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Après nous le déluge? Infrastructure development and direct democracy in aging societies

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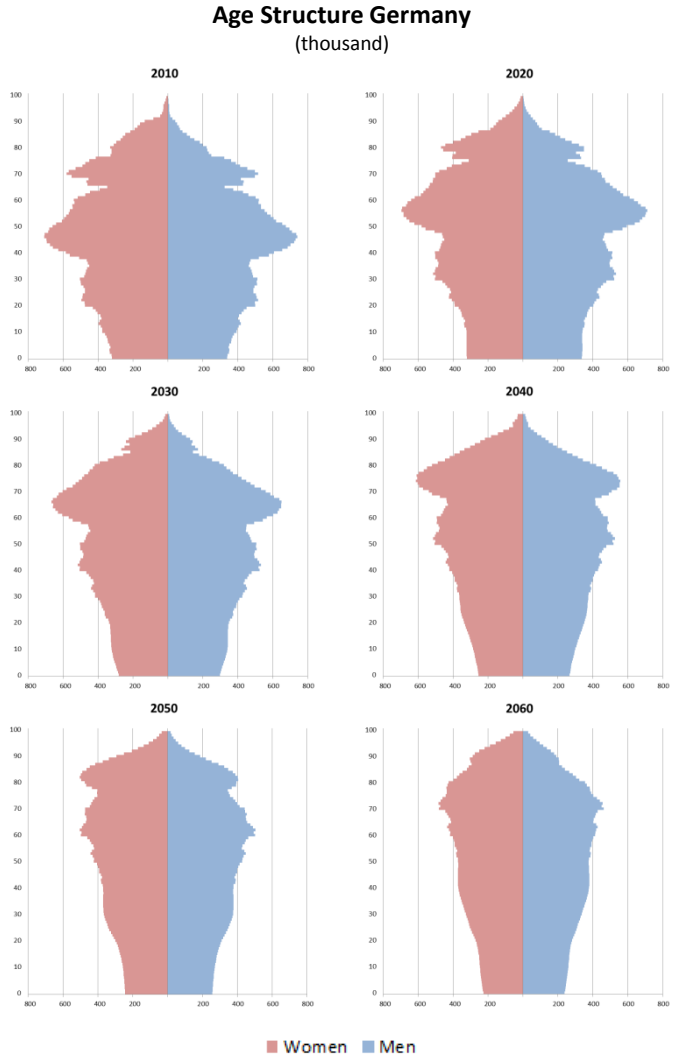
Demographic Change: 12th coordinated population projection



Source: own illustration; Data: Variant 1-W1, 12th coordinated population projection, Statistisches Bundesamt 2009

Assumptions (variant 1-w1)

- Constant birth rate (1.4 children per women) and annual net migration of 100 000
- Increase in life expectancy of newborns by 6.8 years (girls) / 7.8 years (boys) in 2060

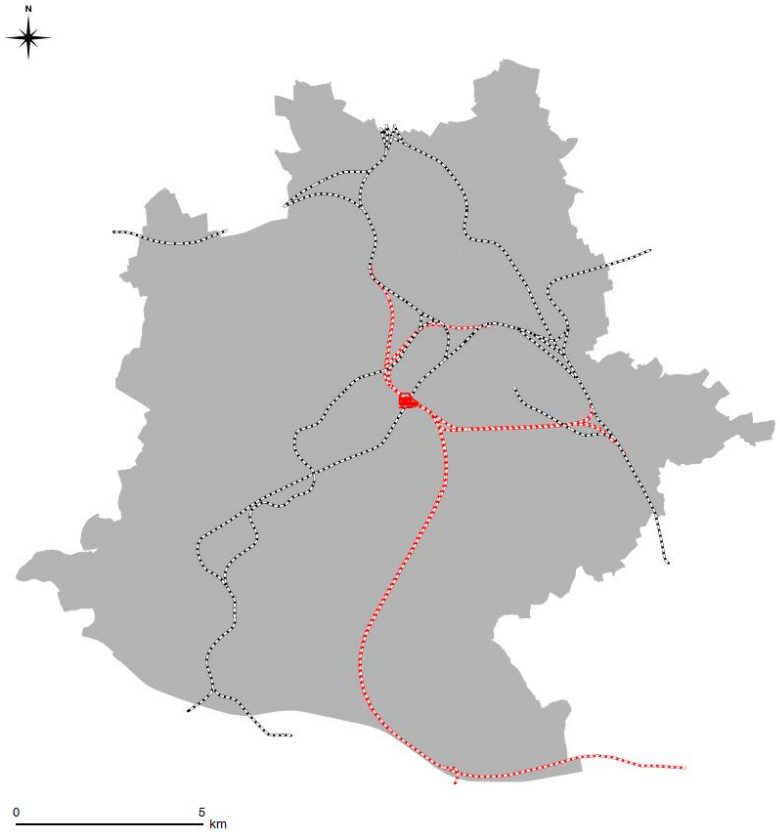
Scenario (variant 1-w1)

- Deficit of birth to increase from 162 thousand (2008) to 553 thousand by 2060
- Population in Germany to decline by 17 million people between 2008 and 2060
- Old-age dependency ratio to increase from 29 (2008) to 59 by the year 2060

Demographic Change: Some areas of economic research

- Health care: Rising costs anticipated, however during the last decades there appears to be evidence for a decrease in the time an individual dependents on care (e.g. Freedman et al., 2004)
- Economic growth: Ambivalent findings, however it is likely that a higher life expectancy does not necessarily lead to a faster growth of income per capita (e.g. Acemoglu & Johnson, 2007)
- Lump-of-labor: Recent research tends to decline the assumption that higher retirement ages increase unemployment among young people (e.g. Brösch-Supan & Schnabel, 2010)
- Political enforceability: Issues such as retirement policy gain more weight in political discussions as share of elderly people among voters increases (e.g. Sinn & Übelmesser, 2002)
- ***Research question: What are the possible consequences and challenges that might result from the ongoing demographic change for the future development of new infrastructure, in particular when accounting for more public participation in decision finding (e.g. Osborne & Turner, 2010)?***

Stuttgart 21: The project



Source: own illustration; Geodata: Bundesamt für Kartographie und Geodäsie, 2014

Key facts

- Part of railway project Stuttgart-Ulm (which also includes the HS Wendlingen-Ulm and the redevelopment project Neu-Ulm 21)
- Construction of a new underground central station and a tunnel as a link to Stuttgart airport and HS Wendlingen-Ulm
- Existing over ground track field of Stuttgart central station to be freed for use as a new urban redevelopment zone
- 57 km of new rail line, including 30 km high-speed line and 33 km in tunnels, expected investment of EUR 2.8 billion

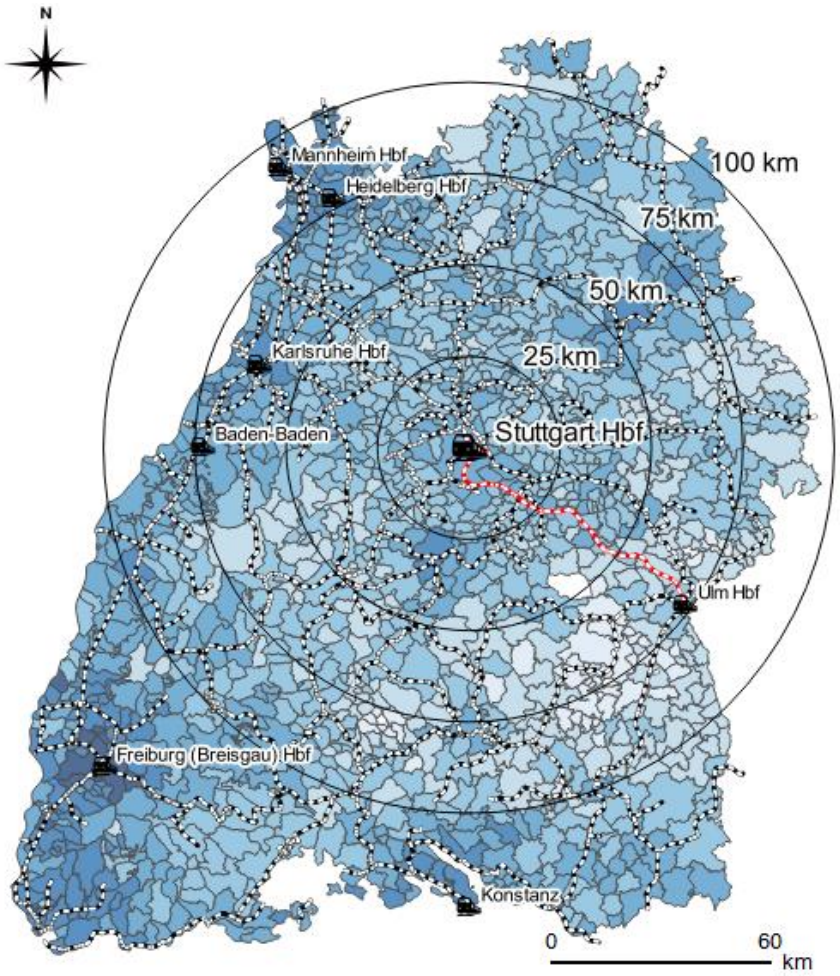
Stuttgart 21: Timeline of events

- **1985** Extension of rail line Plochingen – Günzburg "preferential need" (BVWP)
- **1988** First concept of new underground main station for express trains only (Heimerl-Plan)
- **1990** Urban planers propose sub-terrain station and deconstruction of track field
- **1992** State government favors construction of a new high-speed-line Stuttgart - Ulm
- **1994** First public presentation of the S21-project
- **1997** Regional planning procedure for S21-project completed
- **1998** German Rail (DB) stops all further planning on S21
- **2001** New finance agreement on S21 and start of public works planning
- **2006** Last legal protest against S21 rejected by court

2010 / 2011

- **02|02|2010** Official start of construction works accompanied by few protests
- **July/August 2010** Preparation for works at Stuttgart central station, protests intensified
- **09|30|2010** "Black Thursday" 116 people injured in the Schlossgarten
- **October/November 2010** Public mediation under the chairmanship of Heiner Geißler
- **03|17|2011** State election resulting in a Green/Social Democrat coalition
- **11|27|2011** Referendum on the future realization of S21 station project

Stuttgart 21: The referendum



Source: own illustration; Geodata: Bundesamt für Kartographie und Geodäsie, 2014

Key facts

- Statewide voting in 1101 municipalities on November 27th, 2011 with a total number of 7 624 302 people entitled to vote
- Voters asked whether they approve the abrogation of the financing contract, thus voting "Yes" means opposing the project
- Proposed legislation refused by a majority of 58.9% of the voters with highest share of Yes-votes in the city of Freiburg
- 3 682 739 million voters participating in the referendum, corresponding to a state wide voter turnout of 48.3%

Empirical Strategy: Data and models

Data

- Percentage share of Yes-votes per municipality used as main dependent variable and local age structure described by average age of population

- Socioeconomic (gender, income, unemployment, high-skilled, population density), political (share of Conservative and Green-party vote in 2009 federal election) and involvement (metric distance to Stuttgart, distance zones or commuter-weighted average change in rail travel times) controls included

Empirical Strategy

- Baseline models showing OLS estimates with standard errors adjusted for spatial dependence (Conley, 1999)

$$YES_i = \alpha + \beta \cdot AGE_i + \gamma \cdot Z_i + \varepsilon_i$$

- WLS regressions and weighted binary choice models as further robustness checks

$$log\left(\frac{yes_i}{1 - yes_i}\right) = \alpha + \beta \cdot AGE_i + \gamma \cdot Z_i + \varepsilon_i$$

Results: Baseline models

	Model 1: OLS		Model 2: OLS	
	Estimate	Conley SE	Estimate	Conley SE
Average age (years)	1.941***	(0.237)	0.890***	(0.145)
Male (%)			-0.0432	(0.165)
Income (1000 € per capita)			-0.125	(0.0862)
Unemployment (%)			-0.106	(0.466)
Homeowner (%)			-0.165***	(0.0443)
High-skilled (%)			0.138	(0.102)
Population density (100 people/km²)			0.225***	(0.0824)
Conservatives (%)			-0.706***	(0.0620)
Greens (%)			0.447***	(0.130)
Distance Stuttgart (km)			0.107***	(0.00660)
Constant	36.85***	(0.728)	28.89***	(0.609)
R^2 | AIC | N	0.120 |8004.3 | 1101		0.694 | 6859.7 | 1101	

Notes: All variables centered except for distance measures. Conley SE adjusted for spatial dependence (15.6 km cutoff zone): * p < 0.1, ** p < 0.05, *** p < 0.01

Results: Baseline models

Fig. 2a. Yes-votes & Average age (unconditional)

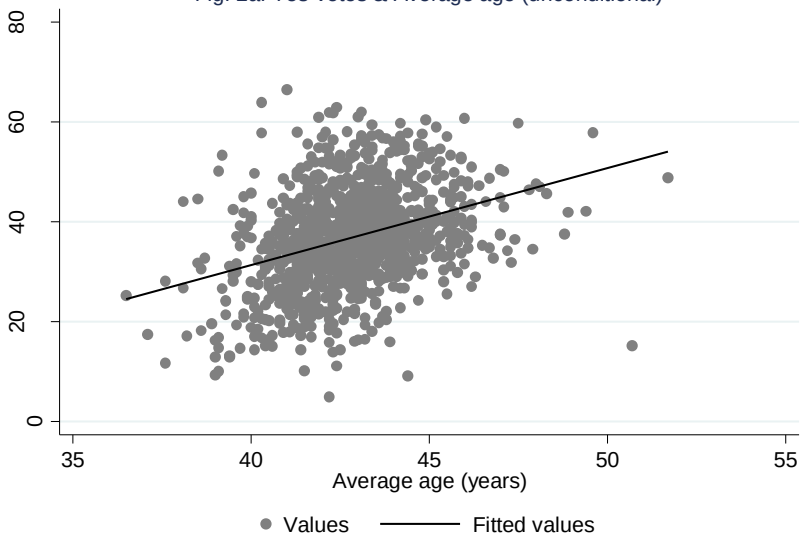
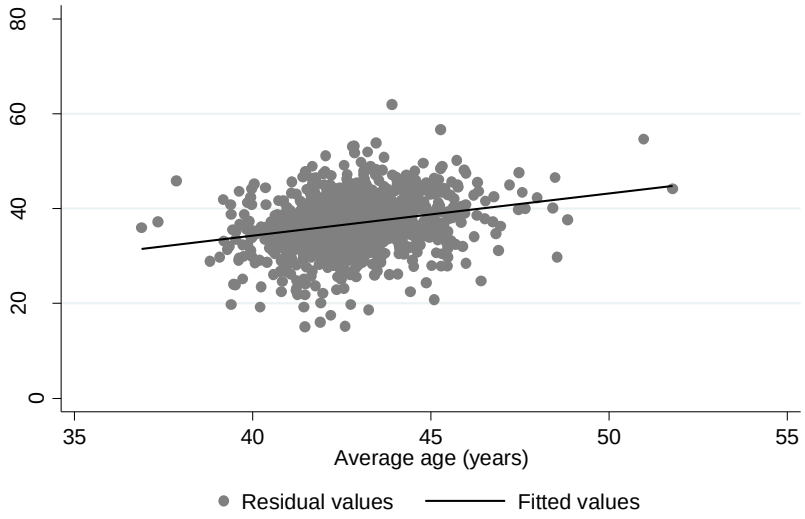


Fig. 2b. Yes-votes & Average age (conditional)



First findings

- Highly significant positive correlation between the average age of a municipality's population and the respective share of Yes-votes clearly visible, both in unconditional and conditional regressions
- Among the other controls, especially the rate of homeownership, the population density, political preferences and the local involvement as measured by the crow fly distance to Stuttgart appear to be of statistical significance

Results: Alternative measures of local involvement

	Model 3: OLS		Model 4: OLS	
	Estimate	Robust SE	Estimate	Robust SE
Average age (years)	0.951***	(0.128)	0.921***	(0.115)
Delta travel time (minutes)	0.478***	(0.0858)		
Distance Stuttgart 25-50 km (dummy)			2.671***	(0.482)
Distance Stuttgart 50-75 km (dummy)			5.526***	(0.626)
Distance Stuttgart 75-100 km (dummy)			7.527***	(0.643)
Distance Stuttgart 100 km < (dummy)			12.12***	(0.603)
Constant	37.29***	(0.261)	30.35***	(0.424)
Socioeconomic controls	YES		YES	
Political controls	YES		YES	
R^2 AIC N	0.590 7179.9 1101		0.681 6911.6 1101	

Notes: All variables centered except for distance measures. White-robust SE: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Results: Alternative estimation techniques

	Model 5: WLS		Model 6: BC	
	Estimate	SE	Estimate	SE
Average age (years)	0.843***	(0.124)	0.0398***	(0.00496)
Distance Stuttgart (km)	0.103***	(0.00503)	0.00427***	(0.000223)
Constant	29.12***	(0.384)	-0.870***	(0.0174)
Socioeconomic controls	YES		YES	
Political controls	YES		YES	
R^2 AIC N	0.751 6529.1 1101		0.687 -163.5 1101	

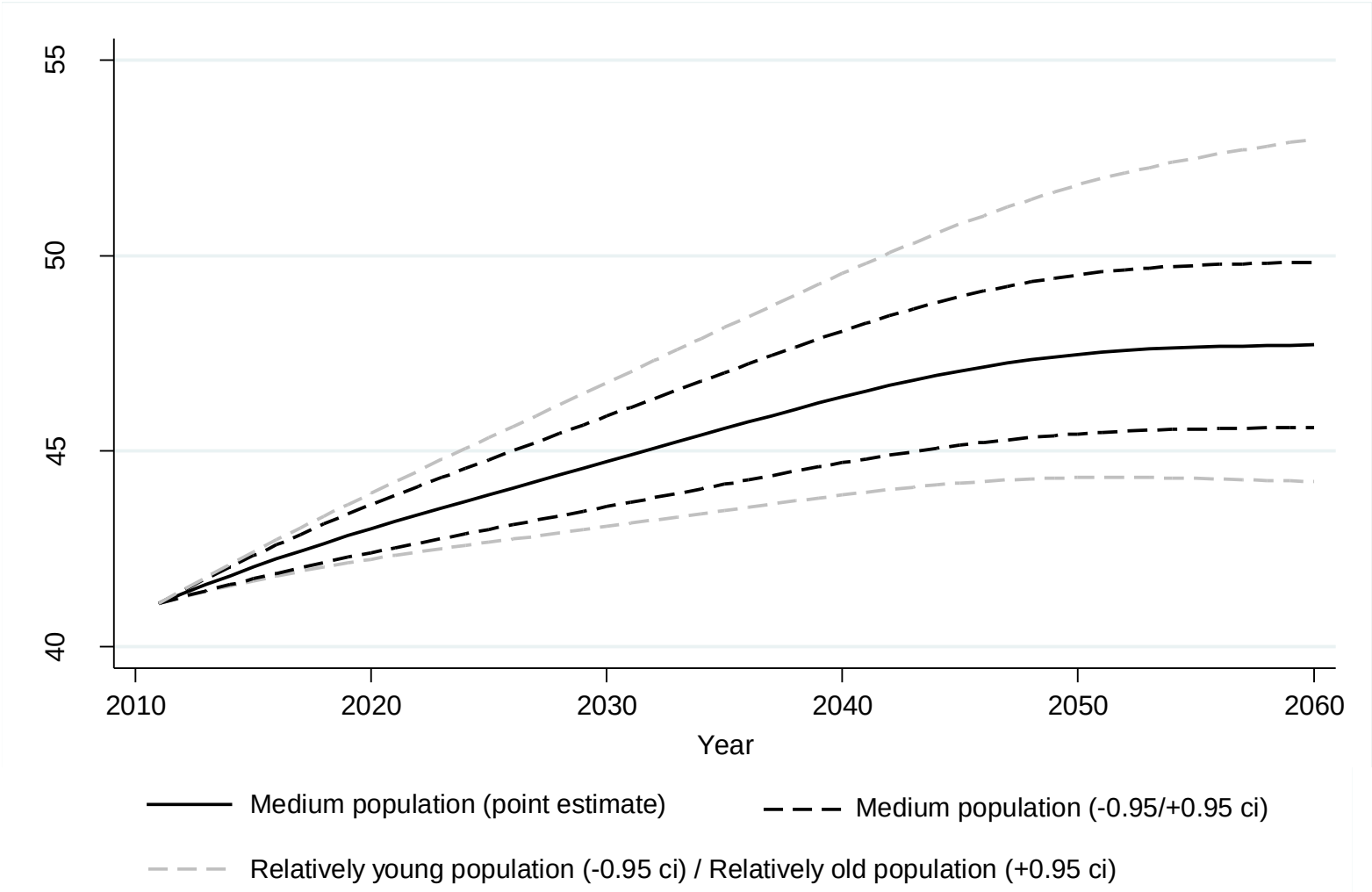
Notes: WLS estimates weighted by number of voters participating, log odds displayed for binary choice model, all variables centered except for distance measure. SE: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Results: Interaction models

	Model 7: OLS		Model 8: OLS	
	Estimate	Robust SE	Estimate	Robust SE
Average age (years)	0.899***	(0.110)	0.882***	(0.108)
Male (%)	-0.291*	(0.171)	-0.0817	(0.195)
Homeowner (%)	-0.162***	(0.0291)	-0.173***	(0.0293)
Age * Male	0.188***	(0.0423)		
Age * Homeowner			0.0537***	(0.0104)
Distance Stuttgart (km)	0.107***	(0.00436)	0.108***	(0.00447)
Constant	28.98***	(0.356)	28.99***	(0.365)
Socioeconomic controls	YES		YES	
Political controls	YES		YES	
R^2 | AIC | N	0.699 | 6841.4 | 1101		0.701 | 6834.1 | 1101	

Notes: All other socioeconomic and political controls included, all variables centered except for distance measure. White-robust SE: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Projection



Source: own illustration; Data: own calculations model 2; 12th coordinated population projection, variants V1-W1, V3-W2 and V6-W1, Statistisches Bundesamt 2009

Conclusion

- A rise in average age leads to an increase in opposition towards the Stuttgart 21 railway project as expressed by the share of Yes-votes in the referendum
- Among the other covariates especially the rate of homeownership, the urban settlement structure, political preferences and the local involvement appear to be of statistical significance
- Age effect is robust to different estimation techniques and alternative measures of local involvement
- Interaction models indicate that the age effect increases in the share of male residents and homeowners
- Given the projections of long-term demographic development, such effects could accumulate to an economically significant size, however a hypothetical flip of the referendum seems unlikely
- In the light of the ongoing aging of the population, the results can be seen as evidence for the absence of a common-value-environment as a precondition for the efficiency of public referendums

Thank you

Literature (Selection)

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