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EQCHANGE
Annual Assessment 2022

Carl Grekou

Highlights

- One year after the major shock that represented the Covid-19 pandemic, the global configuration of currency misalignments between 2020 and 2021 has shown a relative stability;
- The US dollar registered a moderate decrease of its overvaluation; the Chinese renminbi has experienced an upward movement that slightly eroded its undervaluation and aligned it with its fundamental value; the Japanese yen underwent the opposite direction and moved from a slight to considerable undervaluation;
- The euro area is featured with various situations: Germany, Ireland and the Netherlands displayed undervaluations; Belgium, Finland, France, Italy, Luxembourg, Portugal and Spain were rather close to their equilibrium; Austria and Greece displayed overvaluations;
- Europe is also characterized by a considerable heterogeneity with undervaluations prevailing in Northern countries (Norway, Sweden), overvaluations in Eastern and South Eastern countries and scattered cases of currencies in line (e.g., Poland, the United Kingdom);
- Movements in EMEs were very heterogenous; the Turkish lira continued to fall hence increasing its undervaluation; the Brazilian real continued to depreciate and slightly increased its undervaluation; the Korean won and the Indian rupee remained stable and maintained their undervaluations; most emerging economies and particularly in South-East Asia experienced downward movements (reduction in overvaluations/ increase of undervaluations).

Abstract

This publication, accompanying the 2022's update of EQCHANGE, aims at providing an overview of exchange rate misalignments for 2021. Overall, one year after the major shock that represented the Covid-19 pandemic, the global configuration of currency misalignments between 2020 and 2021 has shown a relative stability. Among advanced economies, the picture was broadly unchanged. The US dollar registered a moderate decrease of its overvaluation; the British pound and the Canadian dollar have not shown any significant movements; the Japanese yen plunged and increased its undervaluation. The euro area is again featured with various situations with undervaluations prevailing in Germany, Ireland and the Netherlands while Belgium, France, Italy, Portugal and Spain were close to their equilibrium. In emerging economies, the Turkish lira registered the largest swings against the US dollar and have consequently increased of its undervaluation. The Chinese renminbi has experienced an upward movement that slightly eroded its undervaluation and aligned it with its fundamental value.

Keywords

EQCHANGE, Exchange Rates, Currency Misalignments, Global Imbalances.

JEL

E3, E4, E5 ,E6, F3.

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RESEARCH AND EXPERTISE ON THE WORLD ECONOMY

EQCHANGE annual assessment 2022

Carl GREKOU*

Summary

Without doubt, the year 2020 will remain marked by the outbreak of the Covid-19 pandemic. With a 10% contraction in world GDP in the second quarter of 2020 —compared to the same quarter of the previous year, the Covid-19 crisis appears unprecedented since World War II. In the direct wake of 2020, the year 2021 has not been immune from the socio-economic consequences of the different waves of contagion and variants.

However, despite the important and lingering effects of the pandemic, the global configuration of exchange rate misalignments remained broadly unchanged between 2020 and 2021. This owes much to the prompt and important actions (e.g., swap lines, expansionary fiscal packages, unconventional monetary policies) that have ensured a broadly shared resilience.

On the whole, major currencies have shown a relative stability. On average, between 2020 and 2021, the US dollar depreciated by around 5% in real effective terms (REER). Meanwhile, the equilibrium exchange rate (ERER) stalled (+0.2%). As a result, the US dollar registered a moderate reduction of its overvaluation —around 5 percentage points— that settled around 11% in 2021. Against the depreciating US dollar, the euro appreciated by 3.5% between 2020 and 2021 —in average. The pass-through to the member countries' real effective exchange rates (REER) has however been uneven. While in most countries changes in the REER were negligible, for France or Greece, the REER depreciated by around 1.5%. In Portugal, the REER depreciated by 2.4%. With no noticeable changes in the equilibrium exchange rate, except in Austria, Germany and Greece, the configuration of currency misalignments remained relatively unchanged between 2020 and 2021: Germany, Ireland, and the Netherlands displayed undervaluations; Austria, Greece and Spain displayed overvaluations; and Belgium, Finland, France, Italy, Luxembourg and Portugal were

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close to their equilibrium. The British pound and the Canadian dollar did not register significant changes in their currency misalignments due to movement of similar importance in both the REER and ERER. In contrast, the Japanese yen, for the advanced economies group, exhibited the largest swing as its REER depreciated by 9.7% which resulted in 8.5 p.p. increase of its undervaluation.

In emerging economies, movements were very heterogenous but again marked by the Turkish lira continued plunge against the US dollar. The lira appears 50% below its fundamental value, 10 p.p. lower compared to 2020. The Thailand baht has also seen a similar increase of its undervaluation. In contrast, the largest reductions in the currency misalignments —actually undervaluations— have been noted for Mexico and South Africa. The Korean won and the Indian rupee remained relatively stable and maintained their undervaluations.

Overall and in line with previous observations, the Covid-19 pandemic does not seem to have had, so far, any disruptive effect on the global configuration of exchange rate misalignments. However, it is worth noting the primarily conjunctural nature of the adjustments noted for 2021. Indeed, coming years might unveil important changes as the world faces a combination of factors likely to affect the global economy. Among others, many economies may experience lasting damage to supply potentials and therefore persistent output losses. While the different support policies (i.e., fiscal packages, unconventional monetary policies) that aimed at minimizing these setbacks have raised the issue of debt sustainability —in the medium term—, the inflation return, fueled by the global supply chain disruptions, the war in Ukraine and its associated consequences namely in terms of energy prices, put the global economy to the edge. Indeed, with reduced fiscal spaces and climbing interest rates, all against the backdrop of geopolitical tensions, fears of hard landings and economic "doom loop(s)" are being voiced ever louder.

The CEPII's *EQCHANGE* annual assessment 2022 presents estimates of equilibrium exchange rates and corresponding currency misalignments for the year 2021. It draws on information available from the CEPII's *EQCHANGE* database.

Convention:

As used in this publication, the country/economy name, when associated with a term pertaining to the exchange rate level or dynamics —i.e. overvaluation, undervaluation, appreciation, depreciation— refer instead to the country's currency.

This publication was prepared by Carl Grekou. It also benefited from the guidance of Cécile Couharde, Thomas Grjebine and Valérie Mignon.

1. Overview

The present publication, which accompanies the 2022's update of *EQCHANGE*, aims at providing an overview as extensive as possible of the exchange rate misalignments for the year 2021. It also aims at discussing the evolution of exchange rates and currency misalignments between 2020 and 2021 as well as their underlying factors, hence identifying global patterns and monitoring —global— imbalances.

This publication is organized as follows. Section 2 briefly overviews the configuration of the currency misalignments in 2021 as well as the changes that occurred between 2020 and 2021. Section 3 discusses in greater depth the case of 35 major economies. In Section 4, we provide regional outlooks.

Box 1 — EQCHANGE: objectives and approach

Concerns about the persistence of relatively large macroeconomic imbalances have refocused real exchange rate distortions at the core of international debates. However, despite their importance, publicly available data regarding these distortions are very scarce and limited in terms of country and time coverage. In order to fill this gap, the CEPII has developed *EQCHANGE*, a database covering a large sample of countries (187 in the largest sample).

EQCHANGE is a global database of indicators on effective exchange rates. It includes two sub-databases containing data on *(i)* nominal and real effective exchange rates (both levels and indices data computed using different weighting schemes), and *(ii)* equilibrium real effective exchange rates and corresponding currency misalignments for advanced, emerging and developing countries.

The substantial enhancements —compared to existing databases— introduced by *EQCHANGE* cover both sub-databases. Regarding the first sub-database, *EQCHANGE* provides not only the largest coverage (both temporal and spatial), but also different measures grouped in two categories: *(i)* indices including nominal and real effectives exchange rate indices, and *(ii)* levels consisting of multilateral price levels data. The second sub-database itself constitutes a major contribution by providing estimates of currency misalignments based on different approaches —including the Behavioral Equilibrium Exchange Rate (BEER) approach used for this publication.

The BEER approach. The BEER approach is a good alternative to PPP-based measures or normative approaches —such as the Fundamental Equilibrium Exchange Rate approach. Indeed, one of the difficulties when computing equilibrium exchange rates is to identify the long-run equilibrium paths of the economies. The BEER approach here appears more pragmatic as it does not require to estimate or to make assumptions on the long-run values of the economic fundamentals.[1] Instead, the BEER approach consists in directly assessing the equilibrium level of real exchange rates through the estimation of a long-run relationship between the real exchange rates and their fundamentals. We obtain currency misalignments by computing the difference between the real effective exchange rate and its fitted value from the long run relationship. See Couharde et al. (2018)[2] for further details.

[1] We do not postulate that the BEER methodology achieves superior performance against other approaches. On the contrary, all the approaches are rather complementary.

[2] Couharde, C., Delatte, A.-L., Grekou, C., Mignon, V., Morvillier, F., (2018), "EQCHANGE: A world database on actual and equilibrium effective exchange rates", *International Economics*, Vol. 156, p.p. 206-230.

Box 2 — EQCHANGE: vintage 2022

Since its inception, the *EQCHANGE* database is updated every year and these updates are accompanied by a number of new features aiming to reinforce the interest and comprehensiveness of the database. Recently, *EQCHANGE* was amended with the *MULTIPRIL* subdatabase providing price levels-based measures (see Box 3).

The 2022's version of *EQCHANGE* therefore includes —both levels-based and indices-based— data on *(i)* effective exchange rates (monthly, quarterly and yearly frequency in the case of indices) and on *(ii)* equilibrium real effective exchange rates and corresponding currency misalignments.

Regarding the sub-database on equilibrium real effective exchange rates and currency misalignments, we consider five fundamentals (see below). However, due to a too high uncertainty regarding the assessments of equilibrium exchange rates for a number of countries, this update only covers 151 countries (territories). Countries (territories) included are: Albania, Algeria, Angola, Antigua & Barbuda, Armenia, Australia, Austria, Bahrain, Bangladesh, Barbados, Belarus, Belgium, Belize, Benin, Bhutan, Bolivia, Bosnia & Herzegovina, Brazil, Brunei, Bulgaria, Burkina Faso, Burundi, Cabo Verde, Cambodia, Cameroon, Canada, Cayman Islands, Central African Rep., Chad, Chile, China, Colombia, Comoros, Congo, Congo D.R., Costa Rica, Croatia, Cyprus, Czechia, Côte d'Ivoire, Denmark, Djibouti, Dominica, Dominican Rep., Ecuador, Egypt, Equatorial Guinea, Estonia, eSwatini, Ethiopia, Fiji, Finland, France, Gabon, Gambia, Georgia, Germany, Ghana, Greece, Grenada, Guatemala, Guinea-Bissau, Guyana, Haiti, Honduras, Hong Kong, Hungary, Iceland, India, Indonesia, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kiribati, Kuwait, Kyrgyzstan, Laos, Latvia, Lesotho, Lithuania, Luxembourg, Macedonia, Madagascar, Malaysia, Mali, Malta, Mauritius, Mexico, Moldova, Mongolia, Montenegro, Morocco, Namibia, Nepal, Netherlands, New Zealand, Niger, Nigeria, Norway, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Romania, Russia, Rwanda, Samoa, Saudi Arabia, Senegal, Serbia, Seychelles, Sierra Leone, Singapore, Slovakia, Slovenia, Solomon Islands, South Africa, South Korea, Spain, Sri Lanka, Sweden, Switzerland, São Tomé & Principe, Tajikistan, Tanzania, Thailand, Togo, Trinidad & Tobago, Tunisia, Turkey, Turkmenistan, Uganda, Ukraine, United Arab Emirates, United Kingdom, United States, Uruguay, Vanuatu, Vietnam, Zambia.

Finally, data on equilibrium exchange rates and currency misalignments available from *EQCHANGE* correspond to averages over all the models and estimation samples. Accordingly, standard errors are also provided.

The data used in this publication:

This publication draws on data available from the latest version of *EQCHANGE*. As a result of the inclusion of two new fundamentals, the assessments of the equilibrium exchange rates and currency misalignments were based on five models, each model augmenting the previous with an additional fundamental as specified below:

$$reer_{i,t} = \underbrace{\mu_i + \beta_1 BS_{i,t}}_{Model\ 1} + \underbrace{\beta_2 nfa_{i,t}}_{Model\ 2} + \underbrace{\beta_3 tot_{i,t}}_{Model\ 3} + \underbrace{\beta_4 gov_{i,t}}_{Model\ 4} + \underbrace{\beta_5 open_{i,t}}_{Model\ 5} + \varepsilon_{i,t} \quad \text{(Box Eq. 2.1)}$$

- *REER*: the real effective exchange rate is computed using nominal bilateral exchange rates and the Consumer Price Index from the International Monetary Fund (International Financial Statistics). The trade weights are computed *vis-à-vis* 186 trade partners over the 1973-2018 period.
- *BS*: the Balassa-Samuelson effect is proxied by the different proxies. See the *RPROD* database.
- *NFA*: the net foreign asset positions | Lane and Milesi-Ferretti database and updated using data on the current account balances from IMF (World Economic Outlook database).
- *TOT*: the terms of trade | United Nations Conference on Trade and Development database.
- *GOV*: the government spending | World Development Indicators database (World Bank).
- *OPEN*: the trade openness | World Development Indicators database.

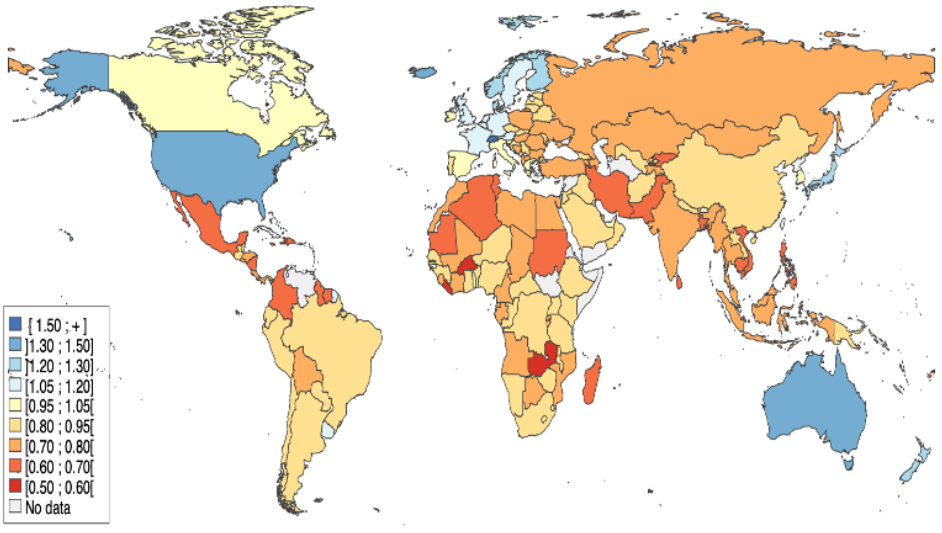
Box 3 — MULTIPRIL: a database on multilateral price levels and currency misalignments*

Initially covering a sample of 178 countries over the 1990-2018 period, the *MULTIPRIL* database has been extended to widen the coverage and more importantly the temporal coverage. While providing so far Multilateral Price Levels (*MPL*, the geometric weighted average of its bilateral relative prices relative to its trading partners; see equation B.3.1) based on the World Bank *World Development Indicators* (WDI) data on prices, the new version gathers different data sources to cover the period 1973 onwards. Specific *MPL* series are computed from each of the considered sources: WDI, Penn World Tables (6.1, 6.2, 6.3, 7.0, 7.1, 8.0, 8.1, 9.0, 9.1 and 10.0).

$$MPL_{i,t} = \prod_{j=1}^{N} \left(\frac{PL_{i.US,t}}{PL_{j.US,t}} \right)^{w_{ij,t}} \qquad \text{(Box Eq. 3.1)}$$

where $\frac{PL_{i,US,t}}{PL_{j,US,t}}$ is the price level of country i relative to the trading partner j in period t; $PL_{i,US,t}$ and $PL_{j,US,t}$ are respectively the price levels of country i and country j relative to the US; N denotes the number of trading partners, and $w_{ij,t}$ is the trade-based weight associated to the partner j.[1] Defined this way, *MPL* corresponds to the level of the real effective exchange rate of country i against its N trading partners. Thus, a value of, for instance 1.2 indicates that prices in country i are on average twenty percent higher than in its trading partners—at date t.

While the *MPL* series actually reproduce stylized facts noted with the traditional relative price to the US —e.g. a positive relationship between the price level and the development level—, they also offer a different vision of relative prices and price-competitiveness around the world since the *MPL* series have almost always been higher than bilateral price levels (further details in Couharde et al., 2020).[2]. The *MULTIPRIL* database also contains *MPL*-based currency misalignments series. By focusing on price *level* data, it usefully complements the *EQCHANGE* database on equilibrium exchange rates and currency misalignments derived from series in *indices*. Its multilateral setting also provides a more comprehensive picture of relative price levels and currency misalignments compared to existing bilateral measures.



Box Figure 3.1 — Global distribution of multilateral price levels in 2020

[1] For the sake of homogeneity, the trade-weighting schemes are similar to those used in the EQCHANGE database (see Couharde et al., 2018, for further details) —i.e. computed *vis-à-vis* two sets of trading partners (the top 30 and 180 —if data permit) according to three different trade-weighting schemes.

[2] Couharde, C., Grekou, C., Mignon, V., (2020), "*MULTIPRIL*, a new database on multilateral price levels and currency misalignments", CEPII Working Paper N°2020-12.

* The *MULTIPRIL* database is embedded in the *EQCHANGE* database (Free Access).

2. The global configuration of currency misalignments

Figures 1 maps out the exchange rate misalignments for the year 2021, the most recent year for which data are available.[1] As visible, it reveals diversified situations but most importantly, a relative stability amid the Covid-19 pandemic (between 2020 and 2021). Again, developing countries (DCs) and emerging economies (EMEs) displayed the largest currency misalignments. Currency misalignments also appear to be geographically concentrated. Africa is the region where undervaluations are the highest and more prevalent, with Swaziland, Algeria and Tanzania heading the list. As the majority of African countries, most of the Asian economies as well as the Near and Middle East countries have undervalued currencies. Among European countries, undervaluations mostly prevailed in Germany, Ireland, the Netherlands, Norway, Sweden and the United Kingdom.

Overvaluations, contrary to undervaluations, are more scattered. Nonetheless, one can note clusters of relatively few countries particularly in South-East Asia and in Europe. Among advanced economies, only few countries such as New Zealand, Switzerland and the United States remain overvalued.

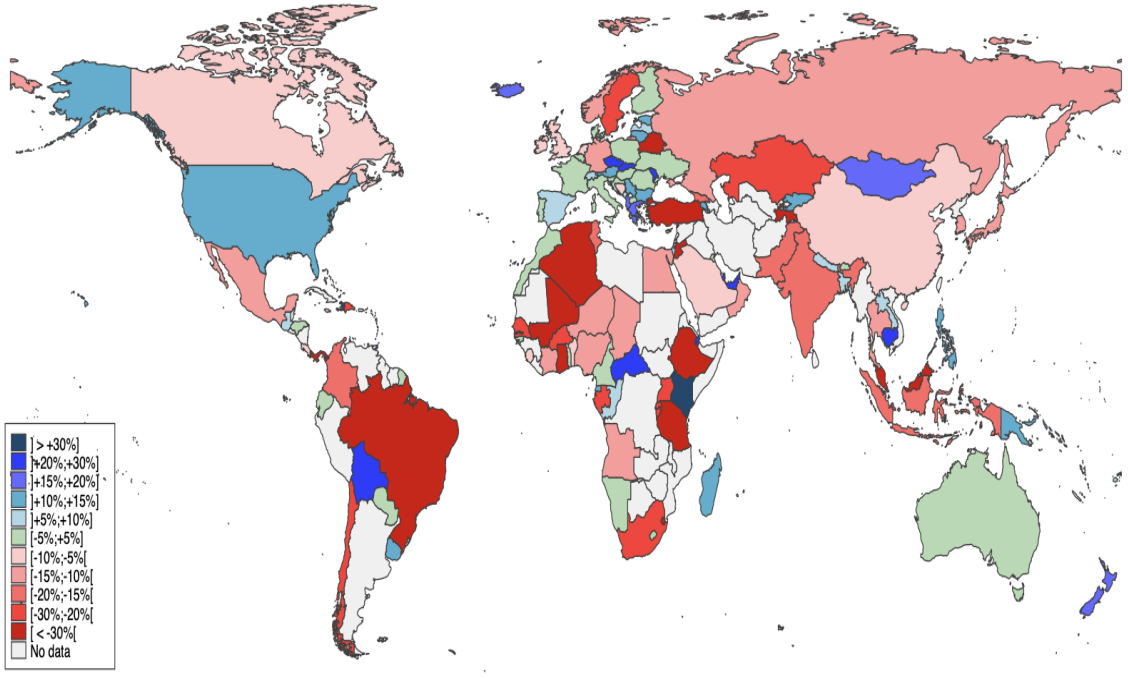


Figure 1 — Currency misalignments in 2021

Source: *EQCHANGE* (CEPII). Data correspond to the averages of estimates over the different models and weighting systems (vis-à-vis 186 trade partners).

[1] Table A.1 in Appendix A reports the averages and standard deviations of estimated misalignments across the different types of specifications and for each country of the sample.

Overall, the year 2021, as noted above, was marked by minor changes that left broadly unchanged the global configuration of currency misalignments despite the shock caused by the pandemic. These changes are characterized in Figure 2. The left chart plots the distribution of the changes in currency misalignments during this period while the right chart depicts the distributions of the currency misalignments for 2020 and 2021. As can be seen, the distribution of the changes in currency misalignments appear slightly skewed to the right with around 75% of the changes falling in the -/+5 percentage points interval. The relative stability of the misalignments between 2020 and 2021 —notwithstanding the slight left shift— is also confirmed by the right chart that overlays the distribution of currency misalignments for the two years.

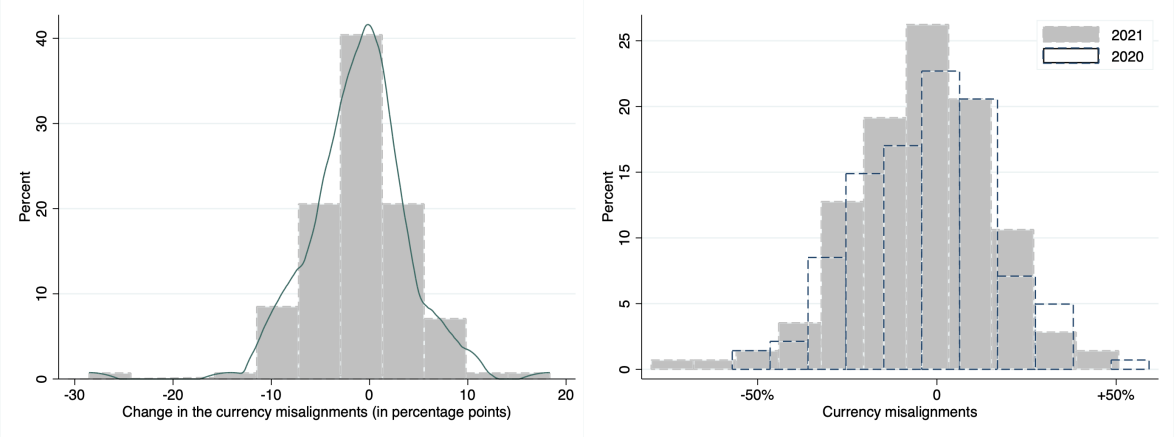


Figure 2 — Distributions of the changes in currency misalignments and the currency misalignments

Notes: The left chart depicts the distribution of the change in the currency misalignments between 2021 and 2020 (the solid line represents the kernel density). The right chart plots the distribution of the currency misalignments for 2021 (gray bars) and 2020 (dashed blue bars).
Source: *EQCHANGE* (CEPII)

The global configuration of the currency misalignments noted hitherto, however, hides some disparities across countries and regions, as can be seen in Figure 3. Notwithstanding few countries displaying upward movements in their currency misalignments (e.g., Chile, Mexico), Latin America appears to be the most homogenous region in terms of dynamics with countries experiencing downward movements in their misalignments between 2020 and 2021. This is also the case for most Eastern European countries. In Africa however, the situation was quite heterogenous with Southern and a number of Western African countries having registered upward movements in contrast with the others. Similarly, changes in Asia and Europe were also heterogenous —both in amplitudes and dynamics.

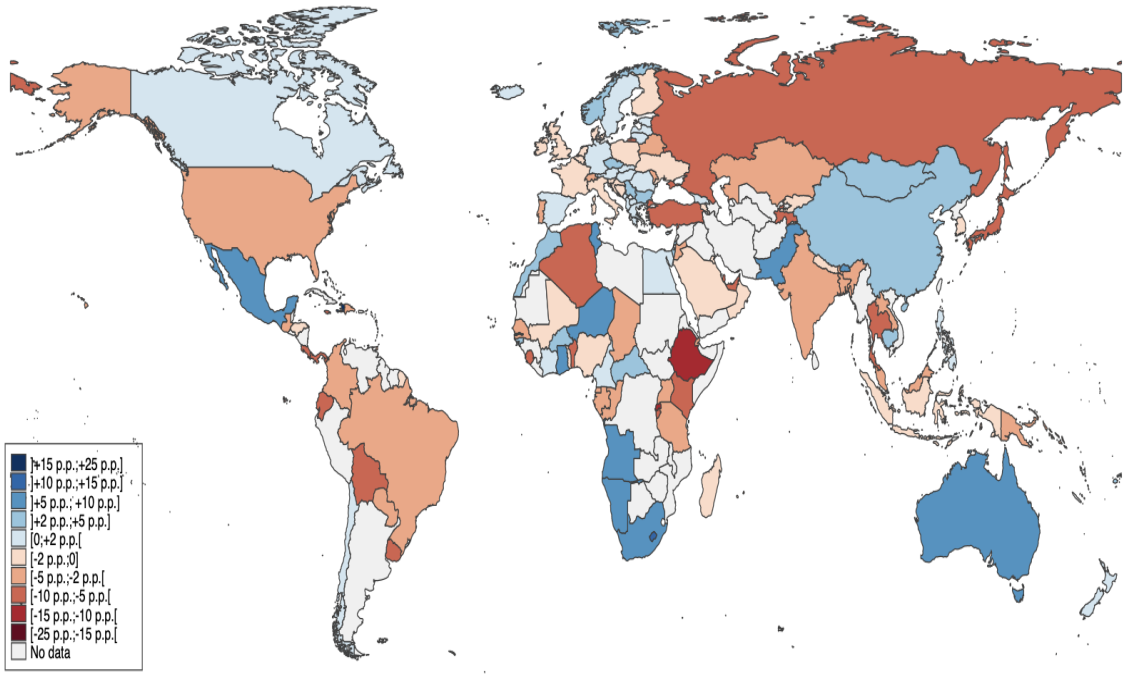


Figure 3 — Changes in currency misalignments between 2020 and 2021

Note: Data correspond to changes (in percentage point) in the averages of estimates over the different models and weighting systems (vis-à-vis 186 trade partners). The green (resp. red) color indicates a reduction (resp. an increase) in the misalignments (in absolute values), the shades reflecting the amplitude of the changes.
Source: *EQCHANGE* (CEPII)

Box 4 — Currency misalignments in 2021: key points

• One year after the major shock that represented the Covid-19 pandemic, the global configuration of currency misalignments between 2020 and 2021 has shown a relative stability;

• Developing countries (DCs) and emerging economies (EMEs) again exhibited the most important currency misalignments;

• The US dollar registered a moderate decrease of its overvaluation; the Chinese renminbi has experienced an upward movement that slightly eroded its undervaluation and aligned it with its fundamental value; the Japanese yen underwent the opposite direction and moved from a slight to considerable undervaluation;

• The euro area is featured with various situations: Germany, Ireland and the Netherlands displayed undervaluations; Belgium, Finland, France, Italy, Luxembourg, Portugal and Spain were rather close to their equilibrium; Austria and Greece displayed overvaluations;

• Europe is also characterized by a considerable heterogeneity with undervaluations prevailing in Northern countries (Norway, Sweden), overvaluations in Eastern and South Eastern countries and scattered cases of currencies in line (e.g., Poland, the United Kingdom);

• Movements in the EMEs were very heterogenous; the Turkish lira continued to fall hence increasing its undervaluation; the Brazilian real continued to depreciate and slightly increased its undervaluation; the Korean won and the Indian rupee remained stable and maintained their undervaluations; most emerging economies and particularly in South-East Asia experienced downward movements (reduction in overvaluations/ increase of undervaluations).

3. The misalignments of the major currencies/economies

The aim of this section is to document the currency misalignments for a set of 35 economies, their evolutions and their underlying factors between 2020 and 2021. The considered economies are: Australia, Austria, Belgium, Brazil, Canada, China, Denmark, France, Germany, Greece, Hong Kong, India, Indonesia, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Malaysia, Mexico, the Netherlands, New Zealand, Norway, Portugal, Russia, Singapore, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, the United Kingdom and the United States.

3.1. The misalignments

The exchange rate misalignment estimates for 2021 are represented in Figure 4. Table 1 gives our assessments of these estimates for each of the countries. The assessments for 2020 are also reported to illustrate the dynamics of the misalignments.

Over our 35 economies, 6 countries display overvaluations higher than 5% while 19 countries exhibit undervaluations higher than 5% —i.e., below -5%. The remaining 10 countries lie within the -/+5% interval suggesting that these countries are in line with their fundamentals, i.e., at their equilibrium value —see countries in green in Table 1. This is the case for Australia, Belgium, Denmark, France, Italy, Luxembourg and Spain that maintain themselves in this group, but also for China, Hong Kong, Italy and Portugal entering the group.

Overvalued currencies were actually spread between the first two categories. The first, moderate overvaluations (within the 5%-10% interval), consists of Israel and Switzerland. The second, intermediate overvaluations (10%-15% interval), includes Austria, Greece, New Zealand and the United States. Greece again appeared as the most overvalued currency within this group. The United States, among the most overvalued currencies in previous assessments, registered a slight downward movement that positioned the US dollar at the border of the moderate overvaluations group.

Turning to undervalued currencies, countries fell within the different groups. The moderate undervaluations group is composed of Canada, Ireland, the Netherlands, Singapore and the United Kingdom. Compared to 2020, Canada and Singapore are new entrants in this group. Germany, Japan, Korea, Mexico, Norway, Russia and Thailand form the intermediate undervaluations group in 2021. The last group —"large undervaluations"— is composed of Brazil, India, Indonesia, Malaysia, South Africa, Sweden and Turkey.

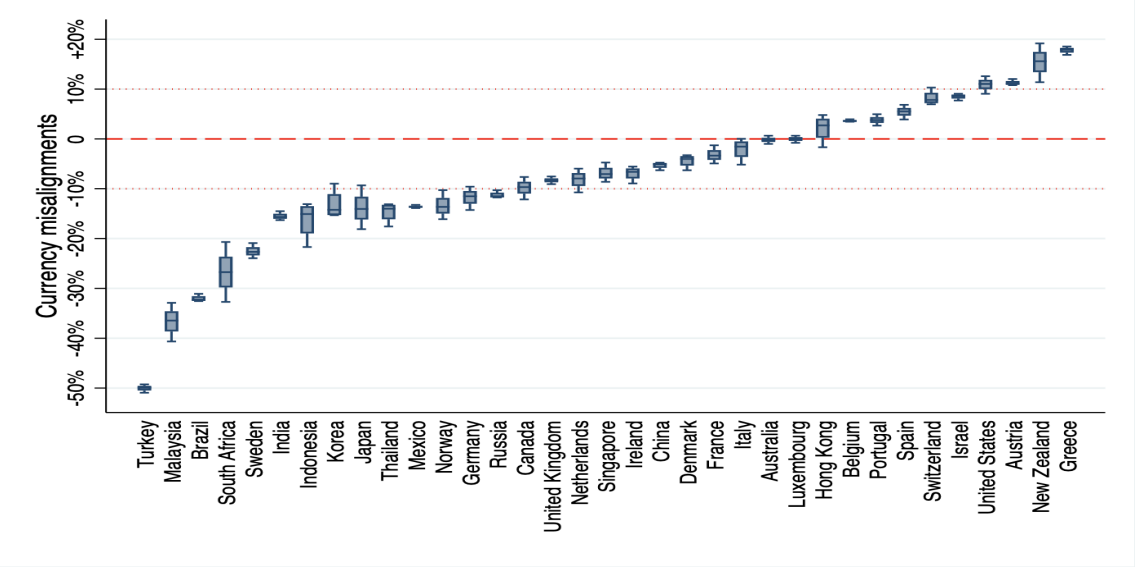
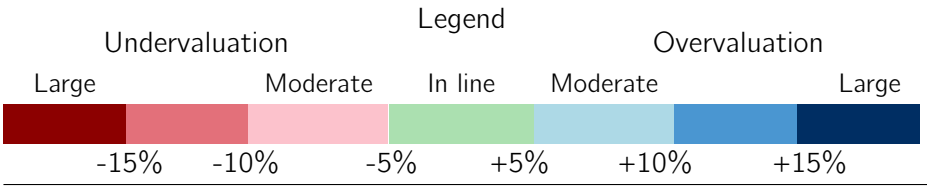


Figure 4 — Currency misalignment in 2021 (estimations range)

Note: Data are from *EQCHANGE* (CEPII). The red dot lines indicate the +10% and -10% levels.

Table 1 — Currency misalignments assessment

Country	Assessment 2020	Assessment 2021	Country	Assessment 2020	Assessment 2021
Australia			Luxembourg		
Austria			Malaysia		
Belgium			Mexico		
Brazil			Netherlands		
Canada			New Zealand		
China			Norway		
Denmark			Portugal		
France			Russia		
Germany			Singapore		
Greece			South Africa		
Hong Kong			Spain		
India			Sweden		
Indonesia			Switzerland		
Ireland			Thailand		
Israel			Turkey		
Italy			United Kingdom		
Japan			United States		
Korea					



Note: The proposed categorization is based on the average of country's misalignments, taking into account the standard deviation.

3.2. Evolutions during 2021 and the driving factors

Changes during 2021 have generally been modest. As a consequence, the pattern of currency misalignments in 2021 for the 35 considered economies is close to the one identified in 2020. Figure 5 supports this point, i.e., the existence of a certain inertia in the currency misalignments —most countries being very close to the 45-degree line.

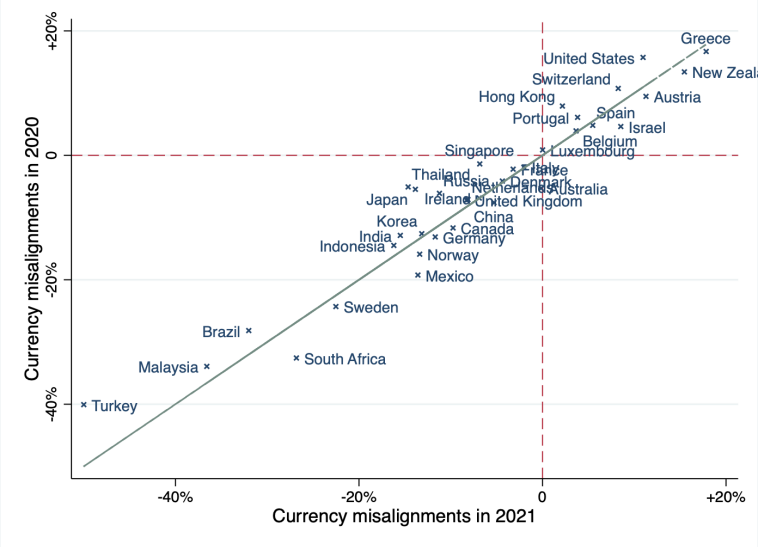


Figure 5 — Currency misalignments in 2021 and 2020
Note: The dashed green line represents the 45-degree line.
Source: *EQCHANGE* (CEPII)

Factors that shaped the evolutions of currency misalignments between 2020 and 2021 are multiple. Policy implications about changes in misalignments can be drawn on a number of grounds, including the magnitude of these variations (small or large), the direction of these changes (improvement or worsening) and finally the roots of these evolutions (depending on whether they come from an improvement in fundamentals or an adjustment in the real effective exchange rate which is likely to be more temporary). In this respect, Figure 6 initiates the identification process of the underlying factors. Indeed, we plotted the changes in the estimated equilibrium exchange rates (ERER) and the changes in the real effective exchange rates (REER) —as well as the changes in the average currency misalignments in the left panel (see Box 5 for the definition of these various concepts). Hence, Figure 6 aims at illustrating the extent to which the evolutions of the currency misalignments have been related to variations in the real effective exchange rates and/or in the equilibrium real exchange rates.

Box 5 — Concepts and definitions

Nominal and real effective exchange rates (2010=100)

An effective exchange rate measures the rate at which a country's currency exchanges against a basket of other currencies, in either nominal or real terms.

The nominal effective exchange rate of country i in period t ($NEER_{i,t}$) measures the value of the currency of country i against a weighted average of foreign currencies:

$$NEER_{i,t} = \prod_{j=1}^{N} NER_{ij,t}^{w_{ij,t}} \quad \text{(Box Eq. 5.1)}$$

where $NER_{ij,t}$ is the index of the nominal bilateral exchange rate between the currency of country i and the currency of its trade partner j in period t, N denotes the number of trading partners and $w_{ij,t}$ is the trade-based weight associated to the partner j. These weights are normalized so that their sum is equal to one, i.e. $\sum_{j=1}^{N} w_{ij,t} = 1$ (see Couharde et al., 2018).

The real effective exchange rate of country i in period t ($REER_{i,t}$) is calculated as the weighted average of real bilateral exchange rates against each of its N trading partners j:

$$REER_{i,t} = \prod_{j=1}^{N} RER_{ij,t}^{w_{ij,t}} \quad \text{(Box Eq. 5.2)}$$

where $RER_{ij,t} = \frac{NER_{ij,t}P_{i,t}}{P_{j,t}}$ is an index of the real exchange rate of the currency of the country i *vis-à-vis* the currency of the trading partner j in period t. $P_{i,t}$ and $P_{j,t}$ stand respectively for the price index of country i and of country j.

With these definitions, an increase in the real (nominal) effective exchange rate index corresponds to a real (nominal) appreciation of the domestic currency.

Equilibrium real effective exchange rates and currency misalignments

The equilibrium exchange rate series correspond to the average of the estimated equilibrium real exchange rates ($ERER$) over different models and samples (see Box 1). The $ERER$ series therefore correspond to the equilibrium levels of the exchange rates suggested by the fundamentals of the economies, i.e. the fitted values from the models — an increase reflecting an overall improvement in the fundamentals. Thus, the $ERER$ serves as a summary variable for the economies' performances but also as the benchmark for the $REER$. This benchmark level is used to derive the extent of the currency misalignments. There are calculated by doing the log-difference between the actual real effective exchange rate ($reer_{i,t}$) and its estimated equilibrium level ($erer_{i,t}$) at date t.

$$Mis_{i,t} = reer_{i,t} - erer_{i,t} \quad \text{(Box Eq. 5.3)}$$

The misalignments' values then give the magnitude of the real exchange rate adjustment that would restore equilibrium. Given the definition of the real effective exchange rate, a negative sign of the misalignment ($reer_{i,t} < erer_{i,t}$) indicates an undervaluation (the real exchange rate must appreciate to converge towards its long-run equilibrium value), whereas a positive sign ($reer_{i,t} > erer_{i,t}$) indicates an overvaluation of the real effective exchange rate (the real exchange rate must depreciate to converge towards its long-run equilibrium value).

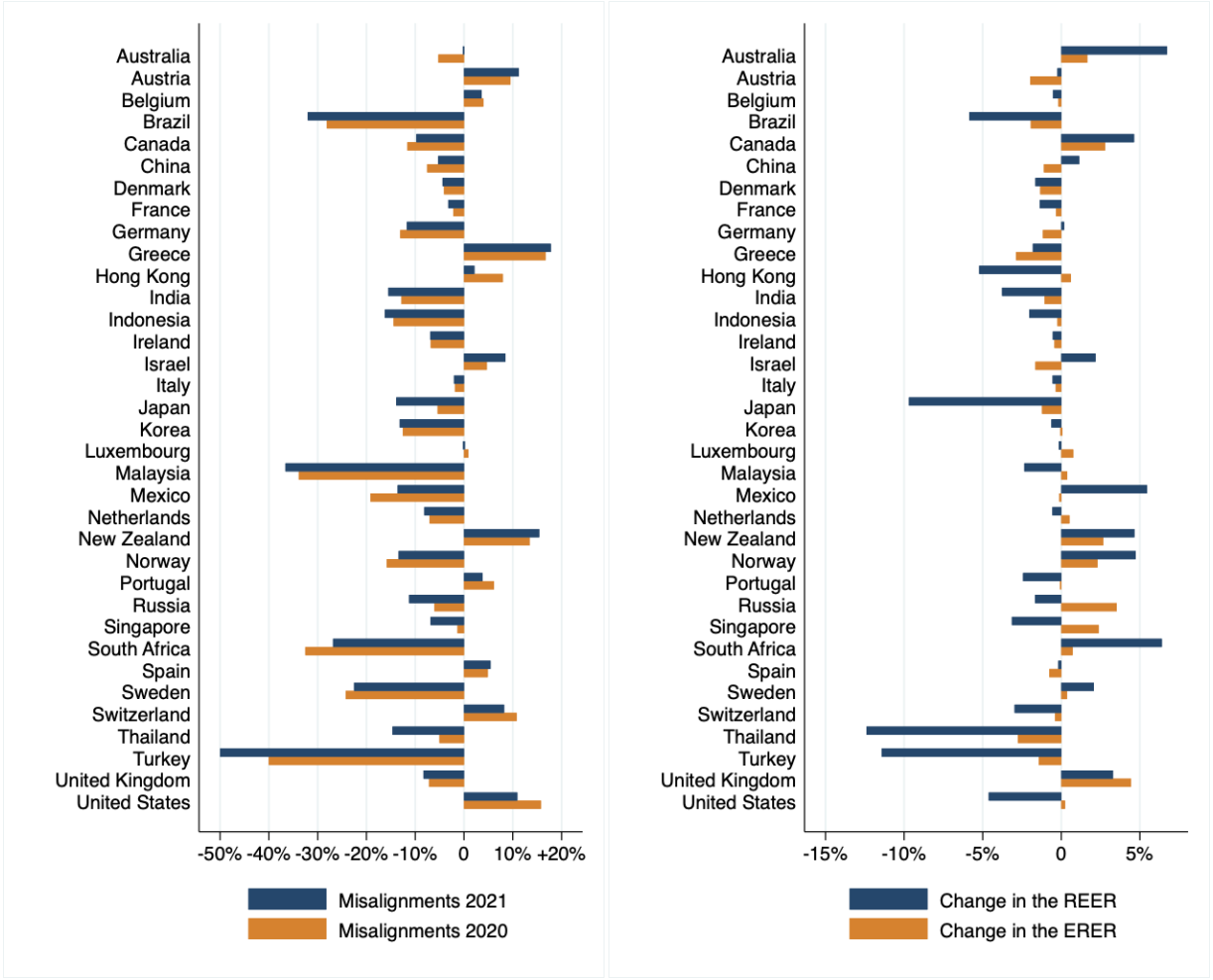


Figure 6 — The misalignments and the exchange rates' dynamics (percent change)

Note: The left chart displays the average of the estimated currency misalignments. In the right chart, we plot the percentage changes —between 2020 and 2021— in the Real Effective Exchange Rates (REER) and in the estimated Equilibrium Real Exchange Rates (ERER). A positive sign in both measures indicates an appreciation.

Source: EQCHANGE (CEPII)

One year after the initial shock and still amid the Covid-19 pandemic, exchange rates in major economies remained surprisingly stable. Indeed, except Australia, Brazil, Hong Kong, Japan, Mexico, South Africa, Thailand and Turkey, changes in the REER were modest and contained within the -/+5% interval. Changes in the ERER were even of smaller amplitudes.

As visible in the left panel, Turkey is by far the economy that registered the most important change in its misalignments. The lira's undervaluation actually increased by 10 p.p. (percentage points) and settled around -50% in 2021. As previous years, the change in the Turkish undervaluation has been mainly driven by the fall of the REER, originating itself from the continued fall of the lira vis-à-vis the US dollar (see Figure 7). It is worth noting that the increase in the undervaluation has been rather limited to the extent that the depreciation in the REER was of only -11.4%

due to the countering effect of inflation (the lira depreciated 23.3% vis-à-vis the US dollar). Turkey is closely followed by Thailand and Japan who display changes of similar importance also driven by the REER depreciations that increased significantly the extent of the undervaluations. The picture is the same for other countries with the most important changes in the misalignments (i.e., Australia, Brazil, Hong Kong, Mexico and South Africa).

As aforementioned, changes in the ERER are of different magnitudes, principally ranging from -2% to +2%. Very few countries exhibited changes in the ERER outside this interval. On the one hand, Greece, followed by Thailand, registered the most important equilibrium exchange rate depreciation — -2.9% and -2.7% respectively. In the Greek case, the depreciation of the ERER is mainly explained by the deterioration of the net foreign asset position (i.e., current account deficit) while for Thailand it was a combination of both lower relative GDP growth and current account deficit. At the other end of the spectrum, Canada, New Zealand, Norway, Russia, Singapore and the United Kingdom registered the highest improvement in the equilibrium exchange rates. The United Kingdom and Russia top the list with improvement of 4.4% and 3.5%, respectively.

In the euro area, countries experienced different movements in their currency misalignments, although marginal. Portugal displayed the largest changes in the currency misalignments, 2.3 percentage points (p.p.) decrease from 2020 to 2021 that led to a 3.8% overvaluation. The Netherlands and France follow behind with 1 p.p. increase in the misalignments (increase of the undervaluation). In all these cases, the currency misalignments dynamics have been shaped by the REER depreciations. In contrast, Austria and Germany registered the most important upward movements in the currency misalignments almost entirely related to the equilibrium exchange rate dynamics. The ERER depreciations actually led to a 1.7 p.p. increase of the Austrian overvaluation and a 1.3 p.p. reduction of the German undervaluation. Except Greece that also registered a slight increase of its overvaluation, the other considered euro area countries have shown very negligible changes.

The United States, owing to the depreciation of its REER, registered a 4.9 p.p. decrease of its overvaluation. In 2021, the US overvaluation settled around 11%. The depreciation of the REER also explains the decrease of the overvaluations of Hong Kong (-5.9 p.p.) and the increase of the undervaluations of Mexico and South Africa —5.6 p.p. and 5.4 p.p., respectively. In China, the mild appreciation of the REER was accompanied by a deterioration of the equilibrium exchange rate of the same extent and resulted in a reduction of the undervaluation of 2.4 p.p, almost

shifting China from the "moderate undervaluations group" to the "broadly in line currencies group".

In the continuity of Figure 6, Figure 7 focuses on the sources underlying the REER movements. We plotted, in the left chart, the changes in the NEER (Nominal Effective Exchange Rate) and in the NER (Nominal Exchange Rate vis-à-vis the US dollar) and, in the right chart, the changes in the REER against the changes in the NEER. The left chart hence addresses the issue of the effect of the NER —and of the trade structure— while the right chart investigates that of the inflation differential vis-à-vis the trade partners.

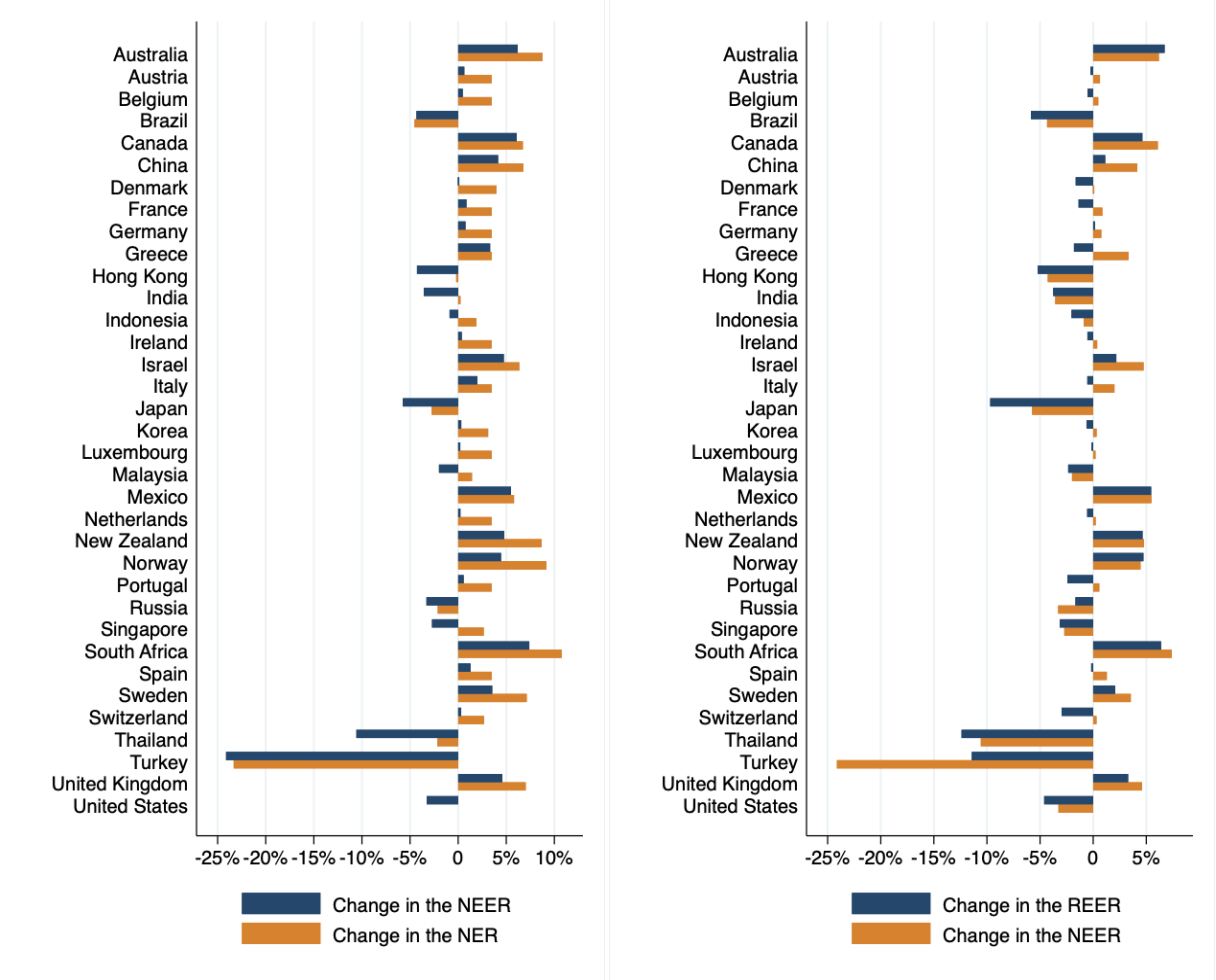


Figure 7 — Exchange rate variations (2020-2021)

Note: "*REER*" (resp. "*NEER*") stands for the Real (resp. Nominal) Effective Exchange Rates; "*NER*" stands for the Nominal bilateral Exchange Rate (*vis-à-vis* the US dollar). A positive sign indicates an appreciation. Both scale express changes in percentage.
Source: EQCHANGE (CEPII) and IMF

As visible in the left chart, changes in the currencies have been mostly upward (nominal appreciations vis-à-vis the US dollar). Indeed, after the initial flight to safety during 2020 and the associated appreciations, reserves currencies and particularly the

US dollar have depreciated and accordingly other advanced and emerging economy currencies have rebounded. The South African rand displayed the highest rebound with a 10.8% appreciation against the US dollar between 2020 and 2021. Australia, New Zealand and Norway follow behind with appreciations around 9%. In most of these cases, the changes vis-à-vis the US dollar shaped the NEER and REER dynamics. Notable exceptions are the euro area countries which appreciated in nominal terms but depreciated in real terms —except Germany.

However, some currencies depreciated vis-à-vis the US dollar between 2020 and 2021. This has been the case for the Brazilian real, the Japanese yen, the Russian rouble, the Thailand baht and the Turkish lira. As aforementioned, the lira continued its fall against the US dollar by depreciating by 23.3% during 2021, after the 21% drop in 2020. While translating entirely to the NEER, the 17.9% inflation rate during 2021 has eroded the transmission to the REER which only depreciated by 11.4%. In contrast with the Turkish lira, the 4.5% depreciation of the Brazilian real observed during 2021 seemed to indicate a soft landing after the 26.7% depreciation vis-à-vis the US dollar in 2020 — amid concerns related to the resilience of the economy in the Covid-19 pandemic context. While depreciating marginally vis-à-vis the US dollar, the Japanese yen and Thailand baht have registered more important REER drops — -9.7% and -12.4%, respectively.

Overall, changes in the currency misalignments between 2020 and 2021 came principally from the changes in the real effective exchange rates. Indeed, exchange rate movements explain the changes in at least 20 countries. For the other countries, the evolutions of the fundamentals have also been at stake, reinforcing or countering the effects of the exchange rates. Regarding the exchange rates, much of the movements were related to the direct consequences/suites of the pandemic that also had indirect effects by exacerbating existing vulnerabilities especially in EMEs (e.g., Brazil, Turkey).

In Figure 8, we dig a bit further the issue of the changes in the estimated equilibrium exchange rates by investigating the underlying factors. We plotted the change in the Balassa-Samuelson effect proxy —relative GDP per capita in PPP terms— and the changes in the Net Foreign Asset (NFA) position.[2]

[2]Both fundamentals are the main drivers of the equilibrium exchange rates in advanced economies (for further details see Couharde et al. 2018). Figure B.2 in Appendix B shows the changes in the terms of trade.

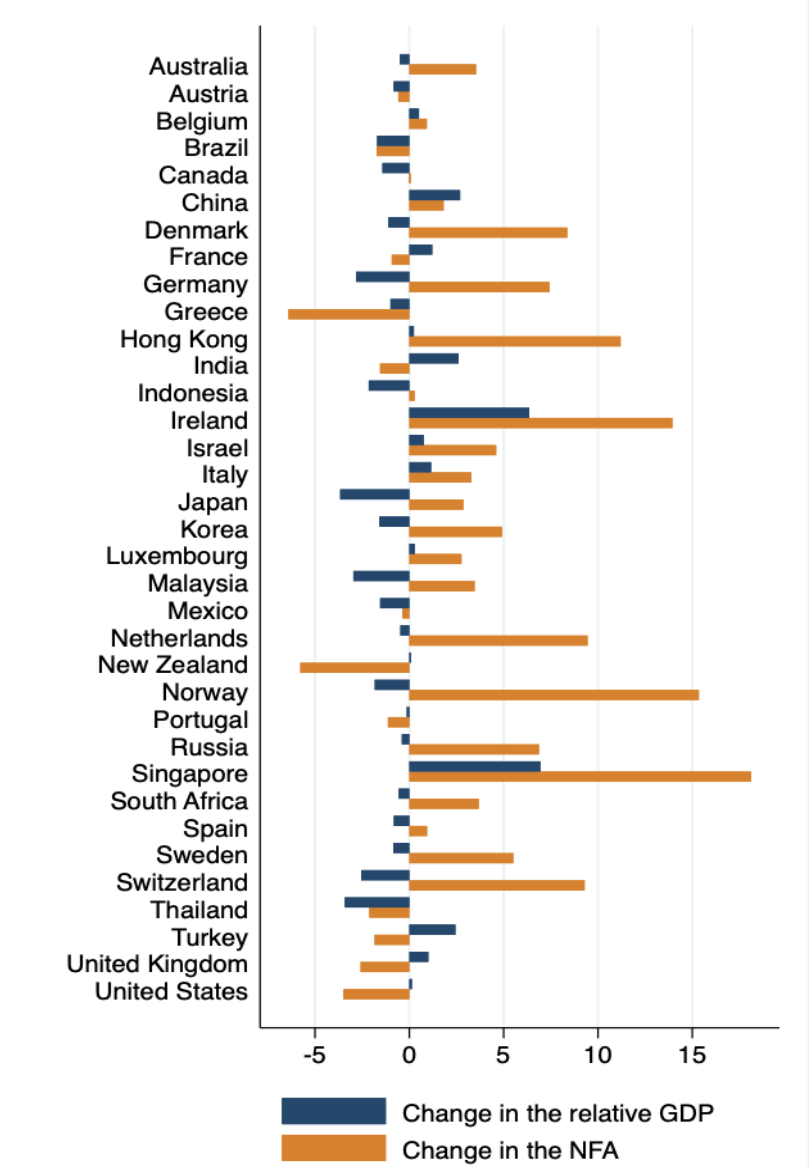


Figure 8 — Changes in the fundamentals: relative *GDP vs. NFA* (2020-2021)

Note: "Change in the relative GDP" corresponds to the change in the GDP per capita of country i relative to the trade partners GDP per capita —both in PPP terms. "NFA" stands for the Net Foreign Asset position (as share of GDP). Changes in the relative GDP are expressed in percentage while those in the NFA are expressed in percentage points.
Source: EQCHANGE (CEPII)

In contrast with the resulting ERER (estimated Equilibrium Real Exchange Rates), the changes in the fundamentals and especially the net foreign asset position (NFA) during 2021 were quite significant.[3] Indeed, countries like Denmark, Germany, Hong Kong, the Netherlands, Norway, Russia, Singapore, Sweden and Switzerland display the most important improvements in their net foreign asset position (more than +5 percentage points). These improvements were, as visible in Figure B.4 in Appendix B, mainly driven by the large trade surpluses registered during 2021. In general, and

[3]Accordingly, the weak changes noted for the ERER are mostly explained by the opposed dynamics in the fundamentals.

in contrast with previous years, most countries actually registered an improvement in their net foreign assets position. However, at the other end, Greece followed by New Zealand, Thailand, Turkey, the United Kingdom and the United States, have seen a deterioration of their positions —owing principally to their trade deficits that drove their current account deficits.

Looking at the relative GDP give somewhat the opposed picture. Indeed, most countries appears to have suffered from the lingering effects of the crisis as they displayed negative relative GDP growth. Singapore and Ireland are the two countries that registered the largest increase in their GDP relative to trading partners —6.9% and 6.3% respectively. Within the euro area, the Covid-19 pandemic had uneven growth impacts. On the one hand, Germany, Greece and Austria —and to a smaller extent the Netherlands— have registered a fall in their relative GDP. Germany is the country that registered the most important fall, -2.8%, followed by Greece, -1%. Excluding Ireland, France and Italy displayed the highest increase in their relative GDP (1.2% and 1.1%, respectively). Considering our whole sample of major economies, the worst growth performances were displayed by Japan and Thailand with respectively -3.7% and -3.4% fall in the GDP relative to the trading partners. As a wrap-up —but also to give more insights, Table 2 provides an overview of the different movements that shaped the evolutions of currency misalignments between 2020 and 2021.

Table 2 — Summary of the movements in the major currencies (2020-2021)

	Misalignments		Exchange rates			Equilibrium exchange rates and fundamentals			
	2020	2021	REER	NEER	NER	ERER	Rel. GDP	NFA	TOT
Australia	-5.3	-0.2	6.7	6.2	8.8	1.7	-0.5	3.4	22.1
Austria	9.5	11.2	-0.2	0.6	3.5	-2.0	-0.8	0.3	-2.5
Belgium	4.0	3.6	-0.5	0.5	3.5	-0.2	0.5	0.5	-1.6
Brazil	-28.1	-32.0	-5.9	-4.3	-4.5	-1.9	-1.7	-1.7	13.5
Canada	-11.6	-9.8	4.6	6.1	6.7	2.8	-1.4	0.1	14.7
China	-7.6	-5.3	1.1	4.2	6.8	-1.1	2.7	1.8	-8.8
Denmark	-4.1	-4.4	-1.6	0.1	4.0	-1.3	-1.1	8.2	-3.7
France	-2.2	-3.2	-1.4	0.9	3.5	-0.3	1.2	0.3	-1.6
Germany	-13.1	-11.7	0.2	0.8	3.5	-1.2	-2.8	7.4	-3.0
Greece	16.7	17.8	-1.8	3.3	3.5	-2.9	-1.0	-6.4	-0.4
Hong Kong	8.0	2.1	-5.2	-4.3	-0.2	0.6	0.2	11.3	-0.4
India	-12.8	-15.5	-3.8	-3.6	0.2	-1.1	2.6	-1.1	-11.1
Indonesia	-14.4	-16.2	-2.0	-0.9	1.9	-0.2	-2.2	0.3	2.3
Ireland	-6.8	-6.9	-0.5	0.4	3.5	-0.4	6.4	14.3	-6.7
Israel	4.7	8.5	2.2	4.8	6.4	-1.6	0.8	4.3	-5.7
Italy	-1.9	-2.1	-0.6	2.0	3.5	-0.4	1.2	3.1	-4.9
Japan	-5.4	-13.9	-9.7	-5.8	-2.8	-1.2	-3.7	3.2	-11.6
Korea. Rep.	-12.6	-13.2	-0.6	0.3	3.1	0.0	-1.6	4.9	-2.8

Notes: Entries —excluding the misalignment columns— correspond to the variable's changes between 2020 and 2021 (year average values) expressed in percentage —except changes in NFA which are expressed in percentage points. "REER" (resp. "NEER") stands for Real (resp. Nominal) Effective Exchange Rate; "NER"= Nominal bilateral Exchange Rate vis-à-vis the US dollar; "ERER"=estimated Equilibrium Real Exchange Rate; "Rel. GDP" stands for Relative GDP per capita in PPP terms (our Balassa-Samuelson effect proxy); "NFA"= Net Foreign Asset position; "TOT"= terms of trade.

(Continued on next page)

Table 2 — Summary of the movements in the major currencies (2020-2021; *Continued*)

	Misalignments		Exchange rates			Equilibrium exchange rates and fundamentals			
	2020	2021	REER	NEER	NER	ERER	Rel. GDP	NFA	TOT
Luxembourg	1	0	-0.2	0.2	3.5	0.8	0.3	4.8	2.2
Malaysia	-33.9	-36.6	-2.4	-2.0	1.4	0.4	-3.0	3.8	5.8
Mexico	-19.2	-13.6	5.5	5.5	5.8	-0.1	-1.6	-0.4	0.0
Netherlands	-7.1	-8.2	-0.6	0.2	3.5	0.5	-0.5	7.2	-2.4
New Zealand	13.5	15.4	4.7	4.8	8.7	2.7	0.1	-6.0	1.7
Norway	-15.8	-13.4	4.7	4.5	9.2	2.3	-1.8	14.8	43.1
Portugal	6.1	3.8	-2.4	0.6	3.5	-0.1	-0.1	-1.2	-1.2
Russian Federation	-6.1	-11.3	-1.7	-3.3	-2.1	3.5	-0.4	6.9	25.7
Singapore	-1.3	-6.9	-3.1	-2.7	2.7	2.4	6.9	18.1	2.6
South Africa	-32.5	-26.9	6.4	7.4	10.8	0.7	-0.6	3.7	4.0
Spain	4.9	5.4	-0.2	1.3	3.5	-0.8	-0.8	0.9	-3.2
Sweden	-24.3	-22.5	2.1	3.5	7.1	0.4	-0.9	5.4	0.9
Switzerland	10.8	8.2	-3.0	0.3	2.7	-0.4	-2.6	7.4	-2.9
Thailand	-5.0	-14.7	-12.4	-10.6	-2.2	-2.8	-3.4	-2.1	-0.2
Turkey	-40.0	-50.0	-11.4	-24.1	-23.3	-1.4	2.4	-1.7	-11.7
United Kingdom	-7.2	-8.3	3.3	4.6	7.0	4.4	1.0	-2.0	13.3
United States	15.8	10.9	-4.6	-3.3	0.0	0.2	0.1	-3.7	4.5

Notes: Entries —excluding the misalignment columns— correspond to the variable's changes between 2020 and 2021 (year average values) expressed in percentage —except changes in NFA which are expressed in percentage points. "REER" (resp. "NEER") stands for Real (resp. Nominal) Effective Exchange Rate; "NER"= Nominal bilateral Exchange Rate vis-à-vis the US dollar; "ERER"=estimated Equilibrium Real Exchange Rate; "Rel. GDP" stands for Relative GDP per capita in PPP terms (our Balassa-Samuelson effect proxy); "NFA"= Net Foreign Asset position; "TOT"= terms of trade.

4. Regional outlooks

This section is devoted to an overview of the geographical configuration of currency misalignments in 2021. It also briefly documents the dynamics of these currency misalignments as well as their sources. We relied on the United Nations M49 standard for the country groupings. It covers 138 countries distributed as follows: 38 African countries, 22 for America, 33 Asian countries, 38 countries for Europe and 7 countries for Oceania.

4.1. Africa

Overall, as visible in Figure 9, the configuration of currency misalignments in Africa evolved marginally between 2020 and 2021. Actually, 17 countries (out of 38) registered change in their misalignment greater —or equal— to 5 percentage points.

On the one hand, Algeria, Burundi, Congo D.R., Mauritius, Rwanda and Sierra Leone increased by at least 5 percentage points their misalignments. More specifically, these countries experienced downward movements that resulted in an increase of their undervaluation. Rwanda and Algeria top the list with around 10 p.p. increase in the undervaluations.

On the other hand, for Angola, Comoros, Ghana, Kenya, Lesotho, Niger, Seychelles, South Africa and Tunisia, the misalignments noticeably decreased. The changes between 2020 and 2021 were particularly substantial in Lesotho, Kenya, Ghana, Tunisia Seychelles and Niger were the undervaluations plummeted by 9-10 p.p. For Comoros, South Africa and Angola, the changes ranged from -6 p.p. to -5 p.p.

The right chart of Figure 9 gives more details on the sources of the changes by disentangling the dynamics of the REER and that of the ERER. For all the above countries, the main driver of the misalignment changes was the REER dynamics. Algeria and Tunisia are exception as the evolutions of the currency misalignments resulted from the opposite evolutions —and of rather similar amplitudes— of both the REER and ERER.

The rest of the countries display relatively small changes in their misalignments —i.e., within the -/+5 percentage points range. As noted in Figure 3, changes in Africa were rather balanced with an almost equivalent number of countries experiencing upward and downward movements. Overall, the general picture remained however the same between 2020 and 2021 as the "major" changes that occurred in few countries did not end up with an overturning of the situations.

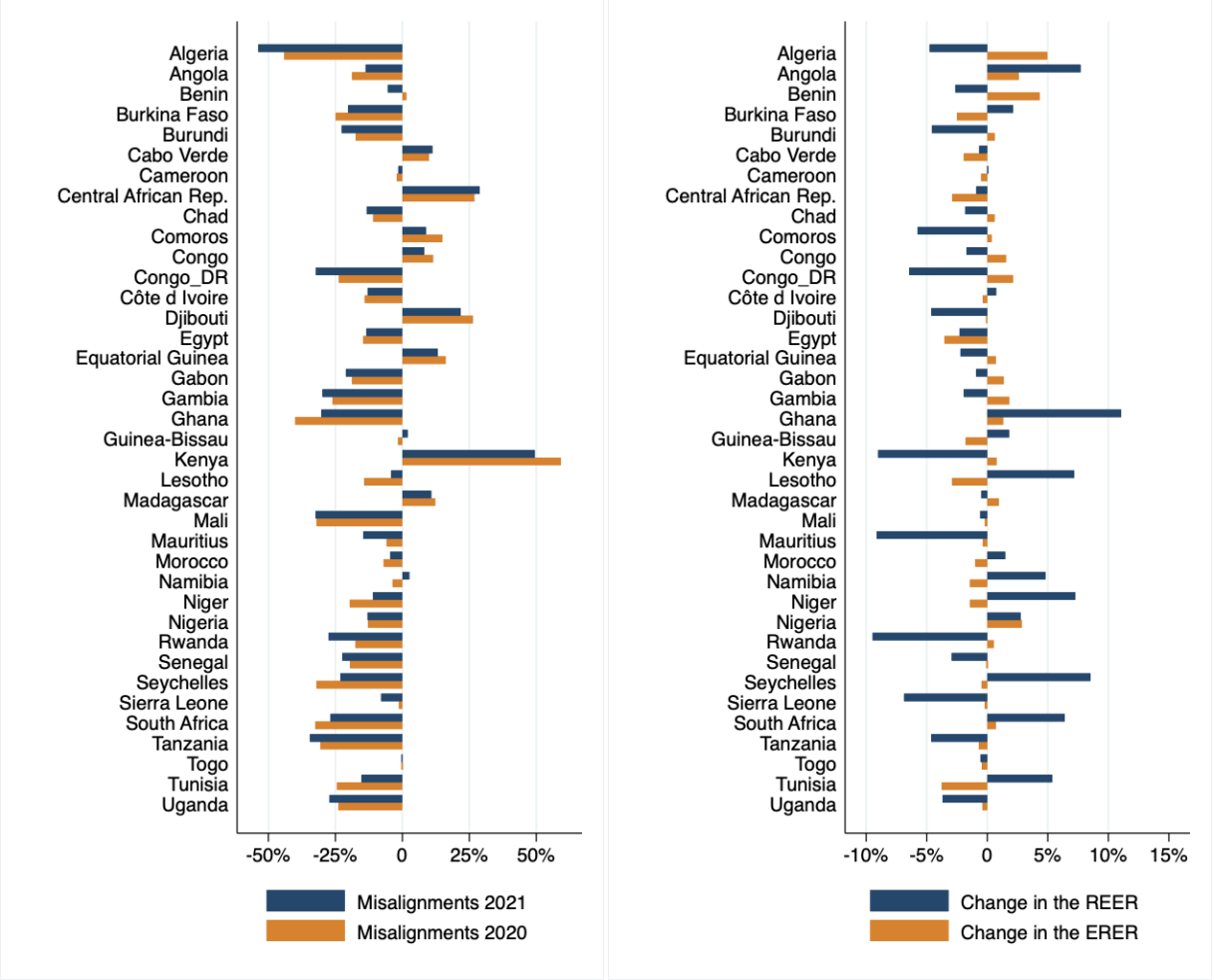


Figure 9 — Africa | Currency misalignments and sources of the changes (2020-2021)

Note: In the left chart, a positive (resp. negative) sign indicates an overvaluation (resp. undervaluations). In the right chart, "REER" (resp. "ERER") stands for the Real Effective (resp. Equilibrium Real Effective) Exchange Rates. A positive sign in both measures indicates an appreciation. Both scale express changes in percentage.
Source: EQCHANGE (CEPII)

4.2. America

In America, the currency misalignment dynamics between 2020 and 2021 have been mostly downward, leading to an increase of undervaluations especially in Latin America and to the decrease of the few overvaluations.

From 2020 to 2021, the US dollar depreciated by around 3% in nominal effective terms and 4.6% in real effective terms. Meanwhile, the change in the ERER has been negligible. As a result, the US dollar has registered a 4.8 percentage points decrease of its overvaluation. In Canada, the level of the currency misalignment in 2021 is broadly unchanged compared to 2020. In fact, Canada has witnessed a very slight reduction of its undervaluation, -1.8 p.p., owing to the 4.6% appreciation of its REER and the 2.7% appreciation of its ERER.

Figure 10 — America | Currency misalignments and sources of the changes (2020-2021)

Note: In the left chart, a positive (resp. negative) sign indicates an overvaluation (resp. undervaluations). In the right chart, "REER" (resp. "ERER") stands for the Real Effective (resp. Equilibrium Real Effective) Exchange Rates. A positive sign in both measures indicates an appreciation. Both scale express changes in percentage.
Source: EQCHANGE (CEPII)

In Latin America, as noted, the changes regarding currency misalignments were generally downward. Excluding Haiti, Ecuador, Costa Rica and Jamaica exhibited the largest changes in their misalignments, a 9-10 p.p. drop. While this move led to a realignment in Ecuador, it shifted away Costa Rica and Jamaica from the broadly in line currencies group to the intermediate undervaluation group. For Brazil, Colombia, Dominica, Dominican Rep. and Panama, undervaluation have increased by 2.5 p.p. to 5 p.p. Again, the REER dynamics have been the main driver of such changes except in Colombia where the ERER depreciation offset a large part of the REER depreciation. Similarly, this downward trend led to a reduction of the overvaluation in Antigua Barbuda, Bolivia, Guatemala, Trinidad Tobago and Uruguay. The largest fall in the overvaluation has been noted for Bolivia that has registered a 7.2 p.p. reduction of its overvaluation thanks to the REER depreciation. Mexico and Canada

are the only two countries that registered the opposite move with a reduction of their undervaluation.

Overall, excluding few dynamics noted above, movements in currency misalignments for the American countries between 2020 and 2021 did not modify the general picture from previous years. Most importantly, almost all changes were shaped by the dynamics of the REER and therefore appear of temporary nature —in contrast with movements in the ERER that entail longer term adjustment.

4.3. Asia

In line with the other regions, changes in the currency misalignments between 2020 and 2021 have been rather weak. Only 9 countries (out of 33) displayed changes greater or equal to 5 p.p.

As visible in Figure 11, Turkey registered the largest change in its currency misalignments between 2020 and 2021, a 10 p.p. increase of its undervaluation explained by the depreciation of the REER —itself originating from the continued fall of the lira against the US dollar. Japan and Thailand showed shifts of similar amplitudes —again fueled by the REER depreciation— that placed them at the frontier of large undervaluations —i.e., larger than 15%. To a smaller extent, Bahrain, Malaysia, India, Indonesia and Singapore also registered an increase in their misalignments.

This general downward trend has also led to significant reduction of overvaluations in some countries. This is especially the case for Hong Kong, Qatar and the United Arab Emirates (UAE) that have seen their overvaluation reduced by around 6 p.p. While for Hong Kong and the UAE the main driver was the REER dynamics, for Qatar, it was the ERER appreciation owing to the terms of trade rebound and the current account surpluses.[4] Few countries however experienced an upward movement that resulted in lower undervaluations (e.g., China, Pakistan) or higher overvaluations (e.g., Cambodia, Israel). Apart from these countries, the relative stability of 2021 has thus entrenched —somehow— the groups of countries identified in 2020.

[4] The UAE has also registered an important increase in the terms of trade along with current account surpluses but the positive effects on the ERER have been offset by the rather large negative relative GDP growth.

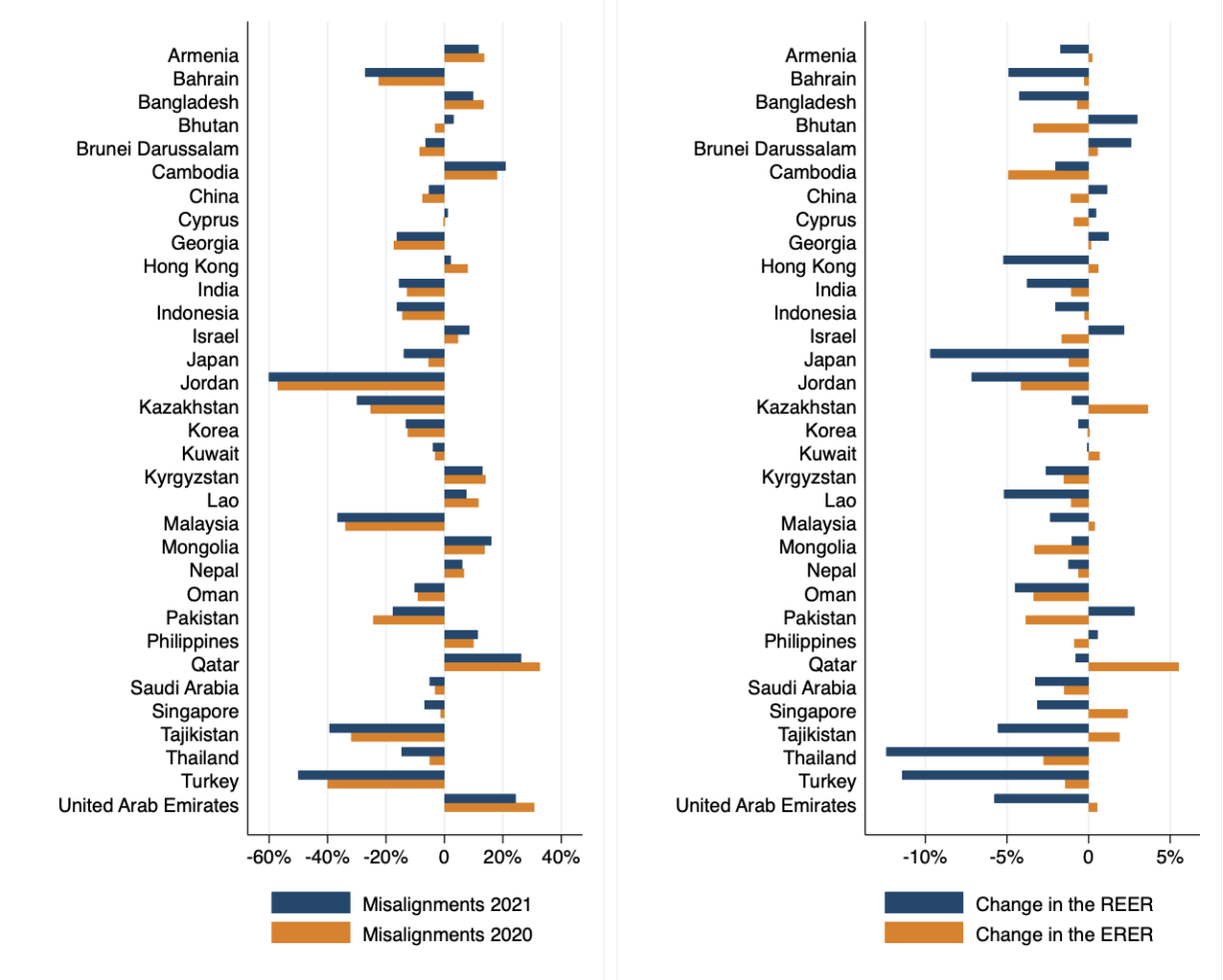


Figure 11 — Asia | Currency misalignments and sources of the changes (2020-2021)

Note: In the left chart, a positive (resp. negative) sign indicates an overvaluation (resp. undervaluations). In the right chart, "REER" (resp. "ERER") stands for the Real Effective (resp. Equilibrium Real Effective) Exchange Rates. A positive sign in both measures indicates an appreciation. Both scale express changes in percentage.
Source: EQCHANGE (CEPII)

4.4. Europe

With an almost equivalent number of increases and decreases, changes in the currency misalignments between 2020 and 2021 in Europe have been rather balanced.[5]

Furthermore, as visible in Figure 12, only ten economies (a quarter of the considered countries) registered changes greater or equal to 2 p.p. —in absolute terms. Russia registered the most important change in the exchange rate misalignments; a 5 p.p. fall that led to a 11% undervaluation in 2021. This latter increase in the rouble undervaluation was fueled by the appreciation of the ERER, amplified by the REER mild depreciation. Russia was followed by Moldova, Switzerland and Portugal that registered decreases between 2 p.p. and 3 p.p. However, in contrast with Russia,

[5] To avoid any unnecessary repetition, we do not discuss again the case of major European currencies. Similarly, Box 6 focuses on the main euro area member countries.

these countries have seen a reduction in their overvaluation, entirely explained by the REER depreciations. At the other end, Czechia experienced the largest upward movement in Europe, an almost 5 p.p. increase in its overvaluation that settled the misalignments around +23% —due to the REER appreciation. Czechia was followed by Malta that registered a 4 p.p. decrease of its undervaluation —also explained by the REER dynamics.

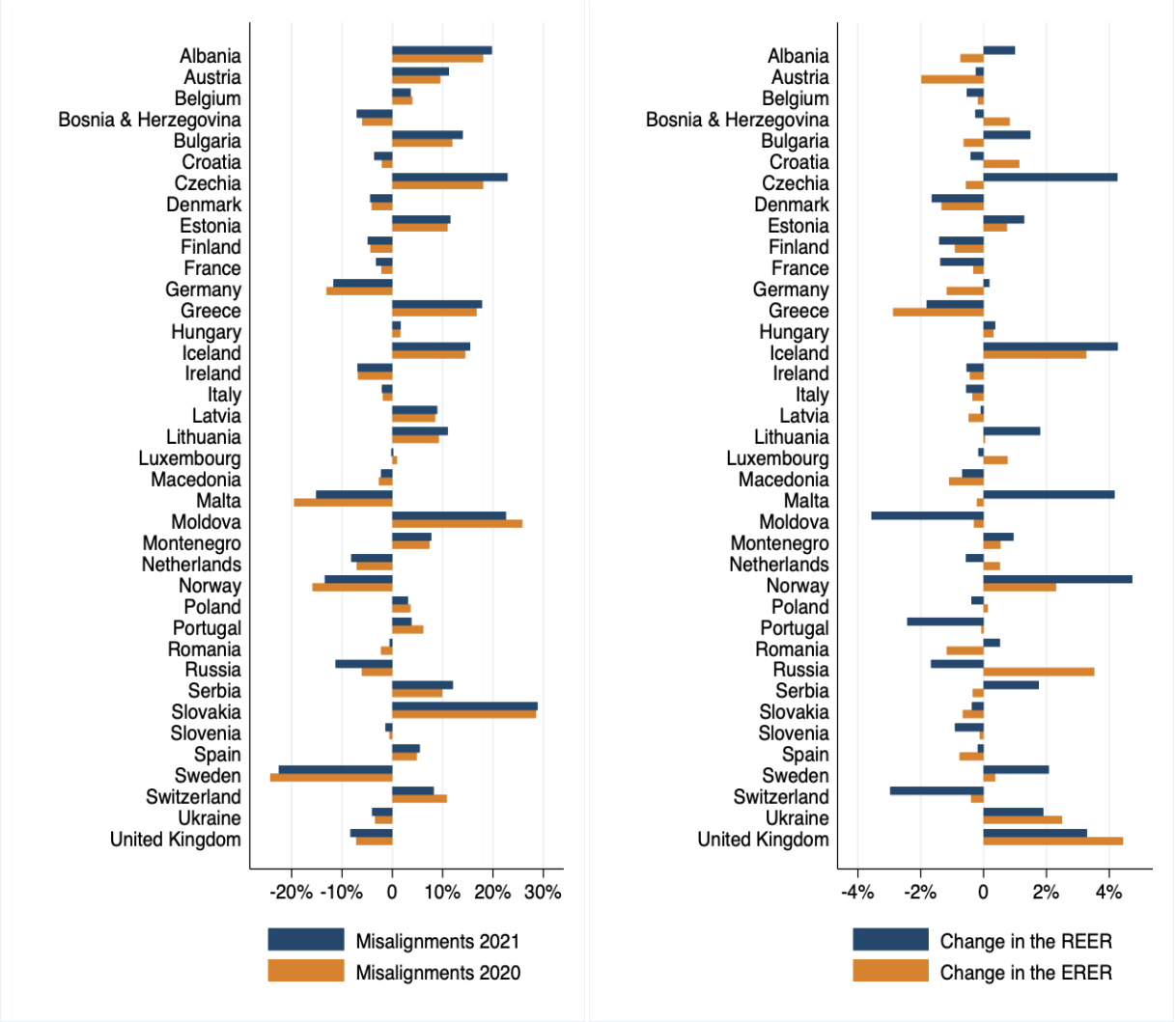


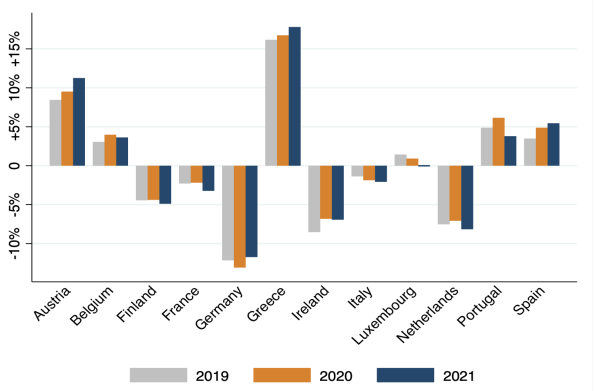
Figure 12 — Europe | Currency misalignments and sources of the changes (2020-2021)

Note: In the left chart, a positive (resp. negative) sign indicates an overvaluation (resp. undervaluations). In the right chart, "REER" (resp. "ERER") stands for the Real Effective (resp. Equilibrium Real Effective) Exchange Rates. A positive sign in both measures indicates an appreciation. Both scale express changes in percentage.
Source: EQCHANGE (CEPII)

Overall, despite the above changes, the picture remained broadly the same between 2020 and 2021. The Swedish krone is still the most undervalued currency; followed by Malta and Norway. Slovakia and Moldova appear again at the other end with the highest overvaluations. Between these two extremes, Belgium, France, Italy and few Eastern European countries, were broadly in line.

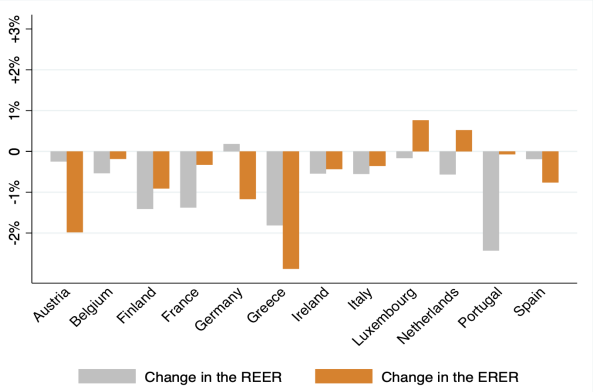
Box 6 — Monitoring (Macroeconomic) imbalances within the euro area

The changes in the currency misalignments —between 2020 and 2021— within the euro-zone have been of relatively small amplitudes (see Box Figure 6.1). Indeed, only Portugal displayed a change higher than 2 percentage points; a reduction of its overvaluation that aligned its currency with its fundamentals. This downward movement was somehow shared by all the countries except Germany that reduced its undervaluation by a bit more than 1 p.p. In general, the observed movements did not change the overall assessment of the currency misalignments between 2020 and 2021. Belgium, Finland, France, Italy and Luxembourg were thus again considered broadly in line during 2021.



Box Figure 6.1 — Currency misalignments

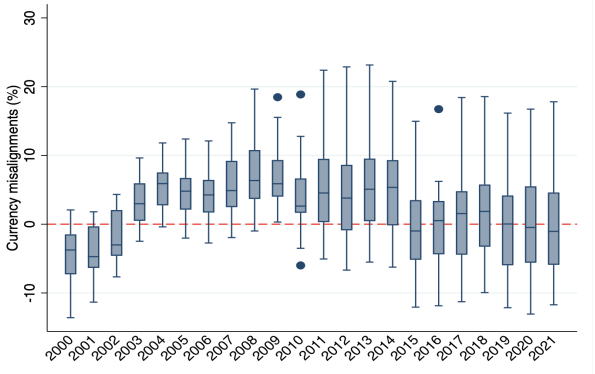
As can be seen in Box Figure 6.2, the evolution of the misalignments was principally shaped by the REER dynamics except in Austria, Germany, Greece, Luxembourg and Spain —and to a lesser extent in Finland and the Netherlands. In the latter countries, the ERER dynamics have been the main engine for the changes. Actually, in the case of Austria, Germany, Luxembourg and Spain, changes in the REER were negligible. In Greece, the ERER depreciation annihilated the REER depreciation.



Box Figure 6.2 — Underlying factors (2020-21)

Note: Changes are expressed in percentage

However, as noted above, it should be kept in mind that the 2021 adjustments were marginal and mostly conjectural as they were generally driven by the —longlasting— effect of the Covid-19 pandemic. In addition, it appears that they had no consequences regarding the heterogeneity between the countries. This latter, proxied overtime by the dispersion of currency misalignments in the zone, remains relatively stable since 2011 —see Figure 6.3.



Box Figure 6.3 — Evolution of the distribution of currency misalignments in the euro area

Note: The different boxplots present the evolution of the misalignments distributions over time. By indicating the ranges and the different quartiles, the boxplots provide information on the heterogeneity within the zone.

4.5. Oceania

The global pattern noted hitherto holds also for Oceania. Indeed, as visible in Figure 13, currency misalignments have marginally evolved between 2020 and 2021. Australia and Samoa are the countries that registered the most important changes during 2021. On the one hand, Samoa has seen a 6 p.p. increase of its overvaluation (from 9.4% to 15.8%) due to the depreciation of the ERER. On the other hand, Australia has seen its undervaluation eroded owing to the REER appreciation. For New Zealand, both the REER and ERER changes, of similar amplitudes, led the currency misalignments broadly unchanged. In 2021, Australia and Fiji were the only economies that could be considered in line in the region. New Zealand and Papua New Guinea maintained overvaluations around 15%; few points below Solomon Islands.

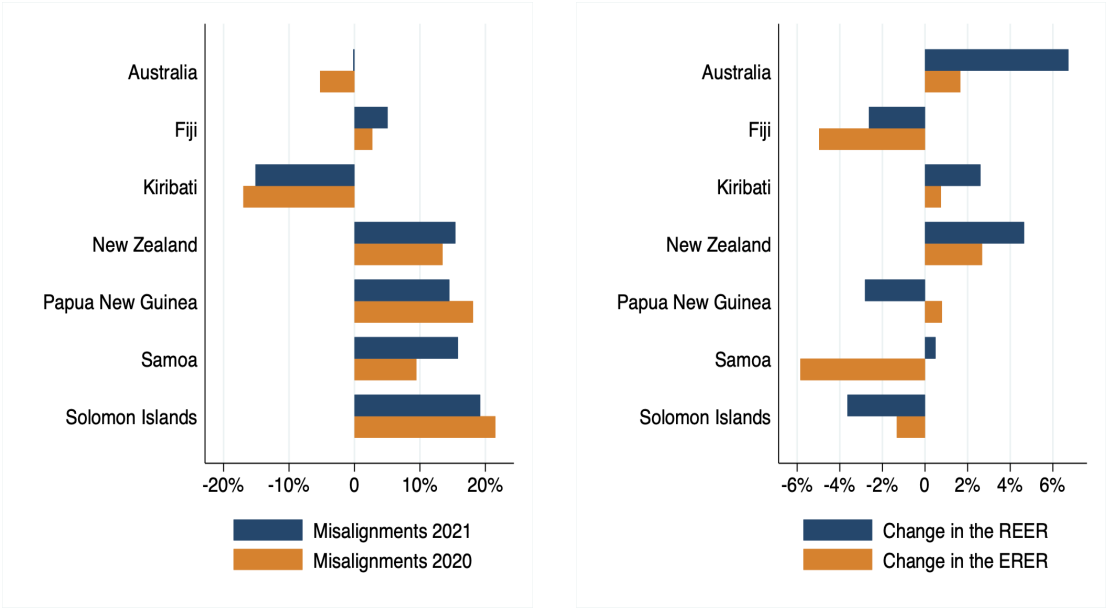


Figure 13 — Oceania | Currency misalignments and sources of the changes (2020-2021)

Note: In the left chart, a positive (resp. negative) sign indicates an overvaluation (resp. undervaluations). In the right chart, "REER" (resp. "ERER") stands for the Real Effective (resp. Equilibrium Real Effective) Exchange Rates. A positive sign in both measures indicates an appreciation. Both scale express changes in percentage.
Source: EQCHANGE (CEPII)

Appendices

Appendix A. Estimated currency misalignments

Table A.1 — Estimates of currency misalignments in 2021 (in %)

Country	Misalignment		Country	Misalignment	
	Mean	St. Err.		Mean	St. Err.
Albania	19.8	1.1	Cyprus	1.1	4.1
Algeria	-53.8	6.3	Czechia	22.9	1.5
Angola	-13.7	3.2	Denmark	-4.4	1.7
Antigua & Barbuda	16.0	4.3	Djibouti	21.8	2.9
Armenia	11.7	3.6	Dominica	-4.5	1.4
Australia	-0.2	1.5	Dominican Rep.	-29.2	1.7
Austria	11.2	2.6	Ecuador	-2.5	1.4
Bahrain	-27.1	2.9	Egypt	-13.4	5.0
Bangladesh	9.9	3.6	Equatorial Guinea	13.2	3.1
Barbados	33.3	4.7	Estonia	11.5	1.5
Belgium	3.6	1.5	Ethiopia	-30.8	2.3
Benin	-5.4	1.5	Fiji	5.1	2.6
Bhutan	3.1	4.8	Finland	-4.9	1.7
Bolivia	27.4	1.5	France	-3.2	1.8
Bosnia & Herzegovina	-7.1	1.3	Gabon	-21.1	3.7
Brazil	-32.0	1.5	Gambia	-29.8	9.7
Brunei	-6.5	1.5	Georgia	-16.3	1.5
Bulgaria	14.0	3.0	Germany	-11.7	2.4
Burkina Faso	-20.2	7.5	Ghana	-30.3	2.6
Burundi	-22.6	1.2	Greece	17.8	1.5
Cabo Verde	11.2	1.1	Grenada	8.5	1.5
Cambodia	20.9	4.6	Guatemala	7.6	3.1
Cameroon	-1.5	4.5	Guinea-Bissau	2.0	4.6
Canada	-9.8	2.3	Haiti	50.7	1.0
Central African Rep.	28.9	5.9	Honduras	-2.2	5.7
Chad	-13.3	6.2	Hong Kong	2.1	3.4
Chile	-26.1	2.5	Hungary	1.6	1.5
China	-5.3	1.5	Iceland	15.5	1.0
Colombia	-17.6	1.5	India	-15.5	1.5
Comoros	8.8	2.7	Indonesia	-16.2	4.7
Congo	8.2	3.6	Ireland	-6.9	1.8
Costa Rica	-9.9	2.1	Israel	8.5	1.5
Côte d'Ivoire	-12.9	1.8	Italy	-2.1	2.7
Croatia	-3.6	1.4	Jamaica	-9.1	6.0

Note: The values in the column " Mean " (resp. " Std. Err. ") correspond to the averages (resp. standard errors) of the estimates over all the specifications (i.e. models, number of trade partners, and weighting systems). Positive (resp. negative) sign indicates an overvaluation (resp. undervaluation).

(Continued on next page)

Table A.1 — Estimates of currency misalignments in 2021 (in %; *Continued*)

Country	Misalignment		Country	Misalignment	
	Mean	St. Err.		Mean	St. Err.
Japan	-13.9	4.4	Philippines	11.4	2.1
Jordan	-60.1	8.1	Poland	3.1	1.2
Kazakhstan	-30.0	1.0	Portugal	3.8	1.1
Kenya	49.4	1.8	Qatar	26.3	6.1
Kiribati	-15.1	7.8	Romania	-0.5	3.9
Kuwait	-4.0	1.5	Russia	-11.3	1.5
Kyrgyzstan	13.0	3.2	Rwanda	-27.5	4.9
Laos	7.5	3.5	Samoa	15.8	1.9
Latvia	8.9	1.5	Saudi Arabia	-5.0	1.5
Lesotho	-4.2	1.5	Senegal	-22.4	5.2
Lithuania	11.0	1.5	Serbia	12.0	1.8
Luxembourg	0.0	1.5	Seychelles	-23.1	3.7
Macedonia	-2.2	2.4	Sierra Leone	-7.9	2.5
Madagascar	10.8	3.9	Singapore	-6.9	2.0
Malaysia	-36.6	3.9	Slovakia	28.8	2.2
Mali	-32.4	3.3	Slovenia	-1.4	1.5
Malta	-15.1	2.0	Solomon Islands	19.2	13.1
Mauritius	-14.6	1.9	South Africa	-26.9	6.8
Mexico	-13.6	2.8	South Korea	-13.2	3.6
Moldova	22.6	1.5	Spain	5.4	1.5
Mongolia	16.1	6.5	Sweden	-22.5	1.5
Montenegro	7.8	1.7	Switzerland	8.2	1.8
Morocco	-4.5	1.1	Tajikistan	-39.4	4.8
Namibia	2.6	1.5	Tanzania	-34.5	4.7
Nepal	6.1	2.2	Thailand	-14.7	2.5
Netherlands	-8.2	2.4	Togo	-0.4	2.9
New Zealand	15.4	3.9	Trinidad & Tobago	23.7	4.1
Niger	-11.0	5.8	Tunisia	-15.3	1.9
Nigeria	-13.0	3.5	Turkey	-50.0	4.9
Norway	-13.4	2.9	Uganda	-27.2	4.1
Oman	-10.2	1.7	Ukraine	-4.0	4.1
Pakistan	-17.7	5.1	United Arab Emirates	24.4	7.7
Panama	-31.7	3.0	United Kingdom	-8.3	3.4
Papua New Guinea	14.5	4.5	United States	10.9	1.8
Paraguay	-4.1	2.5	Uruguay	14.9	4.2

Note: The values in the column " Mean " (resp. " Std. Err. ") correspond to the averages (resp. standard errors) of the estimates over all the specifications (i.e. models, number of trade partners, and weighting systems). Positive (resp. negative) sign indicates an overvaluation (resp. undervaluation).

Appendix B. Evolutions of some fundamentals

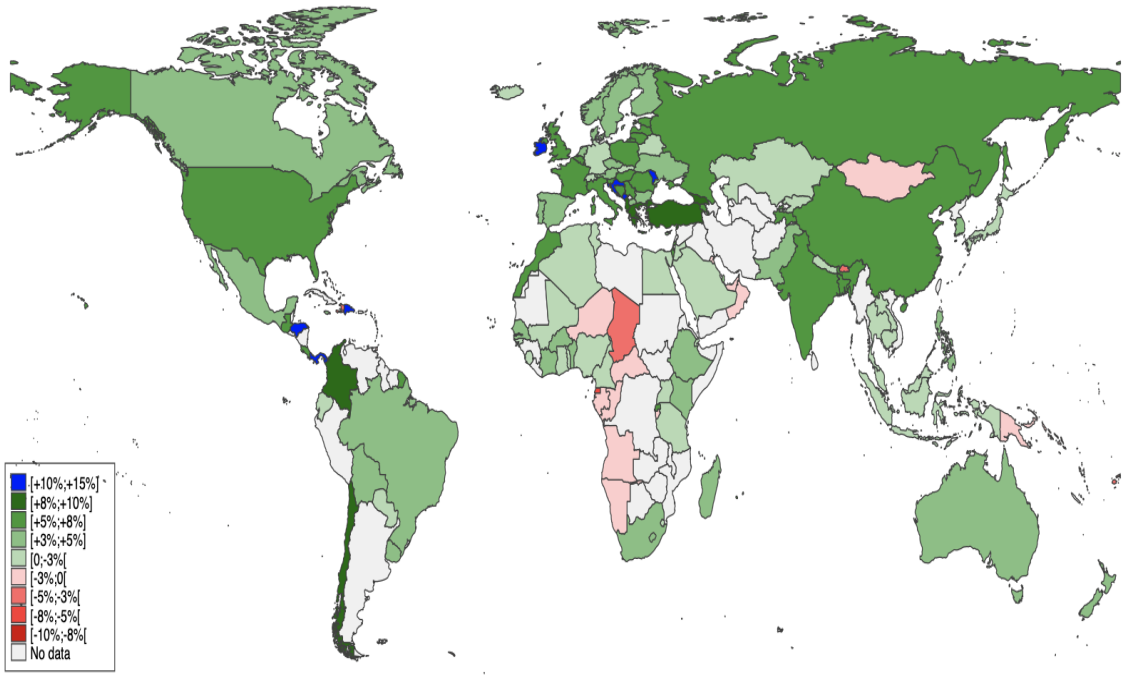


Figure B.1 — Economic growth in 2021

Note: Data —i.e. real GDP per capita in PPP terms— are from the World Development Indicators database (World Bank).

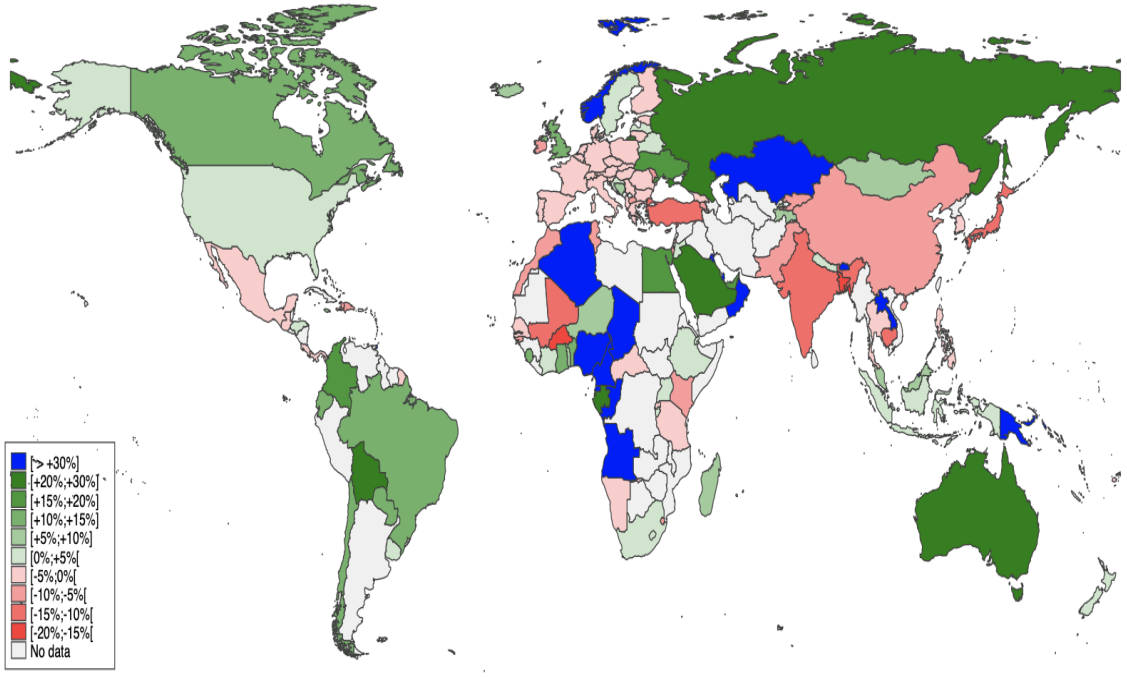


Figure B.2 — Change in the terms of trade (2020-2021)

Note: Data are from the UNCTAD database.

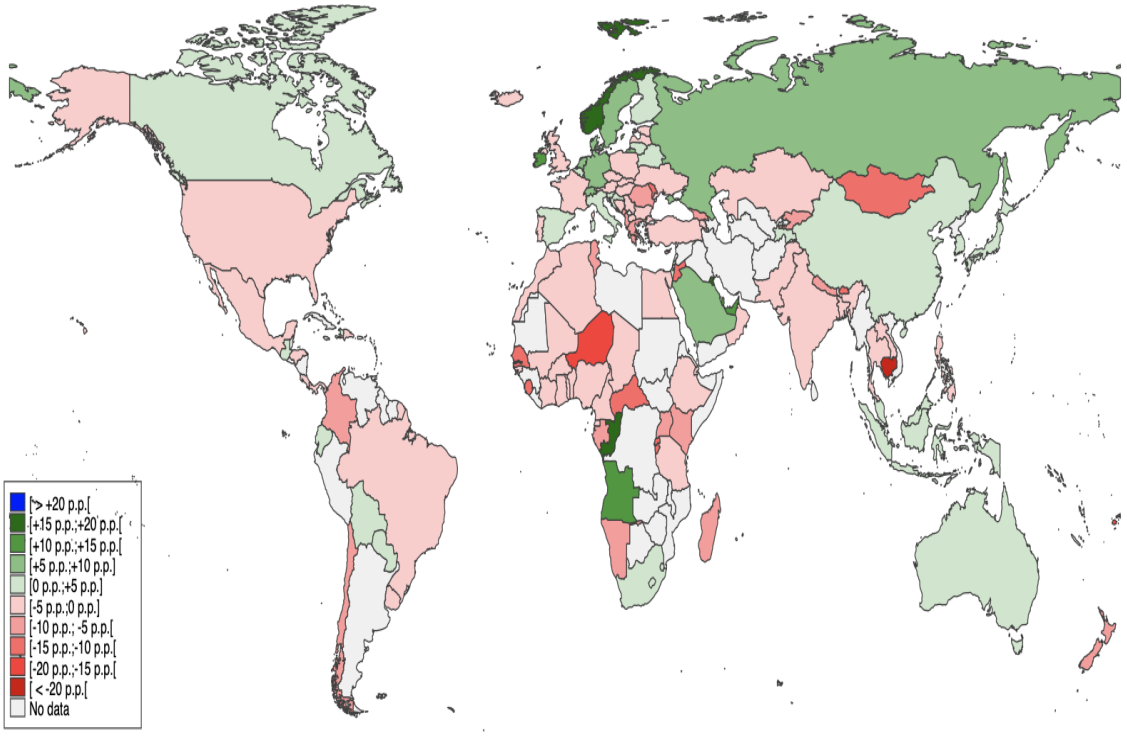


Figure B.3 — Change in the net foreign asset positions (2020-2021)

Note: Changes in the net foreign asset positions are proxied by the current balances. Data are from the IMF.

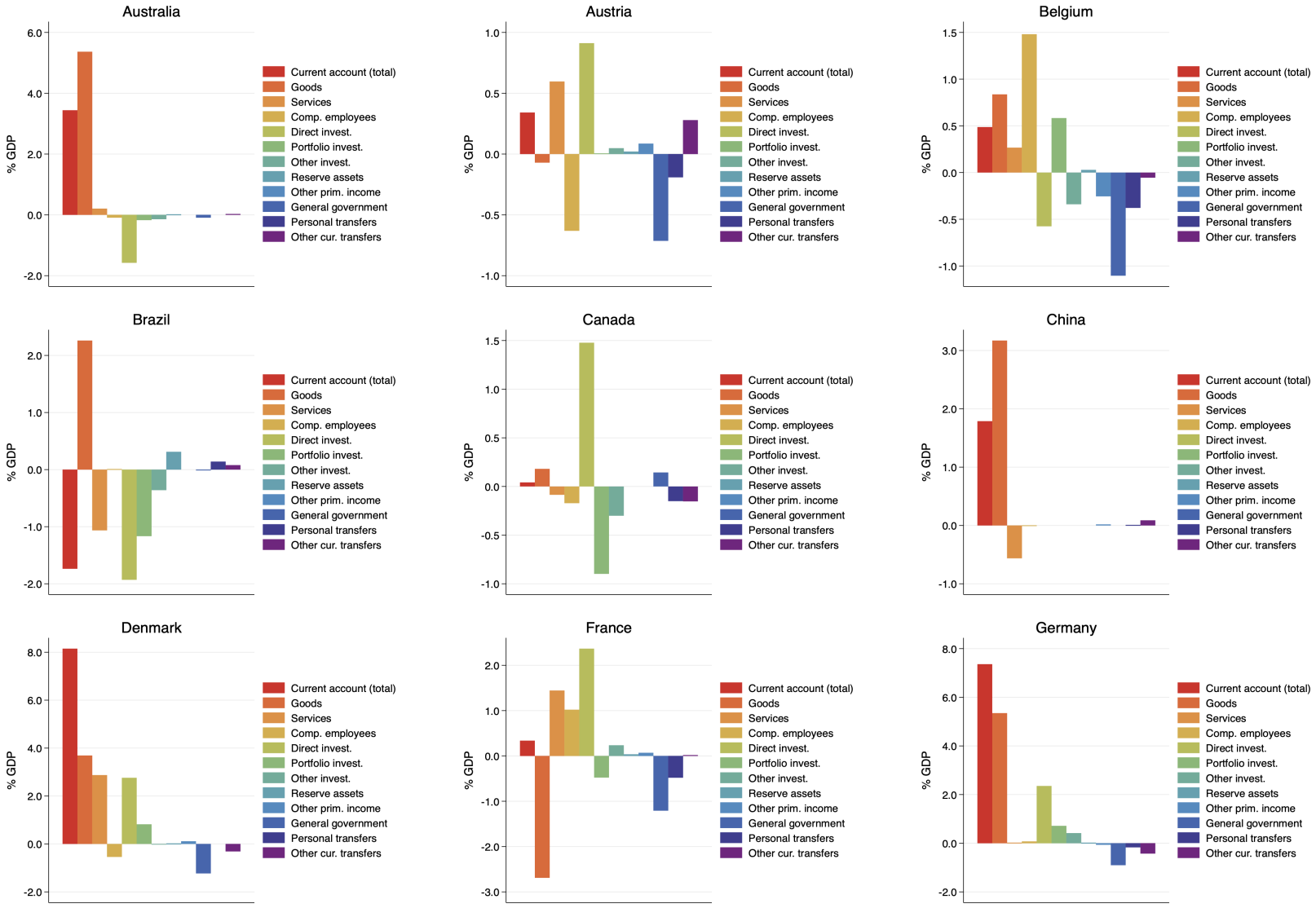


Figure B.4 — Current account and its components (2021, %GDP)

Note: Data are from the Balance of Payments Statistics (BOPS; IMF). "Comp. employees" = compensation of employees; "invest." stands for investment; "Other prim. income" = other primary income; "Other cur. transfers" = other current transfers.

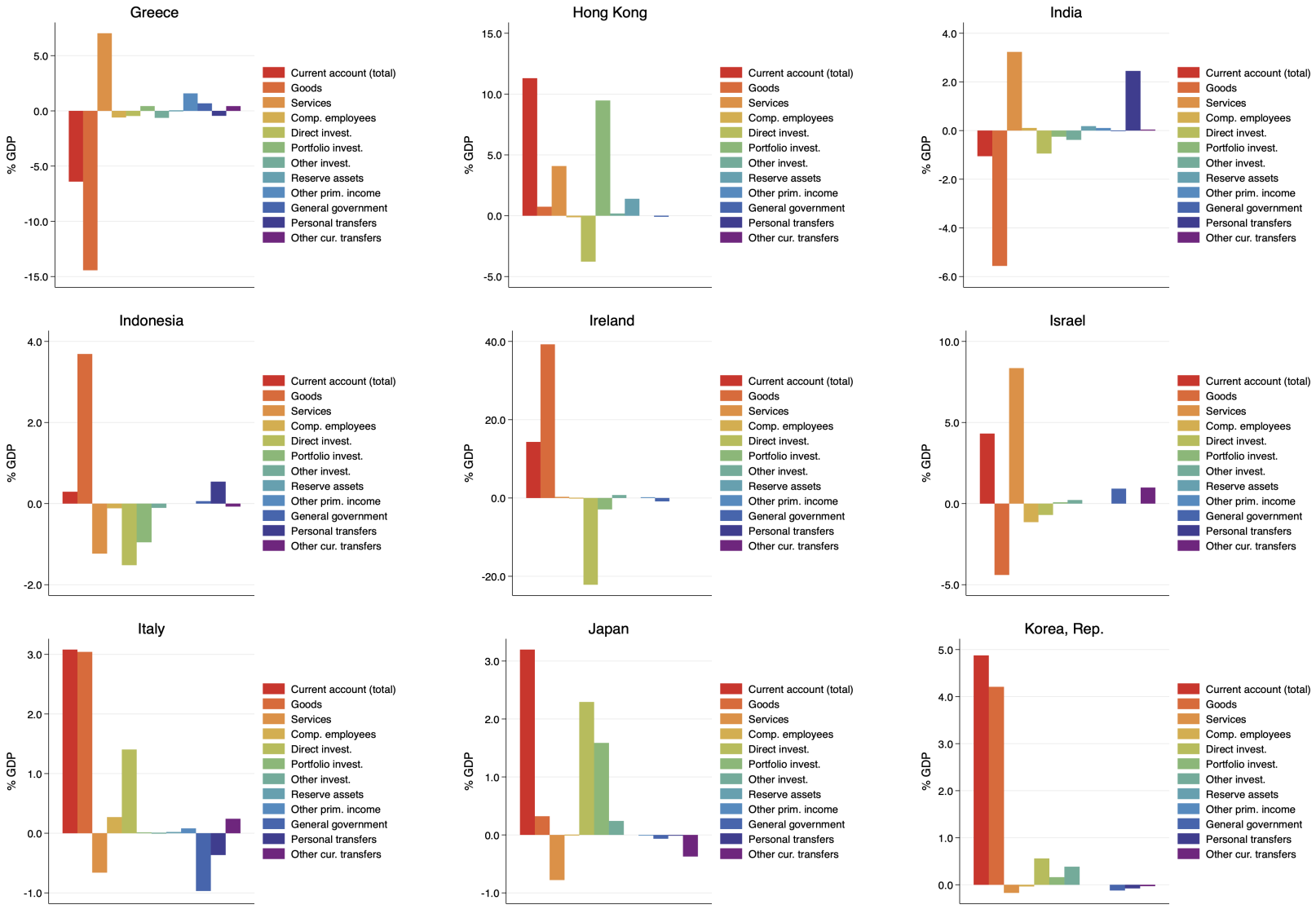


Figure B.4 — Current account and its components (2021, %GDP)

Note: Data are from the Balance of Payments Statistics (BOPS; IMF). "Comp. employees" = compensation of employees; "invest." stands for investment; "Other prim. income" = other primary income; "Other cur. transfers" = other current transfers.

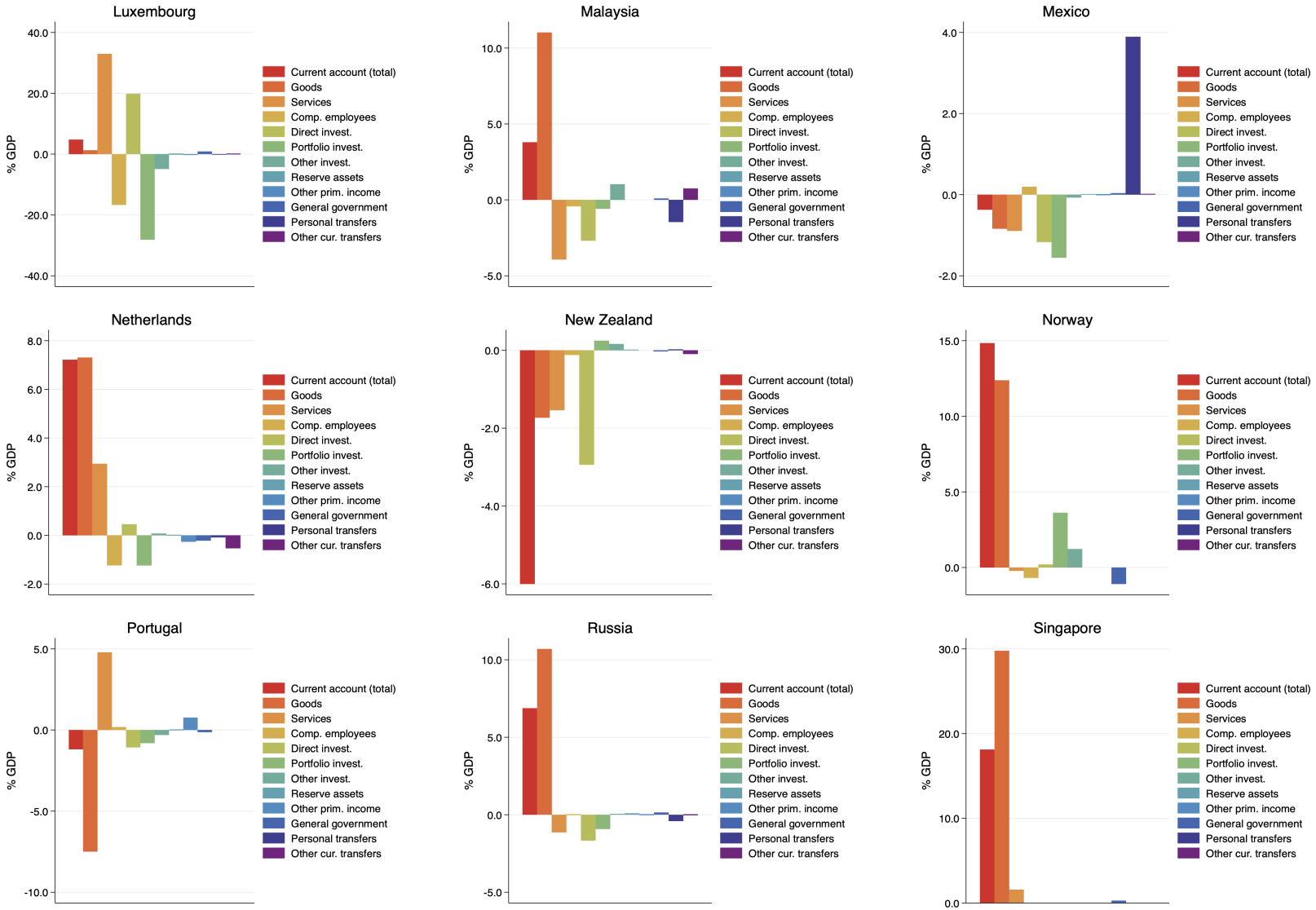


Figure B.4 — Current account and its components (2021, %GDP)

Note: Data are from the Balance of Payments Statistics (BOPS; IMF). "Comp. employees" = compensation of employees; "invest." stands for investment; "Other prim. income" = other primary income; "Other cur. transfers" = other current transfers.

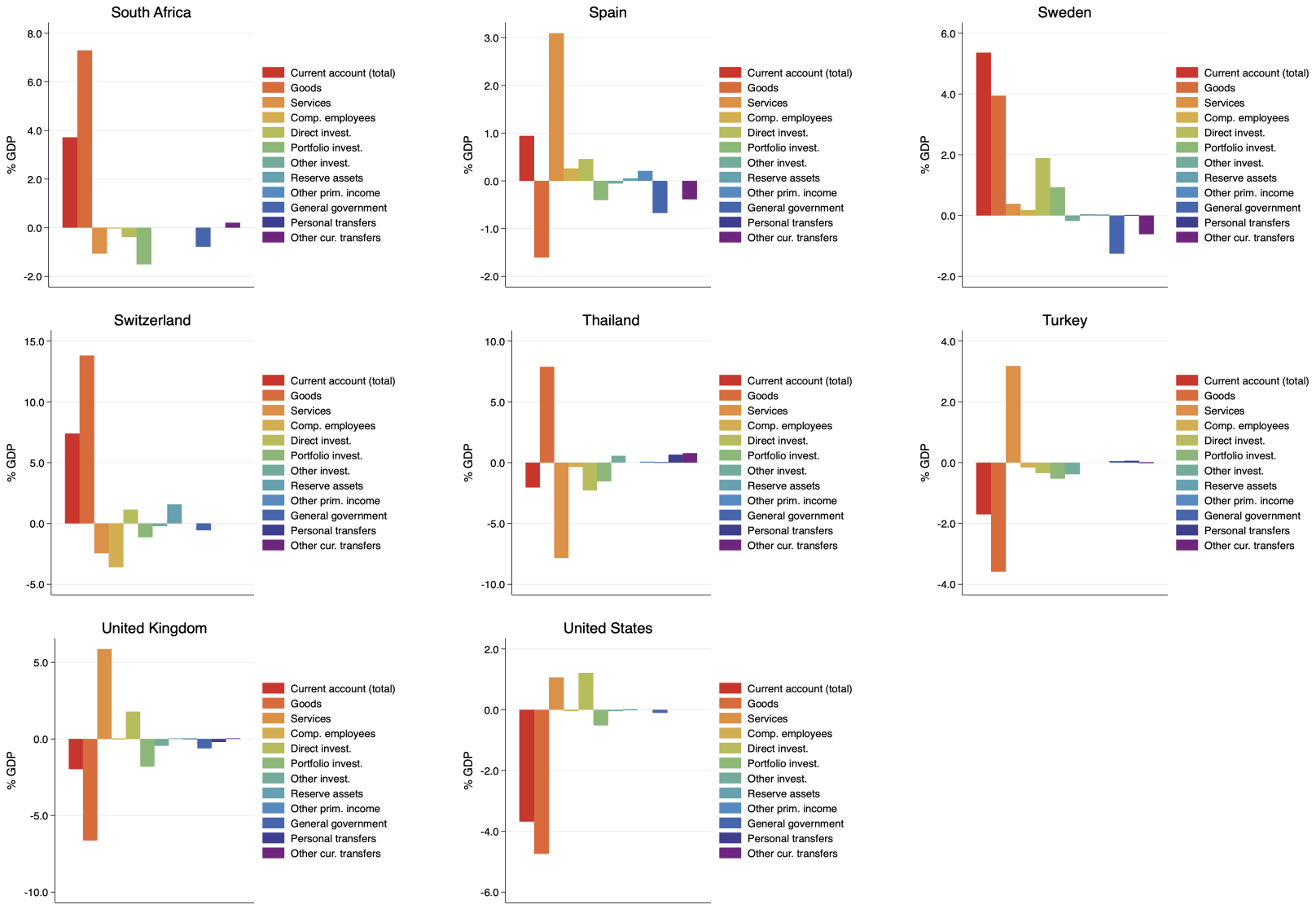


Figure B.4 — Current account and its components (2021, %GDP)

Note: Data are from the Balance of Payments Statistics (BOPS; IMF). "Comp. employees" = compensation of employees; "invest." stands for investment; "Other prim. income" = other primary income; "Other cur. transfers" = other current transfers.

Appendix C. Comparison with the IMF External Sector Report estimates

As is done periodically, the IMF, through the External Sector Report (ESR), analyzes and discusses the evolution and the misalignment of 30 systemic economy currencies. In this appendix, we compare our estimates and discuss the major reasons for differences between the estimates.

The IMF estimates of currency misalignments (or "REER gap" following their terminology) reported in the External Sector Report are based on various equilibrium exchange rate determination approaches. More specifically, the estimates are derived relying on four complementary approaches constituting the so-called External Balance Assessment (EBA) methodology: (*i*) the current account regression-based approach, (*ii*) the real exchange rate regression-based approaches (both index and levels), and (*iii*) the external sustainability approach.[6] The current account-based approach calculates the difference between the current account (CA) projected over the medium term at prevailing exchange rates and an estimated equilibrium current account, or "CA norm". The real exchange rate regression-based approaches directly estimate an equilibrium real exchange rate for each country as a function of the fundamentals of the $REER$ —including controls. Finally, the external sustainability approach calculates the difference between the actual current account balance and the balance that would stabilize the net foreign asset (NFA) position of the country at some benchmark level. Each of these approaches has relative strengths and limitations —which further motivate the need for complementary approaches. Phillips et al. (2013) argues for instance that the current account regression-based approach is often the most informative and reliable of the different EBA approaches because it is able to take full advantage of cross-country information. Its limitations however tend to be most apparent when analyzing countries with high reliance on natural resource sectors (e.g. large oil exporters) and relatively small economies that are financial centers. For a few economies, this approach would yield very large regression residuals, and thus large Total CA Gaps, which require careful further interpretation. The second approach, the real exchange rate regression-based approach (REER index) seem to appear especially useful where the first approach faces a particular difficulty. Its limitations are a reduced reliability in countries with large structural changes, as well as those with short data spans. However, this method, due to fixed effects, forces gaps for each country to be zero on average over time. The third approach,

[6] These approaches are thus in line with the three methods underlying the CGER methodology, the EBA predecessor. For full details of CGER, see Lee, J., G. Milesi-Ferretti, J. D. Ostry, A. Prati, and L. A. Ricci, 2008, "Exchange Rate Assessments: CGER Methodologies," Occasional Paper No. 261, (Washington: International Monetary Fund).

based on $REER$ levels rather than indices, provides a solution to this issue. The fourth approach, is a bit different from the others in that it suits well (more relevant and informative) for countries with large NFA imbalances, and for which there is a clear view of what would be a more appropriate NFA level.[7]

In light of the above, it appears that the main source of differences between the ESR REER gaps and the $EQCHANGE$ estimates should principally lie in the approach retained by the ESR staff —in case there are important divergences between the different approaches.[8]

The different ESR REER gap estimates as well as the $EQCHANGE$ estimates are reported in Table C.1. Among the 29 economies reported (including the euro area)[9], 5 show a very good match between the ESR staff-assessed REER gap midpoints and the $EQCHANGE$ estimates of misalignments. These are: Belgium, the euro area, Germany, Russia and the United States. However, for a number of these countries, the EBA REER-based estimates differ considerably from the EBA CA-based estimates, these latter constituting the retained estimates. This is particularly the case when considering the REER index-based estimates for the euro area which point to overvaluations while the other EBA approaches and $EQCHANGE$ point to undervaluations. The above economies are followed by 9 others for which the different estimates are very close: China, France, Hong Kong, Italy, the Netherlands, Poland, Saudi Arabia, Singapore and Spain.[10]

[7]For further details on the EBA methodology see Phillips, S., Catão, L., Ricci, L., Bems, R., Das, M., Di Giovanni, J., Unsal, F., Castillo, M., Lee, J., Rodriguez, J., Vargas, M., 2013. "The External Balance Assessment (EBA) Methodology," IMF Working Papers 13/272, International Monetary Fund. The technical supplement of the IMF External Sector Report 2018 provides the latest refinements.

[8]The term "principally" is important as there are differences regarding the empirical framework between ESR REER index-based approach and $EQCHANGE$. Indeed, the ESR REER index-based approach departs from strict theoretical background underlying the determination of the equilibrium in many respects (retained regressors, estimation methods) —probably to ensure consistency between the REER approaches and the CA approach regarding the time horizon of the analysis— while the $EQCHANGE$ methodology sticks to the BEER approach. It is worthwhile noting that $EQCHANGE$ is in its infancy and that refinements —through alternative approaches— are already scheduled.

[9]As a reminder, Argentina is excluded from the 2022's vintage of $EQCHANGE$ due to the large uncertainty surrounding the determination of its equilibrium exchange rate.

[10]In the specific cases of China and Saudi Arabia, it is worth noting that the large uncertainty surrounding the IMF estimates of the REER gaps —through the different approaches— makes that our estimates overlap. It is also important to note that the REER gaps for Hong Kong, Saudi Arabia and Singapore are derived by applying the different models' estimated coefficients to the data. Cautious should therefore be taken when extrapolating from these assessments.

Table C.1 — Comparison of estimates: *EQCHANGE* and *External Sector Report* (2022)

	External Sector Report					*EQCHANGE*	
	Staff-assessed REER gap		*Estimates by approach*[a]				
	Midpoint	Range	CA	*REER* level	*REER* index	Mis	Std. Err.
Australia	-13.7	+/- 3	-13.7	24.6	-2.3	-0.2	1.5
Belgium	4.9	+/- 0.4	4.9	26.1	12	3.6	1.5
Brazil	3.1	+/- 4.2	3.1	-19.6	-36.4	-32.0	1.5
Canada	5.8	+/- 1.6	5.8	-7 .2	6.7	-9.8	2.3
China	1.9	+/- 4.2	1.9	10.5	10.5	-5.3	1.5
Euro areaa	-3.4	+/- 1.7	-3.4	7.1	6.8	-4	2.1
France	0.2	+/- 1.5	0.2	8.2	-2.1	-3.2	1.8
Germany	-10.8	+/- 1.5	-10.8	-7.9	7.7	-11.7	2.4
Hong Kong	-2.6	+/- 3.8	-2.6	NR	NR	2.1	3.4
India	-6	+/- 4.3	-6	8.5	10.1	-15.5	1.5
Indonesia	-1.7	+/- 3.6	-1.7	-18.1	1.9	-16.2	4.7
Italy	3.3	+/- 2.7	3.3	10.8	8.6	-2.1	2.7
Japan	3.6	+/- 6.6	3.6	-18.4	-20.1	-13.9	4.4
Korea	1	+/- 2.6	1	4.2	-0.8	-13.2	3.6
Malaysia	-4	+/- 1.1	-4	-29.1	-22.4	-36.6	3.9
Mexico	0.5	+/- 3.1	0.5	7.7	-9.1	-13.6	2.8
Netherlands	-3.3	+/- 0.8	-3.3	6	21.9	-8.2	2.4
Poland	-3.5	+/- 1	-3.5	-20.2	-1	3.1	1.2
Russia	-10.6	+/- 4.6	-10.6	-33.8	-11.2	-11.3	1.5
Saudi Arabia	4.1	+/- 9	4.1	NR	NR	-5.0	1.5
Singapore	-10.4	+/- 3.6	-10.4	NR	NR	-6.9	2.0
South Africa	7.3	+/- 3	7.3	15.9	1.2	-26.9	6.8
Spain	0.4	+/- 2.6	0.4	26.4	8.8	5.4	1.5
Sweden	-4.4	+/- 5	-4.4	-14.8	-11.1	-22.5	1.5
Switzerland	1.9	+/- 1.7	1.9	16.8	10.5	8.2	1.8
Thailand	-3.2	+/- 1.6	-3.2	-2.8	6	-14.7	2.5
Turkey	-22.5	+/- 2.5	0	-50.5	-41.1	-50	4.9
United Kingdom	0.5	+/- 4.1	0.5	5.6	-7.5	-8.3	3.4
United States	8.7	+/- 4.9	8.7	8.9	1.6	10.9	1.8

Notes: Estimates of "REER gap" or "currency misalignment" are in percentage. “NR” indicates that the approach-based estimate is not reported in the IMF ESR 2022. Positive sign (resp. negative) sign indicates an overvaluation (resp. undervaluation).
a: The staff-assessed euro area CA and *REER* gaps are calculated as the GDP-weighted averages of staff-assessed CA and *REER* gaps for the 11 largest Euro area economies (Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, and Spain). We follow the same approach to assess the misalignments for the euro area which is here presented only for comparison purpose.

For the remaining 15 economies presented in Table C.1, the IMF assessments differ —sometimes dramatically— from ours.

As a general statement before diving into explanations of the differences, it is important to note that for these countries, the ESR staff put more weights on the CA model —if not disregarding the other approaches. This is particularly true for Australia, Brazil, Canada, Indonesia, Japan, Malaysia, Switzerland, Turkey and the

United Kingdom for which the *EQCHANGE* estimates match in some way with one of the EBA REER-based estimates. That being said, the discussion is therefore restricted to countries for which we have considerable differences between the *EQCHANGE* estimates and the ESR estimates —particularly those based on the REER index model that is closer to our methodology.

Overall, the differences noted this year are coherent with those noted for previous years. In fact, as noted in previous versions of this report, for Canada, the differences go back to the year 2018 for which we noted significant changes in the IMF ESR estimates. In the ESR 2017, the CA (resp. REER index and REER level) model pointed to an overvaluation (resp. undervaluation) of 6% (9.5% and 19.9%). From 2018, the ESR estimates remained constant; the CA model and REER index model point to an overvaluation of 7% and 2% —respectively, while the REER level model still indicates an undervaluation but of only 6%. While these important changes in the REER based estimates from 2017 to 2018 were hardly explicable —and actually not explained, it fully explains, coupled with the focus on the CA-based estimates, the retained overvaluation for Canada. For 2021, although indicating again opposite misalignments, the gap between the ESR estimates and the *EQCHANGE* ones have widened. This owes principally to the CA gap assessment. With a lower midpoint in 2021 — -1.5% GDP, in contrast with -1.1% GDP in 2020—, the extent of the overvaluation suggested by the ESR estimates is higher.

In the same vein, the 2021 ESR estimates for Mexico differs dramatically from the previous. Indeed, until 2020, the *EQCHANGE* and the ESR estimates were in line. For the year 2020, the ESR reported an assessed REER gap of -21.8% —CA approach— with an important range owing to the 10% undervaluation suggested by the REER-level approach. The *EQCHANGE* estimate was -19.2% —with a standard deviation of 2. While the ESR REER index approach still display in 2021 undervaluation of similar importance with that suggested by the *EQCHANGE* estimates, the change in the CA approach-based REER gaps is surprising. Indeed, the 21-percentage points —upward— correction is hardly explainable by both the appreciation of the REER (around 6% on average between 2020 and 2021) and the CA balance dynamics (from a surplus of 2.4 percent of GDP in 2020 to a deficit of 0.4 percent of GDP in 2021). This observation is also valid for Thailand, and to a smaller extent, Sweden.

Like Mexico, the ESR staff also focused on the CA approach for South Africa and disregarded the REER based approaches. As pointed in previous versions of the *EQCHANGE* annual assessment, the difference regarding the time horizon considered for the estimations play a key role in explaining the differences in the estimates

—especially between the ESR REER index-based and the *EQCHANGE* estimates.[11] Nevertheless, estimates derived with the REER based approaches also differ from the previous. Indeed, in the ESR 2021, the REER index approach indicated a 20.9% undervaluation of the rand in 2020— -32.6% in *EQCHANGE* with a standard deviation of 7.4. In the ESR 2022, the rand was considered broadly in line with its fundamental value — +1.2% in 2021. This suggested 22 p.p. adjustment could not have been possible without a deterioration of the equilibrium rate by 16% given the 6% appreciation of the REER. Yet, South Africa got favorable winds during 2021 that have at least prevented a deterioration of the equilibrium —thereby casting doubts on the temporal consistency of the estimates.

[11] Indeed, in *EQCHANGE*, the 1974-2021 period is considered while the ESR only focus on the period post 1990.