Research seminar

Persistent effects of autonomous demand expansions

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RESEARCH OUTLINE

Motivation

The prevailing macroeconomic wisdom [Solow 1997; Taylor 2000; Blinder 2004] claims that:

- aggregate demand (AD) shocks determine **short run** cyclical fluctuations around an **equilibrium GDP** (potential output) and an associated **equilibrium unemployment rate**, determined by supply factors and, in NEK models, by institutional rigidities;

- potential output and natural unemployment rate (or NAIRU) are viewed as **attractors** towards which the economy tends to return.

> *"Real output in most advanced capitalist economies fluctuates around a rising trend [...] it is part of the usable common core of macroeconomics that the trend movement is predominantly driven by the supply side of the economy (the supply of factors of production and total factor productivity) [...] fluctuations are predominantly driven by aggregate demand impulses [...]."* [Solow 1997, p. 230]

Purpose

Assessing such tendency to **return** to a supply determined potential output independent of AD after an autonomous demand **expansion**.

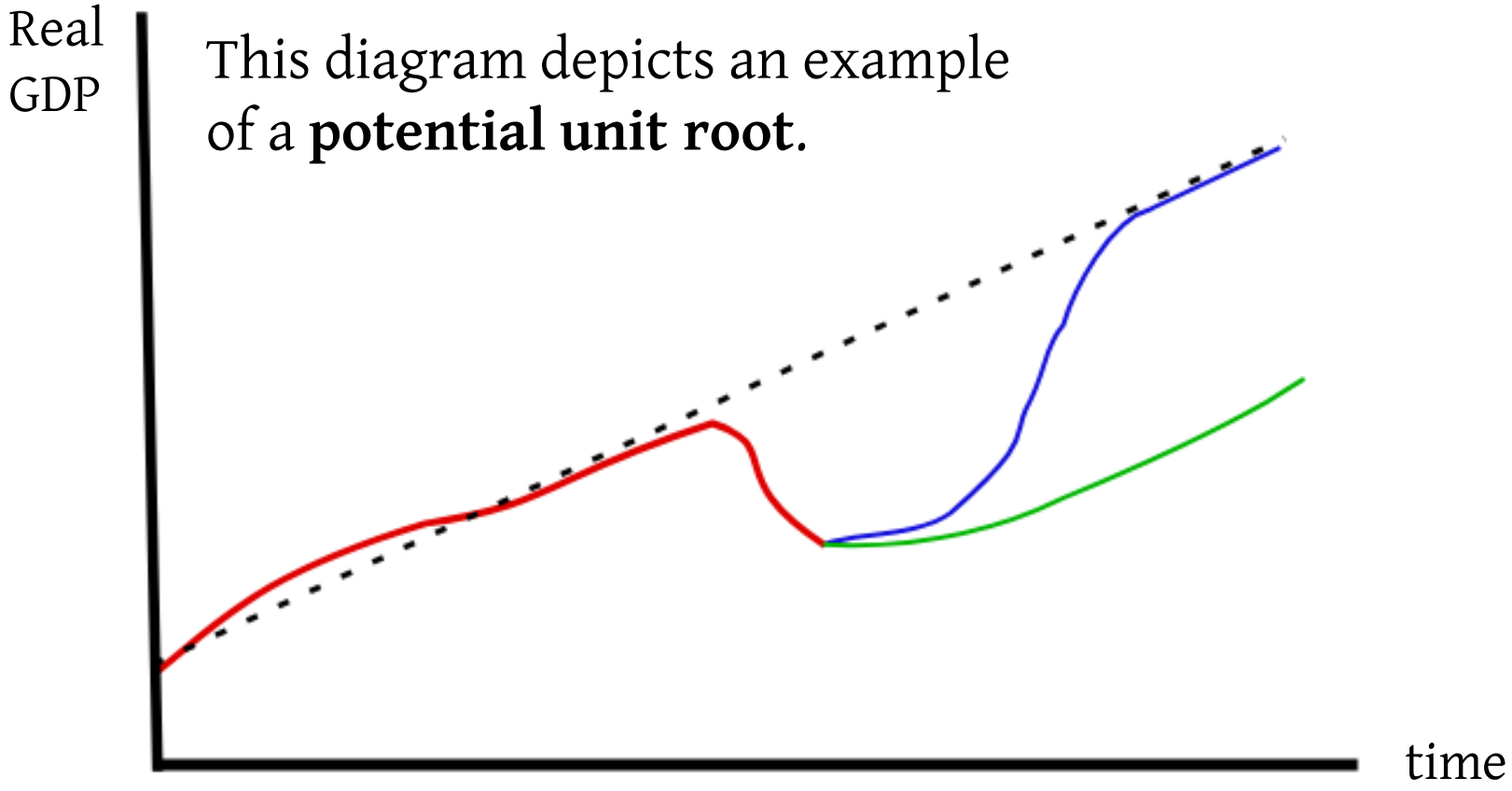
THE RECENT DEBATE ON CYCLE AND TREND

The traditional wisdom has been called into question in the last decades by empirical evidence on GDP unit-roots [Nelson & Plosser 1982; Cushman 2016; Diebold & Rudebush 1989] and "hysteresis" [Blanchard, Cerutti & Summers 2015; Martin *et al.* 2015 among others].

Fluctuations are associated with **persistent** changes in GDP trajectories, and if there is a **return** it is extremely slow, beyond the commonly assumed horizon for fluctuations and policy

The "real business cycle" explanation
Cycle and trend are determined by the same factors,
i.e., are *supply* determined.

New-Keynesian interpretation
If aggregate demand drives fluctuations [Gali 1999], then *both* cycle and trend would be driven by aggregate demand [Fatàs & Summers 2016].



The red line represents an observed drop in output. The green line shows the path of recovery if the series **has a unit root**. The blue line shows the recovery if there is **no unit root** and the series is trend-stationary.
The blue line returns to meet and follow the dashed trend line while the green line remains permanently below the trend.
Does a demand boost lead to a output level higher than the past trend?

THE HYSTERESIS NARRATIVE

The existence of significant persistence in the effects of negative AD shocks, and hence recessions, is interpreted as evidence of **hysteresis** [Blanchard & Summers 1986; Cerra & Saxena 2009; Rowthorn 1995; Martin *et al.* 2015].

A phenomenon in search of explanations [Ball 2009; 2014]:

i) *insider-outsider* models (due to labour market institutions, the insiders can artificially increase the costs of hiring and firing) [Blanchard & Summers 1986; Lindbek & Snower 1985];

ii) *long-term unemployed* (due to detachment and/or loosing employability, they do not exert a competitive pressure on wages) [Blanchard & Diamond 1994; Ball *et al.* 1999; Ball 2009];

iii) the effects of AD on *capital formation* (decreasing investment affects capital stock and productivity). [Rowthorn 1995; Haltmaier 2012; Ball 2014; Fatàs & Summers 2016; Martin *et al.* 2015].

OUR ORIGINAL CONTRIBUTION

A two-sides relation between our work and the literature on hysteresis.

In line → we assess the *persistence* of aggregate demand effects on GDP and other macroeconomic outcomes.

In contrast → much of existing research refers to the persistent effects of recessions, while we test whether persistence is detected also in instances of **expansions** of aggregate demand, and specifically of its **autonomous components**.

Should hysteresis be considered a "distortion" in the working of market economies that holds only in specific circumstances

or

is it a "pervasive" phenomenon which holds most of the time?

RESEARCH DESIGN

STEP I – Dataset creation

We build our 'autonomous demand' variable in a panel of 34 OECD countries between 1960 and 2015.

STEP II – Identification of expansions

We identify episodes of autonomous demand expansion, and we compare them with non-expansion country-years (the "control group").

STEP III – Empirical estimations

We employ local projections [Jordà 2005] to analyze the impact of these expansions on GDP and other key macroeconomic outcomes in the subsequent 10 years.

STEP IV – Interpretation of outcomes

We discuss our findings in connection with the literature on hysteresis, we explore the analytical framework consistent with the empirical results and we draw some implications for current policy debates.

STEP I – DATASET CREATION

Our metric of **autonomous demand** (Z) has been built as follows.

AUTONOMOUS DEMAND	
PRIMARY PUBLIC EXPENDITURE General government current disbursement final consumption expenditure social security benefits property income paid other current outlays – gross government interest payments + government fixed capital formation	**TOTAL EXPORTS** of goods and services

Source *OECD.Stat (Economic Outlook No 100 – Nov 2016)* for government expenditure
World Bank (World Development Indicators) for export flows

STEP II – IDENTIFICATION OF EXPANSIONS (1)

We identify expansion episodes based on two criteria.

(c1) Autonomous demand growth must be higher than its country mean μ_i by at least one standard deviation σ_i in the expansion year.

$$\Delta Z_{i,t} > \mu_i(\Delta Z) + \sigma_i(\Delta Z) \qquad \text{(c1)}$$

(c2) autonomous demand growth must be higher than one half of the country mean in the two years preceding the expansion.

$$\Delta Z_{i,t-1} > \mu_i(\Delta Z)/2 \quad \text{and} \quad \Delta Z_{i,t-2} > \mu_i(\Delta Z)/2 \qquad \text{(c2)}$$

Note. When we have two or more years of expansion in a row (e.g., France 1973/1974), we treat them as being part a single episode.

STEP II – IDENTIFICATION OF EXPANSIONS (2)

Country	EXP	NO EXP	ΔZ mean	ΔZ std dev
AUS	3	22	3.64	2.50
AUT	2	37	2.85	2.71
BEL	1	42	3.14	3.68
CAN	4	40	3.24	2.63
CZE	1	19	4.53	4.68
DEN	5	37	2.74	2.75
EST	1	19	4.29	7.42
FIN	7	47	4.00	3.32
FRA	3	45	3.79	2.49
GER	2	22	2.52	3.06
GRE	1	18	3.07	5.19
HUN	2	18	4.65	5.55
ICE	2	32	3.64	3.92
IRE	2	23	7.31	6.10
ISR	1	15	3.24	4.00
ITA	5	50	3.45	3.28
JAP	4	48	4.77	4.22
KOR	5	39	8.62	6.54
LAT	1	18	5.27	4.71
LIT	2	18	6.21	7.83
LUX	2	23	5.96	5.68
NED	3	42	3.23	3.41
NZL	3	24	2.32	2.58
NOR	3	32	2.75	2.25
POL	3	17	5.47	2.26
POR	2	34	3.80	3.75
SVK	1	19	5.49	6.36
SLO	2	18	4.10	4.99
SPA	3	47	4.84	3.11
SWE	3	50	3.40	3.08
SUI	3	22	2.78	3.95
UK	2	42	2.60	2.97
USA	7	47	3.70	2.09
WDE	3	13	2.90	2.21

Total EXPANSION = 94 NO-EXPANSION = 1039

STEP II – IDENTIFICATION OF EXPANSIONS (3)

Country	Year	ΔZ
AUS	1993	6.36
AUS	2000-01	6.86
AUS	2009	8.00
AUS	1979	6.23
AUS	2000	6.41
BEL	1972-74	8.87
CAN	1973-74	7.57
CAN	1978	6.17
CAN	1994	6.26
CAN	2000	7.13
CZE	2005	10.53
DEN	1974	8.88
DEN	1979-81	5.56
DEN	1994	6.22
DEN	2000	7.90
DEN	2006	5.65
EST	2005	12.86
FIN	1964	7.85
FIN	1968-69	9.04
FIN	1972	10.50
FIN	1974	8.79
FIN	1977	8.14
FIN	1979	7.67
FIN	1992	7.48

Country	Year	ΔZ
FRA	1961-65	7.31
FRA	1970	7.33
FRA	1973-74	10.26
GER	2000	6.96
GER	2006	6.31
GRE	1999-00	11.87
HUN	2000	14.14
HUN	2006	15.27
ICE	2001	10.84
ICE	2008	13.87
IRE	1995	13.58
IRE	2000	15.03
ISR	1999-00	10.01
ITA	1962	8.01
ITA	1965	10.37
ITA	1968	10.75
ITA	1974	7.66
ITA	1976	6.99
JAP	1962	12.83
JAP	1964-66	10.65
JAP	1968-69	12.39
JAP	1974	14.12

Country	Year	ΔZ
KOR	1972-73	29.77
KOR	1976	17.19
KOR	1986	15.93
KOR	1998	19.42
KOR	2008	19.91
LAT	2004-05	14.91
LIT	1997	15.55
LIT	2005	15.33
LUX	1998	11.73
LUX	2000	17.32
NED	1973-74	9.44
NED	2000	9.49
NED	2006	6.75
NZL	1999-00	7.43
NZL	2006	6.63
NZL	2008	6.79
NOR	1979-80	6.81
NOR	1989-90	6.07
NOR	1996	5.84
POL	1997	7.77
POL	2003	9.28
POL	2006	10.60
POR	1978-80	9.90
POR	1989	9.54

Country	Year	ΔZ
SVK	2006	15.76
SLO	2000	11.17
SLO	2006	10.01
SPA	1966	10.79
SPA	1968-69	11.51
SPA	1971	11.07
SWE	1963-64	8.19
SWE	1968-69	7.33
SWE	1974	11.99
SUI	2000	8.15
SUI	2007	8.10
SUI	2013	6.75
UK	1973-74	11.54
UK	2006	7.36
USA	1961	6.02
USA	1966-67	7.78
USA	1970	6.81
USA	1974	6.52
USA	1980	6.31
USA	1992	5.87
USA	2008	6.86
WDE	1976	5.14
WDE	1980	5.42
WDE	1990	6.06

STEP II – IDENTIFICATION OF EXPANSIONS (4)

TREATED vs. CONTROL units

Let us consider each observation (country-year) as a "unit".

in the **treated group** we consider units with an autonomous demand expansion (94); in the **control group** - i.e., non-treated units - we consider units without an autonomous demand expansion (1039).

Before turning to the empirics, we compare treated and control units. Formally, we estimate the Eq(1):

$$\Delta Z_{i,t} = \alpha_i + \delta_t + \beta E_{i,t} + \varepsilon_{i,t} \qquad (1)$$

$\Delta Z_{i,t}$ is autonomous demand (or its components) growth rate;
$E_{i,t}$ is a dummy variable which is equal to 1 if there is an episode of autonomous demand expansion in country *i* at time *t*, and 0 otherwise;
α_i are country-specific fixed effects;
δ_t are year dummies.

STEP II – IDENTIFICATION OF EXPANSIONS (5)

Average increase in autonomous demand growth during expansions (t=0) (relative to non-expansion units)	**Difference (treated – controls)** i.e. β in Eq(1)		
	OLS	**Country FE**	**Two-way FE**
Autonomous demand (Z)	6.24***	6.33***	5.04***
	(0.53)	(0.49)	(0.59)
Exports	12.25***	12.59***	8.43***
	(1.22)	(1.15)	(1.40)
Gov' primary current expenditure	4.61***	4.69***	1.35*
	(0.68)	(0.66)	(0.68)
Gov' gross capital formation	5.75***	5.86***	3.70**
	(1.28)	(1.30)	(1.55)

All variables taken in first differences of natural logs. Coefficients multiplied by 100 for ease of interpretation (so a coefficient of 1 means a 1% difference). For each indicator, we employ a linear regression to compare the mean of the variable in the year of an expansion with the mean in the rest of the sample.
*The test is applied using three models: a simple OLS model without controls ('OLS' column); a fixed-effects model that only controls for country-specific effects ('Country FE'); a two way-fixed effects model which controls for a full set of country and year effects ('Two-way FE'). Robust standard errors clustered by country in parentheses; *** p<0.01, ** p<0.05, * p<0.1.*

STEP III – EMPIRICAL ESTIMATIONS (1)

We employ local projections (LPs) to estimate the behavior of key macroeconomic outcomes (i.e., the average treatment effect) in the decade following Z expansion.

A key challenge: autonomous demand expansions are likely to be partly *endogenous* (i.e., the "treatment" is not randomly assigned).

To assess differences in *pre-conditions*, we compare a number of key observable factors in **treated** and **control** units by estimating the Eq(2) :

$$y_{i,t-1} = \alpha_i + \delta_{t-1} + \beta E_{i,t} + \varepsilon_{i,t-1} \qquad (2)$$

$y_{i,t-1}$ is the variable under analysis;
$E_{i,t}$ is a dummy variable (1 in case of Z expansion, 0 otherwise);
α_i are country-specific fixed effects;
δ_t are year dummies.

STEP III – EMPIRICAL ESTIMATIONS (2)

Comparison of macroeconomic pre-conditions in treated and control units (t-1)	**Difference (treated – controls)** i.e. β in Eq(2)		
	OLS	**Country FE**	**Two-way FE**
Real GDP growth	1.43***	1.34***	-0.01
	(0.38)	(0.38)	(0.34)
Labor productivity growth	0.93***	0.85***	-0.16
	(0.25)	(0.26)	(0.22)
Unemployment rate	-1.48***	-1.08***	0.26
	(0.52)	(0.38)	(0.25)
Real interest rate	-0.79**	-0.84**	0.13
	(0.36)	(0.35)	(0.32)
Participation rate	-0.36	-0.90**	0.05
	(0.61)	(0.34)	(0.20)
Public debt (% of GDP)	-17.07***	-14.56***	-1.06
	(4.85)	(4.47)	(1.21)
CPI inflation rate	0.78	0.88*	0.59
	(0.50)	(0.46)	(0.36)
REER (% change)	-0.97	-0.96*	-1.28**
	(0.59)	(0.56)	(0.56)
Autonomous demand growth (ΔZ)	1.87***	1.76***	0.79**
	(0.31)	(0.27)	(0.36)

STEP III – EMPIRICAL ESTIMATIONS (3)

Controlling for a full set of country and year fixed effects is necessary in order to make the **treated** and **control** units in our sample comparable. In addition, in all specification we control for initial (pre-expansion) values of the dependent variable.

→ **Two-way fixed effects specification**

To further address endogeneity issues we will use **propensity-score** based methods, explicitly addressing the problem that expansions are not randomly assigned - we explicitly account for the influence of relevant variables (e.g., inflation or REER) on the probability of an expansion.

→ **Propensity score-based specification** *(STILL IN PROGRESS)*

Two-way fixed effects specification

Eq(3) is the LP specification for estimating **the effect of a treatment** (i.e., an autonomous demand expansion) at different time-horizons:

$$\Delta y_{i,t+h} = \alpha_i^h + \delta_t^h + \beta^h E_{i,t} + \sum_{j=1}^{p} \theta_j^h \Delta y_{t-p} + \sum_{j=1}^{p} \varphi_j^h x_{t-p} + \varepsilon_{i,t+h}$$

for $h = 1, \ldots, n$ (3)

$\Delta y_{i,t+h}$ is the *% change* in the outcome of interest between *t-1* and *t+h* ;

we consider two pre-treatment lags of the dependent variable (*p=2*);

x are control variables (we always control for two lagged growth rates of GDP, and also for productivity and REER in the robustness analyses).

β^h represents the gap between log(y) in **treated** and **non-treated** observations in the h^{th} year after a Z expansion.

Note: for variables that are stationary we take the absolute value at time *t+h* instead of the change.

STEP III – EMPIRICAL ESTIMATIONS (5)

For instance, in Eq(4) $\Delta GDP_{i,t+h}$ is the *h*-years % *change* in real output between *t-1* and *t+h*, which is equal to $\log(GDP_{t+h}) - \log(GDP_{t-1})$.

$$\Delta GDP_{i,t+h} = \alpha_i^h + \delta_t^h + \beta^h E_{i,t} + \sum_{j=1}^{p} \theta_j^h \Delta GDP_{t-p} + \sum_{j=1}^{p} \varphi_j^h x_{t-p} + \varepsilon_{i,t+h} \quad (4)$$

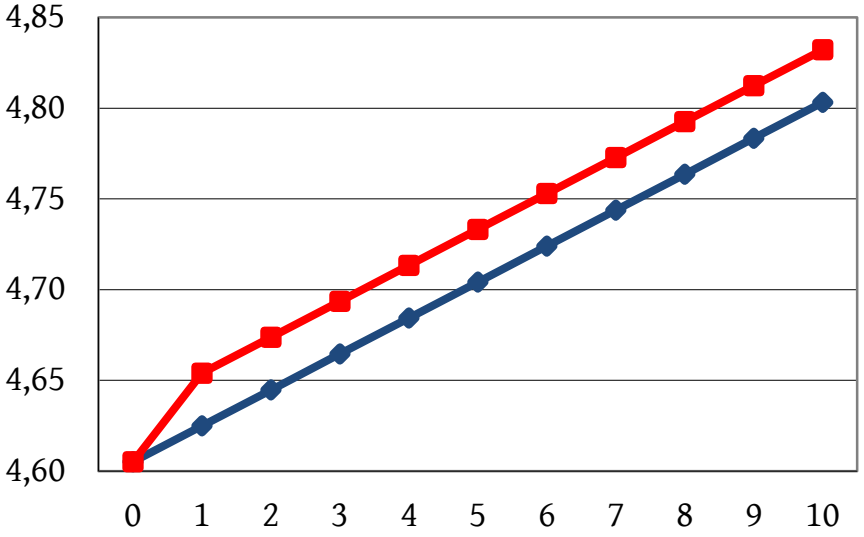
β^h represents the gap between log(GDP) in **treated** and **non-treated** observations in the *h^th^-year* after the Z expansion.

In a nutshell: we assess the effects of a Z expansion by measuring the average GDP variation after an expansion **relative** to a control group of countries that in the same year have not had an expansion, including a set of variables as controls.

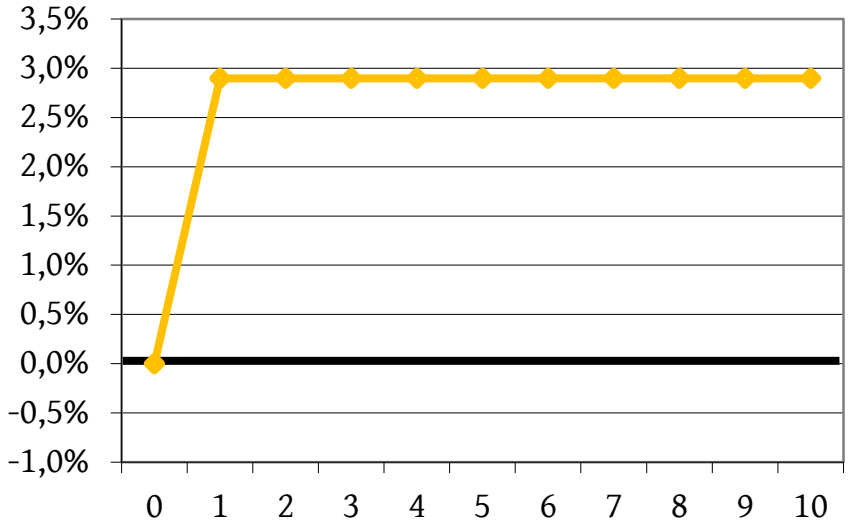
How to look at our findings? (part 1)

A simple numerical example: two countries with the same initial level (t=0) of GDP [log(100) ≈ 4.61]. Let **treated** country grow at 5% in t+1, while **non-treated** country grows at 2%. After, both countries grow at 2% in each period.

Log(GDP)



Log(GDP treated) – Log(GDP non-treated)



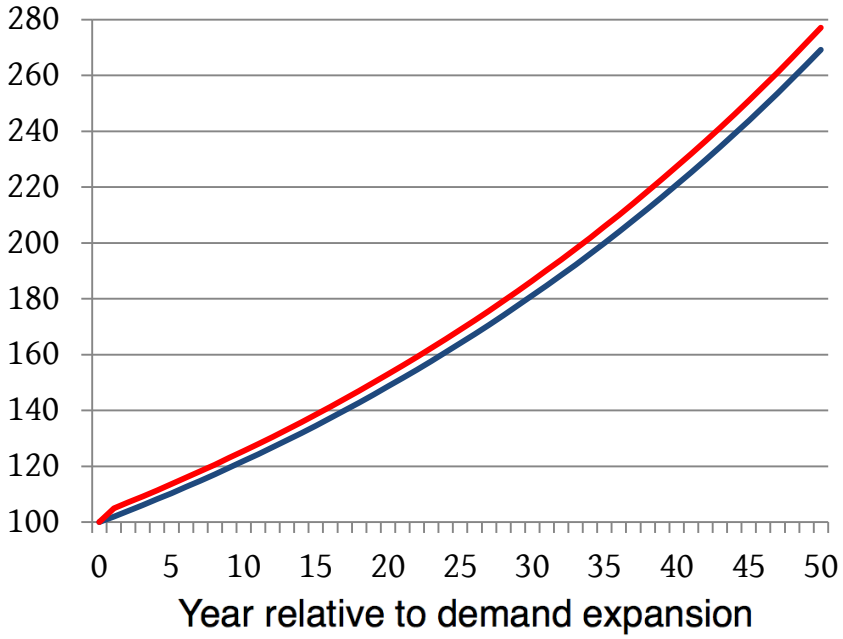
In **treated** country GDP grows at the same rate as in **non-treated** country after the expansion, but with a permanent **shift** in its trajectory
→ long-term (or persistent) **level effect** on GDP of a *one-off* Z expansion.

How to look at our findings? (part 2)

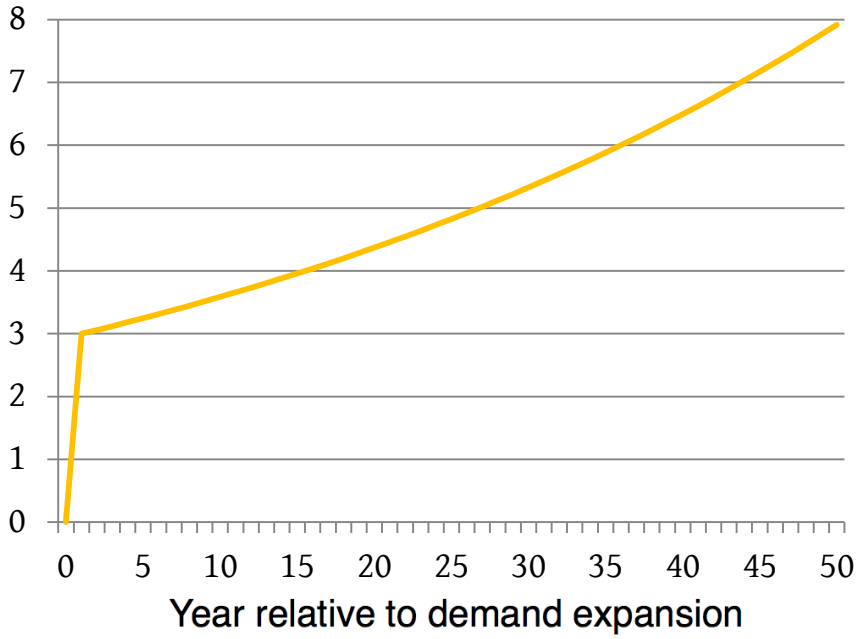
With respect to absolute values (i.e., without log-transformation), the **level effect** will be amplified by "compound capitalization".

Consequently, **GDP trajectories will spread**.

GDP (*a basic 50-years projection*)



GDP treated – GDP non-treated



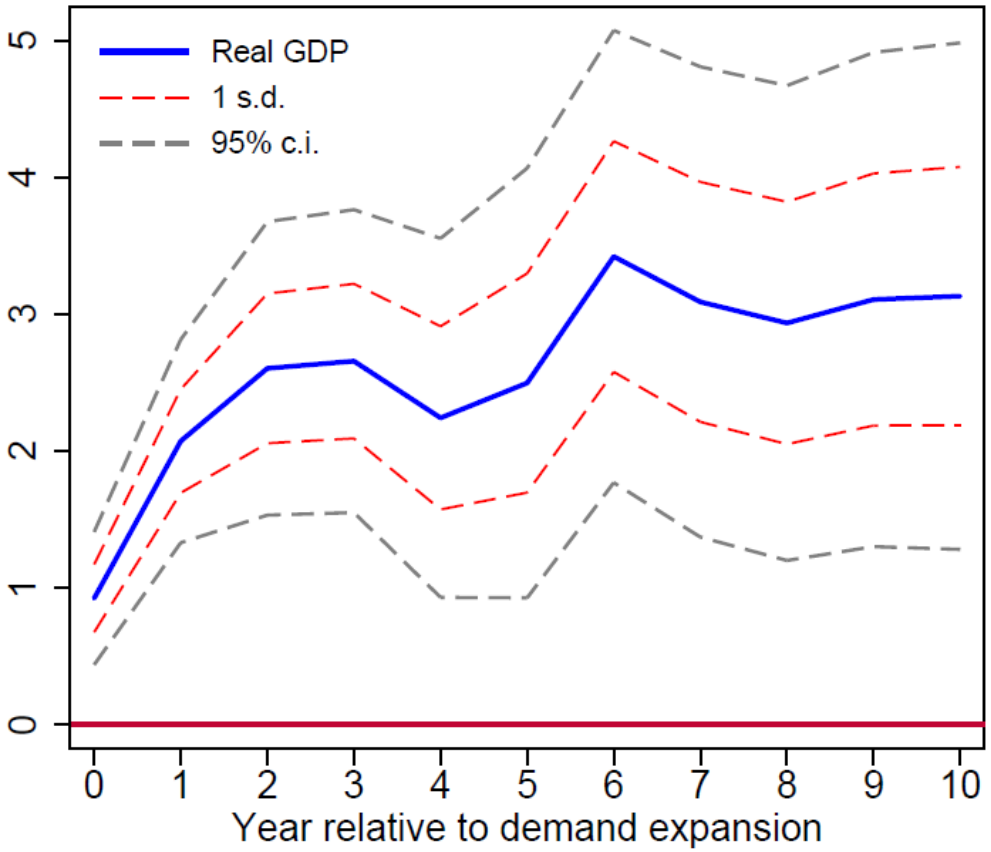
STEP III – EMPIRICAL ESTIMATIONS (8)

Impulse-response function (IRF) for the effect of a Z expansion on Y, obtained through LPs (% points on the vertical axis).

The blue line, i.e. β in Eq(4), shows that the gap stabilizes at 3% after 10 years.

This implies a long-run elasticity of $\varepsilon_{Y;Z} = 3.13/5.04 = 0.62$

Note that the weight of our metric of autonomous demand is, on average, 69.5% GDP in expansion observations (79% in the whole sample).

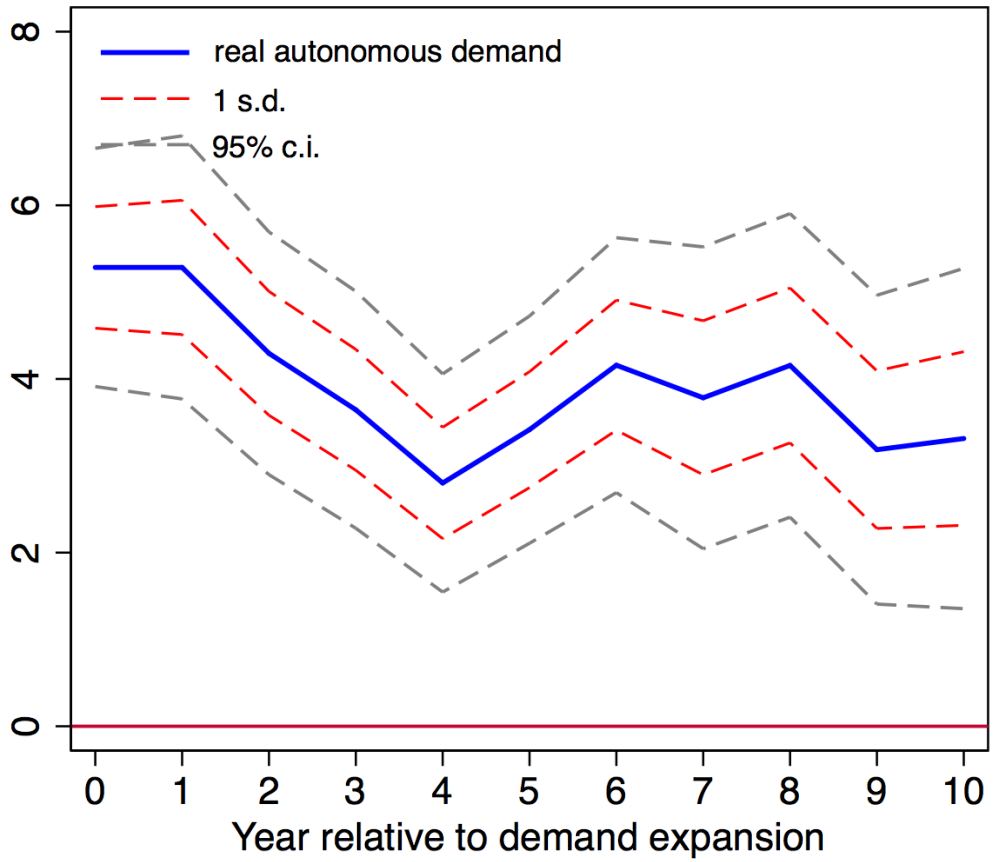


STEP III – EMPIRICAL ESTIMATIONS (9)

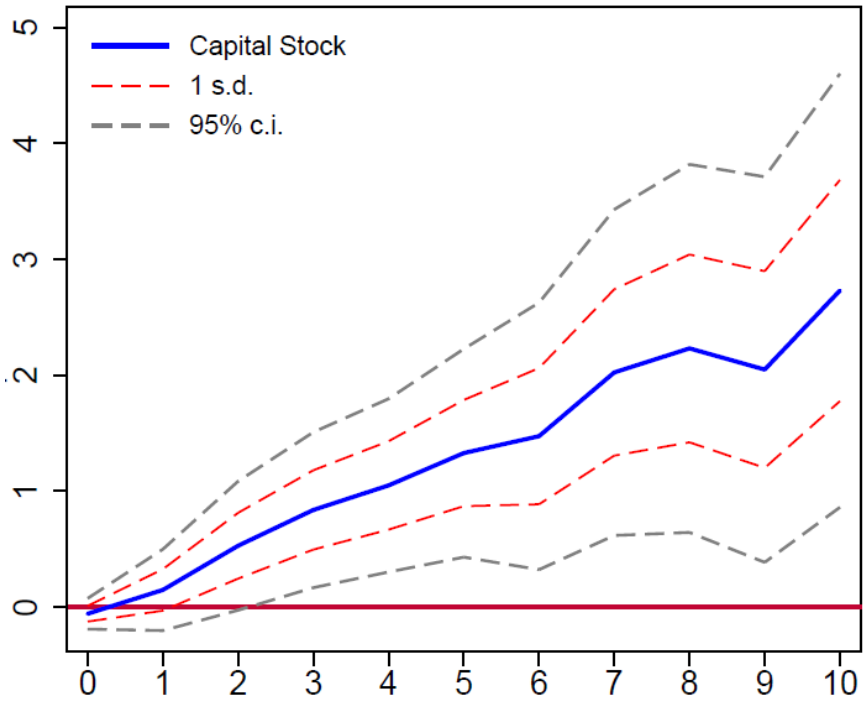
$$\Delta Z_{i,t+h} = \alpha_i^h + \delta_t^h + \beta^h E_{i,t} + \sum_{j=1}^{p} \theta_j^h \Delta Z_{t-p} + \sum_{j=1}^{p} \varphi_j^h x_{t-p} + \varepsilon_{i,t+h} \quad (5)$$

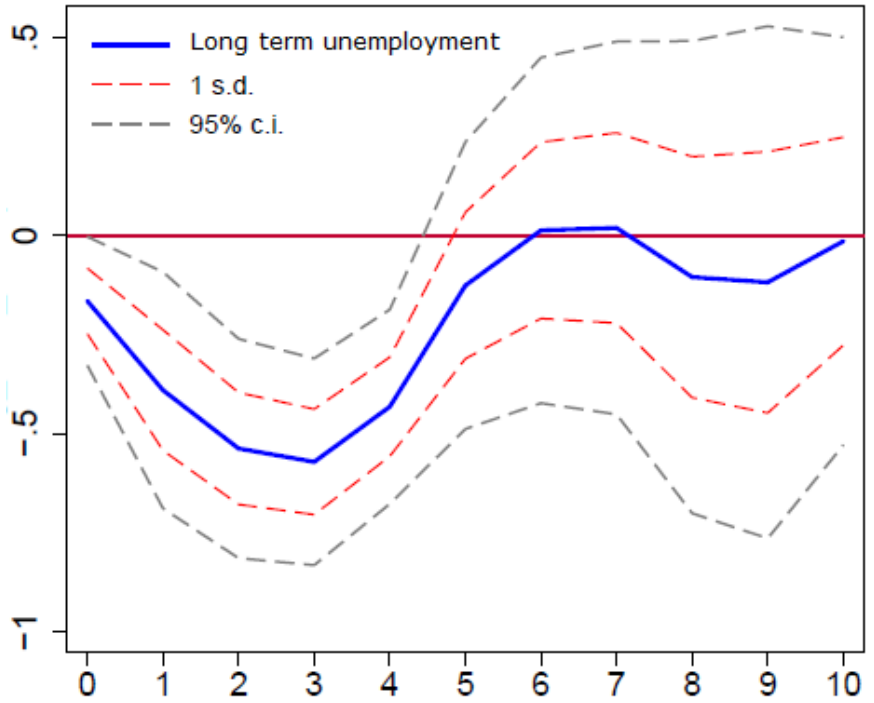
The graph displays the behavior of autonomous demand variable after the expansionary episodes.

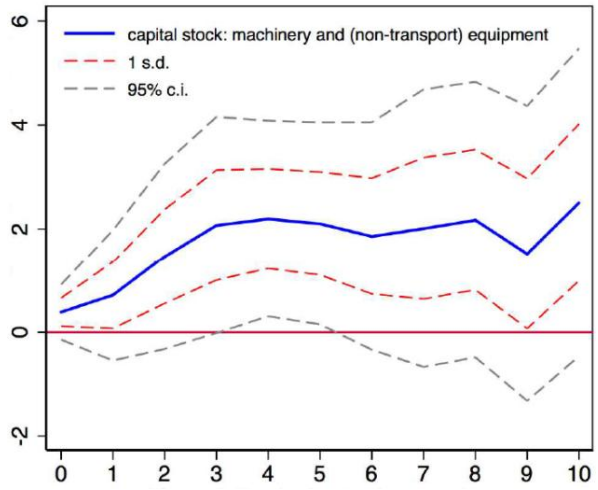
The blue line, i.e. β in Eq(5), shows that the initial gap is about 5% and then stabilizes at 3.5%, indicating a persistent change in Z, consistent with the permanent level effect on GDP.

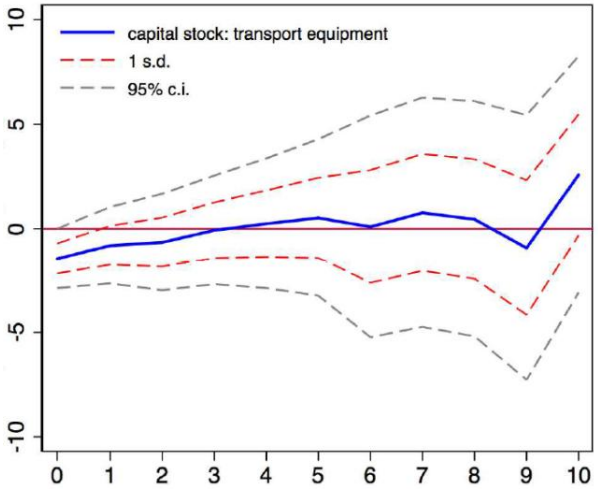


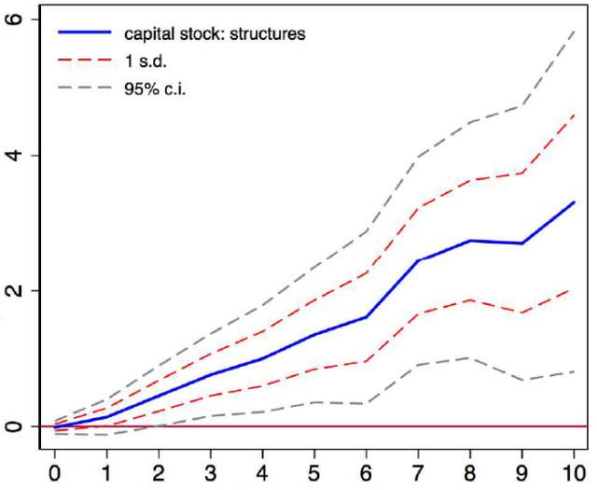
STEP III – EMPIRICAL ESTIMATIONS (10)



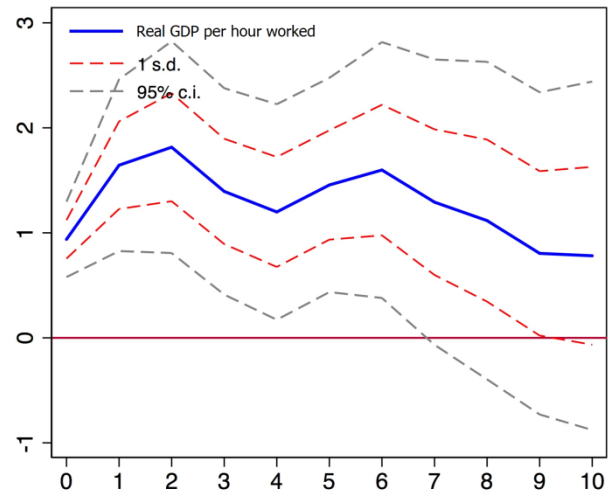


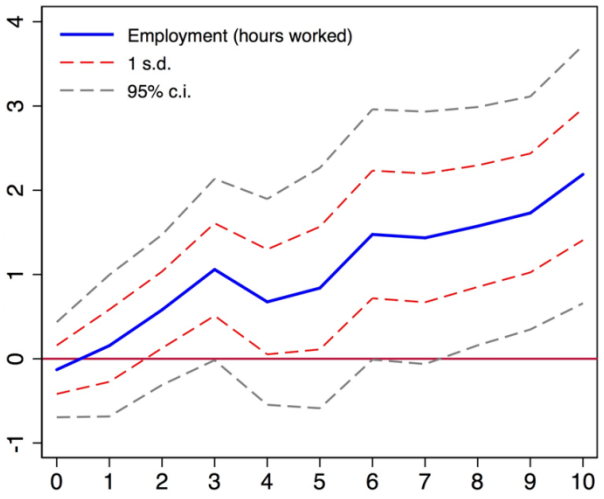


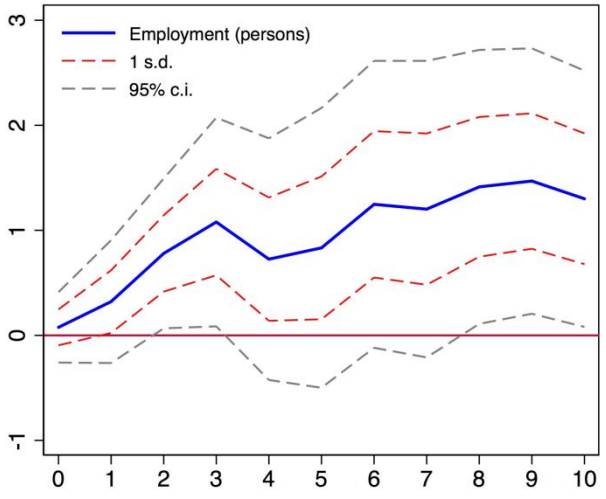


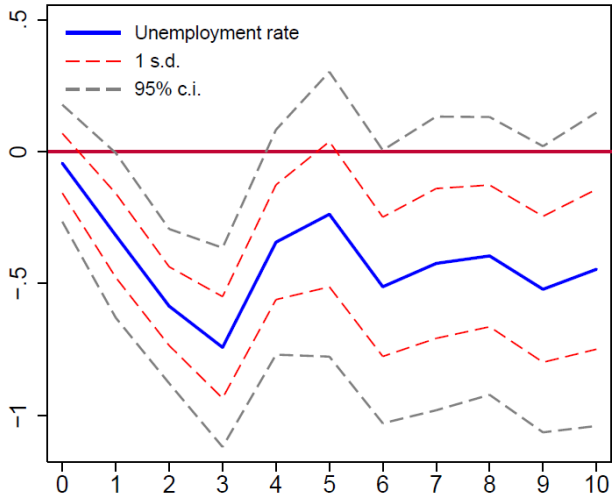


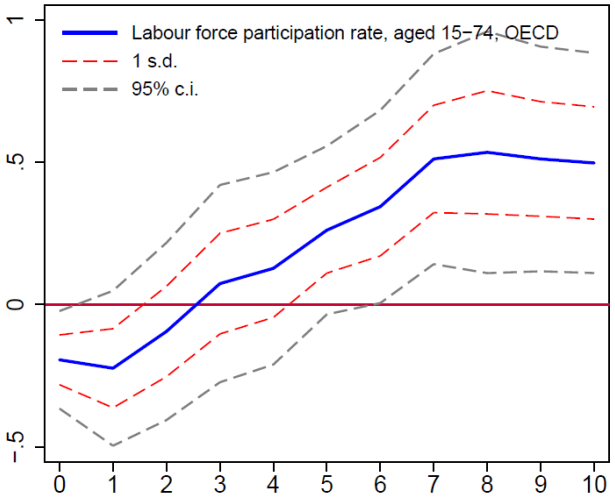
STEP III – EMPIRICAL ESTIMATIONS (11)

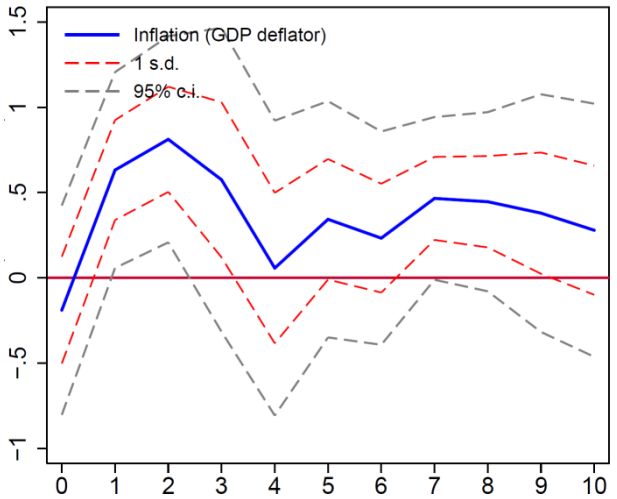












STEP IV – INTERPRETATION OF OUTCOMES (1)

In some contributions to the literature on hysteresis, the persistence of negative AD effects on GDP can depend on ↓investment, affecting capital stock and productivity.

The fall in investment is regarded as a direct consequence of changes in AD. Capital formation is an important channel for hysteresis in unemployment and GDP [Gordon, 1995; Rowthorn 1995; 1999].

Other Post-Keynesian studies have empirically tested the relevance of capital accumulation *vis-à-vis* labour market institutions in affecting unemployment rate or NAIRU: only the former is always statistically significant and has a strong economic impact [Arestis *et al.* 2007; Stockhammer & Klär 2010; Stockhammer *et al.* 2014].

In the recent NEK literature capital formation is pointed as possible cause of hysteresis after a negative AD shock.

> "*There are a number of reasons why growth rates of potential output, and possibly even the level, might fall during a recession. The most obvious is that investment generally contracts, resulting in a permanently lower level of the capital stock even if investment later recovers to its pre-recession level. If technical change is embodied, lower investment may also have a negative effect on the rate of technical progress.*" [Haltmaier 2012, p. 1]

STEP IV – INTERPRETATION OF OUTCOMES (2)

However, the aforementioned empirical literature does not aim at enquiring into the determinants of investment and capital accumulation, though they mention the role of aggregate demand.

A large number of empirical analyses have shown that the main determinant of investment is (lagged) GDP growth or autonomous demand growth [Girardi & Pariboni 2015; 2016], consistently with the *flexible accelerator* principle, while interest rate plays a small role, if any, in determining investments - see Blanchard [1986], Chirinko [1993] and Khotari *et al.* [2014] among others.

Thus, both the empirical literature on investments and that concerning the effects of capital accumulation on the NAIRU along with our findings suggest that the influence of aggregate demand and GDP growth on investments **should be regarded as working in both directions**, that is not only in recessions but also in expansions.

STEP IV – INTERPRETATION OF OUTCOMES (3)

A link between an increase in autonomous demand (G and X), GDP and capital accumulation in the long-run is **inconsistent** with macro-models in which ↑Z causes crowding-out and/or rising inflation (with only temporarily ↑ output).

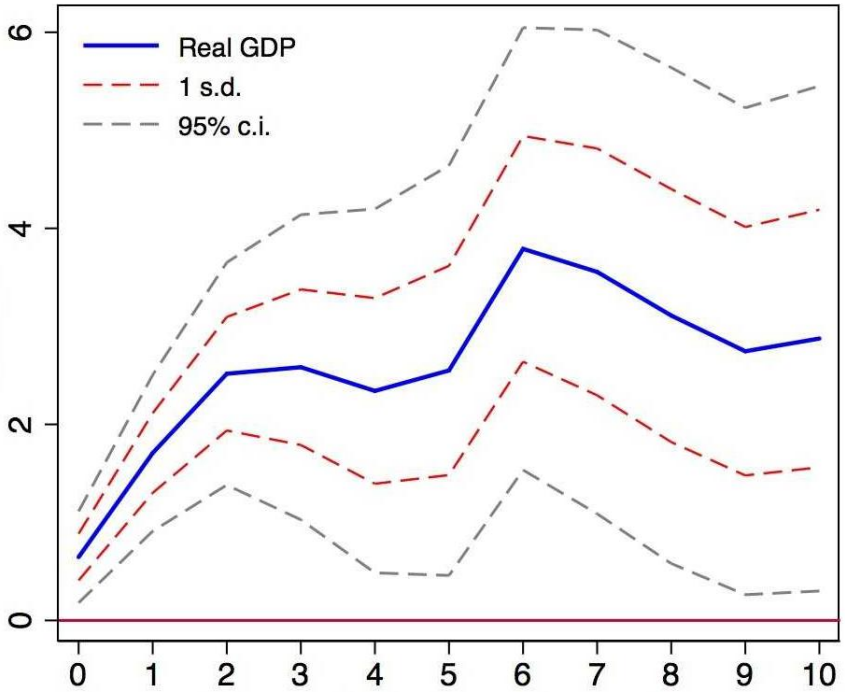
An alternative framework **consistent** with persistent effects of AD changes on GDP is grounded on *three hypotheses*:
1. in any given period, with a given equipment, aggregate demand can differ from the aggregate output that would be forthcoming if the existing fixed capital was utilized in the degree planned by firms;
2. underutilization or overutilization of plants can be persistent enough to induce firms to adjust their capital equipment;
3. even when fix-capital is used in the planned degree, it is possible to increase output simultaneously in the investment goods and consumption goods sectors.

The analytical premises for the analysis of accumulation along these lines were discussed in Garegnani [1962; 1978-79], while theoretical and empirical support to the **demand-led growth** approach has been provided - among others - by Ackley [1963], Cesaratto & Mongiovi [2015, eds.], Garegnani & Palumbo [1997], Garegnani & Trezzini [2010], Freitas & Serrano [2015], Girardi & Pariboni [2016].

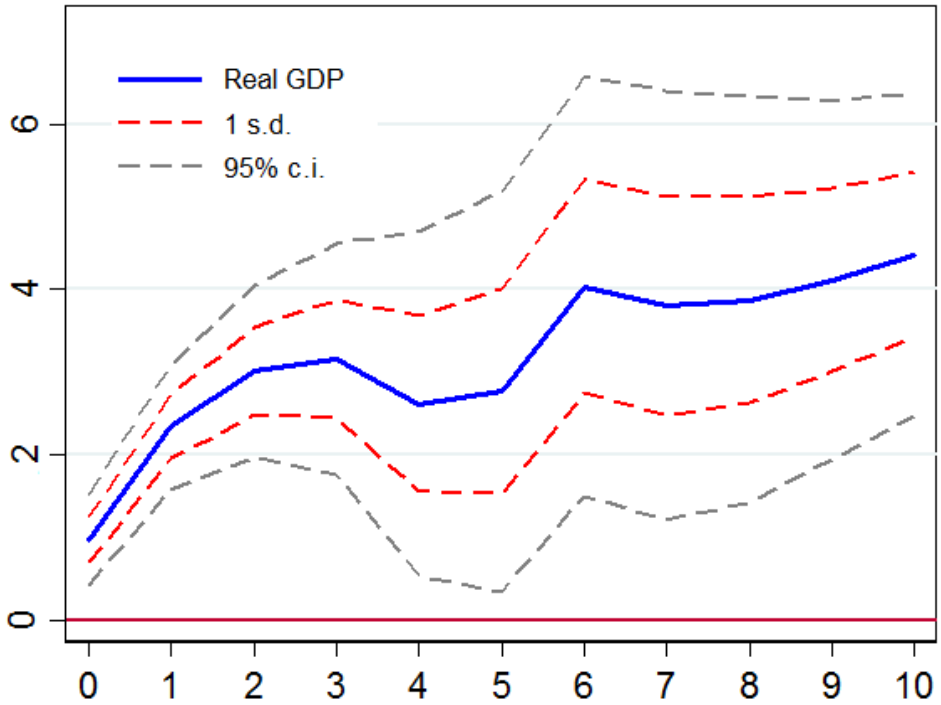
PLANNED IMPROVEMENTS

1. **Propensity score**-based estimations [Angrist *et al.* 2013]
2. **Population-weighted** estimations (to control for country dimension)
3. **State-dependent** estimations (unemployment, income level, etc.)
4. **Adjusted local projections** [Teulings & Zubanov 2010]

Propensity score-based



Adjusted local projections



CONCLUDING REMARKS (1)

EMPIRICAL FINDINGS

We find a highly significant **persistent level effect on GDP**: a *one-off* expansion in our autonomous demand variable by (an average of) 5% is associated 10 years later to a GDP level higher by around 3%, with no sign of mean-reversion.

We also document strong persistent effects on **capital stock**, **employment**, **labour productivity** and **participation rate**. Effects on **unemployment** and **long-term unemployment** are instead strong but transitory.

We do not find that autonomous demand expansions cause accelerating inflation, but only a modest and temporary (not statistically significant) increase in inflation.

OUR INTERPRETATION

The channel linking expansions and recessions to investment and hence to long-term GDP trajectories appears to be the most convincing and empirically supported explanation of the persistent level effects on GDP resulting from changes in AD.

CONCLUDING REMARKS (2)

POLICY IMPLICATIONS

Our results, along with the existing literature on the persistent effects of recessions and fiscal consolidations (and on the weakness of the relationship between unemployment and inflation), suggest policy implications that are rather interesting and at variance with the prevailing official wisdom, particularly in EU institutions.

The *trade-off* in macroeconomic policy **is overturned**: AD expansions bring about *persistent* effects on GDP, productivity, capital stock, participation and employment at the cost of an extremely short-lived and moderate inflation.
Both productivity and factor endowments **are not independent** of AD.

Partially similar conclusions had been reached by the hysteresis literature, although

a) it normally deals with ↑ NAIRU after negative shocks;
b) it conveys the idea of a *distortion* in the normal functioning of the economy in returning to what would have been the normal outcome of free market forces.

On the contrary, we suggest that the *persistence* of the effects of AD changes are pervasive and indeed the result of the *normal* functioning of market forces.

NEXT PRESENTATIONS

INVITED SPEAKER (plenary session)
INET Conference – ***Reawakening***
Edinburgh, October 21-23

Institute for **New Economic Thinking**

21st FMM Conference
The Crisis of Globalisation
Berlin, November 9-11

fmm Forum for Macroeconomics and Macroeconomic Policies

ASTRIL International Conference
Reassessment and perspectives of labour policies
Rome, December 14-15

ASTRIL Associazione Studi e Ricerche Interdisciplinari sul Lavoro

INVITED SPEAKER (plenary session)
INET Special event on "Secular Stagnation project"
New York, December 15

Thank you for your attention.

Persistent effects of autonomous demand expansions

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Comments and suggestions are welcome.