



Household energy demand in Sweden 1920-2005

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Structure

- Issue
- Previous studies
- Framework
- Data
- Results
- Conclusion and how to continue



Issue

- Household energy demand
- Price and income effects
- Growing demand for studies on persistence/stability of preferences determine household energy demand
- International Energy Agency (IEA) shows that most of the Energy/GDP reduction was archived by reduction in end-use energy intensity (housing, transport)



Previous studies; contemporary

- Studies from IEA has shown that the reduction in energy/GDP ratio has slowed down from 2.5% between 1973-1982 to 0.7% between 1990-1998 in the IEA countries
- Previous studies from Sweden has shown a similar trend with a significant improvement during the 1970s and then a stagnation after 1990s
- Nässén, Sprei & Holmberg 2008 shown a strong correlation between energy use and energy prices in the housing /building sector during the period 1970-2002



Previous studies; historical studies

- Lindmark and Andersson 2010, Household energy consumption 1800-1920
- Finds significant income, price and household size effects on energy consumption
- Make projection based on household budget surveys from the 1910s and 1920s
- Cannot however test for changes in preferences over time



Framework

- HH End use of energy is a question of derived demand – from housing and equipments (consuming energy)
- Limited to house-related equipments
- Two-step analysis:
 1. Estimation of HH-energy consuming capital per capita
 - Analysis on real per capita income (and relative price on cap)
 2. Estimation of capital energy intensity
 - Determined by relative price of energy (and real capita income)

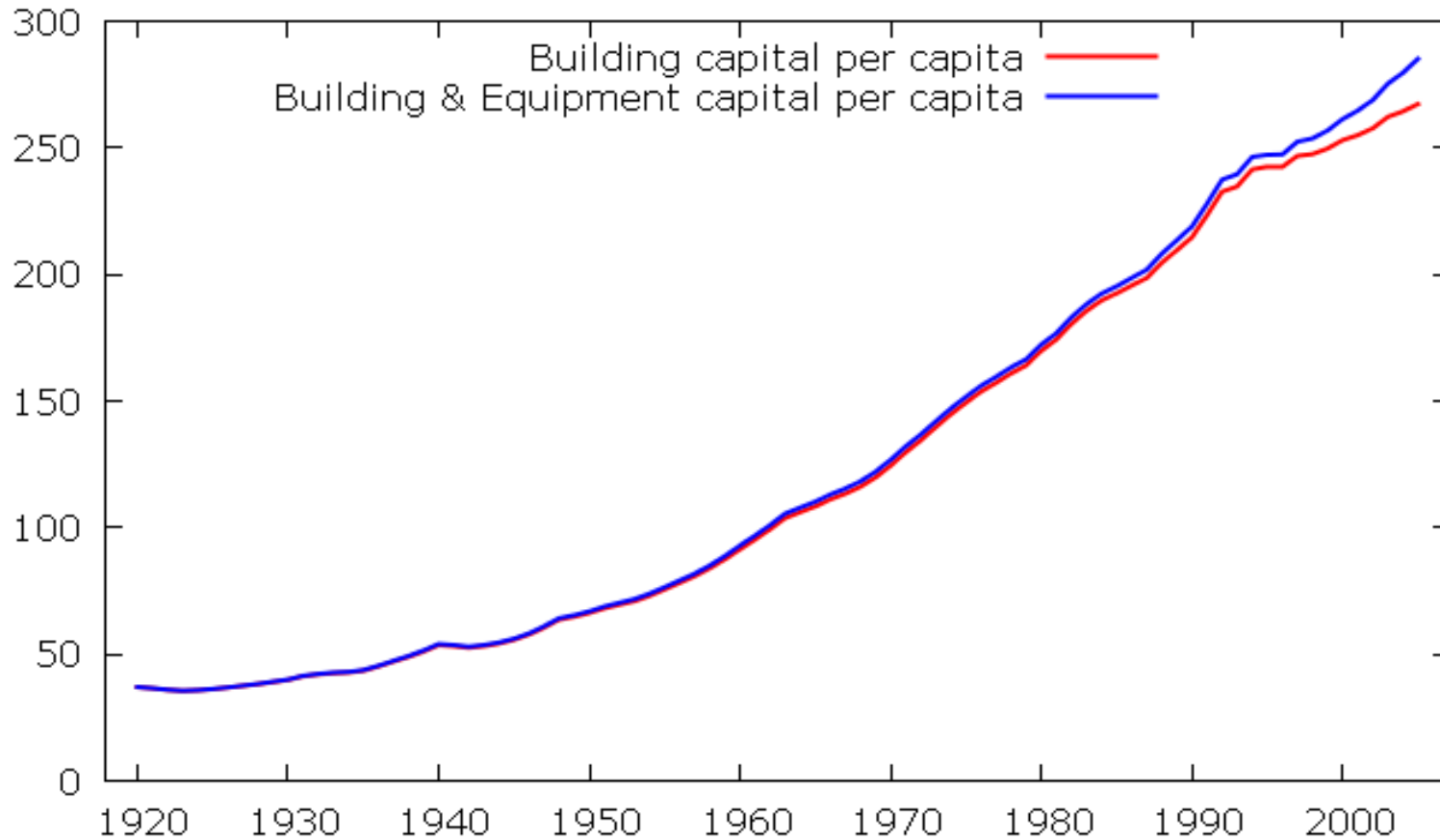


Data

- Capital is made up by accumulated investment in:
 - Buildings
 - Domestic equipments consuming energy (TV, radio, refrigerator etc.)
- Perpetual inventory method (65 year life cycle on buildings, 10 years on equipments)
- Data derived from official statistics (National accounts 1963-2005) and from Ö. Johansson (1967) 1920-1963. Consumption from The Swedish welfare board and price from A. Kander (2002)

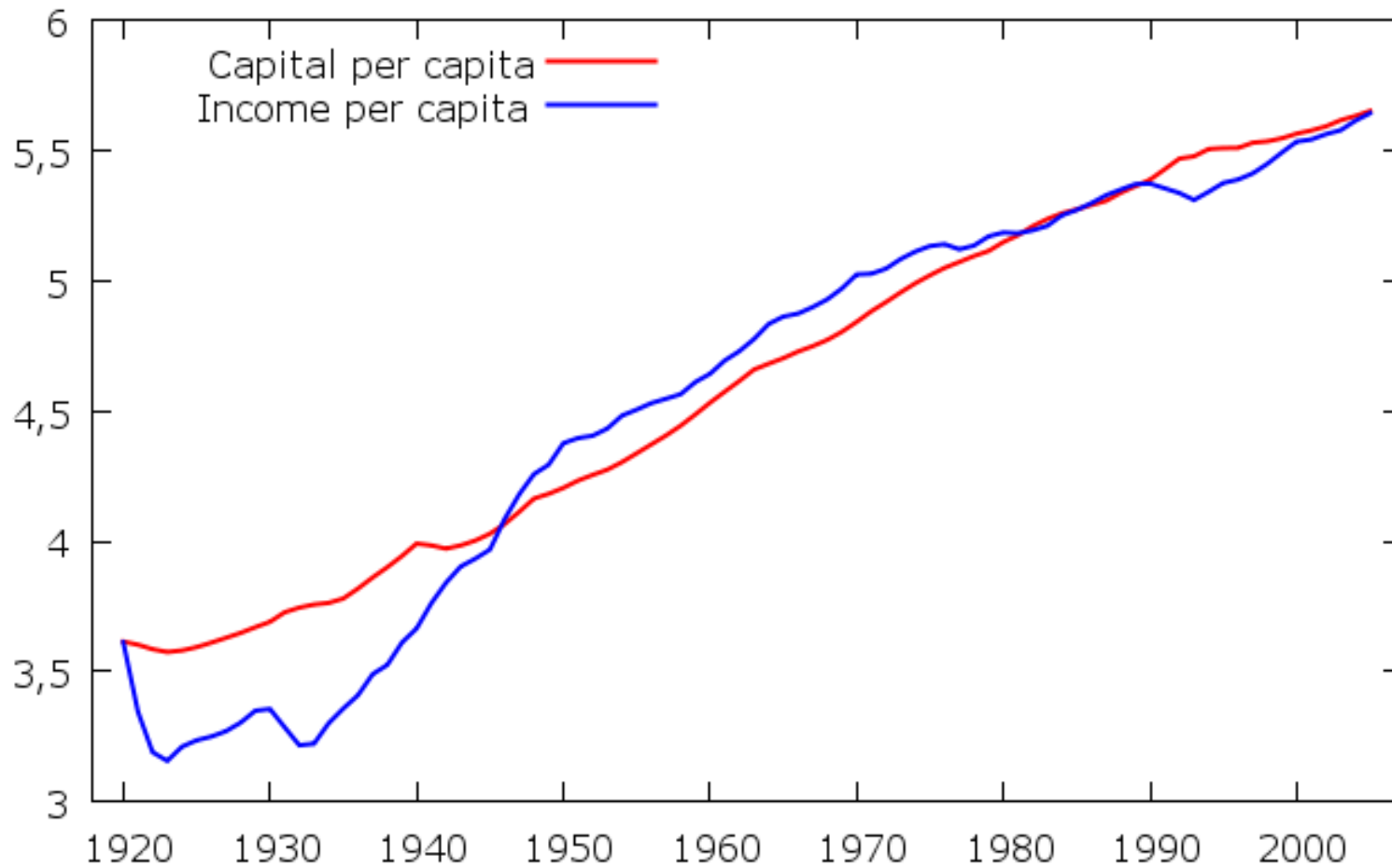


Real capital per capita (th.SEK per capita, 2000 year price)



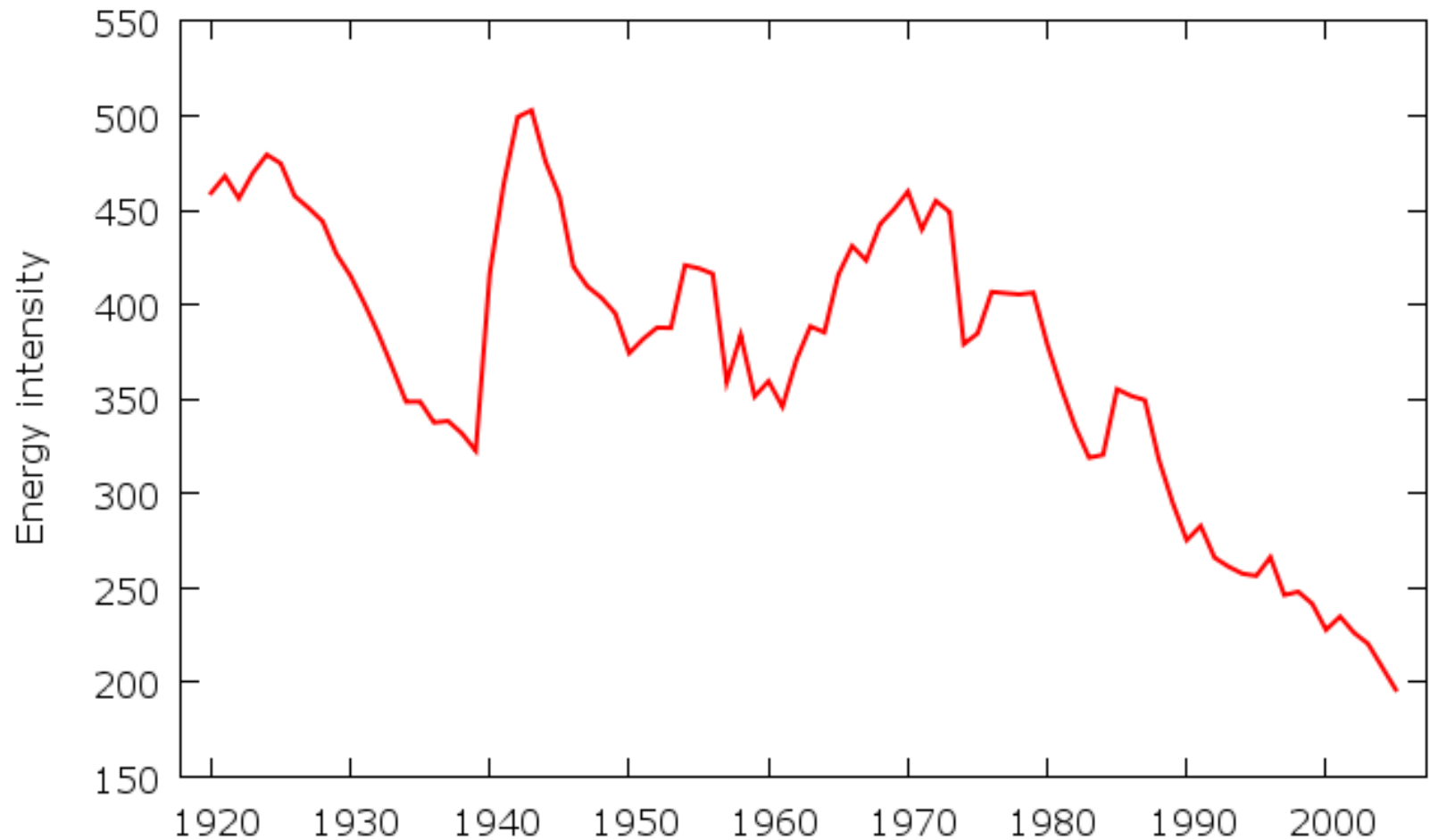


Relation between capital and income (log scale)



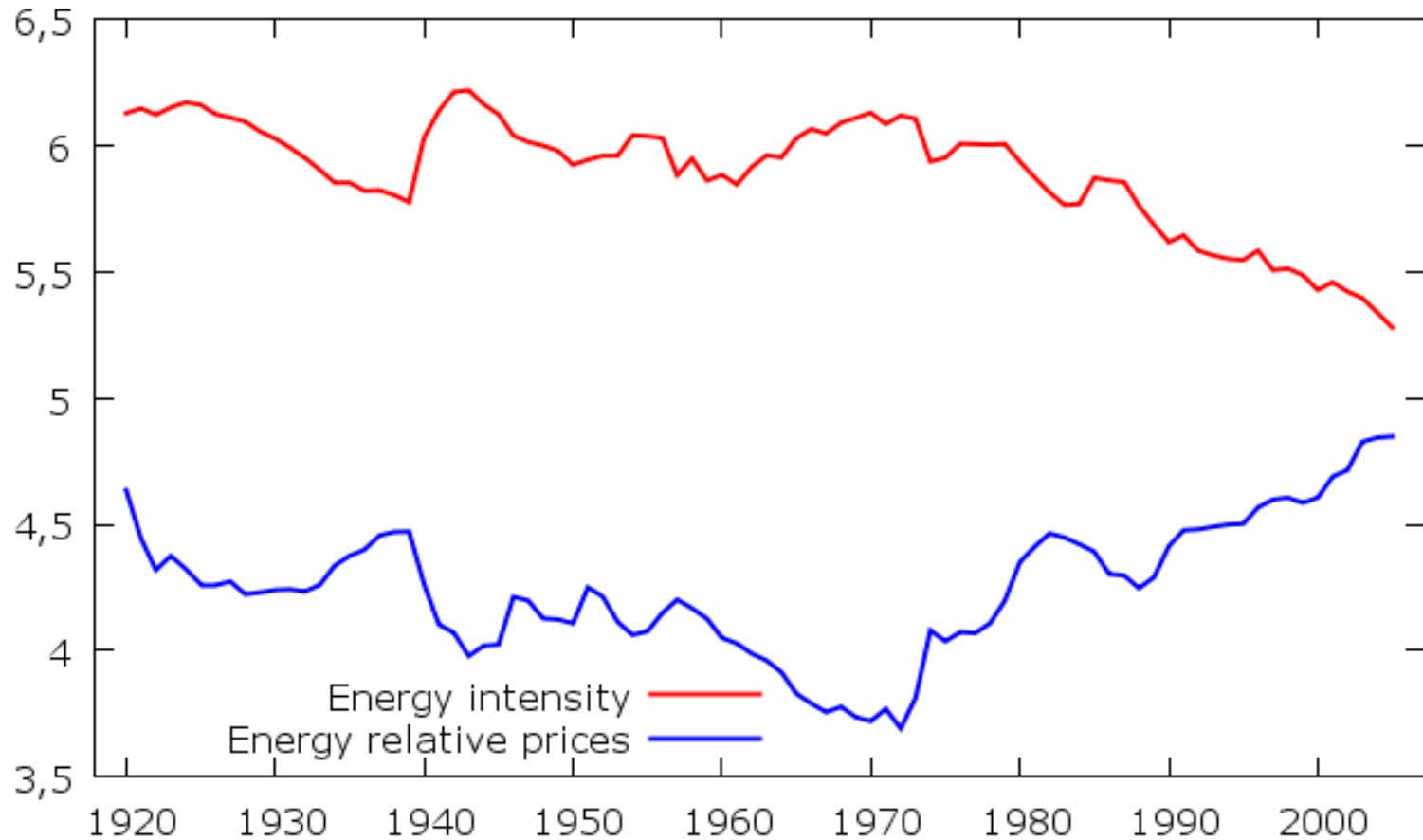


Energy intensity (energy MJ / real capital in Msek 2000 year price)





Relation between energy intensity and energy prices (log scale)





Preliminary regression results: based on auto-regressive (AR) – model

Total capital stock

Model 1	coefficient	std. error	t-ratio	p-value
Income per capita	2275,23	687,21	3,311	0,0014 ***

Mean dependent var	1020348
R-squared	0,99949
Adjusted R-squared	0,99948
P-value(F)	0,00138

Energy intensity

Model 2	coefficient	std. error	t-ratio	p-value
Energy price	-0,710534	0,291	-2,444	0,0166 **

Mean dependent var	371,2296
R-squared	0,922477
Adjusted R-squared	0,921543
P-value(F)	0,01664



Conclusions

- It appears that energy consumption, in relation to household capital, has decreased as consequence of higher energy prices
- However, the lowered energy intensity has not implied lowered energy per capita consumption in the long run
- Income correlates with the capital stock, and the energy price with energy intensity



Coming work

- Test different time series models
- Provide historical background and context to tell a story on the issue
- Energy efficiency?