

tracing empirical trails of schumpeterian development

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purpose

empirical investigation into the meso-macro link of economic development; validation of recent emphasis on structural change in evolutionary and endogenous growth theories

outline

- I. conceptual considerations
- II. readily visible trails
- III. harberger's visualisation
- IV. beyond visual inspection: the econometric evidence
- V. summary and conclusions

theoretical considerations:

neoclassical growth theory: exclusive macro-economic focus with strong homogeneity assumptions: *no variety in industrial structure*;

endogenous growth theory: includes models of „creative destruction“, e.g. with separate research sector; preoccupation with steady states: portrays economy as *merely „scaled-up“*;

schumpeterian view: entrepreneurial innovation as disequilibrating force driving long-term development: *qualitative transformations and structural change*;

stylised system dynamics

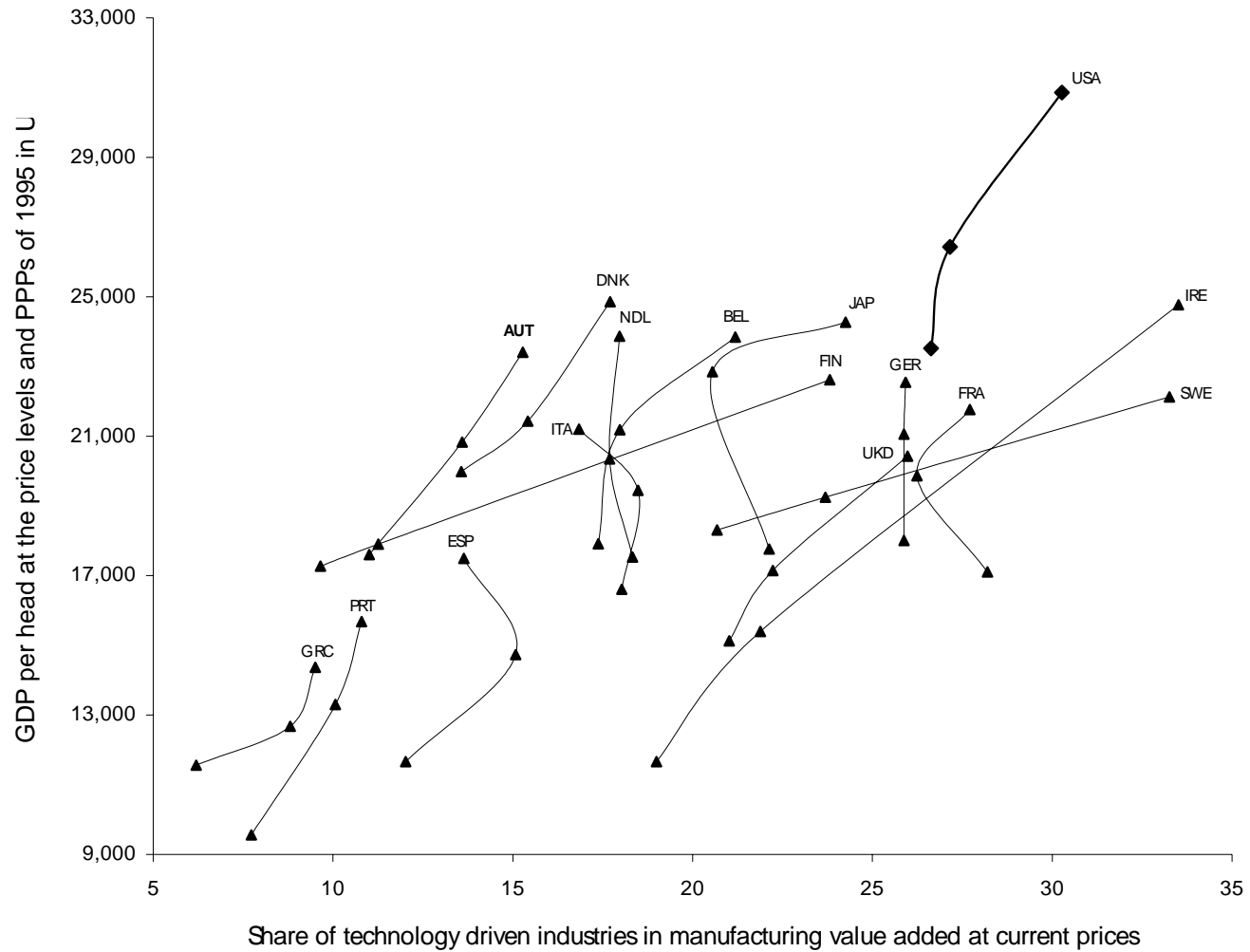
Typical examples	NOVELTY <i>⇒ change</i>	CUMULATION <i>⇒ time</i>	SELECTION <i>⇒ direction</i>
white noise	+	-	-
blind growth	-	+	-
random walk/drift	+	+	-
static equilibrium	-	-	+
steady state growth	-	+	+
evolutionary change	+	+	+

schumpeterian development

- the three elements are also essential for schumpeterian development:
 - entrepreneurial *innovation*
 - *cumulative* / path dependent process
 - directed by competitive *selection*
- distinctive source: the continual tension between „creative“ and “adaptive response“
- distinctive outcome: simultaneous interplay of growth and qualitative transformations
 - at the sectoral level: variations in the sectoral composition of production, i.e. structural change

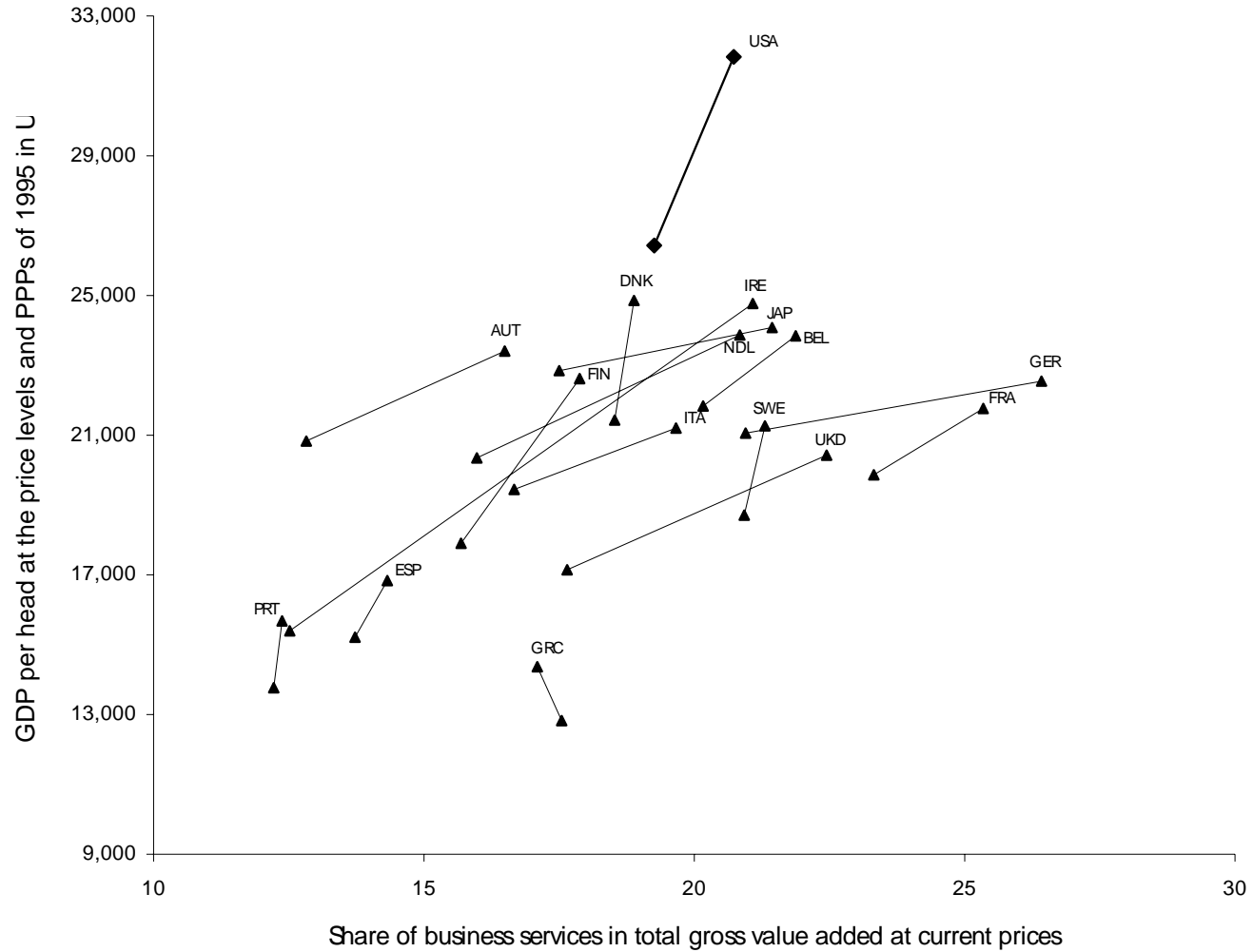
readily visible trails

gdp p.c / share of high tech manufacturing '85, '92, '99



readily visible trails

gdp p.c / share of business services '92, '99



harberger's visualisation

Lorenz-type curves: concentration vs. even distribution of contributions to aggregate growth;

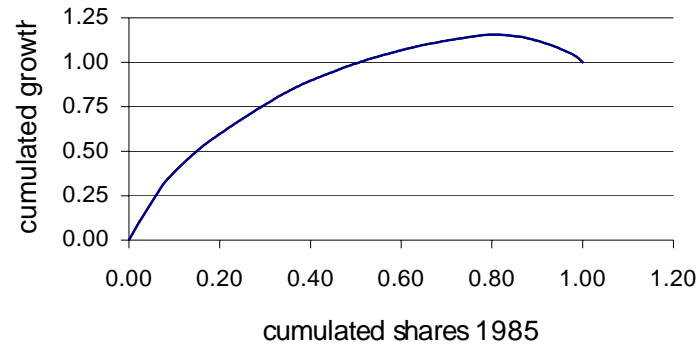
metaphor: „*mushrooms vs. yeasts*“ stands for schumpeterian vs. neoclassical growth

data: 3-digit manufacturing, constant prices

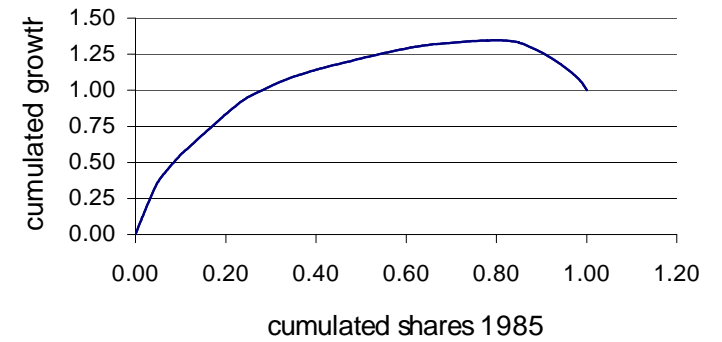
outcome:

- contributions to aggregate growth vary;
- time pattern: periods of pronounced structural change and low aggregate growth are often succeeded by evenly distributed and high growth;

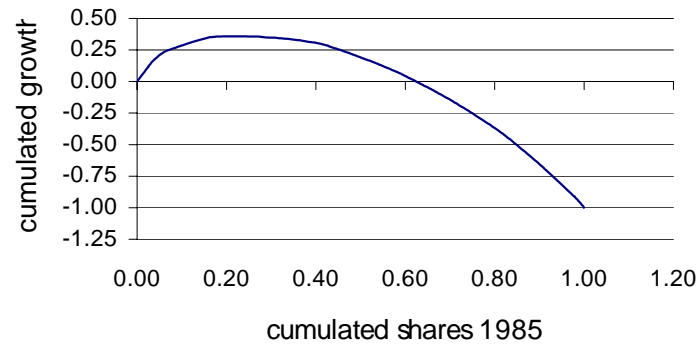
EU: value added at constant prices
1992/85: 1.74% p.a.



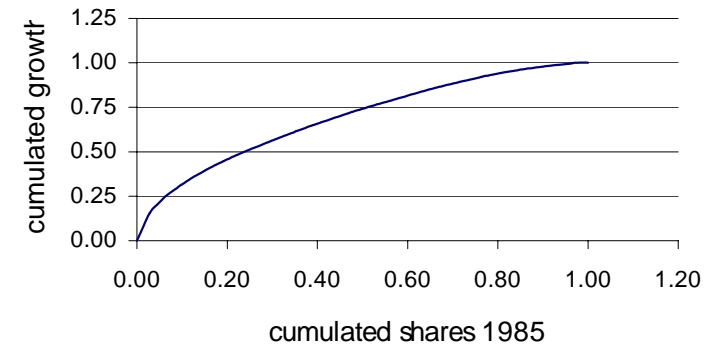
EU: value added at constant prices
1998/92: 1.34% p.a.



USA: value added at constant prices
1992/85: -1.33% p.a.



USA: value added at constant prices
1997/92: 7.43% p.a.



panel growth regressions

data: 28 OECD countries; 1990 to 2000;

dependent variable:

(a) GDP/head (PPP) (b) Δ GDP/head (PPP)

explanatory variables control for:

- demography (IPOP, IPOPWA)
- country-specific business cycle effects (EMR, EMR_{t-1})
- gross fixed capital investment ($IINVT_{t-1}$, $\Delta IINVT$)
- time dummies (global business cycle)
- convergence effects: endogenously lagged variable in (b)

plus variables on industrial structure:

- value-added share of total services ($SOTS_{t-1}$)
- value-added share of business services ($SOBS_{t-1}$)
- relative export shares technology driven (XSR): $tdi_{t-1}, \Delta tdi$;
- relative import shares technology driven (MSR): tdi_{t-1} ,

income
levels

LSDV

1990 - 2000

Dependent variable:	I	II	III	IV	V	VI
$Y_{i,t}$	$\beta(t)$	$\beta(t)$	$\beta(t)$	$\beta(t)$	$\beta(t)$	$\beta(t)$
IPOP	-2.2779*** (- 8.87)	-1.9243*** (-6.74)	- 2.1282*** (-7.22)	-2.4481*** (-7.61)	-2.4447*** (-7.58)	-1.7657*** (-5.34)
IPOPWA	1.6155*** (8.15)	1.4541*** (6.83)	1.5270*** (6.79)	1.8087*** (7.49)	1.8058*** (7.46)	1.3988*** (5.80)
EMR	0.5963*** (3.97)	0.7161*** (3.26)	0.8496*** (3.58)	1.0225*** (4.01)	1.0157*** (3.97)	0.6487** (2.59)
EMR _(t-1)	-0.1088 (-1.00)	-0.4156* (-1.71)	-0.5819** (-2.16)	-0.7290** (-2.54)	-0.7084** (-2.43)	-0.4657* (-1.68)
IINVT _(t-1)	0.2126*** (8.57)	0.2146*** (7.88)	0.2361*** (7.73)	0.2248*** (7.18)	0.2230*** (7.03)	0.2216*** (7.44)
Δ IINVT	0.2112*** (8.43)	0.1588*** (4.80)	0.1658*** (4.58)	0.1457*** (3.95)	0.1452*** (3.93)	0.1707*** (4.89)
XSR_tdi _(t-1)		0.0636*** (3.47)				0.0720*** (3.72)
Δ XSR_tdi		0.0005 (0.02)				
MSR_tdi _(t-1)		0.1187*** (3.95)				0.1193*** (3.64)
SOTS _(t-1)			0.0009 (0.68)		-0.0006 (-0.42)	-0.0024* (-1.84)
SOBS _(t-1)				0.8646*** (4.18)	0.8938*** (4.09)	0.8788*** (4.23)
Year dummies (η_t)	Yes	Yes	Yes	Yes	Yes	Yes
No. observations	330	272	255	231	231	231
No. countries	29	29	29	29	29	29
R-sq within:	0.9006	0.9212	0.9158	0.9197	0.9198	0.9306

Note: GDP at PPP of 1995; XSR = shares in total exports relative to OECD; MSR = shares in total imports relative to OECD; tdi = technology driven industries; hs = high skill industries.

growth

arellano-
bond
(2step)

1990 - 2000

Dependant variable :	I	II	III	IV	V
$\Delta IY_{i,t}$	$\beta(t)$	$\beta(t)$	$\beta(t)$	$\beta(t)$	$\beta(t)$
$\Delta IY_{(t-1)}$	0.7166*** (9.95)	0.6632*** (7.87)	0.5751*** (4.93)	0.4549*** (6.49)	0.7100*** (6.07)
$\Delta IPOP$	- 0.8071*** (- 5.18)	- 0.8208*** (-2.92)	0.0188 (0.05)	- 0.4762** (-2.50)	0.1257 (0.37)
$\Delta IPOPWA$	0.4477*** (3.57)	0.6635*** (2.91)	-0.0909 (-0.24)	0.4725*** (3.08)	-0.2889 (-0.94)
ΔEMR	0.4071*** (3.16)	0.3632*** (3.43)	0.5992*** (3.04)	0.4054*** (3.63)	0.2038 (1.41)
$\Delta EMR_{(t-1)}$	- 0.3453* (- 1.96)	- 0.4212 (- 1.53)	-0.9123*** (-2.78)	- 0.8143*** (-4.75)	-0.2768 (-0.98)
$\Delta IINVT_{(t-1)}$	0.0495*** (3.65)	0.0579 (1.60)	0.1386*** (2.80)	0.1666*** (6.09)	0.0849*** (4.92)
$\Delta 2 IINVT$	0.1965*** (19.79)	0.1816*** (14.14)	0.2125*** (16.40)	0.2127*** (18.01)	0.2547*** (21.47)
$\Delta XSR_tdi_{(t-1)}$		0.0258*** (3.12)			
$\Delta 2 XSR_tdi$		0.0405*** (4.88)			
$MSR_tdi_{(t-1)}$		0.0049*** (2.60)			
$SOTS_{(t-1)}$			-0.0003* (-1.91)		-0.0004** (-2.46)
$\Delta 2 SOTS$			-0.0023*** (-4.56)		-0.0037*** (-13.36)
$\Delta SOBS_{(t-1)}$				0.8827*** (3.21)	0.5674** (2.07)
$\Delta 2 SOBS$				0.5269* (1.76)	0.3432** (2.25)
Year dummies (η_t)	Yes	yes	yes	yes	yes
No. observations	275	242	197	173	173
No. Countries	29	29	28	28	28
A-B test (2)	0.1720	0.9365	0.9033	0.7162	0.6621

summary

standard variables are largely consistent;

positive structural effects for *technology driven* manufacturing and *business services*:

- direct effects (differential growth);
- producer related spillovers;
- user related spillover;

➤ **variations in industrial structure had a significant impact on aggregate income and growth in the 1990s !**