EXPERIMENTAL EFFECTIVE EXCHANGE RATES BASED ON TRADE IN SERVICES

by Martin Schmitz[1]

NOTE: This paper should not be reported as representing the views of the European Central Bank (ECB). The views expressed are those of the author and do not necessarily reflect those of the ECB.

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ABSTRACT

Real effective exchange rates as indicators of competitiveness have received substantial attention in the context of monitoring macroeconomic imbalances among euro area countries. Usually, these indicators are based on manufacturing trade weights. Services trade, however, has gained in importance over the last decades and many differentiated services are traded on global markets. Consequently, effective exchange rates based on trade in manufactured goods only provide a partial assessment of an economy's overall competitiveness. In this paper, competitiveness indicators weighted by international services trade flows are constructed in line with the ECB methodologies of calculating effective exchange rates. In combination with services sector prices, this allows for analysing competitiveness developments in the services sector of the euro area relative to foreign competitors. Moreover, the paper presents effective exchange rates based on a combination of both trade in manufactured goods and trade in services; these effective exchange rates constitute more complete indicators of international competitiveness than the traditional indicators solely based on manufacturing. Finally, some potential applications of the new competitiveness indicators are presented.

JEL codes: F10, F30, F31, F40

Keywords: competitiveness, effective exchange rate, harmonised competitiveness indicators, services trade, trade weights

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1 INTRODUCTION

Real effective exchange rates (REERs) are often used as measures of international price and cost competitiveness. They capture broad macroeconomic developments in the exchange rate and prices or costs and provide a comprehensive assessment of the international pressures on domestic firms over the medium term in respect of costs or prices. However, REERs do not include any firm-level data nor do they explicitly reveal factors relating to non-price competitiveness (such as product quality and reputation). The high relevance of the real effective exchange rate as a measure of competitiveness is also reflected by its inclusion in the scoreboard of the EU Macroeconomic Imbalance Procedure that was adopted in December 2011 (see European Commission, 2012).

While the euro nominal effective exchange rate (NEER) is the weighted average of bilateral nominal exchange rates against the currencies of selected trading partners, the REERs are derived by adjusting the nominal indices for relative price and cost developments between a given economy and its trading partners. To construct these indices in a meaningful way, one needs to decide on the composition of the index and the relative weights of the various partner currencies.

Effective exchange rates (EERs) currently calculated by the ECB as described by Schmitz et al. (2012) – who provide an update of Buldorini et al. (2002) – are based on manufacturing trade weights. While manufacturing trade still accounts for the largest part of euro area trade, services trade has gained in importance over the last decades. Moreover, recent papers by Francois and Manchin (2011) and Johnson and Noguera (2012) report that the role of the services sector in international trade is much larger in value added terms than suggested by gross trade flow data, while the opposite is true for manufacturing trade. Consequently, as many different types of services are traded internationally nowadays, it is crucial to include services trade in the weighting schemes underlying effective exchange rates. This is particularly important in cases where patterns in services trade flows differ significantly from those observed for manufactured goods. While there are still gaps compared with data on trade in manufactured goods, recent improvements in the coverage of bilateral services trade flows over the last decade now allow for constructing services based euro EERs in line with ECB methodologies.

Accordingly, in this paper experimental effective exchange rates based on services trade weights are calculated vis-à-vis 20 trading partners outside the euro area. Moreover, the paper presents effective exchange rates based on a combination of both trade in

manufactured goods and trade in services. The paper also provides a detailed comparison of services trade weights to those of manufacturing trade which gives a more complete picture of the international trade patterns of the euro area and its Member States.

Regarding the real effective exchange rate, one needs to consider the appropriate choice of deflators. While some deflators such as the producer price index (PPI) and unit labour cost in the manufacturing sector (ULCM) are more useful for EERs based only on manufacturing trade data, other deflators such as the consumer price index (CPI), the GDP deflator or unit labour cost in the total economy (ULCT) are also appropriate to use for overall weights based on both manufacturing and services trade. In addition, an index based on consumer services prices is constructed in order to focus exclusively on competitiveness aspects of the services sector of the euro area.

Previous efforts to include services trade into the weighting schemes underlying effective exchange rates were undertaken by a number of institutions. For example, the Bank of England uses bilateral services trade data from the Office for National Statistics of the United Kingdom without accounting for third market effects (UK; Lynch and Whitaker, 2004), the International Monetary Fund (IMF) includes trade in services by using the same weights as for manufactured goods, while tourism flows are used for those countries where these are sizeable (Bayoumi et al., 2005) and the Hong Kong Monetary Authority calculates a REER based solely on services trade vis-à-vis a small group of partner countries (Ha and Fan, 2003). As regards the euro, Di Mauro et al. (2008) have constructed an experimental effective exchange rate (without accounting for third market effects) based on bilateral services trade with regard to 24 partner countries.

The weighting method for euro EERs reflects the importance of different countries in euro area trade. The trade weights combine information on both exports and imports. While import weights are each trading partner's simple share of total euro area imports, export weights are double-weighted to account for "third market" effects. Specifically, they capture the effect of competition faced by euro area exporters in foreign markets from both domestic producers and exporters from third countries.

In the same way as for the euro REERs, harmonised competitiveness indicators (HCIs) for individual euro area Member States are constructed. While intra-euro area trade flows are not considered in the calculation of trade weights for euro EERs, they are used for the HCIs, which are constructed from the perspective of individual Member States. Hence, all other euro area countries are considered as trading partners. The HCIs are highly relevant,

as they show competitiveness developments for each individual euro area Member State. There are also separate HCIs available showing competitiveness developments with regard to fellow euro area Member States and vis-à-vis trading partners outside the euro area.

The remainder of the paper is organised as follows. Section 2 shows how trade in services is measured and how it has evolved over time. Section 3 presents the calculations of different sets of EERs and HCIs and the underlying trade weights. Moreover, trade weights are analysed, caveats of the trade weights calculations are reported and data quality and coverage problems are discussed. In addition, the deflators to calculate REERs are introduced. Section 4 presents some evidence of the development of euro EERs over time, while Section 5 extends this to HCIs of individual euro area Member States. In addition some potential applications of the new competitiveness indicators are presented. Section 6 concludes.

2 THE (GROWING) ROLE OF SERVICES TRADE

2.1 MEASURING TRADE IN SERVICES

Services span a wide range of economic activities, are very heterogeneous and due to their intangible characteristics inherently more difficult to define and measure than goods. According to the WTO (2010), there are two fundamental types of services: transformation services (a production activity that changes the condition of a good) and margin services (activities that facilitate the exchange of products or financial assets). One dimension of services as inputs to economic production is that they facilitate transactions through space or time (Melvin, 1989).

While goods can be produced and consumed at different times and in different places, services often require proximity of producers and consumers. Hence, geographical factors such as distance carry additional costs due to the delivery of certain services, the "proximity burden" (Christen and Francois, 2010). This might lead services providers to set up subsidiaries abroad via foreign direct investments to be able to cater more markets efficiently. According to the WTO (2010) this type of services provision abroad is not covered by trade statistics in international services, but is still a very important component

of international services.[2] Since 1995, trade in commercial services is covered by the WTO General Agreement on Trade in Services (GATS). The GATS specifies four modes of supply in which cross-border services may be provided abroad:

1. Cross-border supply, where only the service crosses the border (for example financial, insurance and telecommunications services)
2. Consumption abroad, where non-residents consume services outside their country (for example travel)
3. Commercial presence abroad, where a branch or subsidiary is opened abroad to provide services there (for example a branch of a bank)
4. (Temporary) movement of (natural) persons to provide services (for example construction services)

The data on international trade in services used in this paper come from three sources: Eurostat, the OECD Statistics on International Trade in Services and the UN Services Trade database. These institutions provide a detailed geographical breakdown of bilateral trade flows for an increasing number of reporter and partner countries. In general they follow the Extended Balance of Payments Services Classification (EBOPS) methodology as set up in 2002. Balance of Payments (BOP) statistics according to this methodology provide the basis for services transactions between residents and non-residents. Both the IMF's sixth Balance of Payment Manual (BMP6) that is scheduled to be introduced for the euro area in 2014 and the Manual on Statistics in Trade in Services 2010 (outlining the EBOPS 2010 methodology) will provide enhancements and more disaggregated statistics on international trade in services.

In line with BOP data, EBOPS relies on the residency concept (where the residence of an institutional unit is based on its centre of predominant economic interest) and records transaction with the rest of the world (export/credits and imports/debits). Transactions should be recorded at market prices, at the time of delivery and in a common unit of account (usually the national currency). The EBOPS 2002 comprises 11 components of international trade in services:

1. Transportation (such as carriage of passengers)

[2] The Manual on Statistics in Trade in Services 2010 recommends compiling Foreign Affiliates Statistics (FATS) in order to shed more light on the operations of affiliates abroad.

2. Travel (such as goods and services acquired by a visitor abroad)
3. Communication (such as telecommunication services)
4. Construction (such as construction works performed by an employee of a foreign company)
5. Insurance and pension services (such as provision of insurances)
6. Financial services (such as financial intermediation services)
7. Computer and information services (such as computer software)
8. Royalties and license fees (such as franchising)
9. Other business services (such as legal, research and development services)
10. Personal, cultural and recreational services (such as audio-visual services)
11. Government goods and services (such as embassies and consulates)

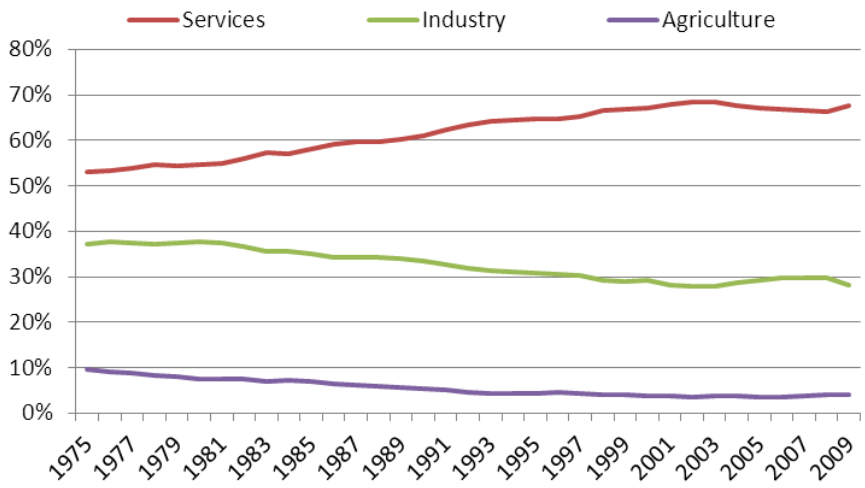
The EBOPS 2010 and BPM6 include two more categories, namely *manufacturing services on physical inputs owned by owners* and *maintenance and repair services not included elsewhere* which are recoded in the goods account in BPM5.

Data on trade in international services are collected from two main sources by national authorities: International Transactions Reporting System (ITRS) and enterprise surveys. In the ITRS international payments channelled through domestic banks are reported to the compiler including the purpose of a payment. Enterprise surveys inquire on all international transactions from a representative sample of services providers. In many cases, a combination of these two sources is used. Some countries collect additional data on travel based on surveys on migration or tourism statistics. Lipsey (2006) reports that the number of countries reporting trade in services has increased substantially over the last decades: in 1973 only 23 countries reported data on total services exports, while in 2003 this number had risen to 154. A similar trend also holds for bilateral data and individual categories of services. For example, for *personal, cultural and recreational services* exports this number has risen from 4 in 1973 to 92 in 2003.

2.2 THE ROLE OF SERVICES FOR THE GLOBAL ECONOMY AND THE EURO AREA

Chart 1 shows that services represent roughly two thirds of global GDP. Overall, the share of the service sector has increased from 53% in 1975 to 68% in 2009; in general it tends to be higher in more developed countries. In the euro area, for example, it amounted to 74% in 2009, in the United States to 79%, while it reached a value of 44% in China.

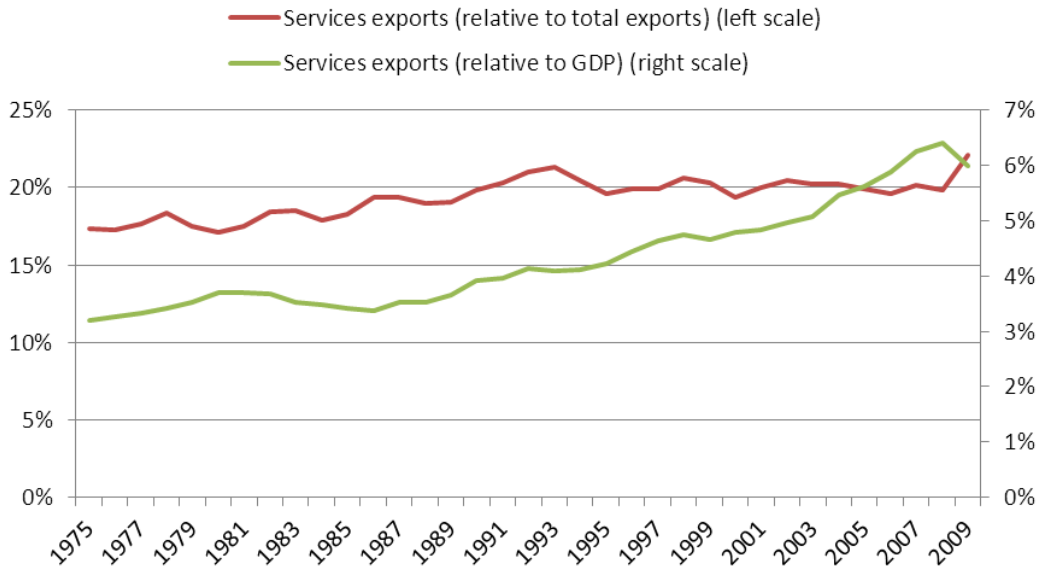
Chart 1: Contribution to global GDP



Source: own calculations based on World Bank World Development Indicators.

In terms of global trade patterns the rise of the services sector is less pronounced however, hinting at the difficulties in trading services internationally relative to goods. Services exports almost doubled relative to global GDP from 3% to 6% over the period 1975 to 2009 (Chart 2). The services share in total export only increased from 17% to 22% over the same period, revealing that goods still dominate global trade.

Chart 2: The role of services in global trade

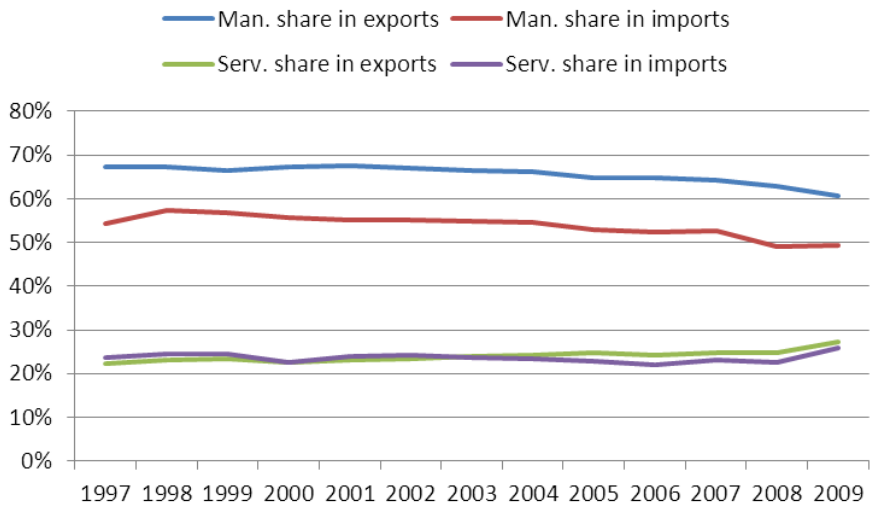


Source: own calculations based on World Bank World Development Indicators.

Francois and Manchin (2011) and Johnson and Noguera (2012) find that the role of the services sector in international trade is much larger in value added terms than suggested by gross trade data, while the opposite is true for manufacturing trade. In addition, Francois et al. (2009) suggest that international services flows account for 45% of total global cross-border trade once mode 3 of services supply (commercial presence abroad) is included.

The largest part of international trade is accounted for by manufactured products. For the euro area this type of trade amounted to about 61% of total exports and 49% of total imports in 2009, while trade in services had a share of 27% on the exports side and 26% on the imports side. Chart 3 showing the development over the last decade indicates that the importance of manufacturing trade for the euro area has decreased to some extent, while that of services has increased.

Chart 3: The roles of manufacturing and services in euro area trade

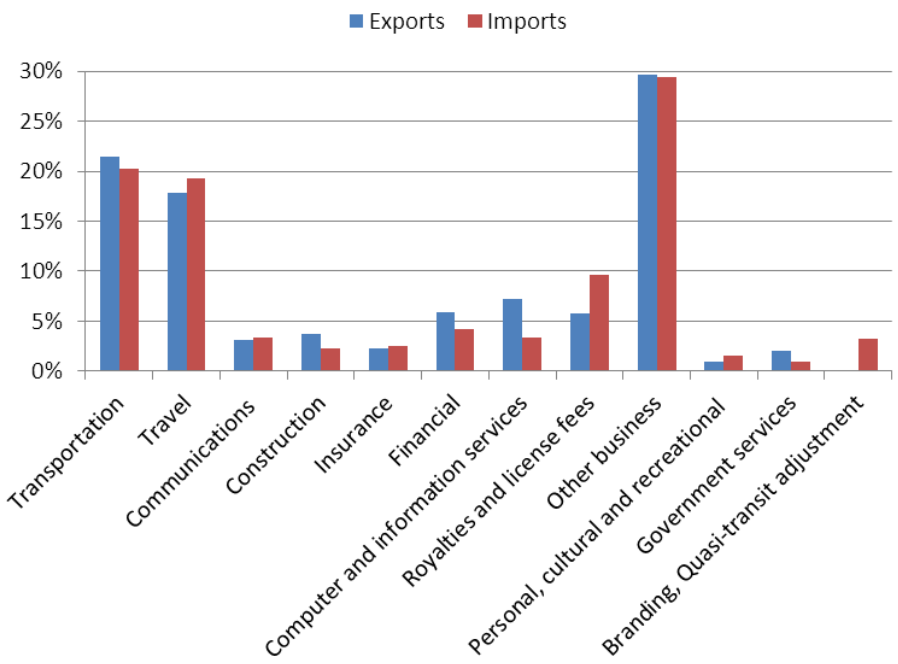


Source: own calculations based on Eurostat data.

In Chart 4, the shares of the different components of euro area services trade are shown. For both the export and import side, *other business* services are the largest component (with shares of almost 30%), followed by *transportation* and *travel services*. *Other business* services include for instance professional and technical services. Among the next items, imports are larger than exports for *royalties and license fees*, while exports exceed

imports for *computer and information services* and *financial services*. *Branding, quasi-transit adjustment* is an item of the services account that measures the gap between the value declared when goods are initially imported from a non-EU country and their value when dispatched to another EU country (please see page 25 for more details).

Chart 4: A decomposition of euro area services exports and imports (2009)



Source: own calculations based on Eurostat data.

3 CONSTRUCTING TWO NEW SETS OF TRADE WEIGHTS

This section builds on Schmitz et al. (2012) in explaining the methodology and construction of the trade weights underlying the effective exchange rates of the euro. This paper calculates two new sets of trade weights: one based on trade in services and the other one including combined manufacturing and services weights.

3.1 TRADE BASIS

Trade flows can be broadly classified into three main categories: manufactured goods, commodities and services. The official euro EERs are based on manufactured goods trade

weights.[3] Choosing manufactured goods trade to calculate trade weights is consistent with the practice of many international organisations and central banks, most notably the BIS.

From a conceptual point of view, it is desirable to include services trade in the weighting scheme, as many different types of services are traded globally (as shown in Section 2).[4] This is particularly important in cases where patterns in services trade flows differ significantly from those observed for manufactured goods.

However, despite improvements in the coverage of bilateral services trade flows over the last decade, there are still gaps compared with the data on trade in manufactured goods. While trade weights for the official euro EERs and HCIs are based on bilateral trade data since 1995 for a broad group of trading partners (the EER-40), it is only possible to construct EERs and HCIs based on trade in services using the same methodology as for those based on trade in manufactured goods starting from 2004.

The weighting scheme does not reflect patterns of trade in agricultural products, raw materials and energy products (the residual in Chart 3). Commodities are not included, as these are considered to be homogeneous goods whose prices are determined in global markets without being influenced by the competitiveness of individual countries. Including trade in agricultural or mining products may distort the competitiveness analysis, as such goods are often heavily regulated or subsidised.

3.2 TRADING PARTNERS

The new EERs of the euro including services trade are calculated against the smaller group of the two main groups of trading partners, the EER-20 group:[5]

- EER-20: this group is composed of the non-euro area EU Member States (Bulgaria, Czech Republic, Denmark, Latvia, Lithuania, Hungary, Poland, Romania, Sweden and the United Kingdom), plus Australia, Canada, China, Hong Kong, Japan, Norway, Singapore, Korea, Switzerland and the United States.

In general, the selection of countries is based on their importance as trading partners of the euro area and on data availability, particularly in respect of the high quality data on price

[3] As defined per Sections 5 to 8 of the Standard International Trade Classification (SITC).
[4] It would be desirable to exclude *branding* (see page 24) and *government services* from the total of services traded as these are not subject to international competition.
[5] In addition, the ECB publishes indices vis-à-vis a broad group of 40 partner countries (the EER-40) and a narrow group of 12 partner countries. As described by Schmitz et al. (2012), trade weights of smaller groups of trading partners are obtained from proportionally rescaling the weights of the largest group.

and cost indicators required for calculating the REERs. In the case of services trade data, the countries in the EER-20 group provide sufficiently detailed data to construct trade weights using the same methodology as described in Schmitz et al. (2012) for manufacturing trade.

3.3 CALCULATING NOMINAL EFFECTIVE EXCHANGE RATES

Following Schmitz et al. (2012), the nominal effective exchange rate (NEER) of the euro is calculated as the geometric weighted average of a basket of bilateral nominal exchange rates:

$$NEER^t = \prod_{i=1}^{N} \left(e^t_{i,euro} \right)^{w_i} \qquad (1)$$

where N stands for the number of competitor countries in the reference group of trading partners, $e^t_{i,euro}$ is an index of the average exchange rate of the currency of partner country i vis-à-vis the euro in period t (expressed in terms of foreign currency per euro), and w_i is the trade weight assigned to the currency of trading partner i. As is common practice one uses geometric averages rather than arithmetic averages for calculating effective exchange rates.[6]

3.4 TRADE WEIGHTS CALCULATION

WEIGHTS BASED ON TRADE IN SERVICES

The approach for calculating the trade weights underlying the effective exchange rates of the euro follows the BIS methodology presented in Turner and Van't dack (1993) and adapted to the euro area by Buldorini et al. (2002) and Schmitz et al. (2012). Under this method, import weights are each trading partner's simple share of total euro area imports. Export weights, on the other hand, are double-weighted to account for third market effects. Consequently, they capture the effect of competition faced by euro area exporters in foreign markets from both domestic producers and exporters from third countries.

In the following the formulae for calculating the weights in services trade are described. The overall weight of each partner country i in the euro EERs is obtained as the weighted average of the export and import weights based on services trade, that is:

[6] Please see Brodsky (1982) on why geometric averages are preferable to arithmetic averages for calculating effective exchange rate indices.

$$w_i^{Serv} = \left(\frac{m^{Serv}}{x^{Serv} + m^{Serv}} \right) w_i^{m^{Serv}} + \left(\frac{x^{Serv}}{x^{Serv} + m^{Serv}} \right) w_i^{x^{Serv}}, \text{ i= 1, 2, …, } N \qquad (2)$$

where $w_i^{m^{Serv}}$ and $w_i^{x^{Serv}}$ are partner country *i*'s import and export weights, respectively, and m^{Serv} and x^{Serv} are total imports and total exports by the euro area, respectively.

The import weight of country *i* is calculated as its simple share of total euro area imports:

$$w_i^{m^{Serv}} = m_i^{Serv} / \sum_{i=1}^{N} m_i^{Serv}, \text{ i= 1, 2, …, } N \qquad (3)$$

where m_i^{Serv} denotes gross services import flows into the euro area from country *i* during the reference period. Hence, this measure captures the relative importance of each of the partner countries in total euro area services imports. It also implies that, the higher the share of country *i* in total euro area services imports, the greater the weight of its exchange rate in the basket of currencies included in the EERs of the euro.

In order to capture the effect of competition faced by euro area exporters from domestic producers in the economies of the trading partners, the domestic supply of domestically produced and sold services in these countries is included in the calculation of export weights. The export weights also take into account each trading partner's bilateral services exports to different foreign markets. In this way, the trade weights also reflect the competition faced by euro area exporters in each given foreign market from exporters of the countries included in the group of trading partners. For this purpose, a distinction is made between *N*, the trading partners (in this case 20), and, *R*, the group of countries referred to as the "rest of the world" (whereby $H = N + R$, with *H* being the total number of export markets). It is assumed that the euro area and the *N* competitor countries are the only suppliers of services in the *R* countries. Hence, the calculations neither include services exports from the rest of the world to the *N* trading partners, nor the rest of the world's domestic services output.[7]

[7] Potential distortions are more likely the smaller the group of trading partners. Hence, improved data coverage permitting to include 40 partner countries (as for manufacturing trade) would be advantageous.

The share of each market in total euro area exports is calculated as

$$x_j^{Serv} = x_j^{Serv} / \sum_{j=1}^{H} x_j^{Serv} \text{ , j= 1, 2, …, } H \quad (4)$$

where x_j^{Serv} denotes the gross export flows in the reference period from the euro area to market *j*. The subsequent adjustment of export shares to capture third market effects yields the double export weights of each partner country *i*, i.e.

$$w_i^{x^{Serv}} = \sum_{j=1}^{H} \left(S_{i,j} x_j^{Serv} \right), \text{ i=1,2…,} N \quad (5)$$

$S_{i,j}$ is the share of country *i*'s supply in market *j*, which is obtained as:

$$S_{i,j} = S_{i,j}^{Serv} / \sum_{i=1}^{N} S_{i,j}^{Serv} \quad (6)$$

where $S_{i,j}^{Serv}$ (for i≠j, i= 1, 2, …, *N*, and j= 1, 2, .., *H*) denotes the gross services exported from country *i* to market *j*, and $S_{i,i}^{Serv}$ (for i= 1, 2, …, *N*) represents the gross services output of country *i* that is sold in its domestic market. Hence, $S_{i,i}^{Serv}$ serves as a proxy for the gross value of the domestically produced supply of services.[8] For each country, it is obtained by adding services imports to the value added of the services sector and then subtracting services exports. Turner and Van't dack (1993) use this method to obtain an estimate of the gross value of the manufactured goods produced and sold domestically which is comparable with international trade data that are also expressed in gross value terms. Equivalent to Turner and Van't dack (1993) for manufacturing trade, imports of services are used as a proxy for both domestic non-services inputs and imported inputs. It was also tested to exclude this proxy, as services production relies less on imported inputs than manufacturing production (Francois and Manchin, 2011; Johnson and Noguera, 2012). However, the overall trade weights were not affected significantly by this.

All of the elements described above are presented for the EER-20 group in Table 1. First, the supply structure matrix of the competitor countries is presented. Each element in this panel ($S_{i,j}$) – excluding those on the main diagonal – represents the percentage of services produced in one of the *N* competitor countries that is exported abroad to one of

[8] The data on the GDP of the services sector are retrieved from the United Nations National Accounts database.

the *H* foreign markets (including the aggregate of the rest of the world countries). The elements on the main diagonal of the supply structure matrix ($S_{i,i}^{Serv}$) stand for the percentage of total services that is accounted for by domestic production in each of the competitor countries. Taking the first as an example, it can be seen that, in Australia, 95.80% of the total supply of services is due to domestic production, while 0.00% is accounted for by imports from Bulgaria, 0.10% by imports from Canada, and so forth, with all these percentages totalling 100%.

Below the supply structure matrix, the simple percentage share of euro area services exports destined for each of the 20 partner countries plus the aggregate for the rest of the world is reported. For example, 1.27% of euro area services exports go to Australia, 0.33% to Bulgaria, 1.44% to Canada, etc.

To obtain the double export weights – shown in the next row of Table 1 – each row of the supply structure matrix is multiplied by the simple euro area export shares as defined in equation (5). For example, the double export weight of 2.02% assigned to Australia is obtained as follows: (1.27% × 95.80%) + (0.33% × 0.02%) + ... + (29.08% × 2.42%). The double export weight of Australia measures the competition faced by euro area exporters from Australian producers in both the Australian market as well as in all of the other markets. 1.22 percentage points (1.27% × 95.80%) of Australia's double export weight (2.02%) are due to competition encountered by euro area exporters in the Australian market, while the remainder stems from third market competition.

Table 1: Services trade weight calculations for the EER-20 group, 2007-09
(percentages)

	Australia	Bulgaria	Canada	China	Czech Republic	Denmark	Hong Kong	Hungary	Japan	Korea	Latvia	Lithuania	Norway	Poland	Romania	Singapore	Sweden	Switzerland	United Kingdom	United States	Rest of the world
Australia	95.80%	0.02%	0.06%	0.17%	0.02%	0.15%	0.77%	0.04%	0.07%	0.26%	0.01%	0.01%	0.08%	0.01%	0.01%	1.64%	0.07%	0.13%	0.17%	0.04%	2.42%
Bulgaria	0.00%	96.02%	0.00%	0.00%	0.11%	0.05%	0.00%	0.13%	0.00%	0.00%	0.06%	0.04%	0.03%	0.06%	0.34%	0.00%	0.03%	0.03%	0.03%	0.00%	0.40%
Canada	0.10%	0.04%	94.53%	0.05%	0.07%	0.09%	0.44%	0.09%	0.03%	0.11%	0.04%	0.01%	0.08%	0.03%	0.17%	0.18%	0.09%	0.40%	0.19%	0.29%	3.66%
China	0.15%	0.07%	0.12%	96.69%	0.42%	0.52%	5.53%	0.11%	0.22%	1.53%	0.14%	0.06%	0.04%	0.07%	0.04%	1.32%	0.18%	0.00%	0.10%	0.08%	7.68%
Czech Republic	0.01%	0.24%	0.01%	0.00%	95.43%	0.08%	0.01%	0.41%	0.00%	0.00%	0.07%	0.17%	-0.14%	0.18%	0.10%	0.01%	0.07%	0.13%	0.06%	0.01%	1.12%
Denmark	0.10%	0.29%	0.04%	0.11%	0.16%	89.27%	0.37%	0.30%	0.04%	0.18%	0.63%	0.65%	1.60%	0.23%	0.07%	0.51%	2.00%	0.49%	0.21%	0.07%	3.61%
Hong Kong	0.30%	0.07%	0.13%	1.00%	0.01%	0.16%	83.81%	0.07%	0.15%	0.36%	0.01%	0.02%	0.05%	0.02%	0.03%	1.38%	0.29%	0.24%	0.33%	0.15%	5.01%
Hungary	0.01%	0.35%	0.02%	0.01%	0.24%	0.06%	0.02%	93.52%	0.02%	0.02%	0.06%	0.08%	0.03%	0.16%	0.76%	0.01%	0.11%	0.13%	0.06%	0.01%	1.07%
Japan	0.29%	0.02%	0.24%	0.38%	0.28%	0.54%	1.21%	0.30%	97.71%	0.89%	0.03%	0.01%	0.14%	0.06%	0.02%	6.32%	0.21%	0.53%	0.61%	0.31%	7.75%
Korea	0.11%	0.01%	0.06%	0.49%	0.06%	0.16%	1.65%	0.23%	0.21%	93.48%	0.03%	0.01%	0.11%	0.11%	0.02%	1.81%	0.05%	0.11%	0.14%	0.12%	4.51%
Latvia	0.00%	0.01%	0.00%	0.00%	0.01%	0.04%	0.00%	0.01%	0.00%	0.00%	94.27%	1.09%	0.03%	0.01%	0.01%	0.01%	0.05%	0.09%	0.01%	0.00%	0.23%
Lithuania	0.00%	0.01%	0.00%	0.00%	0.02%	0.06%	0.00%	0.01%	0.00%	0.00%	1.48%	94.43%	0.03%	0.12%	0.01%	0.00%	0.03%	0.02%	0.01%	0.00%	0.24%
Norway	0.05%	0.00%	0.05%	0.00%	0.02%	1.16%	0.09%	0.02%	0.02%	0.11%	0.07%	0.05%	90.70%	0.02%	0.00%	0.33%	1.38%	0.26%	0.39%	0.09%	2.37%
Poland	0.01%	0.15%	0.02%	0.00%	1.01%	0.21%	0.02%	0.32%	0.00%	0.01%	0.85%	1.69%	0.17%	97.19%	0.11%	0.04%	0.21%	0.48%	0.11%	0.01%	1.77%
Romania	0.00%	0.64%	0.02%	0.00%	0.10%	0.04%	0.01%	0.44%	0.00%	0.00%	0.17%	0.03%	0.02%	0.03%	97.12%	0.00%	0.03%	0.10%	0.05%	0.01%	0.61%
Singapore	0.49%	0.01%	0.05%	0.22%	0.02%	0.51%	1.63%	0.03%	0.18%	0.48%	0.02%	0.03%	0.38%	0.01%	0.01%	76.94%	0.04%	0.56%	0.18%	0.07%	5.27%
Sweden	0.05%	0.15%	0.07%	0.06%	0.20%	1.54%	0.10%	0.24%	0.01%	0.05%	0.57%	0.31%	2.79%	0.20%	0.10%	0.21%	92.03%	1.13%	0.30%	0.05%	3.69%
Switzerland	0.14%	0.28%	0.16%	NA	0.34%	0.68%	0.16%	0.48%	0.08%	0.14%	0.16%	0.09%	0.28%	0.28%	0.26%	0.78%	0.29%	90.80%	0.24%	0.04%	4.18%
United Kingdom	0.87%	1.15%	0.42%	0.17%	0.70%	1.83%	1.43%	1.00%	0.20%	0.29%	0.81%	1.02%	1.70%	0.62%	0.44%	3.52%	1.29%	3.00%	93.96%	0.49%	15.64%
United States	1.52%	0.46%	4.02%	0.66%	0.77%	2.86%	2.75%	2.26%	1.06%	2.07%	0.53%	0.21%	1.88%	0.59%	0.38%	4.99%	1.54%	1.37%	2.82%	98.16%	28.77%
Weights																					
Simple export weight	1.27%	0.33%	1.44%	2.68%	1.18%	2.50%	1.12%	1.22%	2.32%	0.98%	0.18%	0.16%	1.44%	1.86%	0.80%	1.28%	2.74%	9.89%	22.01%	15.51%	29.08%
Double export weight	2.02%	0.45%	2.58%	4.99%	1.49%	3.50%	2.59%	1.50%	4.91%	2.36%	0.25%	0.24%	2.19%	2.43%	0.99%	2.69%	3.88%	10.33%	25.84%	24.78%	
Import weights	1.03%	0.62%	2.00%	3.41%	2.74%	2.55%	1.54%	1.84%	2.79%	1.03%	0.24%	0.33%	1.84%	3.37%	1.08%	1.70%	3.58%	12.76%	26.17%	29.37%	
Overall weight	1.55%	0.53%	2.30%	4.24%	2.08%	3.04%	2.09%	1.66%	3.90%	1.73%	0.24%	0.28%	2.03%	2.88%	1.04%	2.22%	3.74%	11.49%	26.00%	26.97%	

Source: own calculations

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Table 2 shows that ($S_{i,i}^{Serv}$) – the percentage of total services that is accounted for by domestic production in each of the competitor countries – is generally much higher for services than the corresponding number for manufacturing based on Schmitz et al. (2012).

Table 2: Domestic supply for the EER-20 group, 2007-09
(percentages)

	Manufacturing	Services
Australia	73.60	95.80
Bulgaria	73.57	96.02
Canada	49.26	94.53
China	73.58	96.69
Czech Rep.	53.11	95.43
Denmark	60.50	89.27
Hong Kong	3.61	83.81
Hungary	44.54	93.52
Japan	77.41	97.71
Latvia	59.92	94.27
Lithuania	62.45	94.43
Norway	65.01	90.70
Poland	68.57	97.19
Romania	79.71	97.12
Singapore	1.89	76.94
South Korea	42.42	93.48
Sweden	54.89	92.03
Switzerland	66.20	90.80
United Kingdom	71.39	93.96
United States	75.91	98.16
Average	57.88	93.09

Source: ECB and own calculations.

The simple average of $S_{i,i}^{Serv}$ across the 20 partner countries amounts to 57.88% for manufactured goods, while it is 93.09% for services. On the one hand this is due to the domestic production of services being substantially larger than for manufactured goods (as shown in Chart 1), while on the other hand, manufacturing trade flows are also considerably larger than services trade flows. Moreover, Table 1 shows that the share of euro area exports going to the "rest of the world" amounts to 29.08%, while this share amounts to 33.83% for manufactured goods. The aforementioned factors lead to the third market effect (defined as the difference between simple export and double export weights) being somewhat smaller for services compared to manufactured goods. Averaged across

the 20 partner countries it amounts to 1.45 percentage points for services and 1.69 percentage points for manufactured goods.

COMBINING WEIGHTS BASED ON TRADE IN SERVICES AND MANUFACTURED GOODS

The second set of new weights combines the services trade weights with those of manufacturing goods trade as calculated in Schmitz et al. (2012). This follows

$$w_i^{Combined} = \left(\frac{t^{Serv}}{t^{Serv} + t^{Man}} \right) w_i^{Serv} + \left(\frac{t^{Man}}{t^{Serv} + t^{Man}} \right) w_i^{Man}, \text{ i=1,2,…,} N \qquad (7)$$

where t^{Serv} is the sum of total euro area services exports and imports, while t^{Man} is the aggregate of total euro area manufacturing exports and imports. In the period 2007 to 2009 the share of manufacturing goods amounted to 69.7%, while the services share was 30.3%.

USING THE TRADE WEIGHTS

The trade weights for the effective exchange rates of the euro are time-varying as they are calculated over non-overlapping three-year periods. Schmitz et al. (2012) point out several advantages of using three-year averages, as opposed to trade weights that are updated more frequently: they smooth out potentially large short-term fluctuations in trade flows, one avoids frequent updating entailing additional data revisions which could complicate the analysis of competitiveness developments, and one obtains a fairly accurate picture of both current trade patterns, as well as those for past periods. Meanwhile, the frequency of updating is timely enough to capture broad developments such as the rise of emerging market economies (most notably China) as important global trading partners over the last decade.

Due to data availability reasons, two sets of services trade weights are feasible to calculate, namely for the periods 2004 to 2006 and 2007 to 2009. This implies that for all periods before 2004 the set of weights of the period 2004 to 2006 is used. In the case of the combined weights (formula 7) where manufacturing weights are available since 1995 (i.e. for five three-year periods), the overall shares of manufacturing and services change after each three-year period (along with the manufacturing trade weights), while the

(bilateral) services trade weights only change once (from 2007 onwards). In this way one accounts consistently for the changing importance of manufacturing and services trade for the euro area. As a result, five sets of the combined weights are currently available, for 1995-97, 1998-2000, 2001-03, 2004-06 and 2007-09. For the EERs of the euro, fixed chain-linking on a three-yearly basis is used. This means that the indices are chain-linked at the end of each of the five periods (at the end of 2006 for the services weights).[9]

PATTERNS OF TRADE WEIGHTS

Table 3 compares the weights of the euro area's trading partners across the different trade categories. The last column shows the difference between services and manufacturing trade weights. Most striking is the difference for China which is the largest trading partner of the euro area in terms of manufactured goods, while it is only the fourth largest partner for services (with a weight that is 14.5 percentage points lower). Also, trading partners from Asia such as Japan and South Korea and from central and eastern Europe such as the Czech Republic, Hungary and Poland have substantially lower weights in terms of services than in terms of manufacturing, highlighting the important role of the latter for these economies.

In contrast, the United Kingdom and United States are by far the largest trading partners of the euro area in terms of services trade. In fact for both countries, the services weights are more than ten percentage points higher than for manufactured goods trade. The same applies (albeit to a lesser extent) to Switzerland where the services weight is five percentage points higher.

The patterns observed for services trade also have consequences for the combined weight: compared to the manufacturing weights as shown in the second column, the United States and the United Kingdom surpass China as the euro area's largest trading partner, while Switzerland overtakes Japan as the fourth largest trading partner.

[9] See Ellis (2001) for more details on the chain-linking of effective exchange rates.

Table 3: Overview of different trade weights for the EER-20 group, 2007-2009

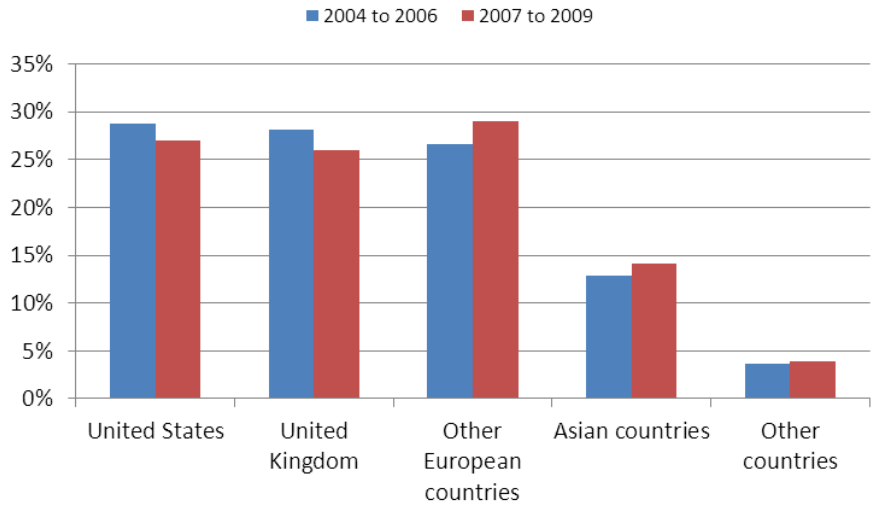
Country	Services	Manufacturing	Combined	(Serv) - (Man)
China	4.24%	18.76%	14.35%	-14.52%
Poland	2.88%	6.18%	5.18%	-3.30%
Japan	3.90%	7.19%	6.19%	-3.29%
Czech Republic	2.08%	5.01%	4.12%	-2.93%
South Korea	1.73%	3.92%	3.26%	-2.20%
Hungary	1.66%	3.19%	2.72%	-1.53%
Sweden	3.74%	4.68%	4.39%	-0.94%
Romania	1.04%	1.97%	1.69%	-0.93%
Lithuania	0.28%	0.41%	0.37%	-0.13%
Bulgaria	0.53%	0.63%	0.60%	-0.10%
Latvia	0.24%	0.24%	0.24%	0.01%
Denmark	3.04%	2.62%	2.75%	0.43%
Hong Kong	2.09%	1.61%	1.75%	0.48%
Australia	1.55%	0.94%	1.13%	0.61%
Canada	2.30%	1.66%	1.85%	0.65%
Norway	2.03%	1.34%	1.55%	0.69%
Singapore	2.22%	1.47%	1.69%	0.75%
Switzerland	11.49%	6.46%	7.99%	5.03%
United States	26.97%	16.87%	19.93%	10.10%
United Kingdom	26.00%	14.87%	18.25%	11.12%

Source: ECB and own calculations.
Note: The table is sorted by the last column.

Chart 5 compares the weights of the largest countries and country groups for the two periods where services trade weights are available. It shows that the United States and the United Kingdom, although remaining the largest individual trading partners of the euro area in terms of services, have a lower share in the period 2007 to 2009 compared to 2004 to 2006. The mirror image is that other European countries and Asia have gained shares. A similar trend is found by Schmitz et al. (2012) for manufacturing weights which is also visible for the combined weights in Chart 6.

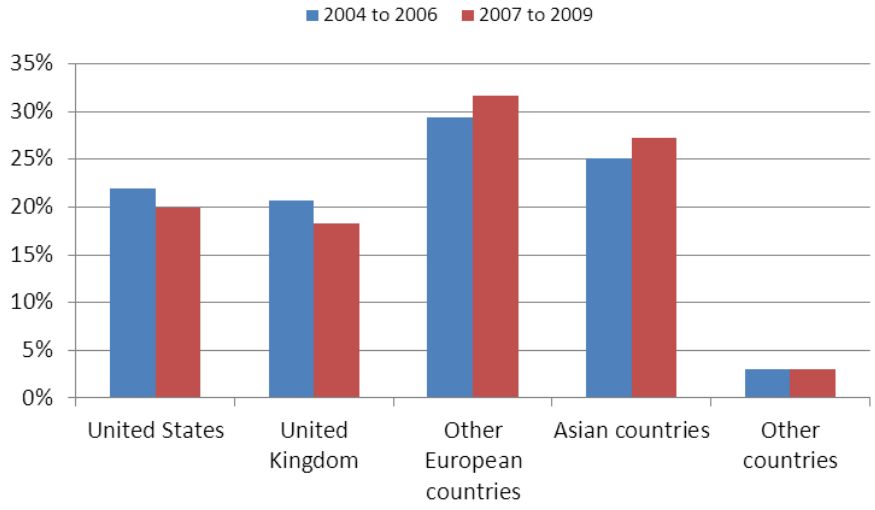
These patterns reflect both the growing importance of emerging Asian economies (in particular that of China in the manufacturing sector) and the steadily intensifying integration of economies in Europe which are increasingly shaping the trade linkages of the euro area.

Chart 5: Evolution of services trade weights for the EER-20 group



Source: ECB and own calculations.

Chart 6: Evolution of combined trade weights for the EER-20 group

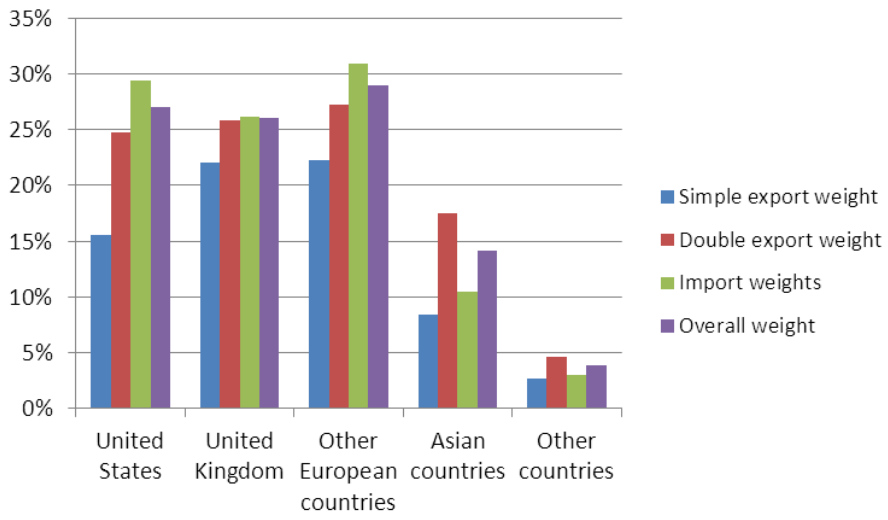


Source: ECB and own calculations.

Chart 7 displays a comparison of overall services trade weights with the import weights and double export weights that are used for their calculation. For illustrative purposes, simple export weights which ignore third market effects are also plotted. For the United States, the United Kingdom and the other European economies, import weights exceed the simple and double export weights. In the case of the United States, the euro area has a trade deficit in terms of services.[10]

Accounting for third market effects leads to some adjustment in the overall trade weights via the double export weights. In particular, in the case of the United States and the other Asian countries competition between euro area and exporters from these countries in third markets results in a significant increase in the overall trade weight assigned to these countries.

Chart 7: Comparison of services trade weights for individual countries and country groups in the EER-20 basket, 2007-09



Source: ECB and own calculations.

Regarding the trade weights of individual euro area Member States used to compute HCIs, Table 4 reveals substantial country heterogeneity across euro area countries in terms of the trade composition.[11] Luxembourg, Cyprus, Ireland and Malta exhibit services shares of

[10] One cannot directly infer that there is a trade deficit if the import weight exceeds the simple export weight as 29% of euro area exports go to third markets. These are "redistributed" across the partner countries in the double export weights.
[11] The shares are calculated by first summing exports and imports for both manufactured goods and services and then calculating the respective shares.

more than 50%, while Slovakia, Slovenia, Belgium, Germany and Italy have a services share of below 30%.

Table 4: Overview of different trade weights for euro area HCIs, 2007-09

	Services share	Manuf. share	Services		Manufacturing		Combined	
			Intra - EA	Extra - EA	Intra - EA	Extra - EA	Intra - EA	Extra - EA
Austria	34.3%	65.7%	63.3%	36.7%	64.0%	36.0%	63.8%	36.2%
Belgium	25.8%	74.2%	58.5%	41.5%	59.9%	40.1%	59.6%	40.4%
Cyprus	72.3%	27.7%	46.3%	53.7%	65.0%	35.0%	51.5%	48.5%
Estonia	38.2%	61.8%	51.2%	48.8%	49.4%	50.6%	50.1%	49.9%
Finland	38.8%	61.2%	41.1%	58.9%	47.1%	52.9%	44.8%	55.3%
France	30.6%	69.4%	47.8%	52.2%	59.6%	40.4%	56.0%	44.0%
Germany	27.0%	73.0%	43.3%	56.7%	47.1%	52.9%	46.1%	53.9%
Greece	57.5%	42.5%	37.3%	62.7%	61.4%	38.6%	47.5%	52.5%
Ireland	64.0%	36.0%	40.8%	59.2%	37.9%	62.1%	39.7%	60.3%
Italy	29.8%	70.2%	53.2%	46.8%	56.1%	43.9%	55.2%	44.8%
Luxembourg	77.0%	23.0%	59.0%	41.0%	62.6%	37.4%	59.9%	40.1%
Malta	60.1%	39.9%	44.5%	55.5%	53.0%	47.0%	47.9%	52.1%
Netherlands	31.1%	68.9%	46.4%	53.6%	51.0%	48.9%	49.6%	50.4%
Portugal	36.2%	63.8%	61.6%	38.4%	76.1%	23.9%	70.9%	29.1%
Slovakia	17.0%	83.0%	45.8%	54.2%	53.4%	46.6%	52.1%	47.9%
Slovenia	23.2%	76.8%	66.4%	33.6%	67.2%	32.8%	67.0%	33.0%
Spain	41.8%	58.2%	51.5%	48.5%	65.4%	34.6%	59.6%	40.4%
Average	41.5%	58.5%	50.5%	49.5%	57.4%	42.6%	54.2%	45.8%

Source: ECB and own calculations.

Furthermore the share of intra- and extra-euro area trade is shown across the different trade weights categories. While on average, there is substantially more intra- than extra-euro area trade for manufactured goods, there are almost as much extra-euro area services traded as internally. In fact, the share of intra-euro area trade is lower for services trade than for manufacturing trade in all Member States except for Estonia and Ireland. Overall, this suggests that euro area countries are more integrated in terms of manufacturing trade than in services trade.

With regard to the combined weights, considerable heterogeneity is once more visible. While on average the share of intra-euro area trade amounts to 54%, a number of countries – most notably Ireland, Finland and Germany – have intra-euro area trade shares of below 50%. In contrast, Portugal, Slovenia and Austria show intra-euro area trade shares in excess of 60%.

CONCEPTUAL CAVEATS OF (SERVICES) TRADE WEIGHTS

Schmitz et al. (2012) describe caveats applying to effective exchange rates constructed in the way described above. The underlying theory of Armington (1969) assumes that there is only one type of good, which is differentiated by the country of origin and exhibits a constant elasticity of substitution. As highlighted by Klau and Fung (2006) the elasticity of substitution might differ across imports from different countries and across various types of manufactured goods. In the case of services this problem persists as services are very heterogeneous and can also differ substantially in terms of quality and other characteristics based on the country of origin.

Furthermore, vertical specialisation implies that products from different countries often do not compete with each other but are complementary parts of the international supply chain. This can lead to biased trade weights, as gross value trade data may obscure the value added at different stages of production. Johnson and Noguera (2012) calculate the value added content of international trade flows and find this to be low for manufactured products relative to services. Accordingly, in value added terms the role of manufactured trade is smaller than gross trade data suggest while the share of services trade is larger. This reflects that manufacturing gross trade flows include a lot of value added provided by other sectors.

Moreover as is the case for manufacturing trade, vertical specialisation implies that services from different countries often do not compete with each other but are complementary parts of the international supply chain. For countries involved in this process, this may imply that imports (intermediate goods and services) and exports (final goods and services) are complements. Complementarity can also arise between manufactured and services trade, for example in the case of transportation services to deliver manufactured goods. In this case, services trade might be a direct consequence of manufacturing trade, although being reported separately in the BOP statistics.

A further caveat of trade data arises from entrepot trade in goods which takes place for example between China and Hong Kong, as a substantial share of China's external trade of manufactured goods takes place in the form of re-exports via Hong Kong (Klau and Fung, 2006). There is some evidence that this type of trade also plays a role in certain

euro area countries, such as the Netherlands, possibly leading to biases in the trade weight calculations, especially for HCIs.

For services data entrepot trade could have an impact, as *Branding, quasi-transit adjustment* has been introduced as a new item to the services account of the European Union Balance of Payments statistics as of 2009. This item refers to the price gap between the value declared when goods are initially imported from a non-EU country and their value when dispatched to another EU country (Eurostat, 2011).[12] It is recorded as a services import of an EU country from the country of residence of the parent company controlling the company that manages the customs procedure related to this product in the reporting economy. It is important to note that this only affects data that are recorded according to the Community Concept which is used to calculate euro area and European Union aggregates.

Chart 4 shows that *Branding* accounts for 3% of total euro area services imports in 2009. For the purpose of calculating trade weights, it would be useful to subtract this services item from total services, as it does not reflect services that are subject to global competition, but merely is imputed to the services account in order to reduce asymmetries in the balance of payments statistics. However, one cannot exclude *Branding* consistently from euro area trade in services statistics as it is neither reported separately for the euro area aggregate before 2007 nor by individual euro area Member States. Furthermore, evidence is found that country level data for trade in services do not include any branding (i.e. follow the national concept instead of the Community Concept). Consequently, the country level trade weights based on servivces to compute HCIs are not affected by entrepot trade.

QUALITY AND COVERAGE OF SERVICES TRADE DATA

Potential problems of trade weights based on services are associated with the coverage and quality of international trade in services data. Although the coverage of international trade in services data has improved tremendously over the last decades as described in Section 2.2, some data gaps and quality issues remain.

[12] This excludes price changes due to storage, tax and insurance.

Data quality problems can be due to limitations of accuracy imposed by thresholds or sample surveys, misallocations and difficult geographical identification of the counterpart, different times of recording or confidentiality reasons. The OECD (2009) reports that the quality of partner country data mirror statistics (e.g. reported exports as compared to mirror imports) for total trade in services varies considerably depending on the partners investigated, while at the level of regional groupings and major players for total services, the quality was judged to be fair overall.

Whereas manufacturing trade weights are available since 1995 for a broad group of trading partners (the EER-40), it is only possible to construct EERs and HCIs based on trade in services in line with the ECB methodology starting from 2004. Eurostat reports data on the euro aggregate of 16 countries over the period 2004 to 2009. In order to compute the euro area aggregate for all 17 current Member States, these data are complemented with bilateral flows reported by Estonia.[13] To calculate third market effects for services trade, bilateral data between all partner countries is needed. In the period from 2004 to 2009, 73% of a total of 2280 (20 countries times 19 partner countries times 6 years) observations can be retrieved from the various data sources mentioned. To fill the data gaps, mirror data are employed, where in case a country does not report bilateral data vis-à-vis a certain partner country, the gap is filled by the data reported by the partner country. This approach leads to a data availability of 98%. The remaining 2% of missing data points are estimated: except for the case of bilateral imports of China from Switzerland where no data are reported, only one year of data is missing for the other country pairs, such that instead of using three-year averages, for these two-year averages in the respective periods are employed.[14]

For calculating HCIs using trade weights of individual euro area Member States, there is an additional problem as – although the data for the euro area aggregate are complete – some of the individual euro area Member States' bilateral services trade data are classified as confidential. Most gaps can be filled using mirror data and calculating two-year averages as described above. For confidentiality reasons German imports from China, Greek imports from Singapore as well as both exports and imports between Portugal and Hong Kong are not reported. In the case of Germany and Greece, we assume that the share

[13] The most commonly used euro EERs as calculated by the ECB treat countries that joined the euro area at a later stage as if they had been Member States since January 1999.
[14] This is the case for 38 bilateral observations.

of both countries in euro area aggregate exports to the respective countries also applies on the import side. For Portugal and Singapore we treat the data as "not available" as information on both exports and imports is missing.

3.5 THE REAL EFFECTIVE EXCHANGE RATE AND ITS DEFLATORS

FORMULAE AND THEORETICAL CONSIDERATIONS

The real effective exchange rate serves as an indicator of international price and cost competitiveness. In accordance the nominal effective exchange rate, the REER of the euro is calculated as the geometric weighted average of bilateral nominal exchange rates which are deflated using relative price or cost measures:

$$REER = \prod_{i=1}^{N} \left(\frac{d_{euro}^{t} e_{i,euro}^{t}}{d_{i}^{t}} \right)^{w_i} \tag{9}$$

where N stands for the number of competitor countries in the reference group of trading partners, $e_{i,euro}^{t}$ is an index of the average exchange rate of the currency of partner country i vis-à-vis the euro in period t, d_{euro}^{t} and d_{i}^{t} are, respectively, the deflators for the euro area and partner country i, and w_i is the trade weight assigned to the currency of trading partner i (as calculated in the previous section).[15]

THE VARIOUS REAL EFFECTIVE EXCHANGE RATES AND DEFLATORS

In choosing the REER deflators, there is a trade-off between the theoretically desired concepts and the availability and quality of data. While some indicators are available on a monthly basis (such as consumer prices) and for a broad set of countries, others are only published on a quarterly basis and/or for fewer countries. Data for the deflators are collected from several sources (mainly Eurostat, the OECD, the BIS and the IMF).[16]

The deflators used to construct real effective exchange rates based on trade in services weights are taken from the ECB's deflator database as described in Schmitz et al. (2012). The most commonly used deflator is the consumer price index (CPI). This index has the

[15] Please see Chinn (2006) and Schmitz et al. (2012) for the different theoretical concepts underlying real effective exchange rates and the choice of deflators.

[16] Where deflators are only available with a time lag, estimations are used. The data are seasonally adjusted and disaggregated from annual data if quarterly data are not available.

advantage of broad and timely data availability and also of comparability (being defined in a similar manner by many countries, in particular, industrial ones). In addition it includes services. However, it also comprises non-tradables. Still, it makes the CPI a useful tool for analysing international competitiveness – in particular if services are incorporated in the analysis. Drawbacks can arise if there are significant differences in productivity between the tradable and non-tradable sectors. Moreover, consumer prices can be distorted due to taxes and subsidies. The harmonised consumer price index (all items) of Eurostat is used for European countries, while similar national consumer price indices are used for all other trading partners.[17]

In addition to this standard deflator, a consumer price index solely focusing on services is used. This allows for constructing competitiveness indicators for the services sector. For euro area and non-euro area EU countries this measure is available on a harmonised basis from Eurostat, while it is retrieved from various sources for the other partner countries in the EER-20 group.[18]

Moreover, the GDP deflator (GDPD) is employed – which also includes services – and is focused on the production side of the economy. However, this also incorporates non-tradables and suffers from distortions stemming from taxes and subsidies. Furthermore, GDP deflators are published at quarterly frequencies only. The Harmonised Indices of GDP deflators are derived from quarterly national accounts.

Another concept of competitiveness is concerned with costs (Marsh and Tokarick, 1996), whereby wages and labour productivity are used to obtain a measure of the unit labour cost. In this paper unit labour costs in the total economy (ULCT) which include the services sector are used. However, this measure also reflects costs in non-tradable goods and services. As with GDP deflators, unit labour costs are published less frequently than CPIs. In addition, they do not cover all of the costs incurred by firms (e.g. the cost of capital, distribution costs and taxes are excluded) and can be influenced by compositional changes in terms of employment and value added across various sectors of an economy (Darvas, 2012). Unit labour costs are calculated as the ratio of the compensation per

[17] Ca'Zorzi and Schnatz (2008) have empirically assessed which deflator works best for the real effective exchange rates of the euro in terms of explaining export performance. Overall, they conclude that consumer and producer prices are "good approximations of euro area price and cost competitiveness conditions", particularly given the timeliness and historical availability of the related data.

[18] For Australia, Canada, Japan, South Korea, Switzerland and the United States it is retrieved from the OECD and available at a monthly frequency (except for Australia with quarterly availability). For China, Hong Kong and Singapore it is constructed using various services price sub-indices from Haver Analytics. The resulting REER index is available from 2001 onwards.

employee and labour productivity, with labour productivity measured as GDP at constant prices divided by the total number of employees.

Compared to the official euro EERs, the real EERs computed in this paper neither employ the producer price index (PPI), that includes industrial products and intermediate goods that can be traded internationally, nor unit labour costs of the manufacturing sector (ULCM). Table 5 provides an overview of the different euro REERs as calculated by the ECB and in this paper. The same set is also available for the HCIs of euro area Member States.

Table 5: Overview of the different real effective exchange rates of the euro

Trade weights	Manufacturing (official ECB EERs)		Services		Combined	
Deflator	**Trading partners**	**Frequency**	**Trading partners**	**Frequency**	**Trading partners**	**Frequency**
Consumer price index (CPI)	EER-40 and EER-20	Monthly	EER-20	Monthly	EER-20	Monthly
Consumer price index for services (CPIS)	Not available	-	EER-20	Monthly	Not available	-
Producer price index (PPI)	EER-20	Monthly	Not available	-	Not available	-
GDP deflator (GDPD)	EER-20	Quarterly	EER-20	Quarterly	EER-20	Quarterly
Unit labour costs in the manufacturing sector (ULCM)	EER-20	Quarterly	Not available	-	Not available	-
Unit labour costs in the total economy (ULCT)	EER-20	Quarterly	EER-20	Quarterly	EER-20	Quarterly

The bilateral exchange rates used in these calculations are, in most cases, the ECB's official daily reference rates (indicative rates published by other international organisations are used when these are not available). For the period before January 1999, "proxies" for the bilateral exchange rates of the euro were calculated (see Schmitz et al. (2012), Section 2.6 for details). The base period for all indices is the first quarter of 1999 (i.e. Q1 1999 = 100), except for the index based on services trade and deflated by consumer prices in the services sector which starts in the first quarter of 2001.

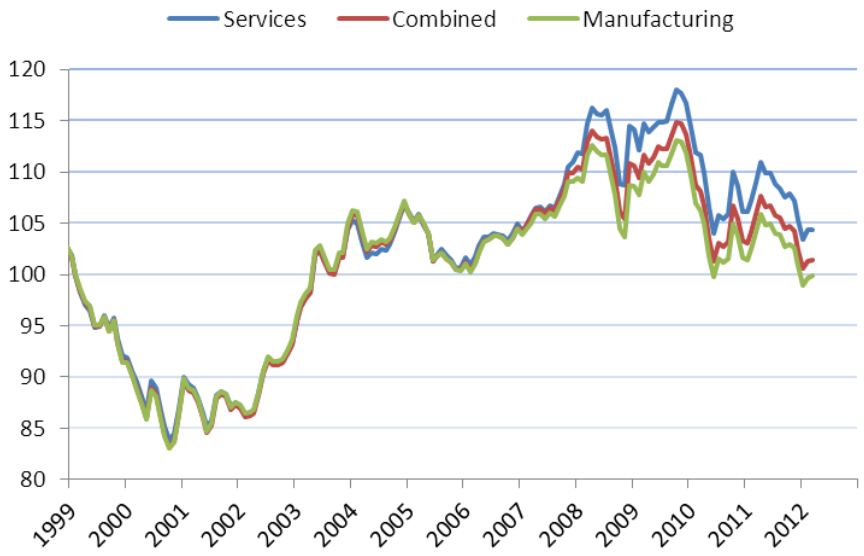
4 COMPARING EFFECTIVE EXCHANGE RATES OF THE EURO OVER TIME

In this section the newly constructed effective exchange rate indicators of the euro are compared to the official ECB EERs based on trade weights in manufactured goods. This

also entails considering competitiveness developments for the euro area as a whole, in particular with respect to comparing the manufacturing and services sectors.

Three different nominal effective exchange rates vis-à-vis the group of 20 trading partners are shown in Chart 8: the official nominal EER-20 based on manufacturing trade weights, the nominal EER-20 based on trade in services and an index combing both sets of trade weights. The combined index is essentially a weighted average of the other two indices.

Chart 8: Nominal euro EERs for the EER-20 group
(January 1999-March 2012)



Source: ECB and own calculations.
Note: A downward movement reflects a depreciation of the euro, while an upward movement indicates an appreciation.

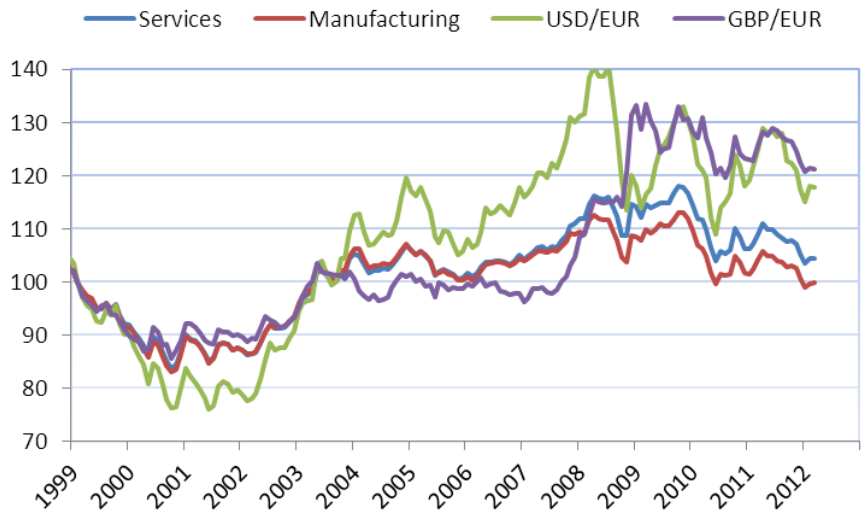
Since the inception of EMU in January 1999, there has been a close co-movement between the services based and manufacturing based indices, showing a correlation of 97%. Until August 2007 the difference between the two indices is always within a band of one point. In the subsequent period, a growing divergence is visible with the services based index being about five points higher in March 2012.

In order to shed light on the drivers of the effective exchange rate indices and the divergence between the two since August 2007, both the euro/US dollar and euro/sterling bilateral exchange rates are included in Chart 9.[19] According to the analysis by Schmitz et

[19] To ensure comparability both bilateral exchange rates are rescaled to be equal to 100 in the first quarter of 1999.

al. (2012) the nominal euro EERs broadly reflect movements in the euro/US dollar bilateral rate, both due to the US dollar on average being the largest trading partner of the euro area and some countries in Latin America and Asia closely linking or pegging their currencies to the US dollar.

Chart 9: Nominal euro EERs and selected bilateral exchange rates
(January 1999-March 2012)



Source: ECB and own calculations.
Note: A downward movement reflects a depreciation of the euro, while an upward movement indicates an appreciation. All series are scaled to equal 100 in 1999, first quarter.

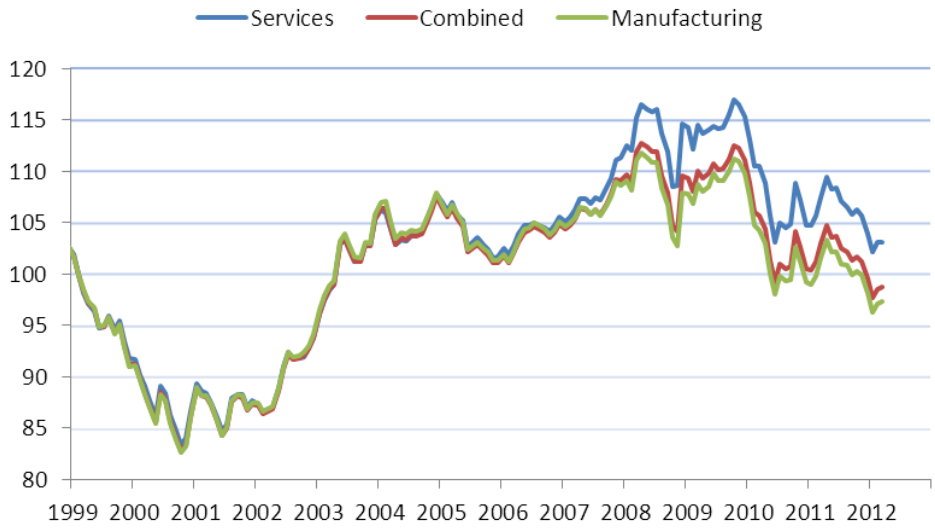
Chart 9 shows that also the effective exchange rate based on trade in services broadly follows the movements of the euro/US dollar bilateral exchange rate (with a correlation of 97%). In addition, it is notable that the divergence between the two NEERs seems to be partly driven by developments in the euro/sterling rate. While the UK has a manufacturing trade weight of 14.9% in the period starting in 2007, the corresponding services trade weight amounts to 26%. Hence, the appreciation of the euro against pound sterling of up to 30% since August 2007 has had an important influence on the nominal EER based on trade in services.[20]

Due to data availability it is not possible to calculate euro EERs for the group of 40 trading partners. However, Schmitz et al. (2012) show that the correlation between the EER-20 and EER-40 indices based on manufacturing trade reaches 99%. Thus, the EER-

[20] The effective exchange rate based on trade in services has a correlation of 82% with the euro/Sterling bilateral exchange rate in the period January 1999 to March 2012.

20 based on trade in services is very likely to also be representative of larger groups of trading partners.

Chart 10: Real euro EERs deflated by consumer price indices
(January 1999-March 2012)

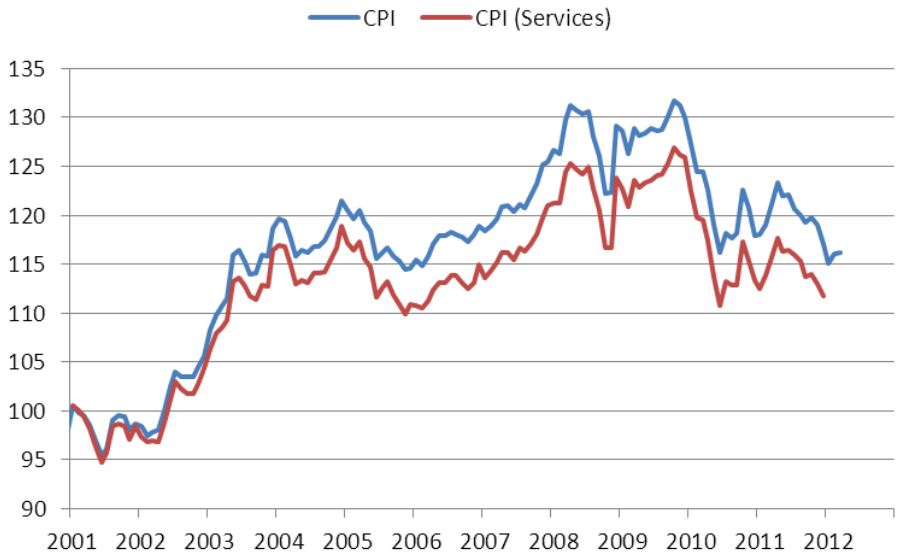


Source: ECB and own calculations.
Note: A downward movement reflects a depreciation of the euro, while an upward movement indicates an appreciation.

Chart 10 shows a similar picture for the real euro EERs deflated by consumer prices which is due to the fact that in general euro REERs are dominated by movements in euro NEERs. In the period since January 1999, the services based REER indicates a small loss in exchange rate based price competitiveness of about 3%, while the manufacturing (official) ECB index indicates a competitiveness gain of 2.7%. For the combined index this implies a slight improvement in competitiveness by 1.3%.

Chart 11 introduces a new REER index focusing on the services sector. As described in Section 3.5 consumer services prices are used here. Comparing this index to an index based on the full CPI index, shows that the euro area is more competitive in terms of services prices than in terms of aggregate consumer prices. In particular since 2005, consumer services prices in the trading partner countries have risen faster than in the euro area.

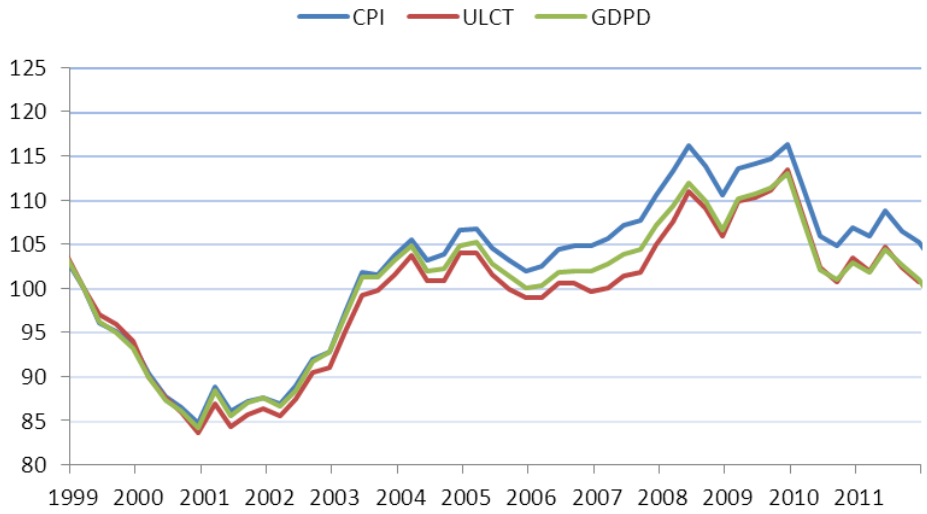
Chart 11: Real services based euro EERs deflated by consumer price indices
(January 2001-March 2012)



Source: ECB and own calculations.
Note: A downward movement reflects a depreciation of the euro, while an upward movement indicates an appreciation. All series are rebased to 100 in 2001, first quarter.

In Chart 12, two further measures of REERs based on services and deflated by unit labour costs in the total economy (ULCT) and GDP deflators (GDPD) are introduced.

Chart 12: Real services based euro EERs
(January 1999-December 2011)



Source: ECB and own calculations.
Note: A downward movement reflects a depreciation of the euro, while an upward movement indicates an appreciation.

In line with Schmitz et al. (2012) for the manufacturing based REERs, the euro area is slightly more competitive in terms of these two deflators compared to using consumer prices as a competitiveness measure.

Table 6 provides an overview of competitiveness developments for the euro area based on the different available REERs over the period from January 1999 to December 2011. For consumer prices the service based REER has appreciated (indicating a loss in competitiveness in services), while the manufacturing based REER-CPI has depreciated. The loss in competitiveness is also confirmed using consumer prices in the services sector (REER-CPIS). The same patterns exist for GDP deflator based REERs and ULCT based REERs where the largest overall gain in competitiveness for the combined index is visible.

Table 6: Overview of developments in the different REERs of the euro 1999-2011

Trade Weights ➡ Deflator ⬇	Manufacturing	Services	Combined
Consumer price index (CPI)	-1.8%	3.9%	-0.5%
Consumer price index for services (CPIS)	NA	11.8%*	NA
Producer price index (PPI)	-4.9%	NA	NA
GDP deflator (GDPD)	-6.7%	1.0%	-4.0%
Unit labour costs in the manufacturing sector (ULCM)	6.9%	NA	NA
Unit labour costs in the total economy (ULCT)	-5.5%	0.7%	-4.4%

Source: ECB and own calculations.
Note: A downward movement reflects a depreciation of the euro, while an upward movement indicates an appreciation of the single currency. Calculated over the period from January 1999 to December 2011.
*January 2011 to December 2011 for CPIS. The corresponding value for CPI for this period amounts to 17%.

The PPI based REER which is only used for manufacturing weights is in line with the observed patterns, while the REER-ULCM is the only indicator with a positive value (hence a decrease in competitiveness) among the official euro EERs. Schmitz et al. (2012) attribute this to the growing importance of emerging and transition economies where productivity gains usually occur in the manufacturing sector. One can assume that this indicator is most appropriate for measuring manufacturing sector competitiveness, while for the services sector the consumer price index in services is most useful. Comparing these two dimensions of euro area competitiveness in the period from January 2001 to

December 2011, the manufactured based REER-ULCM has appreciated by 23%, while the services based REER-CPIS has appreciated by 11.8%, implying that the euro area has been more competitive in the services sector over this period.

5 HARMONISED COMPETITIVENESS INDICATORS OF EURO AREA COUNTRIES

Changes in the real effective exchange rate of the euro reflect changes in the competitiveness of individual euro area Member States vis-à-vis their main trading partners outside the currency union. However, the real effective exchange rate of the euro does not show competitiveness developments within the euro area and the differences in this regard between individual Member States.

The HCIs of individual Member States have recently gained prominence in the context of the European Commission's Scoreboard of the surveillance of macroeconomic imbalances. In fact HCIs have been rather heterogeneous across euro area Member States over the last decade. The European Commission (2012) notes that some real appreciation episodes might be related to price convergence (due to the Balassa-Samuelson effect) as some euro area countries were subject to a process of economic convergence. A study by Frankel and Saravelos (2012) focusing on leading indicators of the global financial crisis shows that countries with larger REER appreciations before the crisis were more negatively affected during the crisis.

It is possible to calculate the same set of HCI indicators as for the REERs as described above. Moreover, indices reflecting price and cost developments vis-à-vis the fellow EMU countries are constructed as persistent divergences within the monetary union are problematic for the functioning of the single currency area. With the new indicators constructed in this paper, a broader assessment of these developments is possible.

First, a scoreboard approach in line with the European Commission is taken by considering three-year changes of the HCIs, while focusing on the services based HCI (deflated by services prices, Table 7). Over the period from December 2008 to December 2011, this measure is negative for most euro area countries, which is driven by external developments in line with Chart 11 for the corresponding euro EER. However, developments vis-à-vis fellow euro area countries are more heterogeneous. Ireland has improved its competitiveness of the services sector by 4.5%, while Slovakia (5%), Luxembourg (2.8%) and Finland (2.8%) have lost competitiveness.

Table 7: Scoreboard approach to various HCIs, 2008-2011

	Services weights and CPIS			Combined weights and CPI			Combined weights and ULCT		
Country	**Overall**	**Intra**	**Extra**	**Overall**	**Intra**	**Extra**	**Overall**	**Intra**	**Extra**
Austria	-1.33	1.65	-6.28	-1.96	1.18	-7.26	-0.01	1.15	-2.01
Belgium	-3.56	0.31	-8.78	-2.52	1.62	-8.32	0.41	2.44	-2.51
Cyprus	-6.23	-1.27	-10.31	-3.70	0.59	-8.06	3.59	6.06	1.03
Estonia	-5.47	-2.08	-8.90	-2.46	1.58	-6.35	-9.53	-9.96	-9.10
Finland	-4.35	2.75	-9.00	-4.71	1.66	-9.58	-0.63	3.14	-3.58
France	-5.09	0.32	-9.78	-4.43	-0.02	-9.77	0.21	2.79	-2.98
Germany	-7.09	-2.13	-10.72	-5.84	-1.13	-9.68	-1.34	1.22	-3.47
Greece	-4.28	1.46	-7.53	-0.99	4.16	-5.43	-3.07	-1.30	-4.64
Ireland	-9.05	-4.45	-12.09	-11.87	-6.96	-14.97	-17.45	-16.51	-18.06
Italy	-3.57	1.34	-8.85	-3.08	1.40	-8.34	-2.32	0.01	-5.11
Luxembourg	-2.45	2.78	-9.52	-1.44	3.34	-8.16	3.92	7.04	-0.56
Malta	-7.63	-1.02	-12.60	-7.08	-1.19	-12.17	-2.14	0.96	-4.91
Netherlands	-3.34	2.34	-8.00	-5.44	-0.41	-10.14	-1.34	1.39	-3.95
Portugal	-4.60	-0.27	-11.16	-2.83	0.22	-9.87	-4.32	-2.19	-9.33
Slovakia	2.42	5.01	0.28	-2.44	0.41	-5.45	0.60	0.49	0.72
Slovenia	-4.68	-2.15	-9.50	-2.00	0.65	-7.16	1.88	2.58	0.47
Spain	-5.68	-0.32	-11.05	-3.82	0.50	-9.86	-9.43	-7.48	-12.22

Source: ECB and own calculations.
Note: A negative value indicates an increase in price or cost competitiveness and vice versa.

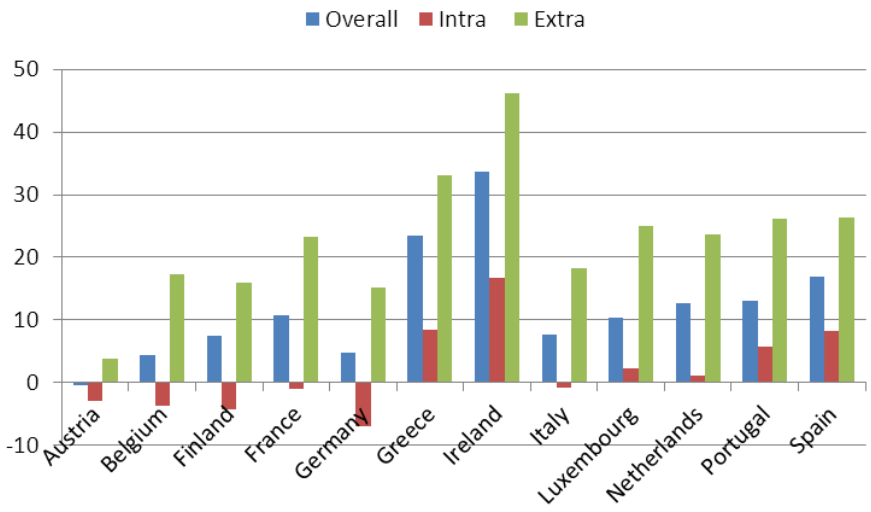
Using consumer prices as the deflator with the combined weights of manufacturing and services trade gives a comprehensive picture of euro area price competitiveness over the considered time horizon. Again, overall competitiveness of the euro area Member States has improved, in line with the external developments and driven by the broad nominal depreciation of the euro. Considering, intra-euro area developments only, it is striking that Greece and Luxembourg have lost some competitiveness relative to their euro area peers, while again Ireland and also Germany have improved their price competitiveness.

Turning to cost competitiveness measures using the combined index deflated by ULCT, there is more heterogeneity visible. Ireland stands out as gaining most competitiveness both internally and externally (overall by 17.5%), followed by Estonia, Spain, Portugal, Greece and Italy while Luxembourg and Cyprus experienced the largest real appreciation. The countries gaining most competitiveness overall are also the countries that show the largest decline in their HCIs relative to their EMU peers.

In general, the divergence in competitiveness is more pronounced in the HCIs based on unit labour costs, while CPI-deflated HCIs have diverged less. ULCT-HCIs weighted by manufacturing trade produce slightly different results (not reported). For example, with regard to intra-euro area developments, Ireland, Estonia and Spain would appear to have gained even more competitiveness, while it would underestimate Cyprus' and Luxembourg's loss in competitiveness.

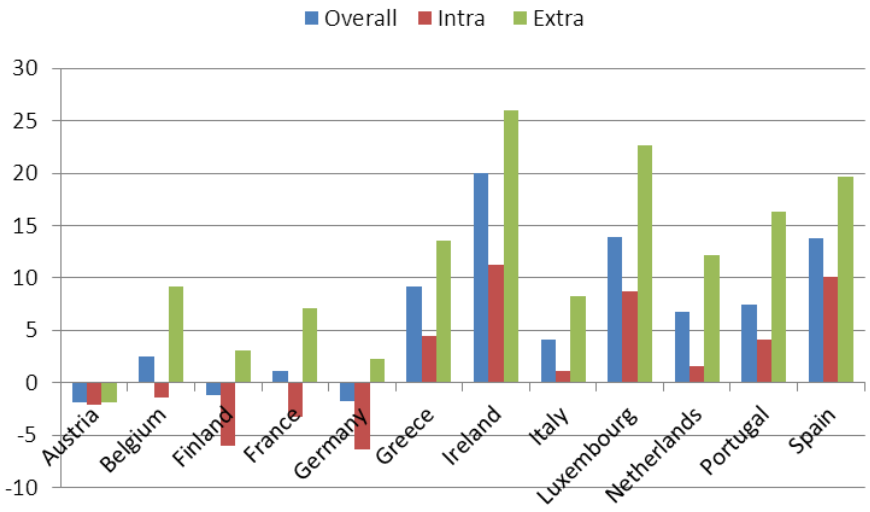
Inspired by Frankel and Saravelos (2012), it is considered how countries performed in terms of their HCIs in the period between the inception of EMU and the end of 2007, thus shortly before the global financial crisis started. Chart 13 shows the services-focused HCI: the external competitiveness of all countries has decreased during this period in line with the nominal appreciation of the euro. In terms of intra-euro area developments a lot of heterogeneity is visible. One group of countries led by Germany has gained competitiveness, while in particular Ireland and Greece became less competitive over the period considered.

Chart 13: Services based HCIs deflated by consumer services prices
(January 2001-December 2007)



Source: ECB and own calculations.
Note: A negative value indicates an increase in price or cost competitiveness and vice versa.

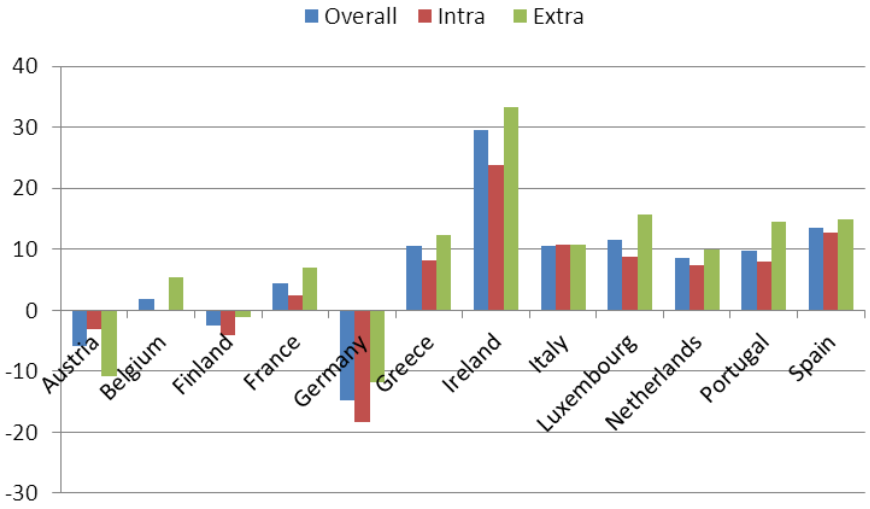
Chart 14: Combined weights based HCIs deflated by consumer prices
(January 1999-December 2007)



Source: ECB and own calculations.
Note: A negative value indicates an increase in price or cost competitiveness and vice versa.

These patterns are similar for combined weights based HCIs deflated by consumer prices (Chart 14) and even more pronounced when deflated by ULCT (Chart 15).

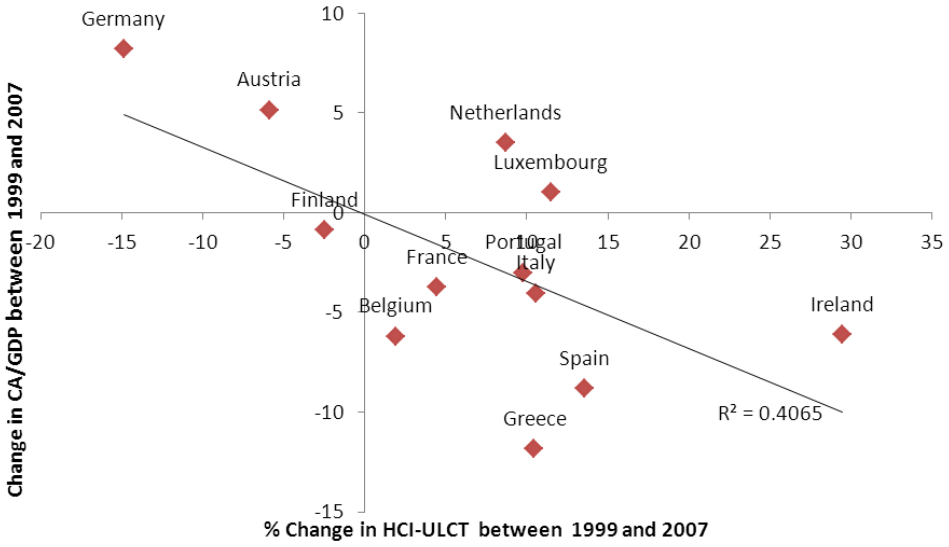
Chart 15: Combined weights based HCIs deflated by ULCT
(January 1999-December 2007)



Source: ECB and own calculations.
Note: A negative value indicates an increase in price or cost competitiveness and vice versa.

The next charts provide some potential applications of the newly constructed HCIs in economic analysis. For example, Chart 16 shows a negative correlation between developments in combined HCIs (deflated by ULCT) and changes in the current account balance for euro area Member States over the period 1999 to 2007. This reveals that the countries loosing most competitiveness between the introduction of the euro and the onset of the financial crisis in 2007 are those which experienced the most severe decline in their current account balances during the same period.

Chart 16: Change in current account balance (relative to GDP) and combined HCIs deflated by ULCT (1999- 2007)



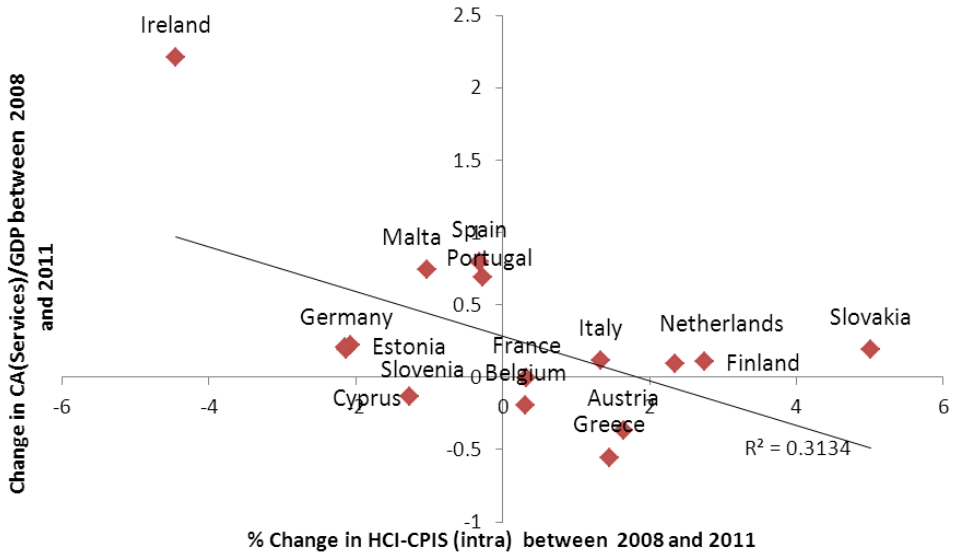
Source: ECB and own calculations.

In Chart 17, the new services based HCI (deflated by consumer services prices and focusing on intra euro area developments) since 2008 is plotted vis-à-vis the changes in the services component of the current account balance. A negative correlation is visible, indicating that countries which improved their services sector competitiveness vis-à-vis the other euro area Member States were also able to improve their trade balance in services.

As suggested above, HCIs for individual Member States constructed in the way described in this paper can serve as useful tools to monitor country developments more in-depth and comprehensively. Furthermore, these indicators can be used in various economic analyses

such as the assessment of equilibrium exchange rates, contribution to global imbalances and price responsiveness of trade flows.

Chart 17: Change in current account balance (services relative to GDP) and services HCIs deflated by consumer services prices (intra) (2008- 2011)



Source: ECB and own calculations.

6 CONCLUSION

This paper contributes to the literature on effective exchange rates by constructing indices based on trade in services weights in line with most recent ECB methodologies. It is the first attempt to consistently calculate EERs based on trade in services incorporating third market effects for a sizeable set of countries. In combination with service sector prices, this allows for analysing competitiveness developments in the services sector of the euro area relative to foreign competitors. Moreover, the paper presents effective exchange rates based on a combination of trade in manufactured goods and trade in services: these effective exchange rates constitute more complete indicators of international competitiveness than the traditional indicators solely based on manufacturing.

The paper shows that the importance of manufacturing trade for the euro area has decreased to some extent over the last decade, while that of services has increased. Trade

patterns in services differ from those observed for manufactured goods: most striking is the difference for China which is the largest trading partner of the euro area in terms of manufactured goods, whereas it is only the fourth largest partner for services, while the United Kingdom and United States are by far the largest trading partners of the euro area in terms of services trade. Also for the trade weights of individual euro area Member States used for the HCIs, substantial heterogeneity is found both in terms of the relative services- and manufacturing shares as well as intra-and extra-euro area trade shares. Nevertheless, since the inception of EMU in January 1999, there has been a close co-movement between the services based and manufacturing based indices. Comparing the new REER index focusing on the services sector to an index based on the full CPI index, reveals that the euro area has been more competitive in terms of services prices than in terms of aggregate consumer prices over the last decade.

Next to the euro EERs and HCIs for the current 17 Member States of the euro area, the new indices described in this paper will also available for the 20 trading partners considered in the EER-20 group. For the future it would be desirable to expand the new indices to the EER-40 group of trading partners as is possible for manufacturing trade. However, data availability to calculate third market effects for this group is still rather limited. Moreover, one can expect that an index for the EER-40 group would move very much in line with the EER-20 index (as found for manufacturing trade by Schmitz et al., 2012).

The newly constructed indices offer a wide range of applications. While the new index focused on services is aimed at explicitly measuring euro area competitiveness in the services sector, the combined effective exchange rates constitute more complete indicators of international competitiveness of the total economy.

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