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***Living standards an ageing, greener knowledge
economy: Towards a period of lean cows?***

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Objectives

This paper is prepared as a contribution to a research project **INNODRIVE** - “Intangible Capital and Innovations: Drivers of Growth and Location in the EU“, sponsored under the EC’s Framework Programme, Project no.: 214576. It constitutes a presentation of the application of the productivity concept for the analysis of the prospects for living standards.

It deals with the specific issues of measuring productivity and, based on the review of these issues, presents an assessment of the prospects for productivity changes, and thus for the potential changes in the standard of living of consumers over the coming decades.

The definition of “living standards”

- Living standards of consumers are determined by “real disposable incomes” which, in turn, are determined by: incomes, taxes and inflation, with the latter determined essentially by productivity and, in an open economy, terms of trade.
- This statement is formally rather trivial but in reality the measurement of inflation and of changes in incomes, productivity and term of trade each raises enormous methodological difficulties. In fact, considerable amounts of time are spent in research departments of statistical institutes and international gatherings to clarify these issues and to arrive at a consensus allowing domestic policy analysis and international comparative studies to be undertaken on a reasonably sound basis.

Structure of the paper

1. The history of output and productivity analysis
2. Measuring the growth of living standards
3. Do we measure inflation and productivity correctly?
4. Future growth of living standards: an assessment
5. Summary and conclusions

Long-term trends: Angus Maddison

- High variability of productivity growth and capital deepening
- Multi-factor productivity: slow increase in 19th century, faster rise from 1913 to 1973, then slow increase from 1973 onwards
- Productivity effect of deepening of tangible capital: some 1-1.5 percentage points.

Long-term productivity trends

Capital/output ratios and productivity, United States

Source: Angus Maddison

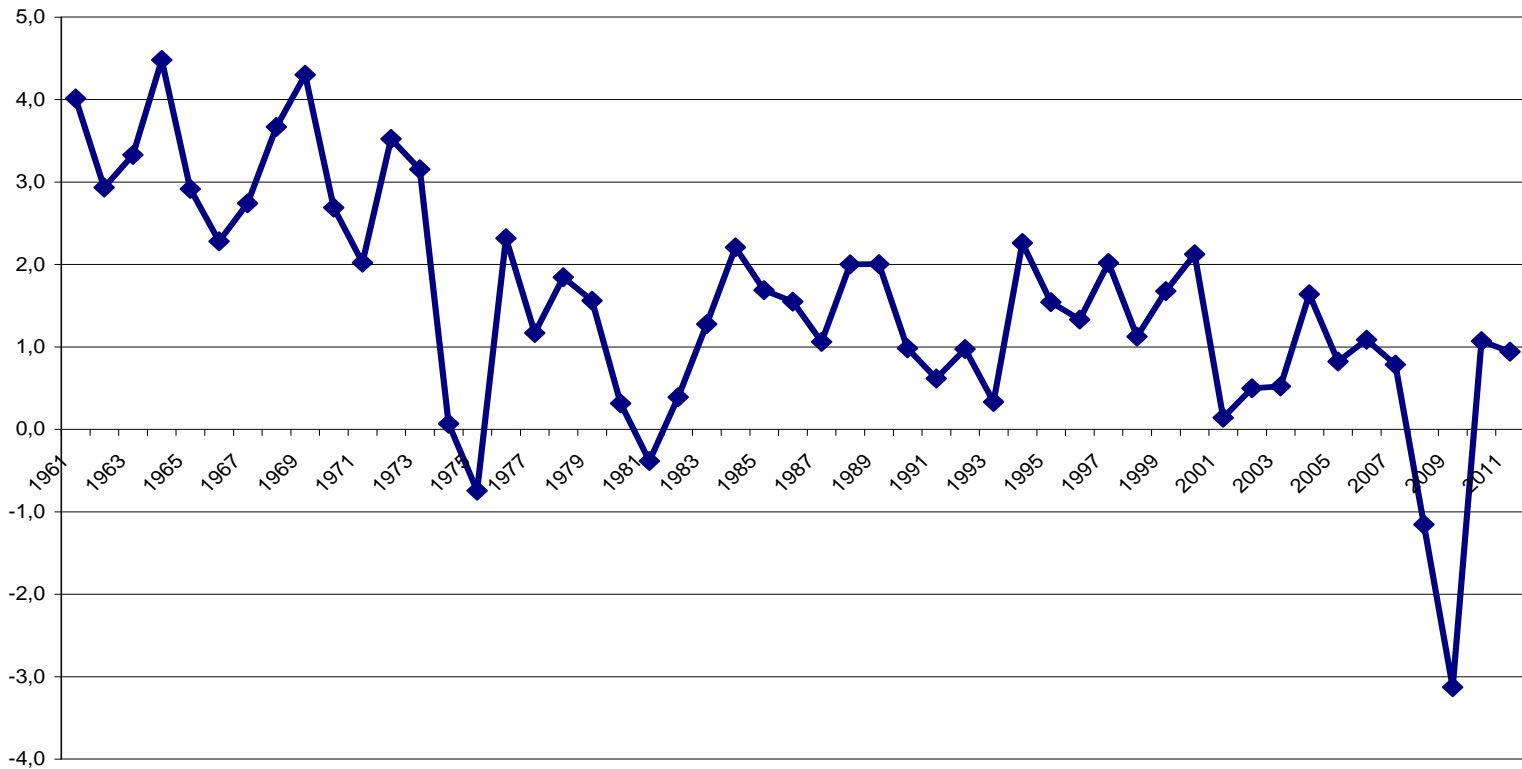
	1820	1870	1913	1950	1973	2003
Capital/output ratio:	0.94	1.71	3.29	2.44	2.10	2.34
Machinery and equipment	0.07	0.20	0.52	0.64	0.64	1.11
Non-residential structures	0.87	1.51	2.77	1.80	1.46	1.23
Productivity (% change)		1820- 1870	1870- 1913	1913- 1950	1950- 1973	1973- 2003
Labour productivity		1.10	1.93	2.47	2.77	1.66
Total factor productivity		-0.15	0.36	1.62	1.75	0.65
Effect of capital deepening		1.25	1.57	0.85	1.02	1.01

Multi-factor productivity growth since 1960 (AMECO) Average 17 OECD countries

	1960- 2010	1960- 70	1970- 80	1980- 90	1990- 2000	2000- 10
Average	1,6	3,3	1,5	1,3	1,4	0,2
Average, weighted	1,5	3,4	1,3	1,3	1,1	0,4
Standard deviation	0,4	1,5	0,6	0,8	0,7	0,6
Coefficient of variation	0,3	0,4	0,5	0,6	0,7	1,4

TPF (MFP) growth Annual % change

Total factor productivity % change, unweighted average



Productivity

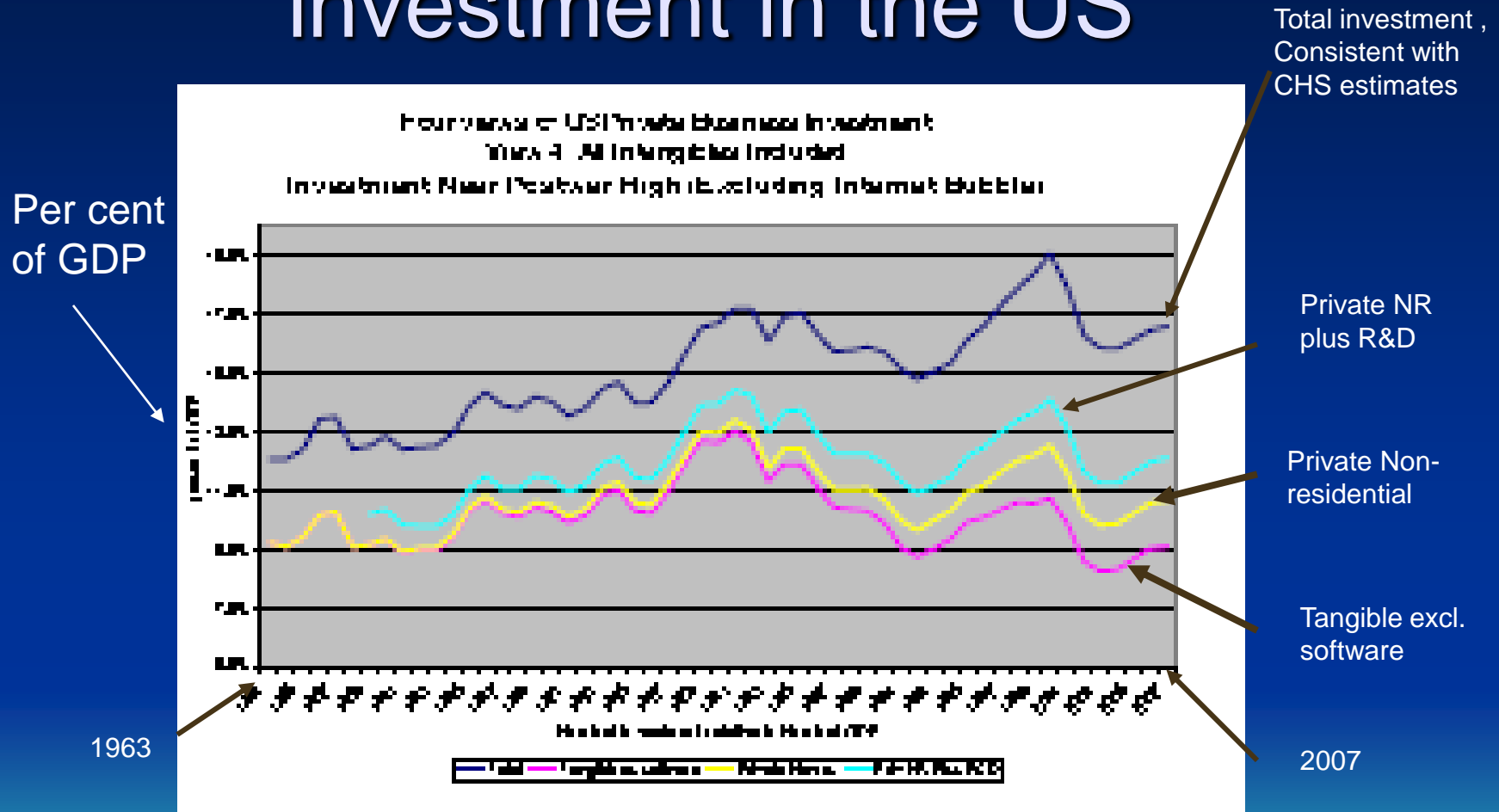
- Increasing contribution from intangibles
- Acceleration of productivity growth in the US in the 1990s and early 2000s much less pronounced than indicated by the unadjusted figures (CHS)
- INNODRIVE: adjusted TFP growth only half of the unadjusted LP

TFP in the US

Source: Corrado, Hulten and Sichel

	1973-1995	1995-2003	Change
Labour productivity (per hour worked)	1.63	3.09	1.45
Capital deepening	0.97	1.68	0.71
Tangibles	0.55	0.85	0.30
Intangibles	0.43	0.84	0.41
Labour composition	0.25	0.33	0.08
Multifactor productivity, including intangibles	0.41	1.08	0.67

Four measures of business investment in the US



Source: Leonord I. Nakamura: Working Paper 09-11

MFP INNODRIVE

	1995-2005			
	LPG	NA-CD	NI-CD	TPF
OS	2,05	0,83	0,26	0,95
DK	1,38	0,45	0,2	0,73
FI	2,83	0,35	0,32	2,14
DE	2,13	1,1	0,21	0,82
IT	0,23	0,42	0,05	-0,24
NL	2,16	0,71	0,16	1,28
PT	1,93	1,92	0,23	-0,22
SE	3,36	0,98	0,36	1,99
UK	2,53	0,92	0,23	1,36
AV	2,07	0,85	0,22	0,98

Living standards

- Pronounced slowdown of growth of private consumption per capita since 1960
- High correlation between TFP growth and PC growth, but a persistent gap
- But much of the gap may be due to a pronounced decline in household saving rate
- What is the role of the demographic dependency ratio?
- Is the gap due to measurement errors?

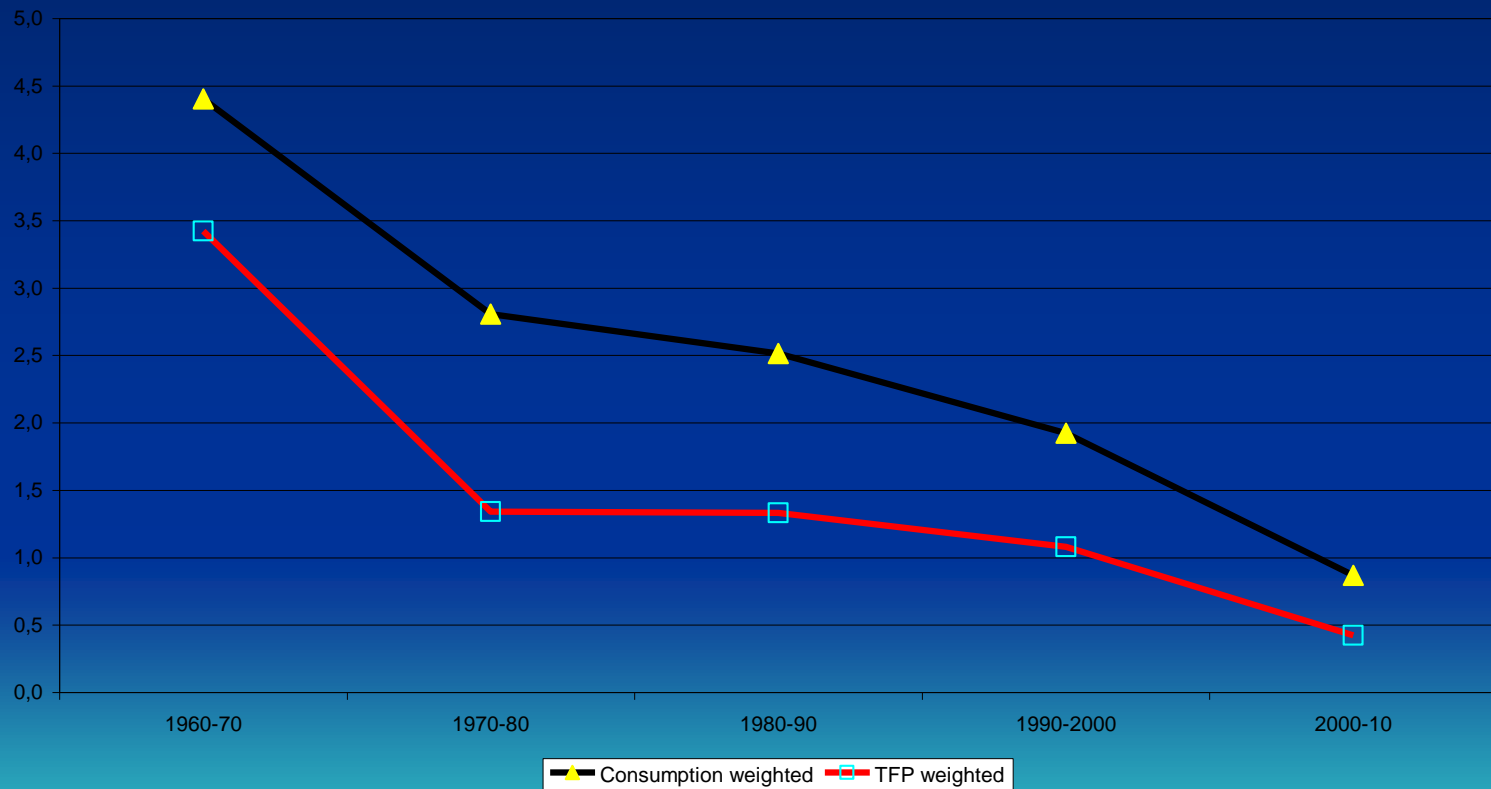
Private consumption per capita

% change, volume, average 19 countries

	1960-2010	1960-70	1970-80	1980-90	1990-2000	2000-10
Average	2.5	4.3	3.0	2.1	2.0	0.9
Average. weighted	2.4	3.9	2.8	2.5	1.9	0.9
Standard deviation	0.4	1.5	0.8	0.8	0.9	0.7
Coefficient of variation	0.2	0.4	0.3	0.3	0.5	0.8

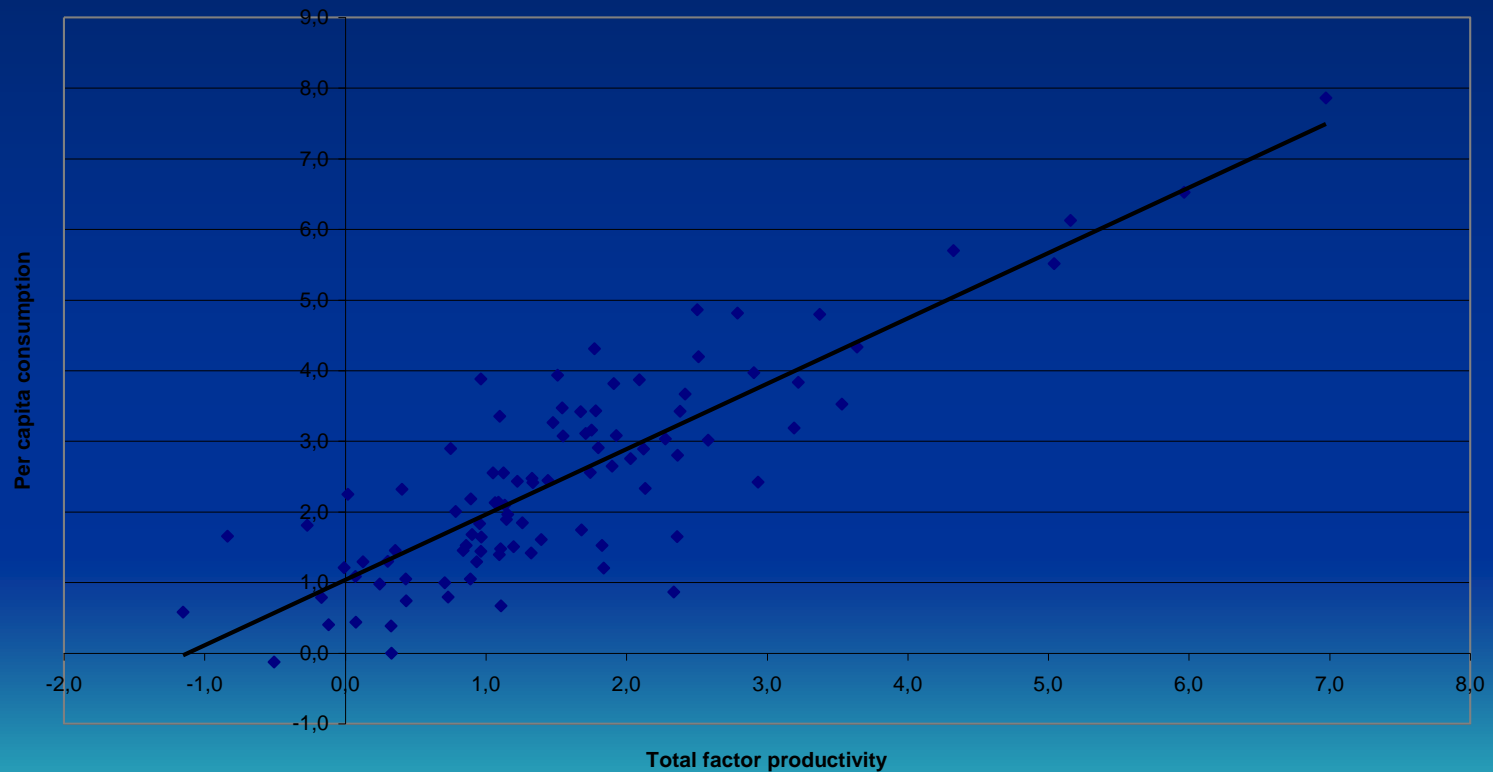
MFP and private consumption

Private consumption and factor productivity
Average for 19 countries, % change



TFP and C growth

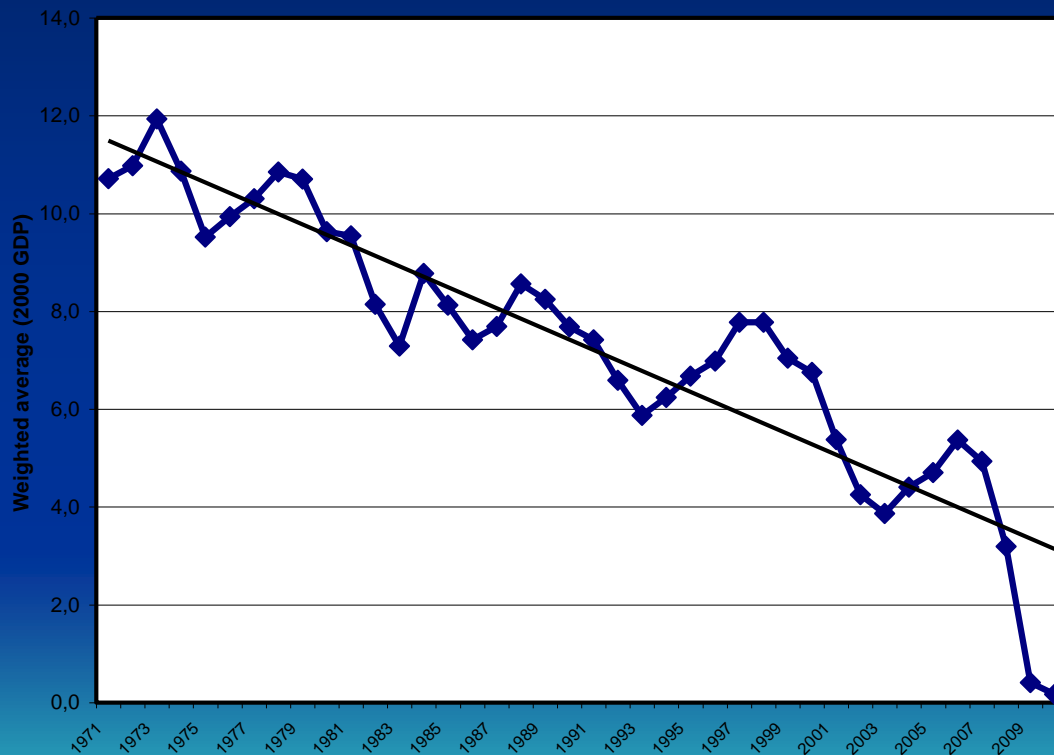
Consumption and productivity,
% change, 10 year averages, 19 countries



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Private saving, % of GDP

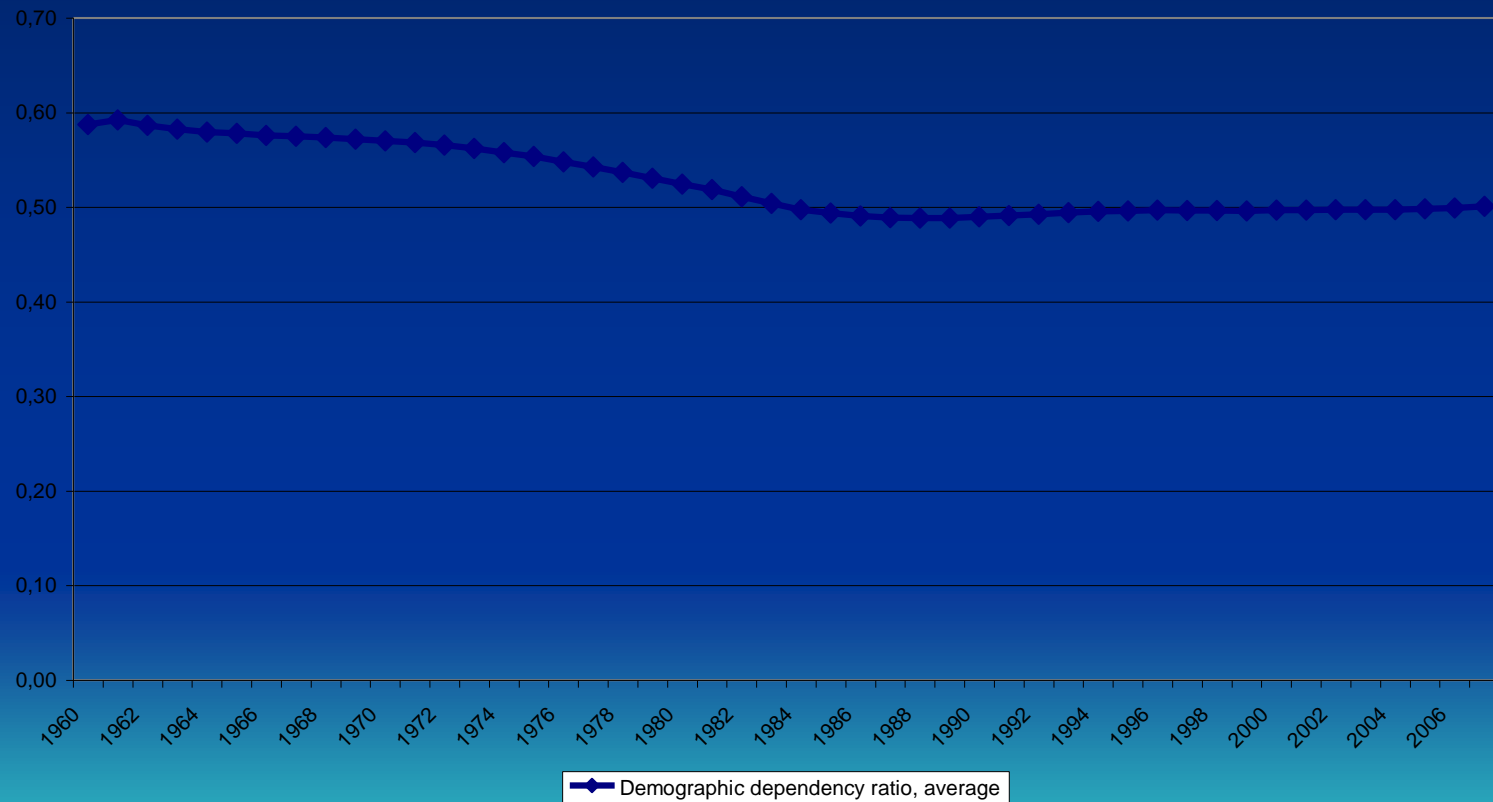
Average of 18 OECD countries



Demographic dependency ratio

(0-14+65 and over/15-64) Average 18 OECD countries

Demographic dependency ratio,
average, 19 countries



Econometric analysis

- A regression analysis with PC growth as the dependent variable and TFP and Dep ratio as the independent variables show a high correlation coefficient (0.8 or more)
- If we introduce time as a variable it takes up a lot of significance, but it does not “explain” anything!

Determinants of living standards

	Coefficient	T-stat
<i>Excluding a time variable</i>		
Intercept	1,06	9,56
Multi factor productivity	0,9	17,34
Demographic dependency ratio	-4,83	-3,34
Net external balance	-0,58	-5,22
R square	0,8	
<i>Including a time variable</i>		
Intercept	1,95	6,63
Multi factor productivity	0,76	11,12
Demographic dependency ratio	-4,52	-3,08
X-M	-0,46	-4,1
Time	-0,22	-3,33
R square	0,82	

Measurement issues

- The rate of inflation may have been over-estimated due to failure to take full account of quality improvements
- But productivity improvements may have been under-estimated for the same reasons
- The narrowing of the gap between TFP and C may be due to improvements in the measurement of productivity growth

Tentative projection

- Likely slowdown of MFP growth due to an increase in capital deepening
- Increasing role of intangibles = further capital deepening
- Rising dependency ratio
- Change in the external balance??
- = pronounced decline in the growth of living standards

Tentative projection

	Consumption per capita % change	Multi-factor productivity % change	Demographic dependency ratio Change	Net external balance Contrib Change	Consumption per capita Change % change Projection	Change percentage points 1960-2010 to 2010-2030
	1960-2010	2010-2030	2010-2030	2010-30	2010-2030	2010-2030
EU15	2,5	1,1	0,1	0	0,9	-1,6
United States	2,2	0,8	0,1	0,2	0,6	-1,6
Japan	3,3	1,3	0,2	-0,2	1,1	-2,2
Average, unweighted	2,5	1	0,1	-0,2	0,8	-1,7
Average, 2000 pop weights	2,5	1	0,1	0	0,8	-1,7
Standard deviation	0,5	0,4	0	0	0,4	0,4

Main conclusion (1)

The “Brussels consensus” points to the need for accelerating productivity increase as the most important tool available for ensuring the future scope for increase in living standards of the ageing population in a greener, less energy-intensive economy. :

- First of all, it is absolutely essential to stress that a large part of future so-called productivity increases will in fact only be obtained through a significant increase in the tangible and intangible capital intensity of the economy;
- If we consider education as an investment rather than public and private consumption, the overall tangible and intangible capital deepening has been and will still be even larger and the multi factor productivity increase even smaller,
- A genuine increase in living standard will thus need to be achieved through an increase in multi factor productivity as adjusted for the “missing intangibles”;
- A genuine rise in multi factor productivity will therefore need to be achieved through technological innovation in areas which can be assumed to produce more goods for lower prices to the consumers.

It is, sadly enough, not easy to see from where and how this productivity increase would emerge

Main conclusion (2)

- Finally, the provisional findings in the present working paper raise a series of questions on measurement and point to a need for a deeper exploration of the most important country cases.
- This would involve, in particular, an examination of the more detailed time profiles of the links between on one side of the equation the evolution and measurement of living standards and on the other side, the evolution and measurement of multi-factor productivity, including notably, intangibles, the evolution of household saving, the external balance and the dependency ratio.
- This paper, consequently, should be considered not the end but rather the beginning of a new phase of research on the prospects for an extended period of “lean cows” over the coming decades.