R O M E
Research On Money in the Economy

No. 17-10 – February 2017

Optimal Adjustment Paths in a Monetary Union

Ansgar Belke, Daniel Gros

ROME Discussion Paper Series

ISSN 1865-7052

Research On Money in the Economy

Discussion Paper Series
ISSN 1865-7052

No 2017-10, February 2017

Optimal Adjustment Paths in a Monetary Union

Ansgar Belke, Daniel Gros

Please direct any enquiries to the current ROME coordinator
Prof. Dr. Albrecht F. Michler,
Heinrich-Heine-University of Duesseldorf, Department of Economics, Universitaetsstr. 1,
Build. 24.31.01.01 (Oeconomicum), D-40225 Duesseldorf, Germany
Tel.: ++49(0)-211-81-15372
Fax: ++49(0)-211-81-15261
E-mail: helpdesk@rome-net.org
albrecht.michler@hhu.de or markus.penatzer@hhu.de

Abstract

What to do when a country experiences a sudden stop in capital inflows and has to adjust externally? Sticky wages make adjustment to an external imbalance more difficult within a monetary union. Periods of high unemployment are usually necessary to achieve the required real depreciation (internal devaluation). Gradual adjustment is usually recommended to distribute the output and employment cost over time. But a gradual adjustment also implies that current account deficits persist for longer, leading to higher debt, and higher debt-service costs. The optimal path of price and wage adjustment thus involves a trade-off between the pain (unemployment) and the gain (lower debt) from adjustment. A simple model shows the determinants of the optimal path in terms of deeper parameters, such as the slope of the Phillips curve and the degree of openness. The rules for the resolution of future crises within the euro area should take this into account. Gradual adjustment is not always the optimal choice, and sometimes the alternative path of introducing abrupt changes produces the desired results.

JEL-Classification: F41, F45, P11

Keywords: Speed of adjustment, openness, Phillips curve, price and wage adjustment, internal devaluation, policy complementarities

Optimal Adjustment Paths in a Monetary Union

by

Ansgar Belke
(University of Duisburg-Essen, Centre for European Policy Studies (CEPS), Brussels, Institute for the Study of Labor (IZA), Bonn)

and

Daniel Gros
(Centre for European Policy Studies (CEPS), Brussels)

Essen and Brussels, February 2017

Abstract

What to do when a country experiences a sudden stop in capital inflows and has to adjust externally? Sticky wages make adjustment to an external imbalance more difficult within a monetary union. Periods of high unemployment are usually necessary to achieve the required real depreciation (internal devaluation). Gradual adjustment is usually recommended to distribute the output and employment cost over time. But a gradual adjustment also implies that current account deficits persist for longer, leading to higher debt, and higher debt-service costs. The optimal path of price and wage adjustment thus involves a trade-off between the pain (unemployment) and the gain (lower debt) from adjustment. A simple model shows the determinants of the optimal path in terms of deeper parameters, such as the slope of the Phillips curve and the degree of openness. The rules for the resolution of future crises within the euro area should take this into account. Gradual adjustment is not always the optimal choice, and sometimes the alternative path of introducing abrupt changes produces the desired results.

JEL codes: *F41, F45, P11*

Keywords: Speed of adjustment, openness, Phillips curve, price and wage adjustment, internal devaluation, policy complementarities

Corresponding author: Ansgar Belke, ansgar.belke@uni-due.de

Acknowledgments: We are grateful for valuable comments from three reviewers and general comments from the editor.

Research highlights:

- With sticky wages, external adjustment in a monetary union requires a reduction in expenditure and an increase in unemployment.
- Immediate adjustment in expenditure increases unemployment, but it also reduces debt accumulation and leads to lower wages, stimulating exports which will bring unemployment back down over time.
- Postponing the adjustment leads thus to higher debt, and, in most cases, ultimately to higher welfare costs.
- We conclude that when external financing dries up it is preferable not to delay the adjustment.

1. Introduction

If an external devaluation (of the exchange rate) is not possible, as within the euro area, internal devaluation may serve as a substitute, but this response requires *costly* declines in both wages and prices (Wasmer, 2012, p. 769).

This general problem acquired great practical and political relevance in Europe in the wake of the Great Financial Crisis. A number of countries had experienced large capital inflows during the credit boom that had accompanied what was then called the 'Great Moderation'. However, when the crisis struck the capital inflows stopped suddenly, forcing the countries that had relied upon them to finance large current account deficits into a quick adjustment.

However, many of the countries that experienced this 'sudden stop' could not rely on the exchange rate as an adjustment instrument. One group comprises the five euro area member states which came under financial stress (Greece, Ireland, Italy, Portugal and Spain – often grouped under the acronym GIIPS). A second group comprises four newer EU Member States in Central and Eastern Europe, which had chosen a fixed exchange rate regime to the euro (Bulgaria, Estonia, Latvia and Lithuania, henceforth BELL).

Each of these nine countries faced the problem mentioned above: how to re-establish external equilibrium without being able to devalue. While there have been a lot of contributions on the optimal path towards the Economic and Monetary Union or EMU (see, for instance, Fidrmuc, 2003), explicit models of the optimal path of adjustment for financially distressed countries, such as the so-called 'program countries' within EMU, are absent. We try to fill this gap with this contribution.

Deciding on the path for prices, wages and output under these conditions involves striking a balance between two apparently conflicting objectives. One approach is to go 'cold Turkey' by quickly restoring competitiveness and the external balance (Belke, Oeking and Setzer, 2015). The other is to keep employment and output from falling too much, but this requires financing for the continuing external deficits. "Debt outcomes are very sensitive to growth or variations in the speed of internal devaluation" (IMF, 2012, p. 90).

The fundamental problem in choosing the right speed of adjustment is that the only adjustment mechanism with a quick impact on the external balance is fiscal policy. Labor market reforms to remove downward wage rigidities and thus make wages more responsive

to (un)employment were also widely adopted (Vogel, 2012, 2014) during the crisis. But it was clear from the beginning that the impact of these so-called structural reforms comes with a delay. They thus cannot avoid the need for immediate adjustment in expenditure (Alcidi et al., 2016, Gros et al., 2014).[1]

Recent working papers from the IMF (the institution that designed much of the adjustment programs in Europe), such as those by Kang and Shambaugh (2013, 2014), Tressel et al. (2014) and Tressel and Wang (2014), emphasize certain patterns. The adjustment has been accompanied by a substantial recession and falling employment. Much of the initial current account improvements have been achieved through import compression due to the recession (see also IMF, 2013, p. 25).

These adjustment programs in the euro area have attracted much criticism because of the deep recessions that followed. The simple argument for more gradualism was that social loss functions are convex, which implies that it would be better to spread the pain over a longer period of time.

This controversy regarding the adjustment programs provides the motivation for our paper. Our contribution is conceptually simple: a slower adjustment also means that external debt continues to go up, thus requiring even more adjustment later because of higher debt service (Alcidi et al., 2016).

We build this inter-temporal budget constraint in a simple sticky price model and a a standard convex social loss function. This basic framework leads to interesting results concerning the desirability of a gradual adjustment. We find that a quick adjustment that overshoots slightly at the beginning could be the best policy in times of crisis when the cost of capital is very high.

Our focus is different from the literature on what constitutes an optimum currency area (Mundell, 1961) and what kind of monetary and fiscal policies might be needed to sustain it. Instead we address a much narrower question, namely what to do when a country experiences a sudden stop in capital flows and has to adjust externally? This was the question policy makers in a number of euro area countries (and in Central Europe) had to answer during the

[1] In practice, relative prices are adjusting at different speeds across countries and with different compositions of wage cuts and labour shedding. See Tressel and Wang (2014).

crisis years. Given this narrow focus we do not take a position on whether the countries concerned should have received much more support and whether the euro area needs fiscal shock absorbers (Furceri and Zdienicka, 2015, IMF, 2013b, and Juncker et al., 2016). We only address the concrete problem policy makers faced in a very second-best world.

The remainder of the paper proceeds as follows. In section 2, some stylized facts of the adjustment during the financial crisis in Europe are presented. Section 3 develops the macroeconomic framework with an eye on the role of ideology and different schools of thought. In section 4, we come up with a simple model to assess whether gradual adjustment or a 'cold turkey' approach is preferable from a social welfare perspective. Among others, we derive the optimum speed of internal adjustment and assess the welfare effects of alternative policy instruments.

2. Adjustment and the path for internal devaluation – Stylized facts from the European experience

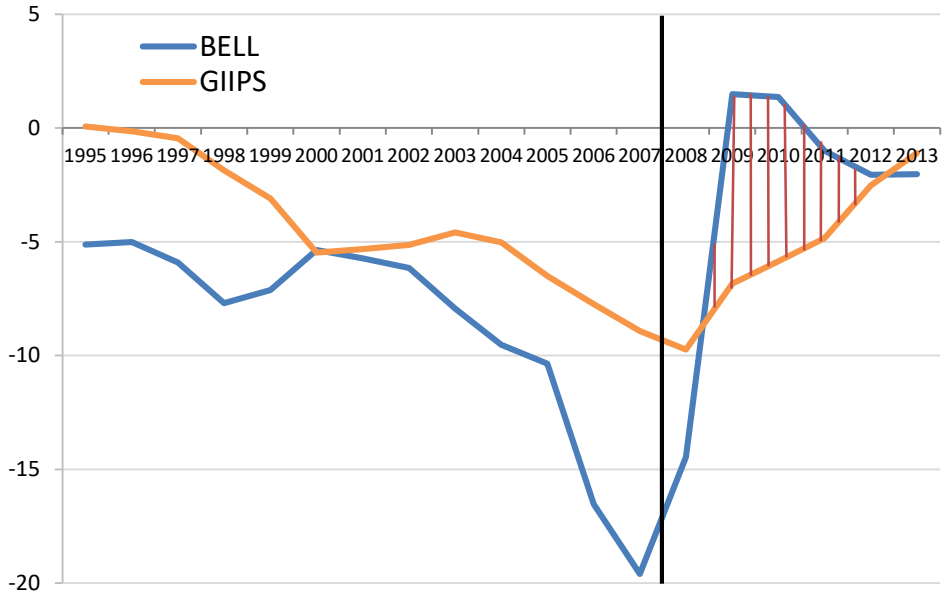
The nine European countries that faced a sudden stop in the availability of foreign capital present a diverse set of experiences. The countries from the euro area (called GIIPS) have received the most attention because their experience can be taken most clearly as an indication of the adjustment problems that might arise in a common currency area. However, the second group of countries, dubbed BELL, also deserves interest because these countries were on a fixed exchange rate and thus faced, at least from a macroeconomic point of view, the same problem: how to adjust without the benefit of an exchange rate instrument (Gros et al., 2014, Sippola, 2011).

Both groups experienced large macroeconomic imbalances before the crisis, whose most important manifestation for the purposes of this paper were large and persistent current account deficits. The underlying reasons for these deficits varied from one country to another. In Spain the excess of domestic absorption over domestic supply was mainly due to a construction boom. In Greece it was consumption expenditure fueled by large government deficits. In the Baltic states the key expenditure item during the boom years was investment, whereas the governments kept their deficits under control (Alcidi et al., 2016, Gros et al., 2014, Sippola, 2011).

Figure 1 below shows the domestic overspending relative to the resources available in the form of the current account balance, as a percentage of GDP. It is apparent that the BELL group had even larger external deficits when the crisis struck. But the adjustment was almost immediate, with the current account improving (on average) for this group by almost 20 percentage points of GDP within 2 years. In the GIIPS, by contrast, the external adjustment was much slower, with deficits being reduced at a rate of about 2 percentage points per annum.

Figure 1 - *Current account reversals under fixed exchange rates in Europe*

Current account as % of GDP



Source: Own calculations based on Eurostat data.

The counterpart of the very rapid current account adjustment in the BELL group was also a higher variability of demand, unemployment and the output gap. Gros and Alcidi (2015) provide some measure of the present value of the cumulated output losses for the two groups of countries, looking at the period from 2009 to 2014 relative to a pre-crisis baseline. Given that the central aim of a slower adjustment is to postpone output losses, they provide a measure of

the present value of output losses by summing the discounted present values of output gaps and unemployment, discounting later ones with an interest of 5%.[2]

Table 1 - *Macroeconomic adjustments compared*

	The benefits from quick adjustment: Current accounts' improvement		**The cost of adjustment: Output and employment losses**		
	Cumulated change in current account balances relative to:		**Cumulated unemployment cost, calculated based on:**	**Cumulated output gap**	
	Exports	**GDP**	Change over baseline	Change over baseline	
GIIPS	62%	24%	40.6	-21.7	
BELL	101%	68%	31.5	-17.8	

Note: The cumulated change in current account is calculated as the sum of current account balances (2009-14) above the baseline (average of 2005-07). Figures are given as a percent of cumulated GDP or cumulated exports (2009-14). All values are given as an average of the GIIPS and the BELL states and represent net present values, i.e. a 5% discount rate has been applied. The cumulated unemployment rate is calculated as the sum of the unemployment rates between 2009 and 2014. The average unemployment rate, taken over the years of 2005-07, constitutes the baseline of our calculation. The cumulated output gap is derived from the sum of annual output gaps over baseline. The output gap is defined as actual GDP less potential GDP as a percent of potential GDP (output gap directly from Eurostat). The cumulated consumption change in calculated in the same way. All values are given as an average of the GIIPS and the BELL and represent net present values, where a 5% discount rate has been applied.

Source: Adapted from Gros and Alcidi (2015).

The data reported in Table 1 suggest that both groups experienced very significant losses of output during the adjustment process. The first two columns show that the quicker adjustment in the BELL group resulted in a much lower accumulation of external debt, whether measured as a % of GDP or of exports. For the BELL countries the difference with the pre-crisis baseline was equivalent to 68% of GDP, compared to 'only' about 24% of GDP for the countries in the euro area (the GIIPS). The difference corresponds roughly to the shaded area in Figure 1.

The last two columns in Table 1 show that the large output losses and that the differences in terms of both unemployment and the output gap were relatively small. These differences and

[2] The rate of 5% is set in arbitrary way but the ranking it implies is robust.

similarities across different groups of countries (and also within these groups) raise the question whether the different adjustment paths were appropriate because of differences in domestic conditions.[3] The model presented below provides a consistent framework to determine which factors would favor a quick adjustment. This allows one to go beyond the often ideologically charged criticism of the official adjustment programs as imposing unwarranted austerity.

3. The macroeconomic framework: Ideology and different schools of thought

As we have seen in several cases in the past, *the ease with which internal adjustment can be implemented is influenced by the country's overall vulnerability to adjustment* and the government's ability to design reforms in ways that spare its core constituency (Copelovitch, Frieden, and Walter, 2016, and, even more extensively, Saint-Paul, 2003, and Rodrik, 2006). Hence, the optimality of the internal adjustment path is a function of political-economic constraints (like government ideology) in the home country. For instance, one may argue that the lower the political-economic obstacles are, the more speedily the internal adjustment should take place (Zemanek, Belke and Schnabl, 2010). This is because it implies less reliance on (external) financing, which reduces the danger of even more debt-sustainability problems in the future. Otherwise, the necessary internal adjustment might be thwarted by interest groups, and for instance, the resolution of the Greek crisis will continue to be a drawn-out, painful and politically costly process.

Note that even without the option of external adjustment, two additional crisis strategies remain, at least theoretically, for the Greek government in the current crisis besides an internal adjustment by the deficit countries: internal adjustment by the surplus countries and a quasi-permanent financing of the deficit. Of course, external adjustment in terms of a depreciation of the euro in general (as currently enacted through quantitative easing) is also an option, and the ECB has been actively working towards a weakening of the currency. As stated, for instance by Biggs and Mayer (2014), owing to more generous external (credit) assistance for

[3] Only one of the BELL countries (Latvia) had an adjustment program, whereas most of the GIIPS countries had either a formal program or came under heavy political pressure to undertake measures to reduce domestic absorption. The more rapid adjustment in the BELL countries thus mostly reflected domestic political choices and financing constraints.

Greece, the optimal speed of internal adjustment could be slower and become conditional on external assistance and, hence, even *indeterminate*. Anyway, materially slower adjustment would have required even more support (Gros et al., 2014). A coordinated break-up of the Economic and Monetary Union has also been considered in policy circles and academic research (Copelovitch, Frieden, and Walter, 2016).

The discussion about adjustment in a monetary union has become highly politicized (in terms of 'Keynesian versus non-Keynesian') and at the same time the discussion *has not taken place with reference to any full-fledged model*. This is a key problem, since without an explicit framework it becomes very difficult to discriminate between different views. A formal model has the advantage that different views of the world can be distinguished through various specific restrictions and assumptions in the model. It was extremely hard to find any academic literature on the issue of the optimal speed of internal devaluation in the strict technical sense. That is somewhat surprising given that the implicit *welfare function* is generally taken to be convex in lost output or unemployment (usually the squared deviations from respective equilibrium values), and there are benchmark, if not consensus, macro-models that relate output to wages and prices in the presence of nominal rigidities (Calmfors, 1998, 2001). We show that the combination of these simple, standard elements leads to important insights.[4]

So what is the core of the diametrically opposed Keynesian-type argument in favor of a trade-off between the external and internal balance? In that respect, Wren-Lewis (2012) states, "[t]he key macroeconomic question is how quick adjustment should be. Should competitiveness be restored quickly or slowly? Macroeconomics has a pretty clear answer which comes from the Phillips curve (of whatever variety) – *slow is much more efficient*" (emphasis added).

Wren-Lewis (2015) continues the argument with an eye on Latvia:

> Now this is all very stylised and partial equilibrium, but there is one important message that will survive complications. The Phillips curve tells *us that reducing the price level gradually over time is more efficient than doing it quickly* [emphasis added]. So even if you believe that you have to stick with a fixed exchange rate, a short sharp

[4] The discussion on monetary policy autonomy and structural reforms is characterized by a wide spectrum of conflicting views as described, for instance, by Duval and Elmeskov (2005) and Hochreiter and Tavlas (2005).

> recession is much less efficient than a more modest but prolonged recession. Thinking about the convexity of the social welfare function reinforces this point.
>
> As a result, even if output growth this year and next year was over 5% p.a., and the country achieves a sustainable level of competitiveness, I would not call the Latvian experience a success story. The competitiveness correction will have cost the economy a huge amount in wasted resources and unemployment misery, when it could have achieved this correction at a much reduced cost.[5]

We do not discuss how policy outside the country concerned could foster or even obviate the need for adjustment. For example, it has been argued that the (external and internal) adjustment by the deficit countries could be much reduced in a general equilibrium perspective by a symmetric adjustment in the surplus countries. We take external demand as given and thus do not consider these general equilibrium effects. Moreover, the external adjustment in the euro periphery would also be facilitated by a depreciation of the euro.

4. Gradual adjustment or cold turkey? A simple model

A critical problem of a country facing a 'sudden stop' in capital inflows is the optimal speed of adjustment. Countries receiving only limited financial support have little choice: when private capital inflows stop, and official financing is very limited, they have to adjust very quickly in the sense that the current account must almost instantaneously go into equilibrium. This was the case of the Baltic countries, as shown in Gros et al. (2014).[6] In the cases of the euro area countries under financial stress (like Greece, Ireland and Portugal), official financial support was relatively plentiful. There the speed of adjustment could be chosen by policy.

The main trade-off is simple: a quick elimination of the current account deficit has the advantage that it avoids the accumulation of further foreign debt (which tends to be expensive during a crisis). However, a quick turnaround in the current account requires an immediate

[5] For more on these arguments, see also "The case of Latvia's 'successful' (speedy) internal devaluation is not a model for the EZ periphery" (http://krugman.blogs.nytimes.com/2011/11/05/roubini-on-internal-devaluation/).

[6] Note in this context that the labour markets in the Baltics were rather flexible. See Purfield and Rosenberg (2010).

sharp reduction in domestic absorption, because it takes time to increase exports, especially if the country does not have a flexible exchange rate.

At first sight, a cold turkey approach could require a sharper fall in demand and GDP than a more gradual approach, which would give time for domestic prices and wages to adjust so that higher exports could contribute to closing the external deficit, thereby sustaining demand and employment later. But when one takes into account that wages are likely to adjust faster when domestic demand is very weak, it turns out that a front-loaded adjustment improves the prospects for the future on two accounts: foreign debt will be lower and wages will have fallen in the meantime, improving competitiveness.

Our model allows one to put this trade-off into more precise terms. The key result is that the choice is not between gradual or rapid adjustment. With an inter-temporal budget constraint the choice is only between adjustment today and adjustment tomorrow.

What remains, as an argument for a gradual (or rather slower) approach, is essentially that the future is discounted: future pain counts for less than pain today. Whether a gradual or a cold turkey approach is better depends on the strength of the discount on the future, relative to the price of the additional foreign debt incurred in a gradual adjustment (and the amount of future employment created by a quick adjustment).

The purpose of the simple model presented here is to formalize these relationships and the trade-off in a standard Keynesian-type model in which import demand depends on domestic absorption and domestic wages, which in turn react in a Phillips curve-type relationship to domestic demand (or rather the output gap). The model should be useful to describe the choices facing a member country of the euro area, or countries with a hard peg, like the Baltic countries whose currencies were linked to the euro.

4.1 The model

The purpose of our model is to capture the essential elements mentioned above. There are only two periods: the present and the future. The basic decision is thus only about the present period. We assume that policy-makers can somehow choose the state of the economy (in terms of the output gap) today. Once this decision has been taken, the starting position for the future

is determined, in the sense that any adjustment that has not been achieved today must be made at some time in the future.

In a multi-period model one could perhaps describe a richer time path for the adjustment. But we are interested in the policy choices made during the initial, crisis, period, because these are the policy choices that have attracted the most criticism. Our two-period model allows us to concentrate on this period. An additional reason for concentrating on the crisis period is that this is the time when the high cost of financing external deficits increases, which, in turn, increases the importance of the inter-temporal budget constraint, which we have emphasized. Hence, we leave the specification of a fully dynamic framework to future research.

We preferred to stick with a *one-country model* to describe the problem faced by a small country which cannot affect the overall equilibrium. This was the problem of the countries in the euro area periphery. A two-country EMU model would have necessarily implied an assumption about the path of the external current account of the entire euro area. If one assumed that the external current account of the entire euro area should remain constant, the result would have been clearly that the adjustment in the two countries has to be symmetric. But in reality the euro area went into a large surplus because the adjustment was, de facto, asymmetric. This was almost surely not optimal. But our focus is not on how to improve the design of EMU, but to deal with a practical issue in a very much second-best world. A two-country EMU model would also not have been appropriate for the BELL countries, which were not part of the euro area.

The model consists of four basic relationships or building blocks:

1. The current account at any point in time (which is equal to the trade balance plus the interest payments on the accumulated foreign debt) depends on domestic demand in the same period and wages in the past.
2. Wages are sluggish, but they react to unemployment or the output gap.
3. The country faces an inter-temporal budget constraint in the sense that the discounted sum of the trade accounts cannot surpass a certain limit (given by the availability of private and official financing).
4. Policy consists of minimizing a standard social loss function.

The basic working mechanisms start from the observation that income and the real exchange rate determine the current account. This is an empirical relationship that is quite robust and has been estimated very frequently. Although the precise parameter estimates vary a great deal there is general agreement in the literature about this specification.

Formally, the first building block is a simple equation for the current account (or rather the trade balance given past debt):

(1) $cab_t = -\beta y_t - \gamma w_{t-1}$,

where y denotes income (which can be understood as the deviation from the equilibrium or trend) and cab_t is the current account balance. Domestic income (in the current period) has an immediate impact on imports and hence the current account. Higher income of course leads to a deterioration of the current account (beta is positive and indicates the degree of openness of the economy).

Exports, however, react to (domestic) wages, w_t, only with a lag. The current account in the present period (cab_t) is therefore a function of wages in the previous period (w_{t-1}). The parameter gamma is also positive, as higher wages should mean lower exports. A higher value of gamma indicates a higher elasticity of export demand to the real exchange rate measured in relative wages (foreign wages are given and taken as constant).

The second building block concerns the adjustment of wages. They are assumed to follow a standard Phillips curve-type relationship in the sense that when income is high (the output gap is positive) wages increase:

(2) $w_t - w_{t-1} = \phi y_t$,

with ϕ representing the usual Phillips curve adjustment parameter, which is necessarily positive. Without loss of generality, the wage rate inherited from the previous period (w_{t-1}) can be normalized to zero.[7]

[7] This normalisation is not decisive. A higher wage inherited from the previous period is equivalent to starting with a current account deficit or some external debt. The initial conditions can thus be defined through the sum of the influence of several parameters. Nothing is thus determined by starting with past wages at the equilibrium level.

This mechanism for the adjustment in wages implies that the trade balance during the second period is given by:

(3) $cab_{t+1} = -\beta y_{t+1} - \gamma w_t = -\beta y_{t+1} - \gamma\phi y_t$.

The trade balance in any period is thus a function not only of current demand conditions, but also, indirectly, of past ones.

This facilitates the exposition of the third building block, namely the budget constraint. It takes the form of the condition that the discounted value of the external deficits incurred in the current period and the future period must equal zero:

(4) $\Omega cab_t + cab_{t+1} = 0$,

where the parameter Ω denotes the interest factor by which a deficit during the first period increases the overall foreign debt of the country at the end of the (first) period (Ω>1).

Using equations (1) and (3) in (4) shows how the output gaps in both periods are related, if the country has a ceiling on the foreign debt it can accumulate (or has to repay) over both periods:

(5) $0 = \Omega(\beta y_t + \gamma\phi w_{t-1}) + |\beta y_{t+1} + \gamma(\phi y_t + w_{t-1})|$.

The wage rate inherited from the past (w_{t-1}) has been made explicit in this equation to show that a high initial wage rate corresponds to a certain level of external debt. This can be seen by rewriting the inter-temporal budget constraint as:

(5)´ $-w_{t-1}(\Omega\gamma\phi + \gamma) \equiv D = \Omega\beta y_t + |\beta y_{t+1} + \gamma\phi y_t|$.

A high inherited wage rate ($w_{t-1} > 0$) is thus equivalent to having a certain amount of foreign debt ($D < 0$). We concentrate henceforth on the case of a country in need of adjustment in the sense that it enters the first period with a wage rate above the equilibrium level. The impact of this adjustment need on the external balance is summarized in the parameter D, which is therefore assumed to be negative.

D does not necessarily need to be negative. In the case of a country entering the current period with an undervalued wage rate ($w_{t-1} < 0$), D would be positive. More generally, D can be thought of as the sum of the total amount of financing available for the economy. In the case of countries under an adjustment program, D would be the sum of the amount of official

financing available during the present, i.e. the first period adjusted for the negative impact of high initial wages.

In the case of a country entering the first period already with foreign debt (and without the possibility of default), D would be negative even if the initial wage rate were at the equilibrium level ($w_{t-1} = 0$), because in this case the country would need to run (on average) current account surpluses over the current and future period. A default would reduce the current account surpluses the country has to run and would thus reduce the size of the adjustment. But even a total default, i.e. a complete elimination of the debt would not eliminate the need for external adjustment for a country with a large current account deficit (as was the case for Greece, whose external deficit had been over 10% of GDP).

At any rate, the focus of this paper is not the size of the adjustment effort, only its distribution over time, i.e. the choice between adjusting today or tomorrow. As will be shown below, the relative distribution of the adjustment over today and tomorrow is independent of the size of the initial debt level. Adding the possibility of default would thus change little in the analysis (except some constants).

For the remainder of this paper, we continue denoting D as the algebraic sum of the external financing available plus the impact of the initial conditions resulting from many factors, including potentially default, but also deviations of the initial wage rate from its equilibrium level of zero. A negative value of D denotes an initial adjustment need.

The trade-off between demand today and demand tomorrow (*ceteris paribus* the external debt ceiling) is summarized by

$$(6)\quad -(\Omega + \gamma\phi/\beta)y_t + D/\beta = y_{t+1}\ .$$

Higher demand today means lower demand tomorrow, because of both the cost of debt (omega>1) and the fact that higher demand today keeps wages up today and consequently reduces future exports.

This relationship is a key insight, because it shows that a gradual adjustment involves a trade-off between lower domestic activity today and tomorrow, not higher activity in all periods. The very term 'gradual adjustment' is actually not appropriate, since it suggests that somehow it is possible to have a higher average path for domestic demand than if the current account

adjusts immediately. The inter-temporal budget constraint implies that this is not possible: less adjustment today necessarily involves more adjustment tomorrow.

Inspection of relationship (6) shows that a steeper Phillips curve makes the trade-off between today and tomorrow steeper in the sense that a given adjustment today is followed by a stronger rebound in the second period.[8]

The impact of a higher degree of openness (higher beta) on the adjustment speed is less clear. A higher degree of openness means that income has to fall less for any given adjustment in the external balance. Nevertheless, this effect works in the same way in both periods and hence has little direct bearing on the choice of whether to adjust today or tomorrow. But it is clear that a higher degree of openness reduces the amount of income reduction that is necessary for any given amount of the initial adjustment need, as summarized by the parameter *D*. The higher the inherited adjustment need (or inherited debt), the lower will be the level of income (or output gap) that can be maintained (over both periods).

To simplify the notation, it is convenient to summarize the influence of various parameters in equation (6):

(7) $\left(D/\beta\right)-\Gamma y_t = y_{t+1}$,

with $\left|\Omega + \frac{\gamma\phi}{\beta}\right| \equiv \Gamma > 1.$

The composite parameter, capital gamma, is larger than one because the trade-off between today and tomorrow is greater than one to one. More specifically, 'austerity', interpreted as a reduction in current demand, yields a double benefit in the future: lower debt-servicing costs (because of a lower external deficit today) and higher exports (because wages will have become more competitive).

The two parameters γ and ϕ always appear together because the indirect impact of lower demand on the (future) current account depends on both the slope of the Phillips curve and the elasticity of exports with respect to wages.

---

[8] See Girardi and Paruolo (2013) for breaks in the shape of Phillips curves in euro area member countries before and after the onset of Economic and Monetary Union.

The constraint resulting from the external budget restriction and the working of the economy does not allow one, per se, to make any inferences about what policy should do. It only shows the trade-off between the two periods.

The fourth building block concerns the policy problem, which is to minimize the present value of the social loss from the (unavoidable) adjustment. The social loss is modeled in a standard way:

(8) $L = \Theta(y_t)^2 + (y_{t+1})^2$,

where Θ represents the degree of preference for the present of the social planner, with Θ>1.

Social loss functions also often contain inflation as a separate variable. However, in this simple set-up wage inflation is linked linearly to output and thus does need not to be considered separately.

In a crisis situation, when risk premia are high, one can assume that the market interest rate is higher than the social discount rate, and thus that Θ<Ω. It is under these circumstances that an adjustment program makes sense.

Note that it is implicitly assumed that y_t is a policy variable. The government of course cannot determine demand directly, but it is assumed here that fiscal policy (austerity) has a direct impact on demand.

The interest rate and time preference, of course, play an important role in any inter-temporal problem. That is the case in this model as well. We show later how any difference between the cost of funds for the country and the degree of time preference of the policy-makers affects the optimal time path.

Finally, we note that in any model with a Philips curve-type relationship one cannot emphasize only wages as the driver of the trade balance, since the Philips curve implies that wages are ultimately driven by domestic demand.

4.2 The optimal speed of adjustment

Minimizing the social loss with respect to y_t, subject to the inter-temporal budget constraint yields the standard first-order condition (FOC):

$$(9)\ \frac{\partial L}{\partial y_t} = \Theta 2(y_t) + 2(y_{t+1})\left[\partial y_{t+1} \big/ \partial y_t\right] = \Theta 2 y_t - 2\left[(D/\beta) - \Gamma y_t\right]\Gamma = 0\ ,$$

where the second equality sign is based on the relationship between income today and the future from equation (7). This can then be simplified to:

$$(10)\ y_t\left(\Theta + \Gamma^2\right) - \Gamma\left(D/\beta\right) = 0\ .$$

This equation can be solved for the income in the present period, which minimizes the social loss, $y_{t,min\ socloss}$:

$$(11)\ y_{t,\min socloss} = \frac{D\Gamma}{\beta\left(\Theta + \Gamma^2\right)}\ .$$

As expected, the best (or rather unavoidable) choice is to keep the current period income low if there is an initial over-valuation (D<0, or equivalently, if w_{t-1} > 0). The reverse is also true: a reduction of the debt, as in the Greek default (also euphemistically called private sector involvement or PSI) operation of 2012, would increase D (make it less negative), allowing for a higher income level to be maintained. Equation (11) confirms that for a country without any adjustment need (D=0), the output gap should be maintained at zero.

This result (11) only shows the amount of adjustment during the current period. The important issue to be addressed here, however, is the time path of adjustment, i.e. income today versus income tomorrow.

Substituting the result for the current income that minimizes the social loss (equation (10)) into the relationship between income today and in the future from the external budget constraint yields a result for the optimal path of adjustment, i.e. the difference between the output gap in the two periods:[9]

$$(12)\ y_{t+1} - y_{t,\min socloss} = \left(D/\beta\right) - y_{t,\min socloss}(\Gamma + 1) = \left(D/\beta\right) - \frac{D\Gamma(\Gamma+1)}{\beta\left(\Theta + \Gamma^2\right)} = \frac{D(\Theta - \Gamma)}{\beta\left(\Theta + \Gamma^2\right)} = \frac{D(\beta\left(\Theta - \Omega\right) - \gamma\phi)}{\Theta\beta^2 + \Omega^2\beta^2 + \gamma^2\phi^2 + 2\Omega\gamma\phi\beta}\ .$$

[9] One needs to use (11) in (7) and solve for y_{t+1} and y_t.

This equation confirms that the output gap should be zero in both periods if there is no initial adjustment need (D=0). But if there is an adjustment need (D<0), the numerator of the fraction in equation (12) suggests that the second period output gap is likely to be smaller (in absolute value) than the one in the first period. This implies that 'gradual' adjustment (defined as a policy under which the output gap is either stable or slowly increasing) is not an optimal policy. A sufficient, but not necessary condition for this result is that the cost of debt is higher than the discount factor in the social loss function ($\Omega > \Theta$). This is likely to be the case, since in a crisis risk premia are usually elevated for a country with an adjustment need (and *a fortiori* for a country that needs an adjustment program, which becomes necessary only when the risk premia are so high as to preclude market access).

The optimal policy described in equation (12) does not imply a cold turkey approach either if one defines cold turkey as a policy under which the output gap is so negative in the first (adjustment) period that it can later become positive on the back of very competitive wage rates. Equation (11) together with equation (7) implies that if D is negative, the output gap should be negative in both periods.

The main result is that even if one takes into account the convexity of social loss functions and a preference for later adjustment, one still finds that a certain initial overshooting in the adjustment remains preferable in the sense that the optimal output gap during the adjustment period is likely to be larger than the one in the following period.

Turning to the general case (in which D does not have to be negative), one can calculate the ratios of the output gaps in the two periods from the equations (11) and (7), which describe respectively social preferences and the inter-temporal trade-off resulting from the budget constraint:

$$(13) \Rightarrow \frac{y_{t+1}}{y_{t,\min socloss}} = \frac{D}{\beta y_{t,\min socloss}} - \Gamma = \frac{D}{\beta}\frac{\beta\left(\Theta + \Gamma^2\right)}{D\Gamma} - \Gamma = \frac{\left(\Theta + \Gamma^2\right)}{\Gamma} - \Gamma = \frac{\Theta}{\Gamma} = \frac{\Theta\beta}{\Omega\beta + \gamma\phi} \ .$$

This result shows that the adjustment should be distributed over the two periods in a proportion, which is determined by the ratio of the time preference parameter in the social loss function to the other parameters of the economy. The greater the weight is of the present in the social loss function (the higher capital theta), the more of the adjustment that will be postponed to the future. The level of external debt accumulation determines the level of

income that can be maintained in both periods, but it does not influence the ratio or the speed of adjustment.

The result (13) also implies that a higher cost of financing external deficits during the adjustment period (a higher value of capital omega) should encourage a stronger initial adjustment if *D* is negative. A more open economy (a higher value of beta) also implies an incentive to postpone the adjustment as well as a higher elasticity of export revenue with respect to wage costs (a higher value of gamma) or a steeper Phillips curve.

4.3 Alternative policy instruments

So far it has been assumed that the only policy instrument was 'austerity', i.e. depressing demand to lower imports and wages. The fiscal consolidation that had to be undertaken in the peripheral countries was in many cases achieved through tax increases. This raises the issue of which taxes should have been increased.

Increasing direct taxes could be seen as particularly inappropriate because exporters have to operate in the formal economy and might de facto be the one sector that actually feels an increase in effective taxation (whereas the non-tradable, often informal sector might be able to evade higher income tax rates). This would imply an increase in effective wage costs in the tradable sector, which could be modeled as $w(1+tax)$, where 'tax' indicates the increase in the tax rate during the second period. The external debt ceiling would then be satisfied by:

$$(5)' \quad -D = -\Omega\beta yt + (-\beta y_{t+1} - \gamma\phi y_t) - \gamma tax \ .$$

The trade-off between demand today and demand tomorrow (given the external debt ceiling), would then worsen to:

$$(6)' \quad -(\Omega + \gamma\phi/\beta)y_t + D/\beta - \gamma tax/\beta = y_{t+1} \ .$$

The fall in domestic demand, *ceteris paribus*, would have to be stronger. Still, this modification would not affect the incentives to push the adjustment into the future. The debt ceiling would be increased (in absolute value) by the impact of the shift of the implicit export supply equation, but the relationship between income today and tomorrow in equation (13) would not be affected.

The same should also hold true of any exogenous wage reduction. The labor market reforms contained in the adjustment program could be interpreted in two ways: some of the measures contained cuts in the public sector and in minimum wages (presumably, mainly for the private sector). Given that any change in minimum wages has an impact on other wages as well, this could be interpreted as an attempt to engineer an exogenous reduction in wages. This model, which should have allowed a higher demand level to be maintained in both periods, would not have affected the optimal speed of adjustment.

Other aspects of the labor market reforms, such as changes in wage bargaining systems, could be interpreted as making the Phillips curve steeper. As shown above, this would strengthen the case for an immediate adjustment in demand (or austerity), because the payoff from a stronger fall in demand today in terms of lower wages would be stronger the steeper the Phillips curve.[10]

4.4 Reducing the overall cost of adjustment

The overall cost of adjustment can be calculated in terms of the social loss function, which can be rewritten as:

$$(14)\quad L = \Theta(y_t)^2 + (y_{t+1})^2 = (y_t)^2\left[\Theta + \left({(y_{t+1})^2}\middle/{(y_t)^2}\right)\right].$$

Using the relationship (13), which determines the optimal speed of adjustment, and the formula for the loss-minimizing income in the current period (equation (11)) yields:

(14)′

$$L = (y_t)^2\left[\Theta + \left(\frac{\Theta}{\Gamma}\right)^2\right] = \left[\frac{D\Gamma}{\beta\,(\Theta + \Gamma^2)}\right]^2\left[\Theta + \left(\frac{\Theta}{\Gamma}\right)^2\right] = \left[\frac{D}{\beta}\right]^2\left[\frac{\Gamma}{(\Theta + \Gamma^2)}\right]^2\left[\frac{\Theta\,(\Gamma^2 + \Theta)}{\Gamma^2}\right]$$
$$= \left[\frac{D}{\beta}\right]^2\frac{\Theta}{(\Theta + \Gamma^2)} = \frac{D^2\Theta}{\Theta\beta^2 + (\Omega\beta + \gamma\phi)^2}$$

This equation can be used to determine the influence of parameters on the overall costs of adjustment.

Recall that $\Gamma = \Omega + \frac{\gamma\phi}{\beta} > 1$.

---

[10] Vogel (2014) derives a similar impact of non-tradable and tradable sector reform on external accounts.

It follows that a higher degree of openness (a higher beta) makes the overall adjustment less costly. A steeper Phillips curve (or a more elastic supply curve of exports) also makes the overall adjustment less costly.

This might explain, at least partially, the different choices of Latvia and Portugal, for example. Latvia is much more open than Portugal and its wages reacted strongly to the crisis (Gros et al., 2014).

Moreover, the emphasis on labor market reforms in the euro area adjustment programs was justified in the sense that a steeper Phillips curve reduces the cost of adjustment. Yet it is also clear from our analysis that labor market reforms can only reduce, not eliminate, the adjustment costs that arise when the economy has to switch resources from the domestic to the tradables sector.

Whereas the main contribution of this paper is novel, namely to derive an optimal adjustment path within a currency union when a country experiences a sudden stop in capital flows and has to adjust externally, there are a plethora of more general relation instances relating this paper to the literature. We would like to mention only two of them. Firstly, it is important to note that in the seminal literature it has sometimes been argued that both drivers of less costly overall adjustment tend to reinforce each other, i.e. a higher degree of openness leads to a steeper Phillips curve (Dornbusch and Krugman, 1976, pp. 570-573, Romer, 1993, and Rogoff, 2004).

However, this finding appears to depend on the exchange rate regime. Openness tends to increase the slope of the Phillips curve, especially under flexible exchange rate conditions (Lane, 2007). Moreover, the previous literature on the link between openness and sacrifice ratios produced mixed results. Temple (2002) does not detect any evidence of a cross-country correlation between the share of imports in GDP and common measures of sacrifice ratios. Daniels, Nouzard and Vanhhose (2005) identify such a relationship by augmenting Temple's regressions with central bank independence variables. Razin and Lougani (2005) estimate a positive impact of openness on the sacrifice ratio when the trade intensity variable is

substituted by indexes of institutional barriers to trade.[11] Hence, we did not formalize this interaction in our model.

However, among the benchmark practice cases of our model there are the East German "Laender" after reunification and entering into a currency union with Western Germany (Wolf, 2011). In a sense the new German Laender faced even more significant challenges than Greece since the entire economic system had to change in a few years and former markets in Eastern Europe disappeared. While these differences constrain the comparability with Greece facing competitiveness challenges in broader terms, the case of German reunification provides insights into the more narrow question whether significant competitiveness problems as measured by high relative unit labor costs can be addressed within the context of a monetary and customs union in a larger, less-open economy, which is the specific focus of our paper (Wolf, 2011).

Secondly, there is a related public choice literature that assesses whether (a) more openness leads to higher reform intensity and (b) whether the latter is higher within or outside EMU. This literature includes much of the "structural reforms/steepness of the Phillips curve/openness" debate led by us in this section. A stronger exposure of firms to international competition is often assumed to increase the pressure and the incentives for market-oriented reforms. In open economies, output and employment tend to be highly responsive to price competitiveness so that there are stronger incentives to reform. The key insight borrowed from the public choice literature on openness, the size of governments and reform efforts (Rodrik, 1996) is that more open economies are more likely to implement rule-based exchange rate stabilization and, hence, generally implement fewer reforms (Belke, Herz and Vogel, 2006, Calmfors, 1998, 2001). In that sense, a lack of reform within EMU is the consequence of self-selection of a country into EMU.

[11] For more details see Rogoff (2006) and Borio and Filardo (2007).

Conclusions

This paper provides a framework to think about the optimal path of adjustment for a country that starts the current period with either a large foreign debt or a wage rate above the level that would allow for external balance at full employment. Modeling this situation while taking into account the inter-temporal budget constraint allows one to show which parameters would justify a quick adjustment.

The question of the optimal path for prices and wages involves striking a balance between two apparently conflicting objectives. One is to restore competitiveness and the external balance, focusing on exports as the driver of growth. The other is the loss of output and employment that results from depressing demand during the adjustment.

Most policy evaluations of the adjustment process in the euro periphery have concentrated on the high cost in terms of unemployment, arguing that a slower pace of adjustment would have involved lower costs. This line of argument, however, does not take into account the inter-temporal budget constraint, i.e. that a slower adjustment (in terms of less unemployment and hence less of a fall in wages) also leads to a slower external adjustment, burdening the country with a higher foreign debt. A simple model with an inter-temporal budget constraint shows immediately that gradual adjustment is not a free lunch, but has its costs in higher future debt service.

One key result of our simple model is that a fairly rapid adjustment is optimal even allowing for the usual convexity of social loss functions in the output gap and a preference for later adjustment. Under the most likely parameter constellations, we find that bringing most, but not all, of the adjustment forward would be a policy that minimizes the social loss.

Our model thus supports the general thrust of the adjustment program in the euro area periphery.[12] A front-loaded fiscal adjustment was needed not only because of unsustainable initial positions, but also because a strong dose of initial austerity tended to support the wage

[12] Based on a closer analysis of the effects of capital variations on net foreign asset positions due to stock or debt market crises, Camarero, Carrion-i-Silvestre and Tamarit (2015) arrive at similar conclusions. Their results point to the "need of abrupt adjustments, either led by the markets or promoted by pro-active policy measures, in order to offset external disequilibria". They also support the surveillance measures proposed by the European Commission.

adjustment, thereby accelerating the external adjustment and thus leading to a lower debt level that the country had to support at the end of the adjustment period. The most successful example of this approach was of course Latvia, where the fall in GDP was sharpest, but also the shortest. In Portugal, Spain and Italy, by contrast, the initial fall in GDP was much more contained, but the recovery also took much longer. It seems that a quick adjustment did pay off.

References

Alcidi, Cinzia, Ansgar Belke, Alessandro Giovannini and Daniel Gros (2016), "Macroeconomic Adjustment Programmes in the Euro Area: An Overall Assessment", *International Economics and Economic Policy*, Vol. 13, No. 3, pp. 345-358.

Barkbu, Bergljot, Barry Eichengreen and Ashoka Mody (2012), "Financial Crises and the Multilateral Response: What the Historical Record Shows", *Journal of International Economics*, Vol. 88, No. 2, pp. 422-435.

Belke, Ansgar, Anne Oeking and Ralph Setzer (2015), "Domestic Demand, Capacity Constraints and Export Dynamics: Empirical Evidence for Vulnerable Euro Area Countries", *Economic Modelling*, Vol. 48, pp. 315-325.

Belke, Ansgar, Bernhard Herz and Lukas Vogel (2006), "Exchange Rate Regimes and Reforms – A Panel Analysis for the World versus OECD Countries", *International Finance*, Vol. 9, pp. 317–342.

Biggs, Michael and Tom Mayer (2014), "Latvia and Greece: Less is More", CEPS High Level Brief, Centre for European Policy Studies, Brussels, 12 February.

Borio, Claudio and Andrew Filardo (2007), "Globalisation and Inflation: New Cross-country Evidence on the Global Determinants of Domestic Inflation", Working Paper Series, No. 227, BIS, Bank for International Settlements, Basle.

Bornhorst, Fabian and Marta Ruiz Arranz (2013), "Indebtedness and Deleveraging in the Euro Area", Euro Area Policies – Article IV Consultation, IMF Country Report No. 13/232, International Monetary Fund, Washington, D.C.

Calmfors, Lars (1998), "Macroeconomic Policy, Wage Setting and Employment - What Difference Does the EMU Make?", *Oxford Economic Policy Review*, Vol. 14, pp. 125-151.

Calmfors, Lars (2001), "Unemployment, Labor-Market Reform and Monetary Union", *Journal of Labor Economics*, Vol. 19, pp. 265-289.

Camarero, Mariam, Josep Lluís Carrion-i-Silvestre and Cecilio Tamarit (2015), "Testing for External Sustainability under a Monetary Integration Process - Does the Lawson Doctrine Apply to Europe?", *Economic Modelling*, Vol. 44, pp. 343–349.

Copelovitch, Mark, Jeffry Frieden, and Stefanie Walter (2016), "The Political Economy of the Euro Crisis, *Comparative Political Studies, Vol.* 49(7), pp. 811-840.

Daniels, Joseph, Farrokh Nourzad and David D. Vanhoose (2005), "Openness, Central Bank Independence and the Sacrifice Ratio", *Journal of Money, Credit and Banking*, Vol. 37, pp. 371-379.

Dornbusch, Rudiger, and Paul Krugman (1976), "Flexible Exchange Rates in the Short Run", *Brookings Papers on Economic Activity,* No. 3, 537-575.

Duval, Romain and Jørgen Elmeskov (2005), "The Effects of EMU on Structural Reforms in Labour and Product Markets", OECD Economics Department Working Papers 438, Paris.

Fidrmuc, Jan (2003), "Optimal Path into the EMU: Big Bang or Gradualism?" In: Karl Aiginger and Gernot Hutschenreiter (eds.): *Economic Policy Issues for the Next Decade*, Kluwer Academic Publishers, Boston, pp. 123-140.

Furceri, Davide and Aleksandra Zdienicka (2015), "The Euro Area Crisis: Need for a Supranational Fiscal Risk Sharing Mechanism?", *Open Economies Review*, Vol. 26, pp. 683-710.

Giavazzi, Francesco and Luigi Spaventa (2011), "Why the Current Account May Matter in a Monetary Union, Lessons from the Financial Crisis in the Euro Area", in: Beblavý, Miroslav (ed.), *The Euro area and the Financial Crisis*, Cambridge University Press, Cambridge.

Girardi, Riccardo, Paruolo, Paolo (2013), "Wages and Prices in Europe before and after the Onset of the Monetary Union", *Economic Modelling*, Vol. 35, pp. 643–653.

Gros, Daniel and Cinzia Alcidi (2015), "Country Adjustment to a 'Sudden Stop': Does the Euro Make a Difference?", *International Economics and Economic Policy*, Vol. 12, No. 1, pp 5-20.

Gros, Daniel, Cinzia Alcidi, Ansgar Belke, Leonor Coutinho and Alessandro Giovannini (2014), "*Implementation of the Macroeconomic Adjustment Programmes in the Euro Area: State of Play*", CEPS e-Book, Brussels: Centre for European Policy Studies.

Hochreiter, Eduard and George S. Tavlas (2005), "The Two Roads to the Euro: The Monetary Experiences of Austria and Greece", In Susan Schadler (Ed.), *Euro Adoption in Central and Eastern Europe – Opportunities and Challenges*, Washington/DC: International Monetary Fund.

IMF (2011), "Regional Economic Outlook, Strengthening the Recovery", World Economic and Financial Surveys, International Monetary Fund, Washington, D.C.

IMF (2012), "Greece: Request for Extended Arrangement under the Extended Fund Facility", IMF Country Report No. 12/57, International Monetary Fund, Washington, D.C., March.

IMF (2013), "Greece: Fourth Review under the Extended Arrangement", IMF Country Report No. 13/241, International Monetary Fund, Washington, D.C.

IMF (2013b), "Toward a Fiscal Union for the Euro Area: Technical Background Notes", International Monetary Fund, Washington/DC, September.

Juncker, Jean-Claude, Donald Tusk, Jeroen Dijsselbloem, Mario Draghi and Martin Schulz (2016), "Completing Europe's Monetary and Economic Union", Report, European Commission, Brussels.

Kang, Joong Shik and Jay Shambaugh (2013), "The Evolution of Current Account Deficits in the Euro Area Periphery and the Baltics: Many Paths to the Same Endpoint", IMF Working Paper No. 13/169, International Monetary Fund, Washington, D.C.

Kang, Joong Shik and Jay Shambaugh (2014), "Progress towards External Adjustment in the Euro Area Periphery and the Baltics", IMF Working Paper WP/14/131, International Monetary Fund, Washington, D.C.

Lane, Phillip (1997), "Inflation in Open Economies", *Journal of International Economics*, Vol. 42, pp. 327-347.

Mundell, Robert A. (1961), "A Theory of Optimum Currency Areas", *American Economic* Review, Vol. 51, pp. 509-517.

Purfield, Catronia and Christoph B. Rosenberg (2010), "Adjustment under a Currency Peg: Estonia, Latvia and Lithuania during the Global Financial Crisis 2008–09", IMF Working Paper WP/10/213, International Monetary Fund, Washington, D.C.

Razin, Assaf and Prakash Loungani (2005), "Globalization and Inflation-output Tradeoffs", NBER Working Paper, No. 11641, National Bureau of Economic Research, Cambridge/MA.

Rodrik, Dani (1996), "Understanding Economic Policy Reform", *Journal of Economic Literature*, Vol. 34, pp. 9-41.

Rogoff, Kenneth S. (2004), "Globalization and Global Disinflation", In Federal Reserve Bank of Kansas City, *Monetary Policy and Uncertainty: Adapting to a Changing Economy*.

Rogoff, Kenneth S. (2006), "Impact of Globalization on Monetary Policy", Proceedings of the Federal Reserve Bank of Kansas, City Jackson Hole Conference, 2006, pp. 265-305.

Romer, David (1993), "Openness and Inflation: Theory and Evidence", *Quarterly Journal of Economics*, 108, pp. 869-903.

Saint-Paul, Gilles (2003), "The Political Economy of Labour Market Institutions", Oxford University Press, Oxford Scholarship Online, November.

Shambaugh, Jay (2012), "The Euro's Three Crises", *Brookings Papers on Economic Activity*, Vol. 44, No. 1, pp. 157–231.

Sippola, Markku, 2011), "Internal Devaluation and the Baltic Labour Market", 3rd International Conference "Economies of Central and Eastern Europe: Convergence, Opportunities and Challenges", 12 – 14 June 2001, Tallinn, Estonia.

Temple, Jonathan (2002), "Openness, Inflation and the Phillips Curve: A Puzzle", *Journal of Money, Credit and Banking*, Vol. 34, pp. 450-468.

Tressel, Thierry (2012), "The Eurozone Crisis and the Sovereign-Bank Nexus: The Case for a Eurozone Banking Union", Selected Issues Paper, Euro Area Policies – 2012 IMF Article IV Consultation, International Monetary Fund, Washington, D.C.

Tressel, Thierry and Shengzu Wang (2014), "Rebalancing in the Euro Area and Cyclicality of Current Account Adjustments?", IMF Working Paper WP/14/130, International Monetary Fund, Washington, D.C.

Tressel, Thierry, Shengzu Wang, Joong Shik Kang and Jay C. Shambaugh (2014), "Adjustment in Euro Area Deficit Countries: Progress, Challenges, and Policies", Staff Discussion Note, SDN/14/7, International Monetary Fund, Washington, D.C.

Vogel, Lukas (2012), "Structural Reforms, Fiscal Consolidation and External Rebalancing in Monetary Union: A Model-based Analysis", *Economic Modelling*, Vol. Volume 29, No. 4, pp. 1286–1298.

Vogel, Lukas (2014), "Nontradable Sector Reform and External Rebalancing in Monetary Union: A Model-based Analysis", *Economic Modelling*, Vol. 41, pp. 421-434.

Wasmer, Etienne (2012), "An Introduction to the Special Feature Section: Price, Wage and Employment Adjustments in 2007–2008 and Some Inference for the Current European Crisis", *Labour Economics*, Vol. 19, pp. 769-771.

Wolf, Holger (2011), "Internal Devaluation in a Monetary Union", *International Economics and Economic Policy*, Vol. 8, pp. 3-6.

Wood, Richard (2014), "Eurozone: Competitiveness Indicators and the Failure of Internal Devaluation", *EconoMonitor*, February 3.

Wren-Lewis, Simon (2012), "What Is It about Latvia?", *Mainly Macro* (blog), June (http://mainlymacro.blogspot.co.uk/2012/06/what-is-it-about-latvia.html).

Wren-Lewis, Simon (2015), "Greece: A Simple Macroeconomic Guide", *Mainly Macro* (blog), February (http://mainlymacro.blogspot.de/2015/02/greece-simple-macroeconomic-guide.html).

Zemanek, Holger, Ansgar Belke and Gunther Schnabl (2010), "Current Account Imbalances and Structural Adjustment in the Euro Area", *International Economics and Economic Policy*, Vol. 7, pp. 83-127.