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Changes in Economic and Financial Synchronisation: A Global Factor Analysis

Alessandro Maravalle, Łukasz Rawdanowicz

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# **ECONOMICS DEPARTMENT**

# CHANGES IN ECONOMIC AND FINANCIAL SYNCHRONISATION: A GLOBAL FACTOR ANALYSIS

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## By Alessandro Maravalle and Łukasz Rawdanowicz

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#### ABSTRACT/RÉSUMÉ

#### Changes in Economic and Financial Synchronisation: A Global Factor Analysis

We estimate dynamic factor models for two sub-samples between 1995 and 2017 for up to 42 advanced and emerging-market economies to investigate changes in the contribution of global and regional factors to fluctuations in real GDP per capita growth, inflation, 10-year government bond yields and equity prices. The combined average contribution of global and regional factors in explaining fluctuations of GDP growth and inflation increased between 1995-2006 and 2007-17. In contrast, for financial variables, the role of country-specific factors strengthened between these two periods. The general findings are robust to alternative specifications of the lag structure, data frequency and the country composition of the largest region. Country-specific factors explain a higher share of variation of financial variables, there is large cross-country heterogeneity regarding the level of contributions of specific factors and their evolution over time.

#### JEL classification codes: C38, E32, E44, F44.

*Keywords*: Financial and trade integration; co-movement; international business cycle; dynamic factor models.

#### \*\*\*\*\*

# Évolution de la synchronisation économique et financière : une analyse factorielle à l'échelle mondiale

Nous avons estimé des modèles factoriels dynamiques pour deux sous-échantillons entre 1995 et 2017 comprenant jusqu'à 42 économies de marché avancées ou émergentes afin d'étudier comment a évolué la contribution des facteurs mondiaux et régionaux aux fluctuations de la croissance du PIB réel par habitant, de l'inflation, du rendement des obligations d'État à 10 ans et des cours des actions. La contribution moyenne combinée des facteurs mondiaux et régionaux dans l'explication des fluctuations de la hausse du PIB et de l'inflation a augmenté entre 1995-2006 et 2007-17. En revanche, s'agissant des variables financières, c'est la contribution des facteurs spécifiquement nationaux qui s'est renforcée entre les deux périodes. Les conclusions générales ne sont pas sensibles à d'autres spécifications de la structure de retard, fréquence des données et composition par pays dans la région la plus grande. La part des facteurs spécifiquement nationaux dans l'explication de l'évolution des variables financières est plus importante dans les économies de marché émergentes que dans les économies avancées. Pour toutes les variables, les contributions respectives des facteurs spécifiques et leur évolution au fil du temps sont très hétérogènes d'un pays à un autre.

#### Codes de classification JEL : C38, E32, E44, F44.

*Mots-clés* : Intégration financière et commerciale ; co-mouvement ; cycle conjoncturel international ; modèles factoriels dynamiques.

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# **Changes in Economic and Financial Synchronisation: A Global Factor Analysis**

By Alessandro Maravalle and Łukasz Rawdanowicz<sup>1</sup>

## Introduction and main findings

Trade and financial integration has been increasing since the mid-1980s, though in some respects it has eased after the global financial crisis (OECD, 2018). Nevertheless, international financial assets and liabilities and, to a lesser extent, trade volumes are much higher now than three decades ago (Figure 1). Moreover, emerging-market economies (EMEs) have been gaining economic importance and have become more integrated in the global economy, especially on the trade side.

The increasing interconnectedness of the global economy raises questions about the extent to which economic and financial developments across countries are linked and driven by common shocks and/or spillovers and how these linkages have evolved over time.

In this context, we analyse the role of common factors in explaining fluctuations of domestic financial and macroeconomic variables and contribute to the existing empirical literature in three respects. First, we estimate two factor dynamic factor models over two subsamples since the mid-1990s for up to 42 countries divided into three regions, representing on average about 80% of the world GDP since 1995. As an alternative specification, we also estimate one factor models for 15 advanced economies over three subsamples between 1980 and 2017, which allows us to estimate changes in the role of the global factor over a longer period, but at the cost of narrower country coverage. Second, we compare the contributions of the factors, and their evolution over time, for four variables: real GDP per capita growth, consumer price inflation, equity prices and 10-year government bond yields. Third, we investigate differences between advanced and emerging-market economies within our group of countries.

We find that between 1995-2006 and 2007-17, on average, the share of the combined contribution of global and regional factors in explaining fluctuations of real GDP per capita growth increased by around 20 percentage points and in explaining fluctuations of inflation by around 10 percentage points. In the case of GDP growth, some of the increase was, however, temporary and driven by the synchronised recession in the early years of the global financial crisis, especially in advanced economies. In contrast, there is tentative evidence about higher fragmentation in international financial markets, with the country specific factors increasing their share of contribution to fluctuations of financial variables between the two analysed periods by around 13 percentage points. In Europe, this likely reflects the euro area sovereign debt crisis.

<sup>&</sup>lt;sup>1</sup> The authors work at the Macroeconomic Policy Division of the OECD Economics Department. We would like to thank Sveinbjörn Blöndal, Nigel Pain, Pierre-Alain Pionnier and Stéphane Sorbe for their useful comments; Sylvie Foucher-Hantala for statistical help; and Isabelle Fakih for final document preparation. We acknowledge Christopher Neely and David Rapach for making their Matlab code to estimate two-factor models available.



Figure 1. Increasing trade and financial integration

1. Trade shares in world GDP are based on volumes at market exchange rates. Trade volumes refer to the average of imports and exports. Country coverage within each group may vary over time reflecting the data availability. Due to the lack of data for big emerging-market economies and the rest of the world data are not shown prior to 1996.

2. Advanced economies include Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, the United Kingdom and the United States.

3. Selected emerging-market economies include Argentina, Brazil, China, Chile, Colombia, Hungary, India, Indonesia, Mexico, Poland, Russia, South Africa and Turkey.

4. Banks' foreign claims are on immediate counterparty basis excluding domestic positions. They are not adjusted for changes in exchange rates and breaks in the series.

*Source*: OECD Economic Outlook 103 database; IMF Balance of Payments; Bank for International Settlements, Banking Statistics and Debt Securities database; and authors' calculations.

Before the crisis, financial variables in advanced economies were generally more affected by global and regional factors than real GDP growth, suggesting that global financial linkages or common financial shocks were stronger than real ones. For financial variables, country-specific factors explain a higher share of variation in EMEs than they do in advanced economies. This may be due to their higher vulnerability and a still smaller degree of integration into global financial markets and less liquid markets.

For the narrower group of 15 advanced economies, we find an increasing contribution of the global factor to fluctuations in equity prices and long-term government bond yields between the 1980s and the mid-2000s, in line with the progressive liberalisation of financial markets. The global factor was also important for explaining fluctuations of inflation in the 1980s, likely reflecting large fluctuations in commodity prices, in particular of oil, in this period.

These findings are robust to different lags employed in the factor models, two alternative ways of splitting the Europe+2 region, and to the use of quarterly frequency, though in the latter case country-specific factors play a much bigger role.

Country-specific factors remain important and there is large cross-country heterogeneity regarding the level of contributions of specific factors and their evolution over time. Thus, economic and financial conditions in individual countries can still deviate from global trends.

## Literature review

In the theoretical literature, stronger trade and financial integration have, *a priori*, an ambiguous impact on business-cycle synchronisation. Trade linkages can strengthen output co-movements if traded goods are complements, as they are in global value chains (GVCs), while the opposite can happen when they are substitutes (Ng, 2010). A higher level of openness to trade, and the growing role of multinational enterprises in national economies, also raise the potential exposure to foreign shocks, all else equal. At the same time, a higher degree of trade specialisation could increase the role of country and industry-specific shocks. Moreover, financial integration can weaken business cycle synchronisation if it improves international capital mobility and countries are mainly affected by idiosyncratic real shocks. It could also strengthen synchronisation after a large financial shock when financial contagion is pervasive (Kalemli-Ozcam et al., 2013a).

As the theoretical impact of a deeper trade and financial integration on international business cycles is ambiguous, the actual impact remains an empirical question. Several empirical studies used factor analysis to investigate these issues. These studies measure the extent to which common factors drive co-movements across certain economic variables in the economies under investigation, but cannot distinguish if these co-movements are driven by common shocks or spillovers.

Some studies, focusing on financial indicators, suggest that a common global factor – the time-varying risk aversion of investors – can account for a substantial share of the variance of asset prices and capital flows across economies (Rey, 2015). This common factor is typically found to be correlated with widely-used indicators of risk aversion, such as the VIX index, and also with US monetary conditions (Forbes and Warnock, 2012; Miranda-Agrippino and Rey, 2017; Barrot and Serven, 2018).

Other studies find that there has been little change in the role of global factors for financial variables since the global financial crisis (Arregui et al., 2018) or that their importance has actually declined (Barrot and Serven, 2018). A possible explanation of the latter finding is that it reflects the decline in the cross-border banking sector flows in recent years (OECD, 2018).

Common regional factors can also affect domestic financial conditions. One example is the influence of European banking sector conditions on European cross-border bank flows prior to the global financial crisis (Cerutti et al., 2017).

The importance of the global factor for explaining international business cycle synchronisation varies across studies, ranging between 10% and 46%, depending on the model specification, and time and country coverage (Crucini et al., 2011; Kose et al., 2012; Karadimitropoulou and León-Ledesma, 2013).

International output growth synchronisation is often explained in terms of stronger international trade linkages that reinforce the transmission mechanism of idiosyncratic

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shocks from one country to its trade partners (Frankel and Rose, 1998; Clark and van Wincoop, 2001; Di Giovanni and Levchenko, 2010; Karadimitropoulou and León-Ledesma, 2013; Duval et al., 2016). An alternative explanation, instead, highlights the role of common shocks in driving GDP co-movements among countries with similar industrial structure (Imbs, 2004).

Deep economic integration also implies that common global factors have a significant influence on inflation fluctuations in many countries, as it has been highlighted by several studies (Ciccarelli and Mojon, 2010; Neely and Rapach, 2011; Ferroni and Mojon, 2016).

## **Empirical approach**

Estimating the relative importance of international and domestic factors in driving co-movements of macroeconomic variables across countries is complicated by the large dimension of cross-section data that reduces degrees of freedom and thus the precision of estimations obtained with standard econometric techniques. Dynamic factor models overcome this challenge by modelling the covariance across variables as a function of a small number of unobservable factors (Otrok and Whiteman, 1998).

Given the interest in testing the evolution of the global factor over time, we face a trade-off between having long time series and wide country coverage. Very long time series of key macroeconomic and financial variables are available only for a few countries that are not likely to reflect global trends properly, especially in recent years. Estimations of factor models for a larger number of countries, including EMEs, are possible only from the mid-1990s.

In view of these data limitations, we focus on up to 42 key advanced and emerging-market economies (Table 1).<sup>2</sup> Although the sample does not allow us to investigate changes in the role of the factors over a longer period, this country sample is broad enough to capture the global factor properly. As an alternative specification, we also estimate models for a group of 15 advanced economies,<sup>3</sup> with data starting in 1980. The nature of the global factor (i.e. pertinent to all countries in a given group – see below) for the 15 advanced economies thus differs from and is not entirely comparable with the global factor for the 42 countries. However, as these 15 countries represented a large share of the world GDP in the 1980s, they could capture the global factor well in this period.<sup>4</sup>

<sup>&</sup>lt;sup>2</sup> Data coverage differs across the variables. For real GDP, data are available for all countries; for inflation, data are missing for South Africa; for government bond yields, data are missing for eight countries (Chile, China, Estonia, Indonesia, Israel, the Slovak Republic, Slovenia and Turkey); for equity prices, data are missing for five countries (Estonia, Latvia, Lithuania, the Slovak Republic and Slovenia).

<sup>&</sup>lt;sup>3</sup> They include Australia, Austria, Belgium, Canada, Denmark, France, Germany, Ireland, Italy, Japan, the Netherlands, Norway, Switzerland, the United Kingdom and the United States.

<sup>&</sup>lt;sup>4</sup> The global factor estimated in the two-factor model and the global factor estimated in the one-factor model are somewhat correlated (0.43) during the period 1995-2006 and highly correlated (0.75) during the period 2007-2017. The high correlation observed in the second sub-period, however, is driven by the years of the financial crisis (2007-09). When this period is excluded the correlation falls from 0.75 to 0.50.

Regions (N° of countries)	Countries
Americas (5)	Brazil, Canada, Chile, Mexico and the United States
Asia and Oceania (8)	Australia, China, India, Indonesia, Japan, New Zealand, South Africa and South Korea
Europe+2 (29)	Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, the Netherlands, Norway, Poland, Portugal, Russia, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland and the United Kingdom + Israel and Turkey

Table 1. Definition of regions for the two-factor model

Source: Authors.

We use two-factor models to decompose fluctuations in a variable of interest into global, regional and country-specific factors. The estimated global and regional factors capture all unobservable features driving the co-movements of a given variable across a group of countries. A global factor affects all countries, a regional factor affects only the subset of countries within a region, and a country-specific factor captures everything not accounted by global and regional factors. For the alternative specification for the 15 advanced economies, a one-factor model is employed that decomposes fluctuations only into global and country-specific factors.

Factors' identification is based on the assumption of orthogonality across them, which does not allow for mutual interactions (i.e. each factor is assumed to have no contemporaneous or lagged impact on other factors). This also implies that the contribution of each factor to the business cycle is independent. The variance unexplained by the global/regional factors is then interpreted as the idiosyncratic, country-specific component.

For the two-factor model, regions are defined primarily according to the geographical criteria, following the practice in the literature (Kose et al., 2003; Crucini et al., 2011; Neely and Rapach, 2011). In the baseline specification, we define three regions: the Americas; Asia and Oceania; and Europe+2 (Table 1). The regions are defined so as to avoid regions with very few countries.<sup>5</sup>

The two-factor model is formally defined in a standard state-space representation by four equations:

$$y_{i,t} = \theta_i^G F_t^G + \theta_i^r f_t^r + e_{i,t} \tag{1}$$

$$e_{i,t} = \rho_i(L)e_{i,t-1} + \varepsilon_{i,t} \tag{2}$$

$$F_t^G = \rho_F^G(L)F_{t-1}^G + u_t^G$$
(3)

$$f_t^r = \rho_F^r(L)f_{t-1}^r + u_t^r \tag{4}$$

where  $y_{i,t}$  is an observable macroeconomic variable for country *i* from a set of *N* countries at time *t*.  $F_t^G$  is an unobservable global factor common to all countries, and  $f_t^r$  is an unobservable regional factor common only to the countries within each region, from a vector of regional factors  $F_t^R = \{f_t^1, ..., f_t^R\}$ , with *R* indicating the number of regions. The

<sup>&</sup>lt;sup>5</sup> The assignment of South Africa to Asia and Oceania is arbitrary. It was motivated by its dominant trade links with this region. Its inclusion to the Europe+2 region does not change the average results.

factor loadings  $\theta_i^G$  and  $\theta_i^r$  are scalar coefficients that capture the relative importance of the two factors in driving  $y_{i,t}$ . The unexplained idiosyncratic error  $e_{i,t}$  is assumed to be normal but may be serially correlated with independent normal innovations. Both factors are assumed to follow an autoregressive process of the same order q with normal uncorrelated innovations ( $u_t^G, u_t^r$ ) that ensure orthogonality across factors.

In the two-factor model, at any time, there are *N* observables (i.e. number of countries) but only I+R global and regional factors, with  $R << N.^6$  The two-factor model specification imposes (R-1)\*N zero restrictions to the (N, I+R) loading matrix  $\theta$ , which are sufficient to avoid rotational indeterminacy when the number of countries (N) is significantly larger than the number of regions (R).<sup>7</sup> The scale of the factors is normalised by setting unitary variance to factors innovations. To avoid sign indeterminacy, sign normalisation is enforced by setting  $\theta_i^G > 0$  for i=1, and  $\theta_i^T > 0$  for a specific *i* of any region r=1,..., R.

The system defined by equations (1) to (3) can be modified to describe the state-space representation of an one-factor model, i.e. including only global and country-specific factors and excluding the regional factor ( $\theta_i^r f_t^r = 0$ ).

Factors are unobservable and are estimated through the "data augmentation" Bayesian methodology developed by Otrok and Whiteman (1998) and Kose et al. (2003, 2012), using modified codes by Neely and Rapach (2011). The posterior distribution of the coefficients and factors is obtained by sequentially drawing from conditional distributions (Gibbs sampling) via a Markov Chain Monte Carlo procedure, with the number of draws being set to 120 000 from which the first 20 000 are discarded for "burning-in". Following the literature, conjugate priors are assumed. They are parametrised so as to be relatively uninformative (Kose et al., 2003; Neely and Rapach, 2011).

At each draw, the contribution of each factor to fluctuations of the variable of interest is obtained through a standard variance decomposition that, for orthogonal factors, boils down to:

$$var(y_{i,t}) = (\theta_i^G)^2 var(F_t^G) + (\theta_i^r)^2 var(f_t^r) + var(e_{i,t})$$

Then, for each country, a median from the posterior distribution of the variance decomposition is calculated. Aggregate results are reported as an average of country-specific medians. To investigate cross-country heterogeneity, for each variable and each factor we also look at the density distribution of contribution of factors across countries and its evolution over time. A rightwards (leftwards) shift in the density distribution points to an increase (decrease) in the average of the contribution of the factor. The change in the variance of the density distribution, instead, shows whether the shift in the average contribution of the factor is generalised across countries and provides information about the change in the degree of cross-country heterogeneity.

<sup>7</sup> At least  $(1 + R)^2$  restrictions are required to avoid rotational indeterminacy and N \* (R - 1) zero-restrictions are imposed. This implies that the following condition must hold  $N \ge \frac{(1+R)^2}{(R-1)}$ , which is respected for  $R \ll N$ .

<sup>&</sup>lt;sup>6</sup> At time t, equation (1) for all countries i=1,...,N can be regrouped in a compact way as  $y_t = \theta F_t + e_t$ , where  $y_t = (y_{1t}, ..., y_{Nt})'$  is a (N, l) vector of observables,  $F_t = (F_t^G, f_t^1, ..., f_t^R)'$  is a (l+R, l) vector of factors and  $\theta = (\theta'_1, ..., \theta'_N)'$  is the (N, l+R) loading matrix where  $\theta_i = (\theta_i^G, \theta_i^1, ..., \theta_i^R)'$  is the (l+R, l) vector of loading coefficients of equation *i*.

The factor models are estimated for four variables: equity price index, 10-year government bond yields, real GDP per capita growth and consumer price inflation. All variables are transformed to ensure stationarity: per cent growth rates are applied to real GDP per capita, consumer and equity prices; and a first difference is applied to 10-year bond yields.

In order to check if the contribution of global and regional factors to evolution of the four variables changed over time, the whole available sample is divided in two subsamples at annual frequency for the 42-country group (1995-2006 and 2007-17). The first subsample includes all years preceding the crisis; the second subsample includes the years of the crisis and the post-crisis period. As a robustness check, to test for the impact of the global financial crisis, estimation is also performed for the last subsample shortened by excluding the peak crisis years (2007-09). However, given the short sample, the results may be less reliable. For the alternative specification with 15 advanced economies, three subsamples are used (1980-1994, 1995-2006 and 2007-17), with the same robustness check for 2010-17.

### Results

#### Financial variables

The combined average contribution of global and regional factors (i.e. non-country-specific factors) in explaining fluctuations of long-term government bond yields declined in 2007-17 from a high level in 1995-2006 (Figure 2). This decline is not affected much by excluding the 2007-09 period, and was more pronounced for EMEs than for advanced economies. The increasing role of country-specific factors is quite generalised across countries, with the density distribution of the contribution of the country-specific factor becoming more tightly distributed around the density peak in the last decade (Figure A2 in Annex).

In Europe+2, the rising importance of country-specific factors for fluctuations of government bond yields after the global financial crisis came at the cost of a waning role of the regional factor, which was an important driving force in 1995-2006 (Table A1 in Annex). This is consistent with the financial fragmentation taking place during the euro area sovereign debt crisis. Government bond yields increased substantially in a number of vulnerable euro area countries, in contrast to safe-haven countries. In addition, the diminished role of global and regional factors at the global level could be explained by quantitative easing, that presumably affected longer-term government bond yields more than conventional monetary policy in the past, having been undertaken at different times and to differing extents in the major advanced economies.

For equity prices, the very high average contribution of non-country-specific factors did not change much from 1995-2006 to 2007-17, though it declined when the 2007-09 period is excluded (Figure 2). In general, this pattern is widespread across countries. This can be seen in the evolution of the distribution of the contribution of global and regional factors across countries that became more concentrated around the distribution mode (i.e. the most frequent value), thus pointing to less heterogeneity. Moreover, it is also evident that the distribution of the global factor shifted leftwards (Figure A1 in Annex). The decline in 2010-17 is common to both EMEs and advanced economies, though it is more pronounced for EMEs. This likely reflects a growing number of country-specific developments, especially in EMEs, related to geopolitical events and large fluctuations in exchange rates, after the initial phase of the global financial crisis characterised by a synchronised collapse in equity prices. Nonetheless, the global factor remained highly relevant, in particular in the Americas and in Europe+2 regions (Table A2). On average, the contribution of country-specific factors to fluctuations in equity prices is generally lower than for government bond yields. This might be explained by a greater role of the sentiment factor for equity investors rather than by a generally higher participation of foreign investors; in some advanced economies, including the United States, foreign investors hold a greater share of outstanding domestic government debt securities than domestic equities (Figure 3).



Figure 2. Estimation results for the group of 42 advanced and emerging-market economies

*Note:* Reported results refer to averages across countries. Factors are estimated in a dynamic two-factor model (global and regional) at annual frequency with one lag. All variables are transformed to ensure stationarity: annual growth is computed for real GDP per capita and for consumer and equity prices, while 10-year government bond yields are first differenced. The 42 countries are listed in Table 1. The country coverage differs across variables – see footnote 2.

Source: OECD Economic Outlook 103 database; and authors' calculations.

# Figure 3. Non-resident ownership of domestic assets has been increasing in the main advanced economies

Assets held by non-residents as a share of domestic assets



1. In Panel B, non-residents' holdings of government debt includes bonds held by residents of other euro area countries. The Maastricht definition of government debt is used in the denominator.

Source: Bank of Japan; European Central Bank; US Federal Reserve; and authors' calculations.

Finally, we observe that financial variables in advanced economies were generally more affected by global and regional factors than real GDP growth (see below), suggesting that global financial linkages or/and common financial shocks were stronger than real ones. This is in line with evidence that business cycle synchronisation between the United States and other OECD countries decreased prior to the crisis despite stronger financial integration (Heathcote and Perri, 2004) and that banking integration can have a negative impact on output synchronisation (Kalemli-Ozcan et al., 2013a,b).

### Real GDP per capita growth

Regarding real GDP per capita growth, the average importance of non-country-specific factors increased between 1995-2006 and 2007-17 (Figure 2). This was partly affected by the peak of the global financial crisis. The synchronised recession in many advanced economies has likely helped increase the role of the global factor, which strengthened from 1995-2006 to 2007-17 but by less when compared with the 2010-17 period. The global factor increased in the three regions, mirrored by a weakening of country-specific factors (Tables A1 and A2 in Annex). However, some heterogeneity can be observed across countries. The density distribution of the contribution of the global factor shifted rightwards and its variance increased (Figure A1).

The rising role of the global factor in GDP fluctuations since the mid-1990s is in line with many empirical studies, suggesting that trade integration strengthens business cycle synchronisation (Frankel and Rose, 1998; Clark and van Wincoop, 2001; Di Giovanni and Levchenko, 2010; Karadimitropoulou and Léon-Ledesma, 2013; Duval et al., 2016). It could also signal that, in the past decade, EMEs have greatly enhanced their interconnectedness with global economy, becoming at the same time more exposed to external shocks and spillovers (see below).

#### *Consumer price inflation*

For consumer price inflation, the average contribution of non-country-specific factors increased from 1995-2006 to 2007-17(Figure 2). While the average role of non-country-specific factors is not affected by the peak of the global financial crisis, the global factor seems to have gained importance compared with the country-specific factor. The developments are likely driven by large swings in energy prices and sizeable global economic slack, in particular in advanced economies. This pattern appears to be common across countries. In the past decade, the density function shifted leftwards and the variance declined (Figure A1 in Annex).

As a result, after the crisis, the global factor has become the dominant driving force of inflation fluctuations, especially for most of the advanced countries in Europe. Also, in Europe, the importance of country-specific factors is the lowest among the three regions, pointing to a reduced role of domestic factors in driving inflation fluctuations.

#### Differences between advanced and emerging-market economies

Given the increasing importance of EMEs in the global economy but their still lower level of integration (Figure 1), we check if there are important differences between advanced economies and EMEs in the contributions of global and regional factors to fluctuations in

the four variables.<sup>8</sup> We do this by comparing the average contributions for the two groups (Table A3 in Annex), without changing the composition of the three geographical regions in the baseline estimation as described in Table 1.<sup>9</sup>

Regarding financial variables, country-specific factors explain a higher share of variation in EMEs than they do in advanced economies, especially for equity prices (Table A3). This may stem from still higher investors' risk perceptions about EMEs, related to generally weaker fundamentals and institutions. They may also reflect a lower degree of integration of EMEs in global financial markets and their less liquid and less developed markets in comparison with the advanced economies. Consequently, domestic events are likely to influence financial markets more than in advanced economies.

In the advanced economies the increase in the importance of the global factor in driving business cycles in 2007-17 compared with 1995-2006 is less pronounced than in EMEs (Table A3). Moreover, the global factor contribution tends to be higher in EMEs than in advanced economies. This is somewhat surprising and might capture a higher reliance of some EMEs on commodities and their increasing importance in the process of international fragmentation of production. At the same time, we find signs of more business cycle convergence within the group of advanced countries but not within EMEs (Table A.3), as the role of the regional factor increased in the former group but remained stable or fell slightly in the latter.

The role of country-specific factors in explaining fluctuations of inflation has evolved in opposite directions between the advanced economies and EMEs. In the advanced economies, the importance of country-specific factors declined from 1995-2006 to 2010-17 probably due to common disinflationary trend related to globalisation and technological progress, sizeable economic slack and changes in commodity prices. In contrast, in EMEs, the contribution of country-specific factors increased. This could be explained by idiosyncratic large fluctuations in exchange rates in 2010-17, which pass through to domestic inflation to a larger extent than in advanced economies.

## European integration

The high degree of economic interconnectedness across European countries, in particular among euro area members, suggests that common factors should play an important role. Indeed, for the euro area and also EU members, the average contribution of the regional factor to fluctuations of 10-year government bond yields and real GDP per capita growth is higher than the average contribution in other countries in all analysed periods. In the last decade, this was also the case for equity prices. Only consumer price inflation is an exception to this pattern, mainly for the large increase in the contribution of global factors in the last decade. For real GDP growth per capita and equity prices, the importance of the

<sup>&</sup>lt;sup>8</sup> Advanced economies include Australia, Austria, Belgium, the Czech Republic, Canada, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, the United Kingdom and the United States. EMEs include Brazil, Chile, China, Hungary, India, Indonesia, Mexico, Poland, Russia, South Africa and Turkey.

<sup>&</sup>lt;sup>9</sup> The changes in contribution of three factors for the real GDP per capita growth are broadly similar as for estimations with two regions dividing countries between advanced and emerging-market economies (not reported in this paper). According to these estimations, the increase in business cycle synchronisation is observed both for the advanced and emerging-market economies, in contrast to the findings in Kose et al. (2012) for the period 1960-2005.

regional factor has strengthened since the mid-1990s. The opposite is true for 10-year government bond yields, most likely reflecting sovereign debt crisis in the euro area – as discussed above.

### The role of the global factor since the 1980s

For the group of 15 advanced economies, the contribution of the global factor to fluctuations in equity prices and long-term government bond yields rose from the 1980s to the mid-2000s and reached high levels, with a corresponding decline in the role of country-specific factors (Figure 4). This general trend likely reflects liberalisation of capital flows and a continued expansion of financial markets and products in the advanced economies. For government bond yields, greater monetary policy synchronisation, including from the creation of the euro area, and an increasing non-resident ownership of government bonds (Figure 3) could also have contributed to the strengthening role of the global factor.

In the 2007-17 period, the role of global factors for financial variables has been more diverse (Figure 4). For long-term government bond yields, the average contribution of the global factor has declined and was not affected much by excluding the 2007-09 period, in line with results from the baseline specification. This result probably captures the euro area sovereign crisis.

In contrast, for equity prices, the contribution of the global factor has increased to a very high level in 2007-17 but this seems to be driven primarily by the peak of the crisis when equity prices collapsed across the world (Figure 4). Excluding the 2007-09 period, the contribution remained broadly stable from the 1995-2006 period. The high contribution is likely to be driven by common shocks related to risk aversion rather than the increasing role of foreign investors (Figure 3) and investment funds, including exchange-traded funds.

Regarding real GDP per capita growth, the contribution of the global factor increased since the 1980s (Figure 4). It reached an especially high level in the 2007-17 period, but this seems to be a temporary effect reflecting the common recession in the advanced economies. Excluding the 2007-09 period, the contribution of the global factor falls to a similar level as in 1980-1994.

For consumer price inflation, the contribution of the global factor was high in 1980-1994, possibly reflecting large fluctuations in commodity prices, in particular of oil, in this period. In 1995-2006, the contribution was very low, which is surprising given the intensification of globalisation and a widespread stabilisation of inflation at low levels in advanced economies. In 2007-17, the contribution increased again and this is not much affected by the crisis given little differences in results when the 2007-09 period is excluded. The results for the last period are again likely due to large swings in energy prices and sizeable global economic slack.



Figure 4. Estimation results for the group of 15 advanced economies

*Note*: Reported results refer to averages across countries. Factors are estimated in a one-factor model (global) at annual frequency with one lag. All variables are transformed to ensure stationarity: annual growth is computed for real GDP per capita and for consumer and equity prices, while 10-year bond yields are first differenced. 15 advanced economies include: Australia, Austria, Belgium, Canada, Denmark, France, Germany, Ireland, Italy, Japan, the Netherlands, Norway, Switzerland, the United Kingdom and the United States. *Source*: OECD Economic Outlook 103 database; and authors' calculations.

#### **Robustness checks**

We perform three robustness checks for the average results. First, we estimate dynamic factor models with up to three lags (Table A4 in Annex). In general, the results differ very little. On the basis of a marginal likelihood analysis the one-lag model specification performs best for most variables and subsamples. The two-lag model specification performs best only in few cases. The three-lag specification always underperforms. Moreover, as we use yearly data and a relatively short time sample, model specifications with more lags imply using fewer data points and estimating more parameters, which might result in a loss of efficiency. For these reasons we opted for the baseline model specification with one lag. For the group of 15 advanced economies, results are also robust with respect to the number of lags (Table A5).

Second, we estimate the same models at quarterly, instead of annual, frequency.<sup>10</sup> The main finding is that the contribution of country-specific factors is much higher with quarterly frequency than with annual frequency. This is expected given more erratic movements and more acute measurement errors for quarterly data. The general findings about the direction of changes in the importance of global and regional factors remain broadly unchanged. However, at quarterly frequency, the contribution of the global factor to explain fluctuations of financial variables is far higher than that of real variables. This suggests that financial shocks propagate much faster than real shocks.

Third, we test two alternative ways of splitting the Europe+2 region as it accounts for more than two-thirds of all countries in the sample (Table A6). The first divides countries

<sup>&</sup>lt;sup>10</sup> Results are not reported in the paper but available from authors upon request.

between (current) euro area members and non-euro area members. The second is based on a distinction between countries that joined the European Economic Area (EEA) or were part of the Single Market before the 2000s and countries that either joined the EEA afterwards or stay outside the EEA. Overall, the cross-country average contributions of global and regional factors do not change much in the alternative estimations with four regions.<sup>11</sup> Also the average contributions of the global factor for the two other regions (the Americas, and Asia and Oceania) are not affected much, with only the results for equity prices in the 2007-17 period differing significantly.

# Conclusions

We estimate dynamic factor models for two sub-samples between 1995 and 2017 for up to 42 advanced and emerging-market economies to investigate changes in the contribution of global and regional factors to fluctuations in real GDP per capita growth, inflation, 10-year government bond yields and equity prices. We find that the combined average contribution of global and regional factors in explaining fluctuations of GDP growth and inflation increased between 1995-2006 and 2007-17. In contrast, for financial variables, the role of country-specific factors strengthened between these two periods. For all variables, there is large cross-country heterogeneity regarding the level of contributions of specific factors and their evolution over time. Thus, economic and financial conditions in individual countries can still deviate from global trends.

Our analysis does not formally measure the relative importance of different explanations underlying the changing role of global and regional factor in explaining the fluctuations of financial and macroeconomic variables. For instance, for financial variables, the role of global factors may depend on the composition of capital flows and investors, which are likely to vary over time (Guichard, 2017). In particular, banking and portfolio capital flows, especially in foreign currency, might be more heavily affected by global factors than FDI flows. The latter are more likely to reflect local "pull" factors (Rey, 2015; Hoggarth et al., 2016; Eichengreen et al., 2017). Also, the growth of exchange-traded funds might have helped to raise the overall sensitivity of portfolio flows to global risk factors, especially for EMEs (Converse et al., 2018). Similarly, the role of the global factor for GDP growth and inflation could be affected by changing trade and GVCs linkages as well as the size of commodity price shocks.

Testing among these alternative explanations will be part of future research, for example via running panel regressions with the contribution of the global/regional factor to the variance of a variable on country-specific characteristics.

<sup>&</sup>lt;sup>11</sup> Results are not reported in the paper but available from authors upon request.

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# Annex A. Supplementary tables and figures

### Table A.1. The role of regional factors, country-by-country results

Contribution of regional factors to the variance of a given variable, as a share

	Real GDP per capita growth		Consumer price inflation		10-year gov.	bond yields	Equity prices	
	1995-06	2010-17	1995-06	2010-17	1995-06	2010-17	1995-06	2010-17
Americas	0.27	0.20	0.15	0.29	0.16	0.16	0.23	0.17
Brazil	0.22	0.29	0.21	0.57	0.49	0.57	0.53	0.24
Canada	0.28	0.24	0.09	0.04	0.04	0.02	0.00	0.04
United States	0.15	0.21	0.07	0.03	0.01	0.03	0.03	0.12
Mexico	0.38	0.17	0.29	0.56	0.10	0.02	0.10	0.09
Chile	0.34	0.08	0.10	0.23	-	-	0.48	0.34
Asia and Oceania	0.33	0.32	0.32	0.23	0.14	0.06	0.39	0.21
New Zealand	0.24	0.66	0.09	0.08	0.03	0.06	0.36	0.14
India	0.07	0.61	0.76	0.54	0.30	0.08	0.41	0.03
Korea	0.73	0.56	0.33	0.05	0.10	0.04	0.62	0.10
Japan	0.13	0.53	0.01	0.04	0.04	0.06	0.55	0.68
South Africa	0.38	0.10	-	-	0.34	0.07	0.23	0.05
China	0.03	0.07	0.12	0.23	-	-	0.03	0.14
Indonesia	0.75	0.03	0.89	0.29	-	-	0.86	0.21
Australia	0.34	0.02	0.01	0.40	0.05	0.07	0.06	0.34
Europe+2	0.32	0.35	0.17	0.22	0.49	0.27	0.06	0.22
Belgium	0.61	0.85	0.03	0.17	0.61	0.55	0.42	0.11
Italy	0.60	0.75	0.12	0.27	0.88	0.61	0.00	0.58
Finland	0.33	0.74	0.21	0.28	0.73	0.12	0.12	0.19
France	0.70	0.72	0.08	0.24	0.74	0.35	0.01	0.43
Netherlands	0.68	0.72	0.04	0.30	0.52	0.11	0.03	0.32
Slovenia	0.28	0.68	0.43	0.29	-	-	-	-
Slovak Rep.	0.31	0.61	0.37	0.28	-	-	-	-
Portugal	0.27	0.56	0.07	0.21	0.90	0.69	0.12	0.27
Czech Rep.	0.02	0.54	0.23	0.27	0.64	0.30	0.02	0.08
Denmark	0.52	0.49	0.19	0.25	0.58	0.07	0.00	0.31
Germany	0.32	0.45	0.07	0.26	0.47	0.08	0.02	0.17
Spain	0.45	0.44	0.08	0.27	0.90	0.41	0.06	0.47
Sweden	0.59	0.39	0.03	0.12	0.84	0.07	0.00	0.12
Hungary	0.01	0.38	0.33	0.26	0.02	0.67	0.04	0.03
Poland	0.47	0.32	0.37	0.25	0.10	0.38	0.01	0.11
Austria	0.75	0.32	0.06	0.27	0.59	0.30	0.06	0.16
Israel	0.27	0.26	0.12	0.21	-	-	0.06	0.15
Switzerland	0.50	0.20	0.08	0.09	0.28	0.07	0.03	0.39

#### Table A.2. The role of regional factors, country-by-country results (Cont.)

	Real GDP per o	capita growth	Consumer pr	Consumer price inflation		ond yields	Equity prices	
	1995-06	2010-17	1995-06	2010-17	1995-06	2010-17	1995-06	2010-17
Luxembourg	0.37	0.16	0.04	0.25	0.41	0.08	0.01	0.02
Turkey	0.03	0.12	0.31	0.06	-	-	0.01	0.02
Estonia	0.04	0.08	0.26	0.25	-	-	-	-
Greece	0.01	0.07	0.15	0.13	0.32	0.43	0.01	0.31
Iceland	0.02	0.07	0.03	0.22	0.14	0.19	0.09	0.25
Lithuania	0.25	0.07	0.26	0.24	0.25	0.10	-	-
Russia	0.10	0.07	0.10	0.14	0.40	0.05	0.06	0.21
Ireland	0.37	0.04	0.19	0.20	0.65	0.55	0.25	0.63
Latvia	0.07	0.03	0.25	0.17	0.41	0.13	-	-
Norway	0.23	0.03	0.15	0.21	0.15	0.08	0.02	0.05
United Kingdom	0.02	0.02	0.31	0.24	0.33	0.08	0.03	0.02

Contribution of regional factors to the variance of a given variable, as a share

*Note*: Factors are estimated at annual frequency with one lag. All variables are transformed to ensure stationarity: annual growth is computed for real GDP per capita and for consumer and equity prices, while 10-year bond yields are first differenced. Countries are sorted based on the 2010-17 value for GDP growth.

Source: OECD Economic Outlook 103 database; and authors' calculations.

	Real GDP per capita growth		Consumer price inflation		10-vear gov	bond vields	Equity prices	
	1995-06	2010-17	1995-06	2010-17	1995-06	2010-17	1995-06	2010-17
Americas	0.20	0.35	0.33	0.19	0.49	0.41	0.60	0.48
Brazil	0.32	0.58	0.31	0.16	0.46	0.06	0.00	0.38
Canada	0.10	0.28	0.01	0.17	0.05	0.50	0.85	0.55
United States	0.10	0.20	0.21	0.17	0.00	0.60	0.00	0.00
Movico	0.10	0.05	0.00	0.42	0.88	0.00	0.05	0.71
Chile	0.15	0.14	0.30	0.00	0.00	0.40	0.30	0.38
Asia and Oceania	0.04	0.71	0.40	0.12	0.24	0.20	0.22	0.00
New Zealand	0.15	0.03	0.23	0.31	0.24	0.25	0.24	0.23
	0.06	0.00	0.21	0.27	0.00	0.45	0.24	0.14
Korea	0.00	0.10	0.15	0.20	0.07	0.05	0.50	0.17
lanan	0.05	0.21	0.20	0.35	0.47	0.55	0.00	0.02
South Africa	0.00	0.62	0.45	0.55	0.21	0.12	0.16	0.07
China	0.20	0.02	-	0.35	0.01	0.17	0.10	0.00
Indenesia	0.04	0.77	0.21	0.00	-	-	0.20	0.00
Australia	0.20	0.00	0.10	0.00	-	-	0.14	0.30
Australia	0.10	0.02	0.27	0.32	0.11	0.39	0.75	0.04
Europe+2	0.13	0.27	0.20	0.49	0.21	0.32	0.07	0.39
Beigium	0.06	0.07	0.10	0.57	0.21	0.11	0.40	0.32
	0.08	0.12	0.39	0.62	0.03	0.10	0.89	0.19
Finland	0.10	0.10	0.08	0.48	0.11	0.47	0.73	0.51
France	0.08	0.13	0.31	0.65	0.11	0.24	0.93	0.49
Netherlands	0.06	0.19	0.03	0.48	0.32	0.50	0.88	0.58
Slovenia	0.18	0.23	0.27	0.57	-	-	-	-
Slovak Rep.	0.23	0.08	0.15	0.53	-	-	-	-
Portugal	0.08	0.29	0.14	0.63	0.02	0.16	0.77	0.42
Czech Rep.	0.20	0.19	0.66	0.55	0.04	0.32	0.16	0.04
Denmark	0.09	0.07	0.09	0.63	0.18	0.57	0.88	0.32
Germany	0.05	0.45	0.08	0.62	0.38	0.54	0.96	0.72
Spain	0.12	0.50	0.31	0.63	0.01	0.12	0.90	0.17
Sweden	0.04	0.04	0.06	0.41	0.04	0.44	0.96	0.64
Hungary	0.01	0.22	0.60	0.57	0.67	0.10	0.51	0.37
Poland	0.09	0.04	0.53	0.69	0.01	0.19	0.27	0.56
Austria	0.05	0.27	0.19	0.58	0.23	0.28	0.25	0.53
Israel	0.24	0.33	0.30	0.43	-	-	0.84	0.15
Switzerland	0.11	0.21	0.14	0.11	0.35	0.48	0.93	0.52
Luxembourg	0.14	0.03	0.12	0.68	0.13	0.52	0.77	0.01
Turkey	0.37	0.43	0.47	0.03	-	-	0.60	0.47
Estonia	0.45	0.69	0.63	0.62	-	-	-	-
Greece	0.05	0.71	0.25	0.40	0.01	0.46	0.47	0.34
Iceland	0.01	0.26	0.09	0.38	0.02	0.13	0.11	0.06
Lithuania	0.26	0.78	0.59	0.58	0.32	0.20	-	-
Russia	0.05	0.70	0.11	0.20	0.60	0.03	0.44	0.54
Ireland	0.13	0.31	0.29	0.21	0.23	0.09	0.72	0.03
Latvia	0.27	0.15	0.15	0.51	0.56	0.53	-	-
Norway	0.05	0.10	0.11	0.25	0.12	0.56	0.70	0.67
United Kingdom	0.10	0.11	0.13	0.63	0.35	0.46	0.91	0.81

Table A 3 The	role of the	global factor	country_b	v_country	results
Table A.J. The	role of the	giobal lactor,	country-D	y-country	I courto

*Note*: Factors are estimated at annual frequency with one lag. All variables are transformed to ensure stationarity: annual growth is computed for real GDP per capita and for consumer and equity prices, while 10-year bond yields are first differenced. Countries are sorted as in Table A1.

Source: OECD Economic Outlook 103 database; and authors' calculations.

#### Table A.4. Comparison between advanced and emerging-market economies

Advanced economies Emerging-market economies Variable N° Factors 1995-2007-2010-1995-2007-2010lags 2006 2017 2017 2006 2017 2017 Real GDP per capita growth Global 0.13 0.40 0.23 0.20 0.36 0.47 1 0.34 0.37 0.23 Regional 0.30 0.25 0.20 Country-specific 0.53 0.40 0.40 0.30 0.54 0.33 2 Global 0.13 0.37 0.23 0.16 0.36 0.44 0.31 0.33 0.35 0.24 Regional 0.29 0.17 Country-specific 0.56 0.30 0.42 0.56 0.40 0.38 0.23 0.34 0.48 0.35 0.26 Consumer price inflation Global 0.25 1 Regional 0.14 0.32 0.20 0.35 0.35 0.31 Country-specific 0.63 0.34 0.32 0.30 0.39 0.44 2 Global 0.24 0.41 0.46 0.43 0.25 0.25 0.14 0.24 0.21 0.31 0.29 Regional 0.27 Country-specific 0.62 0.35 0.33 0.31 0.43 0.46 10-year gov. bond yields 1 0.21 0.37 0.37 0.39 0.12 0.15 Global Regional 0.43 0.21 0.21 0.25 0.23 0.26 Country-specific 0.36 0.43 0.42 0.37 0.65 0.58 2 0.40 Global 0.22 0.33 0.38 0.10 0.15 0.22 Regional 0.42 0.21 0.25 0.23 0.27 Country-specific 0.36 0.46 0.39 0.37 0.68 0.58 Equity prices 1 Global 0.66 0.59 0.39 0.35 0.61 0.36 0.11 0.16 0.25 0.25 0.11 Regional 0.14 0.22 0.36 0.28 0.26 0.40 0.50 Country-specific 2 Global 0.65 0.49 0.43 0.33 0.66 0.26 0.13 0.27 0.21 0.27 0.07 0.20 Regional Country-specific 0.22 0.24 0.37 0.40 0.27 0.54

Average contribution of the indicated factors to the variance of a given variable, as a share

*Note:* Factors are estimated at annual frequency. All variables are transformed to ensure stationarity: annual growth is computed for real GDP per capita and for consumer and equity prices, while 10-year bond yields are first differenced. 42 countries divided in three regions are listed in Table 1. Advanced economies include Australia, Austria, Belgium, the Czech Republic, Canada, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, the United Kingdom and the United States. EMEs include Brazil, Chile, China, Hungary, India, Indonesia, Mexico, Poland, Russia, South Africa and Turkey. The country coverage differs across variables – see Table A1. The averages are calculated for the respective group of advanced and merging market economies. On the basis of a marginal likelihood analysis results from the three-lag model specification are omitted.

Source: OECD Economic Outlook 103 database; and authors' calculations.

# Table A.5. Robustness check with different lags for the two-factor model with 42 advanced and emerging-market economies

Variable	N° lags	Factors	1980-1994	1995-2006	2007-2017	2010-2017
Real GDP per capita growth	1	Global	N.A.	0.15	0.39	0.29
		Regional	N.A.	0.31	0.28	0.33
		Country-specific	N.A.	0.53	0.32	0.38
	2	Global	N.A.	0.14	0.37	0.29
		Regional	N.A.	0.30	0.30	0.31
		Country-specific	N.A.	0.56	0.33	0.41
Consumer price inflation	1	Global	N.A.	0.26	0.32	0.42
		Regional	N.A.	0.19	0.33	0.23
		Country-specific	N.A.	0.55	0.35	0.34
	2	Global	N.A.	0.28	0.37	0.41
		Regional	N.A.	0.17	0.26	0.23
		Country-specific	N.A.	0.55	0.37	0.36
10-year gov. bond yields	1	Global	N.A.	0.25	0.31	0.32
		Regional	N.A.	0.39	0.21	0.22
		Country-specific	N.A.	0.36	0.47	0.46
	2	Global	N.A.	0.25	0.28	0.35
		Regional	N.A.	0.39	0.21	0.23
		Country-specific	N.A.	0.36	0.51	0.43
Equity prices	1	Global	N.A.	0.57	0.59	0.38
		Regional	N.A.	0.16	0.14	0.22
		Country-specific	N.A.	0.27	0.26	0.40
	2	Global	N.A.	0.56	0.54	0.38
		Regional	N.A.	0.17	0.21	0.20
		Country-specific	N.A.	0.27	0.25	0.42

Average contribution of the indicated factors to the variance of a given variable, as a share

*Note:* Factors are estimated at annual frequency. All variables are transformed to ensure stationarity: annual growth is computed for real GDP per capita and for consumer and equity prices, while 10-year bond yields are first differenced. 42 countries are listed in Table 1. The country coverage differs across variables – see Table A1. On the basis of a marginal likelihood analysis results from the three-lag specification are omitted. *Source:* OECD Economic Outlook 103 database; and authors' calculations.

# Table A.6. Robustness check with different lags for the one-factor model with 15 advanced economies

Variable	N° lags	Factors	1980-1994	1995-2006	2007-2017	2010-2017
Real GDP per capita growth	1	Global	0.35	0.41	0.68	0.36
		Country-specific	0.65	0.59	0.32	0.64
	2	Global	0.35	0.41	0.68	0.31
		Country-specific	0.65	0.59	0.32	0.69
Consumer price inflation	1	Global	0.66	0.22	0.53	0.59
		Country-specific	0.34	0.78	0.47	0.41
	2	Global	0.66	0.21	0.53	0.58
		Country-specific	0.34	0.79	0.47	0.42
10-year gov. bond yields	1	Global	0.61	0.78	0.57	0.60
		Country-specific	0.39	0.22	0.43	0.40
	2	Global	0.61	0.78	0.57	0.61
		Country-specific	0.39	0.22	0.43	0.39
Equity prices	1	Global	0.56	0.69	0.84	0.67
		Country-specific	0.44	0.31	0.16	0.33
	2	Global	0.56	0.69	0.84	0.66
		Country-specific	0.44	0.31	0.16	0.34

Average contribution of the indicated factors to the variance of a given variable, as a share

*Note*: Factors are estimated at annual frequency. All variables are transformed to ensure stationarity: annual growth is computed for real GDP per capita and for consumer and equity prices, while 10-year bond yields are first differenced. 15 advanced economies include: Australia, Austria, Belgium, Canada, Denmark, France, Germany, Ireland, Italy, Japan, the Netherlands, Norway, Switzerland, the United Kingdom and the United States. The country coverage differs across variables – see Table A1. On the basis of a marginal likelihood analysis results from the three-lag model specification are omitted.

Source: OECD Economic Outlook 103 database; and authors' calculations.

Table A.7. Alternative	e divisions	of the	Europe+2	region
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Regions	Countries
Version 1	
Euro area (17)	Austria, Belgium, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, the Netherlands, Portugal, the Slovak Republic, Slovenia and Spain
The rest (12)	the Czech Republic, Denmark, Hungary, Iceland, Israel, Norway, Poland, Russia, Sweden, Switzerland, Turkey and the United Kingdom
Version 2	
Advanced Europe (18)	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom
Emerging-market Europe+2 (11)	the Czech Republic, Estonia, Hungary, Israel, Latvia, Lithuania, Poland, Russia, the Slovak Republic, Slovenia and Turkey

Source: Authors.



Figure A.1. The evolution of the density distribution of factors' contributions across countries

Source: Authors.





C. 10-year government bond yield

Source: Authors.