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AN UPDATE OF THE BANK OF ITALY METHODOLOGY UNDERLYING THE ESTIMATION OF PRICE-COMPETITIVENESS MISALIGNMENTS

by Claire Giordano*

Abstract

This paper documents the recent innovations to the methodology underlying the estimation of price-competitiveness misalignments at the Bank of Italy, first put forward in Giordano (2018); it also provides the most recent misalignment estimates for the euro area and for its four main economies, based on five alternatively deflated indicators. The extension of the sample period, the recalibration of the employed trade weights and the significant data revisions and refinements introduced have not qualitatively modified the assessment of misalignments since 1999 for the afore-mentioned economies, yet point estimates have changed non-negligibly. In the first half of 2019 no significant price-competitiveness misalignment is recorded for Italy and for the euro area as a whole, whereas for France, Germany and Spain there is still evidence of a modest undervaluation.

JEL Classification: E31, F00, F31.
Keywords: price competitiveness, real effective exchange rate, equilibrium exchange rate, external imbalances.
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Contents

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1. Introduction[*]

The Bank of Italy employs a quarterly Behaviourial Equilibrium Exchange Rate (BEER) model to estimate real effective exchange rate (REER) or Price Competitiveness Indicator (PCI)[1] misalignments for a large set of – both euro and non-euro area – countries, as well as for the euro area as a whole, since 1999. The methodology owes its name to the assumption that the "behaviour" of the REER is determined by the "behaviour" of its macroeconomic drivers in the long run (Clark and MacDonald, 1998).

The model employed at the Bank of Italy is comparable to the REER regressions underlying the IMF's External Balance Assessment, described in Cubeddu et al. (2019), although the latter are estimated on annual data. The quarterly frequency of the model is of paramount importance for monitoring, policy-making and early-warning purposes, since it allows tracking infra-annual external imbalances in a timely manner.[2]

The details of the BEER methodology, the list of countries and the description of the data employed were originally provided in Giordano (2018).[3] In this paper we first document the refinements and updates introduced to the model since then; next, we provide the latest misalignment estimates for the four main euro-area economies and for the euro area as a whole.[4]

The main refinements and changes introduced are the following: (i) the estimation sample has been extended by six quarters, to cover the overall 1999Q1-2019Q2 period; (ii) Venezuela has had to be dropped from the panel due to the suspension of the publication of its official price data; (iii) the data sources for selected price deflators have been replaced and/or refined; and (iv) the significant, coordinated benchmark revisions of many EU countries' national accounts, undertaken in 2019, have been taken on board.

[*] *The author thanks Silvia Fabiani and Alberto Felettigh for comments on a previous draft of this manuscript.*

[1] According to the Bank of Italy/Eurosystem terminology, PCIs provide an overview of the price and cost competitiveness of individual euro-area countries relative to their main competitors, constructed using the same methodology as the REER of the euro area. The REER of the euro area is, however, computed solely against non-euro area partners and is therefore not strictly comparable to the single euro-area members' PCIs, which are computed *vis-à-vis* both euro and non-euro area competitors; the same applies to the corresponding misalignments.

[2] The main limitation of a quarterly BEER model is that it can be estimated only over a shorter time-span relative to an annual model, due to thinner quarterly data availability. However, Giordano (2019) shows that this does not appear to be a major issue for the four largest euro-area countries, since PCI misalignment estimates stemming from the quarterly model employed at the Bank of Italy are similar to those derived from a comparable annual model, estimated since 1980.

[3] In turn, this study was based on previous research conducted at the ECB and published in Fidora, Giordano and Schmitz (2018).

[4] The data vintage employed refers to data available on 31st December 2019.

Qualitatively, the assessment of price-competitiveness imbalances since 1999 for the euro area and its four main economies has not changed significantly relative to that reported in Giordano (2018), yet point estimates are somewhat different. In the first half of 2019 (most recent period available at the time of writing) the REER of the euro area, as well as Italy's PCI, were on average broadly in line with economic fundamentals; conversely, the average PCI of France, Germany and Spain were still moderately undervalued.

The remainder of this paper is structured as follows. Section 2 outlines the model and the main innovations undertaken over the past two years. Section 3 reports the most recent misalignments estimates for the euro area and for Italy, France, Germany and Spain. Section 4 draws some conclusions.

2. The quarterly BEER model employed at the Bank of Italy

In a nutshell, a BEER model estimates the long-run reduced-form relationship between bilateral real exchange rates (RERs) or multilateral REERs, on the one hand, and key macroeconomic fundamentals, on the other hand (Clark and MacDonald, 1998). The in-sample predictions of the model provide estimates of equilibrium values; the percentage-point difference between the actual and the equilibrium estimates is labelled as the R(E)ER misalignment.

In the specific case of the model used at the Bank of Italy, a cointegrating relationship between RERs *vis-à-vis* the euro (*rer*)[5] and selected economic fundamentals (expressed relative to the euro area)[6] is estimated since 1999 for a large panel of countries. By aggregating (equilibrium and actual) bilateral RERs into (equilibrium and actual) REERs using appropriate trade weights, it is then possible to derive REER misalignments at a quarterly frequency for each of the countries considered, as well as for the euro area as a whole.

Relative to the original model in Giordano (2018), the estimation sample employed herein has been extended by six quarters to cover the overall period 1999Q1-2019Q2. Furthermore, the number of countries included in the panel has dropped to 56, due to the exclusion of Venezuela since 1999; the latter economy has indeed suspended the publication of its official price data. This revision entails that: *a)* we do not compute RE(E)R misalignments for Venezuela anymore; and *b)* all other countries'

[5] The RER is defined in such way that an increase corresponds to a real appreciation of the domestic currency *vis-à-vis* the numéraire currency, the euro. For euro-area countries their *nominal* exchange rate *vis-à-vis* the euro is of course set to one; hence the corresponding *real* rate depends solely on the developments of their prices or costs relative to the euro-area average.

[6] Indeed, the economic fundamentals on the right-hand side of the equation need to be expressed relative to the numéraire economy since the dependent variable is a *bilateral* concept that cannot be determined only by a country's own characteristics (Phillips et al., 2013).

REERs are now computed *vis-à-vis* the remaining 55 trading partners, as opposed to the original set of 56. The list of countries is reported in Table 1.

In spite of the ongoing debate on the topic (e.g. Chinn, 2006; Giordano and Zollino, 2016; Ahn, Mano and Zhou, 2017), there is no consensus on the optimal price or cost to employ in the construction of RE(E)Rs, which makes it necessary to consider a range of alternative indicators. We hence continue to employ five alternative price and cost indices/levels to construct the RER, in particular estimating five models that differ solely with respect to the dependent variable. Indeed, quarterly average nominal exchange rates are alternatively deflated by one of the following indices: *i)* the consumer price index (CPI), *ii)* the GDP deflator, *iii)* the producer price index (PPI), *iv)* the unit labour cost of the total economy (ULCT); or by the following price level: *v)* the purchasing power parity (PPP) rate. The PPI is available only for 53 countries (in particular, data for Luxembourg and Iceland are not available; see Felettigh and Giordano, 2019 for details) and the ULCT is only available for a narrow sample of 38 countries (see Table 1).

Table 1. The list of countries underlying the quarterly BEER model

Euro area	Other advanced economies	Emerging economies
Austria (AT)*	Australia (AU)*	Algeria (DZ)*
Belgium (BE)*	Canada (CA)*	Argentina (AR)
Cyprus (CY)*	Czech Republic (CZ)*	Brazil (BR)
Estonia (EE)*	Denmark (DK)*	Bulgaria (BG)*
Finland (FI)*	Hong Kong (HK)*	Chile (CL)
France (FR)*	Iceland (IS)**	China (CN)*
Germany (DE)*	Israel (IL)	Croatia (HR)*
Greece (GR)*	Japan (JP)*	Hungary (HU)*
Ireland (IE)*	Korea, Republic of (KR)*	India (IN)
Italy (IT)*	New Zealand (NZ)	Indonesia (ID)
Latvia (LV)*	Norway (NO)*	Malaysia (MY)
Lithuania (LT)*	Singapore (SG)*	Mexico (MX)
Luxembourg (LU)**	Sweden (SE)*	Morocco (MA)
Malta (MT)*	Switzerland (CH)*	Philippines (PH)
Netherlands (NL)*	Taiwan (TW)	Poland (PL)*
Portugal (PT)*	United Kingdom (GB)*	Romania (RO)*
Slovakia (SK)*	United States (US)*	Russian Federation (RU)
Slovenia (SI)*		South Africa (ZA)
Spain (ES)*		Thailand (TH)
		Turkey (TR)*

* Narrow ULCT sample.
** Not available for PPIs.

In the BEER model literature there is no prior theory for the selection of economic fundamentals to be included on the right-hand side of the equation. In order to select the relevant economic fundamentals in the quarterly BEER model used at the Bank of Italy, a general-to-specific approach is adopted, in which all the variables suggested by the existing BEER model literature (summarised in Giordano, 2019) are constructed and tested, and only those that are statistically significant at a 10 per cent confidence level in at least one of the five specifications considered are retained.[7]

Turning to these economic fundamentals, one of the most popular explanations of the deviations of RERs from equilibrium is due to Balassa (1964) and Samuelson (1964), which posited that relative prices of non-traded and traded goods are inversely related to the relative productivity in the two sectors, under a set of assumptions, including free labour mobility across sectors. In a partial equilibrium setting, a rise in productivity in the tradable sector entails an increase in wages in the same sector, yet also bids up wages in the non-tradable sector. Since the wage increase in the non-tradable sector is not accompanied by productivity gains, this leads to a higher general price level, which in turn implies a RER appreciation. In order to empirically investigate the Balassa-Samuelson effect, in principle data on sectoral productivity should be employed. Since the model is estimated at a quarterly frequency for a large set of countries, owing to data availability, aggregate, as opposed to sectoral, measures are used, as is anyhow standard in most of the BEER model literature. Moreover, GDP per capita (*gdppc*) is used as a proxy of productivity, given that it is found to be more frequently statistically significant than labour productivity for the sample considered (results available upon request).

Whereas the Balassa-Samuelson model assumes that the RER depends entirely on supply factors, demand-side variables are also typically considered in BEER models, of which the most frequently employed are the following.

First, international trade policy may have an effect on RERs. Lower trade barriers can lead to RER depreciation via a fall in domestically produced goods' prices, in turn due to heightened competition or to cheaper intermediate inputs (Goldfajn and Valdes, 1999; Ricci et al., 2013). Openness to trade (*open*), i.e. the sum of exports and imports as a share of GDP, is used as an inverse proxy of the intensity of trade restrictions.

Second, terms of trade are often included in BEER models as they are generally considered a source of fluctuations of RERs that can be considered as exogenous, since few countries exert

[7] The chosen set of explanatory variables is also supported by Bayesiam model averaging techniques, as discussed in Giordano (2019).

significant market power on export and import prices (Lane and Milesi Ferretti, 2004). In particular, an improvement in terms of trade (*tot*), e.g. an increase in export prices relative to import prices, should lead to a positive income or wealth effect in the domestic economy. The ensuing rise in domestic demand for and the reduction in the foreign supply of non-tradables increases domestic non-tradable prices and therefore leads to a RER appreciation (Neary, 1988).

Third, fiscal policy – here captured by final government expenditure relative to GDP (*gov*) – can positively affect the RER through a composition effect (Froot and Rogoff, 1992; Obstfeld and Rogoff, 1996; Hinkle and Montiel, 1999): because government consumption tends to fall disproportionately on domestic non-tradables, the RER tends to rise together with this demand component. However, excessive government consumption, and therefore spending, may cast doubt on the sustainability of fiscal policy and undermine the confidence in a country's currency, leading to RER depreciation (Frenkel and Mussa, 1985; Melecký and Komárek, 2007). The expected correlation between government consumption and the RER is therefore *a priori* ambiguous.

Fourth, the monetary policy stance can be captured by the real interest rate (e.g. Adler and Grisse, 2017). An (unanticipated) increase in real interest-rate differentials (*int*) should give rise to capital inflows and therefore to a RER appreciation.

The full specification of the model is thus the following:

$$(1) \qquad rer_{i,t} = \beta_{1i} gdppc_{i,t} + \beta_{2i} open_{i,t} + \beta_{3i} tot_{i,t} + \beta_{4i} gov_{i,t} + \beta_{5i} int_{i,t} + \mathrm{FE} + \varepsilon_{i,t}$$

where *i* indicates the country, *t* a quarter in the period 1999Q1-2019Q2, *FE* are fixed effects, namely country fixed effects and cross-section means of both the dependent and explanatory variables, as better explained further on, and $\varepsilon_{i,t}$ is a random error. As mentioned earlier, all the regressors are expressed relative to the corresponding euro-area aggregate.

In order to construct the variables included in the BEER model, the following hierarchy of sources for national account data is employed: Eurostat, OECD, BIS Macroeconomic data, IMF International Financial Statistics (IFS), IMF World Economic Outlook (WEO). The latter dataset is also used for the data related to PPPs and the terms of trade.[8] Period-average nominal exchange rates and price/cost indices are sourced from the ECB and IMF, with the exception of PPIs, which are sourced from the Bank of Italy (Felettigh and Giordano, 2019). Nominal three-month money market

[8] PPPs and terms of trade are the only two variables for which solely annual data are available, and are hence linearly interpolated to obtain quarterly estimates.

rates, sourced from IMF-WEO, IMF-IFS, ECB and BIS, are deflated with (contemporaneous) CPIs to obtain real interest rates.[9]

Relative to the original model reported in Giordano (2018), the data sources for selected price deflators have been replaced and/or refined. In particular, PPIs of Argentina, Brazil and China have been reviewed. Furthermore, the ECB has started to release quarterly GDP deflators for a wider number of emerging economies than in the past; data for these additional countries have been taken on board, thereby replacing the linearly interpolated annual IMF data used previously. Finally, in 2019 most EU countries carried out coordinated benchmark revisions of their national accounts in order to incorporate new data sources and changes in international statistical methodology, as a planned follow-up to the introduction of the European System of Regional and National Accounts (ESA 2010) in September 2014;[10] hence, these substantial data revisions have been incorporated in this new estimation round.

The new BEER model estimation results are reported in Table 2 for each alternative deflator, based on the common correlated effects mean group (CCEMG) estimator, introduced by Pesaran (2006) and Kapetanios, Pesaran and Yamagata (2011). In our view, the appropriateness of this estimation technique is due to the fact that: *(i)* it accommodates for both stationary and non-stationary cointegrated variables (present in the model, as documented in Giordano, 2018); *(ii)* it includes country fixed effects which, in addition to controlling for time-invariant country characteristics, are necessary due to the fact that in four out of five specifications price or cost indices, as opposed to levels, are employed to construct the dependent variable and hence do not contain any meaningful price level information (Fischer and Hossfeld, 2014);[11] *(iii)* it allows for heterogeneous slopes, which is of paramount importance given the vast country heterogeneity in our sample; *(iv)* it includes cross-section averages of the dependent and explanatory variables in order to tackle cross-sectional dependence, i.e. the presence of global shocks which affect all countries in the sample. As it is a

[9] For data availability issues, short-term interest rates are here employed; they are, however, generally correlated with long-term interest rates.

[10] The extent of the 2019 revisions are described at the following Eurostat webpage: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Annual_national_accounts_coordinated_2019_benchmark_revisions_-_impact_on_main_GDP_aggregates#Revision_of_main_production_components.

[11] However, with country fixed effects the predicted RERs are by construction on average equal to their long-run mean, or in other terms each country's regression residuals are forced to average to zero over the sample period, as discussed in Giordano (2019). Results are thus less reliable for short sample spans. Herein this shortcoming is partially overcome by adopting (quarterly) data over the period 1999-2019, which is a relatively long time-span if compared to the existing BEER model literature. Moreover, one of the deflators considered (the PPP) is an actual price level; when it is employed, country fixed effects may be in principle dropped from the estimation of regression (1). In this case, however, also the explanatory variables expressed as index numbers, such as terms of trade, need to be excluded to obtain reliable estimates. Moreover, PPPs suffer from measurement issues. This confirms the usefulness of comparing results based on five alternative deflators, as done in this analysis.

group-mean procedure, coefficients are estimated country by country and then averaged across countries.

Results are qualitatively similar to those published in Giordano (2018), confirming the lack of any significant structural break in the long-run relationships over the past two years. In particular, the Balassa-Samuelson proxy is statistically significant in all but one specification and presents the expected positive sign. All other findings also comply with the economic priors discussed earlier. In particular, an increase in the terms of trade and/or in the real interest rate is associated with a real average appreciation in four out of five specifications. A fall in trade openness also boosts the RER, however deflated. Finally, when it is statistically significant (in the ULCT-based regression), the long-run elasticity of government expenditure is positive, thereby confirming the compositional bias of public spending towards the non-tradable sector.[12]

Table 2 - BEER model estimation results

	Dependent variable: bilateral RER deflated by the…				
	1	*2*	*3*	*4*	*5*
	CPI	GDP deflator	PPP rate	PPI	ULCT
GDP per capita	0.169	0.325***	0.336***	0.203*	0.403**
	(0.104)	(0.101)	(0.109)	(0.117)	(0.192)
Trade openness	-0.402***	-0.332***	-0.364***	-0.243***	-0.242***
	(0.081)	(0.076)	(0.082)	(0.074)	(0.080)
Terms of trade	0.172**	0.391***	0.468***	0.208***	0.198
	(0.077)	(0.093)	(0.100)	(0.078)	(0.157)
Government expenditure	0.178	-0.046	0.282	0.029	2.026***
	(0.328)	(0.253)	(0.298)	(0.290)	(0.418)
Short-term interest rates	0.001	0.002**	0.003***	0.003***	0.002*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Number of countries	*56*	*56*	*56*	*54*	*38*
Number of observations	*4,648*	*4,648*	*4,648*	*4,482*	*3,154*

Source: author's estimations.
Notes: Outlier-robust estimates obtained with a common correlated effects mean group estimator on the period 1999Q1-2019Q2. The specification also includes country fixed effects and cross-section means, here not reported. Standard errors are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

[12] The large coefficient magnitude we find is consistent with the fact that government expenditure affects RERs by pushing up wages that are fully reflected in rises in the ULCT, which in contrast to the other deflators is not contaminated by developments in other cost components.

3. Misalignment estimates for the euro area and for the main euro-area countries

The fitted values obtained from the estimated relations provided in Table 2 are employed to compute the equilibrium values of both bilateral RERs and of REERs, the latter obtained by weighting the bilateral rates with gross trade flows provided by the ECB.[13] The resulting series provide a time-varying and country-specific benchmark against which one may assess actual REERs. Positive (negative) misalignments thus indicate overvaluations (undervaluations) of the REER relative to its equilibrium value. By computing five estimates (one for each alternative price or cost index) for each country-quarter, a range of disequilibria estimates is provided. In the rest of the section the focus turns first to the estimated REER misalignments of the euro area as a whole, and then to the PCI imbalances of the four largest euro-area countries. It is worth again recalling at this stage that the REER of the euro area is computed solely against non-euro area partners and is therefore not strictly comparable to the single euro-area members' PCIs, which are computed *vis-à-vis* both euro and non-euro area competitors; the same applies to the corresponding misalignments.

3.1 The euro area

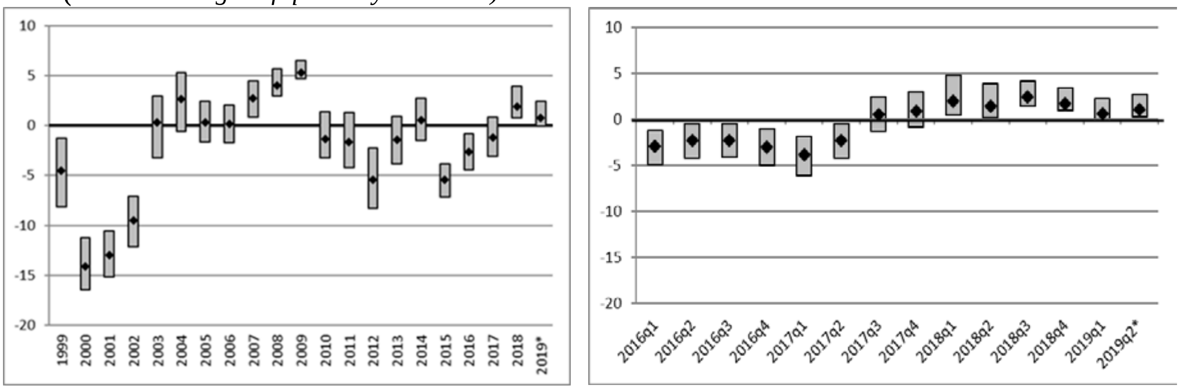
In the first years of the monetary union the REER of the euro area was strongly undervalued, on average by nearly 15 per cent in 2000-01 (Fig. 1, left-hand side panel). After a broad alignment with economic fundamentals in the mid-2000s, the REER then became overvalued peaking at an average 5 per cent approximately in 2009, confirming the developments reported in Giordano (2018). Thereafter, and until 2017, average misalignments were mostly negative. After a modest average overvaluation in 2018 (+1.9 per cent), in the first half of 2019 the euro-area REER was broadly aligned with economic fundamentals (the average misalignment is +0.7 per cent, with estimates ranging between 0.0 and +2.4 per cent).

As for quarterly patterns (Fig. 1, right-hand side panel), since the second half of 2017 the REER of the euro area has been mildly overvalued. Whereas a correction was under way at the end of 2018 and at the beginning of the following year, in the second quarter of 2019 the average overvaluation slightly increased, to 1.1 per cent. Tracking developments over the second half of the year will hence be crucial to assess the overall 2019 outcome.

[13] The trade weights employed are those currently underlying the ECB's official REERs (Schmitz et al., 2013).

Figure 1. REER misalignment estimates of the euro area
(percentage points)

Annual estimates since 1999 *(annual averages of quarterly estimates)*	**Quarterly estimates since 2016**



Source: author's estimations.
Notes: The bars represent the range, across different price/cost indices, of estimated REER misalignments for each year. The diamond represents the mean of the five estimated REER misalignments discussed in the text. A positive (negative) misalignment would require a depreciation (an appreciation) of the actual REER to unwind, provided the equilibrium rate does not change. * The 2019 annual average refers to the first two quarters of the year. The ULCT-deflated misalignment estimate is not yet available for 2019Q2.

3.2 The four main euro-area countries

Moving to the four largest euro-area economies, general patterns are similar to those recorded by the euro area as a whole, with some heterogeneity especially in recent years (Fig. 2), qualitatively confirming the general assessment outlined in Giordano (2018). At the turn of the millennium the PCIs of the largest euro-area countries were strongly undervalued relative to their fundamentals, in particular in Italy. By 2009 the outlook had reversed, with an average overvaluation that was marginally larger in Italy than in the other three economies. Since then, disequilibria have been heterogeneous across these economies.

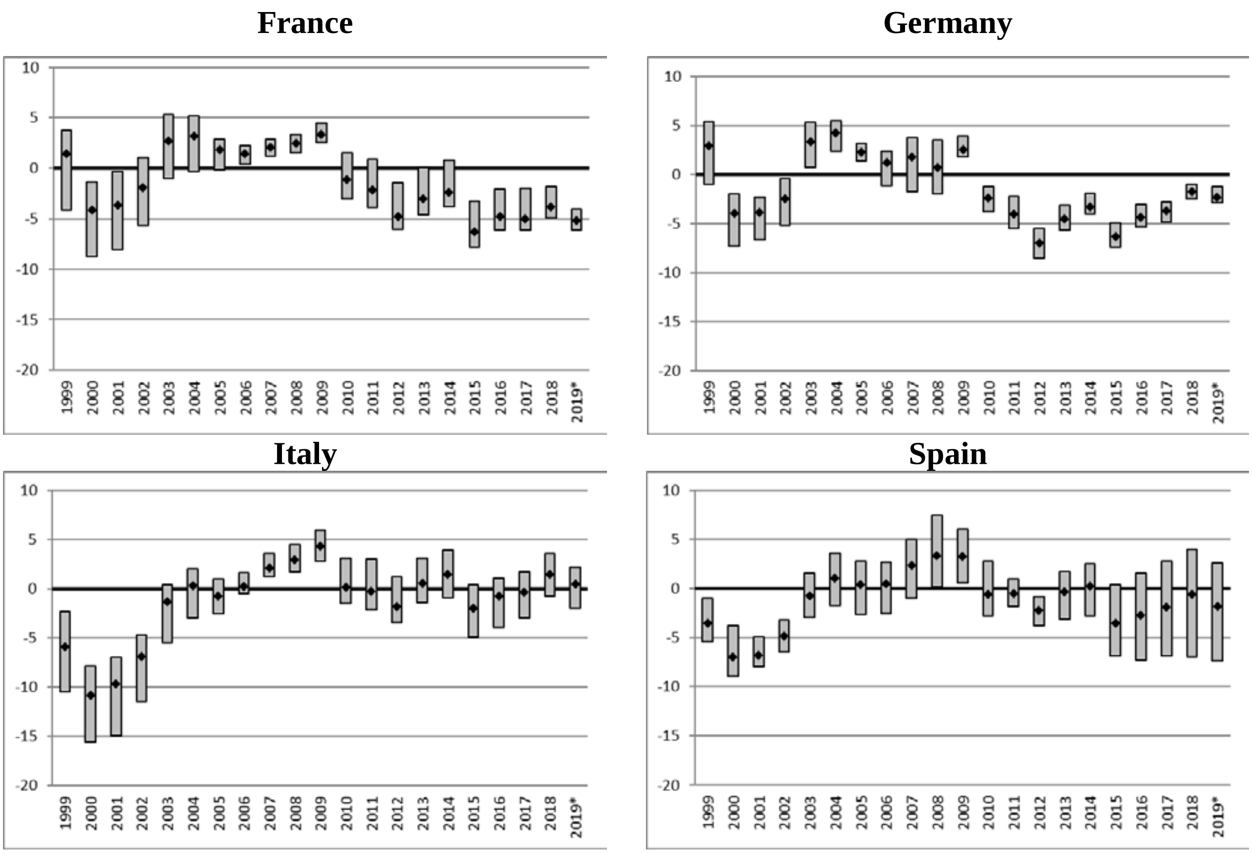
Indeed, since 2010 Germany's PCI has been undervalued, whatever the indicator employed. Between 2015 and 2018 Germany's average undervaluation narrowed, to then widen again slightly in the first half of 2019, when it stood at -2.4 per cent, within a range of -2.9 per cent, according to the GDP deflator-based PCI, and -1.2 per cent, according to the ULCT-deflated measure. Since 2010 France's PCI too has been on average undervalued, but the range of estimates is wider than in the case of Germany, also covering positive values in some years. In the first half of 2019, France's average undervaluation was of 5.1 per cent, falling in a range spanning between -6.1 and -4.1 per cent.[14] Conversely, as of 2010 Italy's average PCI has been broadly aligned with economic fundamentals, with some slight under- and over-valuations in specific years. In particular, after a modest average overvaluation of 1.5 per cent in 2018, in the first half of 2019 Italy's PCI was broadly

[14] Also according to CEPII's most recent estimates based on 186 trading partners and time-varying weights (Couharde et al., 2017), France has recorded an undervaluation since 2011.

consistent with fundamentals (+0.5 per cent, in a range spanning between -2.0 per cent, according to the CPI-deflated PCI, and +2.2 per cent, according to the ULCT-deflated PCI).[15] Finally, since 2015 Spain has recorded the widest range of misalignment estimates compared with the other three countries. In particular, in 2019 its PCI was on average moderately undervalued (-1.8 per cent), yet misalignment estimates span from -7.4 per cent (ULCT-based) to +2.6 per cent (PPI-based), leading to an unclear assessment of the correction needed, if any, for this country.

Figure 2. Annual PCI misalignment estimates of the main euro-area countries since 1999

(percentage points; annual averages of quarterly estimates)



Source: author's estimations.

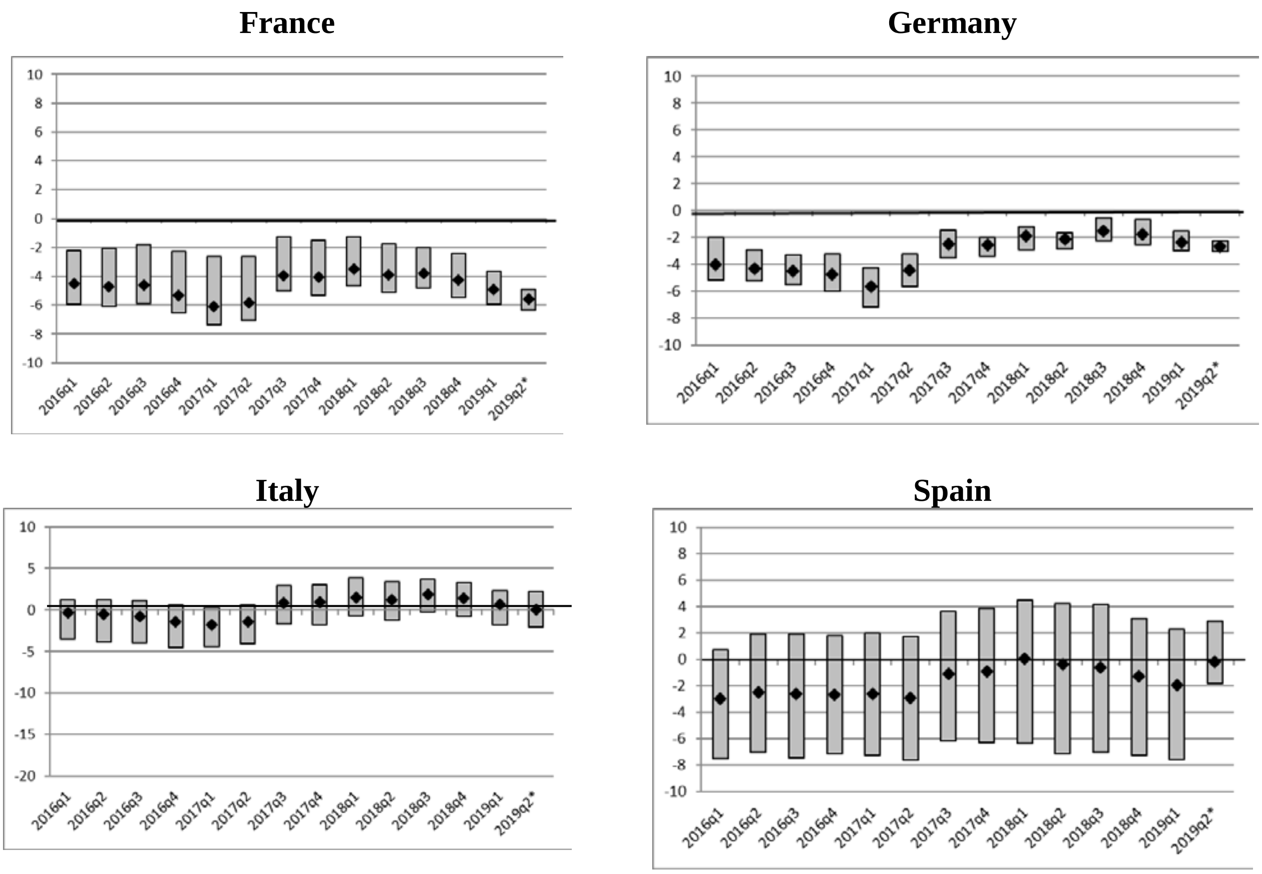
Notes: The bars represent the range, across different price/cost indices, of estimated REER misalignments for each year. The diamond represents the mean of the five estimated REER misalignments discussed in the text. A positive (negative) misalignment would require a depreciation (an appreciation) of the actual REER to unwind, provided the equilibrium rate does not change. * The 2019 annual average refers to the first two quarters of the year. The ULCT-deflated misalignment estimate is not yet available for 2019Q2.

[15] According to the ULCT-based measure, Italy's PCI has been constantly overvalued since 2007.

Turning to the quarterly estimates since 2016 (Fig. 3), France's and Germany's average overvaluations have first widened until the beginning of 2017 and then narrowed until mid-2018, before widening slightly yet again. Italy's PCI has been broadly in line with economic fundamentals in most quarters, with the visible exceptions of late 2016 and early 2017 (modest undervaluation) and of 2018 (slight overvaluation). Spain's developments roughly concur with those recorded for France and Germany, yet the range of estimates is very wide.[16]

Figure 3. Quarterly PCI misalignment estimates of the main euro-area countries since 2016

(percentage points)



Source: author's estimations.

Notes: The bars represent the range, across different price/cost indices, of estimated REER misalignments for each year. The diamond represents the mean of the five estimated REER misalignments discussed in the text. A positive (negative) misalignment would require a depreciation (an appreciation) of the actual REER to unwind, provided the equilibrium rate does not change. * The ULCT-deflated misalignment estimate is not yet available for 2019Q2.

4. Conclusions

The quarterly BEER model used at the Bank of Italy, aimed at estimating REER or PCI misalignments for 56 countries and for the euro area as a whole at an infra-annual frequency since 1999, is a useful tool to measure and monitor external (im)balances, in turn an important prerequisite

[16] The ULCT-deflated measure generally points to a strong undervaluation for Spain; its absence leads to an upward shift of the 2019Q2 misalignment, evident in Figure 3.

for surveillance, early-warning and policy-making purposes. This paper has described the main refinements made to the model since it was first put forward in Giordano (2018), as well as reporting the most recent misalignments estimates for the euro area and for its four main economies.

Modelling uncertainty is vast, and results heavily rely on the modelling choices the practitioner makes, as detailed in Giordano (2019). In particular, in this paper we have shown how even only the choice of the price/cost index/level employed in constructing REERs and PCIs can significantly affect the magnitude of the estimated misalignments. We hence confirm that the use of alternative prices and costs, and therefore the production of a range of misalignment estimates, is crucial for an informed assessment of price-competitiveness imbalances.

Finally, given that both the theoretical and the empirical literature on the determinants of REERs is continually evolving, that more detailed and accurate datasets become available over time and that new econometric tools are frequently being produced and refined, ongoing maintenance, updates and improvements of this type of models are warranted on a systematic basis.

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