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MUNICH RESEARCH INSTITUTE FOR THE ECONOMICS OF AGING AND SHARE ANALYSES (MEA-SHARE gGmbH)

# The Macroeconomics of Aging Populations

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**Joint Vienna Institute, 13 July 2023**

1. The demography of aging
2. Some basic macroeconomics
3. Shrinking labor input
4. Shrinking capital input?
5. Lower productivity growth?
6. Will digitization help or hurt?
7. Deflation? Inflation?
8. Conclusions: Public policy in times of aging voters

# 1. The demography of aging

Demography is driven by three main components:

1. Fertility. Population increases/shrinks if fertility rate  $>< 2.1$ . Mechanical effect on aging.
2. Longevity. Population increases if life expectancy increases. Mechanical effect on aging.
3. Migration. Net immigration obviously increases population size and commonly rejuvenates a population.

# The demography of aging

Crude birth rate (births per 1,000 people)				
Country Name	Change	2020	2035	2050
Ukraine	-0.2	7.8	7.8	7.6
Bulgaria	-0.3	8.5	8.1	8.2
Bosnia and Herzegovina	-1.1	8.6	7.7	7.6
Croatia	-1.2	8.9	7.8	7.7
Serbia	-0.8	8.9	8.0	8.1
Slovenia	-0.2	8.9	8.4	8.7
Lithuania	0.6	9.0	7.9	9.6
Latvia	-0.1	9.2	8.0	9.1
North Macedonia	-1.4	9.2	8.4	7.8
Poland	-1.2	9.4	7.9	8.2
Belarus	-0.1	9.5	8.9	9.4
Hungary	-0.8	9.6	8.8	8.8
Russian Federation	0.4	9.8	9.3	10.2
Estonia	-0.7	9.9	8.7	9.2
Albania	-3.2	10.3	8.5	7.1
Czechia	-0.2	10.3	9.5	10.1
Romania	-0.9	10.3	9.3	9.4
Slovak Republic	-1.6	10.4	8.4	8.8
Kosovo	-3.3	11.2	11.5	7.9
Montenegro	-2.1	11.4	9.8	9.3
Moldova	-0.9	12.5	10.6	11.6
Turkiye	-4.2	15.0	11.7	10.9
<b>Average</b>	<b>-1.1</b>	<b>9.9</b>	<b>8.9</b>	<b>8.9</b>

Life expectancy at birth				
Country Name	Change	2020	2035	2050
Moldova	5.2	70.2	73.2	75.3
Ukraine	8.4	71.2	77.2	79.6
Russian Federation	7.4	71.3	76.4	78.7
Belarus	7.4	72.5	77.3	79.9
Bulgaria	6.4	73.7	77.6	80.1
Romania	7.3	74.3	79.1	81.5
North Macedonia	7.8	74.4	79.8	82.2
Serbia	7.2	74.5	79.3	81.7
Lithuania	6.1	75.0	78.7	81.1
Latvia	4.7	75.2	77.7	79.9
Hungary	5.9	75.6	79.0	81.4
Turkiye	7.8	75.9	81.1	83.7
Montenegro	6.3	75.9	79.8	82.2
Bosnia and Herzegovina	5.9	76.2	79.8	82.1
Poland	6.4	76.5	80.6	82.9
Kosovo	7.2	76.6	81.6	83.8
Slovak Republic	5.9	76.9	80.4	82.8
Albania	7.8	77.0	82.4	84.8
Croatia	5.9	77.7	81.4	83.7
Czechia	5.4	78.2	81.6	83.6
Estonia	4.8	78.6	81.3	83.4
Slovenia	5.6	80.5	84.2	86.2
<b>Average</b>	<b>6.5</b>	<b>75.3</b>	<b>79.5</b>	<b>81.8</b>

# The demography of aging

Old age dependency ratio (65+/15-64)					
Country	Change	2020	2035	2050	
Turkiye	21.9	12.0	20.9	33.9	
Kosovo	20.8	14.3	22.7	35.1	
Moldova	7.3	19.9	22.9	27.2	
North Macedonia	23.4	21.0	30.8	44.4	
Russian Federation	17.8	22.8	30.2	40.6	
Albania	22.4	23.4	38.2	45.8	
Montenegro	16.8	24.3	32.1	41.1	
Belarus	20.2	24.9	33.5	45.1	
Slovak Republic	24.9	25.0	33.7	49.9	
Ukraine	27.2	25.5	36.2	52.7	
Bosnia and Herzegovina	22.4	26.4	37.7	48.7	
Poland	24.6	27.7	35.7	52.3	
Romania	18.9	28.6	35.2	47.5	
Hungary	15.8	30.8	34.9	46.6	
Slovenia	27.9	31.1	44.3	59.0	
Czechia	13.1	31.6	34.9	44.7	
Lithuania	19.3	31.7	44.8	51.0	
Serbia	21.2	31.9	38.2	53.0	
Estonia	18.9	31.9	39.3	50.7	
Croatia	20.9	33.6	44.0	54.5	
Latvia	16.0	34.0	42.3	50.0	
Bulgaria	21.2	34.9	41.2	56.2	
<b>Average</b>	<b>20.1</b>	26.7	35.2	46.8	
Austria	24.5	28.8	44.7	53.3	
Germany	19.5	34.2	49.7	53.6	
France	16.7	34.2	44.3	50.9	
<b>European Union</b>	<b>22.8</b>	32.3	44.6	55.2	

Population, total					
Country Name	Change	2020	2035	2050	
Bulgaria	-29%	6,934,015	5,728,725	4,940,498	
Latvia	-23%	1,900,449	1,657,239	1,463,839	
Moldova	-23%	2,635,130	2,166,079	2,033,826	
Serbia	-22%	6,899,126	6,150,261	5,380,041	
Croatia	-22%	4,047,680	3,560,755	3,173,712	
Poland	-19%	37,899,070	33,528,362	30,510,780	
Lithuania	-19%	2,794,885	2,542,983	2,259,639	
Ukraine	-19%	44,132,049	39,498,828	35,690,236	
Bosnia and Herzegovina	-17%	3,318,407	3,031,666	2,739,014	
Hungary	-16%	9,750,149	8,790,600	8,147,784	
Albania	-16%	2,837,849	2,661,514	2,375,639	
Romania	-16%	19,265,250	17,405,304	16,167,364	
Slovak Republic	-14%	5,458,827	5,006,704	4,688,560	
Belarus	-14%	9,379,952	8,689,560	8,108,152	
Estonia	-11%	1,329,522	1,276,424	1,185,207	
North Macedonia	-10%	2,072,531	2,010,722	1,871,174	
Russian Federation	-9%	144,073,139	137,791,520	131,453,104	
Montenegro	-8%	621,306	603,898	574,052	
Slovenia	-6%	2,102,419	2,069,803	1,979,010	
Czechia	-1%	10,697,858	10,494,263	10,585,315	
Kosovo	-1%	1,790,133	1,812,194	1,772,812	
Turkiye	14%	84,135,428	91,121,385	95,829,258	
<b>Average excl. Turkiye</b>	<b>-15%</b>				
Austria	0%	8,916,864	9,139,223	8,931,299	
Germany	-5%	83,160,871	82,623,472	78,831,904	
France	1%	67,571,107	68,913,272	68,574,248	
<b>European Union</b>	<b>-7%</b>	447,692,315	436,277,059	417,365,104	

## 2. Some basic macroeconomics

$$Y = A * F(L, K) \quad \text{or} \quad Y/N = A * F(L/N, K/N)$$

## Basic macroeconomic implications:

1. Lower labor input per capita – or even in absolute terms
2. Amplified by negative incentive effects due to tax and contribution increases
3. *Lower capital input?*
4. *Lower productivity?*

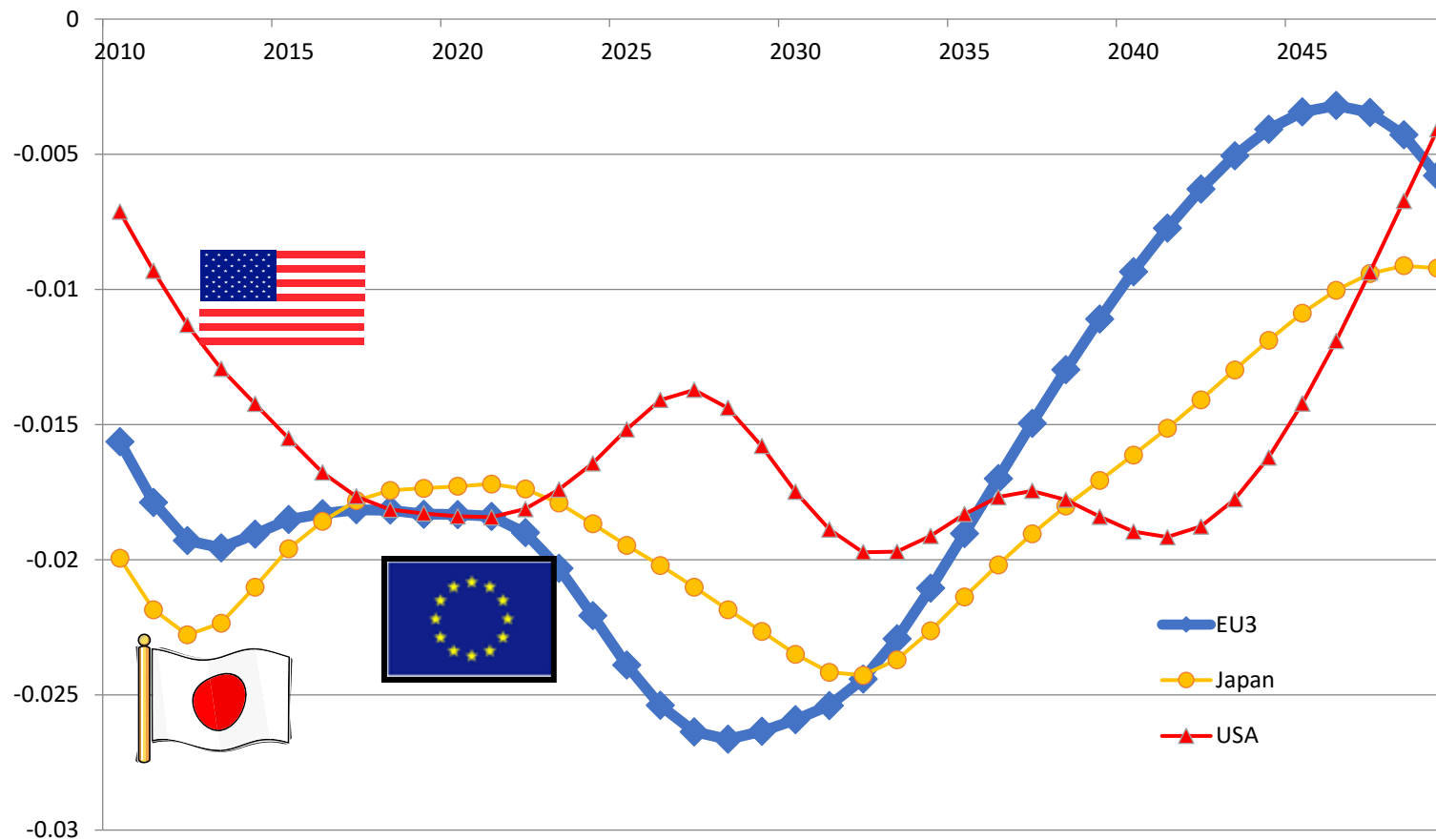
**=> Lower GDP/cap and lower CONS/cap**



### 3. Lower labor input per capita

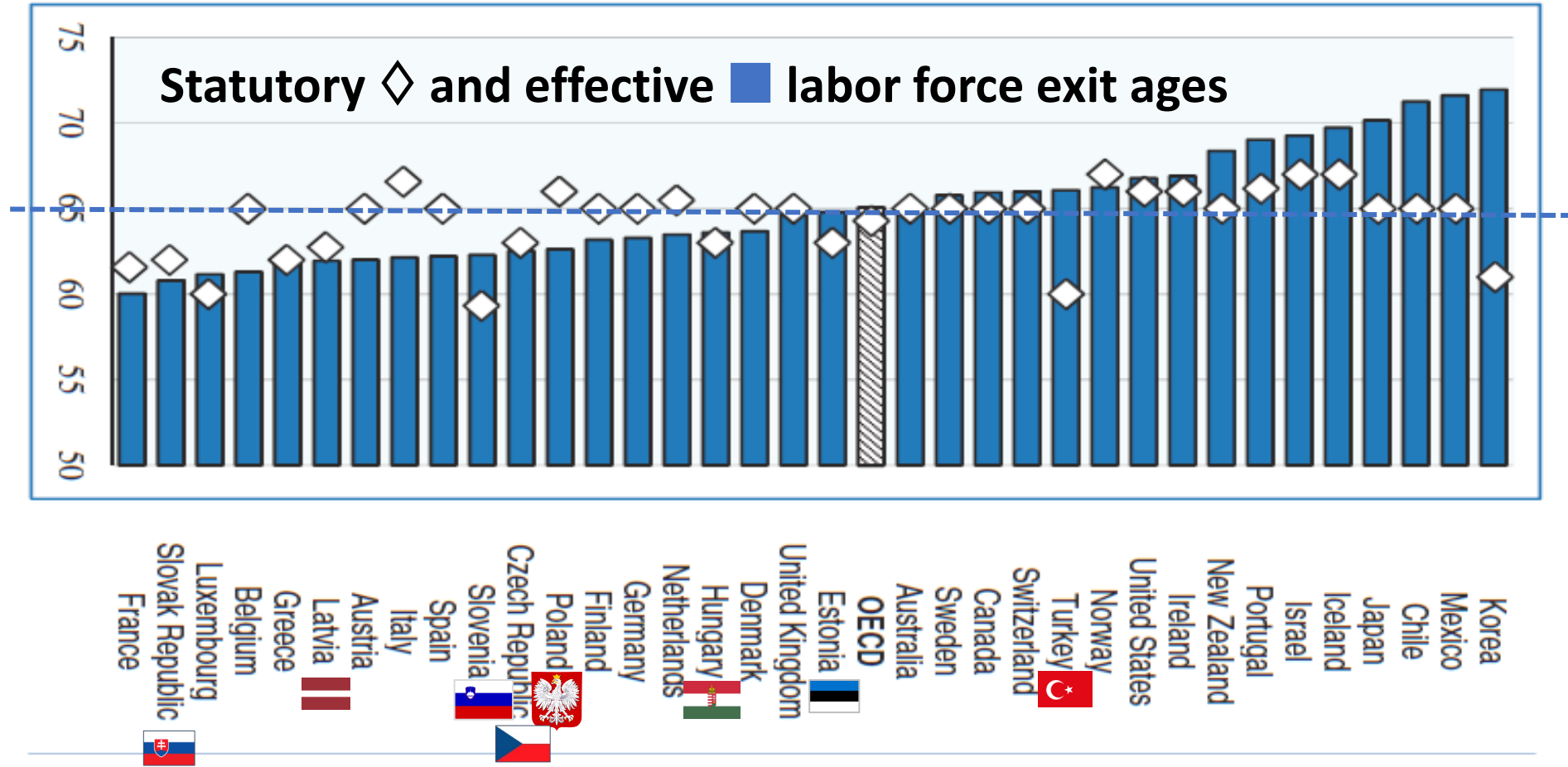
*Role of incentives created by pension systems*

## Annual percentage loss in working age individuals per population

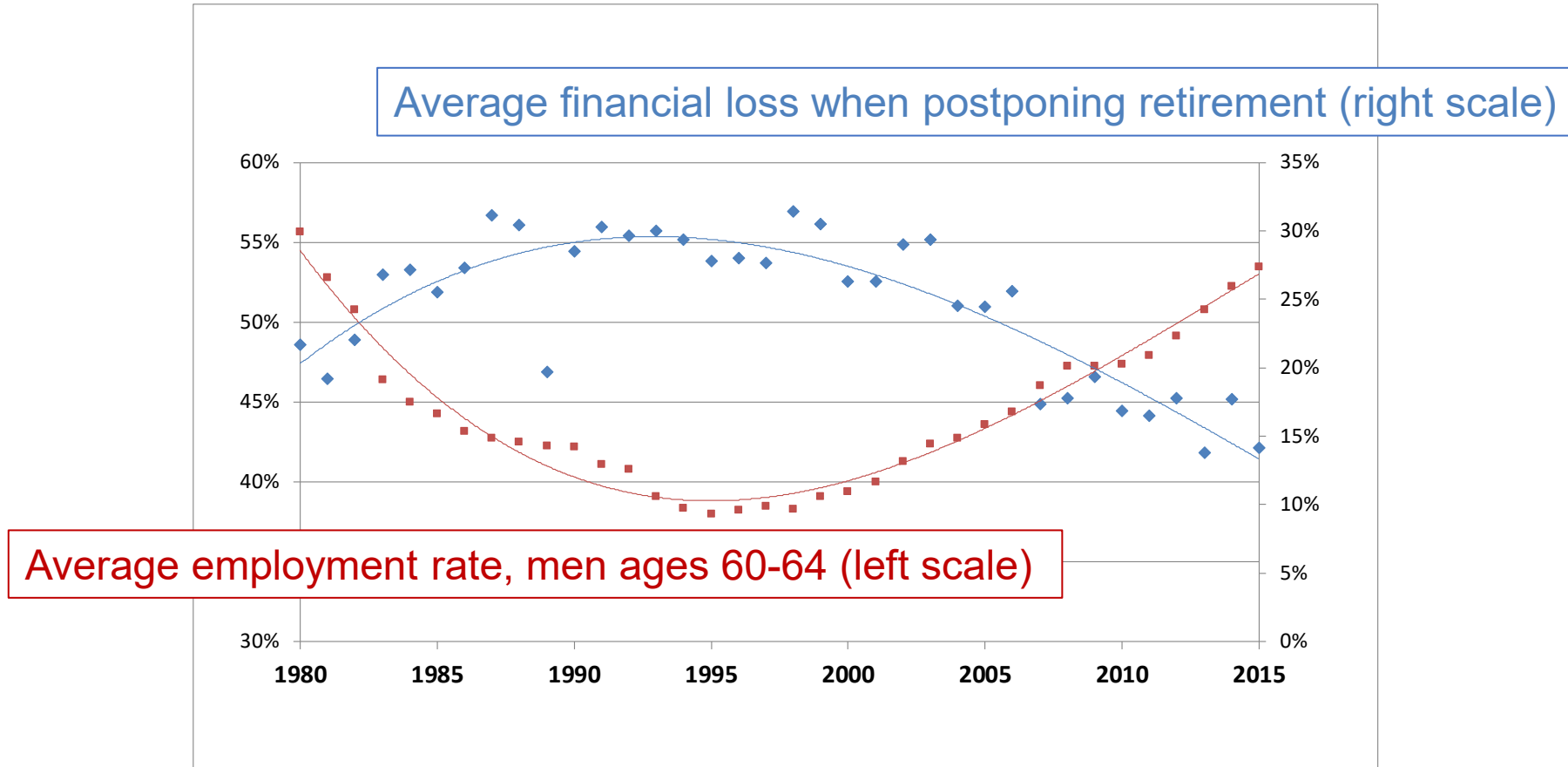


Labour force growth: hours worked								
Country	Avg 2025-2050	2019	2025	2030	2035	2040	2045	2050
BG	-1.2	0.2	-1.2	-1.3	-1.1	-1.1	-1.2	-1.2
CZ	-0.5	0.6	-0.3	-0.3	-0.5	-0.7	-0.7	-0.6
EE	-0.4	0.3	-0.6	-0.6	-0.2	-0.3	-0.5	-0.5
HR	-0.8	0.7	-0.9	-0.7	-0.7	-0.8	-0.9	-0.9
LV	-1.4	-0.6	-1.9	-1.2	-1.2	-1.2	-1.3	-1.4
LT	-1.3	1.3	-1.2	-1.7	-1.2	-1.1	-1.1	-1.3
HU	-0.3	0.9	0.7	0.1	-0.5	-0.8	-0.7	-0.5
PL	-0.9	0.3	-0.7	-0.9	-0.7	-0.9	-1.2	-1.2
RO	-1.1	-0.4	-1.1	-0.8	-1.2	-1.1	-1.2	-1.1
SI	-0.5	0.5	0.2	-0.5	-0.4	-0.6	-0.7	-0.6
SK	-0.9	0.4	-1.0	-0.8	-0.8	-1.0	-1.0	-1.1
Average	-0.8	0.4	-0.7	-0.8	-0.8	-0.9	-1.0	-1.0
EU	-0.3	0.6	-0.1	-0.3	-0.3	-0.4	-0.4	-0.4

# Labor force growth and pension systems



# Labor force growth and pension systems



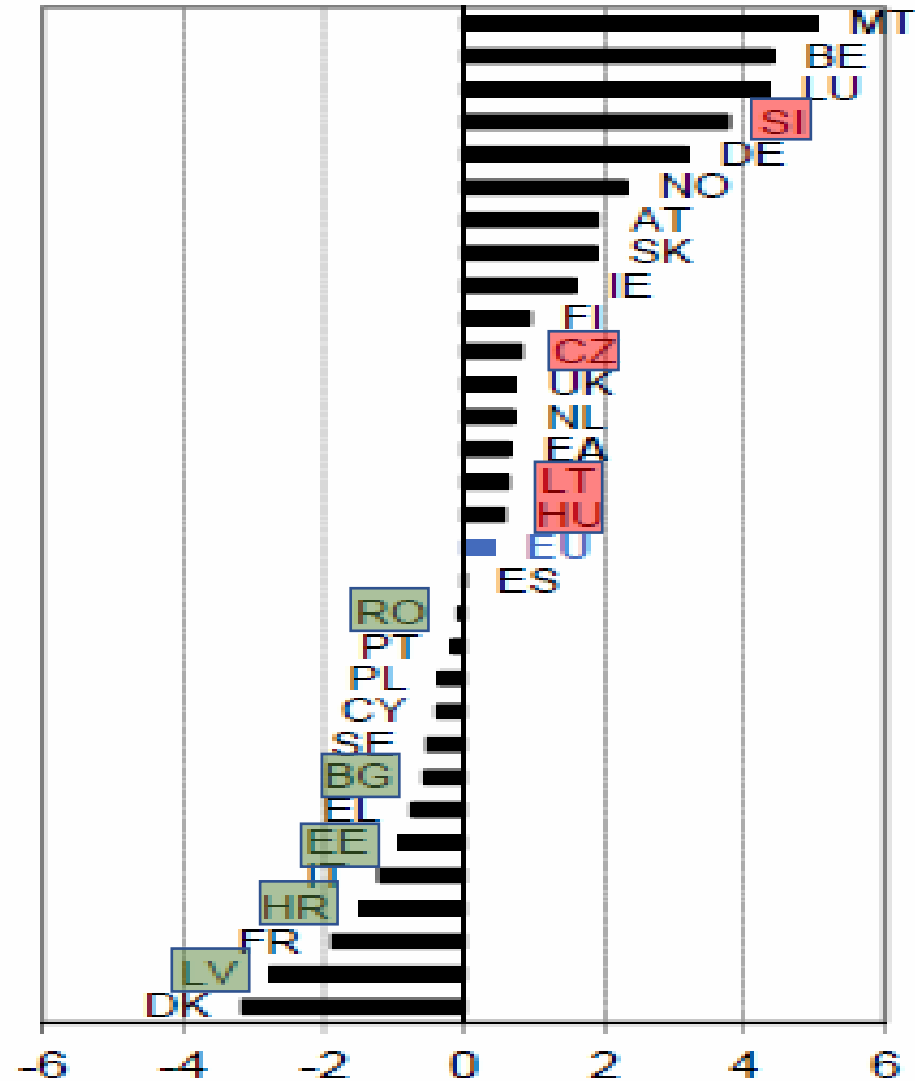
Source: NBER International Social Security Project, Börsch-Supan and Coile (2020)

## Divide longevity gains between work and retirement

- Need about **2 years work** to finance **1 year retirement**  
since  $\approx 40$  years life time work and  $\approx 20$  years retirement
- **Hence: 2 to 1 rule**  
e.g.: 3 added life years  
= 2 added work years  
+ 1 added year of retirement

# Labor force growth and pension systems

*Change in gross public **pension expenditure** over the period 2013-2060 by main general schemes (in p.p. of GDP)*



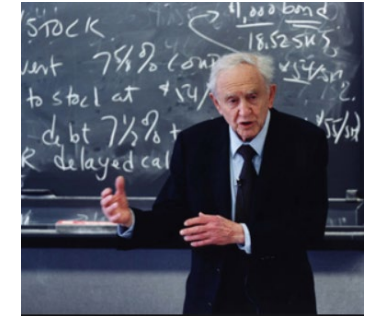
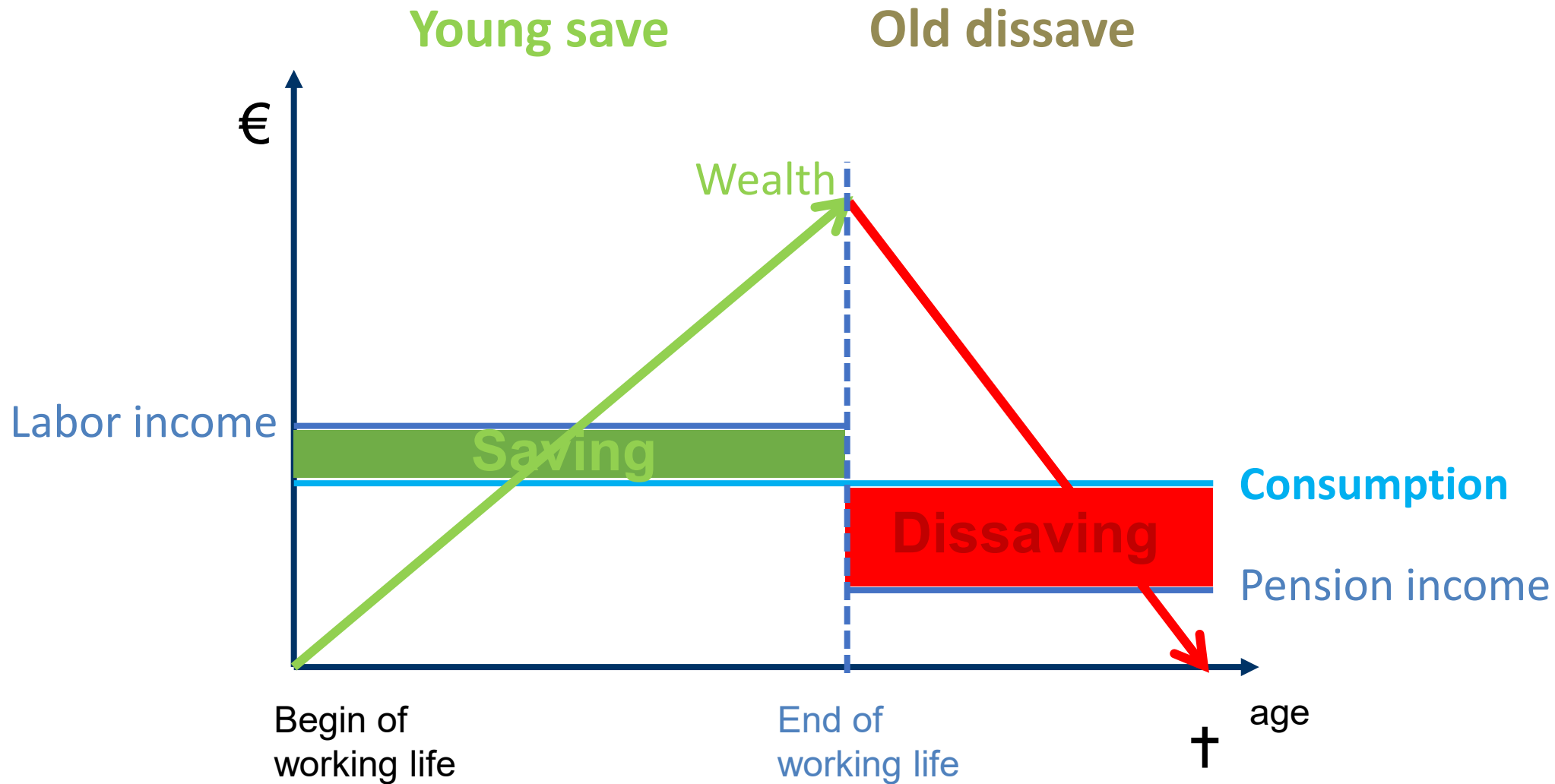
Disincentives to labor force participation for the younger generation

Source:  
Europäische  
Kommission  
2015 Aging Report

## 4. Lower capital input?

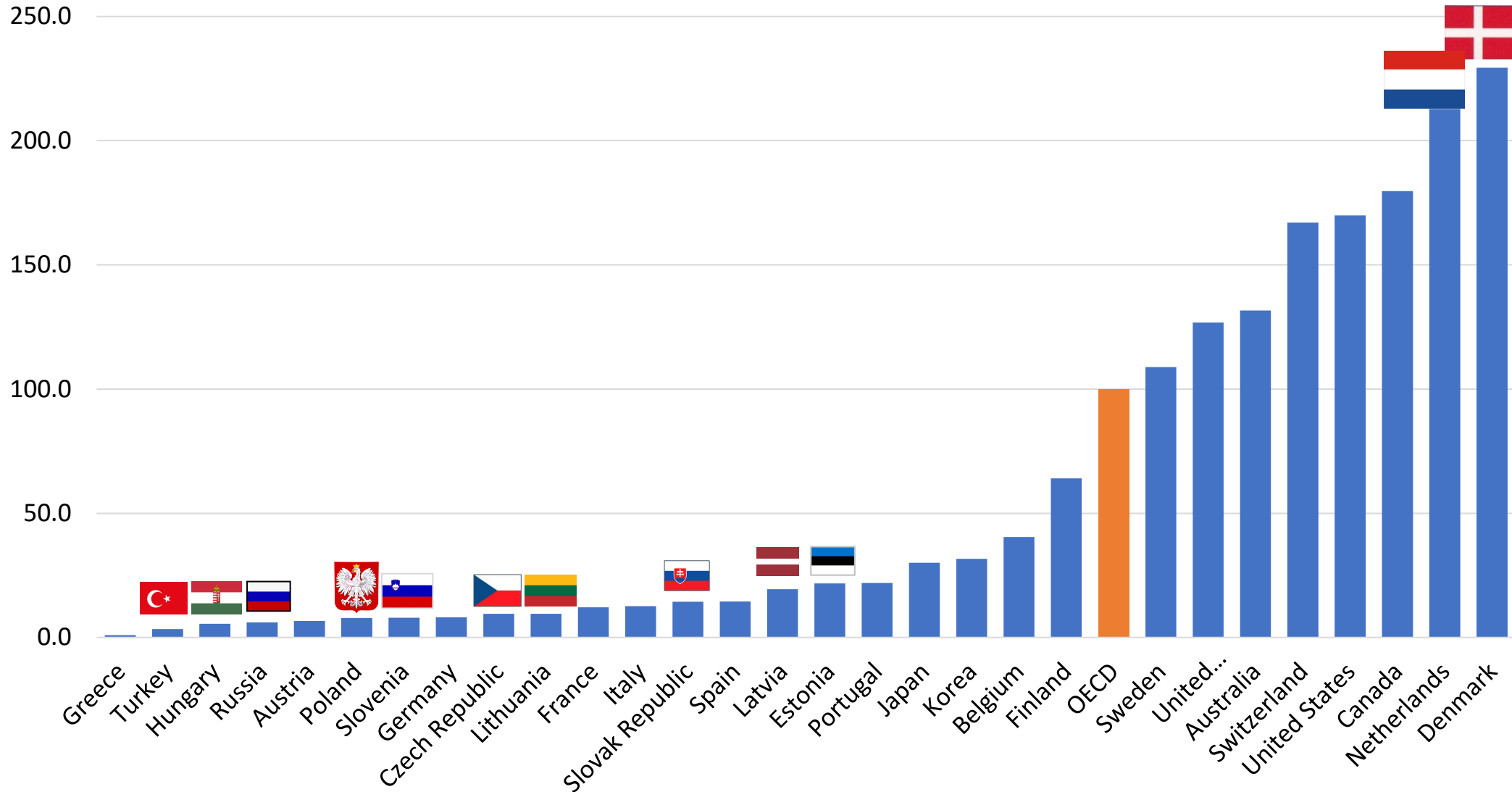
*Role of retirement savings*





Franco Modigliani

## Assets in retirement savings plans (2020 or latest year available)



## THREE PILLAR MODEL



State

Occupational

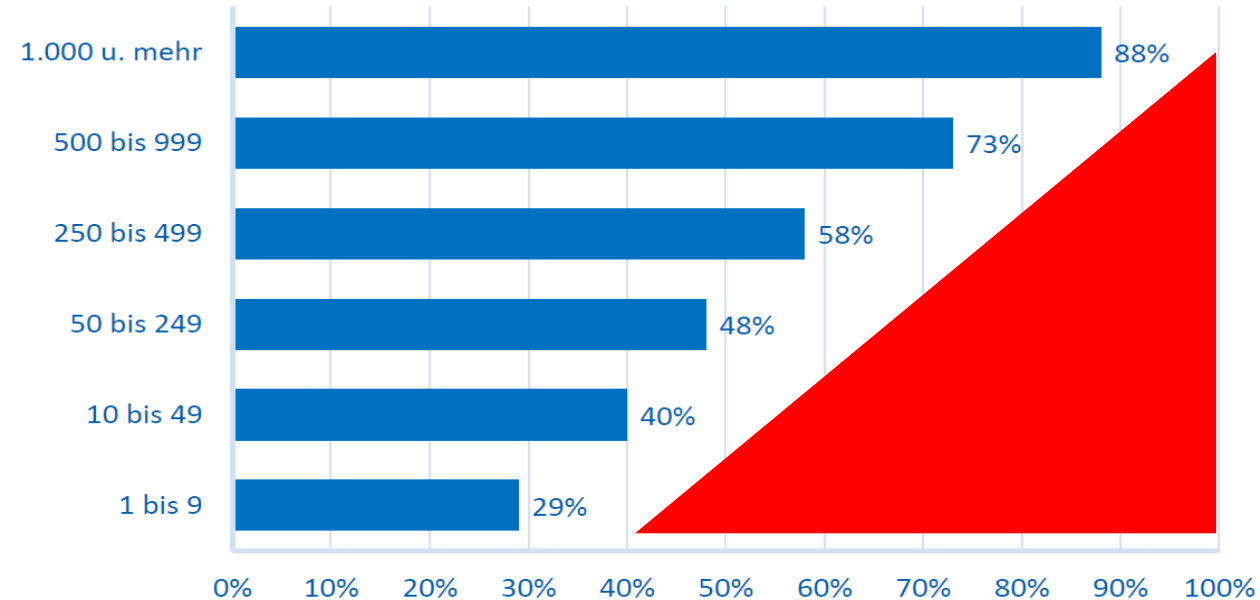
Private Individual

Distributional issues  
Occupational pensions

## Alterssicherungsbericht 2020: Anteil der sozialversicherungspflichtig Beschäftigten mit bAV in der Privatwirtschaft nach Betriebsgröße Ende 2019 (Stand: Nov. 2020)



Betriebsgröße (Anzahl der Beschäftigten)



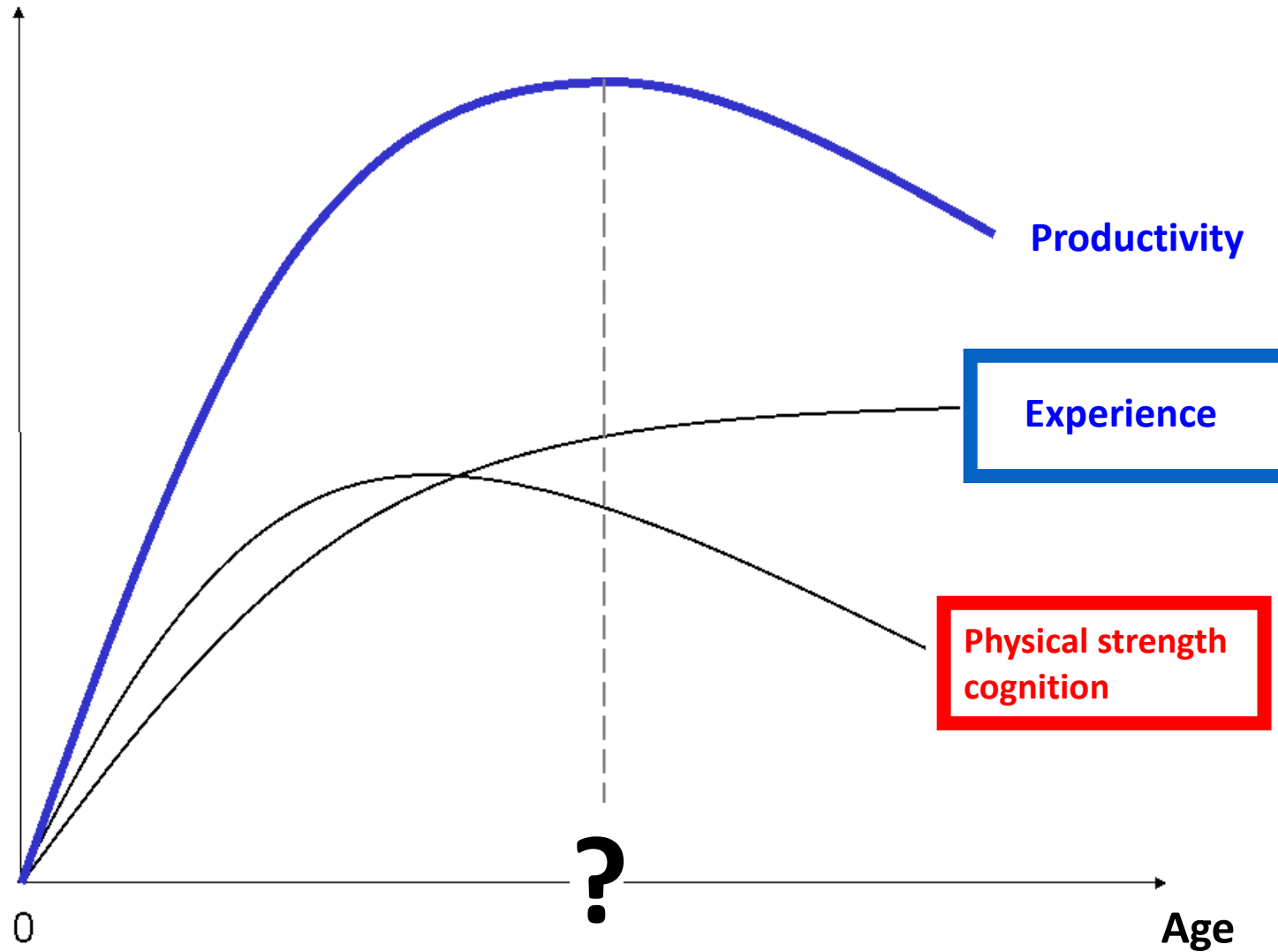
Quelle: Bundesministerium für Arbeit und Soziales (2020): Ergänzender Bericht der Bundesregierung zum Rentenversicherungsbericht 2020 gemäß § 154 Abs. 2 SGB VI ([Alterssicherungsbericht 2020](#)), S. 144, Abb. D.1.2.

© aba Arbeitsgemeinschaft für betriebliche Altersversorgung e.V.

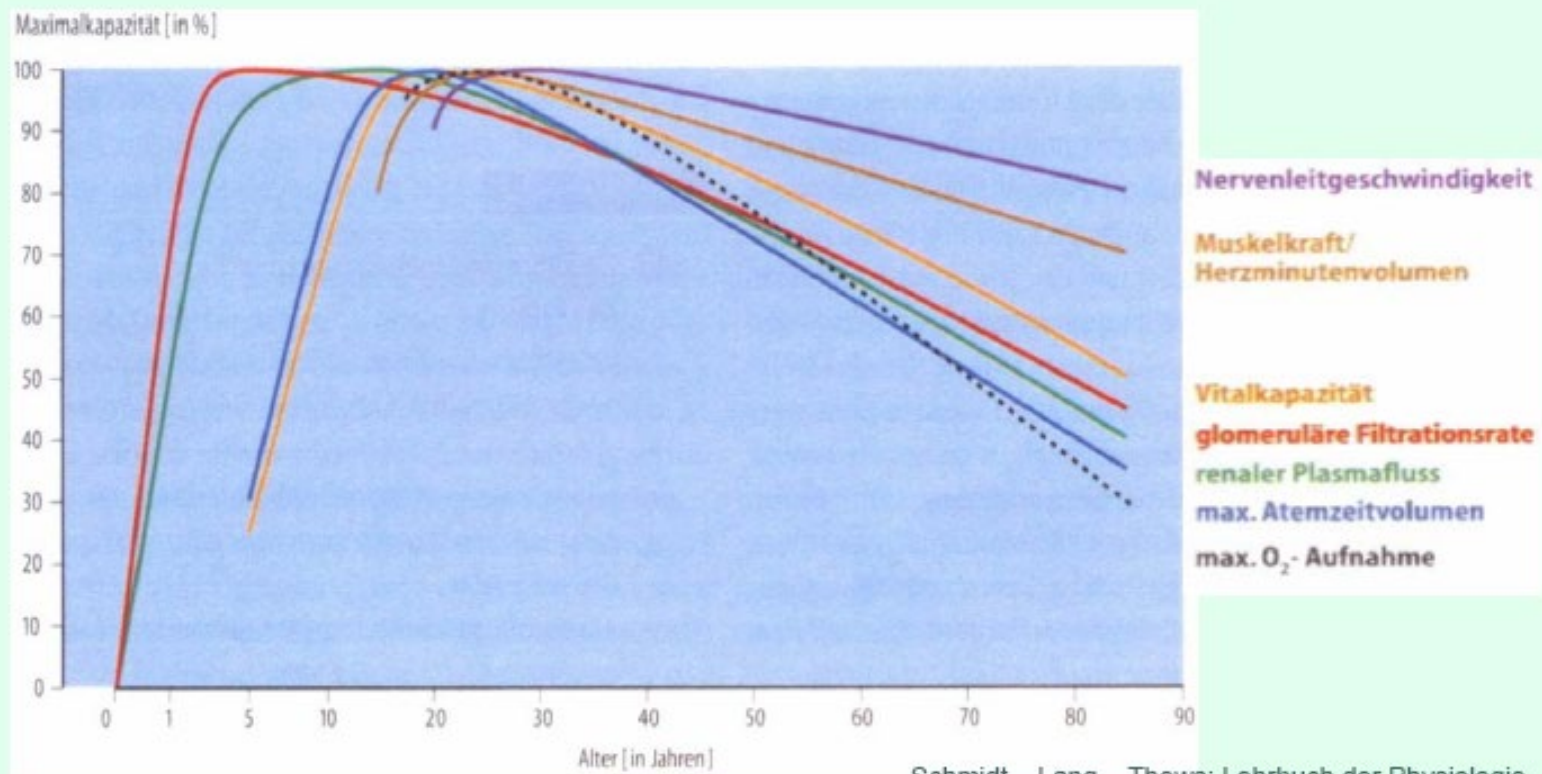
## 5. Lower productivity?

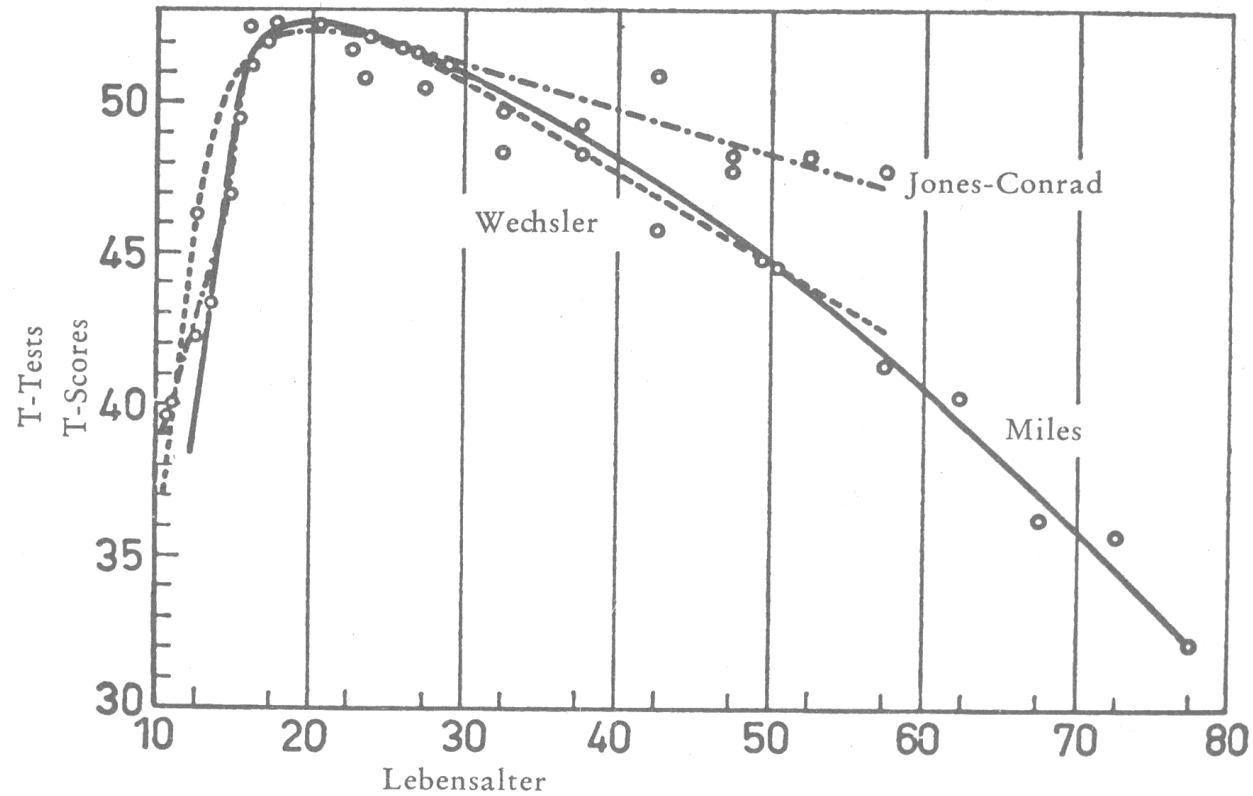
*Micro vs. macro view*

# Productivity at the micro level



## Physiological changes in various body systems





**Average score of three US IQ-tests as a function of age**

Source: Ursula Lehr, *Psychology of Aging*





**Mercedes-Benz**

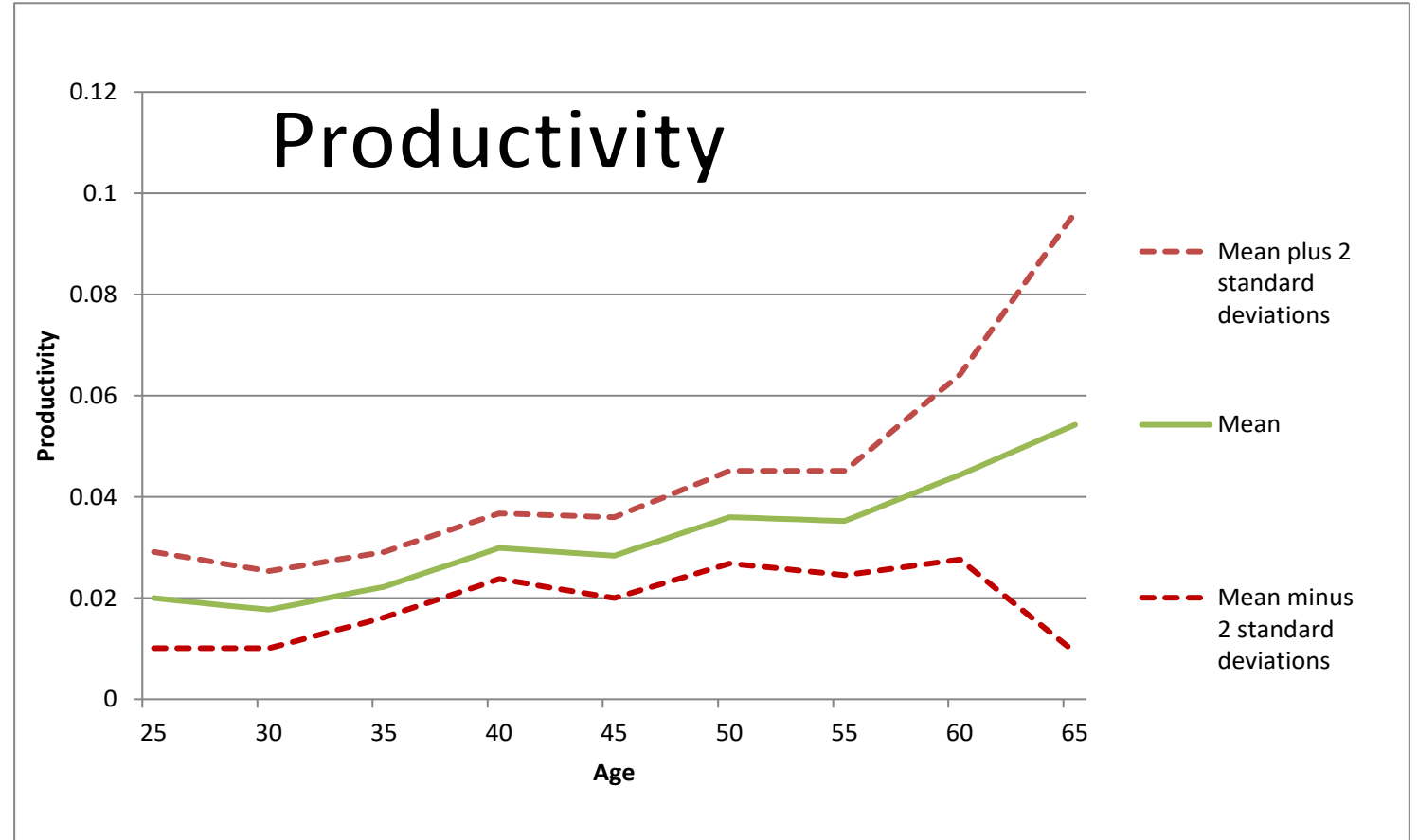
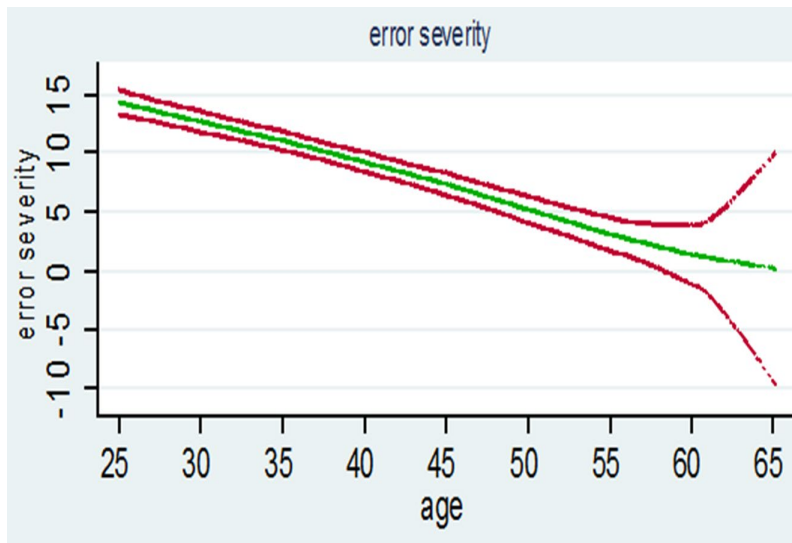
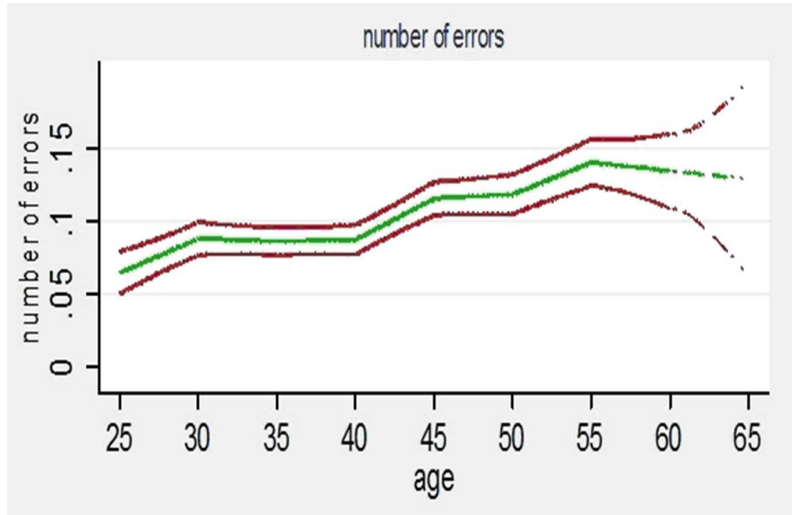
1.2 mio error measurements



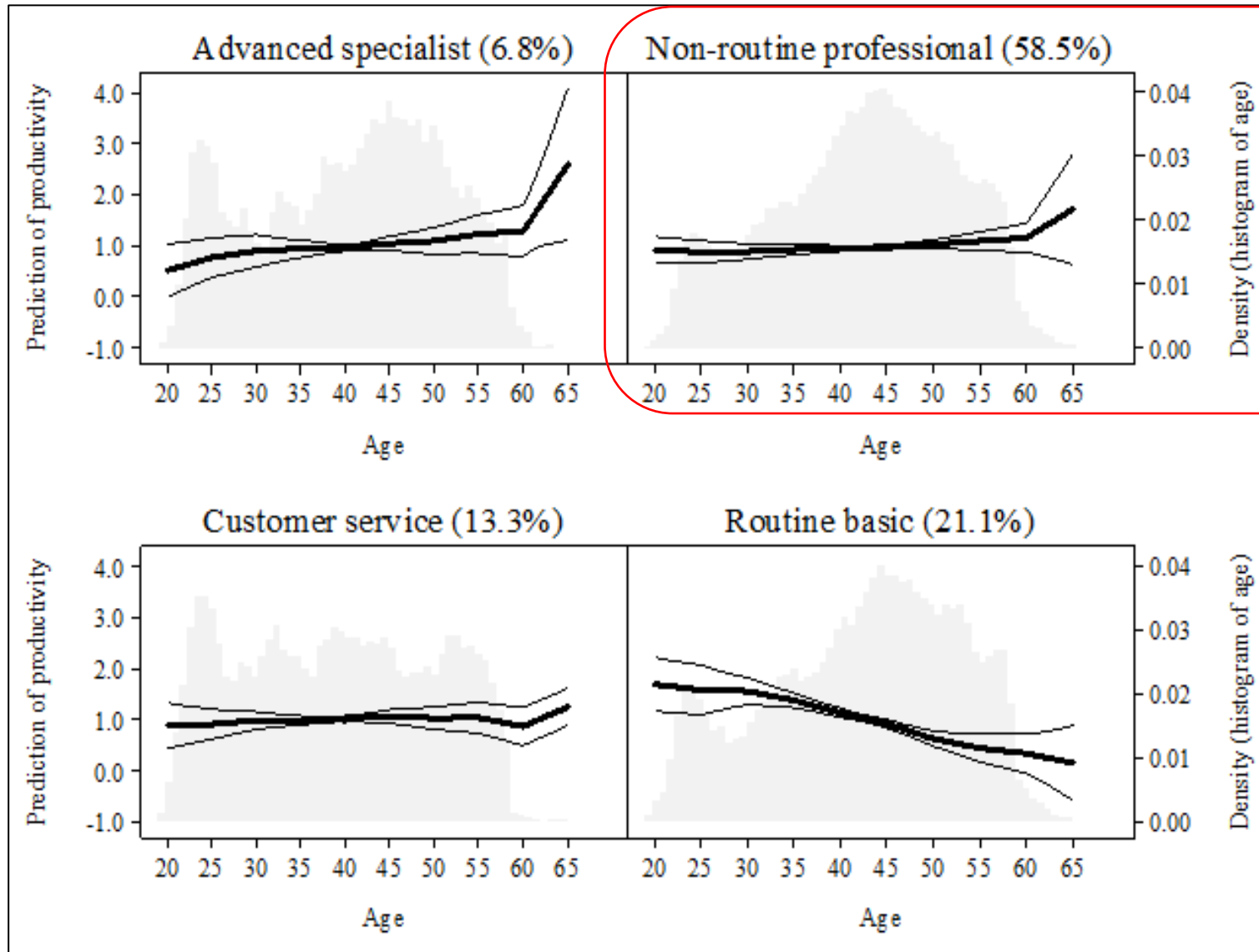
**Large insurance**

4.8 mio output measurements

# Productivity



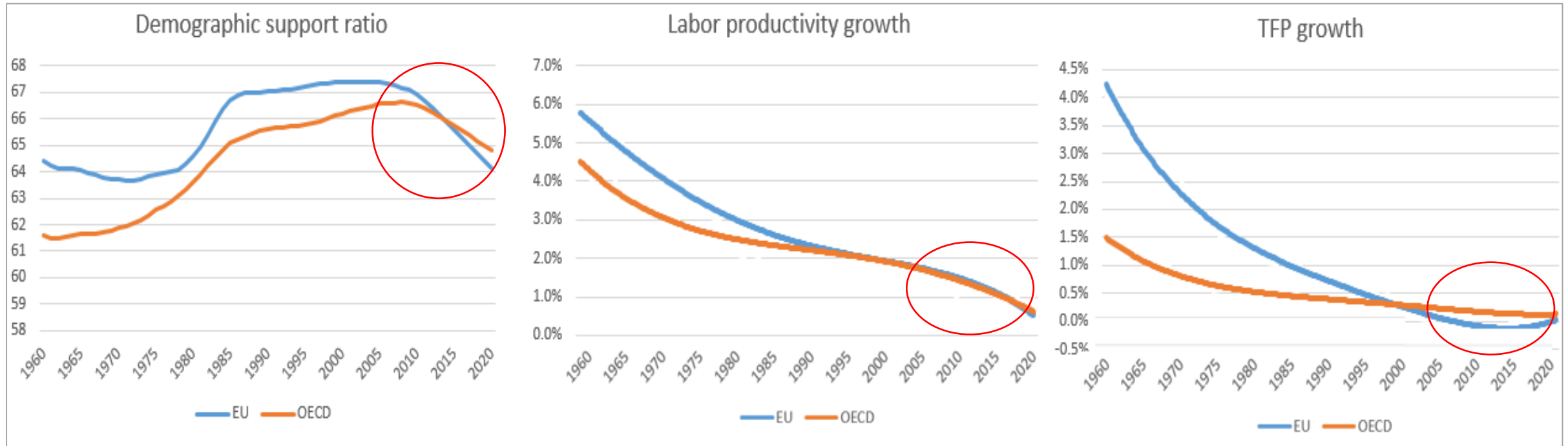
Source: Börsch-Supan and Weiss (2016). Figures depict the conditional mean and the two-standard-deviation error bands



Conclusion  
Micro  
Evidence



# Productivity at the macro level



Source: Penn World Tables (Version 10, Feenstra et al. 2015), World Development Indicators (2021), last updated: 03/19/2021. Labor productivity and TFP smoothed.

Eichengreen (2015), Summers (2015), Gordon (2015, 2016): “Secular stagnation”.

**Innovation:** Public and private research and development (R&D) spending, patents, and similar measures are shown to decline with dependency ratio.

**Entrepreneurship:** Number of entrepreneurs and self-employed persons in a country due less risk tolerance.

Population aging will **lower interest rates**, which reduces reduces competition in the product market in favor of established firms because low interest rates facilitate refinancing assets. Unproductive firms are thus less likely to close, and new firms with greater innovation potential than established firms do not enter markets

**Government expenditures** in aging populations are typically forced to spend large parts of their budgets on pensions, health care, and long-term care, thereby potentially crowding out spending on R&D that supports innovation and entrepreneurship.

Expenditures on the younger generation, including education and family support, are smaller in aging societies. Crowding-out is likely to depress future productivity.

Back to the macroeconomics  
of aging population

## Basic macroeconomic implications:

1. Lower labor input **yes, severe**
2. Amplified by negative incentive effects due to tax and contribution increases **yes, but retirement incentives worse**
3. *Lower capital input* **unclear, depends on pension system**
4. *Lower productivity* **micro level no, but macro level yes**

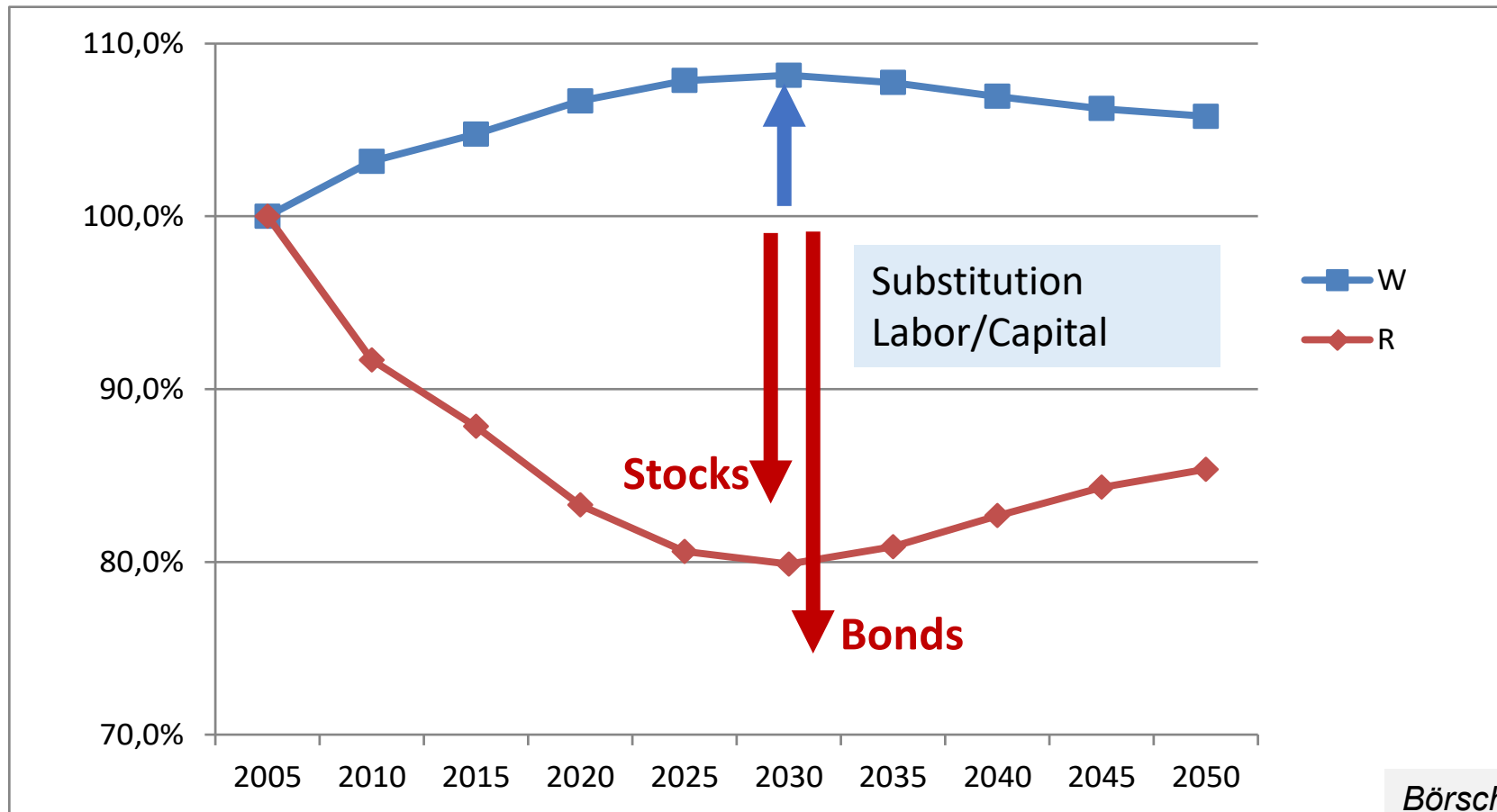
=> **Still: Lower GDP/cap and lower CONS/cap**

## Behavioral responses to aging-induced price effects

1. **Wages up** (scarcity of labor)
2. **Returns down** („asset meltdown“)
3. **International differences**
  - => production where younger workers
  - => capital flows where returns are higher
4. **Time line:**
  - first saving and foreign investment (until ~2035)
  - then re-patriation and consumption (after ~2035)



## Price signals: Wages and Returns (prod.cap.)



Börsch-Supan, Härtl  
& Ludwig, AER, 2014

## Behavioral responses to aging-induced price effects

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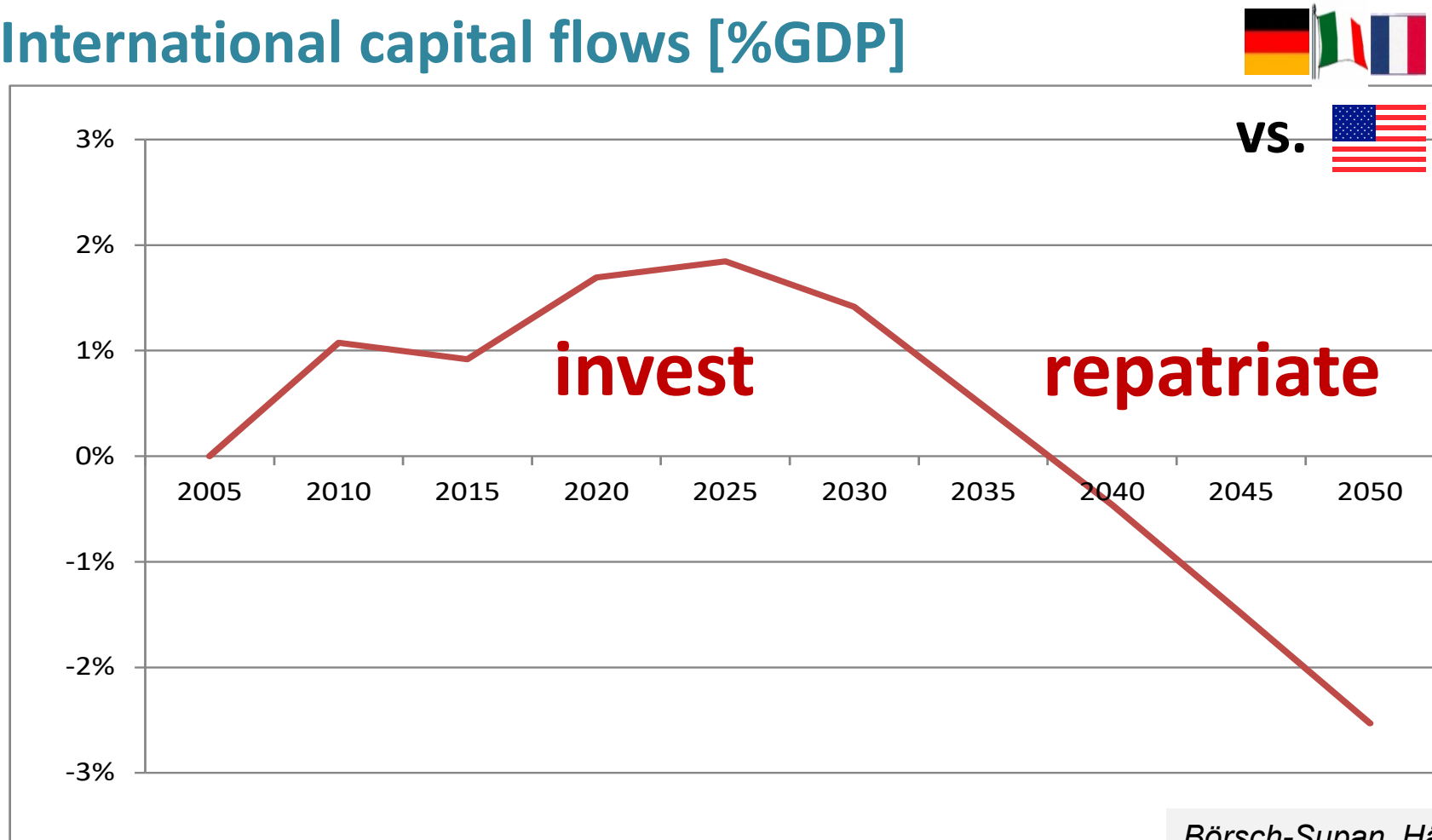
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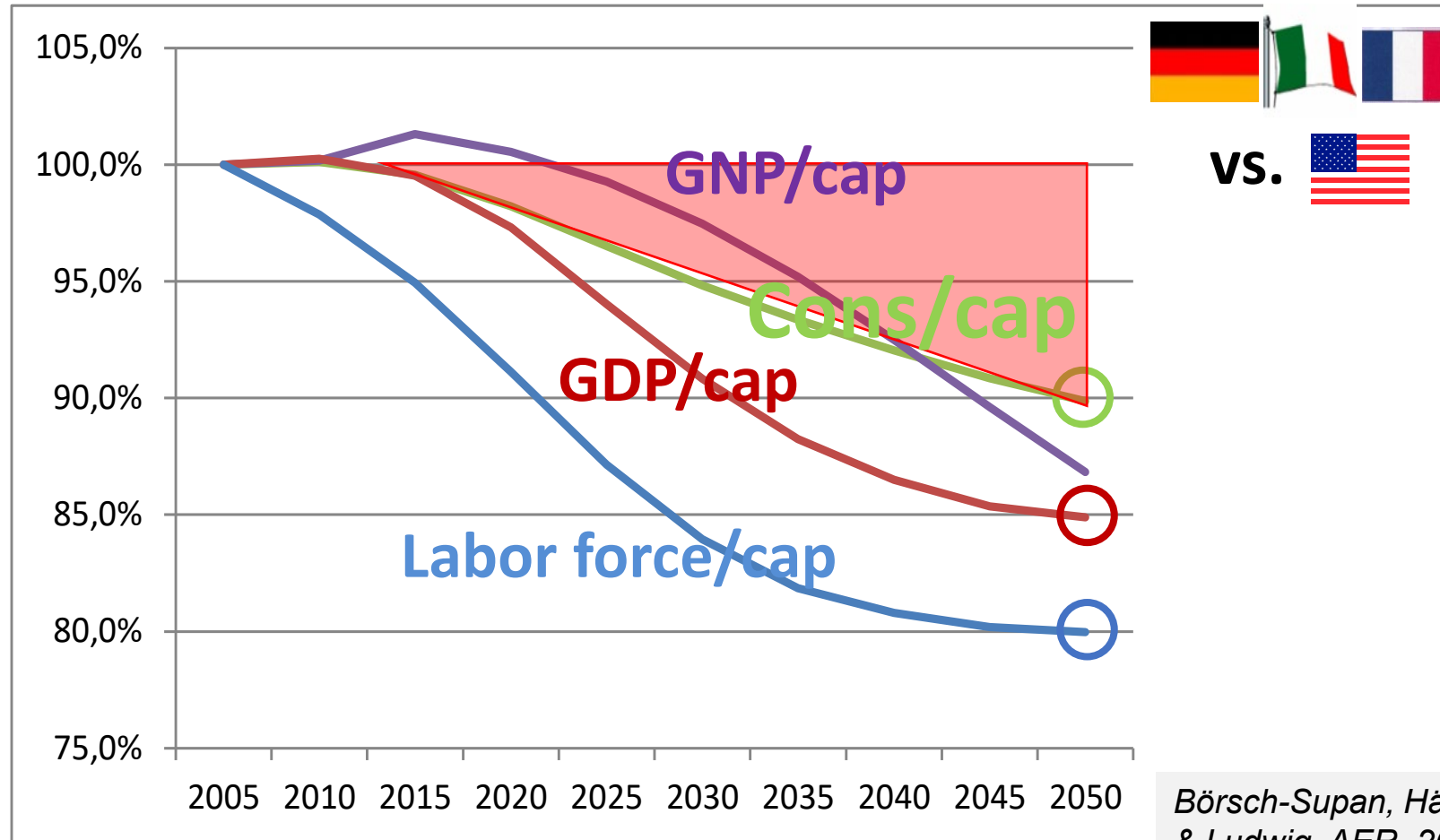
then re-patriation and consumption (after ~2035)

## International capital flows [%GDP]



Börsch-Supan, Härtl  
& Ludwig, AER, 2014

## Material living standards (2005=100%, detrended)



**Reform to increase LFP:**

1. RetireAge + 2
2. EntryAge - 2
3. FemLFP = 90% of maleLFP
4. Unemp=NAIRU

Börsch-Supan, Härtl & Ludwig, AER, 2014

# 6. Digitization



## The Future of Employment

Carl Benedikt Frey & Michael Osborne

2017



of computerisation, wages and educational attainment. According to our estimates, about 47 percent of total US employment is at risk.

Forbes

Mar 31, 2023, 10:48am EDT



Companies—whether they are McDonald's, introducing self-serve kiosks and firing hourly workers to ... [+] GETTY

If generative AI lives up to its hype, the workforce in the United States and Europe will be upended, Goldman Sachs reported this week in a sobering and alarming report about AI's ascendance. The investment bank estimates **300 million jobs** could be lost or diminished by this fast-growing technology.

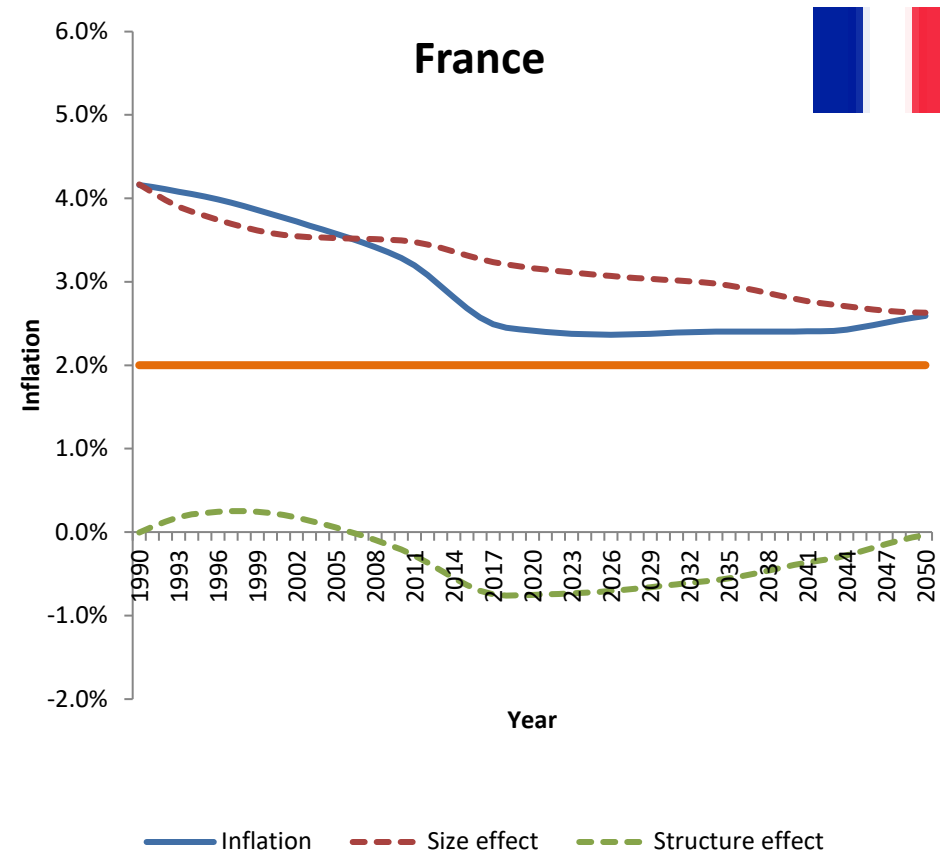
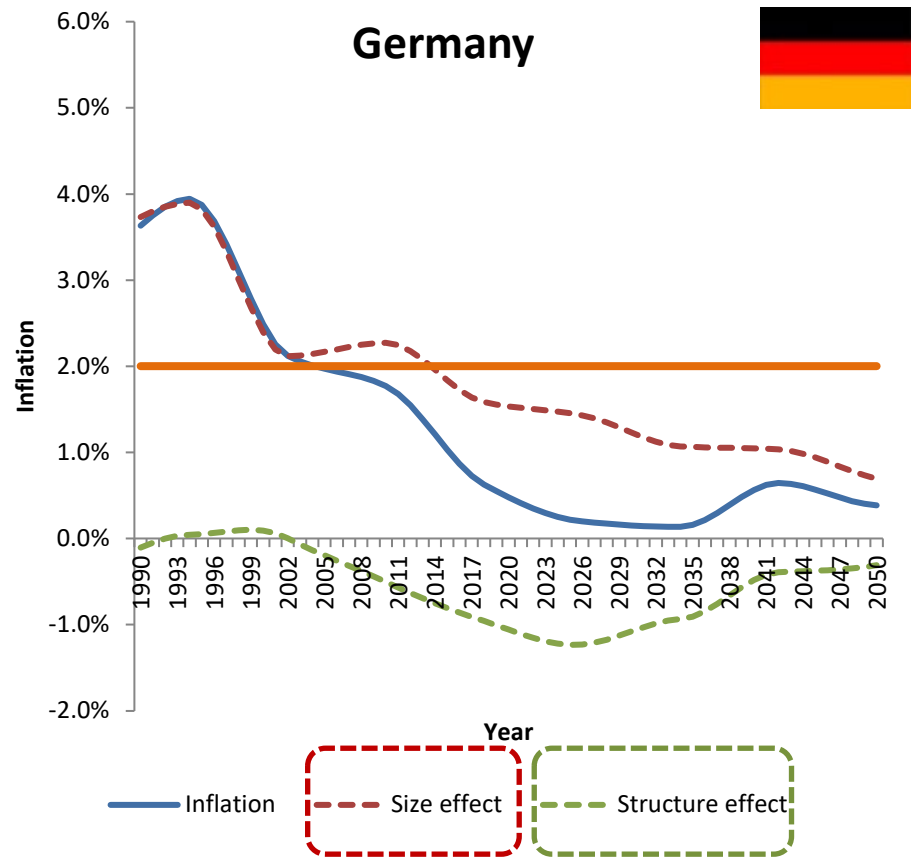
Goldman contends automation creates innovation, which leads to new types of jobs. For companies, there will be cost savings thanks to AI. They can deploy their resources toward building and growing businesses, ultimately increasing **annual global GDP by 7%**.



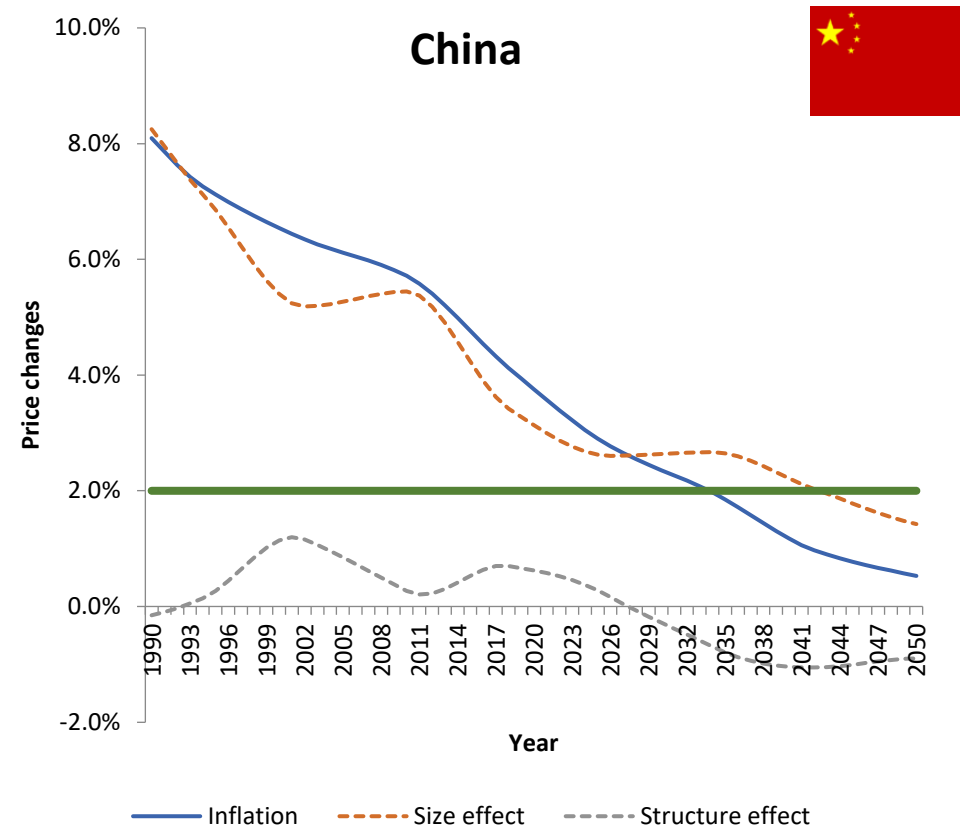
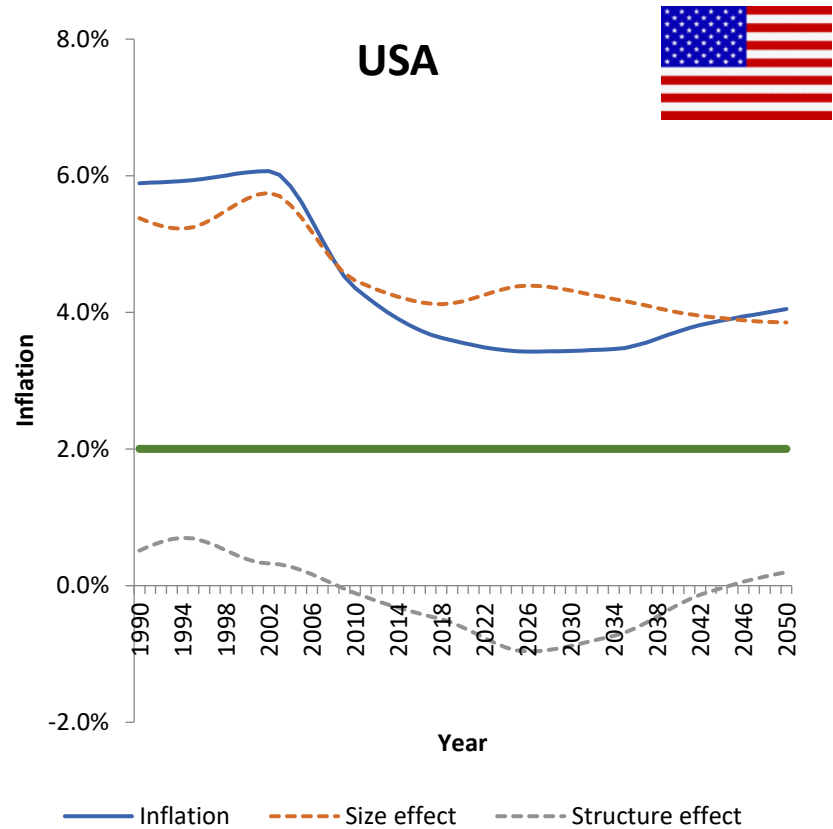


# 7. Deflation? Inflation?

# Deflation? Inflation?



# Deflation? Inflation?



# 8. Conclusions

- Demography matters and is very different across countries
- Distinguish age structure from population shrinkage
- CESEE ex. Turkiye age and shrink stronger than large EU countries
- First round effects on the economy are large, but they are could be mitigated by (potential) behavioral reactions and (possible) reforms
- BUT: reforms much less popular than beggar-thy-kids policies
- International diversification important and helpful
- Digitization helps: complementary to population aging

Increase or at least stabilize labor force

Increase productivity: do not crowd out education, innovation (incl. digitization) and infrastructure

Focus the welfare state on those who need it