An empirical analysis of the asymmetry of consumption

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1. Theoretical Context

Classical-Keynesian Approach to growth & development (accumulation)
(Garegnani 1978-9, 1992)

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Extension of the principle of effective demand (Keynes 1936) to the long-run (i.e. when capacity itself can change)

- ***Aggregate demand*** as the main determinant of the level of output, income & employment in the short run and, in the long run, of capacity accumulation too;
- The economic system, if left to its own devices, can tend to positions of ***under-utilisation*** of capacity and ***unemployment*** of labour;
- Analysis of accumulation is separated from the analysis of distribution. [...]

...

1. Theoretical Context (cont.)

...

- Distribution of output determined by social forces acting within an institutional context and at a particular historical moment;
- ***The wide elasticity of output*** – with respect to productive capacity – to the dynamics of demand is recognised. It shows itself via:
  1. changes in capacity utilisation (short run);
  2. creation, failure to restore or destruction of the capacity itself (long run).

Under this theoretical context, it has been shown how ***consumption expenditure can be an endogenous source of economic growth*** (Garegnani and Trezzini 2010).

2. Theoretical Context

Consumption expenditure as an endogenous source of economic growth

$\Uparrow$

Consumption asymmetry with respect to expansions & contractions of disposable income: *i.e.* a fall in income leads to a fall in consumption in a smaller proportion compared to a rise in consumption when income expands

Which justification?

The Theory of the Social Role of Consumption $\Longrightarrow$ Determine composition & level of consumption expenditure

2. Theoretical Context (cont.)

The Theory of the Social Role of Consumption
(Veblen 1899, Duesenberry 1949)

1. Individuals identify themselves in a ***social class*** also through the consumption of goods & services $\Longrightarrow$ social communication & reference point/standard;
2. When income falls, the consumption expenditure determined by the acquired standard is difficult to compress: ***irreversibility of consumption***;
3. New standard can be set $\Longrightarrow$ ***Emulation*** of «ideal» consumption style of the leisure classes.

$$1 \cdot 2 \cdot 3 \Longrightarrow \text{Asymmetry: } \left(\frac{\Delta C}{\Delta Y}\right)_{+} > \left(\frac{\Delta C}{\Delta Y}\right)_{-}$$

2. Empirical Analysis

At the center of the theory, there's the asymmetry of consumption.

Research Objective: provide an empirical basis for this hypothesis.

	YD	C	Period	Notes
USA	Real Disposable Income	Real Private Consumption	1947 - 2019	Quarterly, per capita, log
Italy	Real GDP	Real Private Consumption	1961 - 2019	Quarterly, per capita, log

Table 1: Summary of variables and data used in the work. Sources: U.S. BEA and OECD EO No 106.

	Model 1	Model 2
USA	1947q1 - 2007q4	1947q1 - 2019q4
Italy	1961q1 - 2008q1	1961q1 - 2019q4

Table 2: Summary of estimated models.

Two variables: consumption (c) and income (y). What is the effect on consumption of a change in income?

$$\begin{bmatrix} c_t \\ y_t \end{bmatrix} = \begin{bmatrix} \nu^c \\ \nu^y \end{bmatrix} + \begin{bmatrix} a_{11,0} & a_{12,0} \\ a_{21,0} & a_{22,0} \end{bmatrix} \begin{bmatrix} c_t \\ y_t \end{bmatrix} + \ldots + \begin{bmatrix} a_{11,p} & a_{12,p} \\ a_{21,p} & a_{22,p} \end{bmatrix} \begin{bmatrix} c_{t-p} \\ y_{t-p} \end{bmatrix} + \begin{bmatrix} w_t^c \\ w_t^y \end{bmatrix} \tag{1}$$

$$c_t = f(c_{t-i}, y_{t-i}) \quad \forall\, i = 0, 1, 2, ..., p. \tag{2}$$

- past consumption as a measure of the acquired (average) standard: *structural component* of aggregate consumption («ratchet effect», Duesenberry 1949);
- income level as the main determinant of consumption (i.e. absolute income hypothesis, Keynes 1936).

From the moving average representation of the system (1), SVAR, it is possible to calculate the ***impulse response function***[1]

$$IRF_j = \varepsilon_j = \frac{\partial c_{t+j}}{\partial y_t} \quad \forall\, j = 0, 1, 2, ..., n. \tag{3}$$

Problem: ∂y_t greater or less than zero has the same effect on c_t in absolute value. In other words, it is not possible to distinguish how consumption varies due to income expansions and contractions.

[1] Suppose that, at time t, a change in income can have a simultaneous effect on consumption and that a change in consumption can have an effect on income from the following quarter, i.e. from $t + 1$.

2. Empirical Analysis: measuring the asymmetry

Following Schorderet (2001, 2003)[2], any time series can be expressed, given the initial value, as the combination of the cumulative positive and negative changes:

$$x_t = x_o + x_t^+ + x_t^- \tag{4}$$

$$x_t^+ = \sum_{i=1}^{t} max\left(\Delta x_i, 0\right) \qquad x_t^- = \sum_{i=1}^{t} min\left(\Delta x_i, 0\right). \tag{5}$$

[2] See also: Granger e Yoon (2002), Shin et al (2014).

2. Empirical Analysis: measuring the asymmetry

x	x_t^+	x_t^-
0	0	0
1	1	0
2	2	0
1.5	2	-0.5
0.5	2	-1.5
0.8	2.3	-1.5
0.6	2.3	-1.7

x_t^+ and x_t^- represent, in our case, the expansions & contractions of income y_t.

2. Empirical Analysis: measuring the asymmetry

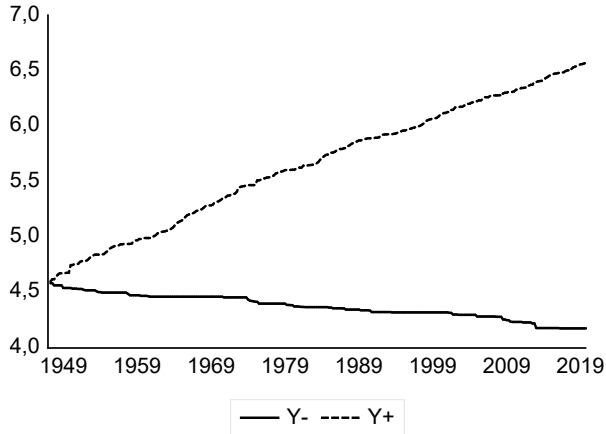


Figure 1: Breakdown of quarterly disposable income (in logarithm) of the United States. Author's elaboration.

We shall write the system of equations (1) by ***splitting the income into its components***:

$$\begin{bmatrix} c_t \\ y_t \end{bmatrix} \implies \begin{bmatrix} c_t \\ y_t^+ \\ y_t^- \end{bmatrix} \tag{6}$$

and calculate, following the previous reasoning, the impulse response functions:

$$\varepsilon_j^+ = \frac{\partial c_{t+j}}{\partial y_t^+} \qquad \varepsilon_j^- = \frac{\partial c_{t+j}}{\partial y_t^-} \tag{7}$$

These are the elasticities of consumption to income changes over a time horizon $j = 0, 1, 2, ..., n$..[3]

[3] It can be shown that if the elasticity of consumption to income is asymmetrical, then the marginal propensity is asymmetrical too.

2. Empirical Analysis: some assumptions/remarks

- Suppose that a change in income can have an effect on consumption in the same quarter. A change in consumption may have an effect on income from the following quarter onwards;
- By definition, a change in y_t^+ cannot also accompanied by a change in y_t^-. In other words, in the same quarter there can be either an expansion or a contraction of income.

3. Empirical Analysis: USA 1947 - 2007

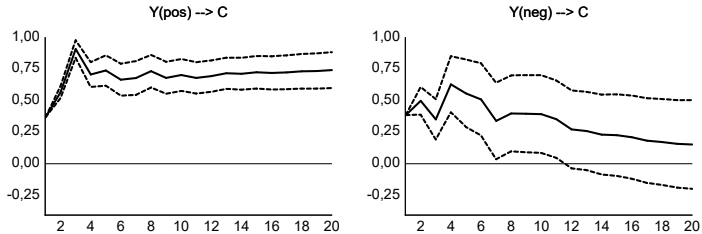


Figure 2: Consumption IRFs with respect to a positive (Ypos) & negative (Yneg) unit change. The dotted lines indicate the confidence interval ±0.68%.

An income expansion ($\Delta y_t^+ = 1\%$) generates a proportionally larger increase in consumption than the decrease in consumption caused by an income contraction ($\Delta y_t^- = -1\%$) ...

3. Empirical Analysis: USA 1947 - 2007

...in particular:

1. an income expansion generates a ***maximum elasticity*** of consumption of 0.91%. It stabilises for values higher than 0.70%;
2. a contraction in income generates a ***maximum elasticity*** of consumption of 0.63%. It decreases sharply in subsequent quarters;
3. the ***median*** elasticities are $\varepsilon^{+}_{med} = 0.71\%$ and $\varepsilon^{-}_{med} = 0.35\%$: consumption expenditure tends to contract by half compared to the case when it expands;
4. consumption expansions are ***persistent***. Contractions are ***transitory*** and ***reabsorbed*** over time.

3. Empirical Analysis: USA 1947 - 2007

Defining with ***degree of asymmetry*** the difference $\Delta\varepsilon = \varepsilon^+ - \varepsilon^-$:

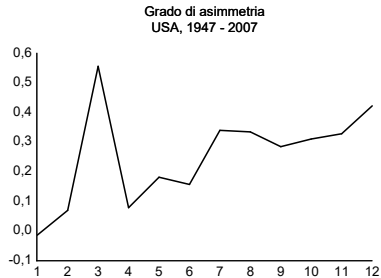


Figure 3: Degree of asymmetry, for the United States, in the model for the period 1947 - 2007 after twelve periods.

$$\Delta\varepsilon_{max} = 0.56\% \text{ when } \varepsilon^+ = 0.91\% \text{ e } \varepsilon^- = 0.35\%.$$

3. Empirical Analysis: USA 1947 - 2019

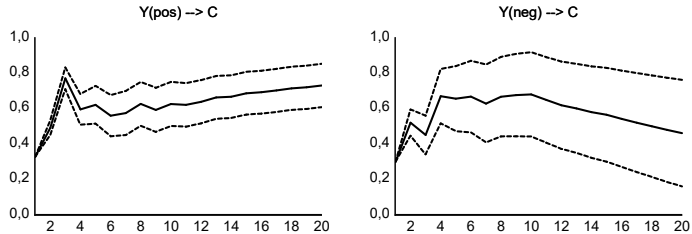
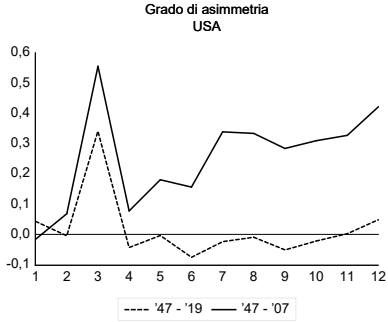


Figure 4: Consumption IRFs with respect to a positive (Ypos) & negative (Yneg) unit change. The dotted lines indicate the confidence interval ±0.68%. Model 1947 - 2019 for USA.

Compared to the previous model, the ***Great Recession*** event changes the income elasticity of consumption in several directions.

3. Empirical Analysis: USA 1947 - 2019

1. a contraction of income has a more persistent and statistically significant effect on consumption throughout the time horizon;
2. an expansion of income has a less strong effect than in the previous model ($\varepsilon_{max} = 0.77\% < 0.91\%$);
3. the asymmetry, although weaker, is nevertheless confirmed in the first quarters after the income variation.



3. Empirical Analysis: Italy 1961 - 2008

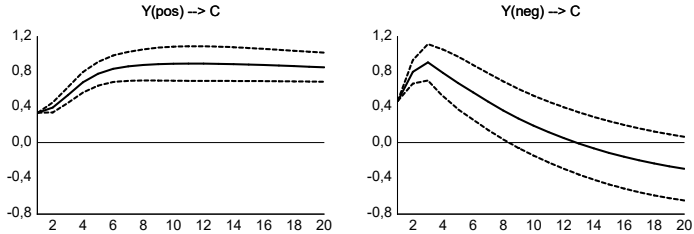


Figure 5: Consumption IRFs with respect to a positive (Ypos) & negative (Yneg) unit change. The dotted lines indicate the confidence interval ±0.68%. Model 1961 - 2008, Italy.

The elasticities show two ***dynamics*** in line with the US case. Income expansions have a persistent effect on the level of consumption; income contractions have transitory effects on the level of consumption. In the first quarters, however, we observe estimates that are not in line with our hypothesis.

3. Empirical Analysis: Italy 1961 - 2019

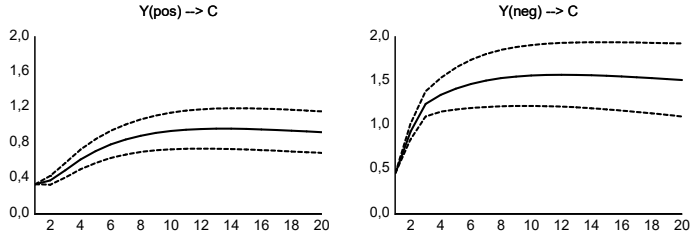
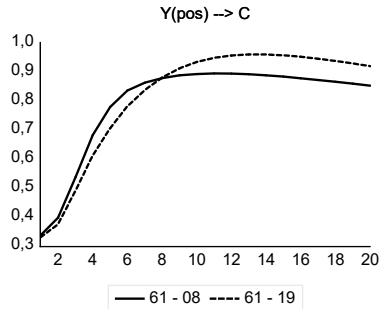
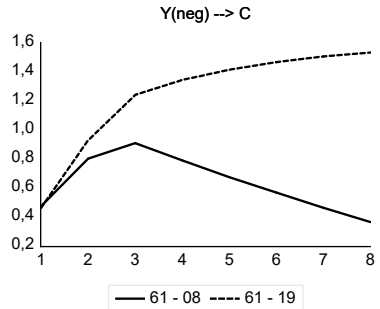


Figure 6: Consumption IRFs with respect to a positive (Ypos) & negative (Yneg) unit change. The dotted lines indicate the confidence interval ±0.68%. Model 1961 - 2019, Italy.

Following the 2008-2011 double-dip recession, the consumption asymmetry reverses: a contraction in income is followed by a contraction in consumption to a greater extent than an expansion produced by an increase in income. This result is in line with the observed pattern of consumption and income.

3. Empirical Analysis: comparing Italian results





3. Empirical Analysis: comparing Italian results

Can these trends be interpreted in the light of the ***Theory of the Social Role of Consumption***?

A starting point: the evolution of household disposable income (thus consumption).

3. Empirical Analysis: comparing Italian results

- Acquired standards justify the irreversibility of consumption when recessions are of limited intensity and duration. An income contraction can be largely compensated by reduced savings or increased debt;
- The Italian recession 2008-2014 was very deep and prolonged in time: in this case it is possible - as the empirical analysis suggests - that the asymmetry is cancelled or reversed.

$\Longrightarrow$ lower socially accepted standards are acquired and a recovery of the economy might not be supported by an expansion of consumption via emulation (now discontinued).

3. Empirical Analysis: comparing Italian results

- Changes in distribution may have reinforced the cancellation or reversal of the asymmetry;

  $\Longrightarrow$ A worsening of the primary and functional distribution over time is documented for Italy, after 2008 too (D'Elia and Gabriele 2018, Franzini and Raitano 2018, Barba 2013).

Continued stagnant economic conditions have played a major role in depressing consumption and reducing acquired standards:

«[…] 57% of Italian households have reduced the quantity and/or quality of their food expenditure in recent years. If non-food consumption is considered, the share rises to 72%.»[4]

[4] FILCAMS-CGIL e fondazione Di Vittorio, «I consumi delle famiglie italiane nel 2015».

Conclusions & Further Research

1. Within the Classical-Keynesian approach to growth and accumulation, consumption can be an endogenous source of economic growth;
2. At the centre, we find the asymmetric behaviour of consumption with respect to income changes;
3. We can justify this asymmetry, following the literature, with the Theory of Social Role of Consumption. Here we have searched for an empirical support;
4. The analysis of the US confirms the characteristic of asymmetry over a wide time span;
5. The analysis of Italy, influenced by the availability of data, provides alternative interpretations and opens up the possibility of a reversal of the theoretical mechanism.

Conclusions & Further Research

- Divide the analysis of the USA into sub-periods and investigate, using the econometric model, the degree of asymmetry: The Glorious Thirty vs «Pitiful Forty» years;
- Kilian and Vigfusson (2011) suggested a methodology that takes into account the difference between expansions and contractions but also their intensity;
- Analytical study of the reversal of the theoretical mechanism (reverse asymmetry): temporary and exceptional condition.

SVAR Identification

$$B_o x_t = \begin{bmatrix} * & * & * \\ o & * & o \\ o & o & * \end{bmatrix} \begin{bmatrix} c_t \\ y_t^+ \\ y_t^- \end{bmatrix} \tag{8}$$