Fiscal consolidation as a self-fulfilling prophecy on fiscal multipliers

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Contents

Abstract

Fiscal policy may affect the size of the fiscal multiplier or lengthen the elevated multipliers period. This notion at first seems controversial, however it is only an outcome of combining two strands of already available literature together. The first strand touches the effects of fiscal policy on economic situation, the second one suggests economic situation affects fiscal multiplier. Having those two premises implies that fiscal policy could indirectly influence the fiscal multiplier size or the length of the elevated multiplier period. This possibility is fitted into a simple model of liquidity trap with hysteresis effects. One of the main outcomes of the model is that, when the government expectations on the size of the fiscal multiplier influence fiscal actions - as it is possibly the case - those expectations may become self-fulfilling prophecies.

1. Introduction

In the aftermath of the recent crisis both deficit and debt levels have increased notably in numerous countries. To improve the fiscal stance many of them have embarked on a programme of budgetary consolidation. However the fiscal adjustments were implemented in an unfavourable macroeconomic environment. Slack in productive capacity, ineffective monetary policy (due to zero lower bound), and possible existence of hysteresis effects increased the costs of austerity for the economy.

Under such conditions, it is particularly important to appropriately distribute the fiscal adjustment process over time. On the one hand, in order to reduce the scale of its impact on economic growth in the short and medium term. On the other hand, to ensure that fiscal policy is perceived by economic agents as credible and consistent. Studies published in recent years show that in most cases it is desirable to carry out current adjustments on a gradual basis[1]. One of the main arguments in favour of postponement of fiscal tightening in the recession is the possibility that fiscal multiplier fluctuates over time depending on economic conditions (see section 2). In the times of recession multiplier is elevated, while during prosperity periods multiplier is relatively low. Consolidating public finances in such conditions affects the economy less than when multiplier is large. Thus it was suggested that if the factors responsible for the elevated multiplier are mostly temporary it is better to postpone the consolidation until multiplier decreases[2]. However if it is assumed that the multiplier stays elevated also in the future, there is no rationale for waiting with fiscal consolidation. This applies particularly when there is market pressure on the governments (e.g. in the form of high interest on sovereign debt).

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[1] Barrios et al. 2010, Baum et al. 2012.

[2] This is in line with empirical work on the subjects (e.g. Batini et.al. 2012; Bagaria et. al. 2012) that confirms that during recessions smooth consolidations affect output less adversely than frontloaded consolidations do.

By using a simple model of liquidity trap developed by Krugman (1998) this work confirms that delaying consolidation until the multiplier is reduced is comparably more beneficial for the economy. It further amplifies this result by claiming that fiscal policy may lengthen the elevated fiscal multiplier period. In the case monetary policy has no leeway to cushion the effects of fiscal consolidation, fiscal actions may push the economy further into recession. In the aftermath of hysteresis effects this would increase the time span of the liquidity trap recession.

This outcome has other specific results if additional assumptions on government decision-taking are made. Government expectations, which influence decision on timing of the consolidation, might become a self-fulfilling prophecy. Specifically when the policy-maker expects the multiplier to stay high in the long term he might choose to consolidate sooner. Austerity in effect further exacerbates the negative stance of the economy and, due to hysteresis effects, prolongs the period of elevated fiscal multipliers. Expectation about lower multiplier has contrary outcomes. In the absence of consolidation the economy returns to demand-supply equality, and to potential economic growth without additional lag.

The paper is organized as follows. Section 2 explains how the seemingly controversial idea of fiscal policy affecting fiscal multiplier is already set in the economic literature. Section 3 provides a brief description of assumptions used in the model described in section 4. Section 5 discusses the theoretical results of the model. Finally, section 6 concludes.

2. Combining two strands of literature on fiscal multipliers

The lengthening of the high multiplier period in the effect of consolidation has not been modelled directly or formulated explicitly. However some authors have made some vague allusion of such possibility. Wren-Lewis (2015) writes: "(…) the current recession is the result of trying to correct the fiscal gap at completely the wrong time. The right policy is to get the output gap to zero, so interest rates can rise above the ZLB, and then you deal with the deficit.". Krugman (2015) notices that: "(…) fiscal austerity (…), when the neutral rate is unattainable, is a terrible idea, even if you have high public debt. Why? Because multipliers are large, so that austerity has a large cost in lost output and unemployment; given hysteresis, it may even make the long-run fiscal situation worse. The appropriate policy during the era of the binding zero lower bound is fiscal stimulus to achieve full employment, and worry about debt later." Fletcher and Sandri (2015) simulate the effects of fiscal consolidation in a variable multiplier environment. In the presented scenarios the multiplier varies inversely and linearly with the output gap or with GDP growth. The authors also consider discontinuous multipliers in effect of a liquidity trap. The simulation results depend on the exact manner the multiplier varies over time. However the main conclusion is that delaying fiscal austerity may lead to significant economic and fiscal situation improvement.

The notion that fiscal policy may affect the size of the fiscal multiplier or lengthen the elevated multipliers period, at first seems provocative. However this is only an outcome of fitting two pieces of a puzzle together. Having the two premises: fiscal policy affects economic situation, economic situation affects fiscal multiplier, it is straightforward to think fiscal policy could indirectly influence the fiscal multiplier size or the length of the elevated multiplier period.

The suggestion that fiscal policy affects economic growth has been extensively discussed. Since there are numerous literature surveys on the subject this article will restrain from providing additional one. Instead, it will present the findings of said surveys. As for the fiscal multiplier dependence on the economic situation the empirical literature is fairly young and therefore sparse. A short survey of the articles on the subject can be found in the following subchapters.

2.1. Fiscal policy influence on economic conditions

As it was previously said fiscal policy influence on economic output has been studied in great lengths. The relationship between the two terms i.e. fiscal multiplier (change in output to exogenous change in fiscal deficit ratio) depends on type of the fiscal actions, economic conditions, economic openness, currency regime and many others factors. Therefore the broad consensus claims that there is no unique size for fiscal multipliers. Though multipliers change according to the circumstances by and large literature on the subject agrees that government expenditure cuts are associated with an economic growth slowdown. In other words spending multiplier – which is of our primary interest - is higher than zero. Below you will find the main results of a number of empirical literature reviews on the subject.

Ramey (2011) finds that the value of fiscal multiplier for a temporary debt-financed increase in government purchases for the US is most probably in the bracket of 0.8-1.5 (though the data do not reject 0.5 or 2.0). Furthermore the range of possible spending multiplier values within studies is almost as wide as the range across studies. The author concludes that despite differences in methodology the results are remarkably consistent.

A comprehensive literature survey on fiscal multipliers can be found in Mineshima et al. (2012). According to authors' findings multipliers vary significantly between

and within countries. A plausible range of first-year spending multipliers calculated using linear models is in the range of 0.5-0.9. Using a non-linear model results in multiplier estimations exceeding unity during economic recessions.

In their meta-analysis Gechert and Will (2012) study 89 articles on multiplier effect. The authors conclude that fiscal multiplier value depends on type of the fiscal impulse, model class and multiplier calculation method. Whatever the conditions multiplier is still higher than 0. Average multiplier is in the range of 0.5 to 1 depending on the model used for calculating the multiplier. Neoclassical models give the lowest results (0.5), with VAR and neo-keynesian models indicating higher multiplier (0.8), while average multiplier calculated using structural macroeconomic models is ca. 1. Average spending multipliers is lowest for transfers (0.4) and highest for investment outlays (1.2).

Boussard et al. (2012) recognise that the fiscal multiplier size is highly dependent on fiscal actions composition and economic environment. Nevertheless they notice that most estimates of first-year spending multipliers are in the 0.4 to 1.2 range. Authors stress the possibility that multipliers might be higher when there are financial constraints in the economy and monetary policy is handicapped.

According to Hall's (2009) review government purchases multiplier calculated using vector autoregressive approaches may be in the range of 0.5 to 1.0 with few exceptions. Though higher values are not ruled out, especially in zero lower bound conditions. A short survey of analyses based on New Keynesian structural models presented in the paper gives multiplier values consistent with VAR literature.

Hebous (2011) has looked into a number of analyses to find that the size of the impact of a spending shock varies across studies and is dependent on the employed specification or the sample period. However he found only one study that for some subsamples and economies has spending multipliers lower than zero (i.e. Perotti

2005). On the basis of studied literature the author concludes that output increases following the expansionary fiscal shock.

Some of the first reviews on fiscal multiplier literature are Bouthevillain et al. (2009) and Hasset (2009). The former concludes that the short-run spending multiplier is higher than zero, despite different methodologies used and different economies analysed. The latter finds that short run effects of fiscal stimulus are uncertain. However the author does not cite any research that finds the short-run spending multiplier below zero.

Some of the analyses point to radically different outcomes of fiscal actions - so-called non-keynesian effects. They suggest fiscal consolidation may increase economic output. Expansionary fiscal consolidations however have been questioned in recent years. Most papers on the subject (e.g. Alesina, Perotti 1996; Alesina, Ardagna 2010) use the episodes of sharp falls in cyclically-adjusted budget deficit and compare them to what happened with output after those episodes. They indicate that output tended to rise after deficit reductions, particularly on those consolidations focused on the expenditures. However there seems to be a lot of causality problems and omitted variables bias in this kind of empirical analyses[3]. Cyclical adjustment may identify consolidations that where not deliberate government actions and downplay the influence of factors other than fiscal policy. In result the consolidations could be the outcome of higher economic growth, not the other way round. This economic growth might be an effect of monetary policy, currency depreciation etc. instead of fiscal actions. There were numerous examples of research that dealt with this problem by studying deliberate fiscal austerity measures using "narrative" or "action-based" analysis. Such studies (e.g. Guajardo et al. 2011;

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[3] The IMF (2010) points to another bias that may skew results in those analyses. Fiscal consolidations that are followed by an economic growth decrease have lower chances of being continued than those that were followed by output increases.

Romer, Romer 2010[4]) find that output typically fell after consolidation programmes were implemented. Also Perotti's (2012) analysis confirms that omitted variable bias may have influenced results of the non-keynesian effects literature. Using case studies the author finds that the GDP growth in previously identified expansionary fiscal consolidation examples[5] was fuelled by factors other than fiscal policy. In some of those cases the expansion was driven by exports, and was associated with currency depreciation or an improvement of economic conditions among trading partners. Furthermore there was a considerable decline of interest rates[6] and wage moderation relative to other countries that played a role in increasing output despite fiscal consolidation. The author concludes that short run budget consolidation may have facilitated the fall in interest rate and wage moderation. However it has not been the direct cause of GDP growth after a consolidation episode.

2.2. Economic conditions influence on fiscal multipliers

Recent work on fiscal multipliers suggests that its value might be dependent on the state of the economy as the Keynesian theory predicts. Therefore fluctuation of fiscal multipliers in the economy might take place. Multiplier size might be substantially larger then unity in economic recession and fall during expansions.

One of the most influential empirical analyses on the subject is by Auerbach and Gorodnichenko (2012b) who study OECD economies and apply regime switching basing on the moving average of real GDP growth. The authors find that the average size of the government spending multiplier for OECD economies over three years is about 2.3 in the recessionary regime, whereas in the expansionary regime the multiplier value is close to zero for most horizons. This result is consistent with

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[4] The authors examine the effects of tax changes.

[5] Notably Perotti studied the episodes included in the first analysis of expansionary fiscal consolidation (Giavazzi, Pagano 1990).

[6] Consolidation on the spending side may decrease demand pressure in the economy and in effect cause central bank interest rate cut. Consequently it might be the monetary policy, not the fiscal one that causes the output rise. IMF (2010, 2012) finds this effect relevant. Though Batini et al. (2012) have not come by the positive effects of monetary policy during spending cuts episodes.

their previous work (Auerbach, Gorodnichenko 2012a) on the US economy which finds that the spending multiplier is approximately zero in expansion and 1.5-2.0 in recession.

Batini et al. (2012) find that fiscal multipliers are considerably higher during recessions than during an expansion defined basing on GDP growth. One-year cumulative multiplier values are similar across countries and for expenditure shock are in the 1.6-2.6 range. In the expansionary regime they are considerably lower (0.3-1.5).

A study by Bachman and Sims (2011) on the US economy emphasizes the confidence effects that give rise to fiscal multipliers fluctuations. On impact in both regimes they are quite similar (ca. 1.1). However in the longer horizons fiscal stimulus effect on output quickly reverts towards zero in expansionary conditions, whereas in the recession regime it grows for a number of quarters. Authors report that the sum multiplier is 0.15 in expansions and 2.16 in recessions.

The extension of the study by Gechert and Will (2012) - Gechert and Rennenberg (2014) using meta-analysis confirms that the multiplier value is indeed connected to the economic stance. In the average regime the fiscal multiplier is in the bracket of 0.4 and 0.7. When the economy is expanding multiplier is close or slightly below that value. Whereas in recession it is significantly higher at 1.0-1.5.

The analysis of the German economy by Baum and Koester (2011) also confirms that fiscal multipliers size depends on economic conditions. When the GDP gap is positive one-year fiscal multiplier for government spending stimulus of 2% of GDP amounts to 0.36. Once there is slack in the economy there is virtually no crowding out in the economy and the fiscal multiplier is 1.04. None of the conclusions changes if a three quarter moving average of GDP is applied as the threshold value.

Mineshima et al. (2012) find supportive evidence for nonlinear effects of fiscal actions on output for G7 economies (except Canada). Spending multipliers are con-

siderably larger when the output gap is negative than when it is positive particularly for the countries where those multipliers are sizable. G7 average one year spending multiplier in recession is ca. 1.2 and is considerably lower in expansion at ca. 0.7.

Some other researches also confirm existence of fiscal multiplier fluctuations. In their empirical work on the US economy Mittnik and Semmler (2012) report that long-term fiscal multiplier is 1.3 when the output growth is below average. The multiplier is somewhat lower (1.1) when the GDP growth is higher than average. A study by Fazzari et al. (2013) divides economic conditions into low and high state basing on output gap, unemployment and capacity utilization. In the low state the one-year government multiplier is higher than in the high state (1.6 compared to 1.2). Canzoneri et al. (2012) finds that for the first quarter the multiplier in recession is 2.25, whereas in expansion it is lower than unity at 0.89.

Ramey and Zubairy (2014) provide an empirical analysis that, contrary to above mentioned literature, claims government spending multipliers were not necessarily higher during recessions identified using the unemployment rate. In times of slack output responds more strongly to defence news which were chosen as a shock due to the fact that they are both unanticipated and exogenous to the state of the economy. However government spending also has stronger response in those circumstances. In result the multiplier does not have to be higher during economic recessions compared with expansions.

This chapter provided empirical literature support for the idea that fiscal policy can affect fiscal multiplier size or lengthen the elevated multiplier period. The main assumptions for the simple theoretical model that draws on these conclusions are presented in the next section.

3. Fiscal multiplier in liquidity trap

Svenson (1999) described the liquidity trap as a situation where "(...) the economy is satiated with liquidity and the nominal interest rate is zero. (...) Expansionary open-market operations, where the central bank purchases bonds and increases the monetary base, then have no effects on nominal and real prices and quantities". This classic definition focuses on monetary effects of liquidity trap, or precisely speaking the inability of standard monetary tools to affect economy in any way. However liquidity trap touches also fiscal policy efficacy. In this case fiscal actions are more potent as the fiscal multiplier, the effect fiscal measures have on output, tends to be higher than when monetary policy is fully operational.

There is vast literature explaining this outcome[7]. In most cases it hinges on the fact that fiscal measures[8] fill the demand gap that exists owing to nominal interest rate being higher than market clearing interest rate. If the government finds a way to tax the saved cash or increase its debt and then spends the acquired funds, it increases the aggregate demand and output in the economy. Central bank has no interest in raising rates so there is no crowding out of private consumption.

Apart from the main mechanism responsible for elevated fiscal multipliers there are also other causes of this outcome mentioned in the literature. Notably the long-term multiplier may rise even further than described above due to hysteresis - a permanent reduction in production capacity of the economy as a result of transitory shocks (e.g. DeLong, Summers 2012). It is a phenomenon associated, in particular, with reinforcing and prolonging unemployment. The easiest explanation of hysteresis is that the long-term unemployed have lower likelihood of finding a job[9] or search for work less intensively. Some of the reasons responsible for this effect may

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[7] e.g. Eggertsson 2011, Woodford 2011

[8] In most researches fiscal actions take the form of government spending on goods and services. We follow this setup.

[9] This effect is called true duration dependence in the literature (e.g. Machin, Manning 1999).

be the deterioration of the human capital of the unemployed with long spells of unemployment, loss of social contacts as the period of unemployment lengthens, reduction of labour force attachment on the part of the long-term unemployed, scarring effects on workers beginning their careers and modifications of managerial attitudes. Hysteresis results in the prolonging of the unemployment. Consequently austerity induced unemployment has negative effects for employment also in the consecutive periods[10].

As we see form the above considerations fiscal multiplier fluctuations might take place due to liquidity trap, and additionally hysteresis effects. When the factors causing liquidity trap are considered temporary it is better to delay consolidation. Once they subside, the fiscal multiplier is likely to decrease, which means that consolidation measures will be carried out at a lower cost in the form of a reduced GDP growth. These considerations suggest that policy expectations are crucial for the consolidation implementation. But is it possible that those expectations influence the outcome? Let's turn to the model for the answer.

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[10] Batini et al. 2012 finds that fiscal consolidation in a crisis has twice the probability of deepening or extending downturn than consolidation implemented in an upturn to trigger a downturn.

4. Model

4.1. Outline

As it was already said this representative agent model is the same as Krugman's (1998) liquidity trap model with one addition – hysteresis effects taken from Rendahl (2014). This is in fact a standard neoclassical model of intertemporal consumption choice in which the disequilibrium state could be interpreted as a liquidity trap.

This is a one good economy. The output produced is a function of labour (l_t), agent works with fixed productivity (z).

$$Y_t = zl_t$$

The workers buy the product for consumption and are hired to produce it, but money transactions are necessary to acquire the final good. The produced good price is denoted P_t. Because there is perfect competition in the economy workers are paid marginal income from producing the good. Thus wage (w_t) is the product of the price of the good and productivity of the worker:

$$w_t = zP_t$$

Workers can use their wages for buying the non-storable product or purchasing one period government bonds (b_t) that yield nominal interest (i_t). Krugman (1998) suggested cash in advance constraint may be necessary in this situation. Firstly to introduce money into the model. Secondly to avoid the suspicion that the conclusions are not objective. This means that each period agents can trade cash for one period bonds and only then last period bonds are converted to money and consumption takes place. Thus the consumption in a specific period cannot be higher than the money supply in the same period. Taking all this into account every period agents face the following constraint:

$$w_t l_t - P_t T_t + P_{t-1} b_{t-1} (1 + i_{t-1}) = P_t c_t + P_t b_t$$

Or when r is the constant[11] real interest rate ($(1 + r) = (1 + i_t) \frac{P_{t-1}}{P_t}$):

$$z l_t - T_t + b_{t-1}(1 + r) = c_t + b_t$$

Consequently the intertemporal budget constraint is:

$$\sum_{t=1}^{\infty} \frac{z l_t - T_t}{(1 + r)^{t-1}} + b_0(1 + r) = \sum_{t=1}^{\infty} \frac{c_t}{(1 + r)^{t-1}} + \lim_{T \to \infty} \frac{b_T}{(1 + r)^{T-1}}$$

There is also government in the economy that taxes the workers with lump-sum taxes (T_t) but can also issue bonds (b_t). It uses acquired money for its own spending (G_t). Additionally government is not interested in hoarding savings. Government spending is a component of the aggregate demand:

$$Y_t = c_t + G_t$$

Each period the government faces the following budget constraint:

$$P_t T_t + P_t b_t = P_t G_t + P_{t-1}(1 + i) b_{t-1}$$

The intertemporal budget constraint for the government will then be:

$$\sum_{t=1}^{\infty} \frac{T_t}{(1 + r)^{t-1}} + \lim_{T \to \infty} \frac{b_T}{(1 + r)^{T-1}} = \sum_{t=1}^{\infty} \frac{G_t}{(1 + r)^{t-1}} + b_0(1 + r)$$

Money supply (M^s), and in effect the interest rate, is controlled by the central bank in an independent manner. In effect seigniorage revenue is not government's income.

Utility comes solely from consumption, and it takes a standard form:

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[11] In the proceeding considerations of the model we will see that the real interest rate will be dependant only on the depreciation rate, which is constant. Thus the real interest rate is also constant.

$$u(c_t) = \frac{1}{1-\rho} c_t^{1-\rho} D^{t-1}, so \ U = \sum_{t=1}^{\infty} \frac{1}{1-\rho} c_t^{1-\rho} D^{t-1}$$

Where c is consumption, ρ is relative risk aversion and D is the discount factor.

The one addition to the model presented by Krugman (1998) is that there is a protracted reduction in production capacity of the economy as a result of transitory shocks i.e. hysteresis effects. It means that short term unemployment turns into a more permanent one. Frictions in the labour market (as in Rendahl (2014)) are of the form:

$l_t = l_{t-1}{}^{\alpha}$, where $\alpha \in (0,1)$, potential employment is constant and normalized to one.

The outcome in period t is determined by the disequilibrium in period t-1. In the case α is 0 there are no frictions in the labour market as the disequilibrium in one period does not affect employment in the next period. Hysteresis effects occur in the economy if α is higher than 0.

The frictions in the labour market prolong the crisis. In effect it takes time for the economy to return to potential output. This assumption makes the model more realistic compared with what non-augmented model was suggesting i.e. that the economy goes back to demand-supply equilibrium next period after the shock. Most types of crises and liquidity trap crises especially, are not short-termed. Although there are not many examples of liquidity traps, the ones the literature is most keen to agree on (Japan since the middle of nineteen nineties and developed countries after the resent financial crisis) are long-term phenomena.

4.2. Steady state

By maximizing the value of utility under the agents' intertemporal budget constraint we can quickly calculate the optimal consumption choice over time. The Lagrangian function would be:

$$L(c_1, \dots, \lambda) = \sum_{t=1}^{\infty} D^{t-1} u(c_t) + \lambda[\sum_{t=1}^{\infty} \frac{zl_t - T_t - c_t}{(1+r)^{t-1}}]$$

First order conditions with respect to c_t are:

$$D^{t-1} u'(c_t) - \frac{\lambda}{(1+r)^{t-1}} = 0$$

By solving the system of equations for c_t and c_{t+1} and rearranging we obtain the standard Euler equation for the neoclassical intertemporal consumption model that is centrepiece for further considerations:

$$(\frac{c_t}{c_{t+1}})^{-\rho} = D(1+r)$$

Or when the real interest rate is split between inflation and nominal interest rate:

$$(\frac{c_t}{c_{t+1}})^{-\rho} = D(1+i_t)\frac{P_t}{P_{t+1}}$$

In the steady state the consumption is stable. In effect:

$$D(1+i_t) = \frac{P_{t+1}}{P_t}$$

So the price inflation has to be compensated by the nominal interest rate and depreciation rate, which is constant and exogenous[12]. Let's assume for a moment that the nominal interest rate is positive. In this condition there is no need to save any cash as it would lose value compared to interest bearing bonds. Thus every unit of money available to the consumers would be spent on consumption. This is in line with Walras' law that implies that when the goods market clear, the bond market must also clear at the steady state real interest rate. In result taxes are the government's only revenue source. Its only expenditure is the cost of goods bought. The other

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[12] In effect the real interest rate is also constant.

outcome of the positive nominal interest rates is that prices in the model are stable implying that the money supply is also stable (when i=(1-D)/D).

Agents spend all of their money on consumption and the government spends its tax revenue on consumption also. There are lump-sum taxes in this economy so they do not distort the agents' goal of maximising its consumption. In effect we acquired a steady state in which all labour force is employed, there is potential output produced, there are no bonds traded, there is no money supply growth and the nominal interest rate is positive and equal to the real interest rate.

5. Liquidity trap considerations

5.1. Getting out of the liquidity trap

We now turn to the analysis of what happens between the two periods – disequilibrium period (t-1) and the steady state (t). What would be the rational choice for consumption between both periods? The Euler equation derived in the last section is:

$$\frac{c_{t-1}^{-\rho}}{c_t^{-\rho}} = D(1 + i_t)P_{t-1}/P_t$$

Because there are lump-sum taxes the government decisions cannot distort the agents' consumption choice, the steady state consumption is sufficient to assure potential output being produced in the economy.

According to the above equation there are four options to increase output to the potential level. The first one is for the central bank to decrease the interest rate (by increasing the supply of money). The second one is to decrease the prices now. The third option is to increase the prices in the future. The fourth option is to convince economic agents that the consumption (or equivalently output) in the future will be high.

We will briefly consider all policy options for attaining the potential output. In the process it will be visible that the disequilibrium state could be a model representation of a liquidity trap where interest rates are close to zero, economy is satiated with money so standard monetary tools have no effect on the economy and price growth and its expectations are relatively low.

Cutting the interest rates is the most obvious and clearly established way central banks fight economic slumps. It has been proven effective by numerous analyses[13]. There is however one problem as central bank can decrease interest rate up to a point. Interest rates cannot be lower than zero (so called zero lower bound). Otherwise it would be rational for economic agents to keep their savings in the cash form not in bonds[14]. This is a result of cash having a guaranteed return of zero.

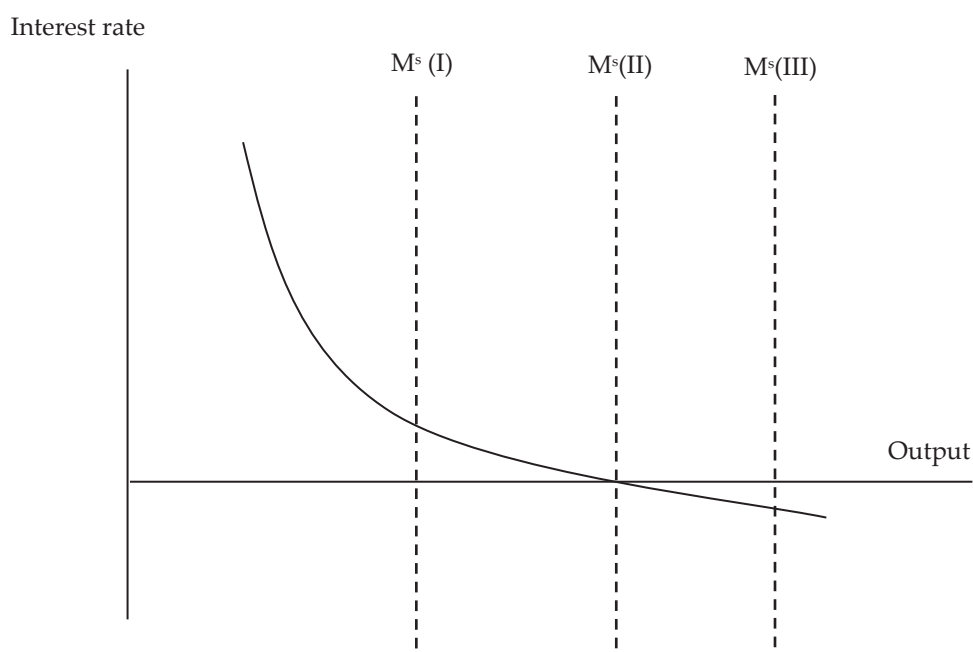Figure 1 Relationship between Output and interest rate

Figure 1 (as in Krugman 1998) illustrates this result. If the money supply is at $M^s(I)$ level, interest rate is positive so there is scope for cutting it in case the output does not match productive capacity. However central bank can cut the interest rate only to zero (by increasing the money supply to $M^s(II)$ level). Any additional increases (for example to $M^s(III)$) have no effects on output or interest rate as there would be

[13] Now-classic work by Friedman (1968) took on the subject of monetary policy outcomes. Since then effectiveness of interest rate cuts has been confirmed many times (e.g. meta-analysis by de Grauwe, Storti 2004) and is now a standard tool of monetary policy.

[14] In practice money held in cash have some disadvantages compared to other form of storing money (e.g. physical storages needed, problems with transferring money). This makes it possible for the interest rate to fall slightly below zero.

no additional consumption. Instead an abundance of cash would occur. Agents would save additional monetary base provided by the central bank, either in the form of cash or in the form of bonds, as at the zero lower bound they become perfect substitutes.

Let's now turn to other possibilities of increasing output to potential one – decreasing the prices now. This option is also limited by the effects of downward nominal wage rigidity i.e. the workers are reluctant to let their nominal wages fall below previous period levels. This possibility has received mixed empirical support in the literature with some researchers supporting its existence (Bewley 1999; Barattieri 2010, Daly et al. 2011; Daly and Hobijn 2014) and some calling it into question (Pissarides 2009). It is however a necessary conditions for liquidity trap in this model. No wage rigidity would mean that prices in the current period would decrease. This cut in prices would result in higher inflation between current and next period. The expectation of higher prices in the future would mean that in the current period consumption would increase. Thus no downward wage rigidity would lead to deflation in the current period, subsequently to potential output being produced in such an economy[15].

The next option is to increase the prices in the future. This would also increase the inflation between both periods. In effect real interest rate would decrease up to market clearing rate. But then again a problem occurs. In Krugman (1998) words "There is no (…) argument that a rise in the money supply that is not expected to be sustained will raise prices equiproportionally – or indeed at all". Specifically in-

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[15] However there is an additional problem if there is no downward wage rigidity when real life considerations are concerned. Using price cuts to get out of liquidity trap might be dangerous for the economy as they could start a deflation spiral. In his classic work Irving Fisher (1933) proposed the mechanism for continuously lowering prices. In this mechanism lower prices would mean that real value of debt would be higher. In effect it would be more difficult to pay off the debt. Consequently consumption would be lowered to acquire necessary means for servicing debt. Therefore prices would go down even further creating a feedback loop. Deflation spiral would come to being. A self-fulfilling deflationary trap is also present in Eggertson, Woodford (2003). Still it is not an outcome of the model, only a crucial element for possible policy consideration.

crease in today's money supply would have price effect only if market expects the supply to stay elevated. Otherwise agents would see the money supply going up but in the consecutive period they would expect it to go down. So the one-off increase in inflation will be met with a proportional deflation in the next period. Consumers would predict the prices would not be affected in the long term. In effect there would be no increase in consumption and no price changes. That is why the central bank has to "credibly promise to be irresponsible", unanchoring the low inflation expectations.

Last possibility for getting out of the liquidity trap is to convince the agents that their consumption or output in the future will be higher. However, as this may be more of a socio-political problem than a purely economic one, we refrain from further considerations of this option.

5.2. Consolidation in the times of liquidity trap

Knowing the conditions for the liquidity trap to occur we can describe the effects of fiscal actions. We will specifically analyse the fiscal multiplier effects as this is the main interest of this research. Comparing fiscal effects in the steady state and then in the liquidity trap would let us answer policy questions concerning the timing of fiscal austerity.

We will show that the multiplier is equal to zero in the steady state as any rise in government spending will not alter output. We can substitute taxes in the agents' intertemporal budget constraint with government's budget constraints:

$$\sum_{t=1}^{\infty} \frac{T_t}{(1+r)^{t-1}} = \sum_{t=1}^{\infty} \frac{G_t}{(1+r)^{t-1}} + b_0(1+r) - \lim_{T \to \infty} \frac{b_T}{(1+r)^{T-1}}$$

Now it is easy to notice that what is relevant for the consumption choice is the government expenditure stream:

$$\sum_{t=1}^{\infty} \frac{(zl_t + \frac{\partial Y}{\partial G}\Delta G) - (G_{ss} + \Delta G)}{(1+r)^{t-1}} = \sum_{t=1}^{\infty} \frac{c_t}{(1+r)^{t-1}}$$

,with:

$$c^* + G_{ss} = Y_{ss}$$

In case there is a change in the present value of government spending, the higher lump-sum taxes decrease the value of agents' available funds while the output cannot be higher than the steady state output because of fixed labour supply and fixed productivity. The economy is bounded by the supply side. Thus consumption drops proportionally to the rise in government expenditure. In result consumption is lower but the government spending is higher equivalently, output does not change[16]. Thus in the steady state the government spending multiplier is equal to zero.

In the case the economy is in the liquidity trap (for the time being without hysteresis effects) the situation changes considerably as is depicted by the disequilibrium state of the model. We start out with the output level lower than the potential one. Monetary policy is ineffective since increasing money supply has no effect on consumption and output likewise. The prices this period do not change because of the downward rigidity, nor is there any expectations of price hike in the future period due to well anchored inflation expectations. In such conditions consumption is lower than steady state consumption ($c^* < c_{ss}$). In the case the government consumption is at its steady state level it is the aggregate demand that bounds the total output:

$$c^* + G_{ss} < Y_{ss}$$

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[16] In case the government changes only timing of taxes and expenditures the consumption does not change at all. In effect output stream does not change either (see Barro, 1974).

The above inequality is linear therefore any rise in the government total spending would increase the aggregate demand proportionally (obviously $\Delta G = \Delta Y$). Fiscal expenditure multiplier, in these conditions, is then equal to one (without hysteresis effects). From the intertemporal consumption constraint we can also confirm that this is the case as the additional taxation (and at the same time spending) which increase the total output would not alter consumption stream in any way. Once again it is helpful to use the equation:

$$\sum_{t=1}^{\infty} \frac{(zl_t + \frac{\partial Y}{\partial G}\Delta G) - (G_{ss} + \Delta G)}{(1+r)^{t-1}} = \sum_{t=1}^{\infty} \frac{c_t}{(1+r)^{t-1}}$$

Taking hysteresis effects into considerations brings additional insight. Employment evolves according to $l_t = l_{t-1}{}^\alpha$. This means that, when α is not equal to zero, it takes more than one period for the employment to get back to the steady state. This effect increases the long-term fiscal multiplier in the liquidity trap above 1. Employment in the period t is equal to Y_t / z so the output in the next period is

$$Y_{t+1} = z(\frac{Y_t}{z})^\alpha$$

In this specification the decrease of output in the period t due to one-period cut in government consumption (ΔG) would be equal to the cut. But the effect in the future periods, would be:

$$Y_{t+1} = z(\frac{Y_t - \Delta G}{z})^\alpha, \quad y_{t+2} = z((\frac{Y_t - \Delta G}{z})^\alpha)^\alpha, \ldots$$

Thus the fiscal multiplier is: $\frac{\partial Y}{\partial G} = 1 + \alpha + \alpha^2 + \cdots = \frac{1}{1-\alpha}$.

An interesting feature of the model is that it is not the aggregate demand lower than steady state output that is the sufficient condition for multiplier being higher than one in the model. It is the ineffective monetary policy, i.e. zero lower bound on

nominal interest rate, that results in high levels of fiscal multipliers[17]. This is because , as a result of hysteresis effect, the output is at this time bounded by the supply side.

These findings have considerable effects for the choice of fiscal consolidation pace. If austerity is imminent, because of market pressure or any other reason, expenditure consolidating would mean that we choose to further decrease output in current and future periods, with fiscal multiplier being equal to unity or higher. Since the economy in the model goes back to potential output in time, cutting expenditure in the future possibly could not have any effects on economy in the forthcoming periods. So there is a substantial difference between consolidating in the present or in the future periods with obvious advantages for delaying the consolidation.

5.3. Conditions for a self-fulfilling prophecy on fiscal multipliers

Previous subchapter argues that when being in a liquidity trap consolidating in the future is less harmful to the economy than consolidating in the current period. This is because the economy will lift itself out of the slump in the future periods. The multiplier will be reduced from elevated levels, as eventually the size of the recession has no effect on the steady state multiplier, which is zero.

For the multiplier to fall, effective monetary policy is indispensable. When it is operational the multiplier in the model is zero. In the case it has no effect on the output, prices etc., the multiplier is elevated. Let us consider when the central bank actions are effective and when they are not. Basic conditions for the monetary policy not being effective, because the economy is in liquidity trap, were numbered out in the previous chapters. We have already specified that to reach this state downward wage rigidity must be present in the economy not to allow for deflation. Expectation about the low future inflation must be well anchored. Agents must not be

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[17] See Figure 2 for a depiction of this kind of situation.

optimistic about the future output. Lastly, central bank is not able to cut nominal interest rates below zero, therefore real interest rate could not equal negative market-clearing rate in the economy (natural interest rate). This last condition means that in the liquidity trap the nominal interest rate in the model is equal to zero. We have to remember that the economy converges towards steady state with no slack in demand, stable prices and, what is crucial, positive nominal interest rate. Therefore at some point in time, on economy's path to the steady state, output is below potential and the nominal interest rate no longer has to be zero. The monetary policy starts to be operational again, consequently the fiscal multiplier falls to zero. Although at this point any consolidation might push the economy back into the liquidity trap, austerity (of appropriate size) in subsequent periods may do no harm to the economic output.

Due to hysteresis effects in the model, the bigger the consolidation effort the longer it takes for the economy to reach this point (also to converge to the steady state). The size of consolidation influences the length of the period the fiscal multiplier is high.

Figure 2 depicts the effect of spending cuts on the length of elevated multipliers period when the economy is in the liquidity trap (caused by an unspecified demand shock). Fiscal austerity outcome is twofold. Not only it decreases the output in the current period proportionally to the spending cut, but also increases the length of the high-multiplier period (by the amount of time depicted on the figure 2 as the shaded time span). As the number of unemployed in the case there is a fiscal shock is higher than in the opposite condition, the number of unemployed is also higher in the future periods in effect of hysteresis. With stable productivity the future output is lower in the fiscal shock case likewise. The amount of time it takes for monetary policy to start being effective and for the multiplier to fall again lengthens.

We come to a conclusion that, not only consolidating in the liquidity trap could have detrimental effects for the economy, it also can prolong the unfavourable conditions in the future. Even though the economy reaches the same steady state the consequences on economic output are far more severe in the no-delay option. The economy loses possible output in the current period and additional amount in the future periods, due to hysteresis effects. While putting-off consolidation to the future periods could possibly cause no additional output loss. This of course depends on the size of the consolidation and the scope of the central bank's cushioning effects but nevertheless the effects of fiscal consolidation in the low fiscal multiplier environment would be comparably lower.

Figure 2 Effect of fiscal consolidation in liquidity trap[18]

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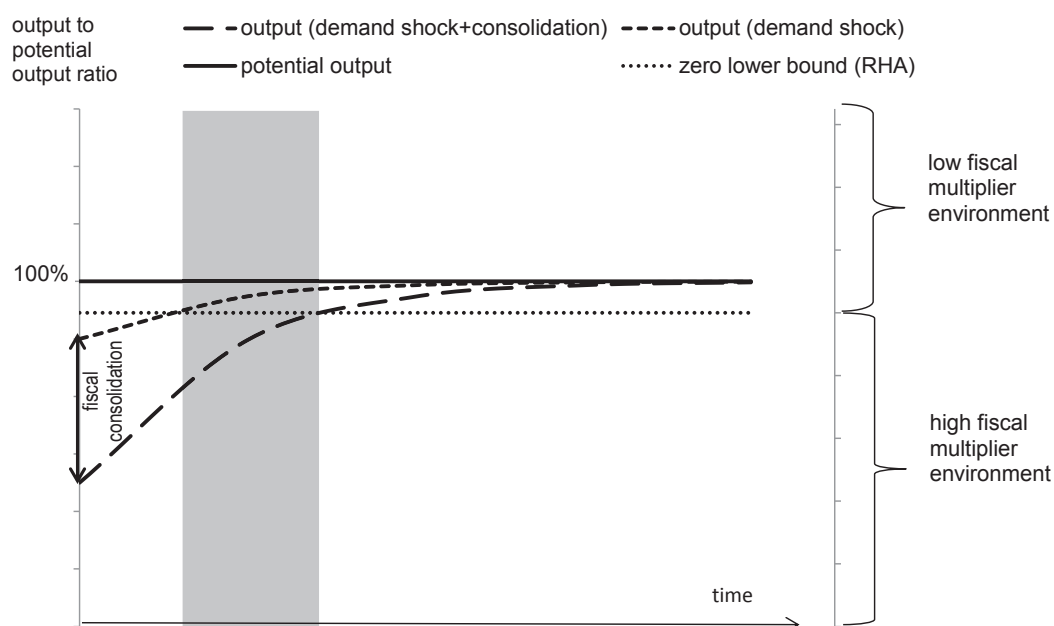
[18] For simplicity it was assumed that zero lower bound is attained at the same ratio of output to potential output. It is based on a premise, that change in output is inversely proportional to the change in interest rate, as for example in Ball's (1999) IS curve calculations. By denoting the coefficient next to the interest rate in the IS equation by β, we get a stable ratio of output at which zero lower bound is attained: $Y_{ZLB}=Y_{ss}-(\beta{*}i)Y_{ss}=const$. Furthermore, even if IS curve would not be linear, the steady state interest rate is positive but close to zero (because $i=(1-D)/D$ where $D<1$ but close to 1, as it is commonly assumed in the literature. So the effect of a small change in interest rate would have to be enormous to change our conclusions. This is highly improbable.

Now, it is the decision of the government that influences the level of the fiscal multiplier in the future. This decision, in turn, could be based on expectation about the future multiplier. This idea was also mentioned in Fletcher and Sandri (2015) who suggest that "the decision about delaying fiscal consolidation should not be shaped by views on the average size of the fiscal multiplier, but rather by the degree to which multipliers vary over the cycle (…)".

 We can think of a government that would like to attain potential output as soon as possible. On the other hand there are pressures from the financial markets that push the government to implement rapid expenditure cuts that would further affect output. The government has to balance those two effects by weighting in the expected fiscal multiplier in the future.

Ceteris paribus, if one assumes that the multiplier in the periods ahead (shaded area on the figure 2) will be low it is optimal to delay consolidation or even loosen the fiscal policy. In effect multiplier would indeed decrease. In the case government claims the multiplier in the periods ahead will be elevated, it implements austerity without lag. In consequence the multiplier stays at high levels. As we can see the government's decision directly affects the outcome. It translates to fiscal policy recommendation of being extremely cautious with implementing consolidations as in the case the government wants to base their choice for austerity timing on the fiscal multiplier expectations, those expectations may be self-fulfilling.

6. Conclusions

In the light of recent work on fiscal multipliers there might be a possibility of decreasing the negative effects of fiscal consolidation for the economy. As the multiplier fluctuates with the state of the economy there is an option of putting off consolidation until the economy finds itself in a low multiplier environment. Austerity should be delayed if the factors responsible for the elevated multipliers are expected to vanish. In the opposite case - when they are likely to stay - there is no benefit from waiting with austerity measures implementation, especially if there are other economic pressures on the economy. Therefore it is crucial for the economy that the expectations on the future fiscal multiplier are correct.

However the theoretical considerations presented in this article state that in some circumstances those expectations may be always correct, as they become a self-fulfilling prophecy. This situation may occur when the government is basing the choice for consolidation timing on its fiscal multiplier expectations. The factors that have to be present for this outcome to arise are liquidity trap and hysteresis effects. And there is ample evidence that both of them may have existed during recent crisis. This work confirms that in such economic conditions, the government should decide to delay consolidation as it would do less harm to the economy.

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