BANCA D'ITALIA

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REASSESSING PRICE-COMPETITIVENESS INDICATORS OF THE FOUR LARGEST EURO-AREA COUNTRIES AND OF THEIR MAIN TRADING PARTNERS

by Alberto Felettigh, Claire Giordano, Giacomo Oddo and Valentina Romano[1]

Abstract

This paper provides new Bank of Italy indicators of price competitiveness for 62 countries. We refreshed the approach adopted by the Bank in the 1990s but later discontinued in 2005 due to the cumbersome statistical requirements in order to accommodate the significant extension of the original geographical coverage. Thanks to progress made in data availability, we were able to update the weighting system to 2009-11 and take into account competitive pressures from local producers in all the outlet markets while keeping the same vast geographical coverage. The new indicators show that the developments in price competitiveness since 1999 in the four largest euro-area countries have been slightly more favourable than those gauged by the current measures. However, the competitiveness gap in 2014 vis-à-vis Germany remained unchanged in Italy and Spain, while it increased marginally in France. The cumulative trend for 1999-2014 in France, Germany and Spain was more favourable vis-à-vis euro-area countries than with respect to the others; no significant difference was recorded in Italy.

JEL codes: F10, F30, F31
Keywords: price-competitiveness indicators, producer prices, local producers' competition, double weighting, real effective exchange rates.

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[1] Banca d'Italia, Directorate General for Economics, Statistics and Research.

1. Introduction[2]

Price competitiveness has returned to the centre of the policy debate in recent years, owing to increasing concerns about the external imbalances within the euro area and the attached vulnerability risks for financial stability and, ultimately, economic growth. Measurement issues are however manifold. An economy's price competitiveness is most commonly approximated by the real effective exchange rate of its currency, i.e. a weighted geometric average of nominal exchange rates of a country's main trading partners, deflated by relative prices or costs.

The indicator is conditioned on the selected number of trading partners and of outlet markets, on the chosen weighting scheme and on the adopted deflator. No consensus on the ideal price-competitiveness measure has however been reached from a theoretical standpoint since the seminal contribution by Armington (1969), which derived the optimal weighting system, leaving however open the choice of the deflator; neither has a consensus been attained in the empirical literature (see, for instance, Chinn, 2006; Giordano and Zollino, 2014 and 2015).

The Bank of Italy has been constructing price-competitiveness indicators following a long tradition since the early 1980s.[3] The indicators currently adopted are computed *vis-à-vis* 61 trading partners, weighted by manufactured goods' bilateral trade data and deflated with the producer price index of manufacturing goods (Finicelli, Liccardi and Sbracia, 2005). The changing geographical composition of trade since the late 1990s has increased the demand for refining and updating the reference methodological framework. Similarly to the current practice, we confirm the use of producer prices of manufactured goods sold domestically as the deflator of our indicators, a choice that we thoroughly discuss in the paper; in particular, we regard these prices as a satisfactory proxy of total production costs in the medium term, in contrast with unit labour costs, which focus solely on cost pressures stemming from one production factor, moreover decreasing in importance over the past twenty years.

The aim of this paper is to spell out the main lines of revision of the current methodology for the Bank of Italy's price-competitiveness indicators, with the effort to maintain a large geographical coverage of 62 individual countries, which is high in comparison with other international institutions, including the European Central Bank (ECB). The framework is similar to the one already employed in the Bank of Italy back in the 1990s, but at the time with by far a more limited geographical coverage (Bank of Italy, 1992; Tristani and Zollino, 1998). The details provided in the paper also allow comparisons with indicators constructed by other institutions world-wide. Various robustness exercises are conducted in order to test the soundness of our new indicators.

Following the computation of the new measures, we assess their impact on the recent developments in price competitiveness in the four largest euro-area countries (Italy, France, Germany and Spain) compared with the current Bank of Italy indicators. We find that relative developments since 1999 are now marginally more favourable; we thus confirm that, whereas France and Germany have recorded substantial price competitiveness gains to date, Italy's price competitiveness has been broadly stable and Spain's deteriorated notably. Current competitiveness gaps *vis-à-vis* the best-performing country (i.e. Germany) are instead on the whole unchanged, with an exception of limited extent for France. A more disaggregated analysis, obtained by restricting the

[2] We are grateful to Alessandro Borin, Silvia Fabiani, Alessandra Liccardi, Rosario Luppino, Libero Monteforte, Roberto Sabbatini, Massimo Sbracia, Anna Maria Stellati, Roberto Tedeschi and Francesco Zollino (Banca d'Italia) and to Bernadette Lauro (European Central Bank) for their useful suggestions and advice on data and methodological issues; we also thank all participants of an internal seminar at the Bank of Italy. Although the paper presents the description of the official methodology used at the Bank of Italy, the views expressed are those of the Authors and do not necessarily reflect the opinions of the Bank of Italy.

[3] The first release of Bank of Italy price-competitiveness indicators, including ten trading partners, dates back to 1982 (Valcamonici and Vona, 1982). A significant methodological revision and extension to 25 countries were then undertaken in 1998 (Tristani and Zollino, 1998); their framework is very close to the one currently adopted both by the ECB and in this paper.

set of competitors to euro and non-euro area countries, is now possible, providing further insights into the strengths and weaknesses of the four economies under scrutiny. In particular, Italy's current competitiveness disadvantage with respect to Germany and to France is less pronounced *vis-à-vis* non-euro area competitors. Moreover, by decomposing price-competitiveness indicators into (weighted) exchange-rate and relative-price dynamics, we confirm that the slower growth in Italy's producer prices relative to that of the average of its competitors only just counterbalanced the nominal appreciation recorded in 1999-2014.

The structure of the paper is as follows. Section 2 defines the methodology underpinning the new Bank of Italy price-competitiveness indicators. Section 3 outlines the impact of the new methodology and the new data on the existing Bank of Italy indicators. Section 4 discusses the trends in price competitiveness of the largest euro-area countries, on the basis of our new measures. Section 5 draws some conclusions and states the future research agenda. Appendix A provides further details on data and methodological issues, whereas Appendix B displays price-competitiveness trends in a selected number of countries, other than the four largest euro-area economies.

2. The methodology

2.1 Trading partners

Within the Bank of Italy price-competitiveness indicators are currently calculated for each reporting country against 61 trading partners. In 2005, when these countries were selected for the first time, they represented approximately 93 per cent of world trade in goods; in 2013 (last year available) this share was confirmed. The selection of these trading partners was based on their relevance in foreign trade for the main euro-area countries and advanced economies, as well as on data availability and quality. The attained geographical coverage of the Bank of Italy price-competitiveness indicators is high in international standards (see Table A1 in Appendix A).[4]

The new Bank of Italy price-competitiveness indicators described in this paper are based on the same sample of countries. However, as well as measures computed *vis-à-vis* all 61 trading partners, we now also provide indicators restricted to subgroups of competitors, e.g. to the euro-area partners. This disaggregation enables an appraisal of price-competitiveness trends of a euro-area country with respect to partners sharing the same bilateral nominal exchange rates, adding further information to traditional competitiveness analysis.

2.2 Weighting methodology

We define an economy's price-competitiveness indicator as a weighted geometric average of the nominal exchange rates *vis-à-vis* its main trading partners, deflated by relative prices or costs. The starting point is the nominal effective exchange rate (NEER), which is calculated as the weighted geometric average of the bilateral nominal exchange rates. Omitting time subscripts for simplicity, the NEER of reporting country *i* in time *t* is defined as:

$$NEER_i = \prod_{j=1}^{N} e_j^{w_j^i} \qquad [1]$$

where N denotes the number of trading partners (N = 62 in our case, including the reporting country), e_j stands for the index of the nominal bilateral exchange rate between country i and

[4] See Table A2 in Appendix A for a complete list of the 62 countries considered by us. For instance whereas the ECB produces NEERs *vis-à-vis* 58 partners its price-competitiveness indicators deflated by producer prices are constructed with respect to 38 partners. The ECB also constructs nominal and real effective exchange rates for the euro-area as a whole.

country j (expressed in terms of j's currency per one unit of i's currency, so that an increase indicates a loss of price competitiveness for i), and w_j^i indicates the overall weight of competitor j for the reference country i (see below for details).[5]

The weighting methodology of the new Bank of Italy price-competitiveness indicators (that is, how the various w_j^i are calculated) is the same as the one adopted in Tristani and Zollino (1998; "old approach" henceforth) and, more recently, in Schmitz et al. (2012), the latter being the reference paper for the ECB measures. As we shall see, three methodological innovations have been introduced relative to the current Bank of Italy indicators (Finicelli, Liccardi and Sbracia, 2005). Table 1 summarizes the old, current and new Bank of Italy methodology, in comparison with the current ECB framework.[6]

Table 1. A summary of the Bank of Italy and the ECB price-competitiveness indicator methodologies

	ECB (current)	Bank of Italy (old)	Bank of Italy (current)	Bank of Italy (new)
Number of countries	20 + 19 euro-area countries (40 + 19 euro area countries only for CPI deflated)	25 countries	44 + 18 euro-area countries	44 + 18 euro-area countries
Deflator	PPI, domestic sales of the manufacturing industry; CPI; GDP deflator; ULCM; ULCT	PPI; export prices (and PPI for local production); ULCM	PPI, domestic sales of the manufacturing industry	PPI, domestic sales of the manufacturing industry
Weighting method	Overall = import weight + export weight (double weighted)	Overall = import weight + export weight (double weighted)	Overall = import weight + export weight (double weighted)	Overall = import weight + export weight (double weighted)
Local production	YES	YES	NO	YES
Weights	1995-97; 1998-2000; 2001-03; 2004-06; 2007-09	Mobile weights, updated yearly	1999-2001; (1989-91 weights available for limited set of countries)	1999-2001 and 2009-11 (1989-91 weights available for a limited set of countries)
Frequency of update of weights	Every three years	Not established	Not established	Not established
Sub-indices	Euro-area weights Non euro-area weights	Import weights Export weights Restricted group indicators available	Import weights Export weights	Import weights Export weights Euro-area weights Non euro-area weights
Frequency of time-series	Monthly, since January 1995	Monthly, since January 1970	Monthly, since January 1993 (since January 1980 for a limited set of countries)	Monthly, since January 1993 (since January 1980 for a limited set of countries)
References	Schmitz et al. (2012)	Tristani and Zollino (1998)	Finicelli, Liccardi and Sbracia (2005)	Felettigh, Giordano, Oddo and Romano (2015)

[5] Among the various advantages of using geometric averaging over simple arithmetic means, it may be worth recalling that geometric averages ensure that a percentage change between two points in time is the same irrespective of the chosen base period (the so-called "time reversal test"; see Brodsky, 1982 and Rosenweig, 1987 for details). Moreover, proportionally equivalent appreciations and depreciations have an effect of the same magnitude, but with opposite signs, on the indicator, whereas arithmetic averaging leads to an upward bias (Schmitz et al., 2012).

[6] Again, see Table A1 in the Appendix for a summary of the methodology underlying the calculation of price-competitiveness indicators by a selected number of institutions. As recalled therein, the ECB does not publish its PPI- and ULCM-based indicators; the ECB methodology is however the same for all its price-competitiveness indicators.

In computing the NEER for country *i*, the overall weight w_j^i of each competitor *j* in the group of *N* trading partners is equal to the weighted average of its import and export weights:

$$w_j^i = \alpha_i \, {}^{x}w_j^i + (1 - \alpha_i) \, {}^{m}w_j^i \qquad [2]$$

where $\alpha_i = \frac{X_i}{X_i + M_i}$ is the share of exports of reporting country *i* on its total trade flows. This is the first difference relative to current Bank of Italy indicators, where α is fixed at 0.5.[7] This methodological innovation, which restores the approach used in the old indicators, implies that countries that are structurally net exporters (importers) are assigned a higher export (import) weight, thereby gauging the competitiveness metrics to the actual composition in trade.

The import weight of competitor country *j* is defined as its share in the reporting country *i*'s total imports:

$${}^{m}w_j^i = m_j^i \Big/ \sum_{k=1}^{N} m_k^i \qquad [3]$$

where m_j^i denotes imports of reporting country *i* from country *j* and the denominator indicates total imports of reporting country *i*, with $m_i^i = 0$ and $\sum_{j=1}^{N} {}^{m}w_j^i = 1$. The higher the share of competitor *j* in the reporting country's total imports, the larger the weight of its exchange rate in the basket of currencies included in the NEER.

The export weight of competitor *j* in the computation of the NEER for country *i* is more articulate, as it is double-weighted in order to account for third-market effects:

$${}^{x}w_j^i = \sum_{k=1,\ k\neq i}^{H} S_k^j x_k^i, \qquad j = 1, \ldots, N \qquad [4]$$

where S_k^j denotes the share of competitor *j* in market *k*, x_k^i denotes the share of market *k* in *i*'s exports and *H* denotes the overall number of outlet markets we consider, which is equal to *N* plus the residual aggregate "rest of the world" (*H=N+1*). Each foreign market *k* is defined, from the viewpoint of reporting country *i*, as the sum of "locally-sold local production", i.e. manufacturing gross output of country *k* sold in its domestic market, and of manufacturing exports to country *k* from all competitors *j* ($j \neq i$). Note that, due to data limitations, the residual aggregate "rest of the world" is treated as an additional outlet market while it is not included in the set of competitors for reporting country *i*.[8] Finicelli, Liccardi and Sbracia (2005) did not consider a residual aggregate "rest of the world"; this is hence the second innovation relative to current Bank of Italy indicators (which is indeed a restoration of the old practice), and it has the advantage of considering an additional market where competition among trading partners takes place.

Equation [4] can be equivalently written by splitting the summation into the term with $k=j$ and the sum of the terms with $k \neq j$; this alternative specification helps clarify the "double-weighting procedure" of exports:

[7] This past choice of using an arithmetic mean was motivated by "reasons of symmetry and simplicity" and "not because it was founded on sound empirical evidence" (Finicelli, Liccardi and Sbracia, 2005, p. 10). At the time, the IMF also adopted these fixed coefficients (see Leahy 1998); for a subset of their indicators (when data on domestic sales are not available) the IMF continues to do so (see Bayoumi, Lee and Jayanthi, 2005, pp. 18-22).

[8] That is, exports from the "rest of the world" to the other markets are disregarded. Moreover, local production is not considered in the definition of the "rest of the world" market. This is of course a simplification of reality, as in this way "rest of the world" is supposed to be only consuming and not producing anything. This is made clear in equation [4] by *k* running up to *N* and not to *H*.

$$ {}^{x}w_j^i = S_j^j x_j^i + \sum_{\substack{k=1, \\ k \neq i,j}}^{N} S_k^j x_k^i \qquad [5] $$

The double-weighted export weight assigned to competitor *j* in evaluating *i*'s competitiveness consists, indeed, of two components: the first term of equation [5], $S_j^j x_j^i$, measures the direct competition faced by reporting country *i* in market *j* from its local manufacturers; the second term measures the indirect competition faced by reporting country *i* from *j*'s exports in third markets *k*. "Locally-sold local production" is the third methodological innovation relative to Finicelli, Liccardi and Sbracia (2005), where instead it was assumed to be zero owing to data availability constraints, at the cost of disregarding an important dimension of international competition.

Summarizing, the export weight of competitor *j* in evaluating *i*'s competitiveness is therefore greater if:

a) country *j* is a significant outlet market for the reporting country *i*;
b) country *j* is an important exporter to a third foreign market that is a key destination also for country *i*; and
c) country *j*'s share of domestically produced and sold manufactures in total domestic supply is large, implying that it is a relatively strong competitor for foreign manufactures.

As already mentioned, in addition to indicators computed *vis-à-vis* all 61 trading partners, we now also provide indicators restricted to a smaller group of competitors, for instance the euro-area members. Notice that the restricted set of trading partners competes, as before, on all 63 markets (including the "rest of the world"). The overall trade weight of competitor *j* in the narrow group of *M* trading partners is calculated by proportionally rescaling the overall trade weight of competitor *j* in the wide group of *N* trading partners:

$$ w_j^{i,narrow} = \frac{w_j^i}{\sum_{k=1}^{M} w_k^i} \qquad [6] $$

The advantage of using this rescaling method is that "narrow" indicators are consistent with the original indicators.[9]

2.3 The data sources for our weights

As is common practice in the literature, we use bilateral trade flows to compute the weights w_j^i, ${}^{m}w_j^i$ and ${}^{x}w_j^i$ described in the previous paragraph. In particular, our weights are based on flows of manufactured goods only (i.e. Sections 5 to 8 of the Standard International Trade Classification, rev. 3), often selected as they are supposed to be a sufficiently homogenous category, less subject to non-market practices, typical of agricultural goods, and to large price volatility, as is the case for raw commodities.[10] Also, our main interest is in assessing the price competitiveness of the largest euro-area countries, whose trade flows predominantly consist of manufactures. Given the rising importance of trade in services, it would be desirable to take these into account too, although at present service trade data still lack completeness, reliability and cross-country comparability.[11]

[9] See Schmitz et al. (2012, pp.12-13) for a further discussion.
[10] Again, this choice of SITC sections is standard in the literature (see Table A1 in Appendix A). Finicelli, Liccardi and Sbracia (2005) considered the same categories, but they excluded category 6.8 (non-ferrous metals).
[11] See Table A1 in Appendix A for the choices made by other institutions. In particular, the Bank of England uses bilateral service trade data but for a more restricted number of countries relative to those considered by us (Lynch and Whitaker, 2004). Underpinning the IMF indicators, trade in services, except for tourism, is assumed to be distributed in the same manner as trade in manufactures and therefore the same weights are used (Bayoumi, Lee and Jayanthi, 2005, p. 7). Similarly, recent research under way at the ECB aims at building price-competitiveness indicators weighted by trade in services (Schmitz, 2013), but again limited to a smaller set of countries (20) than in this paper. In general

Trade weights constructed by Finicelli, Liccardi and Sbracia (2005) were fixed and were based on 1999-2001 trade data.[12] Their series began in 1993; they were however chain-linked to 1980-1992 series based on 1989-91 weights for 50 countries.[13] Time-varying weights, although more accurate in capturing changing patterns in trade, require long reliable time series, which are not available for all countries considered, as well as heavy maintenance.[14] Our new price-competitiveness indicators are based on two matrices of weights: the first, based on 1999-2001 bilateral trade data for 62 countries and their exports to the residual aggregate "rest of the world", is employed to calculate indicators for the January 1993 - December 2004 period; the second matrix, based on 2009-11 data, is employed for indicators since January 2005. The two series are then chain-linked in January 2005.[15] In Figure A1 in Appendix A, using Italy as an example, we show that the adoption of our new 1999-2001 weights to track price-competitiveness trends in 1993 and 1994 (when an updated 1989-91 matrix, impossible to construct, would be preferable) does not convey a biased assessment relative to the adoption of the old 1989-91 weights.

While Finicelli, Liccardi and Sbracia (2005) made extensive use of data from the World Trade Analyzer by Statistics Canada, this dataset is no longer updated and we had to resort to alternative sources. For our new 1999-2001 and 2009-11 weights we used Eurostat bilateral export data for EU countries, converted into US dollars; United Nations Comtrade (UN) export data for non-EU countries; BACI data (published by the Centre d'Études Prospectives et d'Informations Internationales - CEPII) for Taiwan and for other missing observations.[16] In all cases we retrieved the 62-by-62 matrix of bilateral exports together with overall exports by each country so that exports to the 63rd partner "rest of the world" were computed residually. We assumed symmetry in our datasets so that when computing import weights, the imports of country *i* from country *j* were set equal to the exports of *j* to *i*.[17]

As in Tristani and Zollino (1998) and Schmitz et al. (2012), local producers' sales in their domestic market are approximated by the difference of the country's manufacturing value added (VA) and its net manufacturing imports or, in other terms, the sum of manufacturing VA and imports less exports is taken as a proxy for manufacturing gross output consumed locally.[18] This method is based on the assumption that manufacturing goods imports are a reasonable approximation of the total value of intermediate inputs of foreign origin, in turn reflecting the high and growing degree of internationalization of manufacturing production. According to Turner and Van't Dack (1993), this estimate of the gross value of manufactured goods produced and sold domestically is comparable with international trade data, which are also expressed in similar gross value terms.

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anyhow, trade of goods is found to be more reactive to trends in price competitiveness than trade in services, in the context of standard dynamic export and import equations (Christodoulopoulu and Tkacevs, 2014; Giordano and Zollino, 2014 and 2015).

[12] The three-year average is needed to smooth out potential volatility in the underlying series.

[13] The 12 excluded countries in the pre-1993 period were: the eight countries that became independent with the fragmentation of the Soviet Union, Yugoslavia and Czechoslovakia (namely, Estonia, Latvia, Lithuania, Russia, Croatia, Slovenia, Czech Republic, Slovakia), three Eastern Europe countries (Bulgaria, Poland and Romania) that were not market economies, and China, for which reliable data are not available for the 1980s.

[14] This was the reason why Finicelli, Sbracia and Liccardi (2005) opted for a fixed weighting scheme, as opposed to Tristani and Zollino's (1998) time-varying one based on 25 countries only.

[15] A longer time series is available since 1980, obtained by chain-linking the old 1980-92 Bank of Italy price-competitiveness indicators based on the 1989-91 weights to our new series as of 1993 (a similar solution to that adopted by Finicelli, Liccardi and Sbracia, 2005, p. 11). However, in this case, a double inconsistency ensues between pre-1993 and post-1993 data: as well as only 50 countries being considered, the methodology adopted for the pre-1993 indicators is the current Bank of Italy approach, described in Finicelli, Liccardi and Sbracia (2005).

[16] Data from CEPII are described in Gaulier and Zignago (2010).

[17] It is a well-known fact that statistics of exports from country *j* to country *i* are in general not equal to their mirror data (imports of country *i* from *j*), owing to valuation differences (f.o.b. vs. c.i.f.) and to measurement errors and discrepancies.

[18] The European Commission adopts an even lesser refined proxy: the difference between GDP and exports (European Commission, 2014, p. 3).

We retrieved current-price manufacturing VA data for all 62 countries, except Taiwan, from United Nations Statistics.[19] For this last country we used Taiwan Statistical Bureau data for 2009-11 and the World Input-Output Database (WIOD) database for 1999-2001. Manufacturing VA data for China for 1999-2001 was sourced from World Bank data. In the few cases in which our estimates were negative (i.e. Ireland in 2000-01 and in 2009-11 and Singapore in 2010-11), we set them to zero, i.e. we interpreted the negative estimate as a signal that the "true" value was indeed positive but very small.[20] As for manufacturing overall imports, we kept the same hierarchy of sources used for (bilateral) exports, namely Eurostat, UN Comtrade, CEPII.

As a robustness check, we attempted to measure pressures from local competition (manufactured goods produced locally and sold locally) more accurately by replacing the sum of value added and net imports with the difference between gross output and exports as published in WIOD.[21] In this database, however, only 39 countries are available; for the remaining 23 countries we continued using our proxy variable described previously. Although this more proper indicator is approximately threefold larger than our proxy for all countries which are accounted for,[22] its impact on our price-competitiveness indicators was negligible, as shown in Figure A2 in Appendix A for the four main euro-area countries.[23] We therefore preferred to use our proxy of local producers' supply, since this can be computed consistently for all 62 countries.

Finally, we calculated the time-varying coefficients α_i, as shown in equation [2], on the basis of the trade data described above.

Table 2 provides a summary of the sources used by us, in comparison with the sources underlying the current Bank of Italy indicators.

Table 2. Data sources underlying price-competitiveness indicator weights

	BI (current) (Finicelli, Liccardi and Sbracia, 2005)	**BI (new) (This paper)**
Trade data	World Trade Analyzer (Statistics Canada) UN-NBER, ECB	Eurostat, UN Comtrade, CEPII
Local production data	-	UN Comtrade Taiwan Statistical Bureau, World Bank, WIOD
Sets of weights	(1989-91); 1999-2001	(1989-91); 1999-2001; 2009-11

[19] A potential issue is due to the fact that UN national account data are not entirely comparable at the current stage, since only eight countries have already adopted the new SNA 2008 accounts whereas the remaining countries' data still refer to the old SNA 1993 standards. However, the impact of the new SNA 2008 data for all countries, when available, should be negligible; Figure A2 in Appendix A indeed shows how a much larger change of data source in computing local producers' competition has a very marginal effect on our price-competitiveness indicators.

[20] Turner and Van't Dack (1993, p. 117) confirm that it is common to obtain negative estimates of local competition in the case of small, very open economies, which are often a reprocessing base and the host for *entrepôt* trade, as is the case of Ireland and Singapore in our calculation. The IMF has similar problems with Hong Kong and Singapore (see Bayoumi, Lee and Jayanthi, 2005, p. 16).

[21] The WIOD database is available at www.wiod.org.

[22] The IMF too finds an approximate 10:3 ratio between gross manufacturing output and value added for industrial countries of OECD STAN database source, which they then apply to the countries not included in STAN (Bayoumi, Lee and Jayanthi, 2005, p. 16), leading however to implausible results in the case of Hong Kong and Singapore (see note 20), for which an arbitrary 6:1 ratio is used. In order to avoid applying strong assumptions to emerging economies, we preferred to conduct the robustness exercise using the more refined data only when available.

[23] Similarly, when Tristani and Zollino (1998) abandoned input-output tables for the measurement of local production in favour of the same proxy as ours, in order to increase the geographical coverage of their indicators, they stated that the revision "did not have a significant impact on the weights" (Tristani and Zollino, 1998, p. 2).

2.4 Deflators

The price-competitiveness indicator (PCI) of a country *i* in time *t* is defined as the weighted geometric average of its relative prices or costs, where all prices/costs are measured in a common currency. Alternatively but equivalently, the indicator is computed as the product of the NEER and a weighted geometric average of relative prices or costs:

$$PCI_i = \prod_{j=1}^{N} \left(P_{ij} e_j\right)^{w_j^i} = NEER_i \prod_{j=1}^{N} \left(P_{ij}\right)^{w_j^i} \qquad [7]$$

where the last equal sign follows from equation [1] and $P_{ij} \equiv d_i/d_j$, with d_i and d_j are the indices of the deflators for the country *i* and *j*, respectively. Given the way it is constructed, an increase in the indicator implies a loss in price competitiveness.

Discussions on the appropriate deflator are found in Chinn (2006) and Giordano and Zollino (2014; 2015). Both theoretically and empirically no deflator proves to be optimal, but we strongly favour producer prices of manufactures sold domestically, which we regard as a proxy for cost developments that encompasses all production cost pressures, including labour costs, in the sector of tradable goods, which is a broader concept than traded goods, since some tradables may turn out not to be actively traded specifically because of price-competitiveness issues (foreign sales typically involve higher transportation and sunk costs relative to domestic sales). In other terms, the basket of products represented in producer prices of manufactures sold on the internal market is more likely to capture the whole spectrum of potential supply to domestic and foreign markets. It is all the more suitable now that we consider competition by local producers.

Alternative deflators such as unit labour costs are not as satisfactory. Giordano and Zollino (2014 and 2015) show that in a context of increasing internationalization of production processes, price-based indicators are more appropriate than unit labour cost-based measures to correctly assess a country's price competitiveness and track its merchandise export performance.

As for export and import prices, they are in principle more apt to capture price discrimination across markets (see Figure A3 in Appendix A for an example). One may argue that, ideally, in order to assess a reporting country *i*'s export competitiveness, the producer prices of *i*'s exported manufacturing goods should be compared not only with similar prices of its competitor *j* in third markets, but also with its competitor *j*'s producer prices of manufactured goods sold in the domestic market of *j*. Symmetrically, in assessing a country *i*'s import competitiveness, its producer prices of manufactured goods sold in domestic markets should be compared with its competitor *j*'s prices of goods sold abroad.[24] However, three distinct facts turn this ideal situation into a suboptimal one in the real world. Firstly, export and import prices refer by definition to goods that were traded in the past, as opposed to tradables, so that in a sense they are inherently unfit for a forward-looking analysis of sustainable price developments. Secondly, producer prices of manufactures sold abroad are available only for a limited number of countries, in some cases for short time spans, and with an insufficient geographical detail for properly taking into account price discrimination across foreign markets, which instead is well known to be a relevant phenomenon (the same applies to overall-sales producer price indices, which are a weighted average of domestic-sales and foreign-sales producer prices). Thirdly, the alternative option of resorting to unit values is unpalatable since they are known to be biased deflators.

[24] Tristani and Zollino (1998) explain how they attempted to tackle this issue: in their indicators deflated by export prices, they used the latter *vis-à-vis* those of the other exporters competing in the same outlet markets and producer prices to deflate the output of local producers consumed locally (see also Banca d'Italia 1992, p. 1). However, export prices were proxied by unit values, and the construction of the corresponding price-competitiveness indicators was discontinued in 2005 by the Bank of Italy in occasion of the framework introduced by Finicelli, Liccardi and Sbracia (2005).

Producer prices of manufactured goods sold in domestic markets are thus employed by us when available, which is the case for most countries; the sources of producer prices used in our new indicators are reported in Table A2 in Appendix A.

Finally, in choosing producer prices of manufactures sold domestically we are aware of the drawback that they do not include, by definition, information on services' prices, as well as that they are only valid for a short-to-medium term analysis, as competitive pressures may lead firms to refrain from passing cost pressures to prices, at the expense of profit margins, in a manner that is not sustainable in the long run. However, producer price indices also have the advantage of being available on a monthly basis, and PPIs of manufactures sold domestically is the elective choice of all institutions currently producing PPI-based competitiveness indicators.[25]

A further issue concerns the fact that our indicators, as is standard, are based on prices expressed as indices, and therefore indirectly on growth rates, rather than on price levels. This procedure can lead to an underestimation of the competitive pressures stemming from emerging economies. Esteves (2007) spells out the implications of using information on price levels to determine the actual price-competitiveness of euro-area countries, as do Thomas, Marquez and Fahle (2008) for the US. However, relative price levels also have various drawbacks. For instance, since they are derived as the difference between market exchange rates and purchasing power parity exchange rates, they are known to be subject to large measurement errors. Moreover, differences in price levels may reflect differences in quality, in turn an important (non-price) factor for a country's trade performance.

The nominal bilateral exchange rates used in the calculations are retrieved from official sources as daily observations and transformed into monthly averages.[26] The base period for all indices is 1999.

Finally, it is worth mentioning that equations [2] and [7] can be combined to re-write the price-competitiveness indicator as follows:

$$PCI_i = \left[\prod_{j=1}^{N}\left(P_{ij}e_j\right)^{x_{w_j^i}}\right]^{\alpha_i} \cdot \left[\prod_{j=1}^{N}\left(P_{ij}e_j\right)^{m_{w_j^i}}\right]^{1-\alpha_i} \qquad [8]$$

Equation [8] offers an alternative interpretation of the "overall" price-competitiveness indicator, which is here expressed as a geometric weighted average of an export-based competitiveness indicator and an import-based one, the weights being α_i and $(1-\alpha_i)$. Again, given how it is constructed, an increase in the indicator implies a loss in price competitiveness.

3. The impact of the methodological innovations on the Bank of Italy's price-competitiveness indicators

Focusing solely on the four largest euro-area countries for the sake of brevity, it can be shown that the new Bank of Italy indicators improve the price competitiveness of Italy, Germany and Spain by around 2 percentage points over the entire period 1999-2014 (Fig. 1); the gain is about 1.5 points for France. It is possible to break down the differences between our new and the current Bank of Italy price-competitiveness indicators into three sources of variation: (i) the different trade data sources employed, (ii) the different three-year spans chosen for defining the weighting

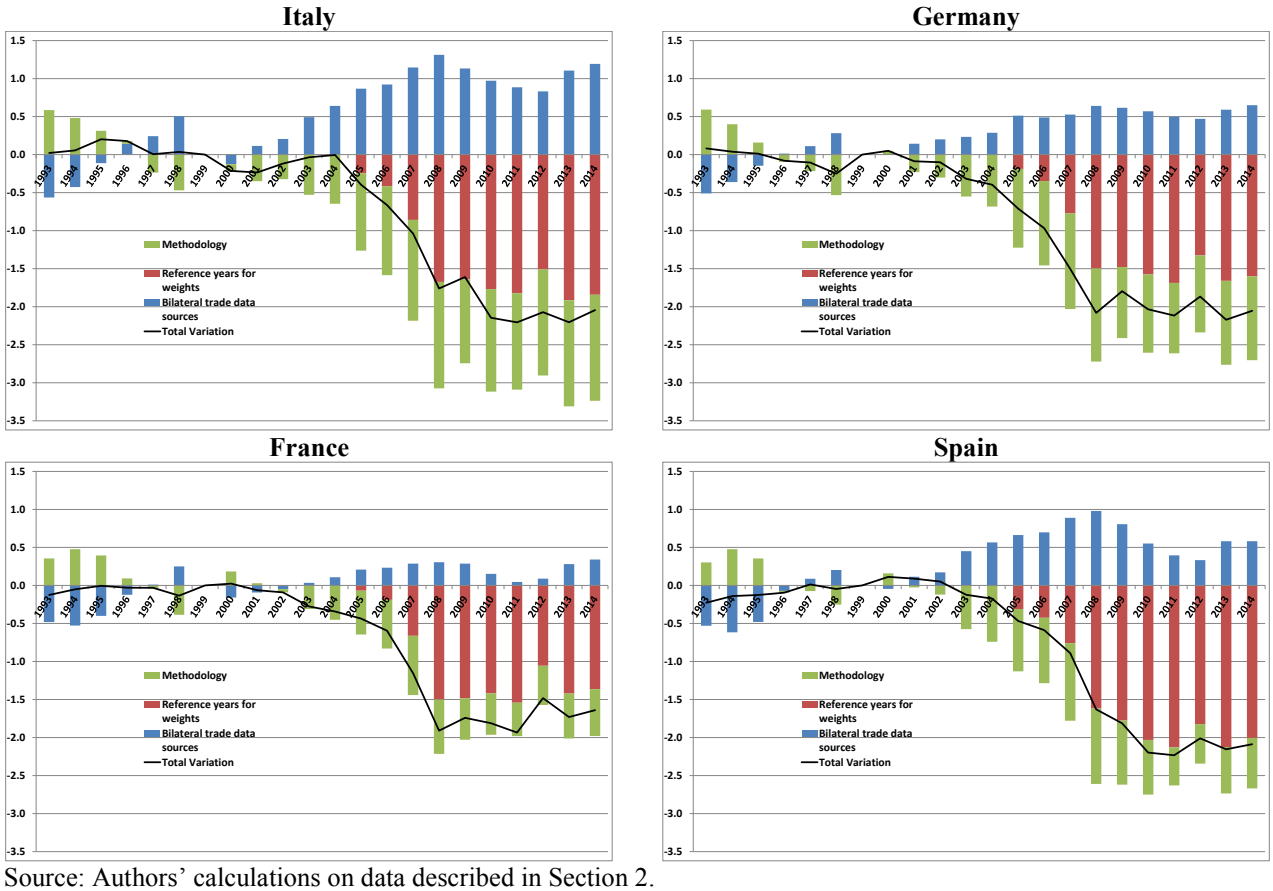
[25] A discussion is however under way at the ECB aimed at the construction of total sales producer price-deflated competitiveness indicators. Figure A3 in Appendix A also reports the developments of these deflators since 2002 in the four countries under study.

[26] See Ellis (2001) on the optimal transformation of daily bilateral exchange rates.

matrices[27] and (iii) the new methodology (mostly, the role of local suppliers, as we shall later see). Since 1999, having changed the data sources leads to an upward revision of the indicators (i.e. a deterioration in price competitiveness) of the four countries under study. The new weights in particular, but also the new methodology, more than offset this effect, leading to an overall downward revision of the new price-competitiveness indicators relative to the current measures. The bulk of the impact of the latter two components is concentrated in the years 2005-08. The reason for this is not the effect of the chain-linking procedure (the linkage period is January 2005); we document this in Figure A4 in Appendix A, in which we arbitrarily shift the linkage period to January 2003 and show that the impact of the new weights and of the new methodology is still large and concentrated in the 2005-08 period. Conversely, we believe this effect is due to the acceleration in the diffusion of global value chains as of the mid-2000s.[28] The increasing internationalization of production processes indeed contributed to reduce the production costs of local suppliers, via offshoring and cheaper imports of intermediate goods; the competitive pressures stemming from local producers thereby heightened after 2005, hence possibly explaining the large impact of our new methodology seen for the 2005-08 years. In Figure A5 in Appendix A we show that by excluding local producers' competition from our new weighting matrices, the contribution of the new methodology vanishes for the four countries under scrutiny.

Figure 1. A decomposition of the differences between the new and the current Bank of Italy price-competitiveness indicators

(percentage points)



Source: Authors' calculations on data described in Section 2.

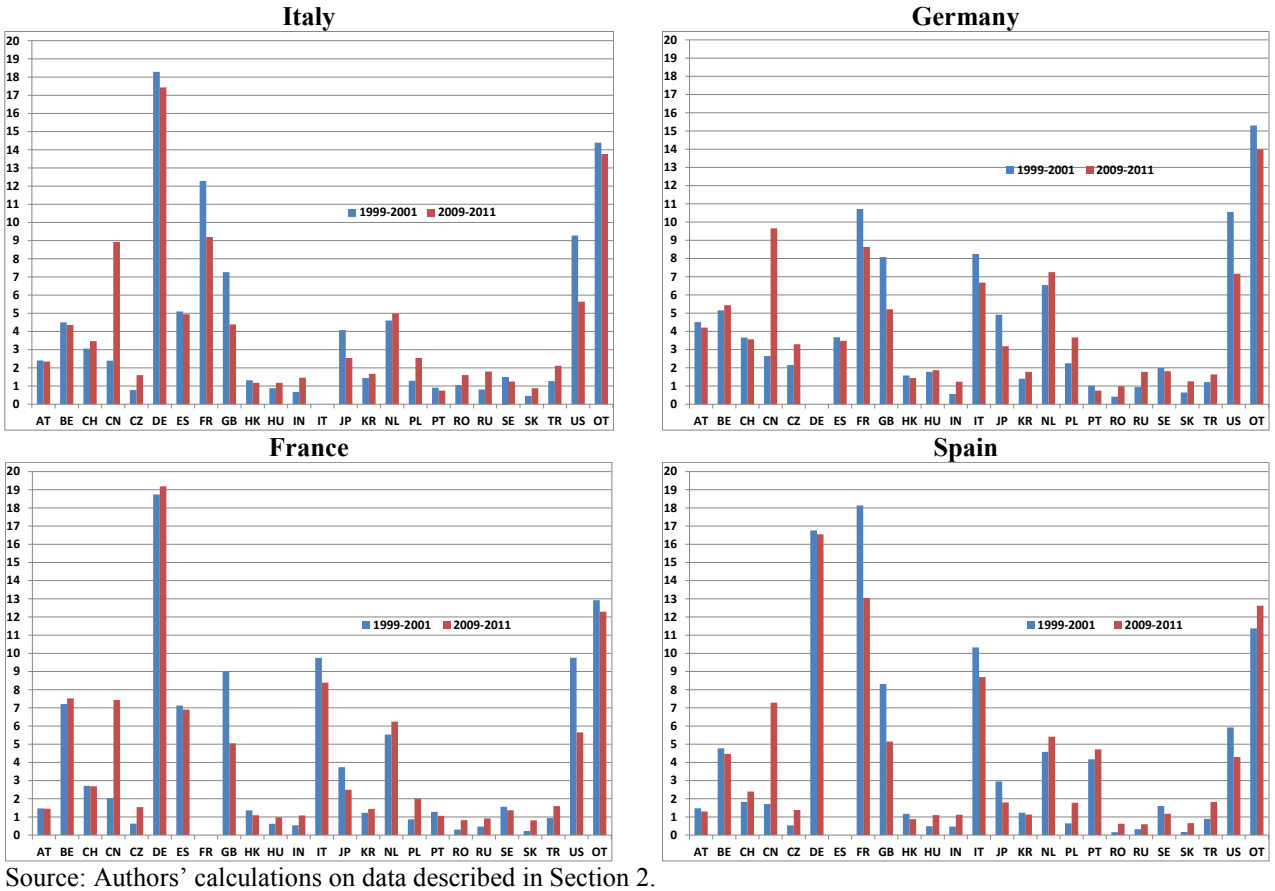
[27] The different three-year span implies a discrepancy between the current indicators (based on a 1999-2001 weighting matrix throughout) and the new ones (1999-2001 up to December 2004, 2009-11 afterwards) only as of January 2005, as seen by the red bars in Figure 1.

[28] Indeed, according to WIOD data from 1995 to 2011, the years 2005-08 are those in which the share of domestic value added in manufacturing exports by the main advanced countries dropped the most (from nearly 74 per cent to just above 69 per cent, at current prices), although the spike in oil prices also contributed to this result.

Focusing on the weights, the structure of trade has changed significantly since the turn of the millennium; this fact is captured by the new weighting matrix, referred to 2009-11 (Fig. 2; see also Tables A3-A4 in Appendix A, which report the new 1999-2001 and 2009-11 import, export and overall weights used in the four largest euro-area countries' price-competitiveness indicators). Indeed, relative to 1999-2001, the weight of China has increased nearly fourfold in the indicators of all four largest euro-area countries, reaching nearly 10 per cent in Germany. The weight of the Netherlands and of East-European countries has also grown significantly, owing to the impact on gross trade flows of the internationalization of production processes and, more specifically, of the strengthening of regional supply chains within Europe. Conversely, the weight of advanced economies, such as the United States, the United Kingdom and Japan has declined for all four countries. Amongst them, France's relevance has decreased markedly, while the decline in the weights of Italy and Spain was in general smaller; Germany's weight has instead increased modestly in France's price-competitiveness indicators. Germany continues to carry the largest weight in the indicators of France and Italy, while for Spain the same holds only in the most recent set of weights. For the latter country, the weight of neighbouring France remains particularly large.

Figure 2. Trade weights of selected competitors in 1999-2001 and 2009-11 in the price-competitiveness indicators of the four largest euro-area countries

(percentage points)



Source: Authors' calculations on data described in Section 2.

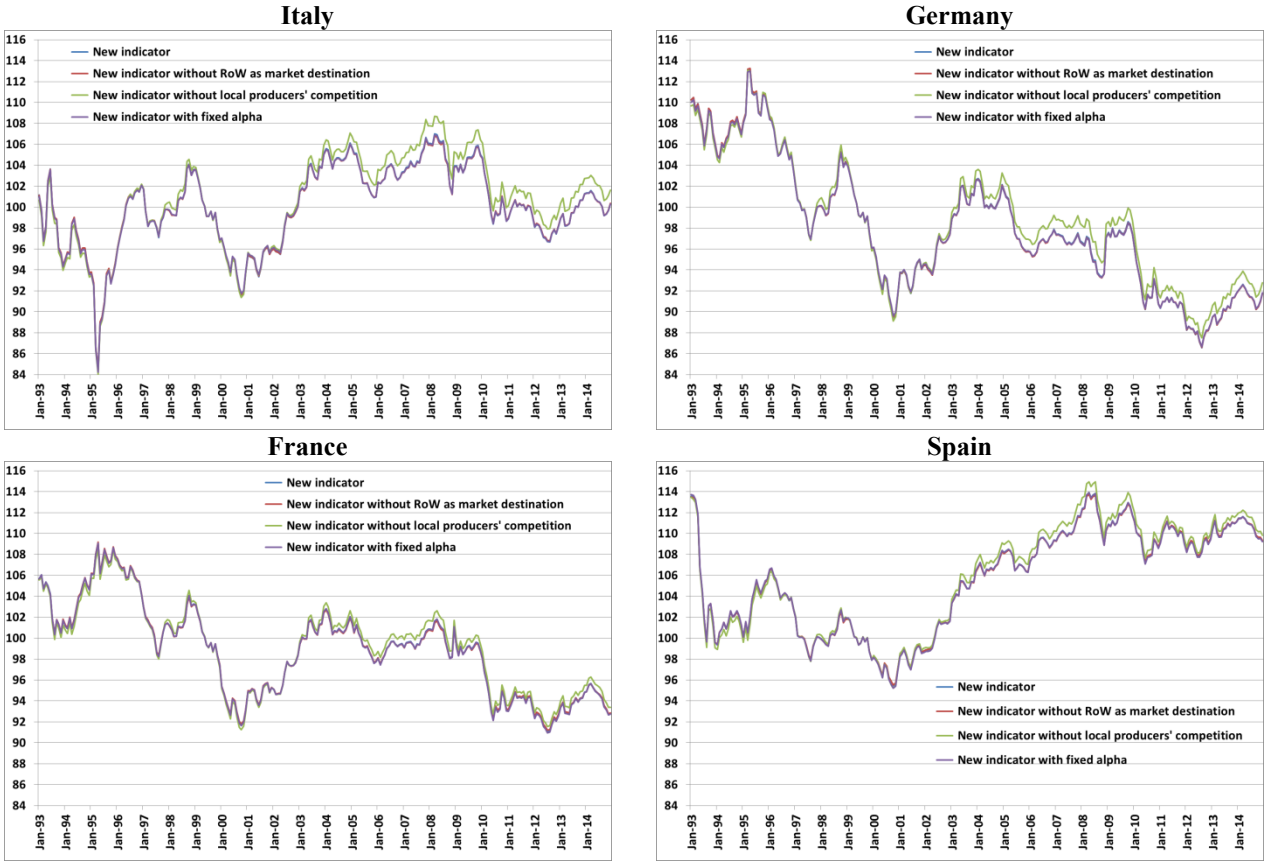
Notes. The 28 selected competitor countries are chosen according to the following criterion: they weight over 1 per cent in the price-competitiveness indicator of at least one of the four euro-area countries considered. OT is the sum of the weights of the remaining 33 countries.

Focusing instead on the impact of the new methodology, the previous section has documented that we introduced three innovations relative to the framework of Finicelli, Liccardi and Sbracia (2005). Once again: *a)* we include a residual country "rest of the world" among the markets where the 62 trading partners compete; *b)* each trading partner competes with each counterpart also on its domestic market; *c)* in averaging out import weights and export weights, we

use an endogenous country and time-varying coefficient α rather than an exogenously fixed one. Figure 3 assesses the relative impact of these three innovations by comparing the new measures, where all of them are introduced, to the corresponding indicators that are obtained by dropping one innovation at a time. As shown also in Figure A5 in Appendix, the most relevant innovation is the inclusion of the local producers' competition in the export weights. Not taking into account this factor would slightly deteriorate price-competitiveness indicators, in particular in Italy and in Germany. As mentioned earlier, the effect is larger in the 2005-08 years.

Figure 3. The relevance of the three methodological innovations in the new Bank of Italy price-competitiveness indicators of the four largest euro-area countries

(indices 1999=100)



Source: Authors' calculations on data described in Section 2.

4. Price-competitiveness trends in the largest euro-area countries according to our new indicators

Our new indicators signal slightly more favourable developments in price-competitiveness for the four largest euro-area countries between 2005 and 2008-10 relative to those currently published by the Bank of Italy (Fig. 4).[29] Outside this time span, the dynamics of the new indicators tend to coincide with those of the old measures, as already pointed out in Figure 1.

Since the inception of the European Monetary Union, France and Germany have gained about 6 and 9 percentage points in price competitiveness respectively, against a broad stability recorded in Italy and a loss of 11 points observed in Spain. Since the outbreak of the 2008 recession, whereas the gains in competitiveness in the former three countries were substantial and comparable (between 4 and 6 percentage points), the improvement recorded in Spain was much less marked (under 2 points). The competitiveness gap with respect to Germany, the best performing country

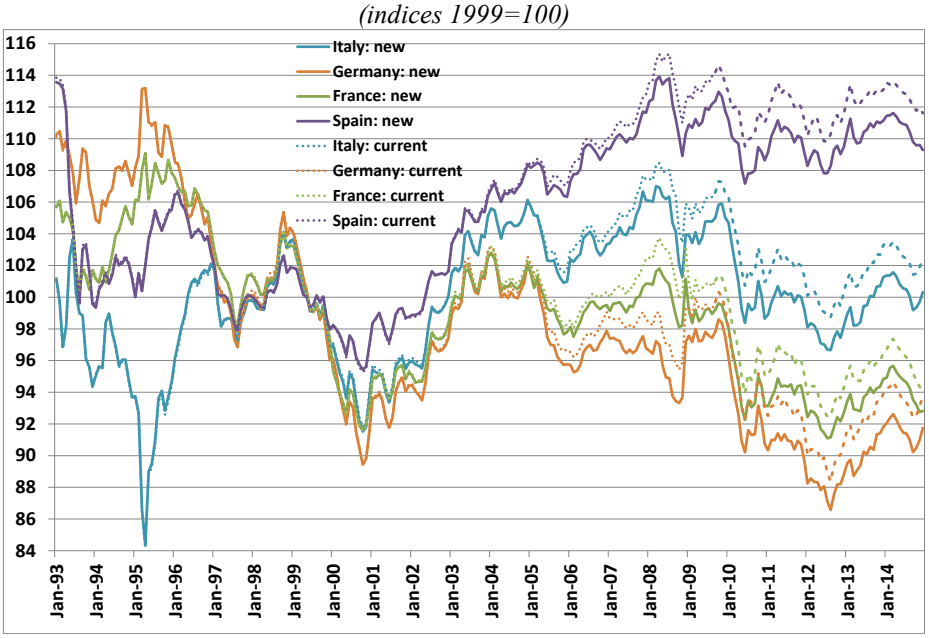
[29] In Appendix B we also provide graphs of price-competitiveness trends, according to the new and current Bank of Italy methodological framework, for eight other major manufactured goods' exporters, namely China, United States, Japan, Korea, United Kingdom, the Netherlands, Taiwan and Canada.

amongst the four largest euro-area economies, currently stands at 3 points for France, 9 for Italy and 19 for Spain. These gaps are almost identical to those recorded on the basis of the current Bank of Italy indicators, with the exception of France, for which it has widened slightly. As is known, somewhat different trends and rankings emerge when considering alternative price-competitiveness indicators, based on different deflators of ECB source (see Figure A6 in Appendix A).

Figure 5 shows that the improvement in price competitiveness recorded by our new indicators relative to the current measures over the period 1999-2014 for Italy, Germany and Spain were broadly in line with that of the "median" country; conversely, in France the gain was slightly less significant.

Figure 4. Price-competitiveness trends in the four largest euro-area countries according to the Bank of Italy new and current indicators

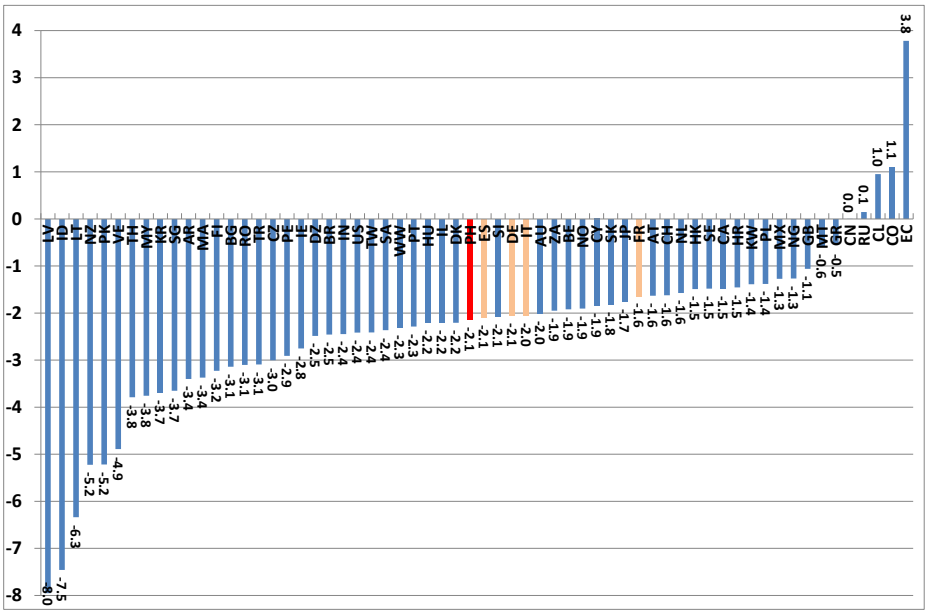
(indices 1999=100)



Source: Authors' calculations on data described in Section 2.

Figure 5. Differences between the change in price competitiveness of 62 countries over the period 1999-2014, according to the new and current Bank of Italy indicators

(percentage points)

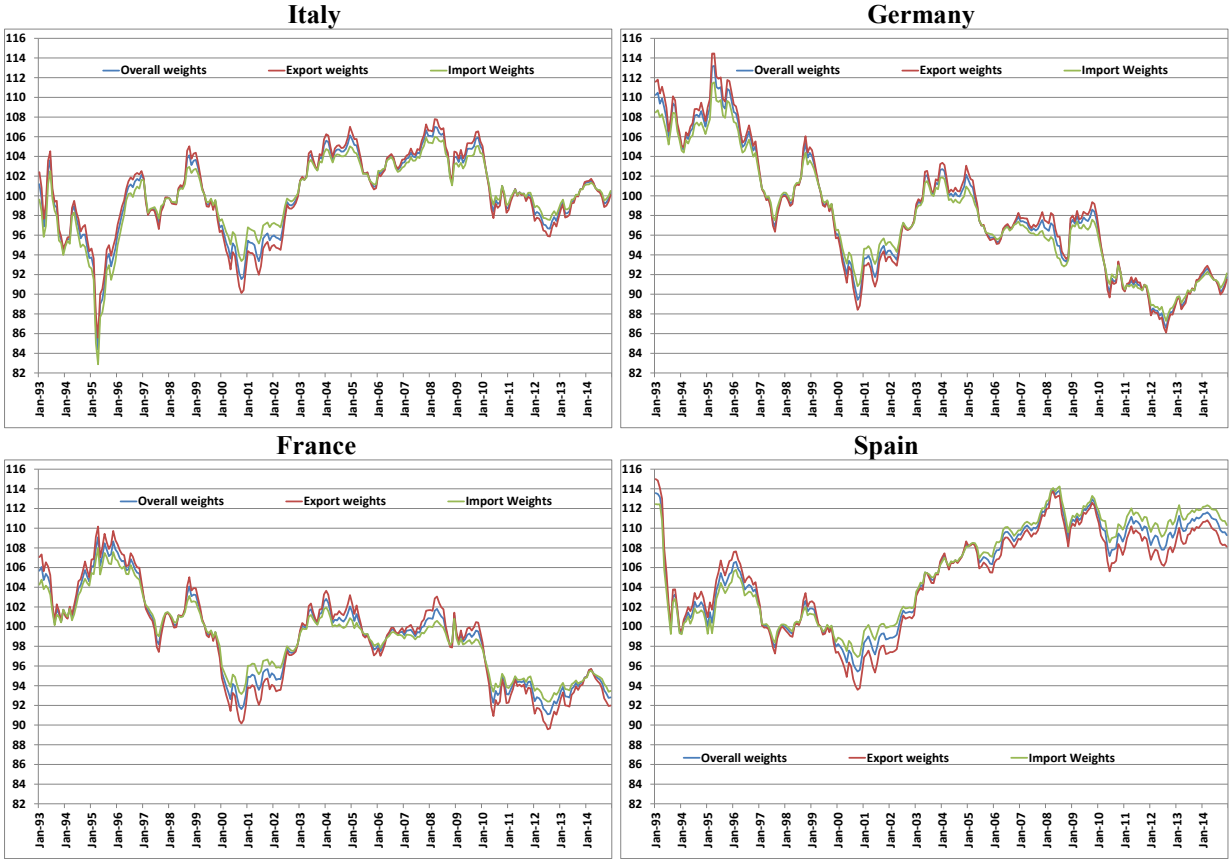


Source: Authors' calculations on data described in Section 2.

Our new price-competitiveness indicators can be decomposed in various ways. We are able to compare indicators based solely on import or solely on export (double) weights, as shown in equation [8] and presented in Figure 6. First, it is interesting to note that the weight of exports on total trade flows (i.e. α in equations [2] and [8]) in 2009-11 was greater than 0.5 for Germany and Italy (net exporters); conversely, it was smaller than 0.5 for France and Spain (net importers). Secondly, cumulated competitiveness trends since 1999 are less favourable when considering the import-weighted indicator for France and, in particular, Spain, whereas no appreciable difference is evident between the two indicators for Germany and Italy. Finally, for Germany, Italy and France export competitiveness shows less favourable dynamics than import competitiveness at all points in time, with the exception of a few years at the beginning of the 2000s and, especially for France, after the 'Great Trade Collapse' in 2009. For Spain a tendency emerges, after 2005, for export competitiveness to systematically outperform import competitiveness.

Figure 6. The new Bank of Italy overall, import and export weight-based price-competitiveness indicators of the four largest euro-area countries

(indices 1999=100)



Source: Authors' calculations on data described in Section 2.

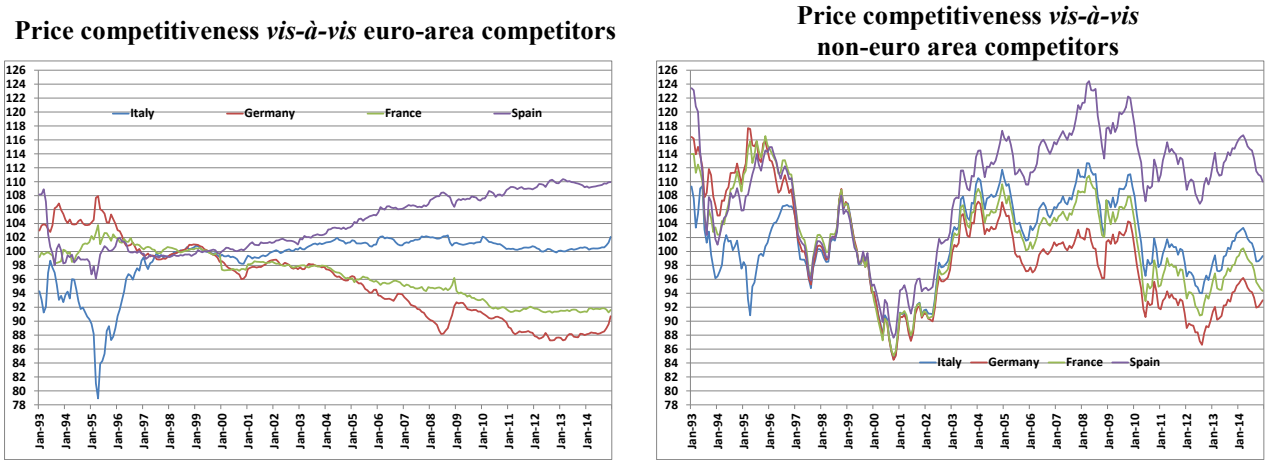
We can also analyse price-competitiveness trends *vis-à-vis* a restricted set of trading partners, such as euro-area and non-euro area subgroups. As shown in Table 3 and Figure 7, Italy's price competitiveness relative to euro-area countries was broadly stable since 1999, whereas its non-euro area indicator was more volatile over time, peaking in 2004-05 and again in 2008-09, and currently signalling a 1 percentage point loss relative to the beginning of the period.[30] In France and

[30] Notice that since the introduction of the single currency in 1999, the euro-area component of the NEER is close to, but not exactly equal to, one hundred for all four countries under examination. This is due to the fact that we consider a fixed-composition definition of euro area including all 19 countries (with the exception of Luxembourg) since the beginning, despite the fact that some countries formally joined the currency area after 1999 (so that their exchange rate *vis-à-vis* the euro was not fixed in the meantime).

Germany, price competitiveness *vis-à-vis* euro-area partners improved significantly in the fifteen years under study. Similar swings to Italy in non-euro area indicators were recorded in these two countries, albeit to a more contained extent; moreover, in 2014 the corresponding price-competitiveness measures were depreciated relative to their 1999 levels, particularly so in Germany. Finally, Spain's loss in price competitiveness was mainly due to unfavourable trends with respect to non-euro area countries (with respect to which the country recorded a cumulative disadvantage of 14 percentage points), although its euro-area indicator also appreciated significantly and progressively since 1999, stabilizing in the last three years at a level approximately 10 points higher than the initial value. Italy's current competitiveness gap relative to France and Germany is therefore less pronounced as far as competition with non-euro area economies is concerned; symmetrically, Italy's advantage over Spain, relative to these competitors, is greater.

Figure 7. The new Bank of Italy euro and non-euro area price-competitiveness indicators for the four largest euro-area countries

(indices 1999=100)



Source: Authors' calculations on data described in Section 2.

Focusing instead on the decomposition of total price-competitiveness indicators into NEERs and relative prices (again see Table 3), the overall broad stability of Italy's price competitiveness since 1999 appears to be due to a nominal appreciation that offset a gain in relative prices, in turn a result of more contained growth of Italian PPI relative to that of its trading partners. In particular, Italy's PPIs increased to an extent comparable to those of the average of its euro-area partners, significantly less than those of the average of its non-euro area partners. A more contained nominal appreciation affected also Germany, France and Spain since 1999. However, in the first two countries, domestic PPIs grew much less than in their competitors (including euro-area competitors), thereby leading to a real depreciation. Conversely, in Spain prices actually rose relative to euro-area competitors, determining a real appreciation. On the whole, since the inception of the European Monetary Union, the bulk of the relative price adjustment of France and Germany within the euro-area occurred before the global financial crisis in 2007 and to a lesser extent thereafter. Conversely, in 2008-14 Italy's price dynamics were more subdued than those of its main euro-area partners, reversing the trend observed in the years prior to 2008.

Table 3. Decomposing the four largest euro-area countries' price-competitiveness indicators

(indices 1999=100; percentage growth rates in sub-periods) (1)

Italy

	Global					Euro area (2)					Non-euro area				
year	PCI	NEER	Relative prices	Prices in Italy	Prices of partners	PCI	NEER	Relative prices	Prices in Italy	Prices of partners	PCI	NEER	Relative prices	Prices in Italy	Prices of partners
1999	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2000	94.1	95.8	98.2	104.0	105.9	99.0	100.1	98.9	104.0	105.1	89.0	91.4	97.4	104.0	106.8
2001	95.1	97.5	97.5	105.2	107.8	99.4	100.2	99.2	105.2	106.0	90.6	94.7	95.7	105.2	109.9
2002	97.8	100.4	97.5	106.1	108.8	100.1	100.2	99.9	106.1	106.2	95.4	100.6	94.9	106.1	111.9
2003	103.1	106.6	96.7	107.6	111.3	100.8	100.2	100.6	107.6	107.0	105.6	114.0	92.6	107.6	116.2
2004	104.9	108.9	96.3	111.1	115.4	101.5	100.2	101.3	111.1	109.8	108.7	119.2	91.2	111.1	121.8
2005	102.9	107.6	95.7	114.6	119.8	101.1	100.2	101.0	114.6	113.5	105.4	116.8	90.2	114.6	127.1
2006	103.1	107.4	96.0	119.2	124.2	101.6	100.1	101.5	119.2	117.4	105.2	116.6	90.3	119.2	132.0
2007	104.6	109.1	95.9	123.2	128.4	101.7	99.9	101.8	123.2	121.1	108.2	120.2	90.0	123.2	136.9
2008	105.1	110.9	94.8	129.4	136.5	101.8	99.8	102.0	129.4	126.8	109.0	124.2	87.7	129.4	147.4
2009	104.6	112.1	93.3	122.1	130.9	101.2	99.7	101.4	122.1	120.4	108.5	126.9	85.5	122.1	142.8
2010	100.6	107.9	93.2	126.5	135.8	101.2	99.7	101.5	126.5	124.6	100.6	118.0	85.3	126.5	148.4
2011	99.9	108.4	92.2	132.7	144.0	100.5	99.7	100.7	132.7	131.8	100.1	119.1	84.1	132.7	157.8
2012	97.6	106.0	92.1	135.3	146.9	100.2	99.7	100.5	135.3	134.6	95.8	113.9	84.1	135.3	160.8
2013	99.6	108.5	91.8	135.2	147.3	100.3	99.7	100.6	135.2	134.4	99.6	119.1	83.6	135.2	161.8
2014	100.5	109.9	91.5	134.3	146.8	100.7	99.7	101.0	134.3	133.0	101.0	122.2	82.7	134.3	162.4
						Cumulated growth rates									
1999-2014	**0.5**	**9.9**	**-8.5**	**34.3**	**46.8**	**0.7**	**-0.3**	**1.0**	**34.3**	**33.0**	**1.0**	**22.2**	**-17.3**	**34.3**	**62.4**
1999-2007	**4.6**	**9.1**	**-4.1**	**23.2**	**28.4**	**1.7**	**-0.1**	**1.8**	**23.2**	**21.1**	**8.2**	**20.2**	**-10.0**	**23.2**	**36.9**
2008-2014	**-4.4**	**-0.9**	**-3.5**	**3.8**	**7.6**	**-1.1**	**-0.1**	**-1.0**	**3.8**	**4.9**	**-7.3**	**-1.7**	**-5.7**	**3.8**	**10.1**
2011-2014	**0.6**	**1.3**	**-0.8**	**1.2**	**2.0**	**0.2**	**0.0**	**0.2**	**1.2**	**0.9**	**0.9**	**2.6**	**-1.7**	**1.2**	**2.9**

Germany

	Global					Euro area (2)					Non-euro area				
year	PCI	NEER	Relative prices	Prices in Germany	Prices of partners	PCI	NEER	Relative prices	Prices in Germany	Prices of partners	PCI	NEER	Relative prices	Prices in Germany	Prices of partners
1999	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2000	92.4	95.1	97.2	103.1	106.0	97.2	100.0	97.2	103.1	106.0	88.8	91.3	97.2	103.1	106.0
2001	93.6	96.4	97.1	104.5	107.6	98.0	100.1	97.9	104.5	106.7	90.2	93.6	96.4	104.5	108.3
2002	95.7	98.9	96.8	104.7	108.1	98.1	100.1	98.0	104.7	106.8	93.8	97.9	95.8	104.7	109.2
2003	100.7	105.6	95.4	105.3	110.4	97.9	100.1	97.8	105.3	107.7	103.0	110.2	93.5	105.3	112.6
2004	100.9	108.0	93.4	107.1	114.7	96.5	100.1	96.5	107.1	111.1	104.5	114.9	91.0	107.1	117.7
2005	98.1	106.7	92.0	109.7	119.2	95.1	100.0	95.0	109.7	115.4	100.9	112.5	89.6	109.7	122.4
2006	96.5	106.4	90.7	112.2	123.7	93.4	99.9	93.5	112.2	120.0	99.3	112.2	88.5	112.2	126.8
2007	97.0	108.2	89.6	114.8	128.1	91.9	99.6	92.3	114.8	124.4	101.2	115.7	87.5	114.8	131.1
2008	95.3	109.9	86.8	118.3	136.3	89.6	99.4	90.1	118.3	131.2	100.1	118.9	84.2	118.3	140.4
2009	97.7	111.2	87.8	114.3	130.1	92.0	99.3	92.6	114.3	123.4	102.4	121.4	84.4	114.3	135.5
2010	92.4	106.5	86.7	117.2	135.2	90.5	99.3	91.2	117.2	128.6	94.3	112.9	83.5	117.2	140.4
2011	90.8	106.9	85.0	122.1	143.7	88.5	99.3	89.1	122.1	137.0	92.9	113.5	81.9	122.1	149.0
2012	88.0	104.1	84.5	123.9	146.6	87.6	99.3	88.3	123.9	140.4	88.7	108.6	81.8	123.9	151.6
2013	90.2	106.8	84.5	123.9	146.7	87.8	99.3	88.5	123.9	140.1	92.4	113.4	81.5	123.9	152.0
2014	91.5	108.3	84.5	123.4	146.0	88.7	99.3	89.3	123.4	138.2	94.1	116.1	81.1	123.4	152.2
						Cumulated growth rates									
1999-2014	**-8.5**	**8.3**	**-15.5**	**23.4**	**46.0**	**-11.3**	**-0.7**	**-10.7**	**23.4**	**38.2**	**-5.9**	**16.1**	**-18.9**	**23.4**	**52.2**
1999-2007	**-3.0**	**8.2**	**-10.4**	**14.8**	**28.1**	**-8.1**	**-0.4**	**-7.7**	**14.8**	**24.4**	**1.2**	**15.7**	**-12.5**	**14.8**	**31.1**
2008-2014	**-4.0**	**-1.4**	**-2.6**	**4.3**	**7.1**	**-1.0**	**-0.1**	**-0.9**	**4.3**	**5.3**	**-6.0**	**-2.3**	**-3.7**	**4.3**	**8.4**
2011-2014	**0.8**	**1.4**	**-0.5**	**1.1**	**1.6**	**0.2**	**0.0**	**0.2**	**1.1**	**0.9**	**1.3**	**2.3**	**-1.0**	**1.1**	**2.1**

France

	Global					Euro area (2)					Non-euro area				
year	PCI	NEER	Relative prices	Prices in France	Prices of partners	PCI	NEER	Relative prices	Prices in France	Prices of partners	PCI	NEER	Relative prices	Prices in France	Prices of partners
1999	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2000	93.3	95.6	97.5	103.0	105.6	97.4	100.0	97.4	103.0	105.7	88.6	90.7	97.7	103.0	105.4
2001	94.9	96.9	97.9	104.5	106.7	98.4	100.0	98.4	104.5	106.2	90.8	93.2	97.4	104.5	107.3
2002	96.4	99.2	97.2	104.4	107.3	98.0	100.1	98.0	104.4	106.6	94.6	98.1	96.4	104.4	108.3
2003	100.8	104.9	96.1	105.1	109.4	97.9	100.1	97.8	105.1	107.5	104.5	111.0	94.2	105.1	111.7
2004	101.2	106.9	94.7	107.3	113.3	96.9	100.1	96.9	107.3	110.8	106.6	115.8	92.1	107.3	116.5
2005	99.5	106.2	93.7	110.2	117.6	96.0	100.1	95.9	110.2	114.9	103.9	114.1	91.1	110.2	121.0
2006	98.9	106.1	93.3	113.8	122.0	95.5	100.0	95.5	113.8	119.2	103.2	113.8	90.7	113.8	125.5
2007	99.7	107.6	92.7	116.9	126.0	94.8	99.9	95.0	116.9	123.1	105.9	117.6	90.1	116.9	129.7
2008	100.4	109.3	91.9	122.7	133.5	94.9	99.7	95.1	122.7	129.0	107.4	121.9	88.1	122.7	139.2
2009	99.0	110.1	90.0	115.0	127.8	93.6	99.7	93.9	115.0	122.5	105.9	123.9	85.5	115.0	134.5
2010	94.4	106.5	88.7	117.7	132.7	92.2	99.7	92.5	117.7	127.3	97.2	115.2	84.4	117.7	139.5
2011	94.1	106.8	88.1	123.9	140.6	91.6	99.7	91.9	123.9	134.7	97.2	116.1	83.8	123.9	147.8
2012	92.1	104.5	88.1	126.4	143.4	91.5	99.7	91.7	126.4	137.8	92.9	110.6	84.0	126.4	150.4
2013	93.8	106.7	87.9	126.2	143.6	91.5	99.7	91.8	126.2	137.6	96.6	115.7	83.5	126.2	151.1
2014	94.4	107.7	87.6	125.1	142.7	91.7	99.7	92.0	125.1	136.0	97.7	118.1	82.8	125.1	151.1
						Cumulated growth rates									
1999-2014	**-5.6**	**7.7**	**-12.4**	**25.1**	**42.7**	**-8.3**	**-0.3**	**-8.0**	**25.1**	**36.0**	**-2.3**	**18.1**	**-17.2**	**25.1**	**51.1**
1999-2007	**-0.3**	**7.6**	**-7.3**	**16.9**	**26.0**	**-5.2**	**-0.1**	**-5.0**	**16.9**	**23.1**	**5.9**	**17.6**	**-9.9**	**16.9**	**29.7**
2008-2014	**-6.0**	**-1.5**	**-4.6**	**2.0**	**6.9**	**-3.4**	**-0.1**	**-3.3**	**2.0**	**5.5**	**-9.0**	**-3.1**	**-6.1**	**2.0**	**8.6**
2011-2014	**0.3**	**0.8**	**-0.5**	**1.0**	**1.5**	**0.1**	**0.0**	**0.1**	**1.0**	**0.9**	**0.5**	**1.7**	**-1.2**	**1.0**	**2.2**

Spain

	Global					Euro area (2)					Non-euro area				
year	PCI	NEER	Relative prices	Prices in Spain	Prices of partners	PCI	NEER	Relative prices	Prices in Spain	Prices of partners	PCI	NEER	Relative prices	Prices in Spain	Prices of partners
1999	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2000	96.8	96.6	100.3	105.7	105.4	100.3	100.0	100.2	105.7	105.4	91.2	90.9	100.3	105.7	105.3
2001	98.5	97.8	100.7	107.5	106.8	101.1	100.0	101.1	107.5	106.4	94.2	94.1	100.1	107.5	107.5
2002	100.5	100.0	100.5	108.1	107.6	101.5	100.0	101.5	108.1	106.6	98.8	99.9	99.0	108.1	109.3
2003	104.9	104.6	100.2	109.7	109.4	102.2	100.0	102.1	109.7	107.4	109.6	112.9	97.1	109.7	113.0
2004	106.9	106.2	100.7	113.8	113.0	103.3	100.0	103.2	113.8	110.2	113.5	117.5	96.6	113.8	117.8
2005	107.3	105.3	101.9	119.2	116.9	104.7	100.0	104.6	119.2	113.9	112.7	115.6	97.5	119.2	122.2
2006	108.7	105.2	103.3	125.1	121.1	106.2	100.0	106.2	125.1	117.8	114.0	115.5	98.7	125.1	126.7
2007	110.3	106.5	103.6	129.4	124.9	106.5	99.9	106.6	129.4	121.3	117.5	119.1	98.7	129.4	131.1
2008	112.2	108.1	103.7	137.2	132.2	107.7	99.8	108.0	137.2	127.1	120.3	123.5	97.4	137.2	140.8
2009	111.7	109.1	102.4	129.7	126.7	107.5	99.7	107.8	129.7	120.3	119.4	126.2	94.6	129.7	137.1
2010	108.9	105.9	102.8	134.9	131.3	108.2	99.7	108.4	134.9	124.4	111.6	117.8	94.8	134.9	142.3
2011	110.2	106.5	103.5	143.7	138.8	109.1	99.7	109.3	143.7	131.4	113.4	119.2	95.2	143.7	150.9
2012	108.8	104.5	104.1	147.5	141.7	109.7	99.7	110.0	147.5	134.2	109.1	113.9	95.8	147.5	154.0
2013	110.6	106.5	103.8	147.5	142.1	109.9	99.7	110.2	147.5	133.9	113.2	119.3	95.0	147.5	155.3
2014	110.6	107.5	102.9	145.5	141.4	109.5	99.7	109.8	145.5	132.5	113.9	122.0	93.4	145.5	155.8
						Cumulated growth rates									
1999-2014	**10.6**	**7.5**	**2.9**	**45.5**	**41.4**	**9.5**	**-0.3**	**9.8**	**45.5**	**32.5**	**13.9**	**22.0**	**-6.6**	**45.5**	**55.8**
1999-2007	**10.3**	**6.5**	**3.6**	**29.4**	**24.9**	**6.5**	**-0.1**	**6.6**	**29.4**	**21.3**	**17.5**	**19.1**	**-1.3**	**29.4**	**31.1**
2008-2014	**-1.4**	**-0.5**	**-0.8**	**6.0**	**6.9**	**1.7**	**0.0**	**1.7**	**6.0**	**4.3**	**-5.4**	**-1.2**	**-4.2**	**6.0**	**10.7**
2011-2014	**0.4**	**1.0**	**-0.6**	**1.2**	**1.9**	**0.4**	**0.0**	**0.4**	**1.2**	**0.8**	**0.4**	**2.4**	**-2.0**	**1.2**	**3.3**

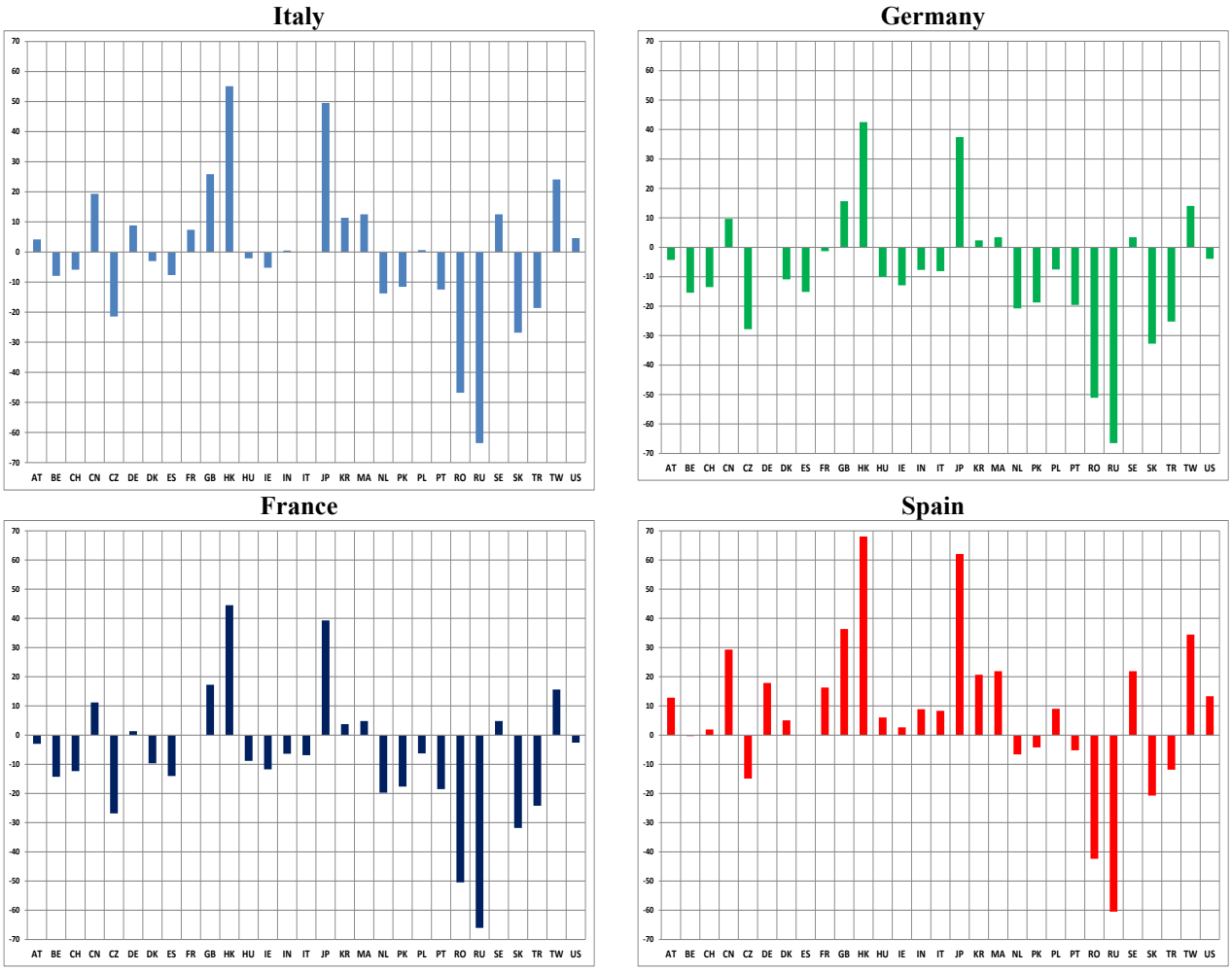
Source: Authors' calculations on data described in Section 2.

(1) The growth rate of total indices between adjacent periods is contained within the interval bounded by the euro and the non-euro area counterparts. However, the same does not necessarily hold for the corresponding indices (i.e. for cumulated growth rates). (2) Fixed composition for the euro area at 18 countries (Luxembourg is excluded), which implies that the NEER index *vis-à-vis* euro-area countries is not necessarily flat at 100 after 1999.

Finally, total price-competitiveness indicators are a weighted average of bilateral real exchange rates, as shown in Equation [7]. Looking at bilateral rates and limiting the scope of the analysis to the largest 28 competitor countries (i.e. considering only those with a weight greater than 1 per cent in at least one of the four price-competitiveness indicators under study), over the period 1999-2014 Italy gained competitiveness relative to Spain and to many euro-area countries, as well as relative to Russia, Romania, Czech Republic and Turkey, whereas it lost ground relative to Germany, France and the US and, to a greater extent, the UK, China, Hong Kong, Japan, Taiwan (Fig. 8). Bilateral real exchange rates of Germany, France and Spain displayed similar developments, although the loss relative to Germany was higher in Spain and more contained in France; in the case of France and Germany, a marginal gain was recorded relative to the US.

Figure 8. Cumulative changes in 1999-2014 in bilateral real exchange rates with respect to a selected number of partners

(percentage points)



Source: Authors' calculations on data described in Section 2.
Notes. The 28 selected competitor countries are chosen according to the following criterion: they weigh over 1 per cent in the price-competitiveness indicator of at least one of the four euro-area countries considered.

5. Conclusions

In this paper we have illustrated in full the methodology, the data sources and the weight-updating process underlying the new Bank of Italy price-competitiveness indicators, which takes advantage of the progress in data availability and improves upon the currently adopted methodology, recovering some features introduced in the pioneering framework of Tristani and Zollino (1998). We have thus overcome the methodological gaps relative to the ECB's framework, in turn maintaining a much larger geographical coverage and providing great flexibility, both in the

choice of the weighting matrix and of the set of partners. The updated weights based on the three-year period 2009-11 prove the surge in China's importance in the price-competitiveness indicators of all four major euro-area countries relative to the previous decade, as well as more modest increase in the weights of the Netherlands and of Eastern Europe, pointing to a growing internationalization of production also at a regional level. Conversely, the main advanced economies (either inside or outside the euro area) have marked a decline in their relevance in their competitors' indicators. However, it is the methodological improvements we have introduced that explain most of the differences between the new and the current Bank of Italy price-competitiveness indicators, and, more precisely, the introduction of a proxy measure for local producers' competition in the export weights.

Notwithstanding the introduced methodological innovations and the updating of sources and reference years for the weighting matrices, price-competitiveness trends since 1999 recorded by the current Bank of Italy indicators are broadly confirmed: by the end of 2014, Germany and France had gained in price competitiveness, whereas Italy's indicator was roughly stable and Spain had lost price competitiveness. As regards medium-term dynamics, the new indicators signal more favourable (around 2 per cent) developments in price-competitiveness for the four largest euro-area countries between 2005 and 2008-10.

We are now able to provide more information on disaggregated developments between 1999 and 2014: France and Germany improved their competitiveness both relative to euro-area and non-euro area competitors, a result mostly acquired before the 'Great Recession'. Spain's price competitiveness deteriorated, more so *vis-à-vis* its non-euro area trading partners. In 2014 Italy's competitive stance was instead broadly unchanged relative to the inception of the European Monetary Union both *vis-à-vis* euro-area and non-euro area countries.

In a future research agenda, given the increasing role of trade in services, trade weights should be reconsidered, once services trade data become available both across the cross-sectional and time-series dimensions. Moreover, an assessment of the informative content of our new price-competitiveness indicators in explaining different countries' trade performance is also warranted. For instance, the more favourable developments in the new Bank of Italy indicators relative to the old measures in 2005-10 may suggest a compensating role, in explaining export dynamics over that period, of more unfavourable non-price competitiveness developments than those previously implied.

Appendix A. A focus on methodological and data issues

A. Alternative methodologies underlying the construction of price-competitiveness indicators

Table A1. A comparison of different methods used by selected organizations to calculate price-competitiveness indicators

Institution	Trade Basis	Maximum number of trading partners	Weighting methods	Update of weights	Deflators	References
Bank of Italy	Manufactured goods (SITC 5-8)	61	Weighted average of import and double export weights (including weighted third market effects)	Average weight fixed over three years, updated every ten years	PPI	This paper
European Central Bank	Manufactured goods (SITC 5-8)	58 (CPI only) 38	Weighted average of import and double export weights (including weighted third market effects)	Average weight fixed over three years, updated every three years	CPI, PPI, GDP deflator, ULCM, ULCT (PPI and ULCM not publicly available)	Schmitz et al. (2012)
European Commission DG ECFIN	Total goods	41	Double export weights (including weighted third market effects)	Annual weights, updated yearly	CPI, GDP deflator, Export prices, ULCM, ULCT	European Commission (2014)
Bank of International Settlements	Manufactured goods (SITC 5-8)	59	Weighted average of import and double export weights (including weighted third market effects)	Average weight fixed over three years, updated every three years	CPI	Klau and Fung (2006) and subsequent update available at http://www.bis.org/statistics/eer/
International Monetary Fund	Manufactured goods (SITC 5-8)	26	Weighted average of import and double export weights (including weighted third market effects)	Average weight fixed over three years, updated at irregular intervals	ULC	Bayoumi, Lee and Jayanthi (2005)
	Manufactured goods (SITC 5-8), commodities (overall weight in global markets), and services (same weights as manufacturing except for countries where tourism is important)	163	Weighted average of import and double export weights (including weighted third market effects) for manufacturing, simple weights for other categories		CPI	
Federal Reserve Board	Total goods (excluding gold and military items from exports, oil from imports when possible)	25	Fixed weighted average of import and double export weights (including third market effects)	Annual weights, updated yearly	CPI	Loretan (2005)
Bank of England	Manufactured goods and services	42	Fixed weighted average of import and double export weights (including third market effects for manufacturing)	Annual weights, updated yearly	CPI	Lynch and Whitaker (2004) and subsequent update available at http://www.bankofengland.co.uk/statistics/Pages/eri/neweri.aspx

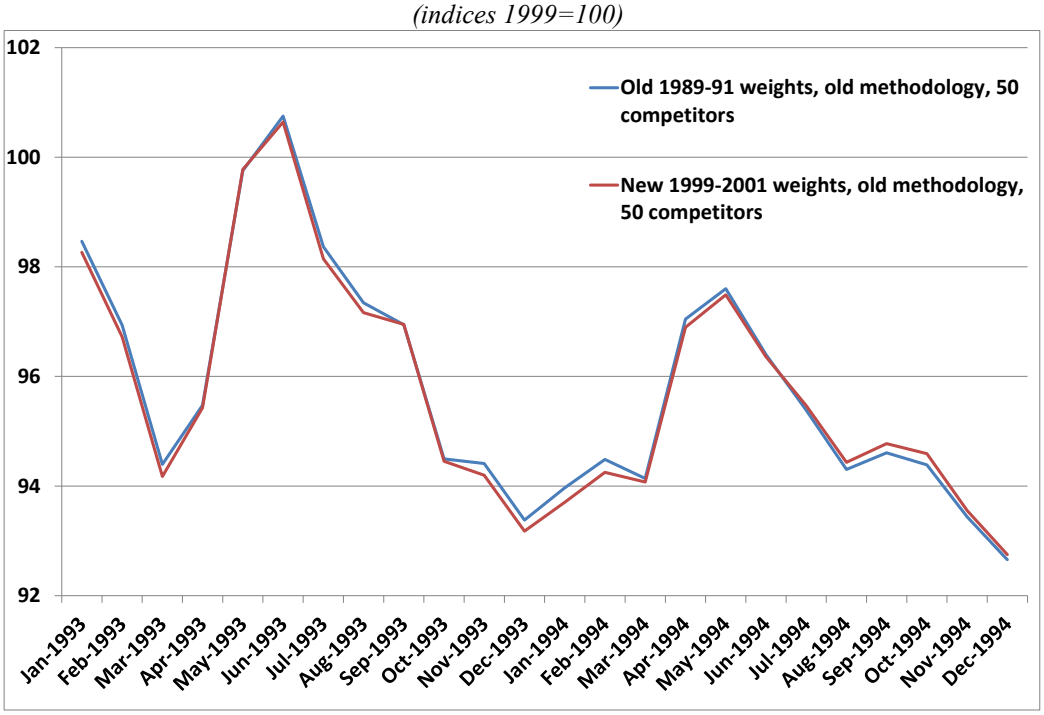
Source: This table is an update of a similar table in Schmitz et al. (2012).

B. Robustness analysis on our new price-competitiveness indicators

A first robustness check aims at verifying that using 1999-2001 weights does not distort our new price-competitiveness indicators at the beginning of the series, i.e. in 1993-94 (a symmetry criterion would rather suggest the implementation of the 1989-91 set of weights, but that is unfeasible for the whole set of 62 partners). We compare the indicator for Italy *vis-à-vis* 50 competitors, as computed by Finicelli, Liccardi and Sbracia (2005) using their fixed 1989-91 weights, with the indicator constructed on the basis of the same methodology, relative to the same 50 countries, but based on our 1999-2001 weights. The behaviour of the two indicators is very similar (Fig. A1). This exercise therefore shows that, using Italy as an example, adopting 1999-2001 weights for our time series as of 1993 does not distort our representation of price-competitiveness developments in the early 1990s.

Figure A1 Assessing the impact of alternative fixed weights on Italy's price-competitiveness indicators in 1993-94

(indices 1999=100)

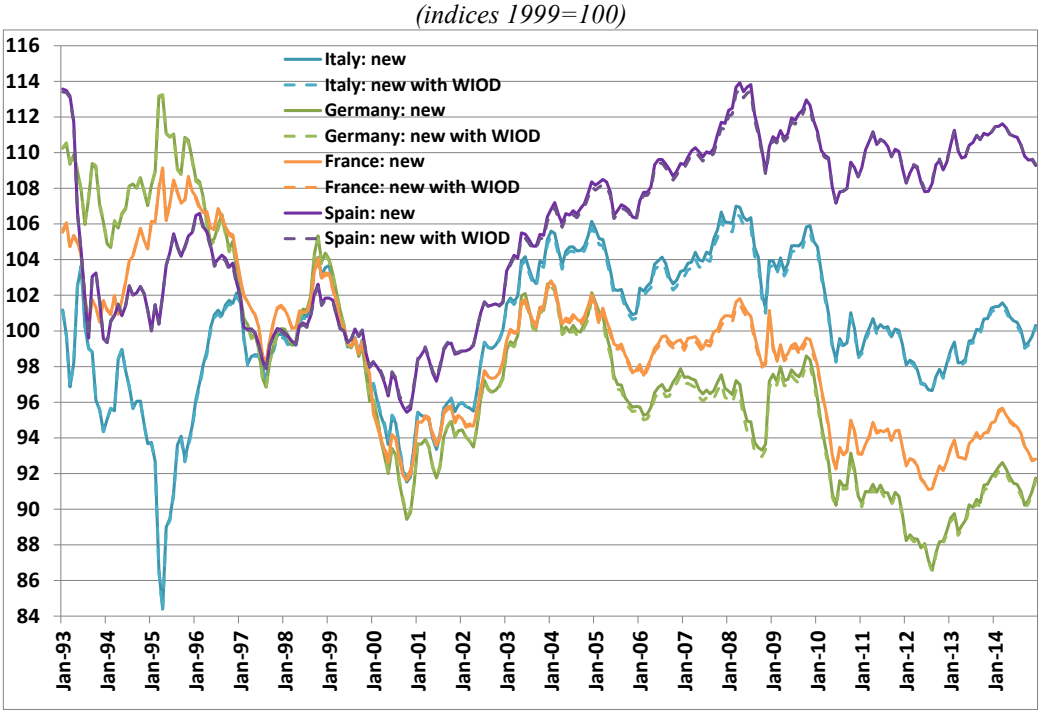


Source: Authors' calculations on data described in Section 2.

As a second robustness check, in building the weighting matrix we replace our standard proxy for manufacturing gross output, i.e. the sum of manufacturing value added and net imports of manufactured goods, with the difference between gross manufacturing output and manufacturing exports based on data taken from WIOD for the 39 countries for which these figures are available. The differences between our new price-competitiveness indicators and those using WIOD gross output data are negligible for the four largest euro-area countries (Fig. A2), confirming the soundness of our proxy measure, which also has the advantage of being constructed homogeneously for all 62 countries.

Figure A2. The impact of a more accurate measurement of local producers' competition on the price-competitiveness indicators of the four largest euro-area countries

(indices 1999=100)



Source: Authors' calculations on data described in Section 2.

C. The deflators used in our price-competitiveness indicators

Table A2. The deflators used by the Bank of Italy to calculate price-competitiveness indicators

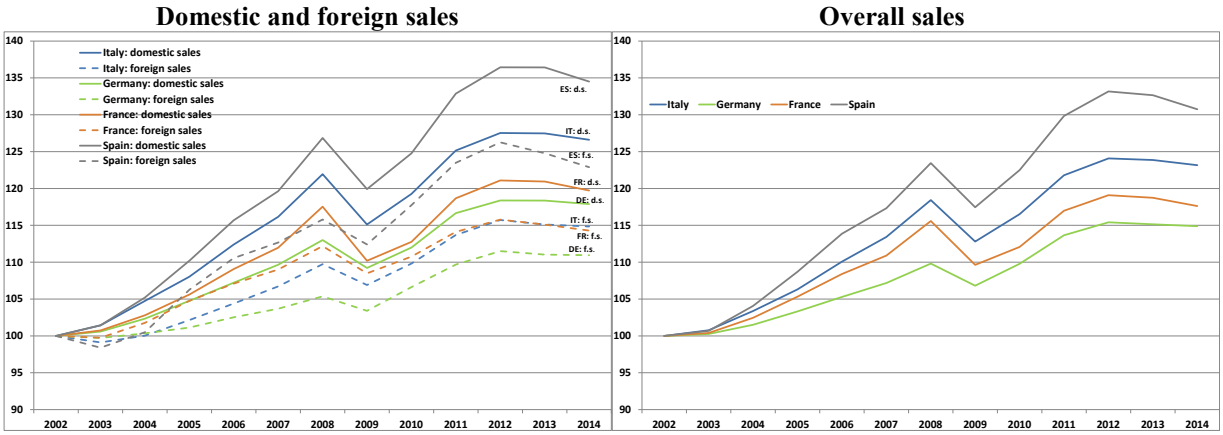
	Country	Deflator	Source
euro-area partners	Austria	PPI, domestic sales of manufactures	ECB
	Belgium	PPI, domestic sales of manufactures	ECB
	Cyprus	PPI, domestic sales of manufactures	IMF/ECB
	Estonia	PPI, domestic sales of manufactures	IMF/ECB
	Finland	PPI, domestic sales of manufactures	IMF/ECB
	France	PPI, domestic sales of manufactures	ECB
	Germany	PPI, domestic sales of manufactures	ECB
	Greece	PPI, domestic sales of manufactures	ECB
	Ireland	PPI, domestic sales of manufactures	IMF/ECB
	Italy	PPI, domestic sales of manufactures	Istat
	Latvia	PPI, domestic sales of manufactures	IMF/ECB
	Lithuania	PPI, domestic sales of manufactures	IMF/ECB
	Malta	PPI, domestic sales of manufactures	IMF/ECB
	Netherlands	PPI, domestic sales of manufactures	ECB
	Portugal	PPI, domestic sales of manufactures	IMF/ECB
	Slovakia	PPI, domestic sales of manufactures	IMF/ECB
	Slovenia	PPI, domestic sales of manufactures	ECB
	Spain	PPI, domestic sales of manufactures	ECB
non euro-area EU partners	Bulgaria	CPI/PPI	IMF
	Croatia	PPI	IMF
	Czech Republic	PPI, domestic sales of manufactures	OECD/Eurostat
	Denmark	PPI, domestic sales of manufactures	OECD
	Hungary	CPI/PPI, domestic sales of manufactures	IMF/ Eurostat
	Poland	Total manufacturing PPI	IMF/OECD
	Romania	PPI, domestic sales of manufactures	IMF/Eurostat
	Sweden	Total manufacturing PPI	OECD
	United Kingdom	Total manufacturing PPI	OECD
non EU countries	Algeria	CPI	IMF
	Argentina	CPI/PPI	IMF
	Australia	PPI, domestic sales of manufactures	OECD
	Brazil	WPI	IMF/OECD
	Canada	PPI, domestic sales of manufactures	OECD
	Chile	WPI/ Total manufacturing PPI	IMF/OECD
	China	PPI of manufacturing intermediate goods	CEIC
	Colombia	PPI	IMF
	Ecuador	PPI	IMF
	Hong Kong SAR	CPI/PPI	IMF
	India	WPI	IMF/OECD
	Indonesia	Total manufacturing WPI	IMF/OECD
	Israel	WPI of industrial goods	IMF
	Japan	PPI, domestic sales of manufactures	OECD
	Kuwait	CPI/WPI	IMF
	Malaysia	CPI/PPI	IMF
	Mexico	PPI, domestic sales of industrial goods	OECD
	Morocco	CPI	IMF
	New Zealand	PPI, domestic sales of manufactures	OECD
	Nigeria	CPI	IMF
	Norway	Total PPI Manufacturing	OECD
	Pakistan	WPI	IMF
	Peru	WPI	IMF
	Philippines	CPI/PPI	IMF
	Russia	PPI, domestic sales of industrial goods	OECD
	Saudi Arabia	CPI	IMF
	Singapore	CPI/WPI	IMF
	South Africa	PPI	IMF
	South of Korea	PPI, domestic sales of manufactures	OECD
	Switzerland	PPI, domestic sales of manufactures	OECD
	Taiwan	WPI	National statistics
	Thailand	PPI	IMF
	Turkey	PPI, domestic sales of industrial goods	OECD
	United States	PPI, domestic sales of manufactures	OECD
	Venezuela	WPI of domestic and imported goods	IMF

PPI: Producer price index. CPI: Consumer price index. WPI: Wholesale price index.

As mentioned in Section 2.4 and shown in the left-hand side panel of Figure A3, a case can be made for the presence of price discrimination on different markets, in particular in Italy and, in recent years, in Spain. It has been argued that a sophisticated price-competitiveness indicator should take into account the different developments in PPIs across markets. For example, considering Italy as the reporting country *i* and Germany as its main trading partner *j*, then in third markets both *i* and *j*'s foreign PPIs should be compared, whereas in the German market *i*'s foreign PPIs should be compared with *j*'s domestic prices. As concerns country *i*'s import competitiveness, *i*'s domestic PPIs should be compared with *j*'s foreign prices. Some institutions suggest employing the overall sales PPI (right-hand side panel of Figure A3), which however is also only available for some countries and for recent years only. We have argued in section 2.4 that the producer price indices of domestically sold production remain our elective deflators, also due to data constraints.

Figure A3. Trends in producer prices of total manufactures, of those sold domestically and of those sold abroad for the four largest euro-area countries

(indices 2002=100)

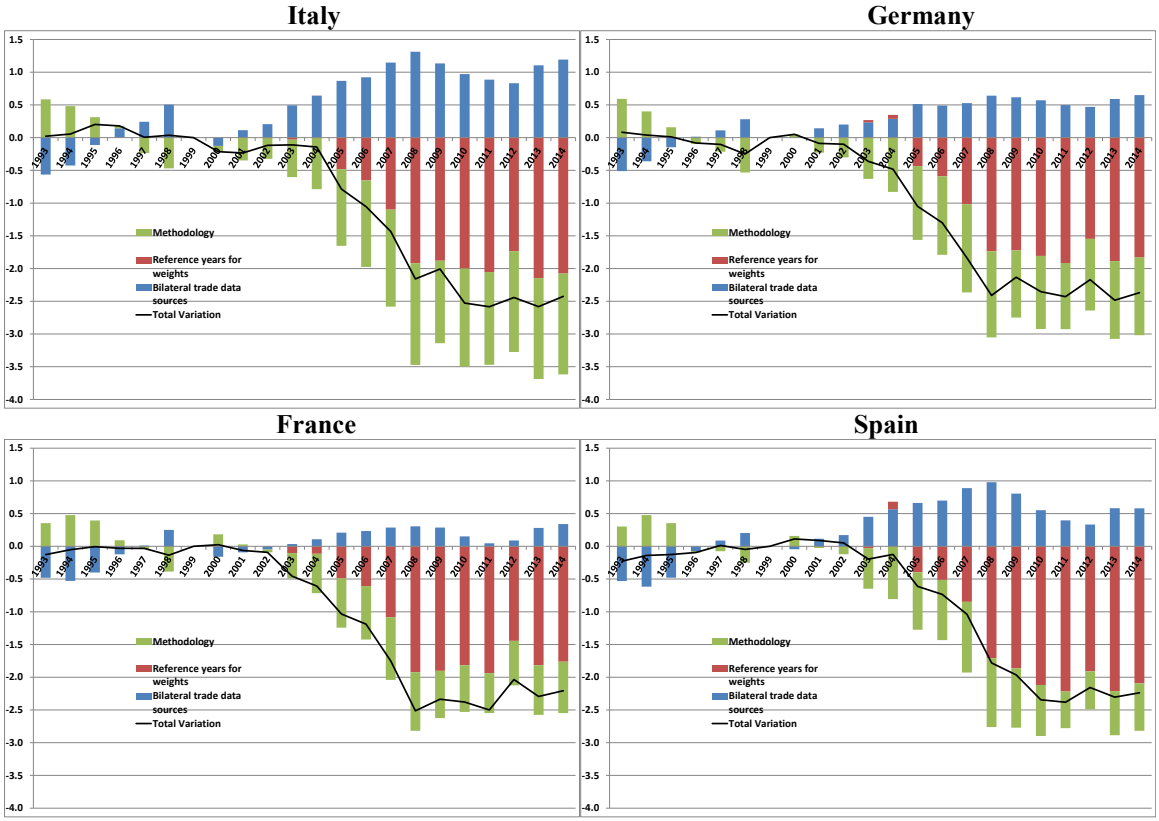


Source: Istat and Eurostat.

D. *The impact of the new methodology and of our new trade weights on the price-competitiveness indicators for the four largest euro-area countries*

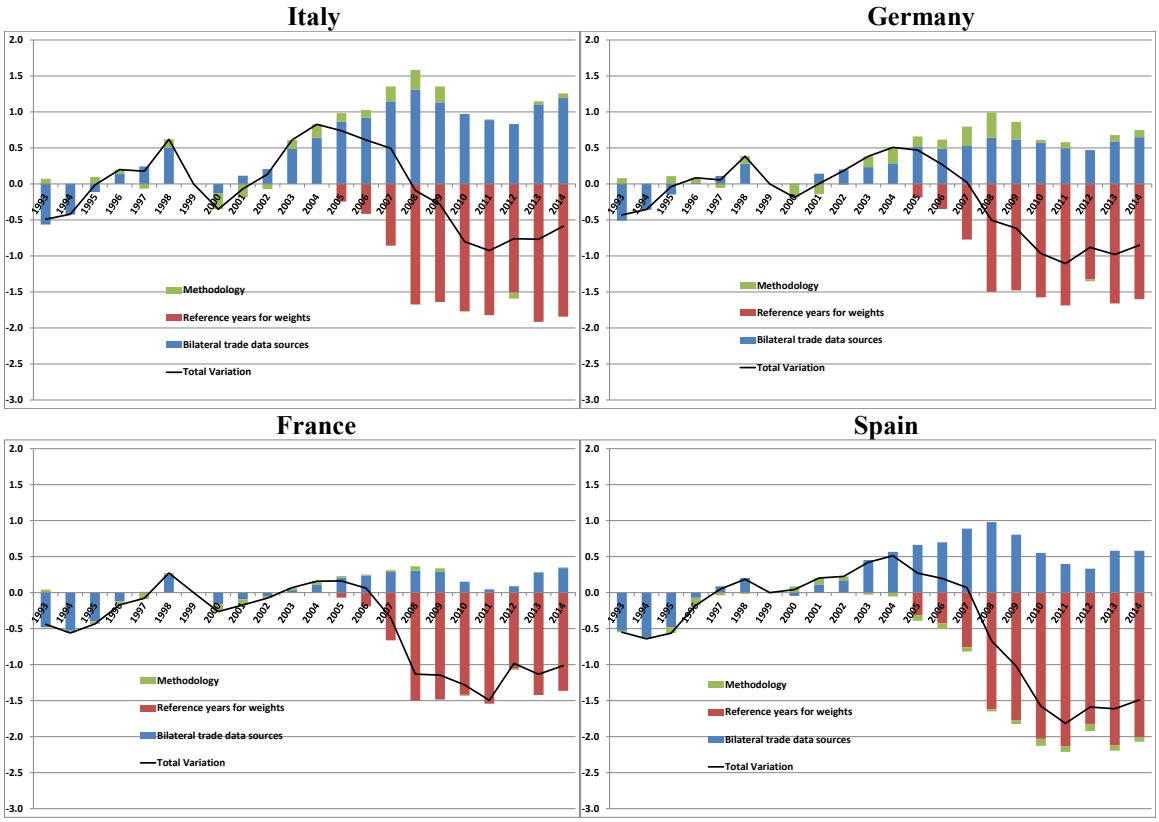
In Figure 1 we showed that the methodology underlying the new Bank of Italy price-competitiveness indicators has a large impact in 2005-08, stabilizing thereafter. This could be due to the fact that we chain-linked our new price-competitiveness indicators, based respectively on 1999-2001 and 2009-11 weighting matrices, in January 2005. Figure A4 shows this is not the case. By shifting backwards the jointing month to January 2003, the bulk of the impact of the new methodology still shows up in 2005-08. In Figure A5 we further show that, if the methodological innovations were limited to adding the new outlet market "Rest of the World" and to introducing time-varying α's, the impact of the new methodology would have been negligible; similar evidence is shown in Figure 3.

Figure A4. A decomposition of the differences between the new and the current Bank of Italy price-competitiveness indicators: a robustness check



Source: Authors' calculations on data described in Section 2.

Figure A5. A decomposition of the differences between the new (without local producers' competition) and the current Bank of Italy price-competitiveness indicators



Source: Authors' calculations on data described in Section 2.

Table A3. 1999-2001 trade weights in the new Bank of Italy price-competitiveness indicators

(percentage points)

	Italy			Germany			France			Spain		
Country	Import weights	Double export weights	Overall weights	Import weights	Double export weights	Overall weights	Import weights	Double export weights	Overall weights	Import weights	Double export weights	Overall weights
Argentina	0.1	0.5	0.3	0.0	0.3	0.2	0.1	0.4	0.2	0.1	0.8	0.4
Austria	2.7	2.2	2.4	5.3	3.9	4.5	1.2	1.7	1.5	1.5	1.5	1.5
Australia	0.1	0.7	0.4	0.1	0.6	0.4	0.1	0.5	0.3	0.1	0.4	0.2
Belgium	5.9	3.4	4.5	6.9	3.8	5.2	10.9	3.7	7.2	5.5	3.9	4.8
Bulgaria	0.4	0.2	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Brazil	0.7	1.0	0.9	0.3	1.0	0.7	0.3	1.0	0.6	0.3	1.2	0.7
Canada	0.3	1.2	0.8	0.3	1.2	0.8	0.3	1.2	0.8	0.2	0.7	0.4
Switzerland	3.7	2.5	3.1	4.4	3.1	3.7	2.7	2.7	2.7	1.9	1.7	1.8
Chile	0.4	0.2	0.3	0.1	0.2	0.1	0.2	0.2	0.2	0.1	0.4	0.2
China	2.0	2.7	2.4	2.2	3.0	2.7	1.3	2.7	2.0	1.6	1.8	1.7
Colombia	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.2	0.1
Cyprus	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0
Czech Republic	0.7	0.9	0.8	2.9	1.6	2.2	0.5	0.8	0.6	0.4	0.7	0.5
Germany	22.5	15.0	18.3	-	-	-	22.4	15.2	18.7	18.8	14.2	16.8
Denmark	0.5	0.9	0.7	1.7	1.3	1.5	0.6	1.0	0.8	0.6	0.8	0.7
Algeria	0.0	0.2	0.1	0.0	0.1	0.0	0.0	0.6	0.3	0.0	0.3	0.1
Ecuador	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Estonia	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Spain	5.0	5.2	5.1	2.9	4.2	3.7	7.4	6.8	7.1	-	-	-
Finland	1.0	0.8	0.9	1.2	1.2	1.2	0.8	0.8	0.8	0.9	0.7	0.8
France	14.5	10.6	12.3	11.4	10.2	10.7	-	-	-	21.5	13.9	18.1
United Kingdom	7.2	7.3	7.3	7.6	8.4	8.1	9.0	9.0	9.0	8.3	8.4	8.3
Greece	0.3	1.4	0.9	0.3	0.6	0.5	0.1	0.6	0.4	0.2	0.8	0.4
Hong Kong SAR	1.3	1.3	1.3	1.8	1.4	1.6	1.3	1.4	1.4	1.2	1.1	1.2
Croatia	0.5	0.4	0.4	0.2	0.2	0.2	0.0	0.1	0.1	0.0	0.1	0.1
Hungary	0.9	0.9	0.9	2.5	1.2	1.8	0.6	0.7	0.6	0.4	0.6	0.5
Indonesia	0.3	0.4	0.4	0.3	0.4	0.4	0.2	0.4	0.3	0.3	0.4	0.3
Ireland	1.6	1.0	1.3	2.2	1.1	1.6	1.9	1.1	1.5	1.4	1.0	1.2
Israel	0.4	0.6	0.5	0.3	0.5	0.4	0.2	0.5	0.4	0.3	0.6	0.4
India	0.6	0.7	0.7	0.4	0.7	0.6	0.3	0.7	0.5	0.4	0.5	0.5
Italy	-	-	-	8.6	8.0	8.3	11.3	8.3	9.8	11.6	8.7	10.3
Japan	3.3	4.7	4.1	4.5	5.2	4.9	2.7	4.8	3.7	2.6	3.4	2.9
South of Korea	1.2	1.6	1.4	1.2	1.6	1.4	0.7	1.8	1.2	1.2	1.2	1.2
Kuwait	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1
Lithuania	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1
Latvia	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Morocco	0.2	0.3	0.2	0.1	0.2	0.1	0.8	0.7	0.7	0.4	0.8	0.6
Malta	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.0
Mexico	0.1	1.0	0.6	0.4	1.1	0.8	0.1	0.9	0.5	0.2	1.2	0.6
Malaysia	0.2	0.6	0.5	0.5	0.7	0.6	0.3	0.6	0.5	0.2	0.5	0.3
Nigeria	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0
Netherlands	5.5	3.9	4.6	9.1	4.7	6.5	6.4	4.7	5.5	4.9	4.2	4.6
Norway	0.3	0.5	0.4	0.5	0.7	0.6	0.3	0.5	0.4	0.3	0.5	0.4
New Zealand	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.1	0.0
Peru	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1
Philippines	0.1	0.3	0.2	0.3	0.3	0.3	0.1	0.3	0.2	0.1	0.2	0.1
Pakistan	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1
Poland	1.1	1.4	1.3	2.5	2.0	2.2	0.6	1.1	0.9	0.4	1.0	0.6
Portugal	0.6	1.2	0.9	1.1	0.9	1.0	1.2	1.4	1.3	3.2	5.4	4.2
Romania	1.4	0.8	1.0	0.4	0.4	0.4	0.3	0.3	0.3	0.1	0.2	0.2
Russia	0.4	1.1	0.8	0.4	1.3	0.9	0.1	0.8	0.5	0.1	0.6	0.3
Saudi Arabia	0.1	0.5	0.3	0.0	0.4	0.2	0.0	0.4	0.2	0.1	0.4	0.3
Sweden	1.7	1.4	1.5	1.8	2.1	2.0	1.5	1.7	1.6	1.8	1.4	1.6
Singapore	0.2	0.9	0.6	1.0	0.9	1.0	0.8	0.9	0.9	0.3	0.7	0.5
Slovenia	0.7	0.5	0.6	0.6	0.4	0.5	0.2	0.3	0.3	0.1	0.3	0.2
Slovakia	0.6	0.3	0.5	0.8	0.5	0.6	0.2	0.2	0.2	0.1	0.3	0.2
Thailand	0.4	0.5	0.5	0.3	0.6	0.5	0.3	0.6	0.4	0.4	0.4	0.4
Turkey	1.0	1.5	1.3	1.2	1.2	1.2	0.6	1.2	0.9	0.5	1.3	0.9
Taiwan	1.0	1.1	1.1	1.6	1.3	1.4	1.0	1.2	1.1	0.8	0.9	0.8
United States	5.5	12.2	9.3	6.8	13.4	10.6	7.5	12.0	9.8	3.9	8.5	5.9
Venezuela	0.0	0.3	0.2	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.3	0.2
South Africa	0.3	0.5	0.4	0.5	0.6	0.6	0.1	0.5	0.3	0.2	0.4	0.3
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Authors' calculations on data described in Section 2.

Table A4. 2009-11 trade weights in the new Bank of Italy price-competitiveness indicators

(percentage points)

	Italy			Germany			France			Spain		
Country	Import weights	Double export weights	Overall weights	Import weights	Double export weights	Overall weights	Import weights	Double export weights	Overall weights	Import weights	Double export weights	Overall weights
Argentina	0.1	0.3	0.2	0.1	0.3	0.2	0.0	0.3	0.2	0.4	0.5	0.4
Austria	2.5	2.2	2.3	5.1	3.6	4.2	1.2	1.8	1.5	1.1	1.5	1.3
Australia	0.1	0.7	0.4	0.1	0.7	0.4	0.1	0.7	0.4	0.0	0.5	0.3
Belgium	5.6	3.4	4.4	8.1	3.6	5.4	11.2	3.4	7.5	4.9	3.9	4.5
Bulgaria	0.6	0.3	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2
Brazil	0.5	1.3	0.9	0.4	1.1	0.8	0.2	1.1	0.7	0.5	1.3	0.8
Canada	0.2	0.8	0.6	0.3	1.0	0.7	0.4	0.9	0.6	0.2	0.6	0.4
Switzerland	4.1	2.9	3.5	4.3	3.0	3.6	2.9	2.5	2.7	2.7	2.1	2.4
Chile	0.5	0.2	0.4	0.0	0.3	0.2	0.2	0.2	0.2	0.2	0.4	0.3
China	8.8	9.0	8.9	8.0	10.9	9.7	5.5	9.6	7.4	7.6	6.9	7.3
Colombia	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.2	0.1	0.0	0.2	0.1
Cyprus	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Czech Republic	1.6	1.6	1.6	5.1	2.0	3.3	1.5	1.6	1.5	1.4	1.4	1.4
Germany	21.9	13.7	17.4	-	-	-	23.8	14.0	19.2	19.2	13.5	16.5
Denmark	0.6	0.7	0.6	1.3	1.1	1.2	0.6	0.8	0.7	0.8	0.7	0.7
Algeria	0.0	0.6	0.3	0.0	0.1	0.1	0.0	0.8	0.4	0.1	0.8	0.4
Ecuador	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Estonia	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.1	0.0
Spain	5.3	4.6	4.9	2.9	3.9	3.5	8.2	5.4	6.9	-	-	-
Finland	0.5	0.6	0.5	0.7	0.8	0.8	0.4	0.6	0.5	0.5	0.5	0.5
France	9.9	8.6	9.2	9.4	8.1	8.6	-	-	-	14.1	11.8	13.1
United Kingdom	3.9	4.8	4.4	4.4	5.8	5.2	4.4	5.8	5.0	5.0	5.3	5.1
Greece	0.4	1.1	0.8	0.2	0.5	0.4	0.1	0.5	0.3	0.2	0.7	0.4
Hong Kong SAR	1.2	1.2	1.2	1.4	1.5	1.4	0.9	1.3	1.1	0.9	0.9	0.9
Croatia	0.5	0.4	0.5	0.1	0.2	0.2	0.1	0.1	0.1	0.0	0.1	0.1
Hungary	1.3	1.1	1.2	2.9	1.2	1.9	1.0	1.0	1.0	1.3	0.9	1.1
Indonesia	0.3	0.4	0.4	0.2	0.4	0.3	0.2	0.5	0.3	0.3	0.3	0.3
Ireland	1.0	0.8	0.9	0.9	1.0	1.0	1.1	1.0	1.1	1.8	0.8	1.3
Israel	0.4	0.5	0.4	0.2	0.4	0.3	0.2	0.4	0.3	0.4	0.4	0.4
India	1.2	1.7	1.5	0.8	1.6	1.2	0.6	1.6	1.1	1.0	1.3	1.1
Italy	-	-	-	6.5	6.8	6.7	9.8	6.8	8.4	9.5	7.8	8.7
Japan	1.6	3.3	2.5	2.4	3.8	3.2	1.4	3.7	2.5	1.3	2.3	1.8
South of Korea	1.1	2.1	1.7	1.2	2.2	1.8	0.8	2.2	1.4	0.8	1.5	1.1
Kuwait	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.1	0.0
Lithuania	0.1	0.2	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Latvia	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.1	0.0
Morocco	0.2	0.4	0.3	0.0	0.2	0.1	0.7	0.7	0.7	1.1	1.3	1.2
Malta	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0
Mexico	0.2	0.9	0.6	0.4	0.9	0.7	0.1	0.8	0.4	0.2	1.1	0.6
Malaysia	0.2	0.6	0.4	0.6	0.7	0.6	0.4	0.7	0.6	0.2	0.4	0.3
Nigeria	0.2	0.2	0.2	0.0	0.1	0.1	0.0	0.2	0.1	0.1	0.1	0.1
Netherlands	6.2	4.0	5.0	11.2	4.5	7.3	7.7	4.6	6.2	6.3	4.3	5.4
Norway	0.2	0.4	0.3	0.5	0.7	0.6	0.2	0.5	0.3	0.3	0.5	0.4
New Zealand	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.1	0.0
Peru	0.2	0.1	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.2	0.1
Philippines	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.2	0.1	0.0	0.1	0.1
Pakistan	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.1	0.2	0.1	0.2
Poland	2.8	2.4	2.5	4.6	3.0	3.7	2.0	2.0	2.0	1.7	1.9	1.8
Portugal	0.5	1.0	0.7	0.8	0.7	0.8	1.2	0.9	1.1	4.5	5.0	4.7
Romania	2.0	1.3	1.6	1.1	0.9	1.0	0.8	0.8	0.8	0.5	0.8	0.6
Russia	1.2	2.3	1.8	0.5	2.7	1.8	0.1	1.8	0.9	0.1	1.1	0.6
Saudi Arabia	0.3	0.8	0.5	0.0	0.6	0.4	0.1	0.8	0.4	0.2	0.5	0.3
Sweden	1.2	1.3	1.2	1.6	2.0	1.8	1.3	1.5	1.4	1.1	1.2	1.2
Singapore	0.1	0.8	0.5	0.6	0.9	0.8	0.9	0.9	0.9	0.2	0.6	0.4
Slovenia	0.8	0.5	0.6	0.7	0.4	0.5	0.4	0.3	0.4	0.1	0.3	0.2
Slovakia	1.0	0.7	0.9	1.6	1.0	1.3	0.9	0.7	0.8	0.7	0.6	0.7
Thailand	0.4	0.7	0.6	0.3	0.7	0.6	0.3	0.8	0.5	0.3	0.5	0.4
Turkey	1.9	2.3	2.1	1.3	1.9	1.6	1.3	2.0	1.6	1.5	2.2	1.8
Taiwan	0.8	0.9	0.8	1.0	1.1	1.1	0.7	1.0	0.8	0.7	0.7	0.7
United States	3.2	7.7	5.6	4.6	9.0	7.2	3.4	8.1	5.6	3.0	5.8	4.3
Venezuela	0.0	0.2	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.4	0.2
South Africa	0.2	0.6	0.4	0.5	0.7	0.6	0.1	0.6	0.4	0.3	0.5	0.4
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

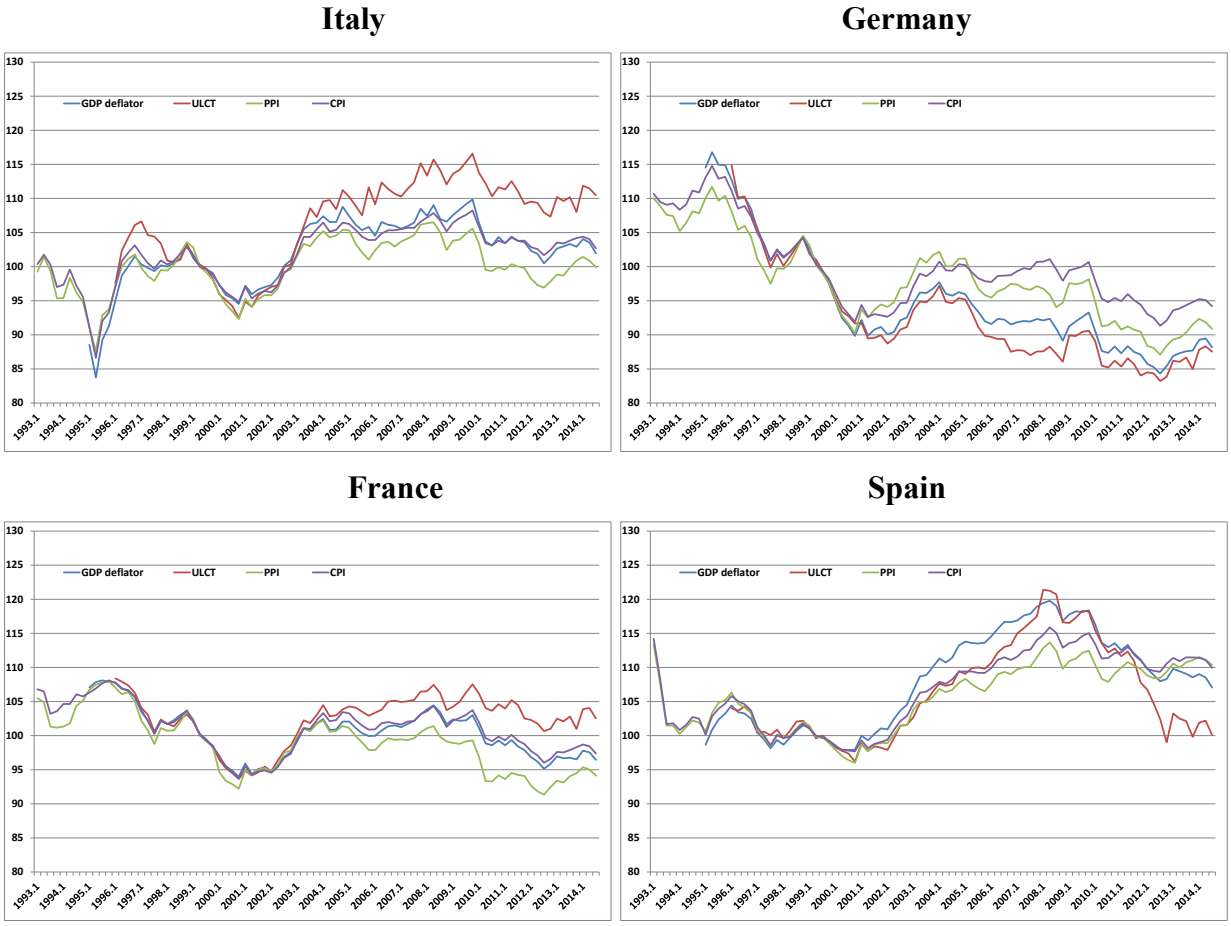
Source: Authors' calculations on data described in Section 2.

E. *Comparing the new Bank of Italy price-competitiveness indicators to the ECB's indicators*

As discussed in Section 2.4, the choice of the deflator underlying a given price-competitiveness indicator may be relevant. Figure A6 compares alternative price-competitiveness indicators for each country under study: our new PPI-based measures and ECB indicators based on GDP deflators, consumer prices (CPI) and unit labour costs in the total economy (ULCT). Price-competitiveness trends are more favourable when measured by PPI-based indicators in Italy, France and, until mid-2011, Spain; currently ULCT-deflated indicators signal larger competitiveness gains for both Germany and Spain.

Figure A6. Price-competitiveness trends in the four largest euro-area countries according to alternative indicators

(indices 1999=100)

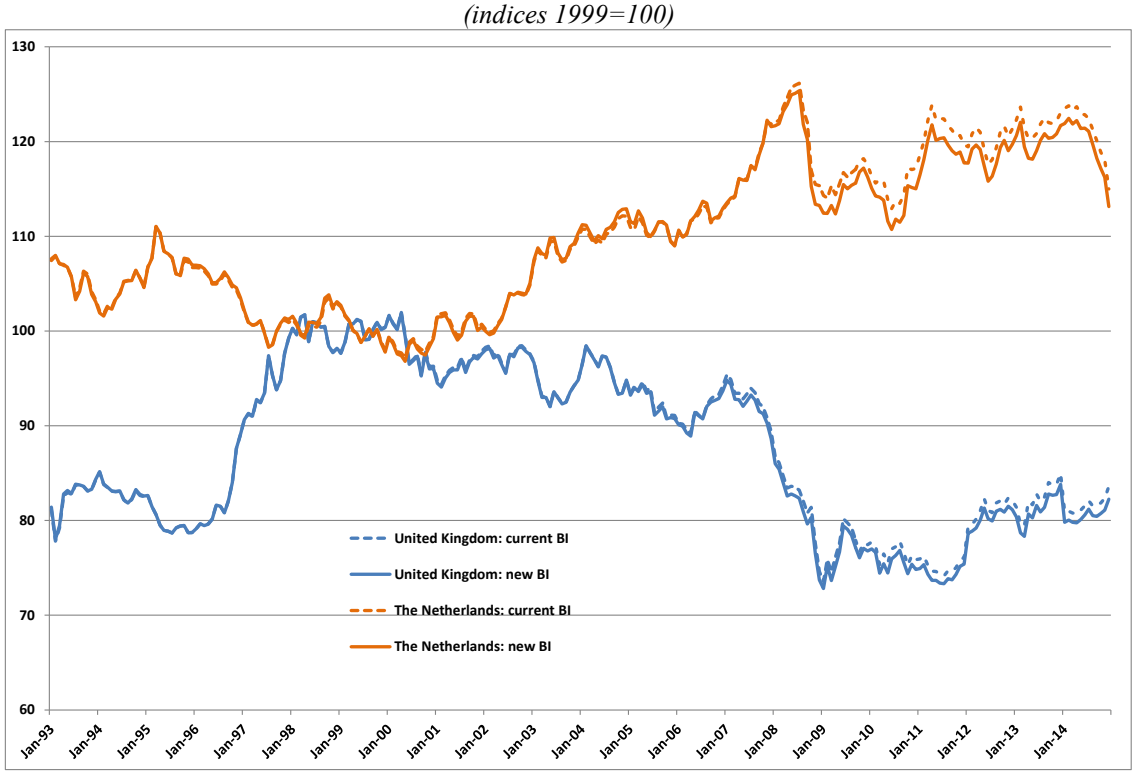


Source: Authors' calculations on data described in Section 2 for PPI-based price-competitiveness indicators; ECB for the other measures.

Appendix B. Price-competitiveness trends in selected countries

Figure B1. Price-competitiveness trends in selected EU advanced economies according to the new and current Bank of Italy indicators

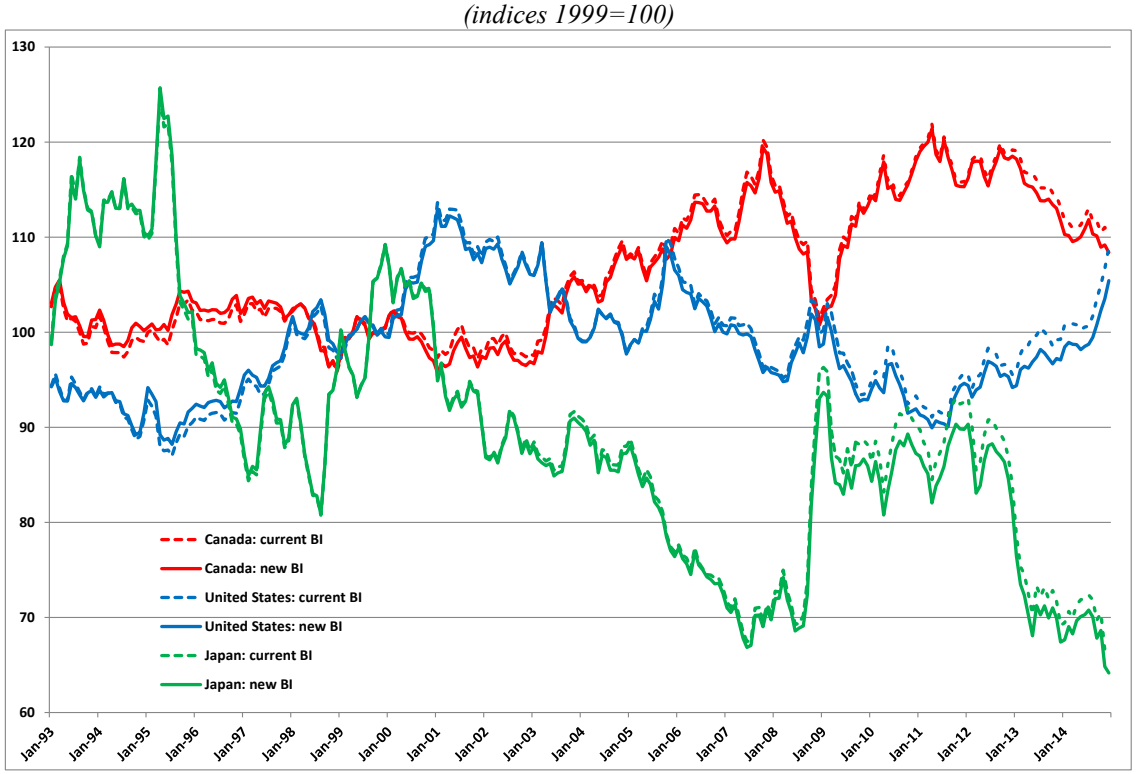
(indices 1999=100)



Source: Authors' calculations on data described in Section 2.

Figure B2. Price-competitiveness trends in selected non-EU advanced economies according to the new and current Bank of Italy indicators

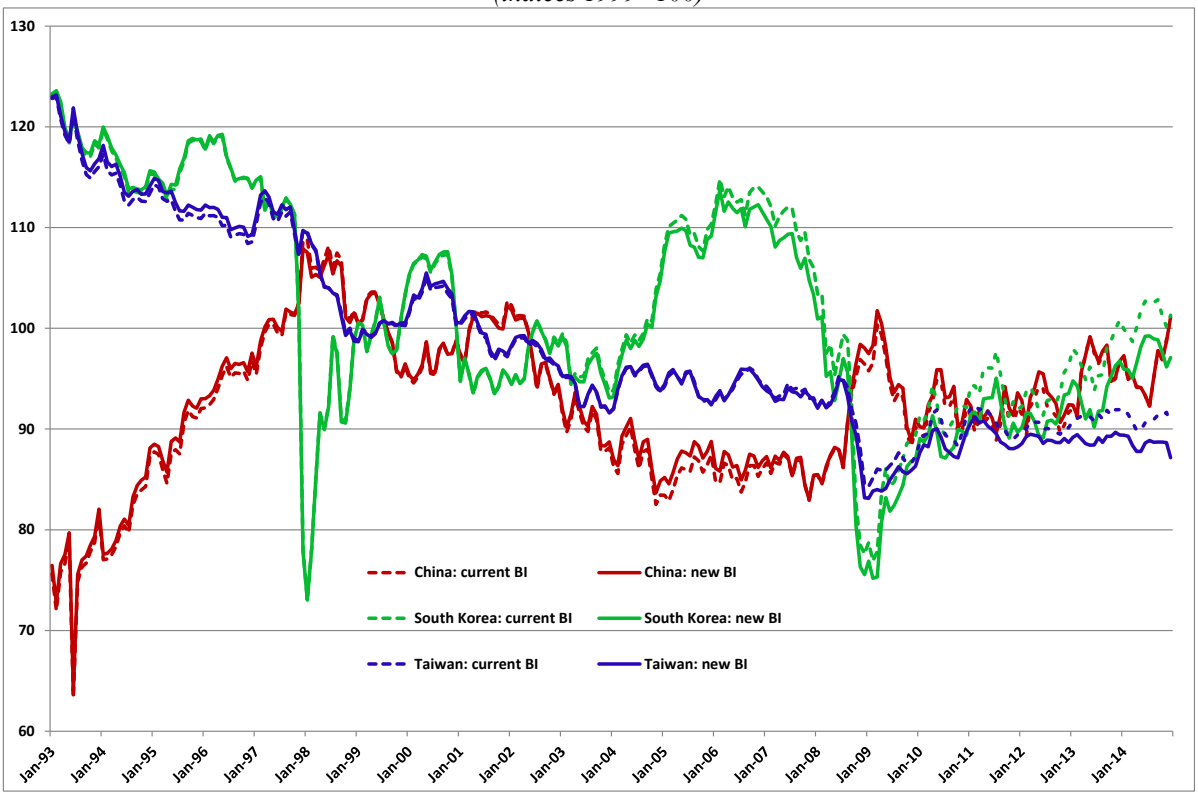
(indices 1999=100)



Source: Authors' calculations on data described in Section 2.

Figure B3. Price-competitiveness trends in selected emerging economies according to the new and current Bank of Italy indicators

(indices 1999=100)



Source: Authors' calculations on data described in Section 2.

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