Did Household Debt Matter in the Great Recession?

Supplement to Blog Post on ekonomistas.se

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This document is a supplement to the blog post "Ska vi oroas av höga hushållsskulder?" published on ekonomistas.se in February 2014. Here I present the data more carefully. I also present some additional analyses and perform some robustness checks.

The question addressed in the blog post is if high household debt is a factor that generates or aggravates economic downturns. The focus is on the *level* of household debt relative to income (the debt ratio), but credit expansion in the form of increasing debt ratios is also of interest. In the blog post I further focus on the recent financial crisis. Were countries that had high debt ratios in 2007 more severely affected during and after the recent crisis?

1. Data Description

The sample consists of 26 OECD countries with a focus on credit expansion in the five years up to 2007, household financial assets and debt in 2007, and the development of unemployment, consumption, and house prices in the five-year period 2008-2012. Of the 34 OECD member countries, Poland was excluded because of missing data on house prices, Greece, Iceland, Israel, Luxembourg, and New Zeeland were excluded because of missing data on household debt, and Chile and Turkey were excluded because of missing data on both house prices and debt.

The main variables in the dataset are presented graphically at the end of the document, where there are also further details about the variables.

2. Main Results

Table 1 presents the main regression results. The regressions take the form[2]

$$X_{0712,i} = \alpha + \beta_1 Debt_{07,i} + \beta_2 \Delta Debt_{0307,i} + \beta_3 CA_{0307,i} + \beta_4 \Delta C_{0307,i} + \epsilon_i \qquad (1)$$

where $Debt_{07}$ is household debt in percent of disposable income in 2007, $\Delta \text{Debt}_{0307}$ is the average annual growth rate of the household debt to disposable income in the five years 2003 to 2007, CA_{0307} is the average current account balance in percent of GDP in 2003 to 2007, and ΔC_{0307} is the average annual growth rate of private consumption per capita in 2003 to 2007. The dependent variable X_{0712} is one of ΔC_{0712} (accumulated percentage increase in private consumption per capita from 2007 to 2012), ΔU_{0712} (percentage points increase in unemployment

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[2] I include both the debt ratio and the growth of the debt ratio in the regressions. Because of country-specific factors such as the depth or design of financial and mortgage markets, the income and wealth distribution, etc, a particular debt ratio may be more problematic in one country than in another. The growth of the debt ratio may mitigate problems with such country-specific factors. The growth of consumption in the years prior to the crisis is included to capture country-specific trends. The current account balance is a broad measure of how a country's wealth changes over time, including both the private and the public sector. It also turns out to be a highly relevant explanatory variable in the dataset that I use. Below, I also consider other variables that are sometimes considered in similar settings (see e.g. the European Commission's scoreboard for macroeconomic imbalances).

from 2007 to 2012), ΔP^{H}_{0712} (accumulated percentage increase in real residential property prices from 2007 to 2012), and ΔY_{0712} (accumulated percentage increase in output per capita from 2007 to 2012).

Table 1: Development of consumption, unemployment, property prices, and output 2007-2012

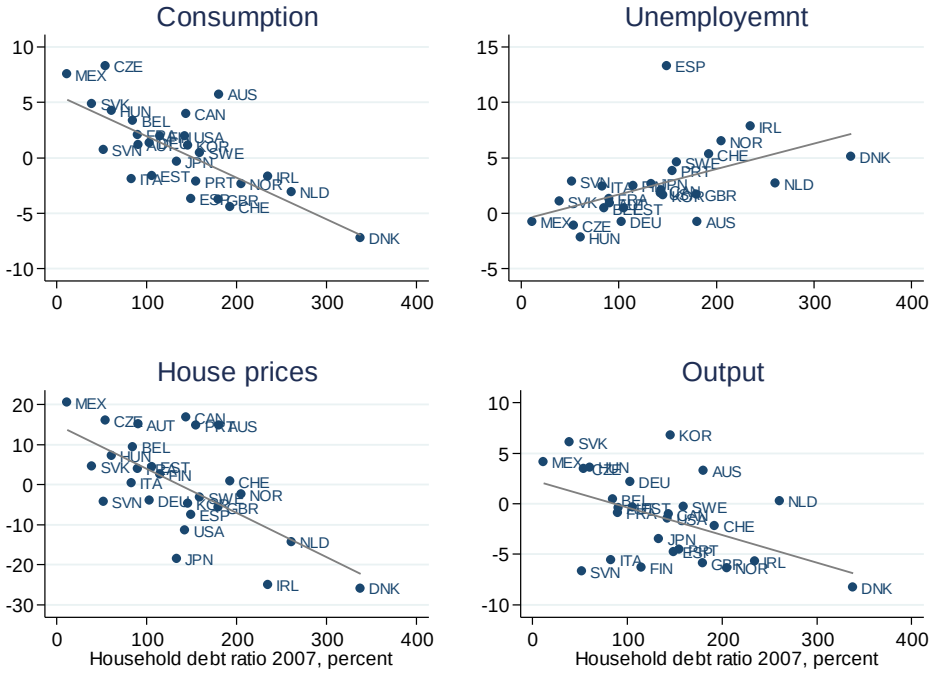
	(1) dC	(2) dU	(3) dPH	(4) dY
Debt/dinc 2007	-0.04**	0.02*	-0.11**	-0.03*
	(0.00)	(0.02)	(0.00)	(0.03)
Growth in debt 03-07	-0.97**	0.28	-2.00**	-0.79**
	(0.00)	(0.16)	(0.01)	(0.01)
CA 03-07	0.38**	-0.35**	1.43**	0.01
	(0.00)	(0.01)	(0.00)	(0.96)
Growth in priv cons, 03-07	2.10**	-0.75	2.64	2.02*
	(0.00)	(0.21)	(0.19)	(0.02)
Constant	5.66**	-0.61	15.00*	2.62
	(0.00)	(0.71)	(0.01)	(0.24)
R2 (adjusted)	0.74	0.38	0.66	0.28
Observations	26	26	26	26

OLS regression as in (1) with dependent variable specified in column head; p-values in parentheses; * and ** indicate significance at 5% and 1% respectively.

From the table, we see that the debt ratio is significant in all specifications. Figure 1 graphically presents the relation between the debt ratio and the dependent variable implied by the regression results in Table 1.[3] More specifically, the graph plots X^{adj}_{0712} against the debt ratio, where I calculate

$$X^{adj}_{0712,i} = X_{0712,i} - (\hat{\beta}_2 \Delta Debt_{0307,i} + \hat{\beta}_3 CA_{0307,i} + \hat{\beta}_4 \Delta C_{0307,i}).$$

Figure 1: Adjusted developments 2007-2012 against household debt ratio 2007



[3] See Figure 4 at the end of this document for the relation between the debt ratio and the dependent variables without adjustments. No clear patterns are visible in that graph.

3. Implications

Figure 2 reports an estimate of country "vulnerability" in 2007 based on the regression results in the first column of Table 1. More specifically, I calculate vulnerability as the predicted consumption fall 2008-2012 based on the country's debt ratio in 2007, growth in the debt ratio prior to the crisis, and the current account balance prior to the crisis, i.e.

$$V_{2007,i} = -(\hat{\beta}_1 Debt_{07,i} + \hat{\beta}_2 \Delta Debt_{0307,i} + \hat{\beta}_3 CA_{0307,i}). \quad (2)$$

Figure 2: Vulnerability in 2007

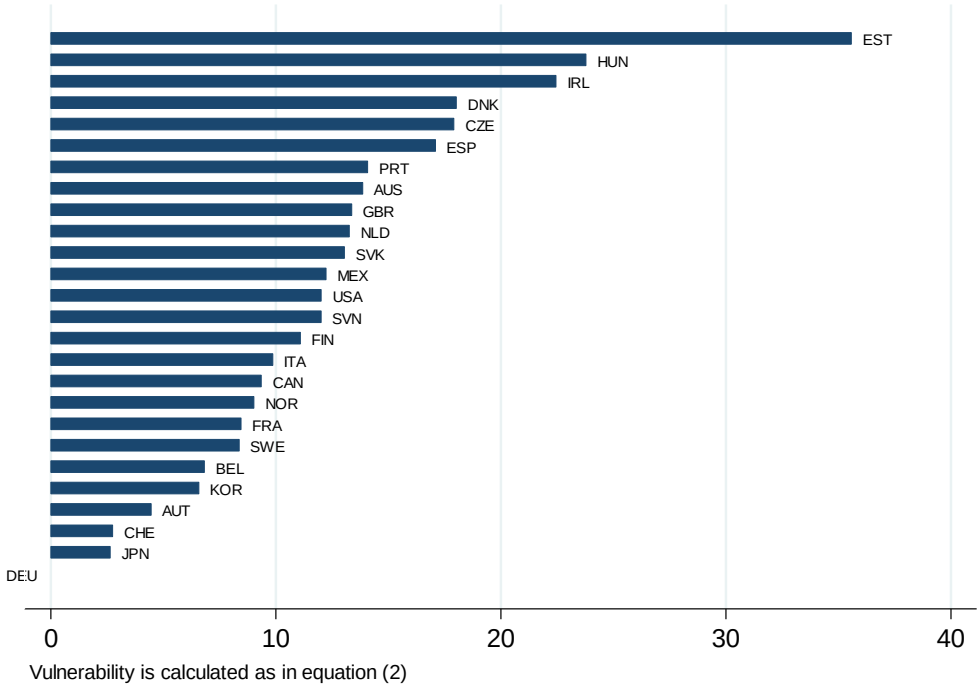
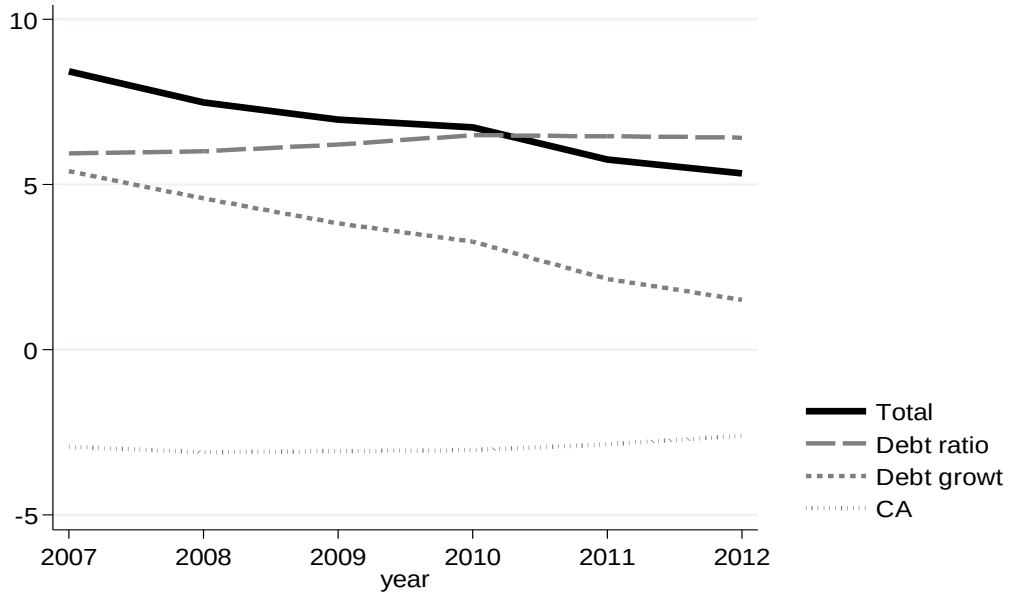


Figure 3 reports how this measure of vulnerability has evolved for Sweden from 2007 to 2012, based on the same approach and parameters as in equation (2), but with data corresponding to the subsequent years. We see that the Swedish economy according to these estimates has become more resilient to external disturbances since 2007. This is all driven by a lower growth rate of the household debt ratio. Both a higher level of the household debt ratio and a slightly lower current account surplus have contributed to making the Swedish economy more vulnerable.

Figure 3: Swedish vulnerability



Total vulnerability and contribution to vulnerability from debt ratio, debt growth, and current account balance

4. Robustness and Alternative Specifications

4.1 Outliers

Table 2 reports results from regressions as in equation (1), but using a method that is robust to outliers.[4] The results are similar to those in Table 1.

Table 2: Development of consumption, unemployment, property prices and output 2007-2012

	(1) dC	(2) dU	(3) dPH	(4) dY
Debt/dinc 2007	-0.04**	0.01*	-0.14**	-0.03*
	(0.00)	(0.03)	(0.00)	(0.03)
Growth in debt 03-07	-0.85**	0.12	-1.23*	-0.73*
	(0.00)	(0.15)	(0.02)	(0.02)
CA 03-07	0.44**	-0.13*	2.32**	0.04
	(0.00)	(0.02)	(0.00)	(0.84)
Growth in priv cons, 03-07	2.45**	-0.01	2.24	1.93*
	(0.00)	(0.98)	(0.13)	(0.03)
Constant	4.52*	-0.25	11.54**	2.87
	(0.01)	(0.73)	(0.01)	(0.24)
R2 (adjusted)	0.74	0.47	0.83	0.23
Observations	25	26	26	26

Outlier robust regression as in (1) with dependent variable specified in column head; p-values in parentheses; * and ** indicate significance at 5% and 1% respectively.

[4] I use the command rreg in Stata.

4.2 Alternative Explanatory Variables

Tables 3 and 4 show results of alternative regression specifications. The household debt ratio is not directly correlated to the outcome variables (see second columns), but household debt and the growth of the debt ratio are significant in most specifications when we control for other variables. Both these variables also add substantial explanatory power.

One might argue that high household (gross) debt should not matter if households also hold substantial assets. In columns 6 and 7 in Table 3 and column 8 in Table 4, I therefore include net financial wealth and growth of wealth as additional explanatory variables. There is no support for household wealth being relevant for the economic development after the crisis. One reason for why debt may matter more than wealth is that liabilities may be concentrated among a small subset of the households.

One may also argue that a housing boom followed by an economic downturn is more problematic if the boom is associated with high construction. There is some support for such arguments. Investment in construction is highly significant and adds explanatory power in column 6 in Table 4. That finding is however mostly driven by two data points (Ireland and Spain), as seen in column 7.

Table 3: Explaining consumption 2007-2012

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	dC	dC	dC	dC	dC	dC	dC	dC
Debt/dinc 2007	-0.04**	-0.01			-0.02*	-0.04**		-0.03**
	(0.00)	(0.45)			(0.05)	(0.00)		(0.00)
Growth in debt 03-07	-0.97**		-0.87**		-0.65**	-0.97**		-0.95**
	(0.00)		(0.00)		(0.00)	(0.00)		(0.00)
CA 03-07	0.38**		0.24	0.47**		0.38**	0.45*	0.35*
	(0.00)		(0.12)	(0.01)		(0.01)	(0.02)	(0.01)
Growth in priv cons, 03-07	2.10**		1.76*	-0.24		2.00**	-0.61	1.99**
	(0.00)		(0.02)	(0.67)		(0.01)	(0.41)	(0.00)
Wealth/dinc 2007						-0.00	-0.01	
						(0.65)	(0.44)	
Growth in wealth 03-07						0.01	0.15	
						(0.94)	(0.57)	
Construction 03-07								-0.24
								(0.55)
Constant	5.66**	-0.27	0.65	-1.32	6.28**	6.44*	0.99	6.62**
	(0.00)	(0.91)	(0.65)	(0.42)	(0.01)	(0.01)	(0.78)	(0.01)
R2 (adjusted)	0.74	-0.02	0.53	0.28	0.47	0.72	0.24	0.74
Observations	26	26	26	26	26	26	26	26

Regression with dC as dependent variable; p-values in parentheses; * and ** indicate significance at 5% and 1% respectively.

Table 4: Explaining unemployment 2007-2012

	(1) dU	(2) dU	(3) dU	(4) dU	(5) dU	(6) dU	(7) dU	(8) dU
Debt/dinc 2007	0.02*	0.01			0.01			0.03*
	(0.02)	(0.44)			(0.18)			(0.01)
Growth in debt 03-07	0.28		0.22		0.28*			0.09
	(0.16)		(0.32)		(0.02)			(0.52)
CA 03-07	-0.35**		-0.27	-0.32*		-0.24**	-0.20**	-0.32*
	(0.01)		(0.05)	(0.01)		(0.01)	(0.00)	(0.01)
Growth in priv cons, 03-07	-0.75		-0.54	-0.04				
	(0.21)		(0.40)	(0.92)				
Construction 03-07						1.24**	0.13	
						(0.00)	(0.69)	
Wealth/dinc 2007								-0.00
								(0.75)
Growth in wealth 03-07								-0.30
								(0.06)
Constant	-0.61	1.75	2.47	2.96*	-1.12	-3.73*	1.53	0.23
	(0.71)	(0.29)	(0.06)	(0.02)	(0.56)	(0.03)	(0.36)	(0.92)
R2 (adjusted)	0.38	-0.02	0.23	0.22	0.16	0.58	0.27	0.43
Observations	26	26	26	26	26	26	25	26

Regression with dU as dependent variable, outlier robust regression in column 7; p-values in parentheses; * and ** indicate significance at 5% and 1% respectively.

Both government debt and growth in house prices are included as indicators in the European Commission's scoreboard for macroeconomic imbalances. Table 5 reports results with those as additional explanatory variables. These variables are not statistically significant and they do not add explanatory power in the regressions.

Table 5: Government debt and growth in house prices

	(1) dC	(2) dC	(3) dC	(4) dC	(5) dU	(6) dU	(7) dU	(8) dU
Debt/dinc 2007	-0.04**	-0.04**	-0.03*		0.01	0.02*	0.01	
	(0.01)	(0.00)	(0.01)		(0.43)	(0.04)	(0.48)	
Growth in debt 03-07	-1.26**	-1.01**	-1.28**		0.79*	0.28	0.81*	
	(0.00)	(0.00)	(0.00)		(0.04)	(0.19)	(0.03)	
CA 03-07	0.32*	0.37**	0.32*	0.43*	-0.32*	-0.35*	-0.32*	-0.40*
	(0.01)	(0.00)	(0.01)	(0.04)	(0.03)	(0.01)	(0.03)	(0.01)
Growth in priv cons, 03-07	2.94**	1.93**	3.09**	0.74	-0.51	-0.74	-0.61	0.57
	(0.00)	(0.00)	(0.00)	(0.58)	(0.61)	(0.28)	(0.52)	(0.57)
Government debt 2007	-0.02	-0.03			0.01	0.00		
	(0.44)	(0.24)			(0.65)	(0.93)		
House price growth 03-07	0.09		0.15	-0.30	-0.08		-0.12	0.17
	(0.72)		(0.52)	(0.42)	(0.78)		(0.65)	(0.54)
Constant	6.36	7.86**	4.15*	-1.63	-2.13	-0.75	-0.61	1.68
	(0.07)	(0.01)	(0.03)	(0.46)	(0.59)	(0.81)	(0.76)	(0.30)
R2 (adjusted)	0.75	0.76	0.75	0.17	0.47	0.34	0.50	0.31
Observations	20	25	20	20	20	25	20	20

OLS regression as in (1) with dependent variable specified in column head; p-values in parentheses; * and ** indicate significance at 5% and 1% respectively.

4.3 Restrict Sample to Countries with Falling House Prices

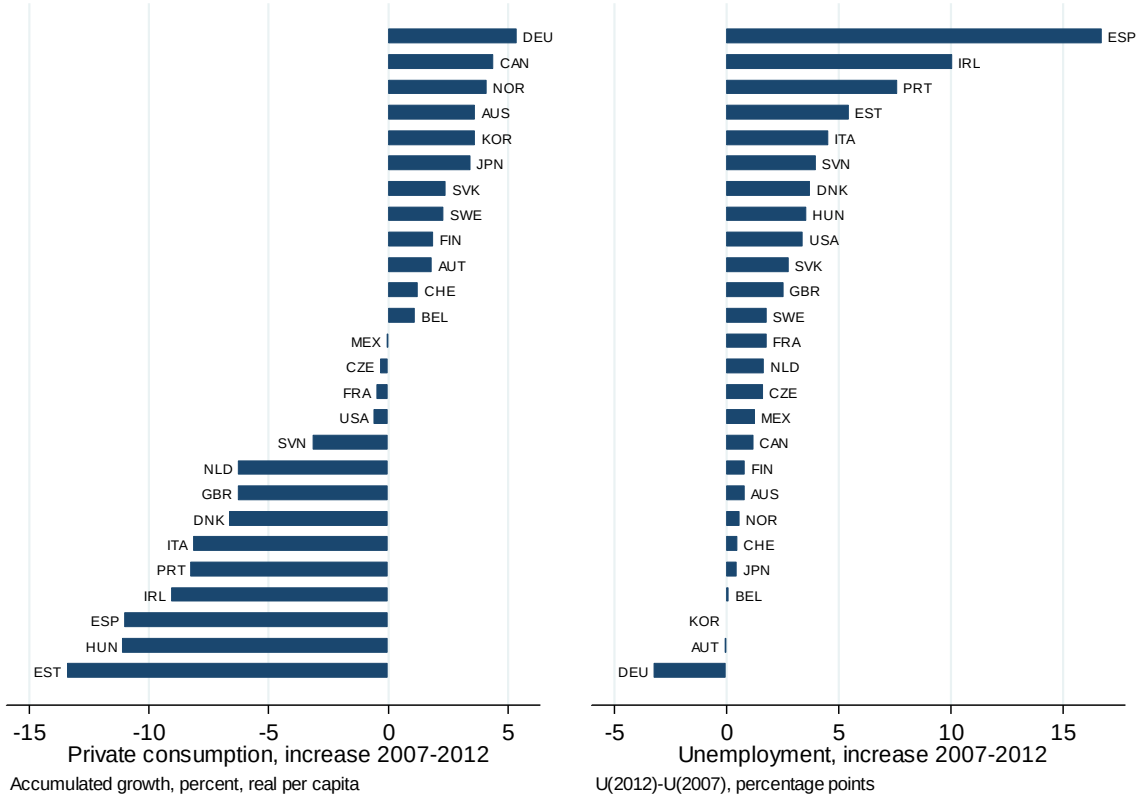
Arguably, high household debt is most problematic when house prices fall. The regression results presented in Table 6 are therefore based on data from the 17 countries where house prices fell from 2007 to 2012. The results are similar to those for the full sample (compare the estimated coefficients on debt and debt growth in columns 1-3 in Table 6 with those in column 1 in Table 1 and columns 2 and 5 in Table 3 and compare columns 4-6 in Table 5 to column 2 in Table 1 and columns 2 and 5 in Table 4). If anything, household debt and debt growth appears to be of less importance when we focus on countries with falling house prices.

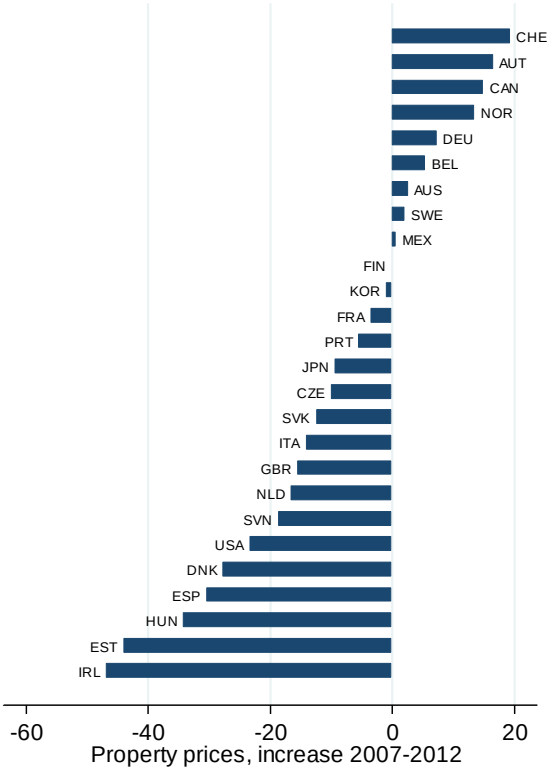
Table 6: Focus on countries with falling house prices 2007-2012

	(1) dC	(2) dC	(3) dC	(4) dU	(5) dU	(6) dU
Debt/dinc 2007	-0.04**	-0.02	-0.03*	0.02	0.01	0.01
	(0.00)	(0.35)	(0.05)	(0.06)	(0.55)	(0.39)
Growth in debt 03-07	-0.86**		-0.58**	0.14		0.18
	(0.00)		(0.00)	(0.56)		(0.28)
CA 03-07	0.59**			-0.64*		
	(0.00)			(0.01)		
Growth in priv cons, 03-07	2.05**			-0.93		
	(0.00)			(0.22)		
Constant	5.11*	-1.98	4.93	0.42	3.09	0.95
	(0.01)	(0.48)	(0.10)	(0.86)	(0.16)	(0.74)
R2 (adjusted)	0.78	-0.00	0.45	0.34	-0.04	-0.02
Observations	17	17	17	17	17	17

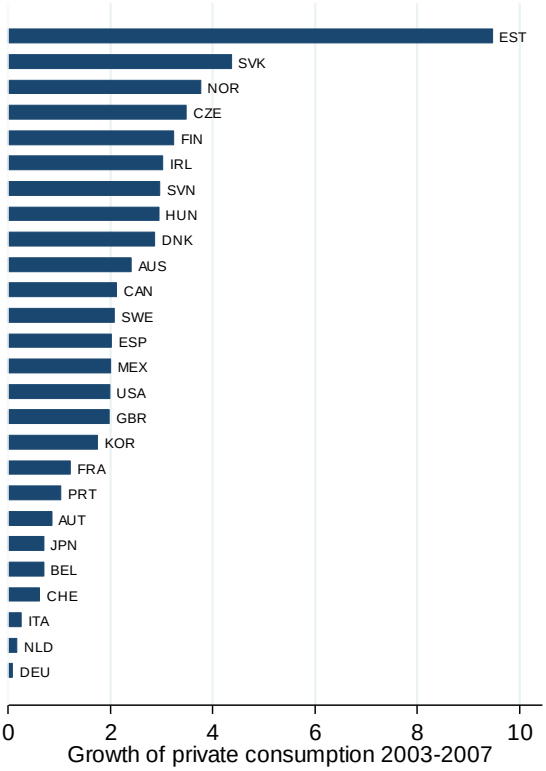
Only countries with falling house prices 2007-2012 included. OLS regression as in (1) with dependent variable specified in column head; p-values in parentheses; * and ** indicate significance at 5% and 1% respectively.

5. Data Plots

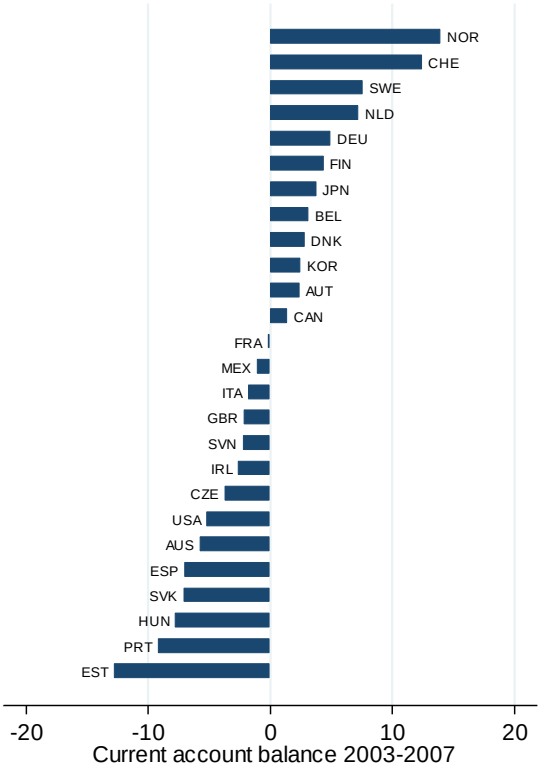




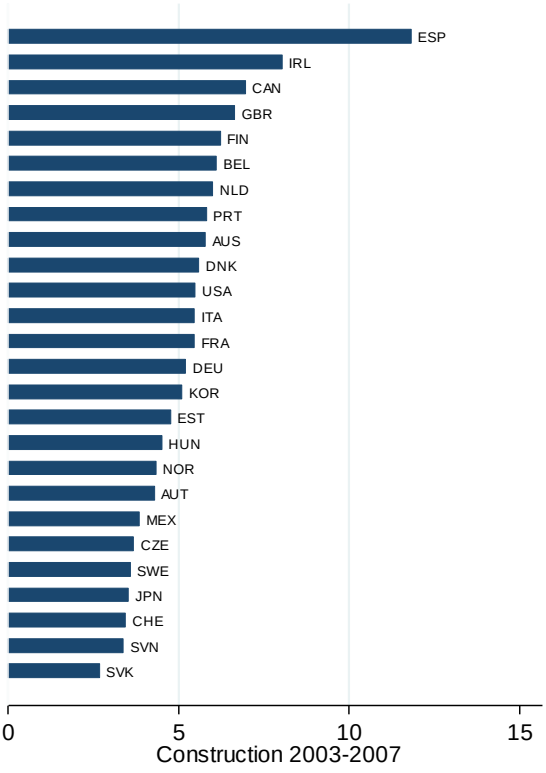
Accumulated growh, percent, real



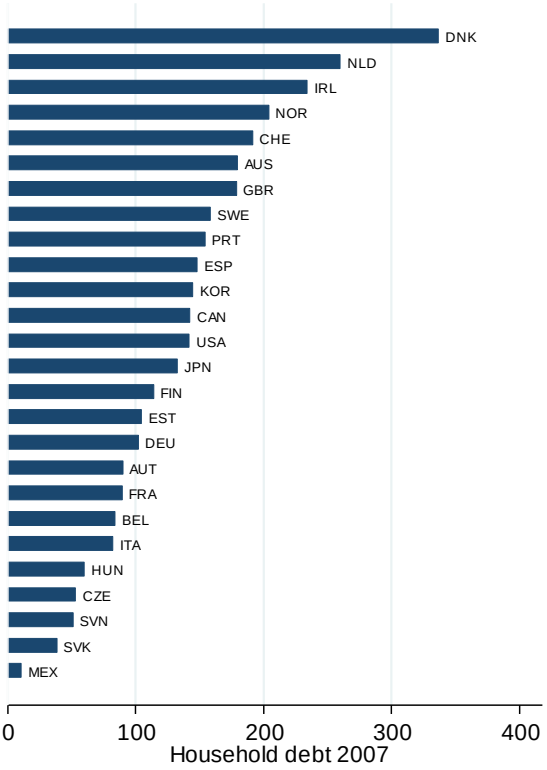
Avg annual growth rate, percent, real per capita



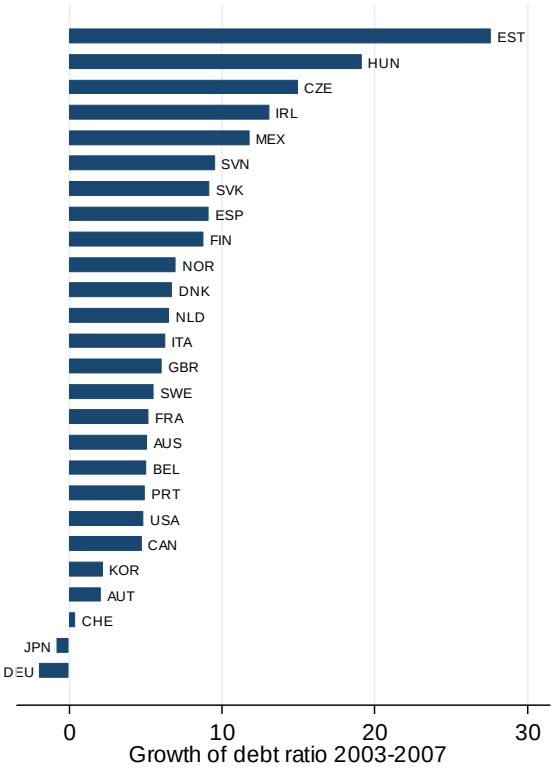
Annual average, percent of GDP



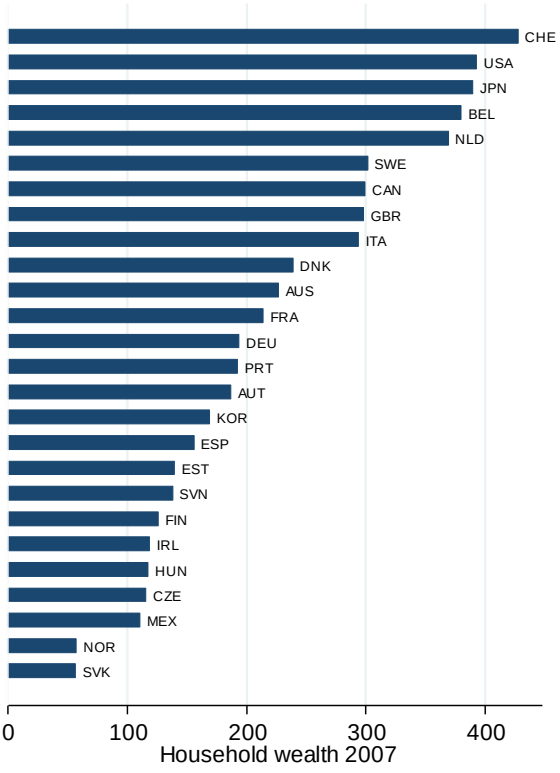
Annual average, percent of GDP



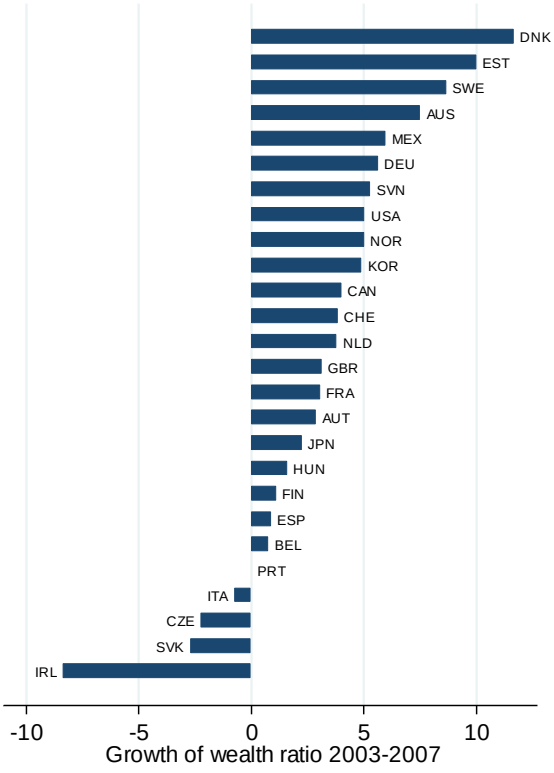
Percent of net disposable income



Average annual growth rate of hh debt ratio, percent

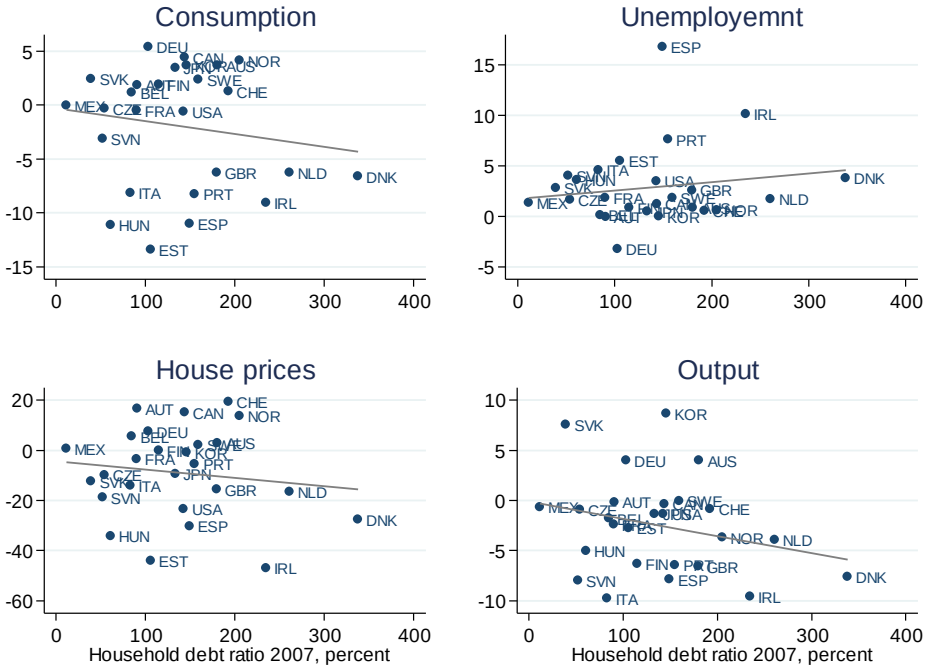


Household net fin wealth, percent of net disp inc



Avg annual growth rate of hh net fin wealth ratio, perc

Figure 4: Developments 2007-2012 against household debt ratio 2007



6. Data Appendix

Data Sources

Short name	Description
BIS	Bank for International Settlements Property Statistics, December 2013
EO90	OECD Economic Outlook 90, December 2011
EO92	OECD Economic Outlook 92, December 2012
EO94	OECD Economic Outlook 94, December 2013
NAFB	OECD National Accounts, Financial Balance Sheets. January 2014.

Variables

Variable	Description and source
dC (ΔC_{0712})	Increase in real private consumption per capita 2007-2012, percent. EO94. Consumption per (working-age) capita is calculated as CPV/POP1500.
dU (ΔU_{0712})	Increase in unemployment rate from 2007 to 2012, percentage points. Calculated as UNR(2012)-UNR(2007). EO94.
dPH (ΔP^H_{0712})	Increase in real house prices from 2007 to 2012, percent. BIS and EO94. See further comments below.
dY (ΔY_{0712})	Increase in real GDP per capita 2007-2012, percent. EO94. GDP per (working-age) capita is calculated as GDPV/POP1500.
Debt/dinc 2007 ($Debt_{07}$)	Debt of households and NPISHs 2007, percent of net disposable income. NAFB.
Growth in debt 03-07 ($\Delta Debt_{0307}$)	Average annual growth rate of (debt of households and NPISHs, percent of net disposable income), 2003-2007. NAFB.
CA 03-07 (CA_{0307})	Current account surplus, percent of GDP, average 2003-2007. EO94.
Growth in priv cons, 03-07 (ΔC_{0307})	Average annual growth rate of real private consumption per capita 2003 to 2007. EO94.
Wealth/dinc 2007 ($Wealth_{07}$)	Financial assets minus debt of households and NPISHs 2007, percent of net disposable income. NAFB.
Growth in wealth 03-07 ($\Delta Wealth_{0307}$)	Average annual growth rate of (Financial assets minus debt of households and NPISHs, percent of net disposable income), 2003-2007. NAFB.
Construction 03-07 (I^H_{0307})	Construction (gross fixed capital formation, housing), percent of GDP, average 2003-2007. Calculated as 100*IHV/GDPV. EO94.
House price growth 03-07 (ΔP^H_{0307})	Average annual growth rate of real house prices 2003 to 2007, percent. BIS, EO85, EO92, and EO94. See further comments below. Data missing for Czech Republic, Estonia, Hungary, Mexico, Slovakia, and Slovenia.
Government debt 2007 ($Debt^G_{07}$)	Government debt 2007 (general government gross financial liabilities), percent of GDP. EO94.

Data on real house prices for the OECD sample of countries (see below) are calculated from tables reporting growth rates of real house prices in OECD Economic Outlook. For those countries, growth rates for 2005-2012 are from EO94 (doi: 10.1787/hsprice-table-2013-2-en),

growth rates for 2004 from EO92 (doi: 10.1787/hsprice-table-2012-2-en), and growth rates for 2003 from EO90 (doi: 10.1787/hsprice-table-2011-1-en).

For countries not covered by the OECD sample, data on nominal house prices are taken from BIS. BIS typically reports several series for each country. In general, the first series reported has been used, and this series typically has the broadest coverage of residential property prices. If data are reported on a higher frequency than annually, the average price over the year has been calculated. Real house prices are then calculated by dividing the nominal price by the CPI or HCPI from EO94. More specifically, the following series (series names as in BIS) have been used:

Country	Specification of house prices
Austria	Q:AT:0:1:0:0:6:0
Czech Republic	Q:CZ:0:1:0:1:6:0 for 2008-2012. This series was linked with Q:CZ:0:2:1:1:3:0 (existing houses) to impute a price also for 2007.
Estonia	Q:EE:0:1:0:1:1:0
Hungary	Q:HU:0:1:0:1:1:0
Mexico	Q:MX:0:1:0:2:0:0
Portugal	M:PT:0:1:0:2:1:0
Slovakia	Q:SK:0:1:0:2:1:0
Slovenia	Q:SI:0:1:0:1:1:0