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WAGE DYNAMICS IN EUROPE: SOME NEW FINDINGS

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The adjustments of the euro area labour markets to the sharp contraction in economic activity during the recent crisis have mostly taken place through a fall in employment and hours worked. In contrast, the response of wages has been very sluggish. This article summarises some of the research findings of the Eurosystem/ESCB Wage Dynamics Network (WDN) on the features of wage setting in Europe that contribute to wage stickiness.

It may be too soon to fully assess the response of euro area labour markets to the recent economic and financial crisis, but so far most of the adjustment has taken place through a fall in employment and hours worked. In contrast, the response of wages to the sharp contraction in economic activity has been very sluggish. Chart 1 shows how the annual growth in overall employment and hours worked in the euro area started decreasing at the beginning of the crisis and became negative towards the end of 2008. Yet nominal compensation per employee grew at increasing rates until the last quarter of 2008, before slowing down to a small positive rate at the end of 2009. Nominal hourly labour costs have been increasing steadily since the end of 2008.

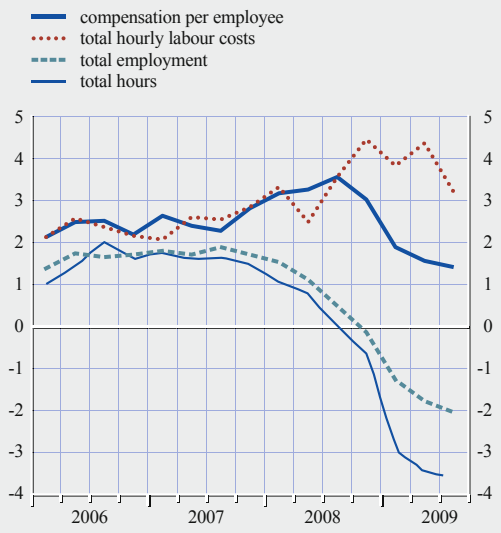
The bulk of the labour market adjustment during the recent crisis has come through changes in employment and hours worked, rather than through wages.

The sluggish response of wages in the euro area masks quite a bit of heterogeneity across countries, as illustrated in Chart 2. Two contrasting cases are Ireland (IE) and Spain (ES), which both started with relatively high nominal wage growth at the beginning of the crisis. In Ireland, wage growth began to moderate in early 2008 and became negative in 2009, whereas in Spain compensation per employee continued to grow at rates higher than 4% p.a. during 2009.

This resistance of wages to the recent fall in demand may slow down the economic adjustment process and have an impact on the outlook for economic activity and price stability. In addition, differences in wage rigidity within a monetary union may give rise to persistent

Chart 1 Employment and wages in the euro area during the crisis

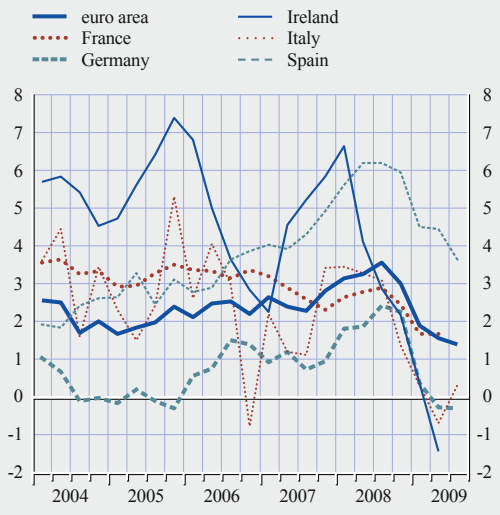
(annual growth rates)



Source: Eurostat.

Chart 2 Nominal compensation per employee in the euro area and some individual countries

(annual growth rates)



Source: Eurostat.

inflation differentials and protracted changes in competitiveness across member countries, even when they are hit by the same shock. More generally, wage rigidity may complicate the conduct of monetary policy as it increases the cost of stabilising inflation, putting a premium on a firm anchoring of inflation expectations. Therefore, from a monetary policy perspective it is important to better understand the factors determining wage rigidity.

This article presents some of the findings of the Eurosystem/ESCB Wage Dynamics Network (WDN)[1] on the sources of wage rigidity, including (i) the frequency of wage changes, (ii) the factors affecting wage setting for new hires, and (iii) the degree of indexation of wages to inflation. It then discusses the macroeconomic implications of these features. Other research results regarding the evolution of the wage structure in Europe, the degree of downward wage rigidity and the pass-through of wages to prices can be found on the WDN pages of the ECB's website at: http://www.ecb.europa.eu/home/html/researcher_wdn.en.html.

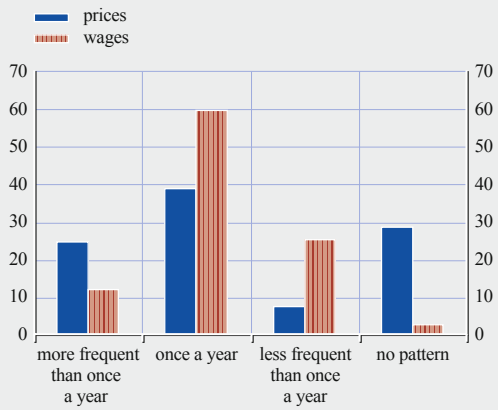
The frequency of wage changes is lower than that of price changes.

Features of wage setting in Europe

Estimates of the frequency of nominal wage (and price) changes are often used to calibrate wage (and price) stickiness in modern macroeconomic models with staggered contracts. The *frequency of wage changes* is indeed an essential determinant of the aggregate degree of nominal wage stickiness. In addition, if nominal wages adjust less often than prices, real wage adjustment may become more sluggish. An important finding of the WDN is that wages change relatively infrequently. As illustrated in Chart 3, the typical frequency of wage changes is once a year. About 60% of the firms surveyed by the WDN in euro area countries reported that they change wages once a year, while 27% change wages less frequently.[2] In contrast, for prices the corresponding percentages are lower, at 40% and 5%, respectively. Accordingly, the average duration of wages (about 15 months), which matches the typical length of bargained labour contracts of between one and two years, is longer than the average duration of prices (about 9.5 months). This evidence, directly derived from survey data, is confirmed by the analysis of micro data in a few countries for which quarterly wage data are available.

Chart 3 Frequency of price and wage changes

(percentages of firms)



Source: Druant et al. (2009).

Wages change less often when collective bargaining coverage is high and employment protection strong, and more often when bargaining takes place at the firm level and there is a formal or informal inflation indexation scheme. Overall, differences in the frequency of wage changes across firms are more driven by national institutions, whereas differences in the frequency of price changes are more driven by sector characteristics such as the labour share and the degree of competition.

The implications of wage stickiness for labour market dynamics also depend on *the behaviour of the wages of newly hired employees*. Most of the variation in hours worked over the business cycle

1 *The WDN is a research network bringing together researchers from 24 EU central banks that has looked at the sources and features of wage and labour cost dynamics that are most relevant for monetary policy, and at the relationship between wages, labour costs and prices both at the firm and macroeconomic levels.*

2 *A survey on wage and price-setting behaviour at the firm level, developed within the WDN, was carried out by 17 national central banks in the EU between the end of 2007 and the first half of 2008 on the basis of a harmonised questionnaire; it covered over 17,000 firms. The euro area countries included in the sample are: Austria, Belgium, France, Greece, Ireland, Italy, Netherlands, Luxembourg, Portugal, Slovenia and Spain. As a follow-up, a more limited survey was conducted during summer 2009 to assess wage behaviour and wage adjustments during the financial crisis.*

occurs at the extensive margin, i.e. through changes in employment rather than in hours per employee.[3] The behaviour of the wages of new hires is therefore a key determinant of how many vacancies firms decide to post and how many new workers to employ or to fire. Yet, as illustrated in Chart 4, almost 80% of the firms surveyed by the WDN report that internal factors such as collective wage agreement and internal pay scale are more important in determining the wages of new hires than external labour market conditions (see Galuscak et al., 2010). External labour market conditions are relatively more important in non-euro area countries (37%) than in euro area countries (15%), in part because of the lower bargaining coverage. Similarly, for firms that appear to face more competition, that employ more high-skilled workers and that face a higher turnover of employees, external labour market conditions matter relatively more. Also here, bargaining institutions and product market competition matter.

Almost 80% of the firms report that the collective wage agreement and the internal pay scale are the most important factors in determining the wages of new hires.

Less than 12% of the firms surveyed in a sub-sample of eight EU countries state that they would reduce wages of newcomers to levels below those of workers with similar experience employed in the firm, if there is an abundance of unemployed workers in the labour market. A similar reluctance to differentiate wages exists in a booming economy. Firms reply that the dominant reasons for not differentiating wages of similarly qualified employees are fairness and the fear that such a differentiation may have a negative impact on worker morale and effort. In some industries, labour regulations such as minimum wage legislation are also an important factor in preventing a fall in wages.

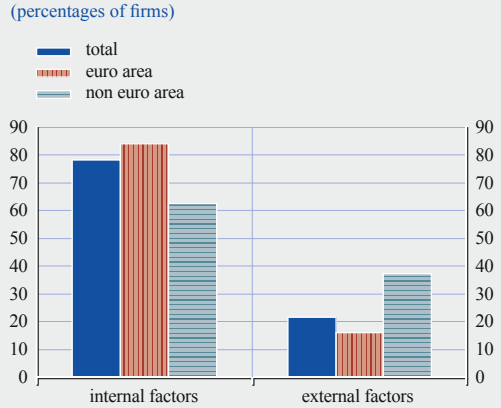
In contrast, micro evidence on the cyclicality of wages in a few countries does suggest that wages of job-movers are more pro-cyclical than those of incumbents. However, this may be partly due to compositional effects, e.g. in booms the availability of high-paying jobs is typically higher than in recessions.

Finally, the *indexation* of nominal wages to inflation is another determinant of wage stickiness. If nominal wage growth is partly based on backward-looking measures of inflation, real wage adjustment may become more sluggish. The incidence of indexation varies considerably across euro area countries. While formal automatic indexation schemes still exist in Belgium, Cyprus and Luxembourg, the adjustment of wages to past inflation is also very common in Spain and Slovenia. On average about one-third of the euro area firms surveyed by the WDN reply that they have an internal policy that adapts base wages to inflation (mostly past inflation). However, in a number of countries with wage bargaining outside the firm, these answers may not capture the role of inflation expectations in the negotiation process.

On average about one-third of firms in Europe have an internal policy that adapts base wages to inflation.

Chart 4 Determinants of the wages of newly hired workers

(percentages of firms)



Source: Galuscak et al. (2010).
Note: The sample in this chart includes: Austria, Belgium, Czech Republic, Estonia, Greece, Hungary, Ireland, Lithuania, Netherlands, Portugal, Slovenia and Spain.

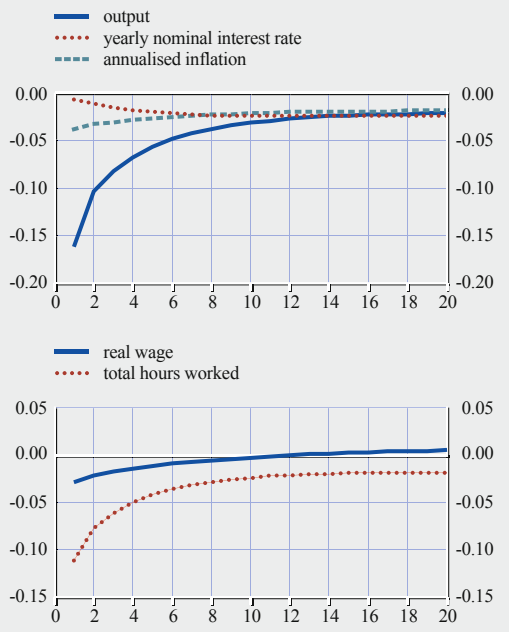
[3] *There have been notable exceptions during the recent downturn due to various, often subsidised, programmes to shorten working hours and thereby avoid lay-offs.*

Macroeconomic implications of the microeconomic evidence

In order to assess the implications of the microeconomic evidence presented above for developments at the aggregate level, WDN researchers have estimated a state-of-the-art macroeconomic model with sticky prices and wages, wage indexation and labour market frictions, using macro data for the euro area (see De Walque et al., 2010). Overall, the findings from the macroeconometric estimation conform quite well with the three wage-setting features described above. The average duration of a wage contract of incumbent workers is estimated to be 4.4 quarters. Moreover, wages of newly hired workers are estimated to be as sticky as those of incumbent workers, consistent with high collective bargaining coverage in the euro area. The macro analysis finds that the degree of flexibility of the wages of new hires matters a lot for the aggregate degree of real wage rigidity and the employment response to various shocks. Finally, the degree of indexation to past inflation is estimated to be one-third. Reflecting second-round effects, inflation indexation mostly leads to a higher volatility and persistence of inflation in response to shocks. Together these features help to replicate the relative volatility in hours worked and real wages in the euro area, as well as their persistence.

As Chart 5 shows, the considerable degree of real wage rigidity leads to a relatively strong employment response to a persistent shock in demand. The latter is consistent with alternative time-series evidence on the effects of various shocks, including a monetary policy tightening.

Chart 5 Responses to a persistent shock in demand



Source: De Walque et al. (2010).
Note: The shock is a 1% decrease in demand.

Conclusions

Overall, the response of wages to the large fall in demand during the recent crisis has been very subdued, with the bulk of the adjustment coming through employment and hours worked. The WDN research summarised in this article uncovers some features of wage setting that contribute to the aggregate degree of wage rigidity. This rigidity of wages in turn explains a relatively mute and persistent response of prices.

When examining the determinants of wage stickiness, the WDN evidence suggests that collective bargaining institutions, employment protection legislation (EPL) and product market competition are important factors shaping the response of wages, employment and prices to economic developments. In particular, higher-level bargaining, stringent EPL and a lack of goods market competition lead to higher real wage rigidity and a stronger employment response to shocks.

Real wage rigidity leads to a stronger employment response to various shocks.

WHEN DOES FISCAL STIMULUS WORK?

By Günter Coenen, Juha Kilponen and Mathias Trabandt

With fiscal stimulus, the government can try to boost overall economic activity by issuing debt and raising expenditure. But does it work? How large is the output response, i.e. the "fiscal multiplier"? And what determines the size of the fiscal multiplier? This article discusses recent model-based evidence in this regard and highlights key factors that are important for successful fiscal stimulus programmes.

Governments around the globe have been using expansionary fiscal policies with the aim to stimulate the economy during the global economic crisis. For the euro area countries, for instance, the fiscal stimulus packages amount to roughly 2% of GDP in 2009-10 (not counting off-balance-sheet measures and the economic support coming from automatic fiscal stabilisers). Based on past experience, however, counter-cyclical (discretionary) fiscal policy is typically discredited because of: (a) delays involved in implementing fiscal measures; and (b) the uncertainty about the private sector's response to temporary fiscal actions and thus the response of the economy to fiscal impulses. This article focuses on the second issue.

The uncertainty about the private sector's response to temporary fiscal actions is pervasive in empirical studies. According to the summary of van Brusselen (2009), fiscal multipliers based on Vector Autoregressive (VAR) models range from negative to well above one. Fiscal multipliers tell us by how much output rises in response to a standardised increase in government spending, or to a standardised reduction in taxes.

Important factors that contribute to these large differences in multipliers are related to the difficulty of identifying purely exogenous movements in fiscal instruments in general and to differences in the empirical methodologies adopted. For example, studies that rely on narrative evidence, i.e. event studies,[1] typically find larger multipliers (especially for tax changes) than those based on standard fiscal VARs.[2] Davig and Leeper (2009) show further that the effectiveness of a fiscal spending stimulus can vary widely depending on the monetary and fiscal policy regime, i.e. whether monetary and fiscal polices are deemed active or passive.

Simulations based on structural general equilibrium models provide a clearer picture. The fiscal multipliers for temporary expenditure or revenue-based stimulus measures are typically positive, with expenditure-based measures delivering in general higher multipliers.

Evidence from a model comparison exercise

Structural general equilibrium models are useful for identifying key factors that matter for the size of the fiscal multiplier.[3] One set of factors is related to the design of the fiscal stimulus itself, e.g. which fiscal instruments are used, and the duration of the stimulus. In addition, whether the nominal interest rate is kept constant or not and how the fiscal stimulus is financed in the medium to long term are also important determinants of the fiscal multiplier.

The quantitative importance of several of these factors was analysed in a recent model comparison exercise coordinated by the International Monetary Fund (IMF) in spring 2009. All models employed in the exercise are in active use at international institutions.[4] The models share many features such as forward-looking behaviour on the part of households and firms, nominal and real

1 *See e.g. Ramey and Shapiro (1998) and Romer and Romer (2010).*
2 *Romer and Romer (2010) find tax multipliers of roughly three, while Blanchard and Perotti (2002) and Perotti (2008) report values of roughly one. Afonso and Sousa (2009) use a structural Bayesian VAR approach for the United States, the United Kingdom, Germany and Italy, and find that government spending shocks, in general, have a positive, but small effect on GDP. Alesina and Ardagna (2009) focus on the growth effects of large spending or revenue adjustments. Their results suggest that tax cuts are more likely to raise growth than spending increases. Favero and Giavazzi (2009) find that augmenting the narrative approach with a fiscal VAR leads to tax multipliers that are closer to one than to three.*
3 *See e.g. recent papers by Christiano, Eichenbaum and Rebelo (2009), Cogan, Cwik, Taylor and Wieland (2009), Corsetti, Meier and Müller (2009a, b), Cwik and Wieland (2009), Eggertsson (2009), Erceg and Lindé (2010), Davig and Leeper (2009), Hall (2009), Uhlig (2010) and Woodford (2010).*
4 *For details, see Coenen et al. (2010). The models considered are from the European Central Bank (NAWM), the US Federal Reserve (FRB-US and Sigma), the International Monetary Fund (GIMF), the European Commission (QUEST), the OECD (OECD Fiscal) and the Bank of Canada (BoC-GEM).*

rigidities, as well as liquidity and/or credit constraints. Hence, the models depart from Ricardian equivalence, where tax and bond-financed increases in government spending lead to equivalent economic outcomes. The models are calibrated to, or estimated for, the United States, the euro area/European Union and the rest of the world. Reflecting the differences between the economic areas, the models feature different degrees of price stickiness, different shares of liquidity/credit-constrained households and different degrees of openness. In all the models, monetary and fiscal policies are characterised by feedback rules. For example, in the ECB's New Area-Wide Model (NAWM), the nominal interest rate reacts to output and inflation, while lump-sum taxes react to the government debt-to-output ratio.

Findings for Europe

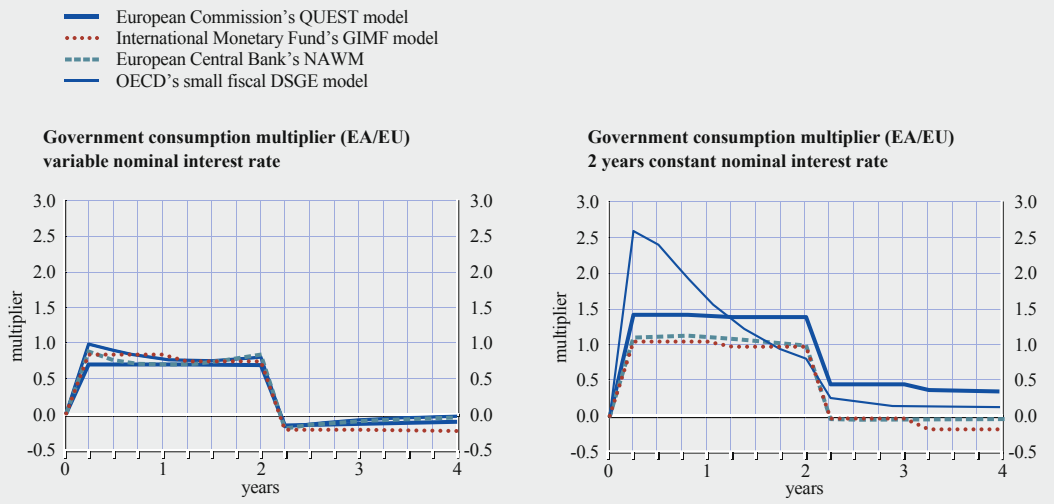
As an example, Chart 1 provides the government consumption multipliers, i.e. the GDP responses to a standardised increase in government consumption, in the euro area/European Union. Specifically, the government consumption-to-baseline GDP ratio is assumed to increase by one percentage point for two years and then return to baseline. The effects are shown under the assumption that the nominal interest rate reacts endogenously according to a simple feedback rule and under the assumption that the nominal interest rate remains unchanged for two years.

Two results stand out clearly from Chart 1. First, the government consumption multipliers are remarkably similar across models (close to but below one) when the nominal interest rate is allowed to counteract the inflationary effects of the fiscal stimulus. Second, with an unchanged interest rate – resembling a recessionary situation in which the zero lower bound on the nominal interest rate is binding and inflation already being very low such that the central bank would not counteract the inflationary effects of government spending – the multiplier increases in all models.[5] Specifically, with an endogenous interest rate reaction, the multiplier ranges from 0.7 to 0.8, while under fixed nominal interest rates the

"…instruments which stimulate aggregate demand directly lead to larger short-run fiscal multipliers than tax cuts…"

[5] *Christiano, Eichenbaum and Rebelo (2009) and Erceg and Lindé (2009) emphasise that the government spending multiplier can be particularly large when the zero lower bound on nominal interest rate is binding (or when the nominal interest rate is kept constant) for a prolonged period of time and when the fiscal stimulus is rapidly implemented.*

Chart 1 Government consumption multipliers for the euro area/European Union: variable vs. two years constant nominal interest rate



Notes: This chart shows the GDP effects of a 1-percentage-point increase in the government consumption-to-baseline GDP ratio across different models of the euro area/European Union. The fiscal expansion lasts for two years with full reversal to baseline thereafter. Within the first two years, the fiscal stimulus is fully debt-financed. The effects are shown when the nominal interest rate varies according to an interest rate feedback rule and when the nominal interest rate is kept fixed for two years.

multiplier ranges from 1.0 to 1.7.[6] In the latter case the real interest rate falls because of emerging price pressures, whereas the real rate rises in the former, causing households and firms, respectively, to postpone their consumption plans and to reduce their investment in physical capital. By contrast, compared to the case where interest rate adjusts endogenously, under fixed nominal interest rates the fall in the real rate leads to higher consumption and investment spending.[7]

"...fiscal expansions are more effective when the nominal interest rate is kept unchanged and prices are sticky..."

The results shown in Table 1 highlight that the temporary use of fiscal instruments which directly stimulate aggregate demand (government consumption and investment) or targeted transfers (i.e. transfers to non-Ricardian households that consume their labour income in each period) lead to higher fiscal multipliers than temporary tax cuts. The difference in the fiscal multipliers is related to the strength of the implied negative wealth effect. In the case of temporary government spending increases, the negative wealth effect of government spending (i.e. an increase in the present value of future tax payments required to balance the government's budget over time) is small.[8] Hence, the crowding-out of private spending is limited when the fiscal stimulus is short-lived. By the same argument, temporary tax cuts have only small effects on private spending since the implied favourable wealth effect is small.

The response of consumer price index (CPI) inflation to the temporary fiscal stimulus is in general rather small, ranging from 0 to 0.3 percentage point in terms of the deviation from baseline inflation rates in various models. The inflation response to increases in government expenditures is somewhat higher when the nominal interest rate is kept constant and thus does not respond to inflationary pressures generated by the fiscal expansion. In the case of revenue reductions (tax cuts), the inflation response is further muted because of their relatively small effect on aggregate demand. The negative inflation response observed for some models in the case of labour income tax cuts reflects the fact that the impact of temporarily lower labour income taxes on

6 *Cogan, Cwik, Taylor and Wieland (2009) find smaller fiscal spending multipliers. One reason for the difference in results is that Cogan et al. assume that the fiscal stimulus is implemented with a delay. In addition, they do not consider the case of a constant nominal interest rate in their benchmark simulations. Both factors reduce the fiscal spending multiplier.*

7 *The models that generate fiscal multipliers greater than one typically assume that a considerable share of households is unaffected by the negative wealth effect (see e.g. Ravn, Schmitt-Grohé and Uribe 2006, Galí, López-Salido and Vallés 2007 and Coenen and Straub, 2005). Monacelli and Perotti (2008) show that models that feature consumption and labour complementarity can also deliver a positive response of consumption to government spending shocks even if the nominal interest rates adjusts freely.*

8 *Corsetti, Meier and Müller (2009a, b) furthermore show that if the current spending increase is partly offset by a spending reversal in the future, private consumption responds favourably to a temporary fiscal stimulus.*

Table 1 GDP multipliers and the impact on CPI inflation based on models for the euro area/European Union

	GDP multiplier		CPI inflation	
	Variable nominal interest rate	2 years constant nominal interest rate	Variable nominal interest rate	2 years constant nominal interest rate
Increases in expenditures				
Government consumption	0.7 - 0.8	1.1 - 1.7	0.0 - 0.1	0.2 - 0.3
Government investment	0.8 - 1.1	1.1 - 1.6	0.0 - 0.1	0.1 - 0.3
General transfers to all households	0.0 - 0.2	0.1 - 0.5	0.0 - 0.1	0.1 - 0.1
Transfers to non-Ricardian households	0.1 - 0.6	0.6 - 1.2	0.1 - 0.2	0.2 - 0.3
Reductions in revenues				
Labour income taxes	0.1 - 0.3	0.0 - 0.8	- 0.1 - 0.0	- 0.1 - 0.1
Consumption taxes	0.2 - 0.3	0.4 - 1.0	0.0 - 0.0	0.1 - 0.2
Corporate income taxes	0.1 - 0.1	0.1 - 0.2	0.0 - 0.0	0.0 - 0.1

Notes: This table provides the ranges (min-max) of the GDP multiplier and the impact on CPI inflation across models. The fiscal multipliers are calculated as the first two years average percentage deviation of real GDP from baseline GDP. The impact on CPI inflation is measured as the annualised first two years average percentage point deviation from baseline inflation. The measure of CPI inflation excludes the direct effect of change in consumption taxes. All fiscal stimuli are standardised to 1% of baseline GDP. Except for corporate income taxes the models are the European Commission's QUEST model, the IMF's GIMF model, the ECB's NAWM and the OECD's Small Fiscal Model. For corporate income taxes the models are QUEST and GIMF. The fiscal stimulus is assumed to last for two years with full reversal to the baseline thereafter. Within the first two years, the fiscal stimulus is fully debt-financed.

firms' marginal costs outweighs the inflationary pressure arising from higher aggregate demand. Furthermore, despite the fall of inflation due to labour tax cuts, monetary policy maintains a constant nominal interest rate. This results in an increase in the real interest rate, which in turn has a further dampening effect on output.

Finally, the simulations suggest that the monetary policy response matters more for expenditure-based stimuli than for revenue-based stimuli in terms of absolute changes in the fiscal multiplier. The latter result is also well aligned with the findings in Eggertsson (2009), which reveal that, at the zero lower bound on nominal interest rates, fiscal instruments that directly stimulate demand imply a larger multiplier than instruments that operate through the supply side. Wage or capital tax cuts can even produce a deepening of the downturn when the economy is at the zero lower bound. The reason for this finding is that the tax cut puts downward pressure on prices and hence upward pressure on the real interest rate.

Europe versus the United States

Table 2 compares the fiscal multipliers and CPI inflation responses across models for the euro area/European Union and the US economy, focusing on a fiscal stimulus of two years with a constant nominal interest rate for the first two years. The model simulations suggest that fiscal stimuli in the euro area/European Union are in general less effective (except for labour income taxes) than in the United States. This is mirrored by stronger CPI inflation responses (except for labour income taxes) in the models for the United States. The difference is primarily explained by the differing degrees of price stickiness in the euro area/European Union and the United States. In the case of a constant nominal interest rate, a higher degree of nominal rigidity generates only limited inflationary pressure. Hence, the real interest rate falls less than in an environment with lower nominal rigidity. Since nominal rigidities are higher in Europe the fiscal multipliers are typically smaller than in the United States (except for labour income taxes).[9]
The difference in the average fiscal multiplier and inflation response is particularly large in the case of targeted transfers (1.43 in the United States vs. 0.88 in the euro area/European Union).

The model simulations in Coenen et al. (2010) also show that the degree of openness matters for the size of spending multipliers. In particular, it turns out that if the nominal interest rate is kept constant in the short run, economies that are more open have somewhat smaller spending multipliers.

[9] *It should be emphasised that this result rests on the assumption of a constant nominal interest rate in the short run. Otherwise, if the nominal interest rate adjusts in the short run, a higher degree of price stickiness typically leads to a higher multiplier. A high degree of price stickiness implies that firms respond to government spending shocks by increasing production more rather than adjusting upwards their prices. Consequently, demand for labour, and hence disposable income and consumption of non-Ricardian households, increase even more. This gives rise to a more positive private spending reaction, and therefore a higher multiplier.*

Table 2 GDP multipliers and the impact on CPI inflation across models for the euro area/European Union and the United States when nominal interest rates are kept constant for two years

	GDP multiplier		CPI inflation	
	USA	EA/EU	USA	EA/EU
Increases in expenditures				
Government consumption	1.70	1.39	0.59	0.27
Government investment	1.72	1.40	0.56	0.20
General transfers to all households	0.43	0.27	0.15	0.08
Transfers to non-Ricardian households	1.43	0.88	0.70	0.26
Reductions in revenues				
Labour income taxes	0.31	0.34	0.03	0.04
Consumption taxes	0.68	0.60	0.26	0.12
Corporate income taxes	0.26	0.17	0.15	0.04

Notes: This table provides the averages across models of the GDP multipliers and the impacts on CPI inflation. For each model, the GDP multiplier and the impact on CPI inflation are calculated as the averages over the first two years. The measure of CPI inflation excludes the direct effect of change in consumption taxes. Except for corporate income taxes the models for the euro area/European Union are QUEST, GIMF, NAWM and the OECD Small Fiscal Model. For corporate income taxes in the euro area/European Union the models are QUEST and GIMF. The models for the United States include QUEST, GIMF, NAWM, FRB-US, Sigma and BoC-GEM for expenditures and labour income taxes. For consumption taxes in the United States QUEST, GIMF and NAWM are used and for corporate taxes QUEST, GIMF, FRB-US, Sigma and GEM are used. The fiscal stimulus lasts for two years. Within the first two years, the fiscal stimulus is fully debt-financed and the nominal interest rate is kept constant.

Temporary versus permanent stimulus

The size of the fiscal multiplier depends on the duration of the fiscal stimulus. In Coenen et al. (2010) it is shown that when the nominal interest rate is kept constant, a two-year expansion has a significantly larger multiplier than a one-year expansion. However, this result does not carry over to the general case. In particular, simulations show that fiscal expansions that go well beyond two years typically lower the output response to stimulus measures, i.e. result in smaller multipliers. This is because more persistent expansions result in a larger increase of the present discounted value of future tax payments, and therefore in a larger negative wealth effect. Taken to the extreme, it is shown that a permanent stimulus that goes hand-in-hand with a permanently higher government debt level – necessitating a rise in e.g. future taxes to service the higher interest rate burden – leads to lower initial multipliers and reduces output in the long run. In other words, long-lasting stimulus programmes that lead to a persistent deterioration of the fiscal balance result in a significantly smaller fiscal multiplier. At the same time, lasting reductions in distortionary taxes that do not compromise the fiscal balance may promote output via favourable supply-side effects in the longer run (see e.g. Trabandt and Uhlig, 2009).

"...stimulus programmes that lead to a persistent deterioration of the fiscal balance result in smaller multipliers..."

Conclusions

The model-based evidence presented in this article, and other related literature, suggests that the response of output to temporary fiscal stimulus measures depends on many factors, such as the chosen fiscal instrument, the persistence of the fiscal stimulus and the reaction of monetary policy.

In particular, fiscal instruments which directly stimulate aggregate demand (government consumption and investment) or targeted transfers lead to higher fiscal multipliers than tax cuts in the short run. Moreover, temporary and well-targeted fiscal expansions based on expenditure increases (assuming that they are implemented without delay) can be relatively effective in stimulating the economy when the nominal interest rate is kept unchanged for a prolonged period of time and prices are sticky. Finally, long-lasting stimulus programmes that lead to a persistent deterioration of the fiscal balance are significantly less effective.

RISK, UNCERTAINTY AND MONETARY POLICY

By Geert Bekaert and Marie Hoerova

Recent ECB research analyses the dynamic interactions among a stock market-based indicator of "risk aversion", stock market volatility and the monetary policy stance. Monetary easing (a negative shock to the real interest rate or deviations from the Taylor-implied rate) leads to a decrease in risk aversion after about six months, while expected stock market volatility ("uncertainty") does not seem to respond to monetary policy. However, high uncertainty leads to monetary easing in the future. The results are robust to controlling for business cycle movements.

The recent crisis has refuelled the debate about whether lax monetary policy can contribute to the build-up of financial imbalances. Prior to the crisis, some rather informal arguments were put forward suggesting that there may be a link between loose monetary policy and excessive risk-taking in financial markets. For example, Rajan (2006) conjectures that in times of ample liquidity supplied by a central bank, investment managers have a tendency to engage in risky, correlated investments. Managers are evaluated vis-à-vis their peers and by pursuing strategies similar to others, they can ensure that they do not under-perform. To earn excess returns in a low interest rate environment, their investment strategies may shift to highly risky, tail-risk sensitive and illiquid securities. This "behavioural" channel of monetary policy transmission can lead to the formation of asset price bubbles and financial instability. Given the dramatic events witnessed in 2007-09, this story sounds prophetic. Yet, firm empirical evidence on how monetary policy affects risk appetites in asset markets is lacking.[1]

"…there is a strong co-movement between a measure of stock market risk (the VIX) and monetary policy…"

At the same time, there can be a link in the other direction, and stock market risk may also affect monetary policy. For example, Rigobon and Sack (2003) find that the Federal Reserve systematically responds to stock prices. Moreover, recent work in the macroeconomic literature shows that heightened "uncertainty" as reflected in stock market developments predicts economic activity (Fornari and Mele, 2009) and generates a sharp drop in employment and output (Bloom, 2009). Waves of optimism and pessimism may be important drivers of economic fluctuations (see, for example, Beaudry and Portier, 2006). It is therefore conceivable that the monetary authority responds to stock market volatility, as it contains advance information about economic outcomes.

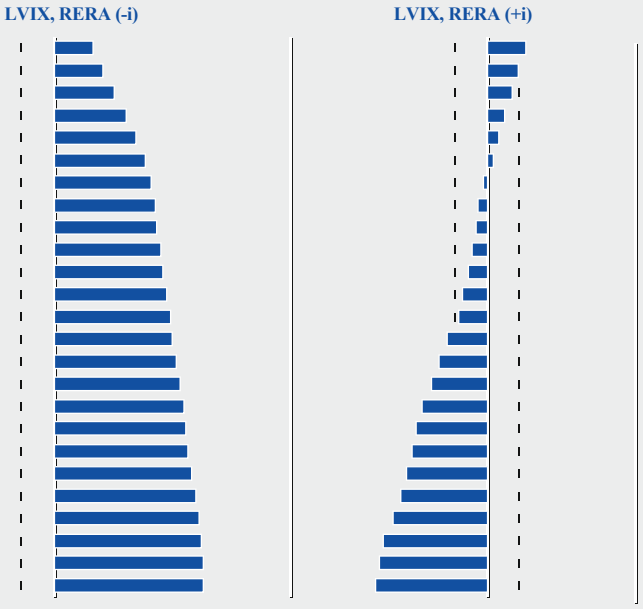
In recent research (see Bekaert, Hoerova and Lo Duca, 2010), we document that a popular indicator of risk aversion in financial markets, the VIX index, shows strong co-movements with measures of the monetary policy stance in the United States. Chart 1 considers the cross-correlogram between the real interest rate (the end-of-month Fed funds rate minus the year-on-year inflation rate of the same month) and the logarithm of end-of-month readings of the VIX index. The VIX contract, traded on the Chicago Board Options Exchange, represents a measure of the market's expectation of volatility for the US S&P 500. The correlogram first reveals a very strong positive correlation between past real interest rates and current VIX levels. This stylised fact is principally consistent with the hypothesis that monetary policy may induce pro-cyclical developments in the financial system through its impact on market participants' risk aversion. Second, while the current VIX is positively associated with real rates in the immediate future, the relationship turns negative and significant after 13 months: high VIX readings today tend to be associated with expansionary monetary policy in the medium run.[2]

These results are intriguing but difficult to interpret. First, the VIX index consists of two components: a component that reflects actual expected stock market volatility ("uncertainty") and a residual, the so-called "variance premium" (see, for example, Carr and

1 *For empirical evidence that monetary policy affects the riskiness of loans granted by banks see, for example, Altunbas, Gambacorta and Marquéz-Ibañez (2010), Ioannidou, Ongena and Peydró (2009), Jiménez, Ongena, Peydró and Saurina (2009), and Maddaloni and Peydró (2010).*

2 *We also find strong Granger causality in either direction in a bivariate vector-autoregression, i.e. the monetary policy stance predicts the VIX and the VIX predicts the monetary policy stance.*

Chart 1 Cross-correlogram between the logarithm of the VIX index (LVIX) and the real interest rate (RERA)



i	lag	lead
0	0.1747	0.1747
1	0.2190	0.1372
2	0.2670	0.1071
3	0.3138	0.0811
4	0.3560	0.0556
5	0.4008	0.0278
6	0.4252	-0.0113
7	0.4418	-0.0342
8	0.4504	-0.0417
9	0.4606	-0.0577
10	0.4713	-0.0813
11	0.4895	-0.0984
12	0.5034	-0.1214
13	0.5124	-0.1667
14	0.5285	-0.2038
15	0.5461	-0.2374
16	0.5612	-0.2773
17	0.5697	-0.2990
18	0.5804	-0.3143
19	0.5943	-0.3389
20	0.6107	-0.3658
21	0.6255	-0.3989
22	0.6356	-0.4351
23	0.6430	-0.4579
24	0.6463	-0.4732

Source: Bekaert et al. (2010).
Notes: The first column presents the (lagged) cross-correlogram between the log of the VIX (LVIX) and past values of the real interest rate (RERA). The second column presents the (lead) cross-correlogram between LVIX and future values of RERA. Dashed vertical lines indicate 95% confidence intervals for the cross-correlation. The third column presents the cross-correlation values. The index i indicates the number of months either lagged or led for the real interest rate variable.

Wu, 2009) that reflects risk aversion and other non-linear pricing effects, and perhaps even Knightian uncertainty. We proceed by decomposing the VIX into these two components. Specifically, the squared VIX is a measure of the risk-neutral expectation of the variance of stock returns. The variance premium equals the difference between the risk-neutral and actual ("physical") expectations of the variance of stock returns. Because stock returns have negative skewness and investors are risk-averse, this difference is essentially always positive.[3] We borrow a measure of the actual expectation of variance from Bekaert and Engstrom (2009). They regress monthly realised variances on a set of predictor variables and construct forecasted series for realised variance. The logarithm of this forecast series is our measure of uncertainty. The logarithm of the difference between the squared VIX and the actual expectation of variance is our improved risk aversion measure.

Second, the two-way link between the VIX and monetary policy may also reflect the joint response to omitted variables, with business cycle variation being a prime candidate. For instance, recessions may be associated with high risk aversion and uncertainty and may represent the true cause of monetary easing. Such policy may, in turn, reduce uncertainty and risk aversion through its lagged expansionary impact on economic activity rather than through the behavioural channel mentioned above. To account for business cycle variation, our analysis incorporates jobless claims, a measure of unemployment.

To establish causal relationships, we use a vector-autoregressive (VAR) framework which comprises four variables: risk aversion, uncertainty, the monetary policy stance as measured by the real interest rate, and jobless claims. Our sample period is January 1990 to July 2007.[4] To assess structural interactions, we employ various identifying restrictions. One set of identifying restrictions we experiment with is a version of long-run money

3 The risk-neutral distribution overweighs "bad" states relative to "good" states and does so more, the more risk-averse investors are.

4 We do not consider the most recent data on the crisis. The depth of the crisis represents an extraordinary event, implying special challenges for our linear framework.

neutrality.[5] We check that our results are robust to alternative identification schemes.

The results reveal that the primary component driving the co-movement between the past monetary policy stance and current VIX levels (first column of Chart 1) is risk aversion. Monetary easing (a fall in the real interest rate) leads to a decrease in risk aversion after about six months.[6] This effect is persistent, lasting for more than two years. The uncertainty component of the VIX lies behind the negative relationship in the opposite direction (second column of Chart 1). Monetary authorities react to periods of high uncertainty in the stock market by easing monetary policy. The persistence of this effect is about one year. These results are robust to using alternative measures of the monetary policy stance (e.g., deviations from the Taylor-implied rate) and business cycle variation (e.g., hours worked or industrial production).

"...monetary easing leads to a decrease in risk aversion in the stock market in the medium run..."

Our findings have potentially important policy implications. In a recent article, Blanchard (2009), commenting on the 2007-09 crisis, noted that the economy and financial markets had "nothing to fear but fear itself", suggesting a role for policy to reduce these fears. His conclusion that markets were "fearful" was inspired precisely by unusually elevated VIX levels. There is also an ongoing debate about the effectiveness of monetary policy in "leaning against" asset price booms. If monetary policy can significantly affect risk appetites in asset markets, it could provide a potent channel for taming financial excesses.

5 *The usual definition of money neutrality holds that monetary policy cannot have a long-run effect on other, real variables. See Bernanke and Mihov (1998) and King and Watson (1992) for empirical evidence in favour of money neutrality.*

6 *This finding links to a large literature establishing that expansionary (contractionary) monetary policy affects the stock market positively (negatively) (see, for example, Thorbecke (1997), Rigobon and Sack (2004) and Bernanke and Kuttner (2005)). Indeed, Bernanke and Kuttner (2005) ascribe the bulk of the effect to laxer monetary policy lowering risk premiums, reflecting both a reduction in economic and financial volatility and an increase in the capacity of financial investors to bear risk.*

Box 1

KEY DEVELOPMENTS IN MONETARY ECONOMICS

On 29-30 October 2009 the European Central Bank (ECB) hosted a conference on "Key developments in monetary economics," which brought together leading academics and central bank researchers to assess the state of monetary economics. A companion conference had taken place at the Federal Reserve on 8-9 October 2009. Papers presented at the two conferences represented early drafts of chapters to be published in an updated edition of the "Handbook of Monetary Economics".

Jean-Claude Trichet (President, ECB) opened the ECB conference drawing some lessons from the recent financial crisis. He advocated more work on models that allow for a deeper interaction between financial markets, banks and the real economy. He also emphasised the need for central banks to adopt monetary policy strategies relying on a comprehensive information set.

The first session of the ECB conference reviewed results on optimal monetary policy. Martin Uribe (Columbia University) discussed the extent to which the inflation objectives of central banks in industrial countries are consistent with the optimal rate of inflation predicted by leading monetary theories. Jordi Galí (CREI and Universitat Pompeu Fabra) analysed the implications for monetary policy of extensions of the New Keynesian framework that model unemployment explicitly. Frank Smets (ECB) reviewed the implications for the conduct of monetary policy of adaptive learning in the private sector's formation of inflation expectations.

The second session focused on monetary policy implementation and banks. Benjamin Friedman (Harvard University) and Kenneth Kuttner (Williams College) reviewed the operational features

of monetary policy, while Hyun Song Shin (Princeton University) presented a reappraisal of the role of financial intermediaries in monetary economies.

The third session explored open-economy aspects of monetary economics. Jeffrey Frankel (Harvard Kennedy School) surveyed the conduct of monetary policy in emerging market countries. Giancarlo Corsetti (European University Institute) reconsidered some classical open-economy questions, such as the desirability of reacting to exchange rate developments or of coordinating policies internationally.

In his keynote speech, Lucas Papademos (Former Vice-President, ECB) emphasised the close interaction existing between the theory and the practice of monetary economics. He spoke about the progress that has been made in the field of monetary economics in the past twenty years, but also underlined some aspects of the economy that appear to be very important from a policy perspective, yet remain imperfectly understood.

In the fourth session of the conference, Alberto Alesina (Harvard University) surveyed the literature on the political economy of monetary policy, with particular emphasis on questions raised by the recent financial crisis. Lars E.O. Svensson (Sveriges Riksbank and Stockholm University) discussed the history, theory and practice of inflation targeting. Finally, Laurence Ball (John Hopkins University) examined the actual performance of countries that have adopted alternative monetary regimes.

The final conference session was opened by Lawrence Christiano (Northwestern University), who reviewed various extensions of the New Keynesian model designed to replicate VAR-based facts about the response of aggregate variables to economic shocks. Jeff Fuhrer (Federal Reserve Bank of Boston) re-examined the concept of inflation persistence. Luca Benati (ECB) and Charles Goodhart (London School of Economics) presented an overview of the historical record of monetary policy regimes and economic performance in industrial countries from 1979 to 2008.

The contributions to this conference can be downloaded from the ECB's website at: http://www.ecb.europa.eu/events/conferences/html/monetaryeconomics.en.html

Box 2

ECB-CFS CONFERENCE SUMMARY

The 12th conference of the ECB-CFS Research Network on "Capital Markets and Financial Integration in Europe" was hosted by the Einaudi Institute for Economics and Finance on 12-13 November 2009 in Rome. Its topic was "Learning from the Crisis: Financial Stability, Macroeconomic Policy and International Institutions". The objectives of the conference were to present state-of-the-art research on the roots and evolution of the current crisis, as well as the issues that it has raised for the reform of the international monetary and financial system, and to provide a forum for debate among market participants, policy-makers and researchers.

Following the opening address by Gertrude Tumpel-Gugerell (ECB), the presentations in the first session focused on the analysis of macro-prudential regulation and supervision issues. Luigi Zingales (University of Chicago) proposed a new and implementable capital requirements mechanism for large financial institutions that are too big to fail. The mechanism mimics the operation of margin accounts. Anton Korinek (University of Maryland) presented a new

analytical framework of macro-prudential capital adequacy requirements that take into account systemic risk. In his keynote speech, Patrick Bolton (Columbia University) analysed the lessons and consequences of the crisis for financial regulation, advocating in particular the usage of covered bonds as a way to align incentives for origination and servicing of the loan.

In the second session, Emmanuel Farhi (Harvard University) argued that there is a role for macro-prudential supervision due to the presence of agency problems in the financial sector and time inconsistency of monetary policy. The optimal regulation takes the form of a minimum liquidity requirement coupled with monitoring of the quality of liquid assets. The link between liquidity, firms' access to external finance, and the real economy was the focus of Oren Sussman's presentation (Oxford University). He showed that there is a feedback mechanism from collateral requirements to the fire-sale price of capital goods and that stabilisation policies that inject liquidity or bail out companies may decrease the probability of a crisis and enhance welfare.

Mario Draghi (Banca d'Italia) highlighted the role that the Financial Stability Board can play in fostering international cooperation to achieve changes to financial system regulation. He also discussed a number of proposals that have been put forward.

The third session focused on the origins of the crisis. Rajdeep Sengupta (Federal Reserve Bank of St. Louis) examined underwriting standards on securitised sub-prime mortgage originations from 1998 to 2007 and found little evidence of a weakening of lending standards within the sub-prime market. Angela Maddaloni (ECB) analysed the root causes of the crisis by studying the determinants of bank lending standards in the euro area. She identified three main causes: (i) the low level of short- and long-term interest rates; (ii) high securitisation activity; and (iii) weak banking supervision standards.

The fourth session addressed the international transmission and real effects of the crisis. Shang-Jin Wei (Columbia University) provided strong evidence of tightening financial constraints for firms in emerging countries during the 2007-09 crisis and argued that the composition of capital flows matters a great deal, with pre-crisis exposures to non-FDI capital inflows exacerbating the credit crunch. Using a unique dataset of German savings banks over the period 2006-08, Sascha Steffen (University of Mannheim) documented that banks affected by the US financial crisis reject substantially more loan applications than non-affected banks, thus providing evidence of the global linkages for the supply of credit. Erasmo Giambona (University of Amsterdam) explored how liquidity conditions affect real firm behaviour. He found that credit-constrained firms (small, private, non-investment-grade and unprofitable) draw more funds from their credit lines, are more likely to face difficulties in renewing or initiating new lines during the crisis, and face more stringent terms on credit line facilities during the crisis compared with large and profitable firms.

In his keynote speech, Olivier Blanchard (International Monetary Fund) discussed reasons why excess reserve accumulation by countries may be inefficient and outlined possible ways to reduce it.

The last session was devoted to accounting issues. Christian Laux (Goethe University Frankfurt and Center for Financial Studies) examined the role of fair-value accounting in the financial crisis and argued that it is unlikely that it added to the severity of the crisis in a major way. Harry Huizinga (Tilburg University) showed that banks use accounting discretion to overstate the value of distressed assets. His results indicated that banks' balance sheets offer a distorted view of the financial health of banks.

The contributions to this conference can be downloaded from the ECB-CFS website at: http://www.eu-financial-system.org/index.php?id=100

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