# The trinity of wage setting in EMU: a policy proposal

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Diverging labor cost developments are often considered to be one of the most important factors that led to large current account imbalances in the euro area (EA) in the run-up to the global financial crisis. It has also been shown that wage growth differentials have significantly lowered the co-movement of EA countries' business cycles – the most widely used meta-criterion for optimum currency areas. Against this background, this paper develops a wage-setting benchmark that aims to keep the economy in internal equilibrium and to maintain price stability, while it also exhibits the capacity to correct for external imbalances. The proposed wage benchmark is very simple and may serve as an anchor for the macroeconomic dialogue in the Economic and Monetary Union (EMU). In order to demonstrate the potentially beneficial effects of such a wage benchmark we present some simulations showing how current account balances and labor costs would have developed across EA countries if the rule had served as a benchmark already in the run up to the crisis.

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## Introduction

The sovereign debt crisis in the euro area has brought back the issue of optimum currency areas (OCA) to the center of discussion both in policy circles and in academia. In particular, the question of possible rebalancing mechanisms in case of internal misalignments in a currency area became increasingly relevant. The first contributions to the OCA literature suggested various prerequisites to ensure a high degree of business cycle synchronization among member states (e.g. economic openness, similarities in inflation rates), or alternatively, appropriate adjustment mechanisms in the case of asymmetric shocks (e.g. price and wage flexibility, labor mobility, fiscal integration etc.). The underlying argument is simple: If business cycles across countries in a currency union diverge, the common monetary policy by the ECB cannot be optimal for all currency union members. This can yield situations in which asset price and demand booms in some economies are accompanied by excessively suppressed demand in others, very much as observed during the early years of the euro area.

Against this background, it seems crucial to examine possible policy options to increase the co-movement of business cycles among EMU members, and to avoid the associated build-up of potentially disastrous external imbalances between currency union members. Especially prior to the introduction of the euro, a large strand of literature examined potential determinants of business cycle synchronization. In particular, the degree of openness or, more precisely, bilateral trade relations between two countries has been found to be the most important determinant of business cycle co-movement (Frankel and Rose, 1998; Inklaar, Jong-A-Pin and de Haan, 2008; Baxter and Kouparitsas, 2005; Gächter and Riedl, 2014).

Furthermore, several other factors have been suggested in the literature to be potentially important for business cycle synchronization, such as fiscal policy, financial integration and industrial specialization (amongst others). Those latter determinants, however, are typically found to be either non-robust or of less importance than bilateral trade relations among member countries. While both wage and price flexibility as well as labor mobility has been highlighted by the early OCA literature as being important to adjust in the case of exogenous demand shocks within a currency area, wage developments as a potential source of such demand shocks, i.e. as a source rather than a consequence of the business cycle, has been disregarded in empirical studies until recently. Gächter, Gruber and Riedl (2015) show, however, that wage growth differentials across countries significantly and causally reduce business cycle co-movement within a common currency area, while such divergences do not play any important role for countries with sovereign money. Remarkably, according to their results, the economic significance of the effect might even exceed the impact of bilateral trade relations in the case of the euro area. Their results suggest that a certain degree of wage coordination among EMU member

states could significantly reduce the cost of a common currency by increasing business cycle synchronization across countries.

Those recent research findings as well as the imbalances that built up within the euro area prior to the crisis naturally raise the question about possible wage coordination mechanisms across EMU countries. While this paper does not put into question the free collective bargaining arrangements on the national level, i.e. tariff autonomy in negotiations between employers' and employees' organizations, we nevertheless develop a country-specific wage growth benchmark as a rough guidance for wage bargaining. The literature on optimal wage rules in general and currency unions in particular is relatively scarce. Most of previous papers are based on the so-called Golden Rule that proposes wage growth equal to (medium-term) productivity growth plus the inflation target of the ECB. While such an approach is useful to stabilize the functional income distribution, it does not contain any mechanism to adjust to external shocks or imbalances. Our benchmark, on the contrary, extends the Golden Rule by an external correction term and thereby combines three crucial economic policy targets. This "trinity" of wage setting aims at (i) internal stability by stabilizing the functional income distribution, (ii) price stability as defined by the ECB price stability target, and (iii) external stability as measured by the current account balance.

The paper is structured as follows. Section two gives a short literature review on why wage setting plays a crucial role in EMU and discusses previously proposed wage setting benchmarks. Section three derives an optimal policy rule by extending the Golden Rule by an external correction term. In section four, we show some simulations how wages and current account balances would have developed under the assumption of a (i) Golden Rule scenario, and the proposed (ii) trinity benchmark scenario. Finally, section five draws some conclusions.

# 2 Literature review

## 2.1 Wage setting and macroeconomic imbalances in EMU

By adopting a common currency, member countries irrevocably fix their exchange rates and give up their control over monetary policy decisions, which is an important economic policy instrument outside a currency union to adjust both to internal (inflation) and external (current account) imbalances. Wage and price flexibility has indeed been proposed as a main prerequisite for successful monetary integration already in the early OCA literature (De Grauwe, 2009). On the one hand, in the case of an exogenous demand shock in one country, relative wage and price adjustment is the only instrument to change the real exchange rate in order to move back to equilibrium. On the other hand, however, Gächter, Gruber and Riedl (2015) highlight the role of wage divergence as a source rather than a consequence of business cycle developments. More precisely, they argue that wage growth differentials across

countries in the run-up to the crisis have led to considerable business cycle divergence. Thus, wage dispersion across countries has not contributed to a re-adjustment of business cycles, but rather acted as a disequilibrating mechanism by triggering domestic demand shocks, eventually leading to lower business cycle co-movement and large current account imbalances.

While considerable wage divergence has been observed in the early years of EMU, the underlying factors driving this development are still controversial. In essence, previous literature proposes two different, but not mutually exclusive views on why wage divergence occurred and, in a further step, external imbalances built-up in the first decade of EMU (Johnston and Regan, 2014). The first perspective highlights the role of the current account, as institutional differences between export-led and domestic demand-led countries gave rise to a loss of competitiveness of the latter, and subsequently, caused high and increasing current account deficits in the periphery. According to this view, export-led core countries typically exhibit corporatist wage-bargaining institutions that favored significant wage moderation, while such coordinated wage bargaining systems are non-existent in peripheral (domestic demand-led) countries. This institutional perspective therefore highlights the role of the current account, while financial inflows to peripheral countries are seen as a consequence of these developments. The second perspective, on the contrary, views the loss of competitiveness and the deterioration of current account balances as a consequence of considerable financial inflows to peripheral countries. It is argued that imbalances started in the financial account, as the convergence in nominal exchange rates and interest rates led to significant reductions in borrowing costs in peripheral countries, giving rise to credit-driven consumption and real estate booms, which further increased wages and inflation. For the case of the euro area, it seems likely that both perspectives played a considerable role in the build-up of imbalances prior to the crisis. Irrespective of the dominant driving factor, however, wage developments are the crucial factor in both theories, and further reinforced external imbalances by two self-amplifying transmission channels (Gächter, Gruber and Riedl, 2015). Higher wages do not only boost domestic demand directly by increasing households' disposable income, but also lower domestic real interest rates due to increasing inflation rates, and thus, stimulate investment and domestic demand also indirectly, thereby further amplifying the original inflation differentials.

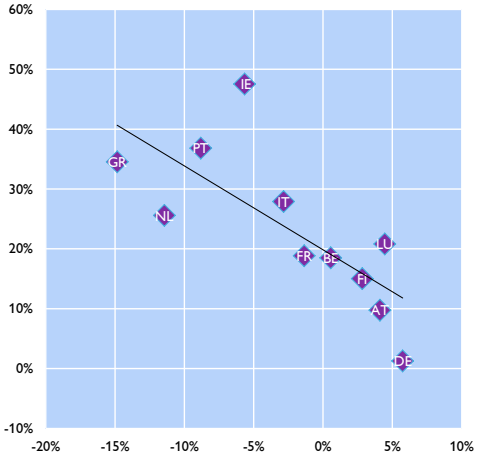
Higher wage growth ultimately leads to a real appreciation and lowers the country's competitiveness, which should theoretically have an equilibrating effect due to lower external demand (and some substitution effect from domestic to foreign goods). Empirical data however suggest that this external effect was rather weak in the short-term, while the internal effect – higher wages leading to lower real interest rates and a domestic demand boom – worked instantaneously. Put another way, the equilibrating external effect was much weaker than the still disequilibrating inter-

nal effect prior to the crisis, leading to further divergence of euro area business cycles and external balances.[2]

*Chart 1: External and domestic effects of wage divergence in a currency union*

**External view: wages and external demand**

*Change in nominal unit labor costs (NULC), 1999–2008*




*Current account balance, 2008*

**Internal view: wages and domestic demand**

*Change in nominal unit labor costs (NULC), 1999–2008*


*Real GDP growth, 1999–2008*

*Source: European Commission, AMECO.*

Chart 1 presents a first descriptive view of the consequences of diverging wage developments in the early years of the currency area (excluding Luxembourg as a notorious outlier but including Greece). In the right-hand chart, it is clearly observable that stronger increases in nominal unit labor costs (NULC) were associated with considerably higher GDP growth. This stylized fact does not imply any causal effect, as higher inflation rates (and a real appreciation against other euro area countries) could also be due to the well-known Balassa-Samuelson effect in catching-up economies. The fact that inflation differentials were driven by wage growth in the non-tradeable sector (which typically exhibits relatively low productivity gains) in those economies, however, does not support the view that real appreciations in the periphery were caused by the Balassa-Samuelson effect. On the contrary, Johnston et al. 2014 renders some evidence that domestic demand booms driven by higher wage increases indeed played an important role for the build-up of imbalances. This line of argument is further strengthened in the left-hand chart. Rising nominal unit

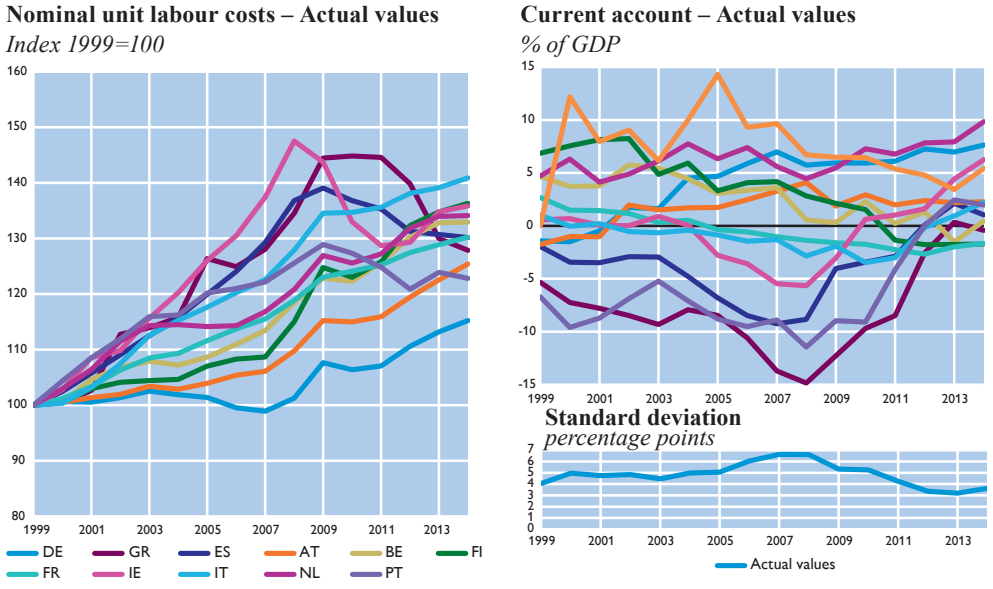
[2] For a more extensive discussion on this issue and related stylized facts, see Gächter, Gruber and Riedl (2015).

labor costs are associated with higher current account deficits (i.e. higher external imbalances) at the peak of the crisis, which further supports the argument of considerable domestic demand booms in the periphery. The lack of wage coordination among EMU countries is therefore likely to have played a considerable role in the build-up of internal and external imbalances.

## 2.2 Wage setting benchmarks

Against the backdrop of the important role of wages for the functioning of EMU, the discussion about possible benchmarks for optimal wage policies is relatively scarce. A reason for this might be the fact that that there has been a rather broad consensus favoring the Golden Rule for wage setting, which suggests that nominal wages should increase in line with medium run productivity growth plus the inflation target of the ECB (Koll, 2005 and 2013, Watt, 2006). This benchmark is widely considered to be a stabilizing anchor for wage setting, while simultaneously having the capacity to generate price stability. Consequently, this rule has also been adopted in the macroeconomic dialogue (Koll, 2013; Collignon, 2009) and countries where advised to pursue wage policies that ensure that this norm is followed.

*Chart 2: The actual picture*




*Source: AMECO Database, authors' calculations.*

Wage developments in EMU member states, however, significantly deviated from the Golden Rule. Chart 2 is somewhat a close-up of the left-hand chart in

chart 1, but also reports developments over time. It shows nominal unit labor costs in the left-hand chart, the current account in the right-hand top chart and the dispersion of the current account measured by the standard deviation at the bottom of the right-hand chart. Nominal unit labor costs strongly diverged across countries and only wage developments in France (see turquoise line) tracked the wage growth rates recommended by the Golden Rule quite closely. Apparently these divergences also went along with a strong divergence in the respective current account positions of the corresponding countries.

These large and persistent imbalances in EMU have even raised concerns whether the full application of the Golden Rule would have been sufficient since it lacks an adjustment mechanism to external imbalances. Indeed, we will show below that even the adherence to the Golden Rule, while mitigating the build-up of external imbalances, would still not have prevented the accumulation of considerable imbalances in EMU.

The most prominent proposal for an extension of the Golden Rule has been formulated by Collignon (2012 and 2013). He recommends extending the Golden Rule by an adjustment term that corrects for excessive deviations of the national return to capital compared to the currency union's average. Given that the rate of return indicates the attractiveness of production for regional investment this should help balancing capital and thus current accounts. Collignon's proposal is a very timely and welcome extension of the Golden Rule since it has the capacity – at least in principle – to account for external imbalances. However, there are some objections with regard to the type of correction. First, the calculation of the rate of return requires knowledge of the stock of capital which is extremely difficult to measure. Second, the correction mechanism is completely unanchored and thus implicitly assumes that the average return to capital in the currency union is "correct". If this is not the case, the correction might even shift the entire union into a wrong direction.

Stockhammer and Onaran (2012) proposed a different mechanism. They also extend the Golden Rule by a correction-term. In their case, however, the correction is based on the deviation of national nominal unit labor costs from the average of unit labor costs in the currency union. While this approach in principle has the capacity to overcome the first major problem of Collignon's approach, the correction term is still completely unanchored. Once again, if average unit labor costs of the union are out-of-equilibrium, the entire system would be pushed to an unsustainable level of unit labor costs. Assume for instance an asymmetric labor market shock in a large economy that transitorily fuels (slows) nominal unit labor costs. The increase (decrease) is justified in the country in which the shock has occurred but it affects overall average unit labor costs. If the rule was to be applied strictly this subsequently would trigger a hike (slowdown) in the nominal unit labor costs in all other countries and eventually would result in a process of permanent wage inflation (deflation). Thus, an optimal benchmark for wage growth would require some form of anchoring. We will discuss such a rule in the next chapter.

# 3 Is there an optimal rule of wage growth?

The existing proposals for wage benchmarks discussed above primarily aim at fixing the functional distribution of income, i.e. the distribution of income between capital and labor. The reason for this is fairly simple: From a theoretical viewpoint, when the economy has reached its steady state and grows at its potential, the capital intensity remains constant, which means that the functional distribution of income should also remain constant. Any other scenario, on the contrary, will ultimately lead to a stagnationist outcome.[3] For these reasons, a stable functional distribution of income will also serve as a reference value for our considerations. Put differently, an optimal wage rate should keep the economy at its equilibrium (steady state) level and thus should fix the functional distribution of income, although external disequilibria must also be taken into account.

## 3.1 Deriving the Golden Rule of wage bargaining

In order to derive the Golden Rule of the macroeconomic dialogue as recommended by Koll (2005) or Watt (2007), we define real wages with $W$, real output with $Y$ and prices with $P$. In this case, the wage share is defined by $W/Y$ (it should be noted that this is also equivalent to real unit labor costs). We thus can write:

$$\Delta \ln\left(\frac{W_t}{Y_t}\right) = ln\left(\frac{W_t}{W_{t-1}}\right) - ln\left(\frac{Y_t}{Y_{t-1}}\right) \tag{1}$$

From our considerations above we know that we want to fix the wage share (and by implication the profit share). Thus, in the optimum, $\Delta \ln\left(\frac{W}{Y}\right) = 0$ which leads us directly to the optimal growth rate of real wages:

[3] Classical economics has been full of models with a changing distribution of functional income that ultimately run into stagnation as e.g. the models of David Ricardo or Karl Marx (Hein, 2004; Piketty, 2014). More recently, Piketty (2014) observed that many industrialized economies do not have a constant capital coefficient (or capital-income-ratio) which accordingly leads to destabilizing inequality and eventually even into a stagnationist scenario. However, this has no implication with regard to the optimality of the Golden Rule of wage setting. Given that the profit share is identical to the product of the capital-income-ratio and the profit rate (i.e. $\frac{\Pi}{Y} = \frac{K}{Y}\frac{\Pi}{K}$), by fixing the profit share ($\frac{\Pi}{Y} = \frac{K}{Y}\frac{\Pi}{K}$) any increase in the capital-income-ratio ($\frac{K}{Y}$) will inevitably lead to a fall of the profit rate. Under normal circumstances this would again – sooner or later – put a halt to the expansion of the capital-income-ratio. Given that equation (2) above by implication also means that not only wages but also profits grow along productivity. Thus, the whole process will stop when all variables (Π, K and Y) grow at the same rate as can be directly deduced from the definition of the wage share above.

$$ln\left(\frac{W_t}{W_{t-1}}\right) = ln\left(\frac{Y_t}{Y_{t-1}}\right) \tag{2}$$

Subsequently, it is a small step to arrive at an optimal rate for nominal wage growth. Adding the change of prices – inflation – at both sides of the equation renders the following optimal rate of nominal wage growth:

$$ln\left(\frac{W_t}{W_{t-1}}\right) + ln\left(\frac{P_t}{P_{t-1}}\right) = ln\left(\frac{Y_t}{Y_{t-1}}\right) + ln\left(\frac{P_t}{P_{t-1}}\right) \tag{3}$$

This allows us to contemplate another fundamental relationship that will prevail in an equilibrium situation. Assuming mark-up pricing[4] and further assuming that real wages grow along productivity growth (as stated in equation (2)) it is easy to see that prices will grow with whatever they are assumed to grow throughout the wage setting process. Put differently, if we substitute price growth on the right side of equation (3) with the price target of the currency union's central bank, we arrive in a situation in which price stability is given.

$$ln\left(\frac{W_t}{W_{t-1}}\right) + ln\left(\frac{P_t}{P_{t-1}}\right) = ln\left(\frac{Y_t}{Y_{t-1}}\right) + ln\left(\frac{P_t^{Target}}{P_{t-1}^{Target}}\right) \tag{4}$$

## 3.2 A trinity of targets

While the Golden Rule of wage bargaining assures that the economy stays in internal equilibrium (if it has reached one), it is not clear whether the economy has simultaneously reached an external equilibrium position. This is no problem if the economy exhibits a free floating exchange rate, because excessive deviations of the external position can be adjusted by fluctuations of the exchange rate. However, as soon as a country enters a currency union and fixes its exchange rate, this adjustment mechanism is no longer available. In a fixed exchange rate regime, the Golden Rule of wage setting is thus turned into a knife-edged wage rule that only applies if (1) all countries entered the currency union at an equilibrium level of the real effective exchange rate and (2) no asymmetric shock occurs thereafter (see chapter 4 for a simulation of the counterfactual).

[4] In principle, there are two circumstances in which a deviation from mark-up pricing can occur. Either there is an adjustment regarding a change in the capital intensity (e.g. a catching up process). In this case, an adjustment of the mark-up could be warranted. Another possibility would be a change in the level of competition on product markets. In any case, whether the adjustment is warranted or due to market failure, this is ultimately determined by product markets and not through the wage setting process. It thus appears to be fairly reasonable to assume a constant mark-up as a default assumption of wage bargainers.

This – of course – is an unrealistic scenario. On the contrary, the euro area has witnessed significant imbalances during the first years of its existence. Thus, an adjustment of the Golden Rule of wage setting appears to be warranted. Given the fact that in a currency union external imbalances can be regarded a key indicator of misalignments of relative unit labor costs and thus wages, a wage benchmark is a natural starting point for an adjustment mechanism.

Fortunately, it is simple to establish a direct link between the current account and wage setting. More precisely, open economies display some relation between nominal unit labor costs and the current account, i.e. the current account can be depicted as a function of real effective exchange rates, and thus, (relative) nominal labor costs within a currency union (where the nominal exchange rate is no longer available as an adjustment mechanism). Note that this result is based on both a competitiveness and an income effect. Even if price competitiveness were to play a subordinated role the income effect will affect the current account (see below for a discussion of the caveats). In other words, the elasticity of the current account to nominal unit labor costs $\frac{PW}{Y}$ can be used to derive a corresponding level of nominal unit labor costs for each level of the current account. Consequently, for a certain targeted level of the current account – CA* – it is possible to derive an optimal level of nominal unit labor costs NULC* at which the economy will be in external equilibrium. More precisely, by correcting nominal wage growth by the percentage point deviation between the optimal level of unit labor costs and the actual level of unit labor costs will push nominal unit labor costs to a sustainable level. This renders the following wage benchmark:

$$ln\left(\frac{W_t}{W_{t-1}}\right)+ln\left(\frac{P_t}{P_{t-1}}\right)=ln\left(\frac{Y_t}{Y_{t-1}}\right)+ln\left(\frac{P_t^{Target}}{P_{t-1}^{Target}}\right)+ln\left(\frac{NULC_{t-1}^{*}}{NULC_{t-1}}\right) \quad (5)$$

Using the custom to note growth rates with a dot over the variable we can note $\dot{w}$ as the growth rate of wages, $\dot{p}$ as the growth rates of prices, $\dot{y}$ as productivity growth and $\dot{p}^{Target}$ as the ECB's target rate of inflation. Let us further denote the term, which assures external stability, as $\dot{c}=\frac{NULC_{t-1}^{*}-NULC_{t-1}}{NULC_{t-1}}$. Now we can simply rewrite (5) and arrive at

$$\dot{w}_t+\dot{p}_t=\dot{y}_t+\dot{p}_t^{Target}+\dot{c}_t. \quad (5')$$

If we further denote nominal wages as $PW_t$ with $PW_{1999} = W_{1999}(1+\frac{p_t}{100})$ we can formalize the path of nominal wages as[5]

$$PW_t^{trinity} = PW_{t-1}^{trinity}(1+\frac{\dot{y}_t + \dot{p}_t^{Target} + \dot{c}_t}{100}) \quad (6)$$

This benchmark has the capacity to achieve a trinity of targets. (i) The first item on the right side of the equation (5') – $\dot{y}$ – creates internal stability and keeps the functional distribution of income constant. Thereby, it ensures that the economy will remain on its steady state once it has achieved it. (ii) The second term – $\dot{p}^{Target}$ keeps the economy on its targeted nominal growth path and ensures that the price level will grow at the envisaged level over the medium term[6]. In EMU, this term reduces to 2% – to the price stability level of the ECB. (iii) Finally, the third term – $\dot{c}$ – ensures external stability. By being linked to the current account, it keeps the economy in a stable external position, i.e. it has the capacity to correct for internal out-of-equilibrium situations as far as these materialize in the current account.[7] Finally, it can work as a memory item that memorizes any uncorrected misalignments, so any necessary external adjustment can in principle be stretched over a longer period of time.

## 3.3 Where is the correct level of the current account?

In theory, we thus have derived a simple mutually stabilizing benchmark for wage growth. However, a decisive question that has remained unanswered up to this point concerns the level of the sustainable current account, i.e. CA*.

In principle, it is possible to estimate the sustainable level of the current account (for instance, IMF, 2006). However, different methodologies prevail and their respective outcomes vary widely. Fortunately, however – with regard to EMU – we can resort to a politically derived optimal level of the current account. The so called scoreboard indicators (European Commission, 2011) set the (maximum) acceptable

[5] Note that, in the same vein, the path of nominal wages under der Golden Rule scenario can be represented as $PW_t^{GR} = PW_{t-1}^{GR}(1+\frac{\dot{y}+\dot{p}^{Target}}{100})$.

[6] In the short run deviations will inevitably occur as adjustments introduced via the third term are ongoing.

[7] Recall the dual function of wages. If the classical savings hypothesis applies – that is if the propensity to save out of profits is higher than the propensity to save out of wages – an excessively high wage share will lead to excessive consumption and thus to a trade deficit and vice versa.

level of the current account deficit to –4%. Using a symmetric corridor this renders a range of desirable levels of the current account between –4% and +4%.[8]

# 4 Empirical results: A trinity benchmark scenario analysis

In this section we want to provide the reader with a rough estimate concerning the empirical implications of our proposed wage setting benchmark. In particular, we are interested in a counterfactual scenario that draws the potential evolution of nominal unit labor costs and current account balances of EMU countries under the assumption that national wage bargainers had stuck to the trinity benchmark since the start of the currency union in 1999. We will outline the empirical approach and the respective results in detail in subsection 4.2. However, in order to isolate the influence stemming from the proposed correction term $(\dot{c})$ which complements our trinity of wage setting, we first look how current accounts would have reacted under a Golden Rule policy.

## 4.1 Observed external balances and the Golden Rule scenario

In order to see how EMU member countries' current accounts would have developed if the Golden Rule of wage setting had been applied, we make use of the existing empirical relation between nominal unit labor costs and the current account. However, before moving in this direction, we go one step back and briefly elaborate on the link between nominal wage growth and unit labor costs.

If nominal wages increase with the growth rate of prices (i.e. inflation) and productivity (as required by the Golden Rule), then nominal unit labor costs will grow at the rate of inflation $(\dot{p})$. Since nominal unit labor costs are defined as the ratio of nominal wages to labor productivity, i.e. the numerator is measured in nominal terms and the de-numerator in real terms, the productivity growth rate driving both terms cancels out and the ratio increases by the inflation rate only.[9] More formally, the relationship between nominal wages and nominal unit labor cost can best be represented if we first recall the path for nominal wages under the Golden Rule scenario, which we derived in section 3.2, namely:

[8] Note that the actual range specified in the scoreboard lasts from –4% to +6%. However, from an economic point of view, in the very long run a country's cumulated current account position will inevitably be balanced rendering an asymmetric corridor dysfunctional. Further, it should be noted that massive capital losses during the crises underline that capital exports from the euro area in the recent past have not necessarily been very wisely invested anyhow (Gourinchas, Rey and Truempler, 2012). This leaves the question whether high current account surpluses – going along with high net capital exports – are generally desirable.

[9] Alternatively, one can think of this ratio in terms of an "inflated" wage share.

$$PW_t^{GR} = PW_{t-1}^{GR}(1+\frac{\dot{y}+p^{Target}}{100}). \quad (7)$$

Given that $ulc_t = \frac{PW_t}{Y_t}$, it is easy to show that $ulc_t^{GR} = ulc_{t-1}^{GR}\left(1+\frac{\dot{p}^{Target}}{100}(\frac{Y_{t-1}}{Y_t})\right)$. As the latter term (converges to 1 for large numbers of Y,[10] the path of nominal unit labor costs of a country *i* in period *t* under the Golden Rule can thus be approximated by

$$ulc_{it}^{GR} = ulc_{it-1}^{GR}\left(1+\frac{\dot{p}^{Target}}{100}\right). \quad (8)$$

Hence, if we create an index variable by setting nominal unit labor costs of all EMU countries to 100 in 1999, i.e. $ulc_{i,1999}^{GR} = 100$, we would observe an increase of this variable at the pace of 2% annually, i.e. at the ECB's targeted inflation rate. This is depicted in the left-hand chart of chart 3 which shows one single line – reflecting the fact that nominal unit labor costs are growing by the same rate in all countries.

Yet, if labor costs would have developed differently over the past 15 years, this of course would have altered the course of current accounts as well. In order to roughly assess these potential deviations, we employ trade elasticities published in an IMF working paper by Tokarick (2010). There are many studies that have calculated estimates of trade elasticities. As the magnitudes of these elasticities vary widely, we have decided to employ the estimates by Tokarick (2010) who uses a well-accepted model of international trade to calculate elasticities without using econometrics.

The elasticities provided by Tokarick (2010) give the response of the trade balance (measured in % of GDP) to shocks in the real exchange rate.[11] Fortunately, in EMU the real exchange rate of a member country is just a relationship of relative prices[12], which are commonly measured by nominal unit labor costs. If we assume – for simplicity – that the current account moves in line with the trade balance[13], we can easily compute EMU member countries' responses of current accounts to changes in unit labor costs by referring to the trade balance elasticities of Tokarick (2010).

Hence, under the Golden Rule policy scenario (GR) the current account $CA_{it}^{GR}$ of a country *i* in period *t* is the sum of the actually realized value of the current account $CA_{it}^{actual}$ and the change in the current account $\Delta CA_{it}$ that is triggered by a change in

[10] Note that, as Y represents the gross domestic product of euro area countries, the expression $\frac{Y_{t-1}}{Y}$ is almost 1. Note also, that this expression algebraically originates out of the fact that we have approximated a relationship that in reality is multiplicative (see equation (1) in section 3.1).

[11] Note that, Tokarick (2010) computes trade balance elasticities under three different scenarios. We use the median of the respective elasticities (Tokarick, 2010, p. 34).

[12] Note that the nominal exchange rate is one in a currency union.

[13] This assumption is not very strong given the high empirical correlation between the respective variables in the EMU-11 countries over the last 15 years.

the real exchange rate $\Delta r_{it}^{GR}$. Given the trade balance elasticity, $\varepsilon = \frac{dCA}{dr}$ the current account under the Golden Rule scenario is then represented by the following expression:

$$CA_{it}^{GR} = CA_{it}^{actual} + \Delta r_{it}^{GR} \varepsilon_i \tag{9}$$

This leaves us with the task of measuring the change in the real exchange rate due to changes in wages. By doing so, we have to consider the fact, that in our scenario all EA-11 countries follow the Golden Rule at the same time, i.e. wages and therefore unit labor costs change simultaneously across those countries compared to their actual labor cost values. Hence, we first compute the actual real effective exchange rate $reer_{it}^{actual}$ for each country *i* given the realized unit labor costs across the region while in a second step we calculate the real exchange rate by $reer_{it}^{GR}$ assuming that unit labor costs would have evolved according to the Golden Rule. That is, the unit labor cost of each country at time *t* corresponds to the value that is given by the line in the left-hand chart of chart 3. Finally, the percentage change between the computed exchange rates gives the change in the real exchange rate

$$\Delta r_{it}^{GR} = \left( \frac{reer_{it}^{GR}}{reer_{it}^{actual}} - 1 \right) 100. \tag{10}$$

To calculate the respective real effective exchange rates we use the geometric weighted average of a basket of bilateral nominal exchange rates, which are deflated using relative unit labor costs. Hence, we define the actual real effective exchange rate as

$$reer_{it}^{actual} = (e_{ikt} \frac{ulc_{it}}{ulc_{kt}})^{(1-\sum_{j}^{N} w_{ij})} \prod_{j=1}^{N} (e_{ijt} \frac{ulc_{it}}{ulc_{jt}})^{w_{ij}} \tag{11}$$

where *j* denotes one of the trading partners of country *i* that are among the group of EA-11, while *k* denotes the region that includes all other trading partners of country *i* (not in the group of EA-11). The weight $w_{ij}$ that is assigned to a partner country *j* is based on bilateral trade volumes and is measured as the sum of exports and imports between country *i* and *j*, expressed as a proportion of total exports and imports of country *i*.[14] Finally, e is the nominal exchange rate which equals 1 for country-pairs that are in the group of EA-11 (i.e. $e_{ijt}=1$). This is not necessarily the case for the bilateral exchange rate of country *i* and region *k*. However, as we will see in a moment, we do not have to assign a value to this variable in order to compute the change in the real effective exchange rate $\Delta r_{it}$.

[14] Note that we use time averages of trade volumes (1999–2011) to calculate weights, i.e. the latter are assumed to be fixed over time. Trade data are extracted from Eurostat (EU-27 Trade). Missing data are provided by UNComtrade and the Vienna Institute for International Economic Studies.

Consistent with the previous formula, we define the real exchange rate under the Golden Rule as follows

$$reer_{it}^{GR} = (e_{ikt} \frac{ulc_{it}^{GR}}{ulc_{kt}})^{(1-\sum_{j}^{N} w_{ij})} \prod_{j=1}^{N} (e_{ijt} \frac{ulc_{it}^{GR}}{ulc_{jt}^{GR}})^{w_{ij}}, \quad (12)$$

where we assume that unit labor costs outside the EA-11 region do not change and that the nominal exchange rate between country $i$ and region $k$ does not change either. Given that, especially for the period of the run-up to the crisis, the aggregated current account balance of the entire region remains relatively unaltered after applying this rule (and also after applying the trinity rule) as compared to the actual development, this does not appear to be an excessively strong assumption. Moreover, note that under the Golden Rule, where all EA-11 countries have the same ULC development, $ulc_{it}^{GR}$ equals $ulc_{jt}^{GR}$ such that the second expression of (12) reduces to 1. Under these assumptions it is easy to show that

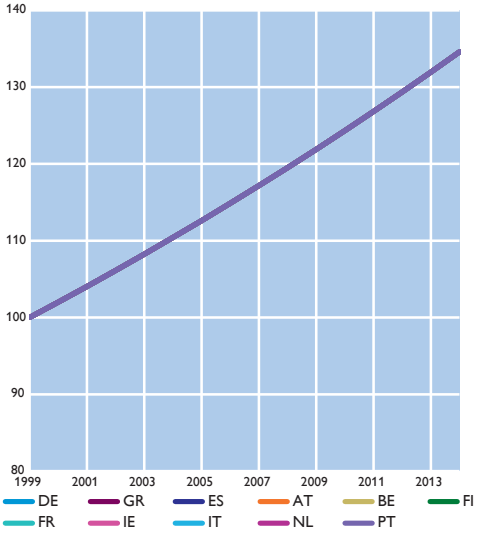
$$\Delta r_{it}^{GR} = \left( \left( (\frac{ulc_{it}^{GR}}{ulc_{it}})^{(1-\sum_{j}^{N} w_{ij})} \prod_{j=1}^{N} (\frac{ulc_{jt}}{ulc_{it}})^{w_{ij}} \right) - 1 \right) 100. \quad (13)$$

Hence, the change in the real effective exchange rate is only a function of relative unit labor costs in the EA-11 region and of country $i$'s trade relations with EA-11 partners and the rest of the world (represented by the term $1-\Sigma_{j}^{N} w_{ij}$).

*Chart 3: The Golden Rule scenario*

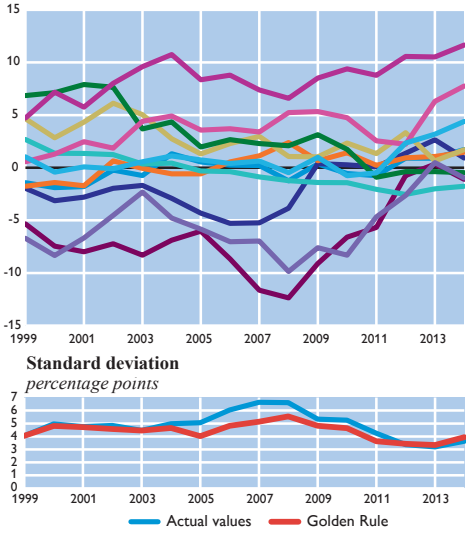
**Nominal unit labour costs – Golden Rule**

*Index 1999=100*




**Current account – Golden Rule**

*% of GDP*




*Source: AMECO Database, authors' calculations.*

After having formalized the last necessary component in equation (9) we are now in the position to calculate the evolution of current account balances in EA-11 under the assumption that countries had stuck to the Golden Rule from the beginning of 1999. The results are shown in the right upper chart of chart 3. What becomes immediately apparent is that the spread in current accounts is not much lower compared to the actual evolution of current accounts, as was shown in section 2.2 in chart 2. In effect, the standard deviation of current accounts under the Golden Rule changes only slightly (particularly in the period 2005–2008), as shown by the red line in the bottom right chart of chart 3. Only in the period 2005–2008 the red line is lower compared to the blue line by around 1 percentage point. Although such a situation would certainly constitute a step in the right direction, it is though far from optimal, as we can still observe countries with current accounts much beyond sustainable values. Hence, we can conclude that it would not have been enough to apply the Golden Rule to correct or avoid current account imbalances in the euro area.

## 4.2 The Trinity Benchmark scenario

We have seen in the previous subsection that sticking to the Golden Rule would not have been sufficient to bring current accounts back to desired levels. Therefore, we extend this rule by a correction term, which is a direct function of countries' current account levels. As outlined in section 2.3., we will alter the growth rate of nominal wages if the current account of a country exhibits a value that is outside a certain range *[–a,+a]* which is symmetric around zero. This leads to a unit labor cost path that is different from the Golden Rule scenario for all those countries whose current accounts were outside this range, at least at one point in time. Hence, our task is to find a rule that – when applied by each country individually – leads to convergence (to a specified range) in current accounts across the EA-11. Moreover, as the rule should serve as a benchmark for the macroeconomic dialog in the euro area, it should be designed in a way as to allow easy application. For the latter reason, the rule will depend only on factors that can be influenced by the country itself, i.e. policy makers do not have to take into account potential changes of unit labor costs of other countries.

More concretely this means that countries, whose current accounts are outside the range in the previous period, will alter their nominal unit labor cost growth rate (of $\dot{p} = 2\%$) by the amount that is necessary to close the gap between their actual and the specified minimum (or maximum) current account value. That is, we need to know by how much unit labor costs have to adjust in country $i$ so as to shift the current account towards the respective threshold level $(\pm a)$. Hence, to calculate this we need to know the gap between the actual level of the current account and the closer threshold level $(\Delta CA^{gap}_{i,t-1})$. Recalling the relationship introduced in the previ-

ous subsection $\varepsilon=\frac{dCA}{dr}$, we can postulate that the gap will be closed if the real exchange rate of country *i* is altered by $\Delta r_{it}^{gap}=\frac{\Delta CA_{i,t-1}^{gap}}{\varepsilon_i}$. If we further assume that trade partners' nominal unit labor costs are not altered – which corresponds to the case where policy makers do not take into account potential changes of unit labor costs of other countries – the necessary change in the real exchange rate $(\Delta r_{it}^{gap})$ is equal to the growth rate of unit labor costs that is required to achieve the desired current account movement, i.e., $\Delta r_{it}^{gap}=\Delta ulc_{it}^{gap}=(\frac{ulc_{it}}{ulc_{it-1}}-1)100$. To see this, note that – consistent with the calculation method of exchange rates in the previous sub-section – the change in the real exchange rate from one period to another can be represented in the following way:

$$\Delta r_{it}^{gap}=\left(\frac{reer_{it}}{reer_{it-1}}-1\right)100=\left(\left(\left(\frac{ulc_{it}}{ulc_{it-1}}\right)^{(1-\sum_j^N w_{ij})}\prod_{j=1}^{N}\left(\frac{ulc_{jt-1}}{ulc_{it-1}}\frac{ulc_{it}}{ulc_{jt}}\right)^{w_{ij}}\right)-1\right)100 \qquad (14)$$

If we assume that trade partners' nominal unit labor costs are not altered, i.e. $ulc_{jt} = ulc_{jt-1}$, the expression in (14) reduces to $(\frac{ulc_{it}}{ulc_{it-1}}-1)100$, which is simply a growth rate of unit labor costs of country *i*.

Given the fact that nominal unit labor costs of some trade partners will move up and of some down if the trinity rule was applied, it is fair to assume that trade partners' nominal unit labor costs do not change on average. The relatively symmetric situation with regard to current account imbalances before the crisis allows us to impose this assumption without a huge loss in realism. Against this background, our approach will only trigger a mild overshooting. If each country imposed the trinity rule, a country with an excessive deficit could expect the aggregate foreign unit labor cost environment to move slightly up, and vice versa. However, the nice property accruing out of our approach is that we can see how the situation would evolve if each country introduced the rule unilaterally (thus without the necessity of a transnational agreement on its application). We will see that nonetheless this will lead to an "invisible hand" of wage settlements.

For each country, the required adjustment to close its current account gap is thus represented by a yearly growth rate at which its unit labor costs must deviate from the Golden Rule benchmark growth rate (of $\dot{p}^{Target}=2\%$). Fortunately, this rate can be easily computed, as the current account gap $\Delta CA_{i,t-1}^{gap}$ as well as the elasticity $\varepsilon_i$ are known parameters.

In the following, we will re-label the growth rate at which unit labor costs shall deviate from the Golden Rule benchmark scenario $\Delta r_{it}^{gap}$ by the term i.e. $\dot{c}_{it}=\frac{\Delta CA_{i,t-1}^{gap}}{\varepsilon_i}$, in order to align notation with the theoretical part of the paper. Finally, we are in the position to formalize the trinity wage rule, which will specify the path of nominal unit labor costs $ulc_{it}^{trinity}$ in the Trinity Benchmark scenario:

$$ulc_{it}^{trinity}=ulc_{it-1}^{trinity}\left(1+\frac{\dot{p}_{it}^{Target}+\dot{c}_{it}}{100}\right) \qquad (15)$$

$$\dot{c}_{it} = \begin{cases} -\left|\dfrac{CA^{trinity}_{i,t-1} + a}{b\varepsilon_i}\right|, & CA^{trinity}_{i,t-1} < -a \\ 0, & -a \le CA^{trinity}_{i,t-1} \le +a \\ +\left|\dfrac{CA^{trinity}_{i,t-1} - a}{b\varepsilon_i}\right|, & CA^{trinity}_{i,t-1} > +a \end{cases} \tag{16}$$

where $ulc^{trinity}_{i,1999} = 100$ and $CA^{trinity}_{i,1999} = CA^{actual}_{i,1999}$. Recalling the relationship between nominal unit labor costs and nominal wages from previous sub-section, the trinity rule for nominal wages can be represented as follows:

$$PW^{trinity}_{it} = PW^{trinity}_{it-1}\left(1 + \frac{\dot{y}_{it} + \dot{p}^{Target}_{it} + \dot{c}_{it}}{100}\right) \tag{17}$$

From (15) we see that the path of nominal unit labor costs will be equal to the Golden Rule scenario if the adjustment parameter $\dot{c}_{it}$ is equal to zero in each point in time. This will only be the case for countries whose current accounts were within the range of *[–a,+a]* in the period 1999 to 2013. Otherwise, their labor costs will deviate from the growth rate path of $\dot{p}$ by the amount that is defined in (16). The specified amount is added to $\dot{p}$ if the country's current account is in surplus and above the specified threshold, as unit labor costs will have to grow faster compared to the Golden Rule path in order to bring current accounts back to the desired range. On the contrary, for countries with large current account deficits, the adjustment has to be subtracted in order to boost competitiveness as to reduce the deficit accordingly. In addition to the already introduced input parameters, the adjustment term $\dot{c}_{it}$ is a function of the parameter *b*, which shall serve as a smoothing device. If this parameter, which has the range *b=[1,∞]*, equals 1, then all of the required labor cost adjustment will be performed promptly (within one year). As this might involve a quite drastic labor cost adjustment, the parameter *b* can be set at higher values in order to moderate the required adjustment. If, in the other extreme case, *b* is set to infinitum, the trinity rule converges to the Golden Rule of wage setting. In the following empirical application we set *b=2*. Hence, countries will adjust their labor costs only by the half of the entire adjustment that would be necessary to close the current account gap instantaneously. Moreover, as already discussed in section 2.3., the threshold parameter of the current account range is set to *a=4*.

Once unit labor costs are determined in period *t*, the current account can be computed as follows

$$CA_{it}^{trinity} = CA_{it}^{actual} + \Delta r_{it}^{trinity} \varepsilon_i \tag{18}$$

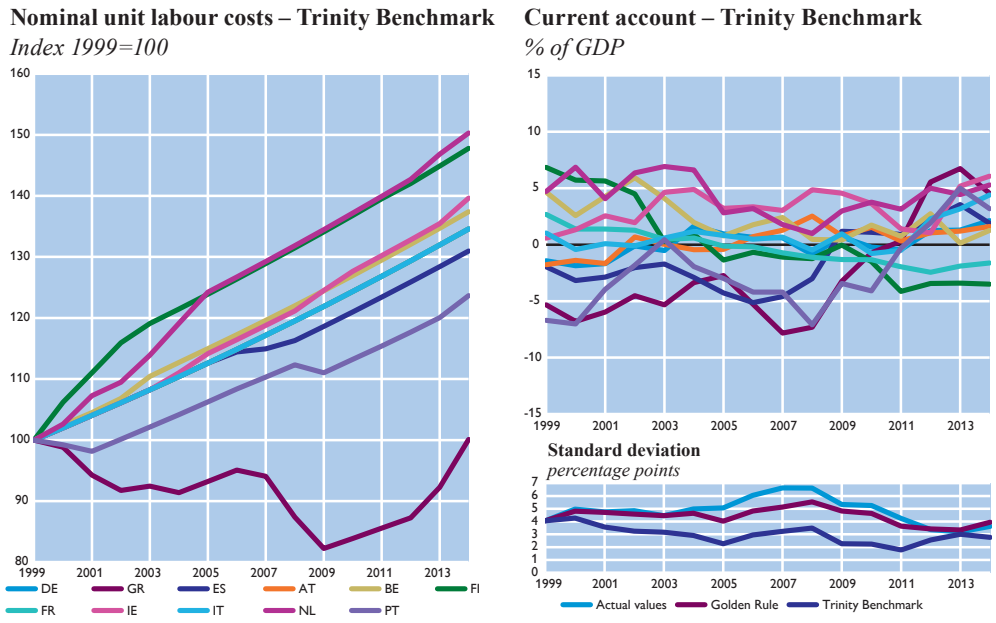
where $\Delta r_{it}^{trinity} = \left( \frac{reer_{it}^{trinity}}{reer_{it}^{actual}} - 1 \right) 100$ is determined along the same lines as in the Golden Rule scenario. The resulting expression though deviates slightly from the one in the previous sub-section, as unit labor cost paths differ across countries under the trinity scenario (i.e. $ulc_{it}^{trinity} \neq ulc_{jt}^{trinity}$ ). Hence, the change in the real exchange rate of country *i* is now also a function of country *j*'s unit labor costs under the trinity rule:

$$\Delta r_{it}^{trinity} = \left( \left( \left( \frac{ulc_{it}^{trinity}}{ulc_{it}} \right)^{(1-\sum_{j}^{N} w_{ij})} \prod_{j=1}^{N} \left( \frac{ulc_{jt}}{ulc_{it}} \frac{ulc_{it}^{trinity}}{ulc_{jt}^{trinity}} \right)^{w_{ij}} \right) - 1 \right) 100. \tag{19}$$

Having derived the last necessary component allows computing the current account under the trinity rule. Before we discuss the respective results, we want to briefly summarize the individual calculation steps. First, unit labor costs are determined in year *t* (15). A change in unit labor costs triggers a change in the exchange rate, which is calculated according to expression (19). This change triggers a reaction in current accounts in the same period, which is computed in (18). The current account in year *t* will in turn serve as an input parameter to determine the next period's unit labor costs *(t+1)*, thus repeating the whole process for period *(t+1)*. Following this procedure, we end up with a path of unit labor costs and current accounts for all EA-11 countries under the trinity scenario. The results are represented in chart 4.

As can be seen from the left-hand chart in chart 4, there are seven countries that deviate from the Golden Rule path of labor cost growth. While, Spain, Portugal and Greece are among those countries that would have needed lower labor cost growth rates compared to the Golden Rule scenario, there is also a group of countries, whose labor cost growth rates should have been higher than 2% in order to avoid current account surpluses of more than 4% percent. This group includes Belgium, Ireland, Finland and the Netherlands. All other countries would have evolved along the lines of the Golden Rule scenario.

*Chart 4: The Trinity Benchmark scenario*




*Source: AMECO Database, authors' calculations, COMP 1999–2014.*

The right upper chart of chart 4 represents the corresponding development of current accounts under the assumption that countries had realized unit labor cost growth rates assigned by the trinity rule. What becomes immediately clear is that current accounts are much closer to the desired range compared to the Golden Rule scenario (see upper right chart in chart 4) and more so compared to the actual development of current accounts. This is especially visible in the lower right chart of chart 4, which gives standard deviations of the current accounts under all three scenarios. In contrast to the Golden Rule, current accounts in the trinity scenario start converging already in the beginning of the 2000s and keep staying close to each other throughout the whole period.

Note that, there are two reasons why not every country in each period is within the defined range *[–4,+4]*. First, the adjustment parameter $b>1$ prevents countries from making the total necessary adjustment to close the current account gap within one year. Second, even if the parameter would have been set to 1 (total adjustment), there might be cases, where individual countries' current accounts end up being above the range. This is because the change in current accounts, which is triggered by a change in the real exchange rate $(\Delta r_{it}^{trinity})$, is added to the actual realized value of the current account in our scenario (recall equation 14). Since the latter value is not known at the time unit labor costs are determined, the realized current account under the trinity scenario might hence lie beyond the desired range. Notwithstand-

ing these facts, the proposed policy rule is still suitable to satisfy the desired goal, namely to keep the economies' external positions stable and hence to avoid dangerous imbalances. Therefore, we can conclude, that the proposed Trinity Benchmark might serve as an anchor for national policy makers to achieve not only internal and price stability, but also external stability as measured by the current account balance.

## 4.3 Caveats and limitations

A certain number of caveats concerning the rule and limitations concerning our modelling approach arise out of the above discussion. As concerns the caveats it has to be stressed that there – of course – are non-wage factors affecting the current account. This relates to non-price factors of competitiveness (e.g. quality, reputation, etc.) as well as to drivers of demand other than wages (e.g. investment, credit, etc.). However, as argued in the introduction it appears as if wages play as far the most important role with regard to dangerous imbalances.

Moreover, the proposed benchmark relies on a constant mark-up. A constant mark-up however is a standard assumption in macroeconomics (and also the basic assumption of the Golden Rule). There are only two potential scenarios in which a change in the mark-up might occur. These are the occurrence of a supply shock (oil price, competiveness, etc.), and a catching up process in which the capital intensity of production increases. In the first case the effect will be temporary, while in the second case, the change is warranted and it will ultimately be up to social partners to decide whether they are confronted with such a situation and a deviation of the rule is justified.

Finally, due to nominal wage rigidity there are non-linear costs to adjust nominal wages. In particular, costs typically increase disproportionately at the zero lower bound. In principle this is a problem that also applies to the Golden Rule. Though, while countries exist that have experienced relatively calm periods of nominal wage cuts (e.g. Estonia), these have been very special cases. In general we do not believe that the potential benefit reaped by nominal wage cuts can potentially compensate for the huge costs in terms of industrial conflict. Fortunately, using the benchmark introduced above nominal wage cuts hardly ever will be necessary. One of the main advantages of the benchmark is the fact that the current account serves as a kind of memory item. If the adjustment in a given year has been insufficient due to nominal wage rigidity this will inevitably crop up in the next year's realized current account. Under normal circumstance thus it would be possible to conduct necessary adjustments via real wage restraint.

With regard to the limitations, we also have to emphasize the simplifying approach of modeling a counterfactual scenario. In particular, we implicitly assumed zero elasticity of demand with regard to wages (this includes the assumption of an unchanged policy rate) and an unchanged exchange rate. Concerning demand

effects, however, the bias introduced hereby would actually overestimate the necessary adjustment. With regard to the exchange rate it should be noted that current account adjustment run in both directions, effectively minimizing the overall effect on the aggregated current account of EMU.

## 5 Discussion and conclusion

During the first years of the euro area, wage dispersion across member states has been one of the key drivers of widening macroeconomic imbalances both within and between EMU countries. Consequently, the recently published Five Presidents' report[15] takes up the crucial issue of wage divergence in a currency union and specifically proposes the creation of national "Competitiveness Authorities" in each member state. Those national authorities would be supposed to assess the performance and national policies in the field of competitiveness, and should also *"assess whether wages are evolving in line with productivity and compare with developments in other euro area countries and in the main comparable trading partners"* (p. 8). From this, the question naturally arises how policy makers can calculate or propose such a "sustainable" rate of wage growth. Earlier literature on wage setting benchmarks have commonly proposed that wage growth should comply with the so-called Golden Rule, which states that wages should grow along with productivity and inflation (or the inflation target, respectively). In a first step, we have therefore simulated a scenario assuming that member states had complied with the Golden Rule of wage setting from the start of the euro area in 1999. This scenario analysis, however, shows that compliance with the Golden Rule would not have prevented external imbalances within EMU from arising. While the report does not propose a more detailed benchmark for wage growth, this paper subsequently derived a theoretical framework for wage setting ensuring not only (1) internal stability in terms of a stable functional income distribution and (2) price stability in accordance with the ECB's notion of the inflation target, but also (3) external stability defined as a specific range of "sustainable" current account balances in individual member states. If a country moves outside this range of "sustainable" current account balances, our benchmark equation includes a simple correction mechanism that brings the country back to equilibrium. In our simple scenario analysis, we are able to show that the compliance of member states to such a Trinity Benchmark of wage setting would have led to substantially lower external imbalances within the euro area. Thus, a stronger coordination of wage setting across EMU countries does

[15] Juncker, J.-C., Tusk, D., Dijsselbloem, J., Draghi, M. and Schulz, M. (2015). Completing Europe's Economic and Monetary Union. Available at http://ec.europa.eu/priorities/economic-monetary-union/docs/5-presidents-report_en.pdf.

have the potential to prevent the build-up of dangerous macroeconomic imbalances across member states of the euro area.

In line with the Five Presidents' report, however, we want to stress that the above derived optimal corridor for member countries' wage developments is considered to serve as a benchmark only and should not be a fixed rule which countries are obliged to follow. Instead, it might be useful as a reference value for wage bargainers, while wage autonomy and the role of social partners should not be put into question. In particular, our simple wage benchmark could be used by the proposed national competitiveness authorities to calculate an annual benchmark as a rough guidance for national actors and institutions in the wage formation process.

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