

The transmission of US economic cycle to the euro area economy

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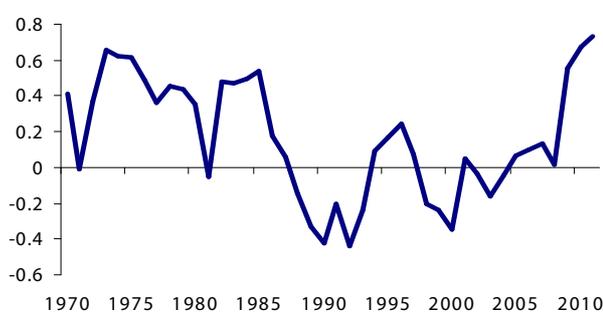
1. Introduction

Many papers have analyzed international business cycle linkages, trying to gauge the stylized features and the co-movement of economy-wide fluctuations across countries. Globalization - the process of continuing integration of the countries in the world- has enhanced the degree of synchronisation of cross-country business cycles over the past three decades. A large role has been attributed to spillover effects from the US to other countries and not in the opposite direction¹, with negative growth shocks being more readily transmitted from the US to other countries than positive ones². A simple correlation between the US and the world's GDP growth excluding the US highlights an increased importance of the US economy to the world's business cycle (Figure 1a), despite the falling contribution of the US economy to global growth (from almost 30% in 1950 to about 20% in mid-2000s and around 10% currently).

The pivotal role of US cyclical developments for the rest of the world came under the spotlight during the global financial crisis in 2007-2009. At the start of the crisis, a widely held view was that the global economy could decouple from the US downturn, as the recession was attributed to domestic US problems regarding the housing market and, more specifically, the sub-prime segment of the US mortgage market. Nevertheless, the financial turmoil widened and deepened with the collapse of some major financial institutions, spreading to the global economy and becoming consistent with previous systemic financial crises³.

The aim of this article is to examine the relationship and the linkages between US and euro area business cycles, in an effort to gauge the implications of a slowdown in the US on the euro area economy. The paper is structured as follows. Section 2 contains a description of the main transmission channels through which a downturn in the US economy could spill over to the euro area. Section 3 introduces the main features of business cycles in the euro area and the US, and Section 4 includes an estimation of the sensitivity of the euro area economy to US economic developments. Section 5 concludes.

Figure 1a: 10-year rolling correlation between the US and the world's GDP growth



Source: The World Bank, Eurobank estimates

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¹ Dassel (2002), Monfort et al. (2003), Giannone and Reichlin (2006)

² Osborn et al. (2005)

³ Reinhart and Rogoff (2009)

2. Transmission channels

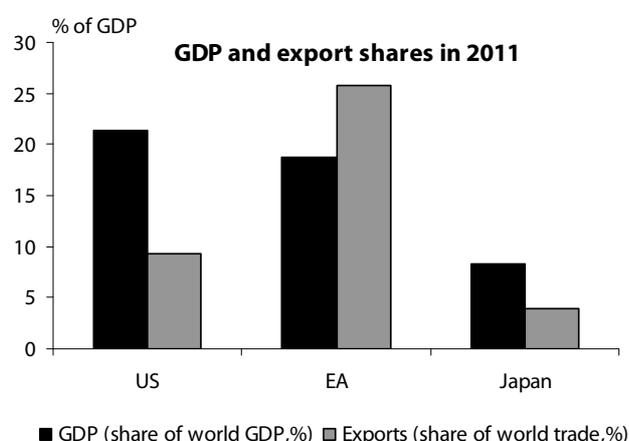
2.1 Trade linkages

A traditional channel through which a downturn or an upturn in a specific economy could have global repercussions is trade in good and services. If two countries trade directly with each other, export to the same countries or just compete in the same industries, then changes in the economic environment of one of the countries could change the relative prices and quantities of goods and services traded by that country and, consequently, influence economic activity in the other economy. Trade linkages can be decomposed into three distinct channels by which an economy can be affected by significant economic fluctuations elsewhere in the world: a competitiveness effect, an income effect, and a cheap-import effect⁴. As far as the competitiveness effect⁵ is concerned, the depreciation of a currency reduces the relative price of the country's exports and, therefore, shifts demand away from goods and services that compete with those exports. The second trade channel is the so-called income effect⁴ or domestic demand effect⁶. A country's negative/positive demand shock that affects its income level and output growth rate would in turn reduce/increase that country's demand for imports. Therefore, other countries that export directly to the specific country will experience a shift in demand for their goods and services. The third trade channel (cheap-import effect⁴, or bilateral trade effect⁵, or supply effect⁶) refers to a devaluation of a country's currency that reduces the relative price of its exports and potentially improves the terms of trade in other trade partners. Imports to other countries become relatively cheaper, allowing them to increase private consumption for any given level of disposable income and, therefore, affect positively those countries' welfare.

Although the euro area is the second largest economy in the world, it has actually the highest share of world trade, accounting for around 26% of world exports (including intra-euro area exports⁷), compared with about 9.5% and 4.0% for the US and Japan, respectively (Figure 1). As far as both exports and imports are concerned, the euro area economy is more open than the US or Japan, with a high share of exports and imports to GDP that increases significantly over time (Figure 2). The high degree of euro area openness highlights the importance of the trade transmission channel in episodes of changes in the euro area's external environment.

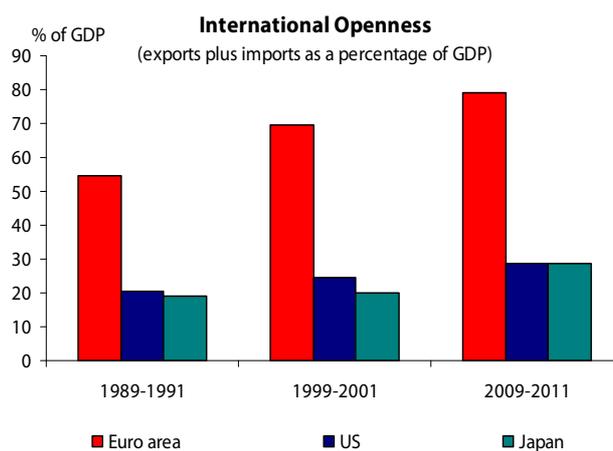
In terms of geographical breakdown, the UK and the US are the largest trading partners of the euro area, representing together almost one-fourth of the euro area's exports in goods (Figure 3). That is why the traditional channel was important in transmitting the most recent 2007-09 US crisis to the euro area economy. Net trade played a substantial role in the downturn of the euro area that followed the US recession, with euro area exports of goods to the US declining by more than 30% in the period 2007-09.

Figure 1



Source: The World Bank

Figure 2



Source: The World Bank

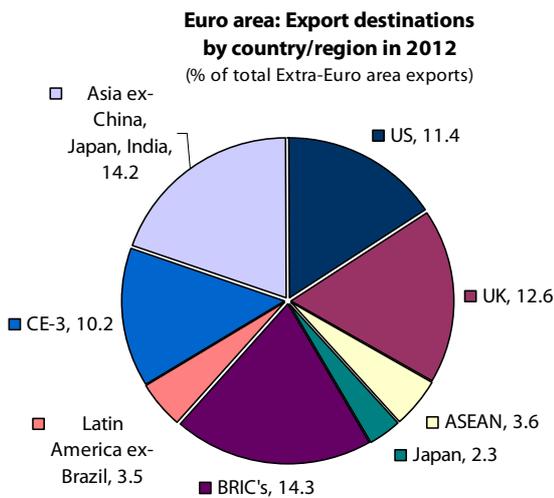
⁴ Forbes (2001)

⁵ Corsetti et al. (2000)

⁶ Wincoop and Yi (2000)

⁷ If we exclude intra-euro area exports, euro area's share of world trade declines to around 15%, but still remains the highest trade share in the world.

Figure 3



Source: Eurostat, IMF, Eurobank estimates

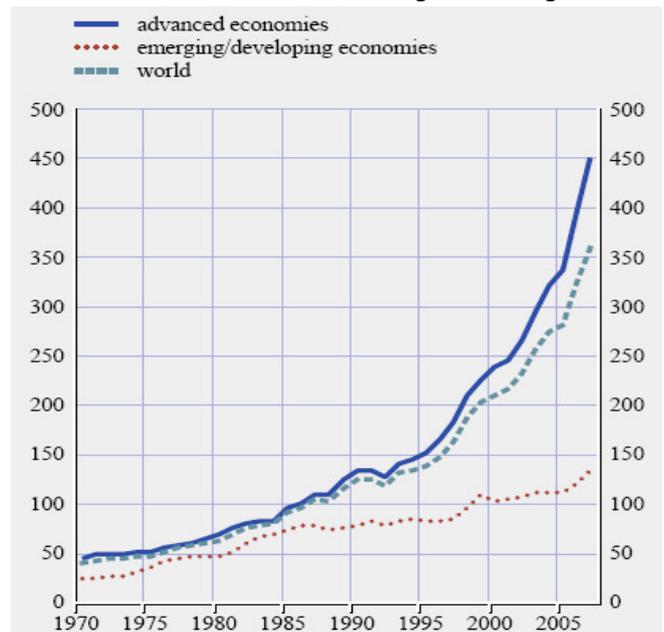
2.2 Capital Flows Channel

Cross-border capital and financial flows may constitute a significant channel of transmission of economic changes in the external environment. The financial account of a country's balance of payments includes flows of financial assets and liabilities with the rest of the world. The sum of the current account balance and the capital account balance equals the financial account balance, which records direct investment, portfolio investment, financial derivatives, reserve assets and other financial transactions such as trade credits, loans and deposits. Portfolio investment and, particularly, foreign investment represent the most important channels for international linkages, with globalization and the internationalization of production making the balance sheets of multinational firms highly reliant on the external environment. The degree of global financial market integration has surged since the late 1980s, with cross-border financial assets and liabilities increasing from 125% of global GDP in 1990 to almost 360% in 2007 prior to the global financial crisis (Figure 4). As is evident in Figure 4, advanced economies account for the largest part of the increase, as the liberalization of national financial markets was initially put into practice in the advanced economies and progressively spread to emerging economies. The gradual easing or lifting of capital controls and other financial account restrictions, combined with improving global economic prospects prior to the crisis that emerged in 2007, prompted capital to flow around the global economy. Figure 5 shows that the gross external assets and liabilities of the euro area increased from approximately €5.9 and €6.3 trillion in 1999 to €15.8 and €17.2 trillion respectively in 2011, an increase in both categories of around 170%, well above the increase

recorded in euro area nominal GDP (approximately 46%). As a result, international financial integration, as measured by the sum of cross-border assets and liabilities as a percent of GDP, increased from 188% in 2009 to 350% of GDP in 2011 for the euro area, pointing to an increase in the importance of cross-border financial flows link in the transmission of international shocks to the euro area.

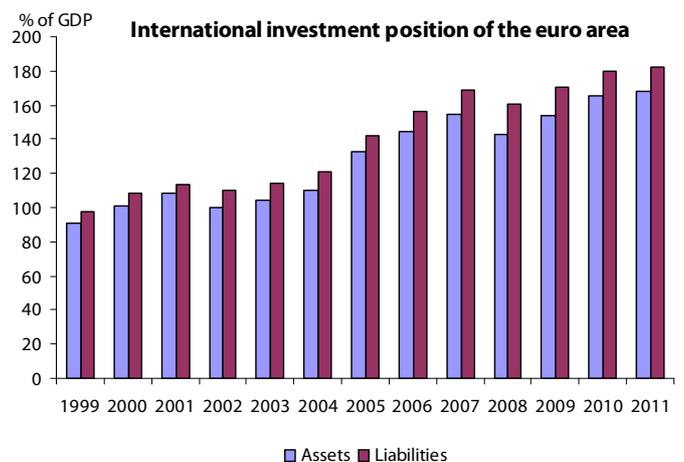
Figure 4⁸

Sum of outstanding amounts of cross-border assets and liabilities as a % of GDP, unweighted averages



Sources: ECB staff calculations based on the updated and extended version of the External Wealth of Nations Mark II database developed by Lane and Milesi-Ferretti (2007). Last observation refers to 2007.

Figure 5



Source: ECB

⁸ Forster, K. and Vasardani, M. (2011), "Euro-area cross-border financial flows and the global financial crisis", Occasional Paper Series, No 126, ECB.

2.3 Financial market linkages

Although economists have conflicting views regarding the underlying mechanisms that explain the positive relation between the degree of development of the financial system and economic development, one cannot question the link between the financial system and economic performance. Equity markets constitute an important source of finance for investment, and can have an important effect on private consumption through wealth and confidence links. Therefore, the transmission of shocks between different equity markets could explain some of the correlation in economic activity between different countries. Equity market valuations of multinational corporations are strongly linked to their global profitability, while investors invest in foreign equity markets in order to take advantage of cross-border diversification and alternative investment opportunities. Moreover, cross-border asset price arbitrage could constitute another reason for correlation between equity markets, in the sense that comparable risks should be priced in a similar way across different countries. Brooks and Catao (2000) highlight the increasing importance of global factors, compared to country-specific factors, in explaining movements in equity prices since the mid-1990s. In particular, the above-mentioned study reports that the greater relevance of global industry factors -at the expense of local factors- has increased the co-movements of equity markets around the world, and especially between the US and the euro area.

Using a simple method to evaluate the importance of the equity market channel between the US and the euro area, we find that the correlation between changes in American and European share prices has risen from 0.5 in the mid-1990s to around 0.9 over the last decade. Nevertheless, the high correlation between the two equity markets does not necessarily imply that shocks in one market are transmitted into the other market, as the co-movement may be due to common external shocks. An ECB Working Paper⁹ that examines the causality of equity market spillovers in Europe concludes that although spillovers to individual euro area equity markets are strongest from shocks in other euro area stock markets, the US equity market remains highly relevant for the euro area equity market. The results of this study imply that a 1% shock to the US equity market causes a change of about 0.4% on average in euro area equity markets. The transmission of equity shocks tends to intensify when large-scale declines in the equity markets occur¹⁰, like the bear equity markets in 2000-2002 and 2008.

⁹ Fratzscher (2001)

¹⁰ Longin and Solnik (2001)

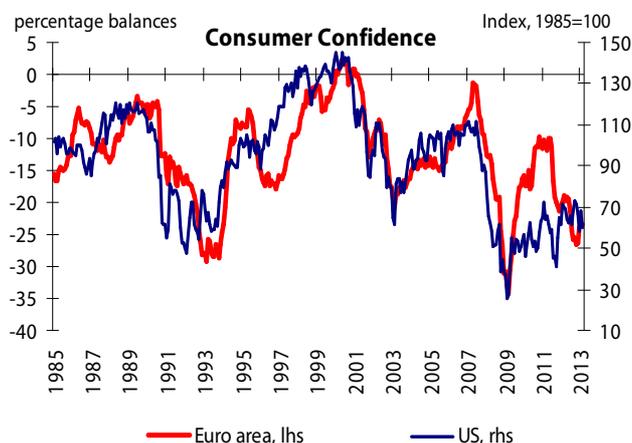
Apart from the equity markets, linkages between major international bond markets can have substantial effects on the countries' business cycles. The presence of a world price of risk, the tendency for international diversification of bond holdings, the presence of global factors that determine real rates, and the possibility that there is a "flight to quality" in times of financial stress, are factors that can lead to an increase in the co-movement of interest rates across countries. Clare and Lekkos (2000) highlight that the linkages between major bond markets are significant during times of financial stress. Academic research finds a link between US and European bond markets: Bremmes et al. (2001) support that US interest rates have a significant impact on German interest rates, and Hassapis et al. (1999) provide evidence that the US rate had an effect on the European Monetary System interest rates. In addition, Ehrmann and Fratzscher (2002), who have investigated interest rate interdependence between the euro area and the US, concluded that the interdependence between the two money markets has increased over time, and that the spillover effects from the US to the euro area money market remain stronger than in the opposite direction.

2.4 Confidence Channel

Beyond the traditional trade and financial channels, the confidence channel is another potential channel of transmission of macroeconomic shocks across borders. Consumer and business confidence can have a significant impact on private consumption expenditures and investment, respectively. Given that industrial output (including construction) in the euro area represents roughly 23% of GDP, while personal consumption is almost 58% of GDP, one can expect that consumer confidence is relatively more important as a transmission channel in the euro area countries than industrial confidence. This is evident in the following Figures (6 and 7), as consumer confidence indices in the euro area and the US seem to be more correlated, compared to the corresponding industrial confidence indices. Indeed, a simple analysis of contemporaneous and lagged correlations between consumer and industrial confidence indices in the two regions from 1985 up to now reveals a low contemporaneous correlation of 0.26 for industrial confidence, and a strong correlation of 0.75 for consumer confidence, about three times the correlation for industrial confidence (Table 1). Moreover, our calculations presented in Table 1 suggest that the Conference Board Consumer Confidence index for the US leads the European Commission's consumer confidence indicator by one quarter, while the ISM manufacturing index for the US seems to lead the European Commission's industrial confidence indicator by around two quarters. Nevertheless, looking at the simple correlations we cannot be sure that this lead represents another channel in the transmission of external disturbances, or it simply reflects the lagging performance of the euro area economic activity versus the US. An ECB paper (Anderton et al.

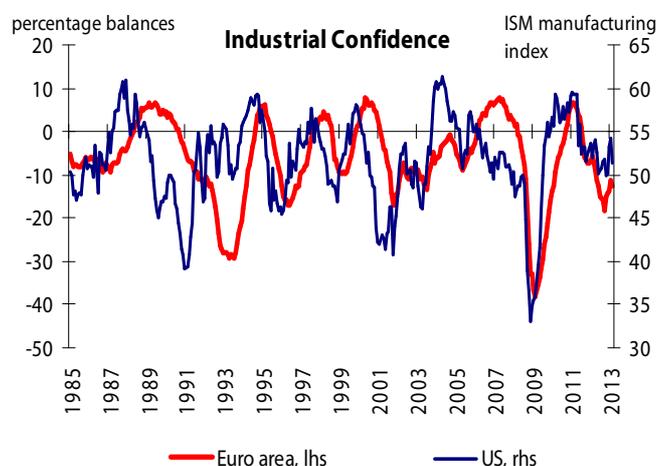
2004), which examined the relationship between confidence indicators in the two regions, has found evidence of the impact of the US confidence on euro area confidence, suggesting that confidence linkages constitute an additional channel for the transmission of shocks between US and euro area.

Figure 6



Source: European Commission, Conference Board

Figure 7



Source: European Commission, Institute for Supply Management

Table 1: Consumer and industrial confidence channels (Jan 1985- March 2013)

Correlation between US and EA	Contemporaneous	1q lag	2q lag	3q lag
Consumer Confidence	0.75	0.78	0.71	0.64
Industrial Confidence	0.26	0.44	0.48	0.46

Source: European Commission, Conference Board, Institute for Supply Management, Eurobank estimates

3. Main features of the euro area and the US business cycles

There is a large empirical literature which highlights the strong link and the high degree of synchronization between US and euro area economic activity¹¹. Business cycles in the euro area and the US have a high correlation, with a very similar magnitude of fluctuations in consumption, investment, prices, inflation, interest rates and monetary aggregates relative to the fluctuations of GDP in the two monetary unions¹². A simple analysis of contemporaneous correlations between the annual growth rates in the two regions (Column 2) suggest that the correlation has increased substantially over the past decade, reaching 0.82 for the period 2000-2012 (Table 2). Output growth in the two regions have a common trend, with US real GDP increasing by an average rate one-quarter higher than euro area GDP (Figure 8). In particular, the average GDP growth rate for the US is 3.1% y-o-y for the period 1965-2012, while the corresponding growth rate for the euro area is 2.8%.

Estimates of potential output and output gaps in Figure 9 suggest that the euro area generally exhibits milder downturns and slower rebounds in comparison with the US economy. The only case that the euro area economy exhibited a deeper contraction in real GDP was during the 2007-2009 financial crisis. However, even in this case, if we take account the fact that the US typically has higher growth potential, the recession was actually more severe in the US (Figure 9). Indeed, looking at the volatility of the business cycles in the US and the euro area, as measured by the variance of the quarterly GDP growth rates, we find that output volatility is higher in the US than in the euro area (Table 3). Nevertheless, although the growth rate of output in the euro area is less volatile than in the US, it is actually more persistent¹³. Persistence can be measured in different ways. In our analysis, we use the variance of that component of the growth rate of output corresponding to cycles of eight years or longer. This is approximately the variance of the Hodrick and Prescott trend (HP trend) with smoothing parameter equal to 1600. As is evident in Table 3, persistence is larger in the euro area than in the US, as the ratio between the variance of the HP trend and the total variance is 0.44 in the euro area versus 0.27 in the US. Persistence implies that the effect of an exogenous shock in the euro area lasts longer than in the US, possibly due to increased protectionism and less flexibility that characterizes the euro area economy compared with the US¹⁴.

¹¹ Canova, Ciccarelli and Ortega (2005), Del Negro and Otrok (2008), Giannone and Reinchlin (2006), Giannone et al. (2009)

¹² Agresti and Mojon (2001)

¹³ Giannone and Reinchlin (2006)

¹⁴ Duval et al. (2007)

Table 2: Correlation between real GDP growth in the US and the euro area

Time period	Contemporaneous	Lagged US GDP growth 1q	Lagged US GDP growth 2q
1961-1980	0.45	0.54	0.39
1981-1999	0.26	0.34	0.38
2000-2012	0.82	0.85	0.74

Source: OECD, Eurobank estimates

Table 3: Volatility and persistence of the business cycles in the US and the euro area, 1970Q1-2012Q2

	US	Euro area
Std (Output growth)	0.85	0.64
Std (HP trend)	0.23	0.28
Std (HP trend)/ Std (Output)	0.27	0.44

Source: OECD, Eurobank estimates

The common euro area business cycle is found to lag the US cycle by several quarters. This is evident in Figure 8, which portrays real GDP growth in the two advanced economies and shows that there is a specific trend regarding the timing of euro area and US downturns and upturns, with euro area turning points lagging US ones. The analysis of simple correlations between lagged US GDP growth and euro area growth presented in Table 2 confirms the evidence. The correlation between output growth in the two regions increases when we use US GDP growth with one quarter lag, and reaches a maximum of 0.85 for 2000-2012.

Furthermore, there is an asymmetry within business cycles, in the sense that a negative shock to the US economy is transmitted faster to the world excluding the US, and consequently the euro area, than a positive one¹⁵. In particular, according to Déés and Vansteenkiste (2007), it takes between 1 and 3 quarters for a US downturn to spillover to another region/country, while it takes between 2 and 10 quarters for an upturn to unfold (Table 4). Spillovers from the US materialize fastest into Latin America, whereas they take longest to occur into Switzerland, Norway, Sweden and Denmark. As far as the euro area economy is concerned, it takes around two quarters for a downturn in the US to transmit to the euro area economy

whereas it takes around seven quarters for an upturn to spillover.

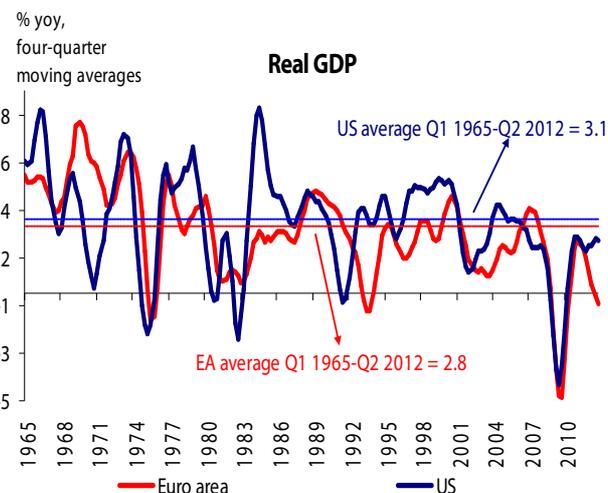
Table 4: Impact of a US domestic shock (by 1 p.p. of GDP) on other countries'/regions' GDP

Country/Region	Number of quarters US leads	
	Low growth	High growth
US - euro area	2	7
US - UK	2	2
US - Other Developed Countries (Canada, Australia, New Zealand)	2	4
US - Latin America	1	2
US - Rest of Europe (Switzerland, Norway, Sweden, Denmark)	3	10

Source: Déés, S. and Vansteenkiste, I. (2007), "The transmission of US cyclical developments to the rest of the world", Working Paper Series, No 798, ECB.

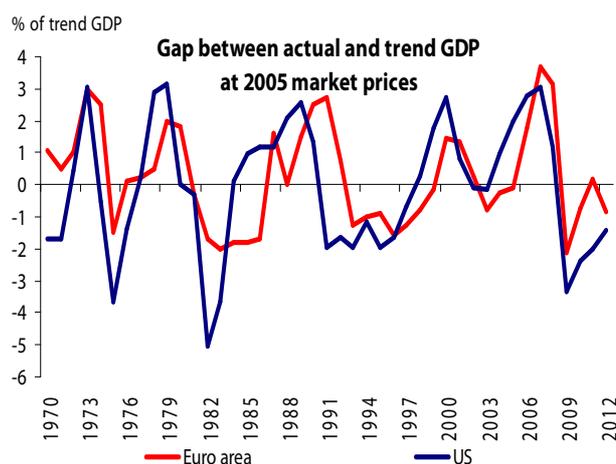
The above-mentioned findings of the academic literature are confirmed by the actual turning points of the US and the euro area economy across time. In 2002, the Centre for Economic Policy Research (CEPR) established a Business Cycle Dating Committee for the euro area, identifying the recessions and expansions of the 11 original euro area member countries from 1970 to 1998, and of the euro area as a whole since 1999. The Committee has identified four complete cyclical episodes since 1970, with peaks and troughs presented in Table 5. The timing of euro area recessions is similar to that of US recession, as defined by the National Bureau of Economic Research (NBER), but the euro area turning points lag US ones. All of the four complete cyclical episodes of the euro area economy (1974-75, 1980-82, 1992-93, 2008-09) coincide with US recessions, with an average lag of 2.5 quarters.

Figure 8



Source: OECD

Figure 9



Source: European Commission

Table 5: Euro area and US Business Cycle Expansions and Contractions

Euro area		US	
Peak	Trough	Peak	Trough
1974Q3	1975Q1	1973Q4	1975Q1
1980Q1	1982Q3	1980Q1	1980Q3
		1981Q3	1982Q4
1992Q1	1993Q3	1990Q3	1991Q1
		2001Q1	2001Q4
2008Q1	2009Q2	2007Q4	2009Q2
2011Q3	-		

Source: CEPR, NBER

4. The magnitude of spillovers from US economic fluctuations

There is historically a high degree of correlation between GDP growth in the US and various regions in the world. The ability to estimate the magnitude of spillovers that could occur in several countries following a shock originating from the US economy is of particular importance, in order to better assess the economic developments in the countries' domestic economies. An ECB working paper (Dees and Vansteenkiste, 2007) has used various methods to measure the size of the sensitivity of several regions in the global economy to US disturbances. The effect from a demand shock originating in the US is being decomposed into trade effects, as well as additional channels, such as financial or confidence linkages. Table 6 shows that the direct trade effects are relatively small for the euro area countries, and benefit mostly other US trading partners, i.e. Canada, Australia, New Zealand, Latin America and Emerging Asia (column 2). However, the effect of changes in US economic activity on the euro area, as well as other European countries, is being amplified through additional trade-related channels (second-round and third-country effects). In case of the euro area economy, higher import demand from the US may benefit not only directly the euro area exports, but also the exports of other countries which, in turn, may increase their imports from euro area member countries. These dynamics produce the so-called "echo effect", and increase Europe's output elasticities to US demand changes (Column 3). Indeed, the elasticity is multiplied by 2 for the euro area, so a 1 percentage point positive/negative shock in the US would result in an increase/decline in the euro area GDP by about 0.19 percentage points via the trade channel. Should we take into account other transmission channels (Column 4), then the effect of a US domestic demand shock is around 2.5 times the one based purely on trade effects. Summarizing the timing and the magnitude of spillovers from US economic fluctuations to the euro area economy, a 1 pp of GDP negative/positive US demand shock would decrease/increase euro area GDP by about 0.27pp over the next two quarters/seven quarters.

Other studies that examine spillover effects from the US to other countries find similar results. According to Bagliano and Morana (2011), a unitary percentage change in US GDP leads to a change in Europe's GDP of about 0.18% at a 2-quarter horizon (short-term) and 0.21% at a 12-quarter horizon (medium term). Osborn, Perez and Sensier (2005) focus on business cycle linkages and find a cumulative spillover effect from the US to E15 of about 0.21-0.26%, while Schneider and Fenz (2008) support that direct spillovers between the US and the euro area account for not more than 0.15%.

Table 6: Impact of a US domestic shock (by 1p.p. of GDP) on other countries'/regions' GDP

Country/Region	Direct Trade Effect	Trade effect incl. echo effect	Overall effect (incl. other channels)
Euro area	0.08	0.19	0.27
Japan	0.14	0.24	0.35
Latin America	0.27	0.37	0.65
Other Developed Countries (Canada, Australia, New Zealand)	0.46	0.57	0.60
Emerging Asia	0.20	0.37	0.23
Rest of Europe (Switzerland, Norway, Sweden, Denmark)	0.08	0.25	0.31
UK	0.08	0.19	0.12
US	1.00	1.11	1.07

Source: Déés, S. and Vansteenkiste, I. (2007), "The transmission of US cyclical developments to the rest of the world", Working Paper Series, No 798, ECB.

In order to quantify the impact of the US economic developments on euro area's economic performance, we model the quarterly growth in real GDP in the two regions, using historical data available at the OECD database. We estimate a two country linear VAR for the growth rate of the US and the EA15 for the period 1960Q4-2013Q1 and the sub-periods 1960Q4-1985Q4 and 1986Q1-2013Q1. We examine the Akaike and the Schwarz selection criteria, to a maximum lag length of 6. On the basis of these results, we use a VAR (2) specification for the subsequent modelling. Our estimates are presented in Tables 7, 8 and 9 and are in line with findings of previous academic and empirical research. As the Tables below show, the coefficient estimates that measure the magnitude of spillovers from the US to the euro area economy range between 0.23-0.27 depending on the reference period. In particular, a 1% quarterly change in US real GDP leads to an average of 0.25% quarterly change in euro area GDP over the next six months. Our results point to an increased importance of the US economy to the euro area's business cycle over the course of time, as the coefficient estimates are relatively higher during the second sub-period 1986Q1-2013Q1 (Table 9) compared to the first sub-period 1960Q4-1985Q4 (Table 8).

Given that US fiscal policy is expected to tighten significantly in 2013, spillovers to the rest of the world and, consequently, the euro area economy would probably propagate through trade channels, as well as financial and confidence linkages. The negative effects will probably be felt the most in immediate neighbors (Latin America and Canada), but also in Japan, European countries and emerging Asia. According to our estimates, the size of the US fiscal restraint will hover around 1.5% of GDP, with a combination of tax increases and government spending cuts. In order to quantify the impact of a US domestic shock on the euro area economy, we use our own estimates which are in line with the estimates from the existing empirical literature. Hence, the US fiscal consolidation is expected to lead to a deceleration of euro area GDP growth by about 0.38 percentage points in 2013, including the negative financial and confidence linkages.

Table 7: Vector Autoregression Estimates

Sample (adjusted): 1960Q4 2013Q1
Included observations: 210 after adjustments
Standard errors in () & t-statistics in []

	USDGDP	EADGDP
USDGDP(-1)	0.260827 (0.07008) [3.72172]	0.173100 (0.05083) [3.40559]
USDGDP(-2)	0.143205 (0.07178) [1.99501]	0.069594 (0.05206) [1.33680]
EADGDP(-1)	0.189280 (0.09507) [1.99094]	0.302800 (0.06895) [4.39151]
EADGDP(-2)	-0.067903 (0.09217) [-0.73674]	0.189515 (0.06684) [2.83515]
C	0.370466 (0.08992) [4.12016]	0.152966 (0.06521) [2.34566]
R-squared	0.163954	0.339688
Adj. R-squared	0.147641	0.326804
Sum sq. resids	130.7630	68.78177
S.E. equation	0.798667	0.579242
F-statistic	10.05044	26.36488
Log likelihood	-248.2364	-180.7794
Akaike AIC	2.411775	1.769327
Schwarz SC	2.491468	1.849020
Mean dependent	0.756914	0.671157
S.D. dependent	0.865076	0.705975
Determinant resid covariance (dof adj.)		0.207980
Determinant resid covariance		0.198194
Log likelihood		-426.0107
Akaike information criterion		4.152483
Schwarz criterion		4.311869

Table 8: Vector Autoregression Estimates

Sample (adjusted): 1960Q4 1985Q4
Included observations: 101 after adjustments
Standard errors in () & t-statistics in []

	USDGDP	EADGDP
USDGDP(-1)	0.244894 (0.10167) [2.40876]	0.135137 (0.06571) [2.05642]
USDGDP(-2)	0.110220 (0.10380) [1.06182]	0.094982 (0.06709) [1.41565]
EADGDP(-1)	0.171281 (0.15381) [1.11360]	0.186373 (0.09942) [1.87468]
EADGDP(-2)	-0.094833 (0.14917) [-0.63573]	0.183148 (0.09642) [1.89950]
C	0.512712 (0.19561) [2.62107]	0.372440 (0.12644) [2.94567]
R-squared	0.113198	0.218389
Adj. R-squared	0.076248	0.185822
Sum sq. resids	98.73323	41.24934
S.E. equation	1.014136	0.655500
F-statistic	3.063549	6.705801
Log likelihood	-142.1665	-98.09078
Akaike AIC	2.914188	2.041402
Schwarz SC	3.043649	2.170863
Mean dependent	0.896688	0.916317
S.D. dependent	1.055160	0.726462
Determinant resid covariance (dof adj.)		0.438113
Determinant resid covariance		0.395810
Log likelihood		-239.8211
Akaike information criterion		4.946952
Schwarz criterion		5.205875

where,

USDGDP = US quarterly growth rate

EADGDP = Euro area quarterly growth rate

Source: Eurobank estimates

Table 9: Vector Autoregression Estimates

Sample (adjusted): 1986Q1 2013Q1
Included observations: 109 after adjustments
Standard errors in () & t-statistics in []

	USDGDP	EADGDP
USDGDP(-1)	0.299249 (0.09988) [2.99614]	0.255778 (0.08909) [2.87090]
USDGDP(-2)	0.266819 (0.10305) [2.58931]	0.018224 (0.09192) [0.19826]
EADGDP(-1)	0.127306 (0.11504) [1.10662]	0.389534 (0.10262) [3.79595]
EADGDP(-2)	-0.113876 (0.11068) [-1.02887]	0.086838 (0.09873) [0.87956]
C	0.262419 (0.08253) [3.17986]	0.054645 (0.07361) [0.74232]
R-squared	0.261640	0.389202
Adj. R-squared	0.233241	0.365710
Sum sq. resids	30.47107	24.24593
S.E. equation	0.541286	0.482839
F-statistic	9.213160	16.56730
Log likelihood	-85.20022	-72.74539
Akaike AIC	1.655050	1.426521
Schwarz SC	1.778506	1.549977
Mean dependent	0.627399	0.443990
S.D. dependent	0.618156	0.606260
Determinant resid covariance (dof adj.)		0.061360
Determinant resid covariance		0.055859
Log likelihood		-152.1007
Akaike information criterion		2.974324
Schwarz criterion		3.221237

5. Conclusion

In this paper, we have analysed the transmission channels through which a US domestic shock could spill over to other countries or regions. Furthermore, we have focused on the relationship between the US and the euro area business cycle, trying to gauge the implications of US economic fluctuations for the euro area economy. Based on our findings and on previous empirical research on business cycle linkages between the US and the euro area, our main findings are the following:

- (i) Business cycles in the euro area and the US have a high correlation, with a very similar magnitude of fluctuations in consumption, investment, prices, inflation, interest rates and monetary aggregates relative to the fluctuations of GDP in the two monetary unions.
- (ii) Output growth in the two regions have a common trend, with US real GDP increasing by an average rate one-quarter higher than euro area GDP.
- (iii) Although the growth rate of output in the euro area is less volatile than in the US, it is in fact more persistent, in the sense that the effect of an exogenous shock in the euro area lasts longer than in the US.
- (iv) The US business cycle leads that of the euro area by several quarters. A negative US economic shock is transmitted faster to the euro area economy than a positive one. More specifically, it takes around 2 quarters for a downturn in the US to transmit to the euro area economy, whereas it takes around 7 quarters for an upturn to spillover.
- (v) A 1 pp of GDP negative/positive US demand shock would decrease/increase euro area GDP by about 0.25pp over the next 6 months.

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