

Chapter 2

The Decoupling of Emerging Economies, A Long-Debated Issue but Still an Open Question: A Survey

2.1 Introduction

Emerging economies (EEs) have progressively increased their role in the international economic scenario, to the point that the share in the global economy of EEs [together with Developing Economies (DEs)] has now reached 50.9 % in 2013 (it was 30.9 % in 1980).¹ From an economic point of view, their importance has grown along different dimensional paths, as mirrored by foreign direct investments and portfolio investments, total currency reserves and, in more general terms, their shares in international commercial and financial trade. Technological innovation (e.g., more efficient means of transport or information communication technology), on the one hand, and policies encouraging commercial and financial trade (reduced customs duties or the setup of free trade areas), on the other, have lent significant support to integrating individual countries at global level (globalization). During the globalization period, for the EEs the trade openness ratio² rose from 30 % to around 80 % and more interestingly for the EEs the increase in international trade was accompanied by a significant rise in intragroup trading, which grew from 9 % of total foreign trade in 1960 to over 40 % in 2005 (Kose and Prasad 2010).

With this growing importance of EEs, a fierce debate has begun as to whether the national economic cycles are converging or whether the cycles of EEs and advanced economies (AEs) are becoming disconnected, the so-called “decoupling of EEs from the AEs”. The convergence argument is based on the idea that all economies have become more intertwined through trade and finance, which should make the national economic cycles more connected. In contrast, the decoupling argument is based on the idea that, together with the strengthening of the EEs’

¹ Data refer to Gross domestic product based on Purchasing-Power-Parity (PPP) share of world total. The source is the International Monetary Fund, World Economic Outlook Database, April 2013.

² Trade openness is the ratio of total trade (export plus import) to GDP.

economic bases, the recent and prominent development of real and financial linkages among EEs may have reinforced the link between the emerging countries to the detriment of their relationships with the AEs, which instead may have relatively weakened.

These two opposing perspectives reflect the fact that theoretical models often make different predictions about the effects of trade and financial integration on the interrelationships among national economic cycles.

Trade theories imply that an increase in trade linkages leads to an increase in intra-industry or inter-industry product specialization.³ The way in which the increased specialization affects the degree of synchronization (comovement) between the national economic cycles is thought to depend on the nature of specialization (Frankel and Rose 1998). More precisely, if the industry shocks (namely the shocks affecting a specific industrial sector) are important in driving economic cycles, then the comovement of the economic cycles is expected to increase when the trade linkages associated with the intra-industry specialization increase, whereas the comovement is expected to decrease when the trade linkages are mainly associated with inter-industry specialization. The two types of industrial specialization are not mutually exclusive, namely in some production sectors there may be inter-industry specialization and in some others there may be intra-industry specialization: comparative advantages encourage inter-industry specialization, and scale economies sustain intra-industry specialization (Krugman 1981). Thus, in theory, the effect of the production specialization on the degree of comovement and linkages in economic cycles is not univocal but depends on which type of production specialization prevails.

There is not univocal theoretical predictions about the effects of financial integration on the linkages of national economic cycles. As explained in depth by Kose and Prasad (2010), financial integration could decrease the synchronicity of economic cycles facilitating inter-industry production specialization through the easy reallocation of capital, given the comparative advantage of each country. On the other side, contagion effects, transmitted through financial linkages, could increase synchronicity via cross-country spillovers of macroeconomic fluctuations. The comovement of economic cycles could also be increased through demand-side effects, as long as the financial integration determines a similar dynamic of wealth across countries.

Many scholars investigated empirically the decoupling hypothesis, and in some cases provided different interpretations of this phenomenon. The decoupling implies a break in a relationship that was previously more coupled and closely linked. The concept is not precisely defined so it allows for different readings. The basic idea is that the economic growth of one area becomes progressively less dependent on growth in another area (Rossi 2009). This concept has been translated

³ Inter-industry trade is the exchange of totally different products between countries. Intra-industry trade is the two-way trade of products in the same industry classification. See Krugman (1981) for more details.

in two main different ways. Firstly, many authors speak on decoupling in terms of decreasing comovement of economic cycles and investigate it by computing correlation patterns between the economic cycles of economic variables of AEs and EEs looking for eventual decreasing correlation path (e.g., Wälti 2012), or investigate it by dividing the sources of a country's economic fluctuations into global, group (namely advanced and emerging economies groups) and national factors looking for eventual increasing importance of group factors in explaining the economic fluctuations (e.g., Kose et al. 2008). Secondly, discussions on decoupling frequently proceed in terms of the extent of spillover of shocks from AEs to EEs (e.g., IMF, World Economic Outlook 2007).

From the empirical point of view, the investigation of the decoupling has been performed with different tools, namely different statistical and econometric instruments such as the correlation analysis or the VAR estimation, and with different set of data such a synthetic indicator like the gross domestic product (GDP) or a richer set of data like the industrial production, the export index and the unemployment rate for example.

Despite the different investigation techniques adopted to study it and the various way explored, the empirical literature has not yet reached a broadly accepted conclusion. Also in the empirical economic literature, as in the economic theory, there is still no prevalent opinion about the potential effects of the international integration on the convergence or decoupling of EEs and AEs. The subject is still open to debate in the academic and it kindles not only the interest of academics. Also policymakers and practitioners are interested in the issue given the important practical implications that decoupling could have, for example, on the definition of national and international economic policies and on the business strategies aimed at investment diversification and risk management.

Given the wide range of parties interested in this issue, its important implications and the absence of a broadly accepted conclusion, it is no wonder that the decoupling issue has been long debated. This survey aims to retrace the steps of this debate. In particular, it intends to present the different interpretations of the phenomenon discussed in the literature (Sect. 2.2); the different predictions of economic theory on the issue of decoupling in the globalization era (Sect. 2.3); how prevalent opinion among academics and leading international observers has changed historically, with the alternating prevalence of views in support and against decoupling (Sect. 2.4); the approaches adopted in the empiric investigation with their respective “strengths and weaknesses” and results (Sects. 2.5–2.8). Finally, Sect. 2.9 presents the conclusions of this chapter.

2.2 Different Interpretations and Measures of Decoupling

2.2.1 Interpretations

Decoupling of EEs from AEs implies a break in a relationship between the two groups of countries that was previously more coupled and closely linked. This definition is quite vague and so allows for different interpretations. Willett et al. (2011) argue that "... there are several different legitimate and useful concepts of decoupling and the key to productive discussion and analysis is to closely identify the type or types of decoupling that are being discussed [in the theoretical or empirical works], not to spend time in debate about what a specific concept of decoupling should be".

Perhaps there are two main simple reasons for the spread of the idea of decoupling among scholars, who then devised different readings of the phenomenon.

Firstly, a simple analysis of the historical GDP dynamic in the various geographic areas, one of the variables most studied not only by academics but also by policymakers and leading international observers, suggests that the economic growth⁴ of the advanced and emerging economies (Fig. 2.1, panels 1 and 2), though similar up to 2001, seem to have differed more during the 2000–2010 decade; nonetheless a certain synchronicity of movement between the two variables has remained.

The second reason is that, though it is quite difficult to imagine that in an increasingly interconnected world the economy of one area can isolate itself from others, it cannot be excluded that the growing global interconnection could shift economic balances and change the economic dependencies between different areas as the concept of decoupling implies. In fact the idea that the economic growth of one area becomes progressively less dependent on growth in another area does not

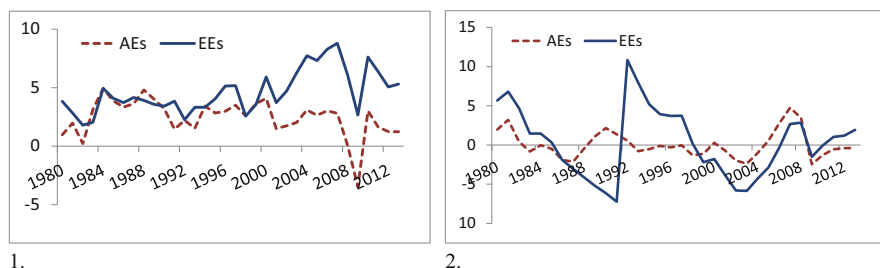


Fig. 2.1 Economic Dynamic in AEs and EEs. Source: own elaboration on IMF data. (1) % GDP annual growth rate, (2) % deviation of GDP (at PPP) from Hodrick Prescott Trend

⁴Reference is made here both to the GDP growth rate and the deviation of GDP from its trend extracted by the HP (Hodrick-Prescott) filter (fully bearing in mind, however, the considerations made in following Sect. 2.2.1 on the possibility that the various trend extraction methods might not be equivalent).

conflict with the phenomenon of globalization and, as illustrated in Sect. 2.3 of this chapter, the economic theory leaves room for the possibility that globalization and decoupling could co-exist without conflicting.

Basically, as already said and anticipated in the introduction, the idea of the decoupling is that the economic growth of one area becomes progressively less dependent on growth in another area⁵ (Rossi 2009). This concept of decoupling has been translated in two main different ways: (1) a decreasing comovement of economic cycles between AEs and EEs over time, (2) an increasing resilience of the EEs to adverse scenarios in AEs.

With respect to the first point, many scholars used mainly two empirical investigation techniques which are different but essentially equivalent. Firstly, authors like Wälti (2012) computed correlation patterns between the growth of economic variables of AEs and EEs. Secondly, others authors (e.g., Kose et al. 2008) divided the sources of a country's economic fluctuations into global, group (namely advanced and emerging economies groups) and national factors, and stated the decoupling in terms of gradually increasing importance of group factors in explaining those fluctuations. Note that, this second way of interpreting decoupling is strictly linked to the first because breaking down national economic cycles can be seen as a different method for quantifying the correlation across countries; in fact let me note that the contribution of the global factor is a measure of the extent of comovement across business cycles of all the countries, and the group factor is a measure of the extent of comovement across business cycles of countries belonging to the same group, as highlighted by Helbling et al. (2007).

With respect to the second point, discussions on decoupling frequently proceed in terms of the extent of spillover of shocks from AEs to EEs (e.g., IMF, World Economic Outlook 2007).

2.2.2 Measures

In general, any concept (decoupling is not an exception) needs to be translated or associated with data in order to perform empirical investigations or for operational purposes. So the question is how to measure the decoupling phenomenon.

The Gross Domestic Product (GDP), despite the well-known criticism on the capacity of this variable to represent the real economic status of a country, is

⁵ Let me note that this reading of decoupling is implied by a more “extreme” concept which refers to decoupling as the notion that one area becomes a self-contained economic entity with potential for maintaining its own economic growth trend regardless of the economic trend of another area. This stance is quite extreme because decoupling is viewed as referring to almost complete regional insulation. It became a popular theme mainly in Asian policy circles in the first years of the 2000s when, despite the 2001 recession and the tepid economic growth of advanced economies from 2004 to 2007, the growth of India and China remained strong during that same period (Athukorala and Kohpaiboon 2009); nevertheless it did not received significant consideration in the economic literature.

probably one of the economic indicators that best summarizes the economic activity of a country, in fact most literature on decoupling has focused on the GDP data. On the other side, some papers did take into account a more extensive set of variables such as the industrial production index, the consumer price index or the current accounts, for example, to have a more detailed picture of the economy⁶ of the country under evaluation. However, over and above the variable (or set of variables) considered, what actually makes the various contributions to the literature profoundly different is not so much the type of variable observed but how they were processed to extract the country's economic trend and the country's economic cycle.

In effect, using a set of indicators such as industrial production, export and unemployment or using a synthetic indicator such as GDP to measure the fundamental characteristics of the economy of a country is essentially equivalent, disregarding the greater or lesser detail level relating for example to the timing of turning points of the economic cycle if the synthetic indicator and set of indicators have different time frequencies (for example quarterly, monthly, etc.). Obviously the information like the exact timing of the economic cycle is a very important one but separating economic trend from economic cyclical is even a more delicate aspect. Economists like Marshall, Edgeworth and Keynes often stressed the distinctions between long term (which refers to economic trend) and short term (which refers to economic cycle), but despite the importance of these concepts, there is no unanimity on the way in which the two components of the economic dynamic, namely trend and cycle, should be handled when investigating the decoupling phenomenon.

An extensive part of literature (e.g., Kose et al. 2008) focuses on the short-term growth rate of real GDP (year on year, for example) to extract economic cycle from the time series. Another part of literature (e.g., Wälti 2012) makes recourse to more sophisticated methods to detrend the time series and to separate the cyclical component from the trend component. The literature indicates several statistical ways of doing this, such as the Hodrick-Prescott filter, the Baxter-King filter or the assumption of a quadratic trend for example. As Canova explained (1998), it can happen that the different methods lead to widely differing results, and therefore there are also contributions in the literature (e.g., Flood and Rose 2010) that instead of using a single method use several to assess the reliability of their results from one method compared to another.

When comparing the economic dynamics of advanced countries against those of emerging countries, the method with which the cycle and trend components are handled must be taken into great consideration because the two components have very important and different roles in determining the overall economic dynamics of the two country types. As documented in Aguiar and Gopinath (2007) emerging markets, unlike developed markets, are characterized by frequent regime switches,

⁶One advantage of using economic indicators other than GDP could be, for example, the greater availability of information resulting from the higher frequency of data publication.

owing to the dramatic reversals in fiscal, monetary and trade policies observed in these economies, and consequently "... shocks to trend growth are the primary source of fluctuations in these markets [emerging markets] as opposed to transitory fluctuations around the trend. On the other hand, developed markets are characterized by a relatively stable trend". So ignoring the fact that there are different ways to treat the two components of economic dynamic could be misleading when the results of different papers, which used different methods, are compared.

In addition to the type of method used to extract economic trends and cycles from time series, another important element to be taken into account in studying the decoupling is the demographic dynamic. As was outlined by Reinhart and Rogoff (2012), the impact of population growth on GDP growth is an important consideration when working with historical series. Considering only the GDP growth rates and ignoring the demographic dynamics can be misleading when the population growth rate is high and unstable, as is the case of many EEs in which the high birth-rate, from one hand, and the significant emigration phenomenon, from the other, make complex the demographic phenomenon.

Perhaps, one may say that, as there are several different legitimate interpretations of the decoupling phenomenon, there are also several different legitimate economic data which can be used to measure it, and what is really important to productive discussion is to identify the measure that is being discussed, not to spend time in debate about what a specific way to measure it should be.

2.3 Decoupling and Globalization: Can They Coexist?

This section will first describe the key stylized facts on the economic integration between different geographic areas (globalization). Further on, it will attempt to illustrate how the economic theory leaves room for the possibility that the concepts of globalization and decoupling can coexist without necessarily conflicting.

2.3.1 *Increasing International Trade Linkages*

In recent decades economies have become more integrated with respect to many different dimensions,⁷ not only the economic one but also, for example, the cultural dimension.

The volume and nature of international trade linkages have changed drastically as result of various forces. Transport and communication costs have been an important factor. Air shipping costs have declined over time, and costs of ocean

⁷ See, for example, Kose and Prasad (2010) for an extensive description of the time path of trade and financial linkages between countries and groups of countries.

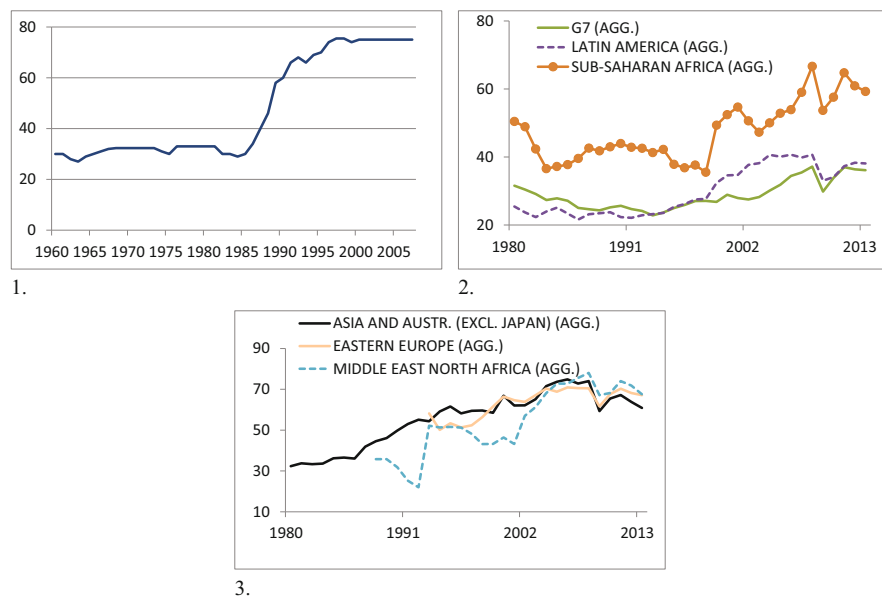


Fig. 2.2 Trade openness. *Sources:* own calculus on National Statistics Offices. (1) Trade liberalization Index, (2) Trade to GDP ratio (%), (3) Trade to GDP ratio (%)

shipping have come down due to containerization and other technological efficiencies (Hummels 2007). Further important factors have been policies to improve the liberalization of international trade, such as the lowering of trade barriers and the reduction of tariffs, or other means of restraining international trade, that were implemented in particular after the breakup of the Soviet Union.

Figure 2.2, panel 1, based on the papers of Sachs and Warner (1995) and Wacziarg and Welch (2008), shows the fraction of countries with a fully liberalized trade regime and, as can be seen, trade liberalization has increased sharply from 1986 onwards (during the globalization period).

Lower costs and stronger policies supporting international trade have encouraged the intensification of international commercial trade, with its share of GDP gradually increasing in all the main geographic areas, as illustrated in Fig. 2.2, panels 2 and 3. The two panels show the evolution of the ratio of total trade to GDP separately for six groups of countries [G7 economies, Latin American EEs, Sub Saharan Africa EEs, Asian EEs, Eastern Europe EEs and Middle East and North Africa (MENA) EEs]. In particular, until 1985, trade openness was relatively stable for G7, Latin America EEs and Sub Saharan Africa EEs, and it increased significantly during the globalization period; while for the other groups the straitening of the openness ratios was significant also before 1985.

In Fig. 2.3, panel 1 shows the distribution of global export percentages among two groups of countries (the G7 and the emerging economies). Whilst the share attributed to the G7 group is still very high, it gradually reduced from around 70 % in the 1990s to 35 % in 2012. At the same time, the percentage of global export

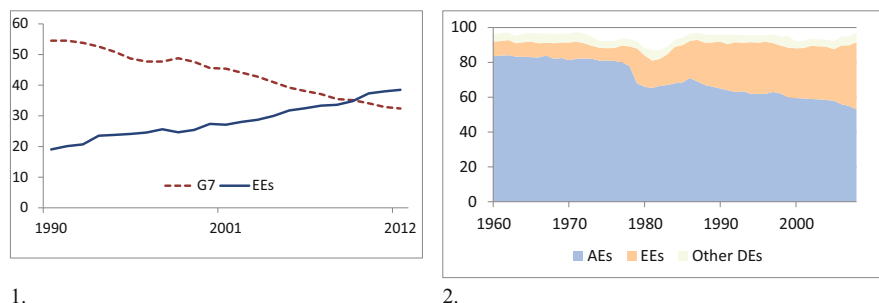


Fig. 2.3 World trade. (1) % share of world good exports; own calculus on IMF data, (2) % share of EEs trade by group partners; own calculation on IMF data

attributable to the emerging economies group grew from 20 % in 1990 to 40 % in 2012. The different distribution of global export flows also reflects a different distribution of the trading flows of the two groups of countries. In particular, for the emerging economies the share of trade with advanced economies has remained significant, but gradually reduced over the years from around 80 % of total emerging economies' foreign trade in 1960 to 50 % in 2005, whilst in the same period the percentage of intragroup trade rose from 9 to 40 % (see Fig. 2.3, panel 2).

Information about production opportunities in foreign countries has become easier to obtain thanks, for example, to the greater availability of information through the Internet (world wide web), or for example promoted by immigrants⁸ and multinational companies facilitating networking (see Kohn 2008). These factors may have supported the expansion of trade in manufactured goods. Figure 2.4 from panel 1 to 6 shows the composition of trade by group of countries from 1960 to 2007. In particular, while the average share of advanced economies' exports accounted for by manufacturing exports rose slightly and remained the highest in the full sample period (see panel 1), for both emerging economies and developing economies the share of manufacturing exports rose strongly and, for example, became the most important part of exports (see panels 2 and 3).

These changes in the share of manufacturing exports reflect changes in inter-industry and intra-industry trade. Intra-industry trade, measured by the average bilateral Grubel-Lloyd index, has been increasing between Emerging economies and G7 countries since 1970, although with regional peculiarities. For G7 countries and Asia the intra-industry trade increased with higher intensity than others regions (Akin and Kose 2008), and for the countries that joined the EU in 2004, despite the share of intra-industry trade has been increasing in recent years, the inter-industry trade still accounts for almost 50 % of the total trade (Kawecka-Wyrzykowska 2010).

⁸ In 2007, an estimated \$240 billion in remittances went to developing countries, more than double the flow in 2001 (Federal Reserve Bank of Atlanta, 2008 conference "Remittances and the Macroeconomy," February 21–22).

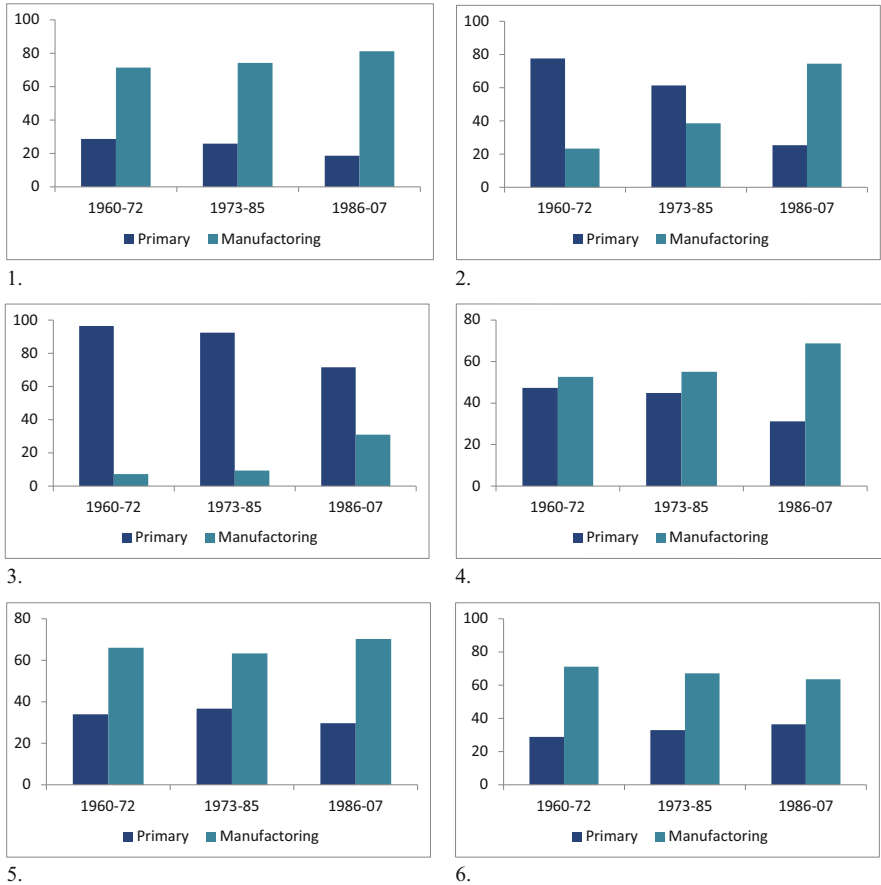


Fig. 2.4 Composition (%) of international trade. *Source:* own elaboration based on Kose and Prasad (2010) data. (1) Export Advanced Economies, (2) Export Emerging Economies, (3) Export Developing Economies, (4) Import Advanced Economies, (5) Import Emerging Economies, (6) Import Developing Economies

2.3.2 Increasing International Financial Linkages

Another area of impressive growth in international linkages has been in financial activities. The strong increase of financial linkages was mainly associated with the rapid liberalization of financial regimes after the mid-1980s. Figure 2.5, panel 1, based on the papers of Bakaert et al. (2006), shows the fraction of countries with a liberalized financial systems. As can be seen, financial liberalization increased sharply in the globalization period. Many structural changes improving the degree of liberalization of financial systems took place among emerging economies. For example the privatization of state-owned enterprises, or the

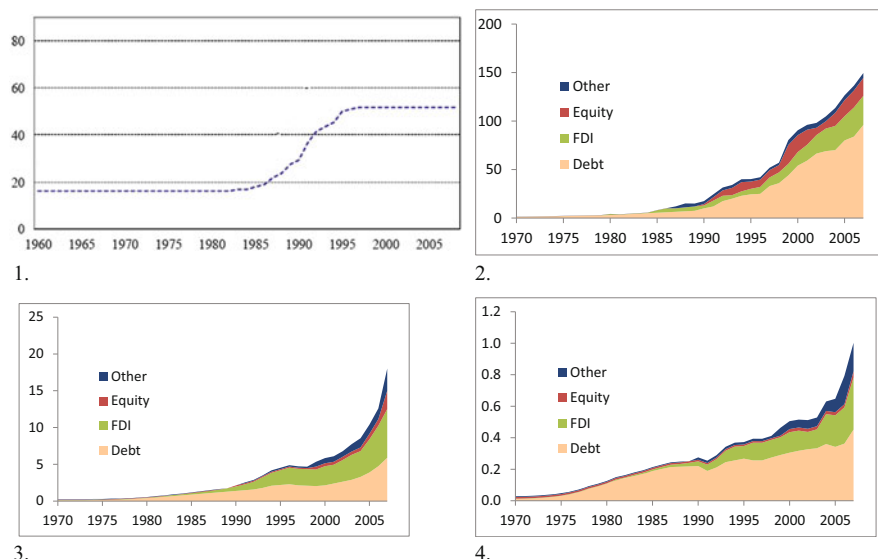


Fig. 2.5 Financial openness. *Source:* own elaboration on IMF data. (1) Financial Liberalization Index, (2) AEs sum of assets and liabilities, trillions of US Dollars, (3) EEs sum of assets and liabilities, trillions of US Dollars, (4) DEs sum of assets and liabilities, trillions of US Dollars

liberalization of domestic banking systems and stock markets, the removal of restrictions on the acquisition of assets by foreigners (see Lane and Milesi-Ferretti 2007).

Following Lane and Milesi Ferretti, the level of the international financial integration of a country can be calculated as the sum of gross international financial assets and liabilities⁹ (the result of this operation is also known as the “financial openness indicator”). Figure 2.5 from panel 2 to 4 plots the financial openness indicators for the AEs, the EEs and the DEs. The figure shows that financial openness increased for all three groups of countries during the globalization period.

The financial integration has occurred globally, however its evolution has been uneven. Integration in industrialized countries measured by the ratio of the sum of their foreign assets and liabilities to GDP has tripled since 1990, while an analogous measurement for emerging and developing economies shows an increase of about 50 % (Lane and Milesi-Ferretti 2007).

⁹The total assets and liabilities contains debt, foreign direct investment (FDI), equity, financial derivatives and total reserves.

2.3.3 Decoupling and Increasing International Linkages: What Does Theory Say?

Does economic integration between different countries preclude the option of decoupling? In theory, as will be illustrated in this sub-section, the growing international integration could either favour or counter decoupling.

Theoretical models make different predictions about the effects of trade integration on comovement among national economic cycles.

International trade linkages represent the way through which both supply-side and demand-side spillovers can spread across countries. These spillovers can increase the degree of business cycle comovement. For example, boosting consumption in one country can generate increased demand for imports, reinforcing economies abroad.

However, the stronger trade linkages can be associated to stronger intra- or inter-industry trade, namely an increase of the international trade can be associated to an increase in intra- or inter-industry specialization. The way in which the industry specialization affects the correlation between the economic cycles depend on the nature of specialization (Frankel and Rose 1998). More precisely, if industry shocks are important in driving economic cycles, then the correlation is expected to decrease when the trade linkages are prevalently associated with inter-industry specialization, whereas the comovement of economic cycles is expected to increase when the trade linkages are mainly associated with intra-industry specialization. The two types of industrial specialization are not mutually exclusive: for some country's production sectors the comparative advantages encourage inter-industry specialization, and for some others the scale economies sustain intra-industry specialization. Thus, in theory, the effect of the production specialization on the degree of correlation between the economic cycles is not univocal but depends on which type of production specialization prevails.

There is also no univocal theoretical prediction about the effects of financial integration on the comovement of national economic cycles. As explained in depth by Kose and Prasad (2010), financial integration could decrease the synchronicity of economic cycles facilitating inter-industry production specialization through the easy reallocation of capital, given the comparative advantage of each country. On the other hand, contagion effects and shocks transmitted through financial linkages could increase synchronicity via cross-country spillover of macroeconomic fluctuations (Classens and Forbes 2001). The comovement of economic cycles could also be increased through demand-side effects, as long as the financial integration determines a similar dynamic of wealth across countries (Lewis 1999; Van Wincoop 1999).

Foreign direct investment flows could be the way that knowledge and productivity shocks spread from one country to others and so, as explained in Kose et al. (2009), foreign direct investments may increase the comovement of economic cycles.

According to some authors, communication technology may play an important role in driving the economic cycle fluctuations (Cochrane 1994). Faster and more accurate dissemination of news¹⁰ may have a positive impact on the synchronization of economic cycles in the case, for example, good news on the economic perspectives of a country increase domestic demand and also raise the consumer demand of other countries holding stocks in the country to which the good news refers.

Macroeconomic policies could act in favour of increasing synchronicity of business cycles across countries, but they could also generate decreasing synchronicity.

On the one hand, increased economic integration could affect the synchronization of economic cycles by conditioning the way in which macroeconomic policies are implemented in the different countries, namely the stronger economic linkages may lead to a higher degree of policy coordination. This could have a positive impact on the comovement of economic cycles because it could increase the correlation between shocks associated with country-specific policies. This point has been debated by many authors such as Darvas et al. (2005), Flood and Rose (2010) and Crucini et al. (2008).

On the other hand, macroeconomic policies can also lead to lower synchronization of economic cycles. More disciplined fiscal policies and more credible monetary policies could act as shock absorbers against external shocks (Rose 2007; Ghosh et al. 2009). For example, prudent fiscal policies with a low level of public debt and deficit could create room to contrast external adverse shocks by implementing strong countercyclical fiscal policies.

2.4 The Long-Debated Issue: A Brief Historical Excursus

The decoupling has been long debated in both academic and non-academic spheres. This is not surprising because, as already seen, from one hand the economic theory (and also the empirical investigation, as will be seen in-depth later on) fails to provide a single key to reading the issue of decoupling, but rather indicates an array of potential effects of stronger international integration on the degree of comovement of economic cycles. From the other hand, the decoupling has considerable practical implications for the implementation of the country's economic policy and for the elaboration of the corporate strategies. Knowing whether fluctuations in the AEs and EEs are similar, understanding their sources and characterizing their time-related variations is important for both policymakers and managers.

If the economic cycles in different countries with different institutions and economic structures are driven by a common cause then international policies, or

¹⁰ Jaimovich and Rebelo (2008) analyze the effects of news about future productivity on business cycles in a small open economy model.

national policy coordinated at international level are (more than national policies alone) the key way to manage each national economic cycle. Moreover, knowing whether and to what extent the economic correlation between countries has been affected by increasing international linkages is crucial because structural time variations may weaken the usefulness of policies that may have been effective in the past.¹¹ For example the IMF Director, Christine Lagarde, said “We need to work better together to understand more fully the impact of these unconventional policies [the quantitative easing adopted by the Federal Reserve Bank to manage the recent financial crisis] local and global...” (speech of 23 August 2013).

As regards the industrial strategies, accepting or rejecting the idea of decoupling has wide-ranging implications because it affects the potential profit margins and risk management of the business as it determines the range of possible optimal allocations of resources and has an impact on the investment diversification. It is no wonder that major investment banks such as Goldman Sachs and Morgan Stanley have been among the key players in discussing the idea of decoupling. Jim O’Neill,¹² chief economist of Goldman Sachs, was one of the main advocates of the decoupling idea, and Keith Fitz-Gerald, the investment director for Money Morning, wrote a book in 2010 entitled “Fiscal Hangover: How to Profit from the New Global Economy”, a broad section of which is dedicated to the decoupling issue.

The issue of decoupling has always kindled a great deal of interest and, as described by Willett et al. (2011), its debate has historically been characterized by alternation between supporters and opponents. Early talks on decoupling took place in the 1980s, in Asia, on the basis of a strong domestic demand and consumer confidence in the region. However, in 1997–1998 with the explosion of the Asian financial crisis the concept of decoupling fell into oblivion. The decoupling thesis came back as a popular theme in Asian policy circles (Athukorala and Kohpaiboon 2009) in 2001 when the US and Europe first went into recession and later, from 2002 to 2007, saw a relatively tepid economic growth, while the growth of emerging economies remained strong during that same period.

The idea of decoupling still continued to be supported in 2007, even after the slowdown of the US economy and the first signs of the US subprime crisis. The IMF report “World Economic Outlook, April 2007” says “Overall, these factors suggest that most countries should be in a position to ‘decouple’ from the US economy and sustain strong growth if the US slowdown remains as moderate as expected” (IMF 2007). At that time, the decoupling idea was not only supported by economists from a number of important international institutions, but also by practitioners. Big

¹¹ The importance of decoupling in the definition of economic policies clearly emerges from analysis of the many reports by leading international institutions, e.g., the IMF (World Economic Outlook, April 2002, April 2007, October 2012), the European Bank for Reconstruction and Development (Transition Report 2009) and the Asian Development Bank (Asian Development Outlook 2009, 2010).

¹² Known for coining the acronym “BRIC” for the world’s biggest emerging markets of Brazil, Russia, India and China in 2001.

investment firms like Goldman Sachs believed “China, together with emerging Asia, stands a very good chance of outperforming and decoupling from the US economy in the coming few years” (Asian Economics Flash 2007).

2008 was the year when prevailing opinion swung away from decoupling. With the Lehman Brothers’ crash, the financial crisis affected the real economy and spilled over to the rest of the world, also sweeping emerging economies into its wake. Doubts about the validity of decoupling also found their way into the minds of those who previously had been its strongest supporters. In 2008 Goldman Sachs mitigated the extent of arguments in favour of decoupling by emphasizing that it was difficult to ignore the slowdown in the US economy for most of the rest of the world (O’Neil 2008).

The swings between “ayes” and “nays” for decoupling have not stopped, however. Even in 2009, when the main advanced economies like Europe and the US continued to show signs of economic weakness while China and India quickly rebounded, the decoupling thesis returned as crucial topic. In its World Economic Outlook of October 2009, the IMF pointed out that emerging economies like India and China would lead the world economic expansion that year, growing at rates of 5.4 % and 8.5 %, respectively. El-Erian (2009) wrote “Given the pick-up in economic activities of some emerging economies and the fact that equity valuations are now back above the pre-Lehman levels, the decoupling argument is again gaining consensus today”.

2.5 Synchronization of Economic Cycles Between AEs and EEs

As is now common practice in literature (see e.g., Frankel and Rose 1998; Rose and Engel 2002; Kose et al. 2003; Imbs 2004, 2006; Baxter and Kouparitsas 2005; Fidrmuc and Korhonen 2006), the economic cycle synchronization is usually measured using the Pearson correlation coefficient between output growth (usually measured by the real GDP growth rate) of two countries¹³ as follows:

$$\rho_{ij} = \frac{\sum_{t=1}^T ((G_i(t) - \overline{G_i})(G_j(t) - \overline{G_j}))}{\sqrt{\sum_{t=1}^T (G_i(t) - \overline{G_i})^2} \sqrt{\sum_{t=1}^T (G_j(t) - \overline{G_j})^2}} \quad (2.1)$$

where $G_i(t)$ is the output growth rate of the country i at time t and $\overline{G_i}$ is the arithmetic mean of the output growth rate over the period $t = 1, 2, 3, \dots, T$; and mutatis mutandis for $G_j(t)$ and $\overline{G_j}$.

In Kose et al. (2003b), the authors perform an empirical investigation based on annual data over the period 1960–1999 for the growth rate of the real GDP per

¹³ Or more countries by averaging the correlation coefficients between pairs of countries.

capita and the growth of the real per capita consumption, using a sample of 76 countries: 21 industrial countries and 55 emerging and developing countries. They compute the correlation coefficients of the two variables of each country with the corresponding world variables.¹⁴ They find that, for the emerging and the developing countries the correlations are in general decline in the 1990s, thus there is some evidence that on average business-cycle comovements have become less synchronized¹⁵ during the most recent period of globalization.

Whilst the results presented in Kose et al. (2003b) support decoupling, those reported by Flood and Rose (2010) are against it. Flood and Rose computed correlation coefficients over 5-year rolling sub-samples of quarterly GDP data from 1974 to 2008 of 64 countries (21 developed economies and 43 emerging economies). In addition to considering the annual GDP growth rate, the authors also performed their investigation on detrended data using other different methods: the Hodrick-Prescott filter, the Baxter-King filter and the assumption of linear and quadratic trends. The data have been used to compute correlation coefficients between pairs of countries in which one country is industrialized and the other is emerging. The main finding is that the average degree of economic cycle synchronicity (the correlation coefficient) varies somewhat over time, but is typically at a level of 0.25 or thereabouts. There is no evidence that the average correlation coefficient is significantly lower towards the end of the sample period; hence there is no evidence in favour of decoupling. The conclusion is the same if only the synchronicity between emerging countries and the G7 aggregate¹⁶ is considered.

An important aspect considered by Kose et al., but disregarded by Flood and Rose, was the demographic dynamic. As mentioned in Sect. 2.2.2, in the time series analysis the GDP growth can be misleading when the population growth rate changes significantly from one period to the following, as is the case in many emerging economies. Therefore using the GDP per capita, as did Kose et al., is more appropriate in cross time and cross country analyses.

On the other hand, however, compared to that of Kose et al., Flood and Rose's analysis—albeit on a more limited set of countries—takes more account of the problem relating to breaking down the economic dynamic of countries into two

¹⁴ The PPP-weighted aggregates (Purchasing Power Parity) of GDP and consumption in G-7 countries were used as the measure of world variables.

¹⁵ To further study and understand the change in the degree of synchronization, the authors also perform a regression analysis of the factors that influence correlations of each country's macro-economic variable with the corresponding world variable. For the output variable, their results are essentially in line with those of some other studies, e.g., as per Imbs (2004), and highlight the importance of trade and financial linkages in accounting for economic cycle comovement among emerging economies and the world economy. For consumption the results are weaker and only trade linkages appear to have a positive effect on cross-country movements in consumption.

¹⁶ The PPP-weighted aggregates of GDP in G-7 countries were used as the measure aggregate variable.

components: trend and cycle. In fact, unlike Kose et al., Flood and Rose assess the reliability of their results against the different methods for detrending time series.¹⁷

Although it is common practice in literature to measure economic growth synchronization by computing the correlation coefficient between the economic variables of two countries, or a group of countries, the correlation's ability to describe the economic cycle synchronization is subject to three important critiques: (1) the use of correlation coefficients over rolling sub-samples of data is problematic in identifying a structural break in the degree of the economic cycle synchronization (see Wälti 2012); (2) the correlation coefficient can be counter-intuitive in its treatment of data (see Yetman 2011a); (3) the correlation coefficient may be biased due to heteroskedasticity of the time series (see Forbes and Rigobon 2002; Willett et al. 2011).

2.5.1 First Critique: Problem in Identifying Structural Breaks Using Correlation Coefficients Over Rolling Sub-samples of Data

With respect to the first critique, as explained in Wälti (2012), by using rolling sub-samples of data it can happen, for example, that the last estimated correlation coefficient is calculated using the last 5 years of data. In this case, if the degree of the economic cycle interdependence changes around the end of the last time window, the correlation coefficient may not catch it. Moreover, in general, the choice of windows can be quite arbitrary and different time windows for the same data set can return different results.¹⁸

To overcome this problem, Wälti proposed an innovative measure of economic cycle synchronization which can be computed at each point of time (for example, each year in the case of yearly data) and expresses the same qualitative information as the correlation coefficient. The advantage of this innovative indicator is that, as it can be calculated at each point of time, it allows for a proper identification of the structural breaks even if they occur at the end of the sample period.

¹⁷ An investigation on the decoupling hypothesis with a special emphasis on the distinction between trend and cycle is presented in Dilip and Dubey (2013). The authors used two heavily data-intensive frequency domain methods: causality testing in the frequency domain and wavelet correlations. They needed to use a highly frequently available measure of output, so the authors employed the industrial production index on which data is generally available monthly. Their focus was on seven Asian emerging economies and, for both methods the conclusion offered strong evidence in favor of decoupling. As stated in Dilip and Dubey, frequency domain causation was suggested in the seminal paper by Granger (1969) and later extended by Geweke (1982, 1984), and the properties of wavelets are discussed in Percival and Walden (2000). See Dilip and Dubey for an overview of the two methods.

¹⁸ For example, this is the case of Artis and Zhang (1997, 1999) and Inklaar and de Haan (2001). They used the same data, different time windows and reached the opposite conclusion about the relationship between the economic cycle synchronization.

Wälti started from the fact that the Euclidean distance between two standardized random variables conveys the same information as the correlation coefficient.¹⁹ Hence he proposed measuring the synchronization between the economic cycles of countries i and j by

$$\varphi_{ij}(t) = |g_i(t) - g_j(t)| \quad (2.2)$$

where $g_i(t)$ and $g_j(t)$ are, respectively, the standardized²⁰ economic growth at time t of the country i and the country j . If $\varphi_{ij}(t)$ is equal to zero, it means that at time t the economies of the two countries, i and j , are perfectly synchronized. Any positive value means less than perfect synchronization; the larger the value of the Euclidean distance indicator, the less synchronized the countries are.

Wälti based his empirical investigation on a dataset ranging from 1980 to 2008 and covering 56 countries, of which 30 emerging economies²¹ and 26 advanced economies. He focused on detrended data of the GDP, in particular on the “output gap”, namely the percent deviation of the actual GDP from the trend of the GDP.²² The output gap of each country was standardized by subtracting the mean and dividing by its standard deviation; in this way for each country i ($i = 1, 2, 3, \dots, 56$) he computed the quantity $g_i(t)$ used in Eq. (2.2).

The author concluded that there has been no decoupling in recent years because the average degree of business cycle synchronization between the economic cycles of the 30 emerging markets and the economic cycles of the 26 advanced countries has increased during the last decade. This result was robust both in relation to the different filters applied to extract the trend from the original time series and to the different grouping of emerging economies (Asian, Latin American and Eastern European emerging countries).

Wälti's work did not take “population trends” into account. However, as can be seen in Fig. 2.6 (panels from 1 to 5), if the same method is applied to per capita GDP, albeit on a broader sample (112 countries of which 23 advanced, 59 emerging and 30 developing countries) and the years 2009 and 2010 are also included, the main conclusions drawn by Wälti remain unchanged. Nevertheless it seems that with the escalation of the worst financial crisis of the last 40 years, the indicator jumped to historic highs in 2009, indicating a low degree of correlation between economic cycles. However, in some cases, for example for the MENA or Europe

¹⁹ See Wälti (2012) for a detailed description of the indicator.

²⁰ $g_i(t) = \frac{(G_i(t) - \bar{G}_i)}{\sqrt{(1/(T-1)) \sum_{t=1}^T (G_i(t) - \bar{G}_i)^2}}$ where $G_i(t)$ is the output growth rate of the country i at time t

and $\bar{G}_i$ is the arithmetic mean of the output growth rate over the period $t = 1, 2, 3, \dots, T$.

²¹ The emerging market countries come from different regions of the world: 8 Asian economies, 9 Latin American countries and 13 Eastern European economies.

²² Wälti explored three different alternative filters (Hodrick-Prescott, Baxter-King, Christiano-Fitzgerald) to extract the trend from the original data.

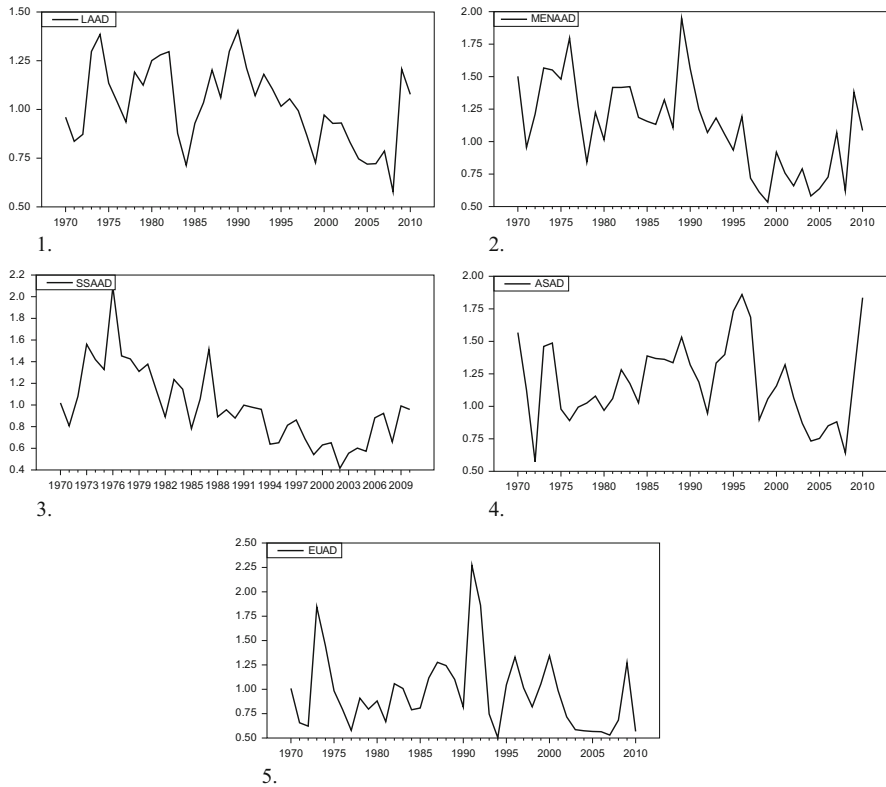


Fig. 2.6 Euclidean distance computed on deviation cycles. Own calculus on Penn World Table 7.1 data. (1) Latin America EEs vs. AEs, (2) MENA EEs vs. AEs, (3) Sub Sahara Africa EEs vs. AEs, (4) Asia EEs vs. AEs, (5) Europe EEs vs. AEs

emerging economies, this movement of the indicator was temporary and by early 2010 the indicator returned under the average of the last 20 years.

2.5.2 Second Critique: The Correlation Coefficient May Be Counter-Intuitive in Its Treatment of Data

With respect to the second critique, as explained in Yetman (2011a), the correlation coefficient may be counter-intuitive. To overcome this critic, Yetman (2011a) proposes an indicator which, as will be shown in this section, is equivalent to the Wälti's indicator described in the above Sect. 2.5.1.

Following Yetman (2011a, b), the Pearson correlation can be broken down into its period-by-period contributions.

Consider the quantity

$$g_i(t) = \frac{(G_i(t) - \overline{G_i})}{\sqrt{(1/(T-1)) \sum_{t=1}^T (G_i(t) - \overline{G_i})^2}} \quad (2.3)$$

which is the same quantity used in Eq. (2.2) for country i . Let compute also $g_j(t)$. The product

$$\rho_{ij}(t) = g_i(t)g_j(t) \quad (2.4)$$

is interpretable as a measure of the economic comovement between the countries i and j at time t and, up to the degrees of freedom correction, the average of these measure equals the Pearson correlation coefficient²³ of Eq. (2.1), namely

$$\frac{1}{T} \sum_{t=1}^T \rho_{ij}(t) = \frac{T-1}{T} \rho_{ij} \quad (2.5)$$

At this point, Yetman easily shows that the correlation coefficient is counter-intuitive in its treatment of data. Consider, for example, the case in which $\rho_{ij}(t)$ is equal to zero. $\rho_{ij}(t) = 0$ means that data at time t suggest the absence of economic comovement between the countries i and j and in fact, as can be seen from Eq. (2.5), it is zero the contribution to the correlation coefficient ρ_{ij} coming from the data at time t . The point is that there are different cases in which $\rho_{ij}(t)$ can be zero, and those different cases give very different information on the synchronization but, even so, the contribution to the correlation coefficient is the same (namely zero).

More precisely, there are three possible cases:

1. $G_i(t) = \overline{G_i}$ and $G_j(t) \neq \overline{G_j}$;
2. $G_i(t) \neq \overline{G_i}$ and $G_j(t) = \overline{G_j}$;
3. $G_i(t) = \overline{G_i}$ and $G_j(t) = \overline{G_j}$

While the first and second cases are consistent with a low degree of economic synchronicity because the average growth in one country occurs simultaneously with the deviation from the average growth in the other country, the third case is more consistent with a strong synchronicity owing to both economies are growing at the respective average rate.

Hence, the Pearson correlation coefficient is an indicator which can process data in a way not fully appropriate to the ultimate aim of analyzing the economic synchronicity between countries.

To overcome this critique, instead of the Pearson correlation coefficient, Yetman proposes using the absolute value of the difference between the quantities $g_i(t)$ and $g_j(t)$ [seen in the (2.4)] multiplied by -1 , namely the same indicator proposed by Wälti multiplied by -1 . As explained by Yetman, his alternative measure is intuitively

²³ See Yetman (2011a, b) for more details.

Table 2.1 GDP growth rate correlations: Asia-Pacific with United States

Countries	Usual measure		Alternative measure	
	1971–1989	1990–2008	1971–1989	1990–2008
	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>
Australia	0.47	0.73	−0.88	−0.41
China	0.49	0.12	−0.76	−0.77
Hong Kong	0.5	0.04	−0.95	−0.75
Indonesia	0.29	−0.34	−1.04	−1.54
India	−0.11	0.25	−1.32	−0.68
Japan	0.63	−0.14	−0.81	−0.81
Korea	0.49	−0.11	−0.86	−0.93
Malaysia	0.28	−0.06	−1.1	−0.93
New Zeland	0.34	0.33	−0.98	−0.59
Philippines	−0.15	0.12	−1.12	−0.63
Singapore	0.22	0.34	−1.11	−0.87
Thailand	0.39	−0.30	−0.99	−1.31

appealing. For example, the three cases listed above, from point 1 to point 3, that generate $\rho_{ij}(t) = 0$ would be treated differently with the alternative measure he proposed. Case 3, where both economy's growth rates are equal to the respective average levels, would be seen as consistent with high synchronization rather than decoupling, in fact in this case the difference between $g_i(t)$ and $g_j(t)$ is zero. On the other cases, 1 and 2, the alternative measure proposed by Yetman would evidence the distance between the growth rate and the average growth rate of the two countries.

The following Table 2.1 reproduces the results of Yetman (2011a). On a sample of 12 Asian countries and GDP data from 1971 to 2008, the author computed the Pearson correlation coefficients between the GDP growth rates of each of the 12 Asian countries and the US (columns *a* and *b*); he also computed the comovement between the GDP growth rates using the alternative indicator he proposed (columns *c* and *d*).

As seen in Table 2.1, while the correlation coefficients (columns *a* and *b*) decline from the oldest sub-sample (1971–1989) to the late sub-sample (1990–2008) for many countries, supporting the idea of Asian decoupling from the US, applying the alternative measure the results are mainly inconsistent with the decoupling idea.

2.5.3 Third Critique: Distortion Due to Heteroskedasticity

The third critique, namely that the correlation coefficient may be biased owing to the heteroskedasticity of the time series, is claimed by Forbes and Rigobon (2002).

The correlation of the GDP growth rates between countries *i* and *j* mixes²⁴ two different components [see the following Eq. (2.6)]. One is the structural link

²⁴ See also Yeyati and Williams (2012).

between the two economies, namely the sensitivity of the GDP growth rate of country j to the GDP growth rate of country i [β_{ij} in Eq. (2.6)]; and the other one is the ratio of the GDP growth rates volatilities (σ_i/σ_j):

$$\rho_{ij} = \beta_{ij} \left(\frac{\sigma_i}{\sigma_j} \right) \quad (2.6)$$

As can be seen from (2.6), even if the beta coefficient remains the same, the correlation increases when the volatility of the output growth rate of country i increases relative to the volatility of the output growth rate of country j ; for example owing to the changes over time in the nature of the local shocks in country i which could modify the volatility of GDP growth rate of country i and so could modify the volatilities ratio (σ_i/σ_j).

This observation is particularly important because some previous studies showed that the ratio between the volatilities of different time series can change significantly over time. For example, Kose et al. (2003c) measured the volatility of GDP growth rates of different countries. For two groups of countries (industrialized countries and developing countries) they computed the median volatilities. As can be deduced from their results, for both groups of countries the median volatility decreased from the 1960–1972 sub-sample to the 1986–2002 sub-sample and the ratio of the two median volatilities decreased too, from 0.6 to 0.5. So, when the decoupling phenomenon is studied by observing changes in the patterns of correlations, it is very important to remember that part of the explanation for changes in the correlation patterns can be due to changes in the volatility (σ_i/σ_j in Eq. 2.6, eventually due to changes in the nature of country-specific and global shocks, for example) in addition to changes in the structural linkages between the two countries (β_{ij} in Eq. 2.6) which indeed is what really matter in studying the decoupling phenomenon.

Forbes and Rigobon (2002) proposed applying a correction to the correlation coefficients to take into account any changes in volatility from one period to another. Suppose we are interested in comparing the synchronicity of output growth rates between country i and j across two sub-samples, and suppose that the correlation coefficients obtained for the two sub-samples are respectively $\rho_{ij}^{(1)}$ for the subsample 1 and $\rho_{ij}^{(2)}$ for the subsample 2. Following Forbes and Rigobon, Yetman (2011a) shows it is incorrect to compare $\rho_{ij}^{(1)}$ and $\rho_{ij}^{(2)}$, instead one of them should be adjusted for the change in volatility between the two time periods, i.e., it is more correct to compare $\rho_{ij}^{(1)}$ and $\rho_{ij}^{(2*)}$ where

$$\rho_{ij}^{(2*)} = \frac{\rho_{ij}^{(2)}}{\sqrt{1 + \delta \left[1 - \left(\rho_{ij}^{(2)} \right)^2 \right]}} \quad (2.7)$$

and

$$\delta = \frac{\sigma_{j2}}{\sigma_{j1}} - 1 \quad (2.8)$$

is the relative variation in the volatility of the output growth rate of country j from the first to the second sub-sample periods.

Using the method proposed by Forbes and Rigobon, Yetman (2011a) finds that the correction²⁵ had quantitatively important effects on the correlation coefficients, nevertheless he reached the same conclusions obtained from the unadjusted usual measure of the correlation coefficients (those showed in Table 2.1, columns a and b), namely declining correlation from the oldest sub-sample to the late sub-sample supporting the idea of Asian decoupling from the US.

In addition to the Forbes and Rigobon correction, a further way to overcome the heteroskedasticity-related distortion in evaluating the decoupling phenomenon is to estimate the parameter beta, namely estimating the structural link between countries [coefficient β in Eq. (2.6)]. For example, this is what Yeyati and Williams (2012) did. They investigated decoupling by estimating the structural link between the output growth rates of EEs and AEs (more precisely 21 emerging countries and the G7 group). They regressed the GDP growth rates of the EEs on the G7 GDP growth rate in two panel regressions, one on the sub-samples 1993–2000 and the other one on 2001–2010 period. They found decreasing betas, so they concluded in favour of the decoupling of the EEs because, basically, they found a lower sensitivity of the EEs output growth rate to the AEs output growth rate in the last decade than in the previous decade. This approach to studying the decoupling phenomenon, which contains important contributions to the economic literature on the decoupling issue, will be described in more detail in Sect. 2.7 of this chapter.

2.6 Breakdown of Advanced and Emerging Countries' Economic Fluctuations

Some authors studied changes in the nature of the economic cycle over time by employing the dynamic latent factor model to estimate global and country-specific components in the main macroeconomic variables (in particular GDP). Their objective is to answer the following question: has the global factor become more important in explaining economic cycles in both advanced and emerging countries? If so, it means that the connection between AEs and EEs has increased over time, casting doubts on the decoupling hypothesis. As already mentioned (Sect. 2.2.1), the contribution of the global factor is a measure of the extent of comovement across national economic cycles, hence the above question may be rephrased as

²⁵ As explained by Yetman, he used the Forbes and Rigobon correction knowing that it is strictly accurate when there are no omitted variables or endogeneity between markets, nevertheless it may provide an indication as to how sensitive the results are to changes in volatility.

follows: have national economic cycles become globally more synchronized? This is basically the same question posed by the authors cited in the above Sect. 2.5.

Kose et al. (2012), on the basis of the work of Kose et al. (2003, 2008), use a dynamic latent factor model²⁶ to break down the growth rates of national GDP, consumption and investment of 106 countries divided in three groups (23 advanced economies, 24 emerging economies and 59 developing economies) into the following factors: (1) the global factor, which captures fluctuations common across all variables and countries; (2) three group factors (advanced economy factor, emerging economy factor and developing economy factor) which are specific to each group of countries and catch fluctuations common to all variables of the countries in the same group; (3) country factors which, for each country, catch the fluctuation common to the variables in the given country; (4) idiosyncratic factors specific to each time series.

Their sample period ranges from 1960 to 2008 and, to study how economic cycles have evolved over time, the authors divide the sample into two separate periods. The first is the pre-globalization period (1960–1984) which was characterized by a set of common shocks associated with strong oil price fluctuations in the 1970s and synchronized contractionary monetary policies in some of the major industrial economies. The second is the globalization period (1985–2008) characterized by increasing global trade and financial flows.

Their major result is that there has been a decline over time in the importance of the global factor in accounting for national economic cycle fluctuations. In parallel, during the globalization period, the group factors have become more important than the global factor in driving national economic cycles in both the advanced economies group and the emerging economies group. So the authors conclude that there is evidence of economic cycle convergence within each of the two groups but divergence (decoupling) between them.

This conclusion is in line with the results presented in Mumtaz et al. (2011) on a dataset of 30 countries, five regions (North America, South Africa, Europe, Asia and Oceania), and annual data for the GDP growth and the inflation from 1860 to 2007. The authors apply the same econometric approach performed by Kose et al. and find that similarities in the growth rates of output increase within regions, while they decrease between regions.

As Kose et al. (2012), Dong and Wei (2012) break down the economic cycle fluctuations into global, regional and country specific components. They use quarterly data for 16 countries (9 emerging Asian economies and the G7 countries) from 1981:Q1 to 2008:Q4 of the GDP growth rate and the inflation. They find that, while the output fluctuations in emerging Asia have remained less linked with the global common factor than industrial countries, the Asian regional factor has become

²⁶ The authors use a multifactor extension of the single dynamic factor model in Otrok and Whiteman (1998).

increasingly important in driving output fluctuations in emerging Asia; these results give support to the idea of decoupling.²⁷

The papers mentioned above, based on the same econometric tools, reach the same conclusions in favour of the decoupling. Unfortunately, as with the correlation analysis, their approach does not allow disentangling the two forces which affect the path of the synchronicity, namely the effects due to changes in economic linkages and the effects due to changes in the nature of shocks. This point is well highlighted in the paper of Kose et al. (2012). The authors, in explaining their results, say that during the pre-globalization period there were two large common disturbances (the oil shocks) and certain correlated shocks in the major advanced economies (the austerity policies in the early 1980s), while during the globalization period common global disturbances have become less important. The authors highlighted that these phenomena may have led to a decline in the importance of the global factor in explaining national economic cycles during the globalization period. Hence, the finding of Kose et al. is not only the result of eventual changes in the structural linkages between AEs and EEs but it is also the result of the changing nature of shocks.

Canova and Ciccarelli (2012) investigated the economic fluctuations in the Mediterranean basin and explored similarities and convergence breaking down national economic cycles into indicators representing regional components and country-specific components. They did not use the factor model, but instead used a panel VAR model with time varying parameters of the type developed in Canova and Ciccarelli (2009) and Canova et al. (2007). They used a dataset covering 16 countries (five Western countries, four Eastern countries and seven countries from the Middle East and North Africa) and GDP, consumption and investment growth rates from 1980 to 2010. One of their main results is that the time pattern of the regional and the country specific indicators are not in line with either convergence or decoupling because both phenomena are present but temporary.

2.7 Regression Analysis and VAR Estimations of Spillover from AEs to EEs

Some authors study how economic sensitivity of some emerging countries to US country has changed over time. They use regression analysis to estimate the parameters representing the structural linkages between countries, or use impulse response functions with vector autoregression (VAR) model to evaluate for example how the spillover of shocks from US to some EEs has changed over time. These econometric tools, adding proper control variables, as will be shown in this section,

²⁷ Dong and Wei's paper did not consider explicitly the distinction between AEs and EEs but instead divided the countries by geographical groups, although in this case grouping countries by geographical regions is basically similar to grouping them by EEs group and AEs group.

allow us to focus on the economic sensitivity of EEs controlling for the changing nature of shocks and controlling for the other sources of coefficient distortion.

With this approach, the question at which one wish to answer is: has the sensitivity of emerging economies' output growth to the advanced economies' output growth decreased (decoupling) or increased over time?

Akin and Kose (2008) used a dataset of 106 countries (23 advanced economies, 23 emerging markets and 60 emerging and developing economies) covering the years from 1960 to 2005. The authors estimated panel regressions relating the GDP growth rate of the emerging economies vs. the GDP growth rate of the advanced economies; and so the estimated regression's coefficients provided a measure of the economic sensitivity of the EEs to the AEs. To control for different sources of GDP growth, the set of explanatory variables was extended to include several other output growth determinant such as the investment to GDP ratio, population growth, the government spending to GDP ratio and inflation. They found that the regression's coefficient associated with the GDP growth rate of the advanced economies is greater in the pre-globalization period than in the globalization period. From their estimated parameters, a 1 % point increase in the advanced economies GDP growth corresponds to 0.76 % points increase in the average GDP growth of emerging economies during the pre-globalization period, and this coefficient is about 0.4 points higher than in the globalization period.

Based on panel regression analysis, Alder and Tovar (2012) assessed for some emerging countries how the sensitivity of their output to an external financial shock changed across regions and time. Their analysis was based on quarterly data for a sample of 40 emerging economies and 9 advanced economies from 1990 to 2010. They used the S&P Chicago Board Options Exchange Market Volatility Index as the financial market stress indicator. Their main result is that, while still significantly vulnerable, both emerging Latin America and emerging Asia are less sensitive to external financial shocks in recent years than in the past. On the other hand, emerging European economies are now more sensitive.

While the results in Akin and Kose (2008) and Alder and Tovar (2012) are basically in favour of the decoupling hypothesis, Helbling et al. (2007) reached the opposite conclusion. On a dataset covering 130 countries and annual data over 1970–2005, Helbling et al. estimated panel regressions relating per capita growth of output in EEs to US, Euro Area and Japanese per capita GDP growth rates, and several control variables: terms-of-trade changes, a short-term interest rate, population growth, controls for the Latin American debt and Tequila crises, for the Asian financial crises of 1997–1998, and for the Argentine crisis of 2001–2002. The regression analysis suggested that the magnitude of the spillovers may have increased over time.

The evolution over time of the magnitude of spillovers was also described in Guimarães-Filho et al. (2008) which estimated the US spillovers to Asian emerging economies by both the estimated coefficients of the panel regression and the impulse response functions performed using vector autoregressions (VARs). Like Helbling et al. (2007) and Guimarães-Filho et al. (2008) did not find evidence in favour of decoupling. From the coefficients of the panel regression, Guimarães-

Filho et al. concluded that spillovers from the US seem to have grown in recent years, in particular for China and India, because the estimated coefficients of the panel regression have increased between 1991–2001 and 2001–2007. This result was broadly consistent with that obtained with the impulse response functions. In fact, the impulse response functions showed that the impact of US shocks was lower for the 1980–1995 sub-sample than the 1996–2007 sub-sample.

Dées and Vansteenkiste (2007), following Stock and Watson (2003), estimated a Factor-Structural VAR model to explain GDP growth rate with the lagged growth rates, the common international shocks and the country-specific shocks. They used a dataset covering 23 countries (advanced economies, emerging Asia and emerging Latin America) on quarterly data from 1979 (second quarter) to 2003 (fourth quarter) and considered two sub-periods: 1979–1992 and 1992–2003. From their results evidence emerges in favour of the decoupling phenomenon. In particular, the spillover effects decreased from the sub-periods 1979–1992 to 1992–2003. Moreover it seems that emerging Asia tends to be mostly affected by regional shocks, while common shocks remain limited. For emerging Latin America it seems that the regional factor is the most important component in explaining the GDP growth rate, and its importance increases from the first sub-period to the second.

Dées and Vansteenkiste (2007) work is particularly interesting because on the one hand, like for example Kose et al. (2012), it allows evaluation of the different components of the economic cycles, and on the other hand it also allows disentangling of the effects due to the economic interdependence (sensitivity) from the effects due to the different nature of shocks (common or country specific shocks). The equation they estimated is:

$$Y_t = A(L)Y_{t-1} + v_t \quad (2.9)$$

Y_t is the vector of GDP growth rates, $A(L)$ is the coefficients matrix providing information about the sensitivity of EE GDP growth to AE GDP growth, while the error term v_t is broken down as follows

$$v_t = \Gamma f_t + \varepsilon_t \quad (2.10)$$

where f_t are the common international factors, Γ is the matrix of factor loadings, and ε_t are the country-specific shocks.²⁸

I believe that the approach described in this paragraph is particularly suited to the study of decoupling because it allows us to focus on the economic sensitivity of EEs while controlling for the changing nature of shocks. However it is important to make a series of observations. First, some of the above quoted papers measure the sensitivity of several emerging countries to the US economy. It is widely believed that the US may be the leading economy in the world, but one should also consider

²⁸ See Dées and Vansteenkiste (2007) for more details.

other advanced countries for a more appropriate assessment of the phenomenon under discussion.

Second, some of the mentioned papers, even if they considered other EAs in addition to the US, used a set of countries rather smaller than those that were the ambitions of the research pursued. Using a small set of countries is not only very inappropriate with respect to the statistical significance of the observed sample, but also affects the realism of the model used because it does not allow us to take into account the many economic interrelations between many countries observed in the real world. Considering the multiplicity of economic relations between many countries is crucial in the study of decoupling because one of the reasons adopted by supporters of decoupling in justifying the phenomenon is that the progressive increase of real and financial linkages among EEs may have favoured the strengthening of economic linkages within EEs while at the same time possibly favouring their moving away from AEs.

Finally, in all the papers cited decoupling is investigated by looking for a structural break in the estimated coefficients located roughly around the end of the 80s. This approach is appropriate and effective if the interrelationship between the countries is assumed to evolve in a discrete fashion over time. The introduction of structural breaks is less effective if the relationship between the countries follows a gradual progression over time, as it could be decoupling; thus, in this case it should be more appropriate to investigate the decoupling phenomenon by assuming that the coefficients can gradually change over time. This point was considered by Pesce (2014). The author used a time-varying panel VAR model to measure how the resilience of EEs to external shocks (i.e., shocks spreading from AEs) has changed over time.²⁹ On a sample period of about 30 years and a large sample of countries (78 countries, of which 43 EEs, 14 DEs and 21 AEs) he found that resilience of EEs has improved over time; however, this increasing resilience was discontinuous over the 30-year sample period, a no-monotonic ‘wavelike’ pattern which deserves further investigation.

2.8 Analysis of Macroeconomic Spillovers from AEs to EEs Using Micro-funded Economic Models

Another way forward in investigating the decoupling phenomenon is to follow a more structural approach by designing micro-funded economic models and examining the transmission of shocks from AEs to EEs through trade and financial linkages. The characteristic of this approach, which differentiates it from the approach presented in Sect. 2.7, is that the theoretical base of the models is micro-funded and particularly rich.

²⁹ Part of the results of the cited paper are discussed in Chap. 4 of this monograph.

Starting from the “real business cycle” (RBC) approach to economic dynamics, which originated in the pioneering work of Finn Kydland and Edward Prescott (1982), most models that emerged have essentially been built on rational expectation with the explicit incorporation of microeconomic behaviour of forward-looking economic agents. Mendoza (1991) developed an extension of the real business cycle framework to the case of a small open economy (SOE), providing a, let us say, “standard small open economy RBC model”.

Since then, a growing economic literature on emerging economies has extended the Mendoza (1991) model to take into account the empirical features of emerging market economies. This led to several evolutions of the “standard small open economy RBC model” in the form of both additional different shocks and nominal frictions, the latter considering the (new) Keynesian flavour in the RBC approach. Given this literature extension and its various aspects, it is useful to first focus on its main features, without entering into too much technical detail as it would be beyond the intentions of this monograph, and then emphasize the contributions of the relative literature that directly investigated the decoupling phenomenon.

2.8.1 *Micro-funded Economic Models: A Brief Excursus*

The standard small-open-economy RBC model in Mendoza (1991) features a representative infinitely-lived household, a representative firm operating a neoclassical production technology subject to random productivity disturbance, and an international credit market of one-period bonds. In this model the credit market is perfect in the sense that the small open economy can borrow or lend any amount of financial assets consistent with the household’s “no-Ponzi game”³⁰ condition at the “appropriate” market-determined real interest rate.

In this model, time is discrete and indexed by $t = 1, 2, 3, \dots$. There is only one type good in each period, which can be produced with a technology given by

$$Y_t = A_t F(K_t, \Gamma_t L_t) \quad (2.11)$$

Where Y_t denotes output, K_t capital available in period t , L_t labour input, and $F(\cdot)$ is a neoclassical production function and A_t is the total factor productivity

$$A_t = e^{z_t} \quad (2.12)$$

where z_t is the shock to the total factor productivity, and it is assumed to follow the process:

³⁰ The No-Ponzi game condition states that the present discounted value of wealth at infinity must be non-negative (Blanchard and Fischer 1989, p. 49).

$$z_{t+1} = \rho_z z_t + \varepsilon_{z,t+1} \quad (2.13)$$

where $|\rho_z| < 1$ and $\varepsilon_{z,t}$ is an i.i.d. shock with mean zero and variance σ_z^2 . In this model the shock $\varepsilon_{z,t}$ is the only source of uncertainty, and the total factor productivity is a stationary process.

Γ_t is a term allowing for labour-augmenting productivity growth. In this basic standard model Γ_t is assumed to follow a deterministic path:

$$\Gamma_{t+1} = e^\mu \Gamma_t \quad (2.14)$$

where μ is the constant growth of labour augmenting productivity.

Capital accumulation is given by the equation:

$$K_{t+1} = (1 - \delta)K_t + I_t - \Phi(K_{t+1}, K_t) \quad (2.15)$$

where I_t denotes investment, δ the rate of depreciation of capital, and $\Phi(K_{t+1}, K_t)$ is the adjusting capital cost function. Adjusting capital cost functions are commonly used in the business cycle literature of small open economies in order to avoid excessive investment volatility. As explained in Mendoza, investment reacts very differently to productivity shocks in open-economy models than in closed-economy models. Access to foreign markets permits individuals to separate savings and investment by allowing them to finance any gap between the two from external resources. Mendoza (1991) shows that a small open economy model, in which capital can be freely accumulated without adjusting cost, exaggerates the variability of investment. This “anomaly” can be avoided by introducing moderate capital-adjustment costs, thus adopting the view that financial capital is more mobile than physical capital, a view previously explored by Dooley et al. (1987).

The economy is inhabited by a representative household with the following utility function:

$$U_t = U(C_t, 1 - L_t) \quad (2.16)$$

Where C_t denotes consumption at time t , the total amount of time available for work or leisure is normalized at unity, and $U(\cdot)$ is a neoclassical utility function.

The representative agent has access to a world market of the only one type bund “B”. Her budget constraint is therefore:

$$C_t + I_t + B_t = w_t L_t + s_t K_t + \left(1 + r_{t-1}^f\right) B_{t-1} \quad (2.17)$$

B_t is the one-period real asset that household holds at time t , namely $B_t > 0$ (credit) if the household is a lender and $B_t < 0$ (debt) if the household is a borrower. The variable w_t denotes the real wage, s_t the real rental of capital, and r_t^f the international (foreign) real interest rate.

In Mendoza (1991), it is assumed that the real international interest rate is sensitive to the level of the country's international financial position (lending or borrowing position) in the sense that the interest rate a country's citizen pays on international borrowing is an increasing function of the country's international debt, and the interest rate that citizens receive for international savings declines as a function of total savings. This assumption does not derive from a solution to the optimal borrower/lender problem, but it is coherent with observed practice in the current credit market. Moreover the assumption has a key role in open economy models for two reasons. On the one hand it reflects the concept of country risk, and on the other hand, as showed in Schmitt-Grohé and Uribe (2003), it “closes the model”, that is it allows to find a single stationary state equilibrium. Note that in this basic standard small open economy the financial market is perfect, one in which the small open economy can borrow or lend any amount that is consistent with the household's no-Ponzi-game condition at the “appropriate” market-determined real interest rate.

In more formal terms, it is assumed that residents of this hypothetical small open economy face an international interest rate given by:

$$r_t^f = r^* + v(B_t) \quad (2.18)$$

where r^* is the world real interest rate assumed to be constant. $v(B_t)$ can be interpreted as a spread on r^* ; $v(B_t)$ must be a decreasing function.³¹ From the (2.15), (2.17) and (2.18) we get the following equation:

$$\begin{aligned} C_t + K_{t+1} + B_t &= w_t L_t + s_t K_t + (1 - \delta)K_t - \Phi(K_{t+1}, K_t) \\ &+ (1 + r^* + v(B_{t-1}))B_{t-1} \end{aligned} \quad (2.19)$$

The household chooses the sequence of values for $\{C_t, L_t, K_{t+1}, B_t\}_{t=0}^{\infty}$ to maximize the expected discounted utility, subject to constraint (2.19) and “no Ponzi game” condition.

The conditions for the solution of the utility maximization problem give the equilibrium conditions to which we have to add the factor payments conditions in order to arrive at the general equilibrium conditions. Given the production function (2.11) and the assumption that factor markets are competitive, the rental rate paid to the owners of capital s_t and real wage w_t , are given by the marginal productivities

$$s_t = A_t F_k(K_t, \Gamma_t L_t) \quad (2.20)$$

³¹ For example, McCandless (2008) assumes $v(B_t) = -aB_t$, a is a positive constant. The minus sign says that as a country accumulate foreign debt, the international interest rate it pays will rise.

$$w_t = A_t F_L(K_t, \Gamma_t L_t) \quad (2.21)$$

Where $F_K(\cdot)$ and $F_L(\cdot)$ are the partial derivatives of $F(\cdot)$ w.r.t. K and L respectively. Note that, as shown for example in Mendoza (1991), under the assumption of a production function homogeneous of degree one w.r.t. K_t and L_t , from (2.17), (2.20) and (2.21) the good market clearing condition holds, that is

$$Y_t = C_t + I_t + B_t - (1 - r_{t-1})B_{t-1} \quad (2.22)$$

where the net trade balance at time t coincides with $[B_t - (1 + r_{t-1})B_{t-1}]$. So, given the initial conditions $\{K_0, B_0, r^*\}$, the competitive equilibrium of the economy is defined by the processes $\{C_t, L_t, K_{t+1}, B_{t+1}, w_t, s_t\}_{t=1}^{\infty}$ that solve the utility maximization problem, satisfy the competitive market factor prices condition (2.20), (2.21) and the markets clearing conditions.

The Mendoza (1991) model was extended in different dimensions adding shocks to productivity trend, shocks to world interest rate, shocks to terms of trade, and especially adding nominal frictions (sticky prices) and credit market imperfections.

Aguar and Gopinath (2007) introduces a stochastic productivity trend in addition to the temporary productivity shocks already present in Mendoza's (1991) Small Open Economy Model. This seemingly small addition, Aguiar and Gopinath argue, goes a very long way towards addressing some of the known empirical figures of emerging market economies, including the strong counter-cyclical behaviour of trade surplus and the higher volatility of consumption relative to output.

Aguar and Gopinath (2007), motivated by the frequent policy regime switches observed in emerging markets, have hypothesized that these economies are subject to substantial volatility in trend growth. Their model has the same framework as the Mendoza (1991) model with addition of the assumption of stochastic productivity growth Γ_t . So, in Aguiar and Gopinath (2007), the assumption (2.14) is replaced by

$$\Gamma_{t+1} = e^{g_{t+1}} \Gamma_t \quad (2.23)$$

Where g_t follows the stochastic process

$$g_{t+1} = (1 - \rho_g) \mu + \rho_g g_t + \varepsilon_{g,t+1} \quad (2.24)$$

$|\rho_g| < 1$, ε_t^g is an i.i.d. process with mean zero and variance σ_g^2 , and μ is the long-run mean value growth of labour-augmenting productivity.

g_t is the shock to productivity growth. We can refer to the realizations of g_t as the growth shocks since they constitute the stochastic productivity trend. A positive realization of $\varepsilon_{g,t}$ implies that the growth of productivity (labour productivity) is temporarily increased, however such a shock is incorporated in Γ_t and hence results in a permanent productivity improvement.

That the addition of permanent productivity shocks has the potential to account for some stylized facts observed in some EEs is intuitively explained by a “permanent income view of consumption”. After a favourable realization of $\varepsilon_{g,t}$, productivity increases permanently. Accordingly, permanent income and therefore consumption can increase more than current income; this explains why consumption may be more volatile than income in emerging economies. The same reasoning implies that after a positive shock to the productivity growth rate the representative household may want to issue debt on the world market to finance consumption in excess of current income, leading to a countercyclical current account.

Neumeyer and Perri (2005) and Uribe and Yue (2006), motivated by the observation that the cost of foreign credit appears to be countercyclical in emerging economies data, propose to introduce foreign interest rate shocks to the Mendoza framework, coupled with the working capital assumption (namely the need for firms to finance a fraction of labour costs in advance) and with a country risk determined endogenously as a function of shocks to productivity.

Qualitatively, the endogenous real interest rate spread and the “working capital” assumption should work as follows. With a spread process endogenously determined as a function of productivity, a favourable productivity shock increases output and reduces the interest rate applicable to representative household debts, thus boosting consumption and investment even beyond the boost to output, at the same time, with the working capital assumption, a drop in the world interest rate reduces the cost of labour, which stimulates output.

Let us modify the basic standard small open economy model to formally take into account the hypothesis proposed in Neumeyer and Perri (2005).

Firstly, the international interest rate Eq. (2.18) is modified to consider both the changing world interest rate and the specific country risk

$$r_t^f = r_t^* d_t \quad (2.25)$$

where d_t is the country-specific spread over r_t^* paid by borrowers in particular economy at time t . The assumption behind the Eq. (2.25) is that there are two forces at play in the interest rate dynamics faced by an emerging economy: international investors’ attraction to risky assets captured by changes in r_t^* , and the specific country risk default captured by d_t .

The most important issue to resolve is what drives d_t . Neumeyer and Perri (2005) propose a minimal country risk model to conduct their quantitative analysis. Their idea is that fundamental shocks to a country’s economy (in their model productivity shocks) drive the business cycle and the country risk at the same time. In other words they assume that the default probabilities, and hence the country risk, are functions of the productivity shocks. The functional relationship does not derive from a solution to the optimal borrower/lender problem, but is an assumption based on the idea that default probabilities are high when expectations of positive productivity shocks are low. Thus the country-risk component of r_t^f is a decreasing function of expected productivity, hence

$$d_t = \zeta(E_t[A_{t+1}]) \quad (2.26)$$

where $\zeta(\cdot)$ is a decreasing function. Note that in Neumeyer and Perri (2005) model the international real interest rate is not sensitive to the level of the country's international financial position (lending or borrowing position), so the model must be “closed”³² in some other way. The authors propose closing their model by adding in the bond holding costs, $\kappa(B_t)$, where $\kappa(\cdot)$ is a convex function. At time t households spend the proceeds from bond holdings and their labour and capital income on consumption, investment, bond purchases and the cost of holding bonds; so the household's budget constraint (2.17) becomes

$$C_t + I_t + B_t + \kappa(B_t) = w_t L_t + s_t K_t + \left(1 + r_{t-1}^f\right) B_{t-1} \quad (2.27)$$

Under the assumption that the firm has to borrow $\theta w_t L_t$ units of goods during the period t (the working capital assumption), the real profit function of the firm is

$$\pi_t = Y_t - (w_t L_t + s_t K_t) - r_t^f \theta w_t L_t \quad (2.28)$$

where θ captures the importance of working capital. From the maximization of (2.28), under the assumption that factor markets are competitive, the condition (2.21) on equilibrium real wage becomes

$$w_t \left(1 + \theta r_t^f\right) = A_t F_L(K_t, \Gamma_t L_t) \quad (2.29)$$

Of course, if θ is set to zero, firms do not need working capital, the term capturing the cost of the working capital in the firm's profit function (2.28) disappears and the supply side of the model reduces exactly to the basic standard small open economy model presented at the beginning of this section.

More recently, Cicco et al. (2010) presented model which combines the features both of the Aguiar and Gopinath (2007) and Neumeyer and Perri (2005) models.

One dimension in which the emerging economies differ from the developed economies is that the EEs rely heavily on a narrow range of primary commodities for their export earnings, and depend heavily on imported capital goods and intermediate input for domestic production. In the light of these structural features, it should not be difficult to see that fluctuations in world prices (fluctuations in the prices of primary, capital, and intermediate goods, and in the world real interest rate) have an important impact on the economic dynamics in the small open emerging countries (Kose 2002). The role of world prices in inducing business cycles in Emerging Economies was explored in depth by Mendoza 1995, and then

³² Remember that “model closure” means finding a single stationary state equilibrium and then being able to find a log-linear approximation of the dynamic model around the stationary state. See Schmitt-Grohé and Uribe (2003) for the ways of achieving “model closure”.

by Kose 2002. They borrow the RBC theory to compute the equilibrium processes of three sector models (non-tradable goods, exportable goods and importable goods) in a small open economy.

A large portion of recent empirical literature on emerging markets takes into account financial market imperfections. This literature proposes financial transmission mechanisms that can be roughly divided into two categories. As well-explained by Arellano and Mendoza (2002), in the first category we find studies that explore financial transmission mechanisms driven by the borrower's ability to pay. In these models borrowers may be willing to repay their debts but their ability to do so is threatened by the realization of "bad" states of nature. Creditors aim to cover their exposure to this default risk by imposing lending conditions on borrowers (usually in the form of collateral or liquidity requirements) or by choosing to incur monitoring costs to assess a borrower's claim that he is unable to repay. The second category emphasizes the borrower's willingness to pay. In these models, borrowers optimally decide to renege on their debts when the expected lifetime payoff of defaulting, net of any default penalty, exceeds the expected lifetime payoff of repaying.

Quantitative application of "ability to pay" models to small open economy setting is represented for example by Mendoza and Smith (2002), which considers a RBC model with two sectors (tradable and non-tradable) and with a borrowing constraint set in terms of a fraction of GDP. This model was extended by Mendoza (2008), adding an environment in which foreign creditors retain as collateral a fraction of the value of the economy's capital stock.

Collateral constraints are features of a variety of private credit contracts but when it comes to instruments like sovereign debt there is very limited scope for enforcing contracts featuring those constraints. In this context, a modelling approach based on "willingness-to-pay" considerations seems an appealing alternative. Arellano (2008) studies a small open economy that faces a credit-market participation constraint. In case of default, the country is punished by permanent exclusion from world financial markets, so default is not optimal whenever the expected useful life of staying in a credit relationship exceeds that of living permanently under financial autarky.

Nominal friction and credit market imperfections together with a monetary policy framework have been considered by authors such as Elekdag et al. (2005), Cespedes et al. (2004), Devereux et al. (2004), Elekdag and Tchakarov (2004), as well as Gertler et al. (2003), and more recently Getler et al. (2007). These authors built upon the model with financial accelerator developed by Bernanke et al. (1999), extending the small open economy environment by adding sticky prices, an imperfect credit market and a monetary policy framework.

2.8.2 Micro-funded Models' Contribution to the Debate About the Decoupling

It is clear that the degree of mathematical complexity has increased over time to improve the accuracy and realism of the micro-funded economic models. However, while the reduced form of models have empirically documented shock transmission from AEs to EEs, the small open economy models have found it difficult to account for foreign disturbances in EEs³³ despite their richness in terms of possible shocks and nominal frictions (see Hermàndez and Leblebicioğlu (2011)). This difficulty is probably the reason why, in spite of the extensive literature on small open economy models, only a small number of them have been directly used to investigate decoupling, as Hermàndez and Leblebicioğlu (2011) for instance.

Hermàndez and Leblebicioğlu (2011) develop a two-country real business cycle model in which one country represents the emerging market and the other represents the US market. The model for the emerging country is characterized by a more risky and greater financial market imperfection than the US model.

Hermàndez and Leblebicioğlu (2011), financial linkages are established through borrowing and lending in the international markets and financial market frictions are adopted in their model as in Neumeyer and Perri (2005). The emerging country must pay an interest rate which reflects the risk level of the country, namely a spread on the US interest rate. As in Neumeyer and Perri (2005), changes in the country spread and the US interest rate affect goods production in the emerging country due to the working capital constraint.

The trade channel is defined as follows. Each country produces a non-traded good and is also completely specialized in producing a traded good.

Their model is estimated with 17 quarterly time series for Mexico and the US from 1994 to 2007. From the results, they conclude that the spillover from the US to Mexico increased over time. While during the first part of the 1990s the Mexican economy's poor performance was driven prevalently by domestic shocks, in the second part of the 1990s the Mexican GDP growth benefited from US economic growth. Based on data of Mexican economy, their finding is against the decoupling idea, but their work considered only the Mexican-US case.

2.9 Conclusion

Decoupling implies a break in a relationship that was previously more coupled and closely linked. There is no precise definition of decoupling and so the phenomenon has been interpreted in various ways.

³³ In designing a small open economy model for Canada, Justiniano and Preston (2010) demonstrate that the inability of the model to generate spillover becomes more evident when the model is estimated instead of calibrated.

Some authors focused on the historical path of synchronization between economic cycles of EEs and AEs by using the rolling windows correlation analyses, or by breaking down the economic cycles into their components, for example the common component and the country-specific component. As explained in the Sect. 2.5 of this chapter, the historical path of synchronization between economic cycles may depend on two distinct forces. It may depend not only on the path of the economic linkages between the countries, let us say the sensitivity of the economic cycle of a country to the economic cycle of the other country, but also from the way in which the nature of shocks changes over time. The correlation analysis and the breakdown of economic cycles do not allow disentangling of the effects of the two forces on the historical path of the synchronization. This observation is highly important because decoupling refers to how the economic linkage between advanced economies and emerging economies changes over time. It is a concept with an economic content, namely a concept of structural significance regardless of the nature and type of shocks that can affect economies from time to time in different historical periods. For this reason, a number of other authors (e.g., Akin and Kose 2008) tried to study the phenomenon focusing on the sensitivity of the economic cycles of some emerging country to the economic cycles of same advanced country by controlling for the changing nature of shocks over time.

Given the different interpretations of the phenomenon, several authors have used different statistical/econometric techniques to analyze the data in their empiric studies; moreover, they have used different data and economic indicators.

As regards the statistical/econometric techniques adopted, these range from correlation analysis on a rolling time window to dynamic latent factor models (in studying the synchronicity of economic cycles in EEs and AEs), and from econometric estimations to simulations of micro-funded models (in studying the sensitivity of EEs' economic cycles to AEs' economic cycles).

With regard to the indicators, in some cases only GDP was considered, whilst in other cases a broader set of economic indicators, such as the industrial production index, consumption and investments for example, were used. In certain studies, e.g., Kose et al. (2008), a mere calculation of the growth rate (year on year growth rate in the case of the paper cited) was used to extract the cyclical component from the time series; in others, such as Flood and Rose (2010), different methods were used to break down the time series into cycle and trend components, such as the Hodrick-Prescott or Baxter-King filters.

Basically, in agreement with Willett et al. (2011), the various interpretations of decoupling are useful and legitimate and, rather than wasting time discussing which is most suitable, it is important to clarify the type of concept to use as reference and document related conclusions in order to effectively contribute to the debate on this issue.

Therefore, on the one hand the dissimilarities between the different interpretations of the phenomenon and between the diverse investigative approaches can be confusing to those seeking to understand if and to what extent the economic linkage between EEs and AEs has changed, but on the other hand those dissimilarities enhance the study of a phenomenon which is complex and wealth of aspects,

namely a phenomenon which lends itself to observation from a variety of viewpoints.

To conclude, despite the fact that the decoupling hypothesis is long-debated, not only among academics, but also among policymakers and practitioners, it is still an open question both from a theoretical and empiric point of view. The absence of a broadly accepted answer calls for further investigative efforts based on the most recent empiric study techniques and by steering studies both (1) towards large groups of countries and (2) towards specific countries.

Advancing research along the first path could prove useful in measuring how the degree of sensitivity of a group of countries to economic disturbances from other groups of countries evolves over time; and the use of a wider sample of countries, as in a Global VAR for example, could make simulations of international shock transmission more realistic; the next two chapters go along this direction.

Studies targeting specific countries, on the other hand, could be useful as case study in identifying existing relationships between the evolution over time of the emerging country's vulnerability to external shocks and the structural characteristics of its economy, e.g., its level of international openness, its geographic proximity to other countries, the availability and quality of its production factors or the implementation of country specific economic policies.

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