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## Consumption and fiscal policies: medium-run non-Keynesian effects

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# CONSUMPTION AND FISCAL POLICIES: MEDIUM-RUN NON-KEYNESIAN EFFECTS

by Giorgio Rodano* and Enrico Saltari**

## Abstract

In this paper we study the effects of fiscal policies on current consumption, distinguishing between Keynesian effects (KE), due to changes in current disposable income, and non-Keynesian effects (NE), due to expected changes in future disposable income. The literature has argued that permanent changes in fiscal policies affect current consumption. We show that the size and sign of such NE effects depend crucially on the expected lifetime of the representative consumer and on the timing of policy changes. In particular we investigate the effects on current consumption of medium run changes in fiscal policy. Using a consumption function based on a perpetual youth model, formulated in discrete time, we show the possibility of reversed NE effects where sign (KE) = sign (NE). All that is required for such reversed NE effects is the satisfaction of a simple and realistic condition depending on the expected lifetime of the consumer and the starting date for the offsetting fiscal measures needed to satisfy the intertemporal public sector budget constraint. We propose a number of exercises showing the importance of the level and dynamics of public debt. The results help to explain anomalous trends in consumption during 90s, as Italy prepared to join the EMU.

JEL classification: E21, E62.
Keywords: consumption function, fiscal policy, public debt.

## Contents



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# 1 Introduction

In this paper we investigate the effects of fiscal policies on the timing of household consumption decisions. The motivation for our work derives from "anomalous" trends in Italian consumption during the first half of the 90s which represent a puzzle for researchers. In particular, in 1992-93, levels of private consumption were strongly affected by fiscal restrictions, dropping further than predicted by major econometric models. The Bank of Italy's 1993 Annual Report points out that:

> «Large though it was, the fall in disposable income cannot explain the downturn in consumer spending, in that the decline in consumption emerged in the second half of 1992 whereas income did not begin to contract significantly until after the turn of the year. Moreover, if consumers had considered the fall in income to be cyclical and hence not likely to have substantial effects on permanent income, as they had in similar circumstances in the past, its impact on consumption would have been greatly reduced.» (Banca d'Italia (1994), p. 38)

FIGURE 1
The anomaly of consumption in the 90s (CER 1999)

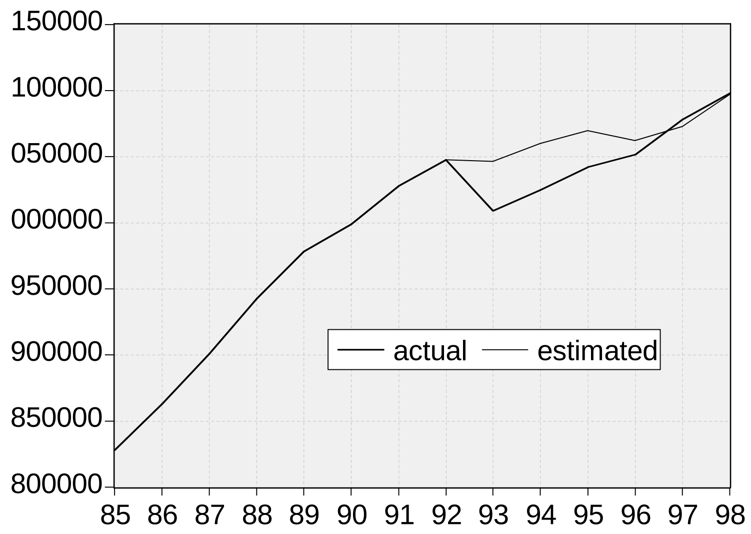
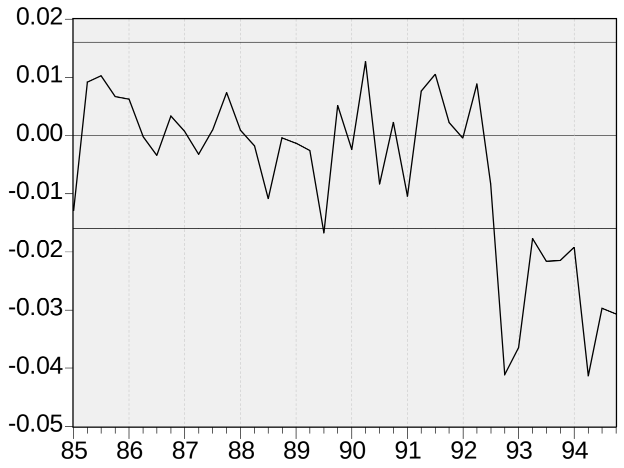



FIGURE 1 compares actual levels of household consumption with the predictions of the CER econometric model based on the historical values of input variables (see CER (Centro Europa Ricerche) (1999), p. 37). As can be seen the model predicts initial stagnation followed by a slow recovery. Actual consumption, on the other hand, showed a sharp initial drop which is not predicted by the model. Predicted values continue to be higher than actual values until 1997.

As can be seen in FIGURE 2, taken from Locarno and Rossi (1995), the Bank of Italy's, pre-1993, econometric model makes a similar over-estimate of consumption, with the anomaly appearing precisely in the third quarter of 1992.[1] Researchers have offered a number of different explanations for

FIGURE 2
Simulation errors in the consumption equation (Locarno and Rossi (1995))




these trends. The drop in consumption has been attributed to precautionary saving caused by uncertainty about the country's critical economic situation and the consequences of the currency crisis, which reached its peak between September and October 1992. Other authors have explained the drop as the result of a wealth effect: the expectation of capital losses due to the falling value of securities. A third possible explanation was put forward in the Bank of Italy Annual Report, quoted earlier, namely that the fall in consumption was the result of "the growing conviction that the tax measures adopted that

[1]The graph shows residuals, that is to say the difference between observed and the predicted values. In this setting a negative value indicates an overestimate. The error becomes statistically relevant when it exceeds the confidence interval $\pm 2\sigma$ indicated in the graph by the two horizontal lines.

summer were insufficient and that more severe measures lay in store" (Banca d'Italia (1994), p. 38). In the model discussed in the following pages, we will try to give a firm theoretical foundation to this idea.

It is well-known that changes in taxation and government spending cause changes in households consumption. Analyzing these changes, it is possible, as a first step, to distinguish between "direct" and "indirect" effects. Direct effects work through the consumption function; indirect effects, through multipliers. In the textbook income-expenditure model, for example, an exogenous tax change influences disposable income and hence consumption. This is a *direct* effect. In the same model, a tax change (or a government spending change) modifies exogenous expenditure, leading to changes in output and thus consumption: this is an *indirect* effect. If the consumption function is $C = c(Y - T) + \overline{C}$ (where $C$ is consumption, $T$ is taxation, $Y$ is output and $\bar{C}$ is autonomous consumption), it follows that:

$$\frac{dC}{dT} = c\left(\frac{dY}{dT} - 1\right) + \frac{d\overline{C}}{dT}$$

Assuming that $\frac{d\overline{C}}{dT} = 0$, the tax change has both a direct effect ($\frac{dC}{dT} = -c$) and an indirect effect ($\frac{dC}{dT} = c\frac{dY}{dT}$). The effect of a change in government spending is, on the other hand, exclusively *indirect* ($\frac{dC}{dG} = c\frac{dY}{dG}$).

Let us now examine what happens if household consumption is affected by expectations of future disposable income. In this case the issue of direct and indirect effects becomes more complicated. Autonomous consumption can be specified as $\overline{C} = c_f\left(Y_f^e - T_f^e\right)$, where the expression in parenthesis represents future disposable income, and the superscript $e$ indicates expected values. The change in consumption following an exogenous tax change is therefore:

$$\frac{dC}{dT} = c\left(\frac{dY}{dT} - 1\right) + c_f\left(\frac{dY_f^e}{dT} - \frac{dT_f^e}{dT}\right) \tag{1}$$

Current and future levels of taxation are linked through the government intertemporal budget constraint. It would thus be incorrect to assume that the two derivatives in the second term on the right hand side of the equation (1) are usually zero. The second term in this derivative represents the so-called non-Keynesian effect of fiscal policies. In short, Keynesian effects (KE) are effects caused by changes in *current* disposable income (the first term in 1); whereas non-Keynesian effects (NE) are effects associated with the timing of household consumption decisions (the second term). The main idea - similar to the concept at the heart of the Ricardian equivalence proposition - is that, given the government intertemporal budget constraint, any change in current taxation will always be followed by a future change in the opposite direction. If we assume, therefore, that consumers have a time horizon which extends beyond the current period, they will choose their optimal level of consumption so as as to take account of both changes and of the corresponding effects on their disposable income. This suggests then that the sign of NE will be *opposite* to that of KE.[2]

This point can be illustrated by means of FIGURE 3, which describes the consumers intertemporal choice. The initial situation is indicated by the point $E$ where the consumer's budget constraint line intersects with the Euler equation (line $C$).[3] Let us consider the case of fiscal restrictions causing current income to fall to $Y_t'$. Assuming $Y_f$ unchanged, the new equilibrium is indicated by point $K$. This allows us to identify the Keynesian effect on consumption, shown in the graph by the arrow KE. If, however, the fiscal restrictions induce the consumer to correct the expected level of $Y_f$ with $\Delta Y_f > 0$,[4] the equilibrium moves to point $N$. There is thus a non-Keynesian effect on current consumption, identified by the arrow NE.[5]

In the following sections we will use a simple theoretical model to explore the importance and sign of this non-Keynesian effect. The focus of the model

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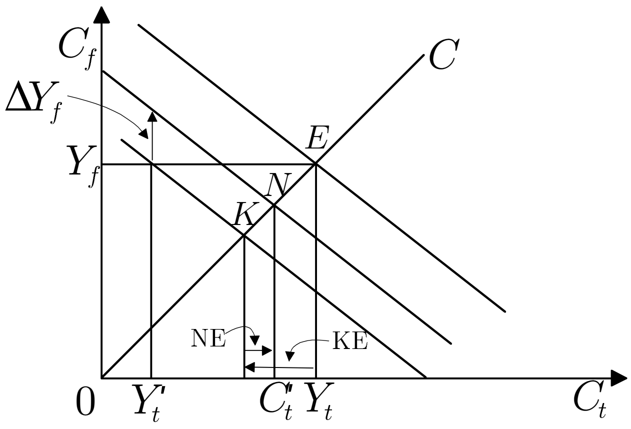
[2] This idea is presented by Hellwig and Neumann (quoted by Giavazzi and Pagano (1990)) as follows: «According to conventional wisdom, any policy of consolidation is likely to contract real aggregate demand in the shorter run. This Keynesian conclusion, however, is misleading as it neglects the role of expectations. A more adequate analysis differentiates between the direct demand effect of cutting the growth of government expenditure and the indirect effect of an induced change in expectations. The direct demand impact of slower public expenditure growth is clearly negative ... The indirect effect on aggregate demand of the initial reduction in expenditure growth occurs through an improvement in expectations if the measures taken are understood to be part of a credible medium-run program of consolidation, designed to permanently reduce the share of government in GDP ... [and thus] taxation in the future.» (Hellwig and Neumann (1987), pp. 137-38). The expression "direct effect" corresponds in our terminology to "Keynesian effects", whereas "indirect effect" corresponds to "non-Keynesian effects".

[3] To simplify, we have assumed that the interest rate and the time preference are both zero. It follows that $C_t = C_f$ so that the Euler equation is a 45° line. Moreover we have assumed that in the initial situation $Y_t = Y_f$, so that $C_t = Y_t$ (and, obviously, $C_f = Y_f$).

[4] This does not mean to impose that the expected change of future consumption is such to leave the value of wealth unaltered, which in our case would occur when $\Delta Y_f = -\Delta Y_t$. For instance, the current fiscal restriction could be compensated, at least in part, by a future expansion of public expenditure. Another possibility is that the budget consolidation occurs beyond the time horizon considered by the consumer.

[5] Observe that, if the consumer predicts a *reduction* of $Y_f$ (due, for instance to additional future taxation), the non-Keynesian effect would have the same sign as the Keynesian effect. The existence of these reversed non-Keynesian effects will be discussed at depth in the following pages.

FIGURE 3
Keynesian and non-Keynesian effects




will be exclusively on consumption changes caused by taxation; it is not claimed therefore that the model is a realistic one. As we will see, one of the hypotheses of the model is that aggregate output is constant over time. In terms of equation (1), this is equivalent to the assumption that $\frac{dY}{dT} = \frac{dY_f^e}{dT} = 0$. In short, the model aims at capturing the *direct* (Keynesian and non-Keynesian) effects of changes in taxation; there will be no attempt to model *indirect* effects. In what follows we will investigate the possibility that the size and sign of non-Keynesian effects depend, in a crucial way, on the expected lifetime of the representative consumer. For this reason we will formalize the decision problem for the representative consumer, using what is known in the literature as a *perpetual youth* approach. The version presented in what follows is formulated in discrete time.[6] This approach makes it possible to analyze the way in which non-Keynesian effects change with variations in the expected lifetime of the consumer, extending to the limiting case in which the consumer has an infinite time horizon. It also allows us to study the effects of fiscal policies which, while not permanent, last for an *extended* period of time. Focussing exclusively on the direct effects of tax measures makes the model extremely manageable. It can be reduced, in fact, to just two equations: a microfounded consumption function and a

[6] In the perpetual youth literature (see Blanchard (1985), Blanchard and Fischer (1989), Giavazzi and Pagano (1990) and Sutherland (1997)) models are formalized in a continuous time framework. We have preferred to build a discrete time model. This facilitates our analysis of fiscal policies and their effects on current consumption.

government intertemporal budget constraint. The effects of fiscal measures are analyzed using simple comparative statics, with the results depending on two parameters, representing, respectively, the expected lifetime of the consumer and the timing of the measures.

The main results of the model may be summarized as follows:

(*i*) the timing of fiscal policies *matters*: the timing of later compensatory adjustments (forced by the government intertemporal budget constraint) plays a significant role in determining the effect of the initial policy measures;

(*ii*) the sign and size of non-Keynesian effects are strongly determined by the level of public debt as well as by the current and expected dynamics of the debt;

(*iii*) Last but not least, it is possible to define sequences of fiscal measures which lead to a *reversed non-Keynesian effect*, where KE and NE have the same sign.[7] Later in this paper we will argue that it is precisely such a reversed non-Keynesian effect which led, in Italy, to the anomalous consumption of the early 1990s - a period marked by rapid changes in tax policy, the public deficit and debt objectives as the country prepared for membership of the EMU.

The paper will be structured as follows. In Section 2 we present a brief survey of the relevant literature. In Section 3 we formalize our model, and in particular, the consumption function. In Section 4 we apply the model. Section 5 presents some conclusions of our work.

# 2 A short survey of the literature

The literature on non-Keynesian effects originates from observation of the way in which the private sector reacted to the unusually restrictive tax measures adopted in Denmark and Ireland during the 1980s. In Denmark, for example, government spending cuts and tax increases in the period 1983-1986 led to an increase in the primary surplus equivalent to 10% of GDP. In Ireland, in the two years from 1987 to 1989, the the full employment primary

[7] The only way, in our model, in which reversed non-Keynesian effects can occur is through changes in taxes. Since the model is able to capture only the *direct* effects of taxation, the Keynesian effect of a change in current public expenditure is, by definition, null.

deficit was cut by the equivalent of 7% of GDP. And yet in both countries, regardless of the predictions of the textbook income-expenditure model, private consumption - and more generally aggregate demand - grew at annual rates well above 3%. In other words, the restrictive tax measures turned out to be expansionary. This is exactly the opposite of what happened in Italy at the beginning of the 90s, where, as we have seen, the deflationary effects of government tax measures were stronger than predicted by the main econometric models.

Giavazzi and Pagano (1990) have analyzed the Danish and Irish episodes, examining how far existing explanations of "expansionary fiscal restrictions" can explain the historical data. Extending the examination to include investigations of stabilization policies in OECD countries, over the last twenty years, we discover two main categories of explanation: on the one hand the traditional Keynesian or short-run view; on the other the non-Keynesian or long-run view based on changes in expectations. This is the so-called "expectations" or "German" view.

Remaining within a traditional Keynesian framework, it is not difficult to explain how a restrictive fiscal policy can have expansionary effects. In the IS-LM model, a fiscal contraction, driven by an increase in taxes or a cut in public expenditure, leads to reduced interest rates. The consequent increase in the market value of real and financial assets induces a wealth effect which stimulates consumption. A fall in the interest rate, and the consequent wealth effect, introduces the "credibility issue" raised by Dermott and Wescott (1996). The main idea is that, in countries with high public debt, restrictive fiscal policies can lower the risk of insolvency, thereby reducing the corresponding risk premium and lowering interest rates.

Most researchers, however, have concentrated their attention on trends in consumption over time - a phenomenon which traditional Keynesian models are unable to capture. Patterns in private consumption in Italy during the early 90s are an example of this failure. Although the CER econometric model included the wealth effect it nonetheless overestimated consumption. For this reason, most of the literature prefers explanations based on expectations. The main argument put forward by the proponents of the expectations view is that current fiscal policies signal important information about future policy and thus modify agents' expectations. A fiscal policy which is considered restrictive in the short-run can be perceived as expansionary in the long-run if it induces expectations of future expansionary tax measures. As a consequence the effects on current consumption will depend on whether or not there is a change in expectations. Both the sign and the magnitude of the reaction will depend on the way in which expectations change. Given the differing ways in which they can affect consumption non-Keynesian effects are very often labelled as "non-linear" (though the correct term is probably "non-monotonic").

To cite one example, Giavazzi and Pagano (1990, 1996), and Giavazzi, Jappelli, and Pagano (2000), argue that the size and the persistence of fiscal adjustments play an important role in determining changes in expectations and thus in current consumption. If cuts in government expenditure are small, they will lead, at most, to the usual depressive effect on consumption, as predicted by the traditional income-expenditure model (in a neoclassical framework, the effect is zero, see case (*iii*) ahead). A large reduction in government spending, may, on the contrary, signal lower public expenditure in the future and thus lower taxes. This implies, in turn, an increase in permanent income which would be positively reflected in current consumption.

More generally, the literature has considered many different situations which might lead to a revision of expectations and thus in permanent income:

1. *the size of fiscal adjustment*. This is emphasized not only by Giavazzi, Pagano and Jappelli, but also in Drazen (1990) and Bertola and Drazen (1993). In this last work, however, the authors argue that restrictive fiscal measures and consumption can be *positively* correlated: as in the traditional Keynesian model, increases in public expenditure stimulate household consumption. The reasons are, however, different. Though Bertola and Drazen's model is strictly neoclassical, one of the implications of the model is that when government spending rises beyond a threshold level, it will thereafter tend to fall. It follows that when public spending is low, it crowds out consumption in the usual way (though this is not completely due to the prospect of cuts in the future). When, on the other hand, it is high, every additional increase makes its future cuts more likely. This leads to changes in expectations and thus to an increase in current consumption;

2. *the composition of the fiscal adjustment*, as in Alesina, Ardagna, Perotti, and Schiantarelli (1999) and Alesina and Perotti (1995, 1997). The idea here is that when reductions in current government spending affect public pay-rolls, labor market mechanisms will lead to a corresponding fall in private sector wages. This reduction leads in turn to increased profits, and thus, in the last analysis, to increased investment and output;

3. *the level of public debt*, as in Blanchard (1990), Sutherland (1997) and Perotti (1999). In Sutherland's model, for instance, an increase in the government deficit has an expansionary effect only when the level of debt is low. When public debt is high, the government deficit has a

negative impact on current consumption, increasing expectations of tax increases to stabilize the debt.

In recent years it has become standard practice to evaluate tax policies in terms of their impact on expectations. It is argued that «fiscal adjustments that reduce deficits do not always and necessarily cause a recession, but instead can be expansionary, even on impact» (Alesina, Blanchard, Galì, Giavazzi, and Uhlig (2001), p.8). This conclusion is usually based on empirical data. As far as the Italian case is considered, however, the data does not seem to support the conclusion. As our model will show, there are also good theoretical grounds why things are not that easy.

# 3 A framework for non-Keynesian effects

In order to study the non-Keynesian effects of fiscal policies we will consider a simple intertemporal optimization model for the representative consumer. In the model we will focus on direct non-Keynesian effects. We will assume, in other words, that the level of gross output is exogenously given and constant. In order to specify the dynamics of non-Keynesian effects, saving will be determined as the reaction to expected changes in taxation: if the expected level of taxation is constant over time, saving will be equal to zero.

The model comprises two equations specifying: $(i)$ the government budget constraint; $(ii)$ the consumption function for the representative consumer, obtained, as usual, from an age independent utility function and the consumer budget constraint. The analytical specification of the consumption function depends on assumptions concerning the consumers' time horizon. In our case, we will assume that generations overlap and that the lifetime of each generation is determined stochastically. This is equivalent to assuming perpetual youth.

## 3.1 The government budget constraint

If the ratio of the government spending to GDP is given by $g$, the interest rate by $r$, and the ratio of tax to GDP by $t$ the government budget constraint can be written in the form:[8]

$$\sum_{i=0}^{\infty} g_{t+i} (1+r)^{-i} + b_t (1+r) = \sum_{i=0}^{\infty} t_{t+i} (1+r)^{-i} \quad (2)$$

For the exercises in the following section, it is useful to rewrite the government budget constraint (2) in a more compact form, where spending and taxation after a future date, *f*, is assumed constant and equal to $g_f$ and $t_f$ . We will thus write:

$$b_t (1+r) + \sum_{i=0}^{f-1} \frac{g_{t+i}}{(1+r)^i} + g_f \sum_{i=f}^{\infty} \frac{1}{(1+r)^i} = \sum_{i=0}^{f-1} \frac{t_{t+i}}{(1+r)^i} + t_f \sum_{i=f}^{\infty} \frac{1}{(1+r)^i}$$

which reduces to:

$$b_t (1+r) + \sum_{i=0}^{f-1} \frac{g_{t+i}}{(1+r)^i} + \frac{g_f}{r (1+r)^{f-1}} = \sum_{i=0}^{f-1} \frac{t_{t+i}}{(1+r)^i} + \frac{t_f}{r (1+r)^{f-1}} \quad (3)$$

## 3.2 The consumption function

The basic hypotheses underlying the exercise are: $(h_1)$ the utility function is separable and the felicity function $u(C)$ has positive, decreasing marginal utility (i.e. $u^{'} > 0$ and $u^{''} < 0$); $(h_2)$ the time preference rate $\beta$ is such that $\beta(1+r) = 1$; $(h_3)$ the consumer's pre-tax income and the level of interest are constant over time; $(h_4)$ current and future changes in fiscal variables ($g_{t+i}$ and $t_{t+i}$) are always perfectly foreseen by the consumer (the perfect foresight hypothesis).

As stated earlier, the model assumes overlapping generations; the lifetime of the consumer is determined by an exogenous probability of dying, set equal to $p$. Given that we assume the felicity function to be independent of age, what we are describing is a perpetual youth model. The usual practice is to derive such models in continuous time. In our case it seemed more appropriate to formalize the model in discerte time. This formulation makes it easier to obtain clear-cut results.

**Size of population.** By assumption, each generation has an initial size $p$. Given that $p$ also represents the probability of dying the probability of

[8]Starting from the identity $b_{t+1} = g_t - t_t + (1+r) b_t$, which describes the dynamics of public debt, iterating and taking into account the transversality condition $\lim_{i \to \infty} b_{t+i} (1+r)^{-i} = 0$, so as to exclude "Ponzi games", we obtain equation (2).

surviving is given by $1 - p$. After $t$ years, the generation thus has:

$$p(1-p)^t$$

members. The overall population is composed by the set of all existing generations and has size:

$$\sum_{s=-\infty}^{t} p(1-p)^s = p\left[1 + (1-p) + (1-p)^2 + \ldots\right] = 1 \tag{4}$$

In short, the generation born in this period has size $p$; the generation born one period earlier has size $p(1-p)$, the generation born two periods earlier has size $p(1-p)^2$, and so on.[9] The use of $p$ to represent the size of the current generation ensures an overall population size of 1.

**Expected lifetime.** What is the residual expected lifetime for an individual whose probability of dying in any one period is given by $p$ ? Death after one period occurs with probability $p$, after two periods with probability $p(1-p)$, after three periods $p(1-p)^2$, and so on. It follows that, on average, the individual's expected lifetime is:

$$\sum_{t=1}^{\infty} tp(1-p)^{t-1} = p\left[1 + 2(1-p) + 3(1-p)^2 + \cdots\right] = \frac{1}{p}$$

In other words, the residual expected lifetime is the reciprocal of the probability of dying.

**The consumption function.** The representative consumer's probability of surviving is $(1-p)$. It follows that the relevant discount rate for the representative consumer's budget constraint is not $1 + r$ but is $\frac{1+r}{1-p}$.[10] If we recall that the size of the total population is 1, it follows that the budget constraint for the population living at time $t$ is:

$$\sum_{i=0}^{\infty} C_{t+i}\left(\frac{1-p}{1+r}\right)^i = \sum_{i=0}^{\infty}(Y - T_{t+i})\left(\frac{1-p}{1+r}\right)^i \tag{5}$$

[9] The distribution defined by $p(1-p)^n$ is known as a geometric distribution since the terms in the distribution form a geometric series. The distribution defines the probability of achieving one success in $n$ trials where the probability of "success" in any trial is $p$.

[10] In each period a new generation of dimension $p$ is born. It follows that the relevant discount rate for the government budget constraint is still $1 + r$ . If the aggregate output produced in any one period is equal to $Y$, the output produced by the survivors of the preceding period is $(1-p)Y$; the output produced by the newly born in the current period is $pY$.

Preferences are described by the expected utility function:

$$E(U)=\sum_{t=0}^{\infty}\beta^{t}u(C_{t})(1-p)^{t}$$

where symbols have the usual meaning. In summing expected utility we do not include terms with probability $p$. By definition the event which occurs with probability $p$ (death) has zero utility.

We thus obtain the Euler equation:

$$\frac{u'(C_{t})}{\beta(1-p)u'(C_{t+1})}=\frac{1+r}{1-p}$$

Given $(h_2)$,namely that $\beta(1+r)=1$, it follows that:

$$u'(C_{t})=u'(C_{t+1})$$

and thus that:

$$C_{t}=C_{t+1}$$

In other words $(h_2)$ implies constant consumption or perfect "consumption smoothing". This result is independent of the specification of the felicity function (see p. 16)

Substituting this result in the constraint (5) we obtain on the left hand side:

$$C_{t}\sum_{i=0}^{\infty}\left(\frac{1-p}{1+r}\right)^{i}=C_{t}\frac{1+r}{r+p}$$

and on the right hand side:

$$\sum_{i=0}^{\infty}(Y-T_{t+i})\left(\frac{1-p}{1+r}\right)^{i}=Y\frac{1+r}{r+p}-\sum_{i=0}^{\infty}T_{t+i}\left(\frac{1-p}{1+r}\right)^{i}$$

Solving for $C_t$, we derive the consumption function:

$$C_{t}=Y-\frac{r+p}{1+r}\sum_{i=0}^{\infty}T_{t+i}\left(\frac{1-p}{1+r}\right)^{i}$$

which can be rewritten in terms of ratio to GDP:

$$c_{t}=1-\frac{r+p}{1+r}\sum_{i=0}^{\infty}t_{t+i}\left(\frac{1-p}{1+r}\right)^{i}\tag{6}$$

As expected, function (6) implies that, if taxation is constant over time ($t_{t+i} = \bar{t}$ for all $i$), $c_t = 1 - t$, that is to say consumption is equal to (permanent) disposable income and saving is zero. For $p = 0$ (infinite horizon) (6) consumption at time $t$ becomes:

$$c_t = 1 - \frac{r}{1+r} \sum_{i=0}^{\infty} t_{t+i} \left( \frac{1}{1+r} \right)^i$$

while, for $p = 1$ (no future), the consumption function becomes $c_t = 1 - t_t$ (consumption is equal to current disposable income).

Finally, to distinguish between Keynesian and non-Keynesian effects, it is useful to recall that the marginal propensity to consume with respect to current disposable income is $\frac{r+p}{1+r}$.[11]

# 4 Some exercises

In order to investigate the size of the non-Keynesian effects of tax policies, we will now consider some simple exercises in comparative statics.

## 4.1 *One off* changes

As a starting point, we consider the effects of a *one off* change in current taxation. This change is compensated at a later date, $t + f$, by a change of opposite sign, either in taxation or in public expenditure, guaranteeing that the government budget constraint is satisfied. We repeat the same exercise considering a change in current government expenditure. We thus have four distinct cases: ($i$) $dt_t$ compensated by $dt_{t+f}$; ($ii$) $dt_t$ compensated by $dg_{t+f}$; ($iii$) $dg_t$ compensated by $dg_{t+f}$; ($iv$) $dg_t$ compensated by $dt_{t+f}$.

**Case ($i$).** The government budget constraint (2) immediately implies:

$$dt_{t+f} = -(1+r)^f \, dt_t$$

[11] The marginal propensity to consume with respect to permanent income is obviously equal to unity. Distinguishing between current disposable income $y_t = Y_t - T_t$ and future disposable income $y_f$, permanent income is defined as: $y_P = \frac{r+p}{1+r} y_t + \frac{1-p}{1+r} y_f$. This result is easily obtained from the implicit definition: $\sum_{i=0}^{\infty} y_P \left( \frac{1-p}{1+r} \right)^i = \sum_{i=0}^{\infty} y_{t+i} \left( \frac{1-p}{1+r} \right)^i$ by imposing $y_{t+i} = y_f$ for $i > 0$ and solving for $y_p$. Assuming continuous time and $p = 0$ (infinite horizon), the definition of permanent income in discrete time becomes $y_P = r y_t + (1-r) y_f$ . We thus see that current income's share of permanent income is defined by the interest rate $r$. This result is consistent with the intuition that the consumer can permanently consume the flow of interests deriving from a change in current income.

Applying this result in the consumption function (6), we obtain:

$$\frac{dc_t}{dt_t} = -\frac{r+p}{1+r}\left[1-(1-p)^f\right] < 0$$

If we exclude the case where $p = 0$ (infinite horizon), the overall effect of a change in taxation is negative.[12] Using the marginal propensity to consume with respect to current disposable income, the equation can be decomposed so that $\text{KE} = -\frac{r+p}{1+r} < 0$ and $\text{NE} = -\text{KE}(1-p)^f > 0$. The two effects are equal (in absolute value) only for $p = 0$. This condition is exactly met in the Ricardian equivalence proposition. It should be noticed that the absolute size of the Keynesian effect increases with reductions in the expected lifetime of the consumer ($\frac{d|\text{KE}|}{dp} > 0$). The size of the non-Keynesian effect, on the other hand, decreases both with increases in $f$ (i.e. with later implementation of complementary measures) [13] and with increases in $p$ (reductions in life expectancy). Both of these results are consistent with intuition.[14]

**Case (*ii*).** In this case the only change is in current taxation with $dt_{t+f} = 0$. In this case the change in consumption is determined exclusively by the Keynesian effect:

$$\frac{dc_t}{dt_t} = -\frac{r+p}{1+r} = \text{KE}$$

Consumers know that the government budget constraint will be satisfied via a change in future public expenditure. As a result they have no need to adjust their consumption to take account of future taxation. The non-Keynesian effect is therefore equal to zero.

**Case (*iii*).** This is the simplest case. Given that there is no change in current or future taxation, changes in current public expenditure have no

[12] This result is equivalent to the result obtained by Giavazzi and Pagano (1990) . See their equation (5) at page 108.

[13] It can be seen immediately that as $f$ tends to infinitity, the non-Keynesian effect tends to zero.

[14] The non-Keynesian effect is represented by the function $n(f,p,r) = \frac{r+p}{1+r}(1-p)^f$. As far as this effect is concerned it is possible to show that, strictly speaking, $\frac{\partial n}{\partial f} < 0$ and $\frac{\partial n}{\partial r} > 0$. The function is non monotonic with respect to $p$. As can easily be seen $\lim_{p\to 0} n(p) = \frac{r}{1+r}$ and $\lim_{p\to 1} n(p) = 0$.

Between these two extremes $n(p)$ can be increasing for sufficiently small values of $f$ (precisely for $f < \frac{1-p}{r+p}$).

effect on consumption:

$$\frac{dc_t}{dg_t} = 0$$

Keynesian and non-Keynesian effects are both zero ($\text{KE} = \text{NE} = 0$). Remember however that the model we are using can capture only the direct effects of fiscal policies (those operating through the consumption function). Indirect effects are zero by assumption.

**Case (*iv*).** From the government budget constraint (2) we obtain:

$$dt_{t+f} = (1+r)^f \, dg_t$$

It follows that the effect on consumption is:

$$\frac{dc_t}{dg_t} = -\frac{r+p}{1+r} (1-p)^f < 0$$

In this case the change in consumption is entirely due to the non-Keynesian effect, which is of the same size as in case ($i$). If $p = 0$ (infinite horizon) the consumption effect is:

$$\frac{dc_t}{dg_t} = -\frac{r}{1+r}$$

In other words the consumer (correctly) considers that the change in current public expenditure will change his permanent income, in proportion to the relative weight of current income in permanent income.

**Smoothed compensation.** The previous results do not change if future compensatory measures, rather than being concentrated in a single time period, $t + f$, are smoothed over all time periods following that date. Let us consider, as an example, case ($i$). We will follow the same reasoning used in the previous exercises. First of all we need to calculate the permanent change in future taxation that has to be implemented from time $t + f$ onwards, so as to guarantee the satisfaction of the intertemporal government budget constraint. Let us indicate this value with $dt_f$. From (3) we immediately obtain:

$$dt_f = r\,(1+r)^f \, dt_t.$$

Applying this result in the consumption function (6), we derive the change in consumption:

$$\frac{dc_t}{dt_t} = -\frac{r+p}{1+r} + \frac{r}{1+r} (1-p)^f$$

where the first term on the right hand side represents the Keynesian effect (which is the same as in case $(i)$), while the second term defines the non-Keynesian effect. The size of this effect is (of course) smaller than that of the KE, except when $p = 0$ (infinite horizon). In this case the two effects compensate each other exactly.

From this first group of exercises we conclude that to measure the size of non-Keynesian effects we have to take into account *both* the expected lifetime of the representative consumer *and* the time period over which compensatory policies are implemented, as well as the duration of the initial policy. The shorter the expected lifetime of the consumer, the longer the gap between the initial measures and the subsequent compensatory measures and the longer the period over which these measures are smoothed, the weaker will be the non-Keynesian effect. The only case in which the timing of compensatory measures becomes irrelevant is when the consumer's expected lifetime is infinite, as implied by the Ricardian equivalence proposition.

## 4.2 Fiscal adjustments extended over time

So far we have considered *one-off*, *temporary* tax measures, implemented at time $t$ but not applied in following time periods. In this section we will investigate the effects of measures which are also applied in time periods following the current one. We will examine three cases: $(a)$ a *permanent* change in government expenditure compensated, from a determined future date, $t+f$, onwards, by a permanent change in taxation satisfying the intertemporal government budget constraint; $(b)$ a tax change effective from $t$ to $t+f-1$, subsequently compensated by a second, permanent change of opposite sign; $(c)$ a change in government spending from $t$ to $t+f-1$ followed by a permanent tax change.[15]

**$(a)$ A permanent change in expenditure.** In this case the dynamics of expenditure are given by $g_{t+i} = g_t + dg$ for $i = 1, \cdots, \infty$. The present value

[15] If the change in current expenditure is compensated by a change in future expenditure, the non-Keynesian effect on consumption will be zero, regardless of the way in which these changes are distributed in time. If changes in government spending are to influence permanent income this has to be via changes in taxes - the the only component to appear explicitly in the consumption function. In brief, if $dt_{t+i} = 0$, for all $i$, it necessarily follows that $dc_t/dg_t = 0$.

of the total change in expenditure is given by:

$$dg\sum_{i=0}^{\infty}(1+r)^{-i}=\frac{1+r}{r}dg$$

The compensatory change in taxes is introduced at $t+f$ and smoothed over subsequent periods. Using the government budget constraint (3) we can thus derive the condition:

$$\frac{1+r}{r}dg=\frac{1}{r\,(1+r)^{f-1}}dt_f$$

The change in taxes from $t+f$ onwards is thus given by:

$$dt_f=(1+r)^f\,dg$$

Applying these changes to the consumption function (6) a simple calculation gives us the following (non-Keynesian) effect:[16]

$$\frac{dc_t}{dg}=-\,(1-p)^f \tag{7}$$

As $f$ tends to zero, (7) gives us:

$$\frac{dc_t}{dg}=-1$$

This is the traditional result discussed in the literature on non-Keynesian effects (see, for instance, Giavazzi and Pagano (1990), p.109). Note that setting $f=0$ is equivalent to the assumption that from the current period onwards the profile of taxes over time exactly coincides with the profile for expenditure. Perpetual youth models formulated in continuous time obscure this condition, which is essential for the result. The other case where $\frac{dc_t}{dg}=-1$ is when $p=0$, that is when the time horizon becomes infinite. These are the only cases in which the NE on consumption exactly compensates the change in government spending. In the first case ($f=0$) the permanent change in expenditure is *immediately* compensated by an equivalent change in government revenues; alternatively we have to assume that consumers have an *infinite* time horizon ($p=0$); in this latter case the timing of compensatory measures is irrelevant. In all other cases the change in consumption is smaller than the change in expenditure change. The shorter the time horizon for consumers (i.e. the higher the value of $p$) and the longer the delay before the introduction of compensatory measures (i.e. the larger the value of $f$) the smaller will be the change in consumption.

[16]Recall again that in our model, when the adjustment is related to current government spending, the (direct) Keynesian effect is always equal to zero.

**(b) A tax adjustment.** Here we consider a change in taxes lasting for $f$ time periods and then changing sign so as to satisfy the government budget constraint (smoothed compensation). Government spending is set to be constant. We thus have:

$$\begin{cases} dg_{t+i} = 0 & \forall i \\ dt_t = dt_{t+1} = \cdots = dt_{t+f-1} = dt > 0 \\ dt_{t+f} = dt_{t+f+1} = \cdots = dt_f < 0 \end{cases}$$

where the value of $dt_f$ is calculated so to satisfy the government budget constraint (3).

We thus obtain:

$$dt \sum_{i=0}^{f-1} \frac{1}{(1+r)^i} + dt_f \frac{1}{r(1+r)^{f-1}} = 0$$

an equation which allows to calculate the value of $dt_f$:

$$dt_f = -(1+r)^f \left(1 - \frac{1}{(1+r)^f}\right) dt \tag{8}$$

Let us now consider the effect on private consumption. Our starting point is, as usual, equation (6). Using (8), a simple calculation shows that:

$$\frac{dc_t}{dt} = -\left[1 - (1-p)^f\right]$$

As usual, this result is the sum of the Keynesian (KE) and the non-Keynesian (NE) effects. The former is given by:

$$\text{KE} = -\frac{r+p}{1+r} > 0$$

while the latter can be computed as:

$$\text{NE} = \frac{dc_t}{dt} - \text{KE} = -\left[1 - (1-p)^f - \frac{r+p}{1+r}\right] \tag{9}$$

Again, for $p = 0$ (infinite horizon) we obtain the standard Ricardian equivalence result: $\text{NE} = -\text{KE}$ and $\frac{dc_t}{dt} = 0$. In the same way, for $f \to \infty$ we obtain $\frac{dc_t}{dt} = -1$: a permanent increase in taxes reduces permanent income by an equivalent value (since the tax refund never happens). These are the only two cases where Ricardian equivalence result holds.

**(*c*) An adjustment in public spending** Our last exercise concerns government spending and is, in some respect, symmetric to exercise (*b*) on taxation. This time we consider an expansion in public expenditure extending over $f$ periods. In periods after $f$, government spending is constant and the initial increase in expenditure is compensated by an increase in taxes (smoothed compensation). Hence we have:

$$\begin{cases} dg_t = dg_{t+1} = \cdots = dg_{t+f-1} = dg > 0 \\ dg_{t+f} = dg_{t+f+1} = \cdots = 0 \\ dt_t = dt_{t+1} = \cdots = dt_{t+f-1} = 0 \\ dt_{t+f} = dt_{t+f+1} = \cdots = dt_f > 0 \end{cases}$$

where, as usual, $dt_f$ is calculated so as to satisfy the government budget constraint (3). Applying the same methodology as in the previous exercises, we obtain:

$$dt_f = dg\,(1+r)^f\left(1 - \frac{1}{(1+r)^f}\right)$$

Introducing the change in taxation into the consumption function (6) we see that:

$$\frac{dc_t}{dg} = -\,(1-p)^f\left(1 - \frac{1}{(1+r)^f}\right)$$

that is, the probability of surviving multiplied by the intertemporal discount factor.

If we compare this result with case (*b*) where we considered a tax adjustment, we see that the size of the non-Keynesian effect is different. For purposes of comparison, suppose that the exercise in case (*b*) had begun with a tax cut (for the first $f$ time periods). In this case the non-Keynesian effect deriving from compensatory measures in the period after $t+f$ would have been the same as in the present exercise. In pratice, however, case (*b*) also includes an additional non-Keynesian effect *of opposite sign* caused by the increase in disposable income between time $t+1$ and $t+f-1$.

## 4.3 Reversed non-Keynesian effects

In exercise (*b*), unlike the other exercises discussed in the previous section, the total non-Keynesian effect is given by the sum of two values of opposite sign. In the other exercises the effect of NE is that increases in current spending and/or tax cuts imply a reduction in current consumption, and vice versa. In case $(b)$, on the other hand, at least one of the components of the total non-Keynesian effect has the same sign as the Keynesian effect. Hence, it is important to investigate the conditions governing the sign of NE.

Let us return to the equation for the non-Keynesian effect from case $(b)$, equation (9). NE will have the same sign as KE, if the term in squared brackets in equation (9) is positive. Using this expression, we immediately obtain:

$$\frac{1-(1-p)^{f-1}(1+r)}{1+r}(1-p)$$

To determine the sign of NE all we have to do is check the sign of the numerator in this expression. The numerator is positive if the following condition is satisfied:

$$\frac{1}{1+r} > (1-p)^{f-1}$$

In logarithms:

$$-\ln(1+r) > (f-1)\ln(1-p)$$

Applying the usual approximation $\ln(1+x) \approx x$, we obtain:

$$-r > -(f-1)\,p$$

from which we find the following condition for $f$ :

$$f > \frac{r}{p} + 1 \tag{10}$$

This tells us that if the interval before the introduction of compensatory measures is longer than $\frac{r}{p}+1$ the total non-Keynesian effect will have the same sign as the Keynesian effect. For instance, if the expected lifetime of a generation $(1/p)$ is fifty time periods, the interest rate is given by $r = 2\%$ and compensatory measures are introduced more than two time periods after the initial measures the sign of the NE be the same as that for the KE.

## 4.4 Public Debt

In this subsection we will examine two cases illustrating the impact of the level of public debt on the size and sign of non-Keynesian effects.

**A threshold level for public debt.** Consider the following situation. The primary government budget is balanced. In these circumstances the only way in which public debt can increase is through interest payments. When the debt reaches an exogenously determined threshold level, this leads to a "change of regime": from this point onwards the goal of fiscal policy becomes debt stabilization at the threshold level. Rigidities in government spending mean however that the only way to achieve the primary surplus necessary to stabilize debt is through increased taxation. Hence we have:

$$\begin{cases} g_{t+i} = g & \text{for} \quad i = 0, 1, \cdots, \infty \\ t_{t+i} = t = g & \text{for} \quad i = 0, 1, \cdots, f \end{cases}$$

where the date $t+f$ represents the moment when debt reaches the threshold level $b_f$. The date $t+f$ can be calculated by using the equation below and solving for $f$ :

$$b_f = (1+r)^f b_t$$

To compute the size of the tax increases necessary to stabilize debt, starting in time *f,* we apply the following equation, which can be derived from (3) :

$$t_f = t + r(1+r)^f b_t$$

Using the notation $\Delta t_f = t_f - t$, we can then use the consumption equation to obtain:

$$\Delta c_t = -r(1-p)^f b_t$$

When the time horizon is infinite ($p = 0$) the reduction in consumption is equal to the flow of interest on the public debt and is independent of the time when debt reaches the threshold level. In the general case, however, the expected lifetime of the consumer is short, and future compensatory measures are far away in the future. As a result the decrease in consumption is smaller.

**Reducing the level of the public debt (the "Maastricht" world).** This second case is more complex, but of greater relevance to the Italian consumption anomaly of the early 1990s. As in the previous exercise, we assume that public expenditure is constant at level $g_{t+i} = g$ $(i = 0, 1, ...)$. This time, however, the aim is to quantify the consequences of tax changes designed to achieve a level of debt $b_f < b_t$ by time, $t+f$, and thereafter to maintain the level of debt stable. We assume here that the desired level of debt is given by $b_f = \alpha b_t$ with $\alpha < 1$. Suppose that up to the change of regime, at time $t$, the system has been in a steady-state equilibrium with a balanced public budget, such that $t_{t-i} = rb_t + g$ (with $i > 0$). At time $t + f$, we will have $t_f = rb_f + g$. It therefore follows that:

$$t_f - t_{t-i} = \Delta t_f = r\left(b_f - b_t\right) = rb_t\left(\alpha - 1\right) < 0 \qquad (11)$$

In the new steady state, after the debt has been stabilized, taxes will be lower.

What we now have to do is to calculate tax levels over the intervening interval. From the dynamic equation for the government budget constraint (see note 8) we see that:

$$b_{t+1} = (1+r)\, b_t + (g_t - t_t)$$

Assuming constant public expenditure (at level $g$) and taxation (at level $t$), iteration gives:

$$\begin{aligned} b_{t+f} &= (1+r)^f\, b_t + (g-t) \sum_{i=0}^{f-1} (1+r)^i = \\ &= (1+r)^f\, b_t + (g-t)\, \frac{(1+r)^f - 1}{r} = \alpha b_t \end{aligned}$$

This equation makes it possible to compute the level of taxation necessary to achieve the desired level of debt at the date $t + f$. Solving the equation for the level of taxation $t$, we obtain

$$t = g + rb_t \frac{(1+r)^f - \alpha}{(1+r)^f - 1}$$

Given that $\alpha < 1$, the value of this ratio is higher than one: achieving the desired level of debt requires an increase in taxes with respect to the previous steady state equilibrium. That is, $t > t_{t-i}$ or, more precisely:

$$t - t_{t-i} = \Delta t = rb_t \left[\frac{(1+r)^f - \alpha}{(1+r)^f - 1} - 1\right] = rb_t \frac{1-\alpha}{(1+r)^f - 1} > 0 \qquad (12)$$

We now have to examine the way in which these trends in taxes - an initial temporary increase followed by a permanent reduction below the initial level (since $t > t_{t-i} > t_f$) - affect consumption:

We proceed in the usual way, using equations (12) and (11) in the consumption function (6). We thus have:

$$\Delta c_t = -\frac{r+p}{1+r} \left[\Delta t \sum_{i=0}^{f-1} \left(\frac{1-p}{1+r}\right)^i + \Delta t_f \sum_{i=f}^{\infty} \left(\frac{1-p}{1+r}\right)^i\right]$$

Substituting equations (12) and (11) in the above equation, we obtain:

$$\Delta c_t = -rb_t (1-\alpha) \frac{1-(1-p)^f}{(1+r)^f - 1}$$

If we assume $p = 0$ (i.e. consumers have an infinite time horizon) the tax measures will have no effect on consumption. In other words, KE $= -$NE. In all other cases, however, the total effect will be negative: the non-Keynesian effect is not sufficient to compensate for the Keynesian effect. Rather the contrary, the possibility of a reversed non-Keynesian effect means that on many occasions the two effects work in the same direction.

It is easy to see that:

$$\text{KE} = -\frac{r+p}{1+r} \cdot \frac{rb_t (1-\alpha)}{(1+r)^f - 1} < 0$$

and the non-Keynesian effect is given by:

$$\begin{aligned} \text{NE} &= \Delta c_t - \text{KE} = \\ &= -\frac{rb_t (1-\alpha)}{(1+r)^f - 1} \left[ 1 - (1-p)^f - \frac{r+p}{1+r} \right] \end{aligned}$$

Again, if (10) holds, that is

$$f > \frac{r}{p} + 1$$

NE will be negative. This result has an obvious economic interpretation.

# 5 Some conclusions

The exercises presented in the previous pages show how current fiscal policy (a change in taxation $dt_t$ or in government spending $dg_t$) can lead to changes in current consumers expenditure ($dc_t$). In our examination we have distinguished between a Keynesian effect KE, which works through changes in current disposable income (measured by the short-run marginal propensity to consume), and a non-Keynesian effect NE, which works through comsumer rational expectations of future compensatory measures (the perfect foresight hypothesis) and of their effects on permanent income. In the cases we have discussed changes in consumption are smaller than the change in disposable income determined by the initial tax measures. With the exception of special cases, the final effect on aggregate demand (disregarding multiplier effects) is never zero.

These same exercises have allowed us to identify conditions which will lead to what has been called a reversed non-Keynesian effect. In particular we have presented two, economically realistic, cases, where changes in consumption caused by the non-Keynesian effect have the same sign as the changes determined by the Keynesian effect (that is sign (NE) = sign (KE)).

The reversed NE is due to the fact that, unless consumers have an infinite time horizon, the timing of fiscal policy matters. Given that in practice the time horizon for consumers is shorter than the infinite period over which the government budget constraint has to be satisfied, household resolve their intertemporal optimization problem using a higher discount rate than the rate applying to the government decision problem. In short ($\frac{1+r}{1-p} > 1 + r$). If consumers expect that in the *near* future fiscal policy will not change, and thus that compensatory measures will occur only in the *distant* future, then the non-Keynesian effect of current policy (due to expected changes in permanent income) may well have the same sign as the Keynesian effect, which in turn will have the same sign as the policy itself.

The exercises on the role of public debt give us greater insight into the nature and the size of the non-Keynesian effects of fiscal policies (including the case of reversed effects). In particular, the case we have labelled as a "Maastricht world" provides an interesting theoretical framework for the discussion of trends in Italian consumption during the 1990s. If empirical data supports our model it would seem reasonable to expect a significant recovery in private consumption in the future.

This future cannot, however, be imminent. There are two reasons for predicting a delay in the recovery of consumption. The first derives from the continuing high level of Italian public debt relative to the 60% target established in the Maastricht treaty. The second, more general reason is inherent in the basic mechanism of intertemporal choice: older generations have lower permanent incomes than younger ones; as a result they also have lower permanent consumption. Lower consumption by older generations reduces aggregate consumption, introducing a degree of inertia into consumption dynamics. Consumption will come to depend on the permanent income of the youngest generations only when the contribution of the older generations has become so small as to be irrelevant.

# References


Alesina, A., S. Ardagna, R. Perotti, and F. Schiantarelli (1999). Fiscal policy, profits and investment. *NBER working paper n.7207*.

Alesina, A., O. Blanchard, J. Galì, F. Giavazzi, and H. Uhlig (2001). *Defin-*

*ing a Macroeconomic Framework for the Euro Area.* CEPR 3.

Alesina, A. and R. Perotti (1995). Fiscal expansions and adjustments in OECD countries. *Economic Policy 21*, 205–48.

Alesina, A. and R. Perotti (1997). Fiscal adjustments in OECD countries: Composition and macroeconomic effects. *IMF Staff Papers 44*, 210–48.

Banca d'Italia (1994). *Relazione Annuale per il 1993.*

Bertola, G. and A. Drazen (1993). Trigger points and budget cuts: Explaining the effects of fiscal austerity. *American Economic Review 83*, 1170–88.

Blanchard, O. (1990). Comment. *NBER Macroeconomic Annual 5*, 111–16.

Blanchard, O. J. (1985). Debts, deficits, and finite horizons. *Journal Political Economy 93*, 223–47.

Blanchard, O. J. and S. Fischer (1989). *Lectures on Macroeconomics.* Cambridge (Ms): The MIT Press.

CER (Centro Europa Ricerche) (1999). Le imprese, gli investimenti e le politiche pubbliche. *Rapporto 6*.

Dermott, C. J. M. and R. F. Wescott (1996). An empirical analysis of fiscal adjustment. *IMF Staff Papers 43*, 725–53.

Drazen, A. (1990). Comment. *NBER Macroeconomic Annual 5*, 117–22.

Giavazzi, F., T. Jappelli, and M. Pagano (2000). Searching for non-linear effects of fiscal policy: Evidence from industrial and developing countries. NBER working paper n.7460.

Giavazzi, F. and M. Pagano (1990). Can severe contractions be expansionary? Tales of two small european countries. *NBER Macroeconomic Annual 5*, 75–111.

Giavazzi, F. and M. Pagano (1996). Non-keynesian effects of fiscal policy changes: International evidence and the Swedish experience. *Swedish Economic Policy Review*, 75–111.

Hellwig, M. and M. J. M. Neumann (1987). Economic policy in Germany: Was there a turnaround? *Economic Policy 5*, 105–40.

Locarno, A. and S. Rossi (1995). L'Italie après la dévaluation: Au delà des idée reçues. *Economie Internationale 65*, 55–70.

Perotti, R. (1999). Fiscal policy in good times and bad. *Quarterly Journal of Economics CXIV*, 1399–1436.

Sutherland, A. (1997). Fiscal crises and aggregate demand: Can high public debt reverse the effects of fiscal policy? *Journal of Public Economics 65*, 147–62.

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