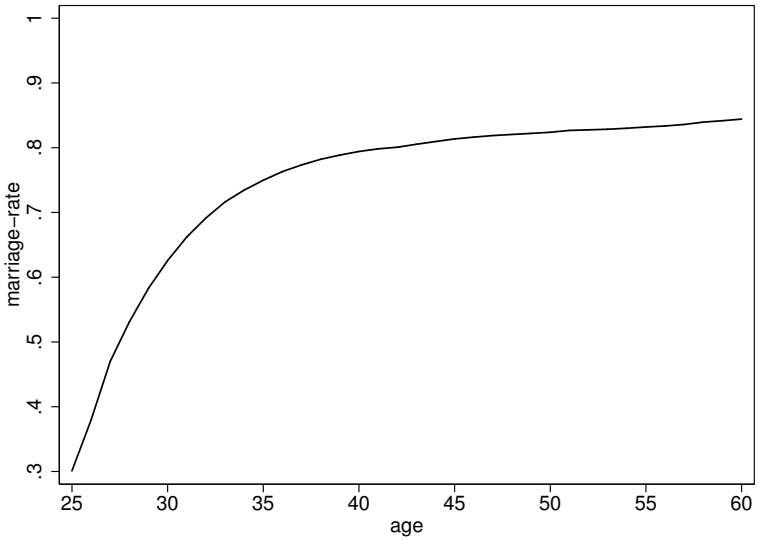


Low-Skilled



Medium-Skilled



Average Tax Rates

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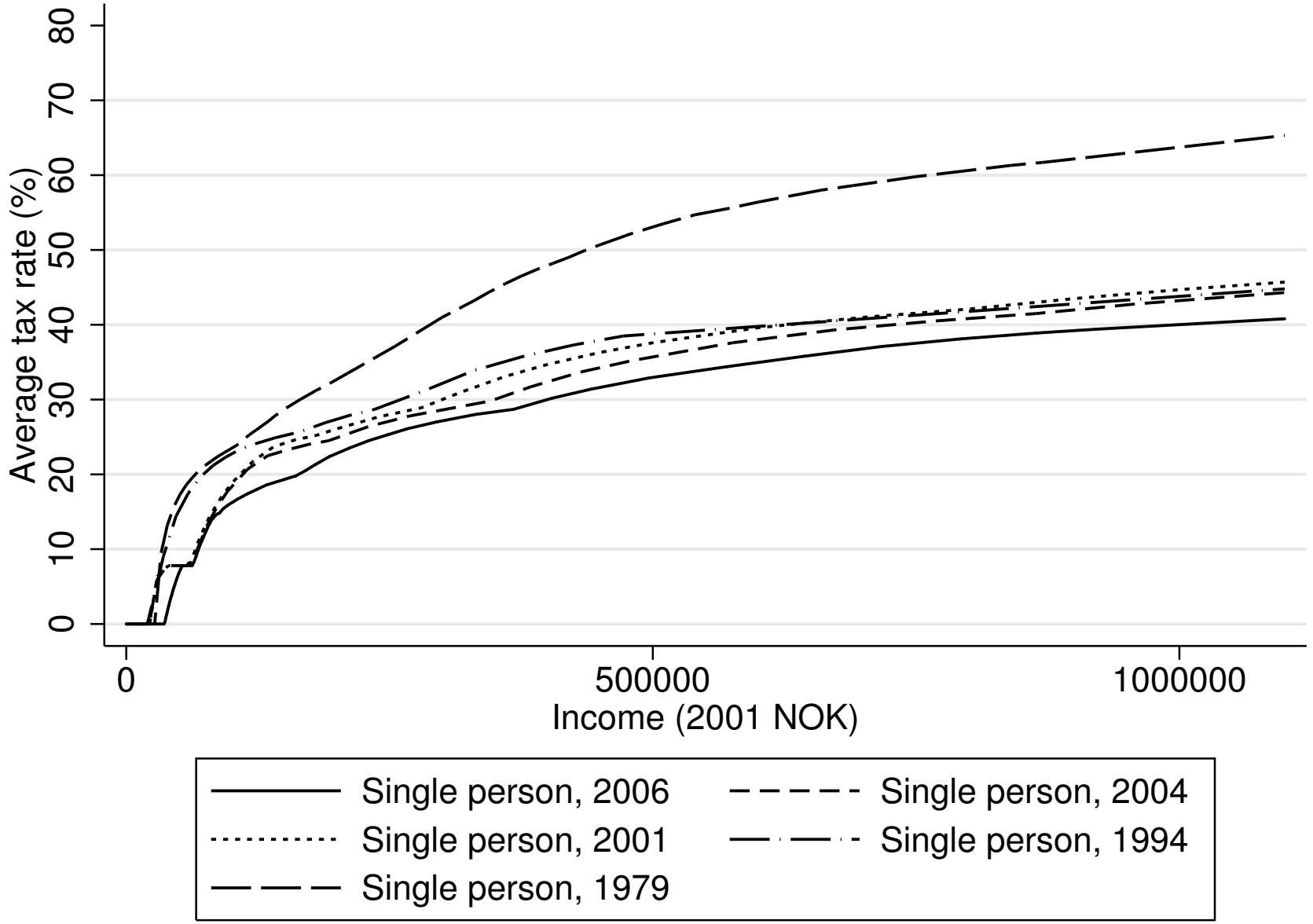

Marginal Tax Rates

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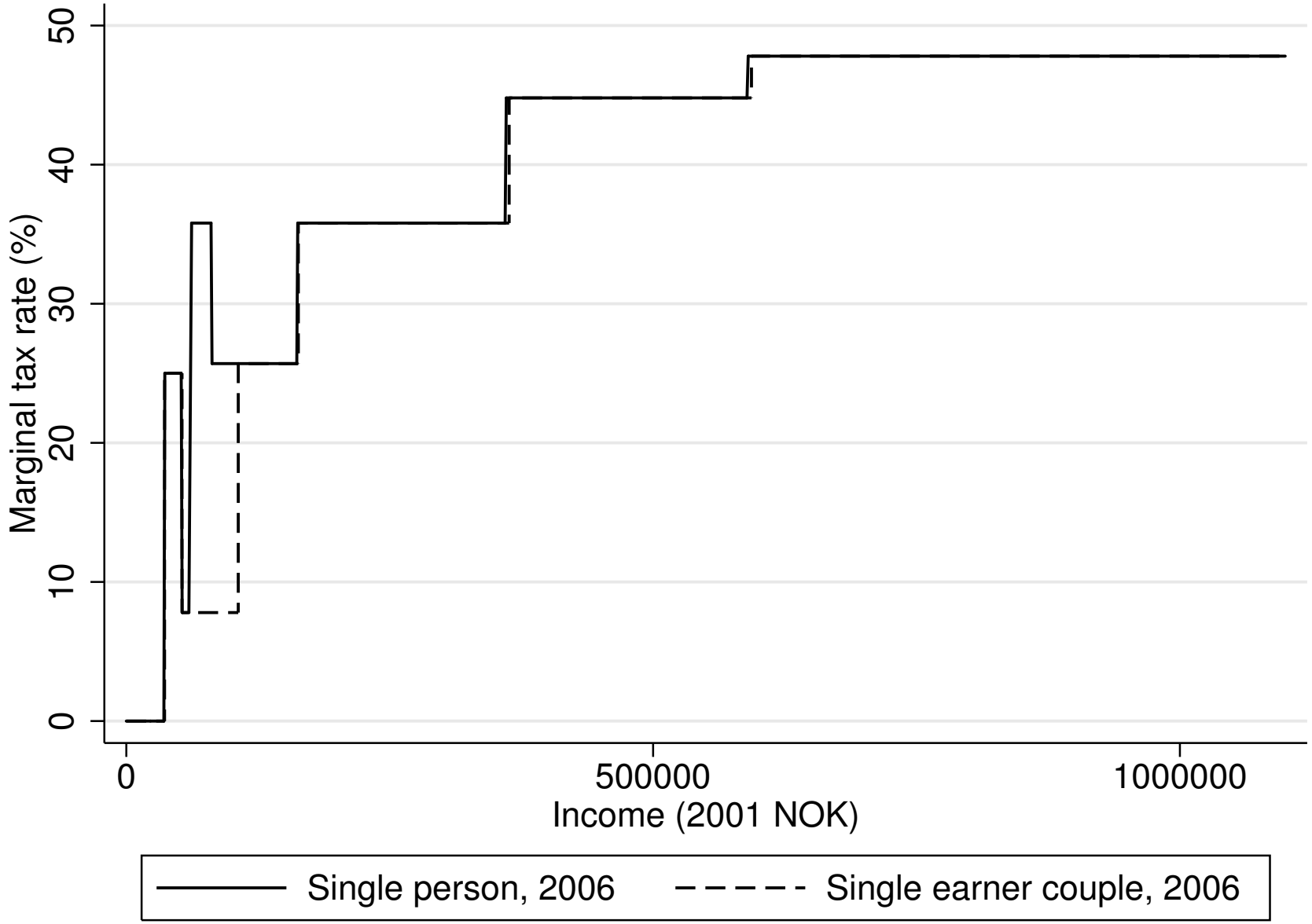

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Total household income by income source for each decile:

Decile	*Labour income*	*Self-employment*	*Capital income*	*Cash Transfers*
1	*42%*	*4%*	*-5%*	*59%*
2	*45%*	*5%*	*1%*	*49%*
3	*58%*	*5%*	*1%*	*36%*
4	*68%*	*4%*	*1%*	*26%*
5	*74%*	*4%*	*1%*	*21%*
6	*77%*	*4%*	*2%*	*17%*
7	*79%*	*5%*	*2%*	*14%*
8	*81%*	*5%*	*2%*	*12%*
9	*82%*	*6%*	*3%*	*9%*
10	*69%*	*11%*	*15%*	*5%*

HETEROGENOUS PROFILES

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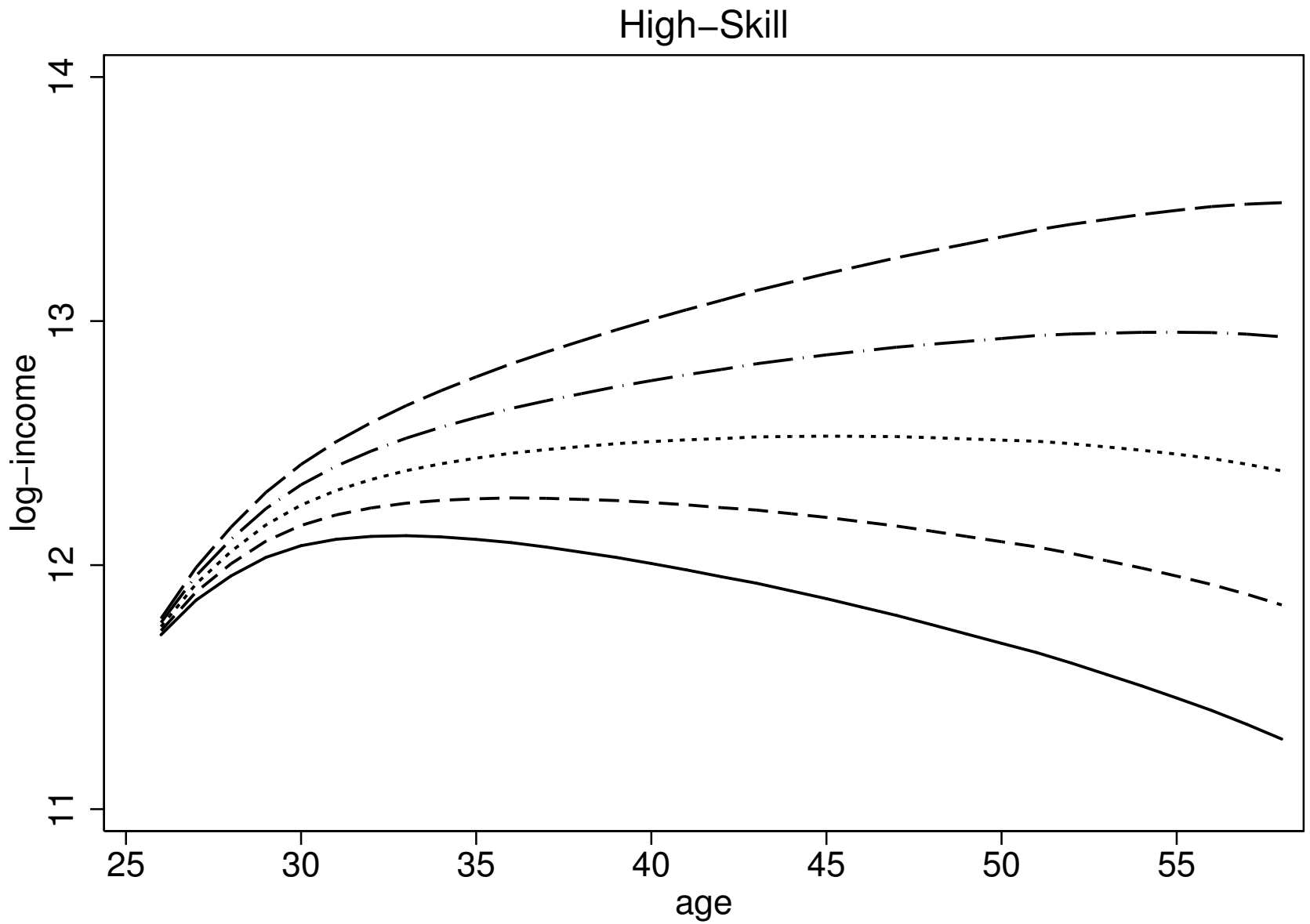

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