Global and Developing Country Business Cycles

Eri Ikeda

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Eri Ikeda
born in Hokkaido, Japan

International
Institute of
Social Studies

Doctoral Committee

Doctoral dissertation supervisors

Prof.dr. P.A.G. van Bergeijk

Other members

Prof.dr. D.V. Gabor, University of the West of England, Bristol

Dr. S.T.H. Storm, TU Delft

Prof.dr. R.E. van der Hoeven

Co-supervisor

Dr. H.V.B. Nicholas

To my family

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Acronyms

ABC	Austrian Business Cycles
ACs	Advanced Countries
ADF	Augmented Dickey-Fuller (test)
AI	Asymmetric Information
ARM	Agricultural Raw Materials
BB	Bry and Boschan
BBQ	Bry and Boschan Quarterly (analysis)
BP	Band-Pass (filter)
CODACE	Brazilian Business Cycle Dating Committee
DCs	Developing Countries
DSGE	Dynamic Stochastic General Equilibrium
EBC	Equilibrium Business Cycles
ECRI	Economic Business Cycle Research Institute
EDA	Exploratory Data Analysis
EMA	Exponential Moving Average
EU	European Union
FED	(U.S.) Federal Reserve System
G7	Group of Seven
GDP	Gross Domestic Product
GNI	Gross National Income
GNP	Gross National Product
HP	Hodrick-Prescott (filter)
IMF	International Monetary Fund
MENA	Middle East and North Africa

MS	Markov-switching (model)
NBER	(U.S.) National Bureau of Economic Research
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
PAT	Phase Average Trend
RBC	Real Business Cycles
UBS	Union Bank of Switzerland
U.K.	United Kingdom
UN	United Nations
U.S.	United States of America
VAR	Vector Auto Regression
WB	World Bank
WDI	World Development Indicators

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Abstract

The purpose of the study is to identify and explain the phenomena of so-called business cycles in developing countries. The justification for doing so is twofold: first, the observation that developing countries appear to be displaying cyclical patterns in their economic activity which are increasingly corresponding to such patterns in the advanced countries; and, second, the relative dearth of studies of cycles in the developing countries. It is this lacuna that the present study attempts to contribute to filling.

The study takes as its point of departure a conception of generic cycles which is fundamentally different from that of mainstream conceptions, and uses this as a basis for a) conceptualising global and developing country cycles, b) identifying them, and c) discerning their most important drivers. Specifically, and in contrast to mainstream conceptions, cycles are conceived of as recurrent, non-periodic and non-symmetric movements in economic activities in relation to trends in these activities, which are inherent to the functioning of the capitalist system. They are seen as distinct from random fluctuations in economic activity that are the result of exogenous shocks to the system — the mainstream conception of cycles. Global cycles are conceived as the synchronised cyclical movement of a majority of countries within the global economic system. Cycles in developing countries are conceived of with reference to global cycles. Particular importance in their conceptualisation is attached to the distinction between cycles and fluctuations since developing economies are seen as being subject to a large number of shocks leading to many fluctuations over the course of their cyclical movements.

Mainstream methods of identifying cycles are critically assessed with a view to developing an alternative methodology for cycle identification at the generic, global and developing country levels. Mainstream methods which identify cycles by means of the use of filters, mathematical models, *maxima* and *minima*, and the like, are rejected in favour of the identification of cycles on the basis of an *ex post* identification of cycle bottoms (not cycle *minima*).

Cycles in economic activity are depicted by cycles in real GDP growth rates, notwithstanding the known problems with this variable, because of the need to construct composites of country cycles and make comparisons between clusters and individual countries. As in most cycle-identification methods, importance is accorded to the derivation of trends. However, non-linear trend derivations are preferred to linear trend derivations. These alternative cycle-identification methods are then used to identify global cycles and cycles in developing countries. Cycles are shown to exist at the global and individual developing country levels. At the global level it is shown that, for the period under consideration (1961-2015), most countries do indeed tend to experience cycle bottoms at the same time, and that the movement of a composite of non-weighted real GDP growth rates of all countries comprising the global economic system is very similar to the movement of the equivalent weighted composite. It is further shown that similar synchronised cyclical movements can be observed for clusters of developing countries based on income level and structure of production with reference to the cyclical movement of the global economy, although, as one might expect, there are differences in the degree of synchronisation of the cycles of different developing country clusters and the global cycles.

The global cycles are shown to be driven by global manufacturing, and developing country cycles to be driven by global cycles, through both visual inspection of the data and econometric analyses (by way of confirmation of the observations). With regard to the former, it is argued that with China now assuming the mantel of the leading global manufacturer one can discern certain signs of its growing importance in driving global cycles, albeit together with the large advanced country manufacturers. One implication of this is that the U.S. economy can no longer be seen as impervious to what is happening in the rest of the world, particularly in China and Europe. The driver of developing country cycles is shown to be global cycles; as with the identification of these cycles, however, there are important differences between clusters of developing countries. Specifically, in low-income, commodity-producing developing countries that are prone to random fluctuations in economic activity as a result of their greater propensity to be impacted by all manner of shocks, cycles in economic activity tend to be less driven by global cycles than those in middle-income, manufacturing-based developing countries that experience fewer non-cycle-related economic fluctuations.

A fundamental policy implication of the study is that policy makers in all countries, including those in the advanced countries, would do well to consider the state of global cycles when deciding on appropriate macroeconomic policies for their economies. This is particularly important for policy makers

in developing countries since these countries are more likely to be the recipients of impulses from the global economy than the sources of these impulses. The exception among the developing countries is China, which can increasingly be seen as a generator of global impulses rather than a recipient. The policy implication for China, as for the large advanced countries, is to adopt more countercyclical policies — as indeed it has been aggressively doing in the last few years.

Samenvatting

Het doel van dit onderzoek is om zogenaamde conjunctuurcycli in ontwikkelingslanden te onderscheiden en te verklaren. Dit is om twee redenen van belang: ten eerste omdat ontwikkelingslanden cyclische patronen in hun economische activiteit lijken te vertonen die in toenemende mate overeenkomen met dergelijke patronen in ontwikkelde landen, en ten tweede omdat er relatief weinig onderzoek is gedaan naar cycli in ontwikkelingslanden. Het huidige onderzoek probeert deze leemte op te vullen.

Het vertrekpunt van dit onderzoek is het idee van algemene cycli, dat fundamenteel verschilt van de gangbare ideeën. Dit idee vormt de basis voor a) het conceptualiseren van cycli op wereldschaal en in ontwikkelingslanden, b) het onderscheiden van cycli en c) de voornaamste bepalende factoren erachter. In tegenstelling tot de gangbare ideeën worden cycli specifiek opgevat als terugkerende, niet-periodieke en niet-symmetrische schommelingen in economische activiteit met betrekking tot de tendensen in deze activiteit, die inherent zijn aan de werking van het kapitalistische stelsel. In deze opvatting verschillen ze van willekeurige schommelingen in de economische activiteit die het gevolg zijn van exogene schokken toegebracht aan het systeem; de gangbare opvatting van cycli. Wereldwijde cycli worden opgevat als de gesynchroniseerde cyclische beweging van een meerderheid van landen binnen het wereldwijde economische systeem. Cycli in ontwikkelingslanden worden gerelateerd aan wereldwijde cycli. Bij de begripsvorming wordt bijzonder belang gehecht aan het onderscheid tussen cycli en schommelingen, aangezien zich ontwikkelende economieën onderhevig kunnen zijn aan een groot aantal schokken die in de loop van hun cyclische bewegingen tot veel schommelingen leiden.

Gangbare methoden voor het onderscheiden van cycli worden kritisch beoordeeld met het oog op de ontwikkeling van een alternatieve methode voor het onderscheiden van cycli op algemeen, mondiaal en

ontwikkelingsniveau. In plaats van gebruik te maken van gangbare methoden waarin cycli worden onderscheiden met behulp van filters, mathematische modellen, maxima en minima etc., worden cycli onderscheiden op basis van een ex post-identificatie van de lage fase van de cyclus (niet het minimum van de cyclus). Cycli in de economische activiteit worden weergegeven door cycli in werkelijke bbp-groeicijfers, ondanks de bekende problemen met deze variabele, omdat landencyli moeten worden samengevoegd en clusters en afzonderlijke landen met elkaar moeten worden vergeleken. Zoals bij de meeste methoden voor het onderscheiden van cycli wordt belang gehecht aan het afleiden van trends. Niet-lineaire trendafleidingen hebben de voorkeur boven lineaire trendafleidingen. Vervolgens worden deze alternatieve methoden voor het onderscheiden van cycli gebruikt om wereldwijde cycli en cycli in ontwikkelingslanden te onderscheiden. Er blijken cycli te bestaan op wereldschaal en in de afzonderlijke ontwikkelingslanden. Voor de onderzochte periode (1961-2015) blijkt dat op wereldschaal de meeste landen inderdaad tegelijkertijd in de lage fase van de cyclus zitten, en dat de ontwikkeling van een combinatie van niet-gewogen werkelijke bbp-groeicijfers van alle landen die deel uitmaken van het mondiale economische systeem sterk lijkt op de ontwikkeling van het gewogen equivalent. Verder wordt aangetoond dat vergelijkbare gesynchroniseerde cyclische bewegingen kunnen worden waargenomen voor clusters van ontwikkelingslanden op basis van het inkomensniveau en de productiestructuur afgezet tegen de cyclische beweging van de wereldeconomie, hoewel er, zoals te verwachten valt, verschillen zijn in de mate van synchronisatie van de cycli van verschillende clusters van ontwikkelingslanden en de wereldwijde cycli.

Zowel uit visuele inspectie van de data als uit econometrische analyses (ter bevestiging van de waarnemingen) blijkt dat de wereldwijde cycli worden bepaald door de wereldwijde maakindustrie, en de cycli van ontwikkelingslanden door de wereldwijde cycli. Wat het eerste betreft wordt betoogd dat nu China de rol van wereldleider in de maakindustrie op zich neemt, er bepaalde tekenen zijn van het toenemend belang van China als motor achter wereldwijde cycli, maar wel samen met de grote fabrikanten in de ontwikkelde landen. Een van de gevolgen hiervan is dat de visie dat de Amerikaanse economie niet geraakt wordt door wat er in de rest van de wereld en dan met name in China en Europa gebeurt, niet langer houdbaar is. Wereldwijde cycli blijken bepalend voor de cycli van ontwikkelingslanden; net als bij het onderscheiden van deze cycli zijn er echter grote verschillen tussen clusters van ontwikkelingslanden. In ontwikkelingslanden met een laag inkomen die basisproducten produceren treden willekeurige schommelingen in economische activiteit op omdat ze vaker te maken krijgen met allerlei

schokken. Vooral in deze landen worden cycli in de economische activiteit doorgaans minder door wereldwijde cycli bepaald dan in ontwikkelingslanden met een middeninkomen en een productiesector, die minder niet-cyclus-gerelateerde economische schommelingen kennen.

Een fundamentele beleidsimplicatie van dit onderzoek is dat beleidsmakers in alle landen, ook in ontwikkelde landen, er goed aan zouden doen de toestand van de wereldwijde cycli in aanmerking te nemen bij het nemen van beslissingen over een passend macro-economisch beleid voor hun economieën. Dit is vooral van belang voor beleidsmakers in ontwikkelingslanden, aangezien deze landen eerder ontvanger dan bron zullen zijn van impulsen van de wereldeconomie De uitzondering onder de ontwikkelingslanden is China, dat in toenemende mate kan worden gezien als veroorzaker in plaats van ontvanger van wereldwijde impulsen. De beleidsimplicatie voor China en voor de grote ontwikkelde landen is om een anticyclischer beleid te gaan voeren, zoals China dat de afgelopen jaren ook actief heeft gedaan.

Preface

While my PhD journey officially started in October 2012, the desire to understand the functioning of the global economic system seems to have long been in my heart, although it did not really manifest itself until quite late. The reason for this was in part my fear of economics, especially the more technical side of it, and in part the lack of an appropriate opportunity to get into the subject. My study at the ISS made me realise, however, that a better grasp of economics was imperative if I was to understand a number of issues I had always been interested in such as global poverty, inequality, etc. Howard gave me the confidence to believe that getting to grips with this discipline was not beyond me. The problem was how to approach economics in a way that would help me make sense of certain of the most important foundations of the discipline. After a long gestation period, and innumerable discussions with Howard and other academics both inside and outside of the ISS, I realised that I was particularly drawn to the phenomenon of business cycles.

The business cycle has not been a fashionable subject for an academic research for at least the last two decades, and certainly not in the realm of development studies, but I was convinced that it could be an insightful point of departure for the analysis of the global economic system, especially given the experience of the global economic crisis of 2007-9. Needless to say, I had no idea of how daunting the task was that I had set myself. Indeed, had I an inkling of this, I would probably have not started.

In the end, and in accordance with best-practice in most PhDs, the task only became manageable by narrowing the focus and research objectives of the thesis. Specifically, the thesis has sought to establish the existence of a global business cycle and its main drivers, with a view to understanding the existence and movements of cyclical phenomena in developing countries. The substantive part of the study is a combination of theoretical and empirical

analyses; with the former taking as its point of departure the conceptualization of the cycle, and the latter the way in which cycle phenomena have been identified.

Needless to say, upon completion of the study I came to realise both the gaps in it and how much more there is still to be done. From others who have gone down the same path before me, I realise that this is a normal feeling, and one which suggests that the process has been as much one of learning as of discovery. My hope is that if I have learnt something from this process I will have the opportunity to build on it, and, if I have discovered something worthwhile, which I feel I have, I have managed to convey it.

4 Business Cycle Identification

4.1 Introduction

The aim of this chapter is to apply the alternative identification methodology developed in the preceding chapter to identify business cycles, namely global cycles, cycles pertaining to groupings of countries, and individual country cycles, especially the developing countries. Emphasis is placed on the identification of cycles as opposed to fluctuations, particularly when it comes to the identification of individual developing country cycles.

The alternative method for cycle identification described in chapter 3 suggests the following. (1) The use of non-smoothed real GDP growth rates: for the identification of cycles pertaining to the global economy and clusters of countries, the alternative methodology suggests the use of non-weighted and weighted aggregates of individual country non-smoothed real GDP growth rates. (2) The use of moving averages rather than linear estimation techniques for the construction of reference trends, against which cyclical movements in real GDP are to be understood: this trend construction allows for the path dependency of the trend. (3) The use of the lowest points of the real GDP growth rates as troughs, and troughs-to-troughs for the identification of cycle periods. (4) The use of correlation analysis to capture synchronisations between individual countries, groupings of countries, and global cycles.

Cycle identification necessarily begins with the identification of global cycles because, as was argued above, global cycles are seen as conditioning individual country cycles and cycles pertaining to groupings of countries. This means that the identification of cycles pertaining to groupings of developing countries and individual developing countries should be with ref-

erence to global cycles and, similarly, the identification of cycles of individual countries should be with reference both to global cycles and to cycles pertaining to clusters of (developing) countries with which they share common characteristics. It is important to stress that this approach contrasts with the practice in most mainstream studies which attempt to identify cycles in individual countries without reference to cycles in other countries, let alone global cycles. As indicated in the literature review, this is the inevitable consequence of the mainstream view of the drivers of cycles as resulting from certain random shocks, which are for the most part unique to individual countries.

4.2 Identifying global cycles

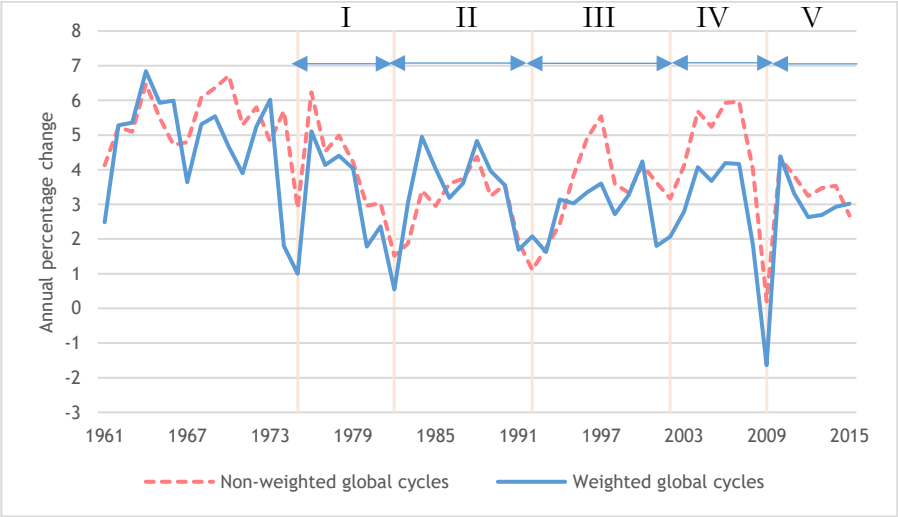
The aim of this section is to apply the methodology developed in the previous chapter to identify global cycles. It does so using real GDP data provided by the World Bank for 199 countries and economies for the period 1961–2015 (these and all other data used in this chapter were accessed on 1 February 2017). One problem with these data is that the country and related time period coverages are not uniform (see Appendix 4.1 for the numbers of countries included[1]). Real GDP data are only available for limited time periods for certain countries, especially developing countries. However, it is felt that the benefits from including those countries with missing data in the construction of growth indicators of various clusters of countries outweighs any benefits from their exclusion. This is because the purpose of the construct is to develop an indicator of the synchronised growth movement of the clusters as a whole.

Global cycles are identified using non-smoothed composites of both non-weighted and weighted global real GDP growth rates. The former depict the synchronised movements of the country constituents of the global economy regardless of the size of these constituents, and the latter reflect the movement of global GDP *per se*. The weights assigned to countries in the weighted composites depend on their share in world GDP on the basis of current U.S. dollars.

Figure 4.1a is a plot of two series for the period 1961–2015 and Figure 4.1b is a trend in these data with the trend beginning in 1968. The importance of using non-transformed real GDP data for the derivation of growth rates needs to be stressed. The trend is constructed using the value of the average duration of cycles between 1975 and 2009 (see Table 4.1a

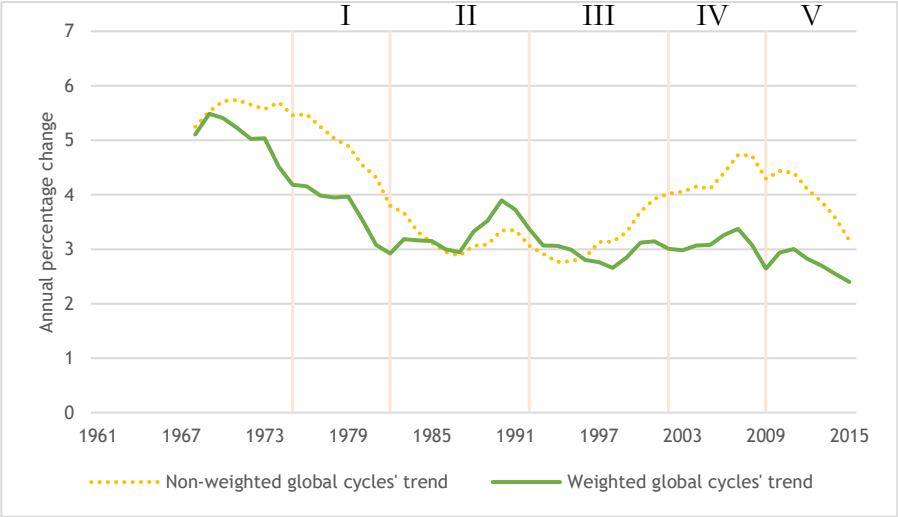
below). Taking the period of each cycle as a trough-to-trough measurement, these data show four complete cycles over this period (labelled as I to IV in Figures 4.1a and 4.1b) and one unfinished cycle beginning in 2009 (cycle V in Figures 4.1a and 4.1b). The precise dates for each cycle are given in Table 4.1a.

Figure 4.1a
Identification of global cycles (average real growth rates), 1961-2015



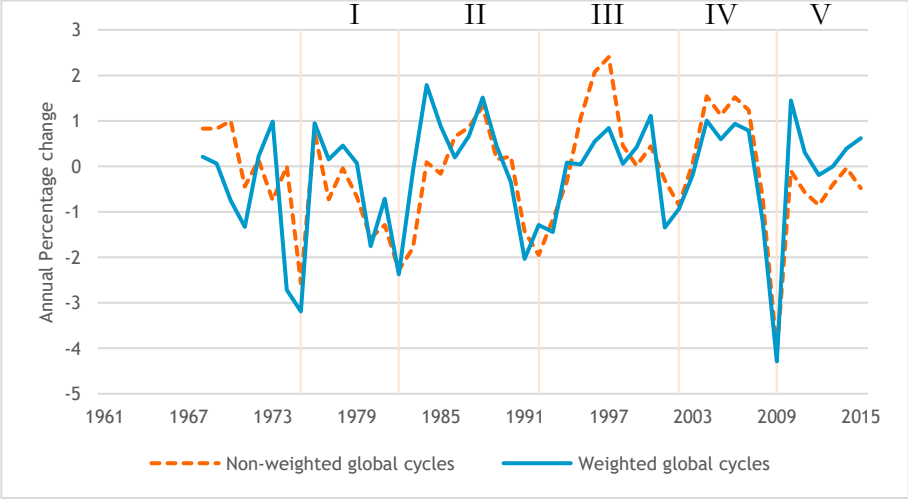
Source: World Bank WDI, author's calculation.

Figure 4.1b
Identification of global cycles (average real growth rates), trend, 1968-2015



Source: World Bank WDI, author's calculation.

Figure 4.1c
Identification of global cycles (average real growth rates), deviation from trend, 1968-2015



Source: World Bank WDI, author's calculation.

A number of observations follow from these data. Firstly, and most remarkably, the non-weighted and weighted series appear to move together both in terms of cycles and trends. The correlation coefficient for the two series for the time period as a whole is 0.87, indicating a high level of synchronisation (see Table 4.1a). The exception is the period pertaining to cycle III (1992–2002) when the correlation coefficient is appreciably lower than for the other cycles. Notwithstanding this anomaly, the fact that the growth rates of most countries appear to move so closely together with (weighted) global GDP growth as depicted by the high correlation between the unweighted and weighted series, suggests that there is a global gravitational force at work. This has a number of far-reaching implications, the most obvious of which is that studies of cycles in particular countries, even large advanced countries, cannot be conducted without reference to global cycles.

Secondly, the non-regularity of the occurrence of cycles needs to be noted. The time period for each cycle ranges from 6 to 11 years. Table 4.1a below shows the time periods for each individual global cycle pertaining to both series as well as an average for all of them, including cycle V (2009–15). This provides support for the argument advanced above that cycles are non-regular and their identification (or non-identification) cannot be based on a presumed regularity of their occurrence as is the case with many orthodox identification methods.

Thirdly, the amplitudes of each cycle differ. The amplitudes are taken to be the highest deviation from peak (*maxima*) to trend added to the highest deviation of the following trough (*minima*) to trend, following the existing standard calculation reviewed in chapter 2. Table 4.1b shows that the amplitudes of all five cycles are different, ranging from around 0.8% to 5.6% (sum of expansion and contraction). The largest amplitude among the five pertains to that of cycle IV (2002–09), mainly because of the unusually sharp and considerable fall in economic growth during the 2007–09 crisis. In addition, the amplitudes of the contraction phases are generally greater than those of the expansion phases. This reinforces the point made in chapters 2 and 3, that amplitudes vary and are asymmetric, making it misleading to base cycle identification on presumed similar amplitudes as some cycle identification methods do. It is also of note that the amplitudes of the two series are on average roughly the same (see Table 4.1b, also Figure 4.1c).

Fourthly, Figure 4.1c shows that the time duration from the cycle peak to the fall of the growth rate below trend, i.e., the movement of the economy into its contraction phase (shown as the shaded region), varies quite considerably between cycles, making the use of cycle *maxima* as 'turning points' of dubious value. Although similar divergences between cycle *minima* and transitions to the expansion phases of cycles are observed across the four cycles, they are not as marked as the divergences between cycle *maxima* and transitions to the contraction phases of the cycles. What is startling is that from 2011 onwards the non-weighted series has been showing the cycle to be continuously in a contraction phase, while the weighted series suggests such a contraction ended in 2013 (see Figure 4.1c).

Fifthly, the trend movements of the two global real GDP composites diverge from the beginning of the 1990s (see Figure 4.1b), providing two contrasting views of movements in the global economy. The fact that the non-weighted series is continuously above the weighted series would confirm the perception that less developed, smaller economies tend to experience relatively higher growth rates than the larger, more developed economies (that are given the larger weights in the weighted series). The divergence of the trend is clearly evident since the beginning of the 1990s, when the non-weighted series started to show higher trend movements.

Table 4.1a
Global cycle identification: Dates, duration, and synchronisation, 1975-2015

Cycle No.	Non-weighted global cycles		Weighted global cycles		Correlation[3]
	Date	Duration[4]	Date	Duration[4]	
I	1975-1982	7	1975-1982	7	0.95
II	1982-1992	10	1982-1993	11	0.81
III	1992-2002	10	1993-2001	8	0.64
IV	2002-2009	7	2001-2009	8	0.99
V	2009-(2015)	(6)	2009-(2015)	(6)	0.97
Avg.[1]		8 (8.5)		8 (8.5)	0.87

1/ Avg is Average (this applies to values provided in all tables in chapters 4, 5 and Appendix).
2/ Values in the brackets are for the unfinished cycle V. Period averages include data pertaining to this cycle (this applies to values provided in all tables in chapters 4, 5 and Appendix).
3/ Correlation between non-weighted and weighted global cycles.
4/ Duration is in years (this applies to all tables in chapters 4, 5 and Appendix).

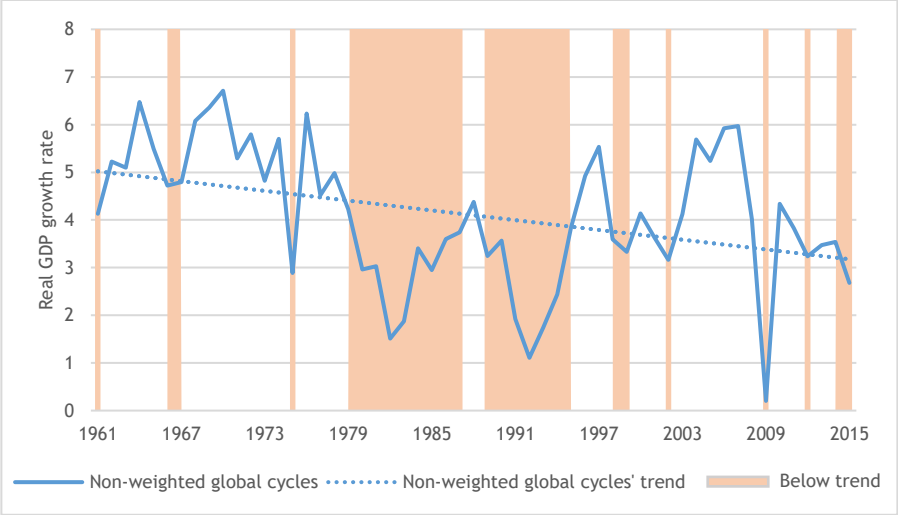
Table 4.1b
Global cycle identification: Amplitudes, 1975-2015

Cycle No.[1]	Non-weighted global cycles			Weighted global cycles		
	Expansion	Contraction	SD[2]	Expansion	Contraction	SD[2]
I	0.76	2.28	1.00	0.95	2.38	1.22
II	1.32	1.95	1.14	1.79	2.04	1.22
III	2.40	1.17	1.18	1.11	1.34	0.74
IV	1.54	4.09	2.03	1.00	4.29	1.78
V	0.04	0.85	0.31	1.45	0.19	0.58
Avg.	1.20 (1.51)	2.07 (2.37)	1.13 (1.34)	1.26 (1.21)	2.05 (2.51)	1.11 (1.21)

1/ The time period for each cycle follows Table 4.1a above.
2/ SD is Standard Deviation (this applies to values provided in all tables in chapters 4, 5 and Appendix).

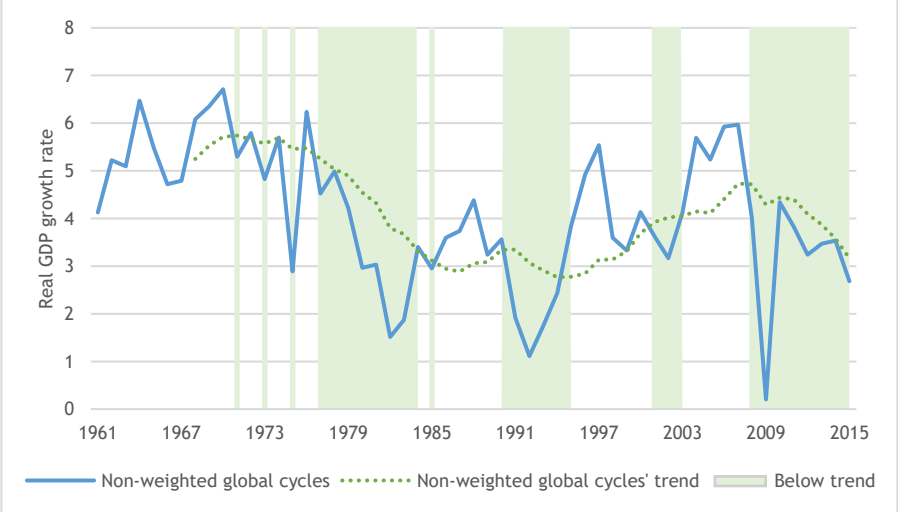
One last point to be made in the context of the identification of the global cycle is the importance to be accorded to the non-linear estimation of the trend.[2] To begin with, the shape of the linear trend by definition depends on the starting date of the data. Thus, while the trend depicted by taking a starting date of 1968 is clearly downward (see Figure 4.2), the trend depicted by taking the starting date as 1992, for example, is upward. Moreover, and following from this point, taking linear trends means it is often not possible to distinguish between sub-periods of relative strength and weakness. While the linear trend starting with 1968 shows the entire period from 1961 to 2015 to be one of continuous economic weakness (see Figure 4.2), a non-linear trend for the same period suggests that, although the period as a whole is one of weakening economic growth (the peak of the second trend cycle being lower than the peak of the first), one can discern sub-periods of relative economic strength such as 1985–90, 1995–2001, and 2003–07 (see Figure 4.3). In fact, one of the consequences of using a linear trend in the identification of cycles, and in this case global cycles, is that it gives a distorted picture of expansions and contractions — which are conceived of in relation to the trend. For example, considering the movement of global real GDP growth in relation to the linear trend suggests that the period from 2010 to 2014 can be characterised as one of (relative) expansion in the global economy (see Figure 4.2), while the movement of global real GDP in relation to the non-linear trend shows this period to be one of continuous weakness (see Figure 4.3) — a view shared by most observers of the global economy, including the central bankers of the dominant global economies who considered it to be a period of such pronounced weakness that it required extraordinary monetary and fiscal policies to compensate.

Figure 4.2
Global cycles (average real growth rates) with a linear trend, 1961-2015



Source: World Bank WDI, author's calculation.

Figure 4.3
Relative expansion and contraction phases in global cycles (average real growth rates), 1961-2015



Source: World Bank WDI, author's calculation.

4.3 Cycles pertaining to groupings of countries

This section attempts to identify the characteristics of cycles pertaining to clusters of developing countries, grouped according to their levels of development and economic structures.[3] As in the global economy case in the section above, the data used for the identification of these cycles are aggregated and non-transformed real growth rates. The identification of cycles pertaining to such clusters is based on a comparison of a non-weighted composite of the growth rates of the countries comprising the cluster and the **weighted** global cycles. The aim is to see the extent to which the cycles of countries comprising various sub-groupings move with global cycles, where the latter are depicted by the weighted average of countries comprising the global economy.

The period for the identification of such cycles is 1983 to 2015, depending on the availability of the data on which the classifications are based. The period covers three complete and one unfinished cycle (i.e., cycles II to V shown in Figure 4.1a above). The basis for the different country clusters is explained in the sections below. Country compositions of different groupings vary from cycle to cycle depending on changes in the level of development and economic structure of the individual countries within each cluster. Modifications of country clusters are made in accordance with the criteria adopted at the beginning (1st year) of each reference cycle, i.e., 1983, 1994, 2002 and 2010. Since data pertaining to clusters of countries based on the level of development are only available from 1987, the data pertaining to these clusters of countries for the first cycle are based on backward extrapolations.[4] Reconstituting country groupings between cycles is considered necessary in order to reflect changes in the structures of individual countries over time, and indispensable if misperceptions are to be avoided. It also reinforces the points made about the problems with conventional identification techniques which are by their nature unable to take into account such changes. The non-linear trend of cluster cycles is derived in the same manner as that in the weighted global series. Although the average duration of cycles is expected to vary across the groupings of economies, to facilitate their comparison with one another and with the global cycles, the same numbers of years are used for the construction of the moving average, i.e., 8 years. Data limitations mean that the trends for various clusters are only available from 1990. Therefore, the amplitudes of cycle

II are only based on the data between 1990 and 1994. This is, admittedly, a serious limitation of the approach.

4.3.1 Level of development

The classification of countries according to their level of development follows the widely used Gross National Income (GNI) per capita classification made by the World Bank. To be specific, on the basis of GNI per capita the World Bank classifies countries as high-, upper middle-, lower middle-, or low-income countries,[5] with the first seen as representing the advanced countries (hereafter ACs) and the latter three typically seen as constituting the developing countries (hereafter DCs). For the purposes of the present study, the cluster of middle-income countries will be taken as a single aggregate, and not divided into upper and lower sub-categories.[6] The numbers of countries included in each cycle identification are noted in Table 4.2 (for the detailed country constituents, see Appendix 4.3).

Table 4.2
Numbers of countries in the different income clusters, 1982-2015

	Income level	1983 (1987[1])	1994	2002	2010
ACs	High	40	43	55	70
DCs	Middle	74	95	86	109
	Low	49	64	64	35
	Sub-total	163	202	205	214
N/A[2]		54	15	12	3
Total		217	217	217	217

1/ The data in 1987 is extended to 1983, which is the 1st year of cycle II.

2/ N/A indicates the numbers of countries where relevant data is not available.

The first country clusters to be identified should logically be at the most aggregated level. These are the clusters of advanced and developing countries. The identification of cycles in developing countries as a whole will then be used to benchmark the identification of cycles in particular clusters

of, and in individual, developing countries, to ascertain whether differences between developing countries in terms of their structures matter for identifying their cyclical movements. To identify cycles in advanced and developing countries, countries in the two groupings are clustered on a non-weighted basis and the cycles pertaining to the cyclical movement in growth rates of these two groupings are then compared to the global weighted cycle as the reference cycle. Figure 4.4a depicts composite weighted global economy growth rates (as derived above) alongside aggregated non-weighted economic growth rates for both advanced and developing countries over the period 1982–2015. Simple moving averages for all the series are shown in Figure 4.4b. What is observed from these figures is the following.

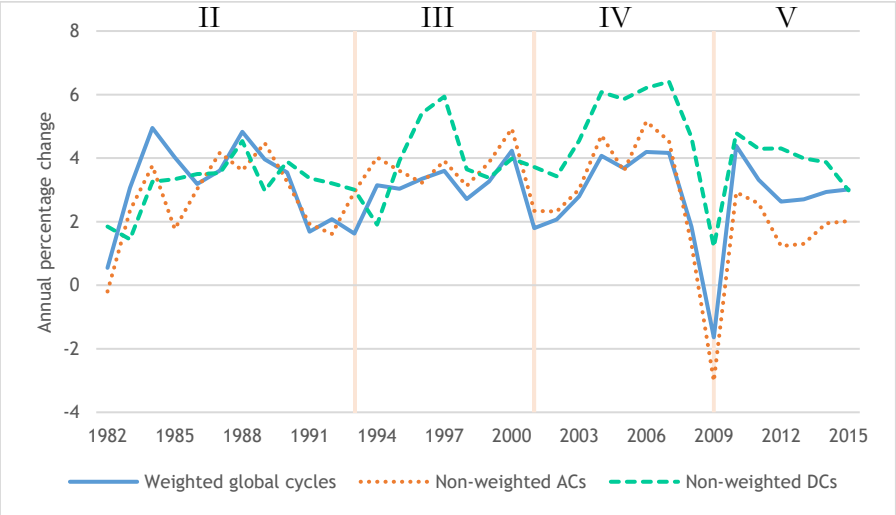
Firstly, the cyclical growth rate movements of the advanced and developing countries are closely synchronised with those of the global economy. The correlation coefficients for the synchronisation of the growth rates of these clusters of economies with those of the global economy are 0.9 and 0.76, respectively, for the period as a whole (see Table 4.3). One important point of note is the apparent decline in synchronisation of the cyclical movement of growth in the developing countries with that of the weighted global cycle (and advanced economies in particular) since 2012 (see Figure 4.4a and Figure 4.4b). This point will be returned to in the discussion of the country drivers of global cycles in chapter 5 since it has certain obvious implications for the explanation of these drivers.

Secondly, the troughs of the cycles in the advanced and developing countries are roughly the same as those of the weighted global cycles, although troughs in the cycles of the developing countries can be seen to lag those of the advanced countries by a year until cycle V (2009–15). The average duration of cycles in the advanced and developing countries is the same as for the global cycles (i.e., 8 years between 1982 and 2015), regardless of these differences in the observed troughs. As with the global cycles, the duration for both clusters of countries, i.e., advanced and developing countries, varies between cycles, contrary to the assumptions underlying many of the mainstream methods used in cycle identification (as discussed in chapter 2).

Thirdly, and also contrary to the assumption of many orthodox cycle identification methods, cycle amplitudes can be seen to vary between cycles.[7] This is evident for the global cycles as well as cycles pertaining to clusters of advanced and developing countries (see Table 4.3). Curiously,

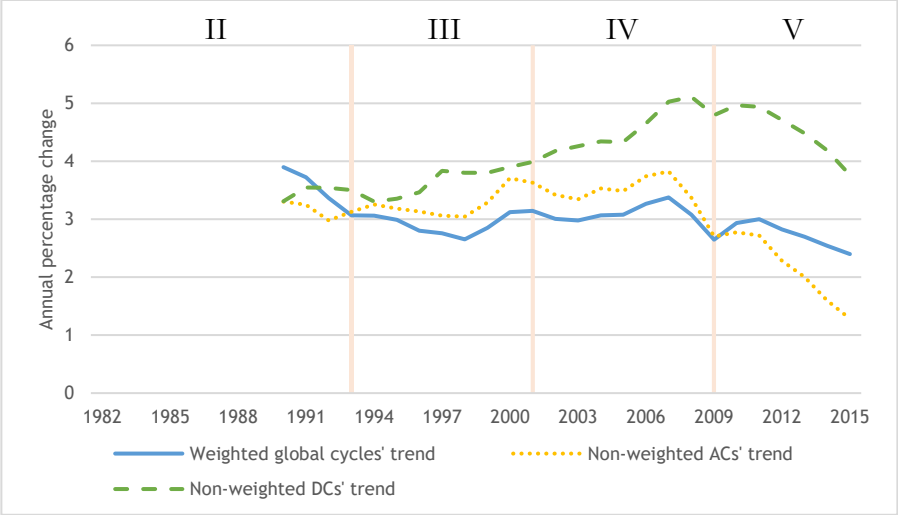
cycle amplitudes for advanced countries appear to be greater than for developing countries.[8]

Figure 4.4a
Identification of cycles in ACs and DCs, 1982–2015



Source: World Bank WDI, author's calculation.

Figure 4.4b
Growth rate trends in ACs and DCs, 1990-2015



Source: World Bank WDI, author's calculation.

Table 4.3
Identification and nature of cycles in ACs and DCs, 1982-2015

Ref. cycle[1]	ACs			DCs		
	Troughs	Amplitudes	Correlation[2]	Troughs	Amplitudes	Correlation[2]
II	1992	1.32	0.78	1994	1.08	0.65
III	2002	2.51	0.92	1999	3.50	0.51
IV	2009	7.13	0.99	2009	5.32	0.96
V	(2015)	1.79	0.90	(2015)	0.60	0.91
Avg.		3.19 (3.66)	0.90		2.62 (3.3)	0.76

1/ The time period for each cycle corresponds to those of the weighted global cycles in Table 4.1a above and applies to values provided in all tables below in this chapter.

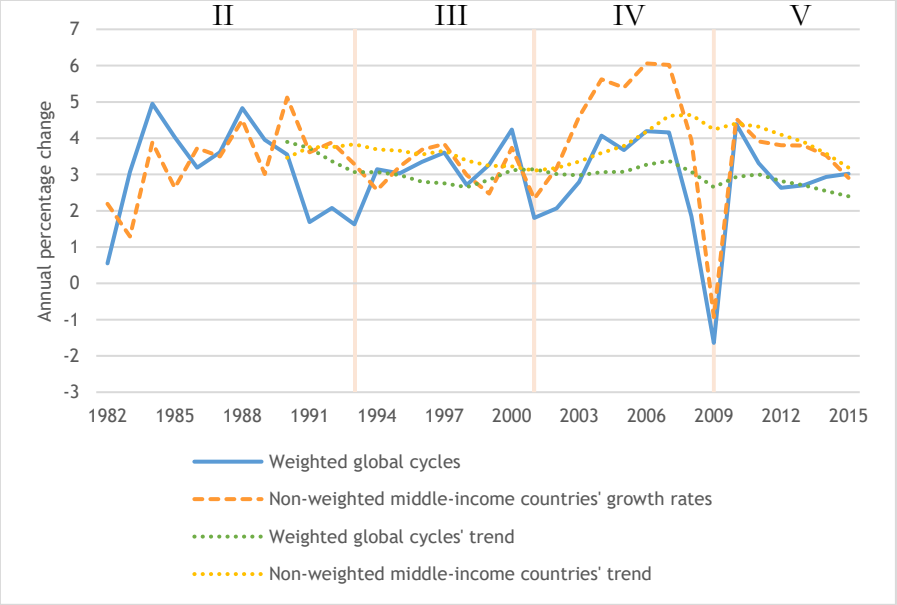
2/ The correlation is with respect to the weighted global cycles and applies to values provided in all tables below in this chapter.

Having identified cycles for developing countries as a cluster, I will now consider the significance for cycle identification when different characteristics of developing countries are allowed for. As noted in chapter 3, the important characteristics which can be expected to have a bearing on cycle identification are the levels of development and structures of production (exports).

It was noted in chapter 3 that levels of per capita national income are typically taken to represent levels of development. To show the significance for cycle identification of different levels of per capita income, a distinction is drawn between middle- and low-income countries. The identification of these two clusters is made using non-weighted real GDP growth series to capture the synchronised movements of the constituent countries.

Figure 4.5 shows unweighted real GDP growth rates for a cluster of middle-income countries alongside weighted global real GDP growth rates. The first thing to note from this chart is that the troughs of the cycles of middle-income countries are roughly similar to those of the global cycles, and there appears to be a high degree of synchronisation between the two series. Table 4.4 confirms this apparent relatively high degree of synchronisation in the form of a correlation coefficient of 0.63 for the two data series over the period as a whole. The second thing to note is that, as with cycles pertaining to larger clusters of developing countries, the duration and amplitudes of those pertaining to middle-income countries vary between cycles (see Figure 4.5 and Table 4.4). This reinforces the points made above regarding the non-regularity and non-symmetry of cycles. Thirdly, further confirmation of the synchronisation of the two series comes in the form of the synchronised movements in their moving average trend growth rates, with — as one might expect — trends in middle-income level countries being consistently above global trend growth rates.

Figure 4.5
Identification of cycles in middle-income countries, 1982-2015



Source: World Bank WDI, author's calculation.

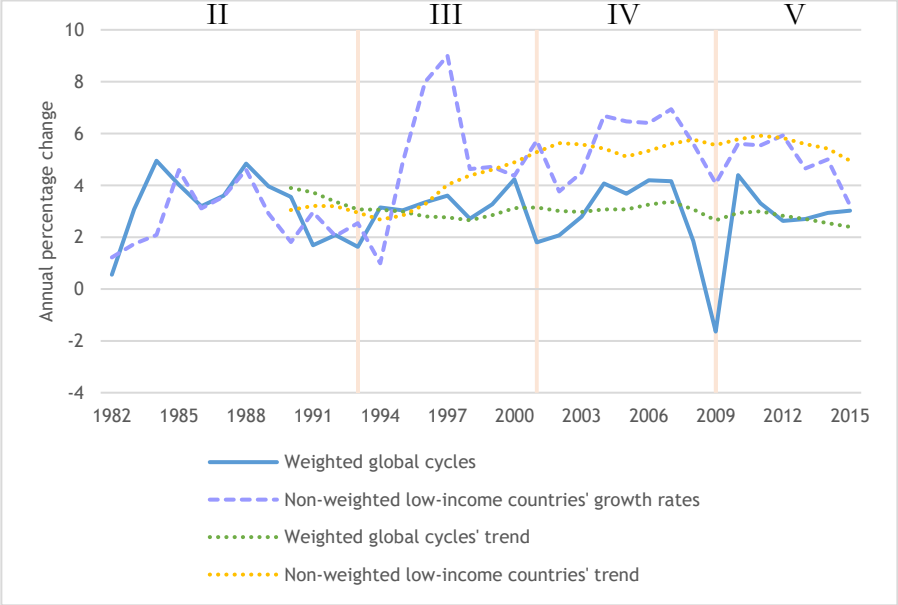
Table 4.4
Identification of cycles in middle-income countries, 1982-2015

Ref. cycle	Troughs	Amplitudes	Correlation
II	1994	2.21	0.16
III	2001	1.62	0.72
IV	2009	7.19	0.99
V	(2015)	0.54	0.65
Avg.		2.21 (2.89)	0.63

Figure 4.6 and Table 4.5 are analogous to Figure 4.5 and Table 4.4, except that they are for low-income developing countries. They show that although cycles pertaining to this cluster of economies can also be identified, they are far less synchronised than those for the middle-income countries. Thus, although there appears to be a coincidence of cycle troughs, at

least for cycles III and IV, and although the moving averages of the growth rates appear to move together, there is clearly a lower degree of synchronisation between the cycles of low-income countries and global cycles than was the case for middle-income countries. In fact, as Table 4.5 shows, the average correlation coefficient for the co-movement of real GDP growth rates for low-income countries with those of the global economy is about half of that for middle-income countries. The lower degree of synchronisation is perhaps to be expected given the fact that such economies tend by their nature (less diversified in terms of their production bases) to be more vulnerable to all manner of shocks. A second observation to be made about the cycles pertaining to the low-income cluster of countries is their relatively higher, but still varied, amplitudes. This is possibly also due to the greater vulnerabilities of these economies to all manner of shocks (see chapter 5 for a further discussion of this point). A third observation is that the trend growth rates depicted by the two series broadly move together, with those of low-income countries being above those of middle-income countries.

Figure 4.6
Identification of cycles in low-income countries, 1982-2015



Source: World Bank WDI, author's calculation.

Table 4.5
Identification of cycles in low-income countries, 1982-2015

Ref. cycle	Troughs	Amplitudes	Correlation
II	1994	0.99	0.36
III	2002	6.66	0.08
IV	2009	3.23	0.75
V	(2015)	1.84	0.24
Avg.		3.18 (3.63)	0.36

4.3.2 Structure of the economy

This section aims to identify cycles for groupings of developing countries based on perceived differing structures of these economies. Since the focus is on developing countries, the key distinction is between manufacturing-based and primary goods-based (i.e., commodity-based) export economies. Among primary goods exporters, a further distinction is drawn between exporters of food, of ores and metals (shortened hereafter to metals), of fuel, and of agricultural raw materials (hereafter ARM). Classification of countries into various groupings is on the basis of export composition, with this composition seen as reflecting the production structures of the economies. A point to note in this context is that, although food and fuel production are usually regarded as part of manufacturing production in general GDP computations, for the purposes of the present study, and the present section in this study, a distinction will be made between the three, insofar as countries can be seen as specialising in and exporting one or another of these. The reason for this distinction is that the extent to which economies specialise in and export one or another of these three appears to be important in explaining different cyclical movements.

Composites of countries based on types of exports are developed in accordance with the World Bank classifications of export products discussed above. The countries are classified as specialising in the export of one product category or another according to the preponderance of the value of the product in the total value of their exports.[9] The product groupings which are used in the following analysis are manufactures, food, metals and fuel. ARM is left out because of the lack of sufficient data. As with the identification of country groupings of cycles based on levels of

development, in their identification with respect to economic structures, the reference cycle will be taken as the aggregate weighted global cycle; for cycles pertaining to clusters of countries the reference will be non-smoothed non-weighted aggregate growth rates of the constituent countries. The classifications based on the above-mentioned economic structures are taken as changing with each cycle, depending on perceived shifts in the structure of exports of the countries concerned. The numbers of countries in each classification is noted in Table 4.6, with details of the countries included in each classification provided in Appendix 4.4. Table 4.6 shows that over the period under consideration increasing numbers of economies have shifted from primary products exports to manufacturing exports, especially from 1982 onwards. The identification of cycles pertaining to the ARM cluster is excluded due to the small numbers of countries with the requisite data which can be included in such a cluster. Instead, the identification of a country which is deemed to be representative of the cluster (viz., Burkina Faso) will be considered in the following section.

Table 4.6
Typology of developing countries based on economic structures (numbers), 1982-2015

		1983	1994	2002	2010
Manufacturing based		13	33	47	39
Commodity based					
	Food	35	33	37	38
	Fuel	16	10	18	22
	Metals	8	5	10	11
	ARM	1	1	5	2
	Sub-total commodity based	60	49	70	73
Total		73	82	117	112
N/A[1] in DCs		50	77	33	32

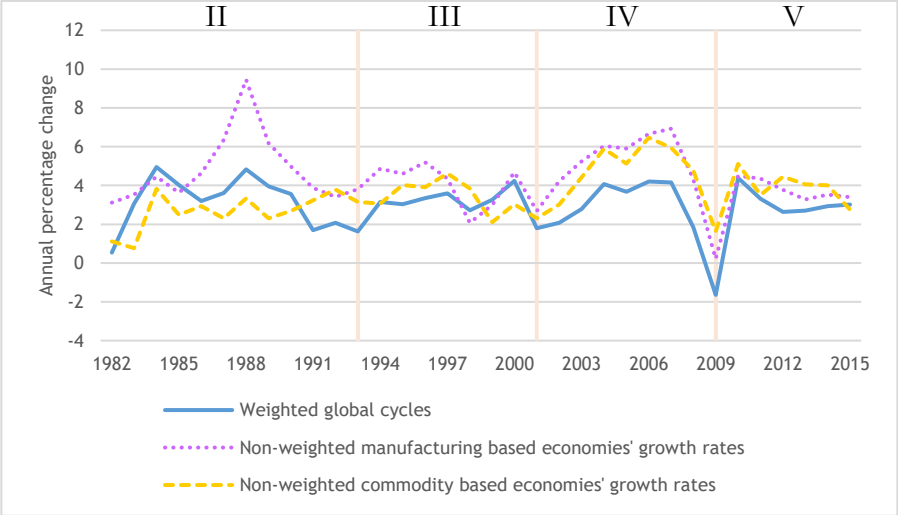
1/ N/A indicates the numbers of countries where relevant data is not available.

The basis for the identification of cycles of different clusters of countries grouped according to different economic structures is, as above,

taken to be the non-weighted aggregation of non-smoothed real GDP growth rates for the clusters of countries concerned over the period 1982 to 2015. The identification of cycles pertaining to clusters of developing countries based on differences in economic structures will begin with the distinction between manufacturers and commodity producers. Plots of economic growth rates pertaining to these two clusters of countries are presented in Figure 4.7a and their trends (i.e., 8 year simple moving averages) are shown in Figure 4.7b.

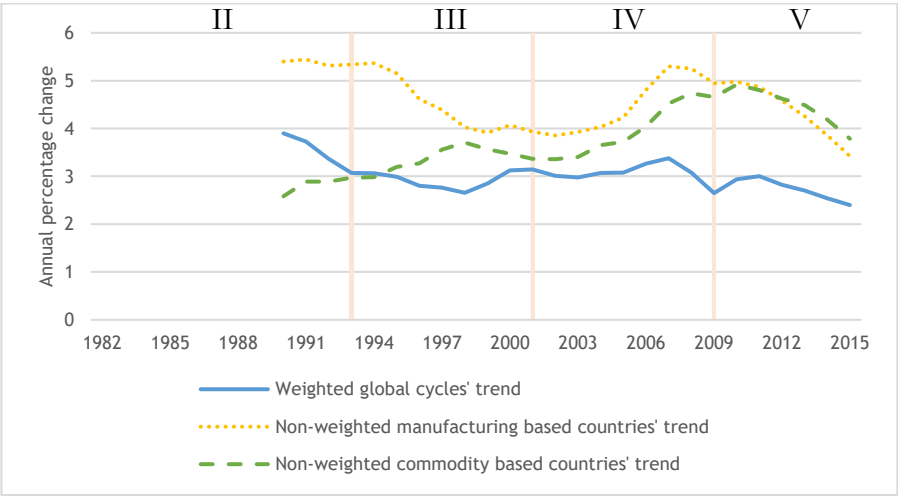
The first thing to note is that the troughs of both manufacturing- and commodity-based economies only coincide with those of the global cycles in cycle IV (2001–09). Secondly, it is apparent that the cyclical movements of the clusters of developing countries are increasingly synchronised with those of the global cycles over the period 1982–2015, with the correlation of the manufacturing-based developing economies being higher than that of the commodity-based economies (with the average coefficients of 0.9 and 0.6, respectively). At the same time, it is also evident that the extent of the synchronisation for both clusters varies between cycles (see Table 4.7). In that light, it could be argued that the recent (post-2009) apparent decline in synchronisation of cycles pertaining to both clusters of developing countries with the global cycle (see Table 4.7) could indicate the beginning of a de-coupling of these economies from the global economy. However, it could also be argued that the apparent fall in the degree of synchronisation since 2009 is simply the product of the usual periodic shifts in global production and trade, which take place over time and in the context of the long-term increase in economic integration between countries (see next chapter for an elaboration of this point). It is noteworthy in this context that the trend growth rates for both manufacturing- and commodity-based economies have tended to move with those of the global economy, while being appreciably above the latter for the period as a whole. Third, in keeping with all the other cycles identified above, the duration of the cycles for manufacturing and commodity exporters varies between cycles (see Table 4.7). Fourth, the overall average amplitudes of the cycles pertaining to the manufacturing-based economies are slightly higher than those pertaining to the commodity-based economies, with amplitudes for both varying between cycles.

Figure 4.7a
Identification of cycles in manufacturing- and commodity-export developing countries, 1982-2015



Source: World Bank WDI, author's calculation.

Figure 4.7b
Identification of cycles in manufacturing- and commodity-export developing countries, trend, 1990-2015



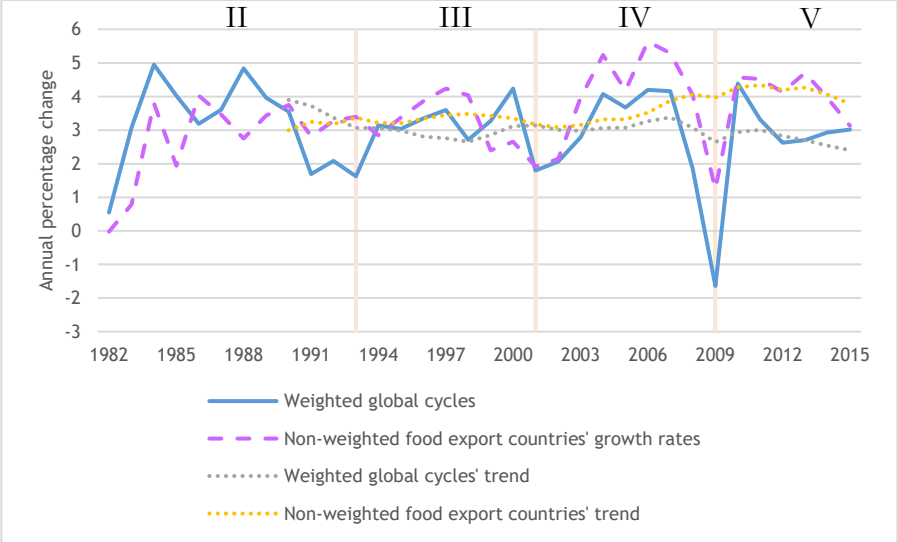
Source: World Bank WDI, author's calculation.

Table 4.7
Identification of cycles in manufacturing- and commodity-export developing countries, 1982-2015

Ref. cycle	Manufacturing-based			Commodity-based		
	Troughs	Amplitudes	Correlation	Troughs	Amplitudes	Correlation
II	1991	1.47	0.59	N/A	0.79	-0.03
III	2001	2.56	0.62	1999	2.51	0.30
IV	2009	6.73	0.99	2009	5.45	0.93
V	(2015)	0.96	0.80	(2015)	1.48	0.46
Avg.		2.93 (3.58)	0.90		2.56 (2.92)	0.60

Figure 4.8 shows the non-weighted growth rates of food export-oriented economies and the weighted growth rates of the global economy. The troughs identified in the food export-based economies generally coincide with those of the global economy, with the possible exception of the trough of cycle II (1982–93). The degree of synchronisation with the global cycles for this cluster is weaker than that for the commodity export-based economies as a whole. Up to cycle III (1993–2001), there is at most only a very weak synchronisation. From cycle III onwards, however, the synchronisation of the two cycles is much more in evidence, making the identification of cycles pertaining to food exporters with reference to the global cycles somewhat easier. It can be noted that the cycles pertaining to food exporters are accompanied by several fluctuations especially in the course of cycles II (1982–93) and III (1993–2001), making their identification with reference to the global cycles much more difficult. The movement of the trend real GDP growth rates for this cluster of countries is similar to that of the global cycles, reinforcing the point made about the high degree of synchronisation of growth rates between the two. Lastly, the amplitudes of cycles for food exporters may be seen to be on average lower than those of the global cycles, but are still varied between cycles (see Table 4.8).

Figure 4.8
Identification of cycles in food-export developing countries, 1982-2015



Source: World Bank WDI, author's calculation.

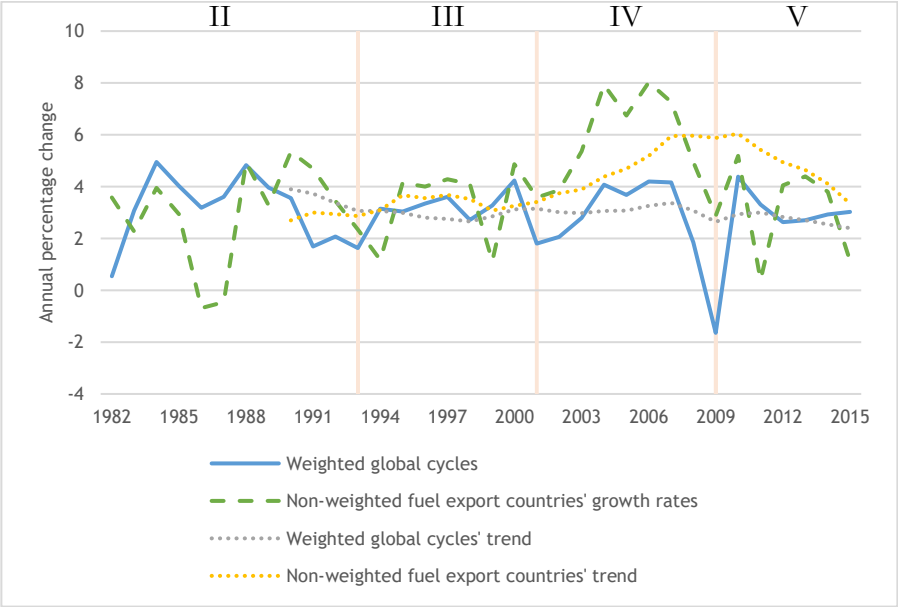
Table 4.8
Identification of cycles in food-export developing countries, 1982-2015

Ref.cycle	Troughs	Amplitudes	Correlation
II	N/A	1.19	0.04
III	2001	2.04	0.30
IV	2009	4.84	0.90
V	(2015)	1.09	0.27
Avg.		2.29 (2.69)	0.38

Figure 4.9 is a plot of the non-smoothed aggregate growth rates of fuel-exporting developing economies alongside the weighted growth rates for the global economy. The first thing to note is that the troughs do not clearly coincide with those of the global economy, even allowing for lags. Related to this, it can be seen that the degree of synchronisation in the movement of the growth rates of this cluster and the global economy is much lower than for commodity producers in general. One reason for this

is that the economies of countries comprising this cluster appear to be more subject to fluctuations than commodity producers in general. As Figure 4.9 also shows, however, trend movements in the growth rates of this cluster generally accord with, and converge towards, trend growth rates in the global economy, but with some minor, but increasingly significant, divergence in more recent years as trend growth rates of this cluster of economies fall relative to global growth rates. Finally, it may be seen from Figure 4.9 that the amplitudes of cycles pertaining to fuel-exporting economies has been higher than that of the global cycles, which is also confirmed in Table 4.9.

Figure 4.9
Identification of cycles in fuel-export developing countries, 1982-2015



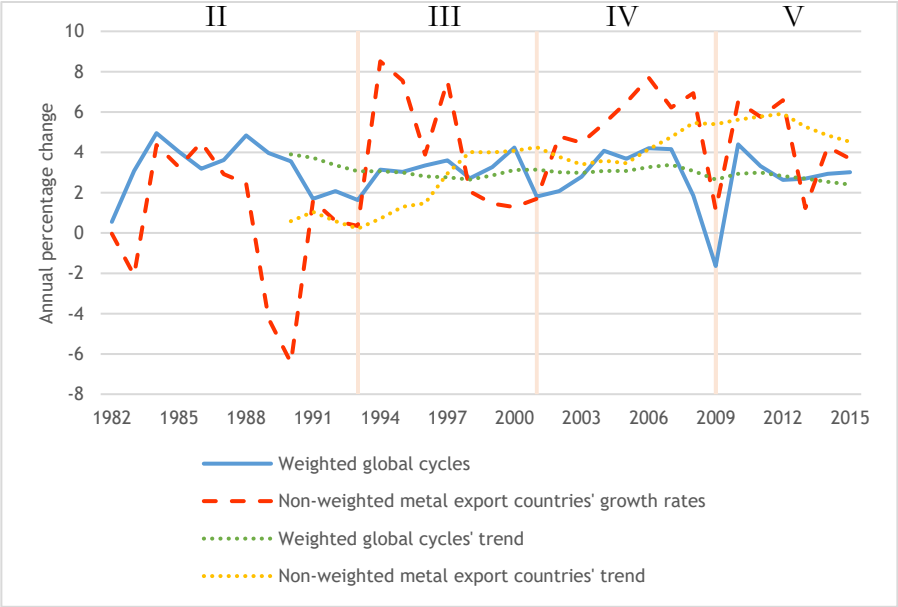
Source: World Bank WDI, author's calculation.

Table 4.9
Identification of cycles in fuel-export developing countries, 1982-2015

Ref.cycle	Troughs	Amplitudes	Correlation
II	(1986)/94	3.17	0.11
III	1999	3.56	0.17
IV	2011	6.54	0.91
V	(2015)	4.78	0.19
Avg.		4.51 (4.42)	0.34

The last of the clusters of raw material producers which requires some consideration in terms of cycle identification is that of metal exporters. The relevant aggregated non-weighted growth rate data pertaining to this cluster, along with the weighted growth rate data pertaining to the global cycles, are shown in Figure 4.10. The cycle troughs pertaining to this group of countries generally coincide with those of the global cycles, typically preceding the latter. The degree of synchronisation between cycles in growth rates of metal exporters and the global economy is weak, with cycles of metal exporters clearly distorted by large numbers of fluctuations (see Table 4.10). However, notwithstanding these distortions and the weak synchronisation between the cycles, trends in the growth rates of the two series move surprisingly close to one another, although they move alternately above and below one another. Lastly, the amplitudes of the cycles of this cluster are the highest for all commodity producers, as one might expect given the relative inelasticity of supply associated with producers of metals.

Figure 4.10
Identification of cycles in metal-export developing countries, 1982-2015



Source: World Bank WDI, author's calculation.

Table 4.10
Identification of cycles in metal-export developing countries, 1982-2015

Ref.cycle	Troughs	Amplitudes	Correlation
II	1990	7.58	0.14
III	1999	10.59	0.12
IV	2009	7.78	0.83
V	(2015)	4.91	0.48
Avg.		7.72 (8.65)	0.39

4.4 Individual country cycle identification

The purpose of this section is to identify cycles in individual developing countries. As indicated in chapter 3, these are to be identified by the non-smoothed real growth rates for the country in question with reference to

the weighted global cycles and cycles pertaining to groupings of countries to which the individual country belongs.

The analysis in this section will build on that presented above with regard to cycle identification, particularly that pertaining to groupings of developing countries. The aim is to show that such cycles need to be identified with reference to global cycles, paying due attention to the characteristics of the country in question and various shocks it may be subject to. Four developing countries are chosen for the purpose, with each seen as representing developing countries with a certain level of development and a particular economic structure. An important consideration in the country choices is the availability of reliable data for long enough time periods. The countries chosen are Brazil, Sri Lanka, Peru and Burkina Faso.[10] Brazil is chosen as a representative of upper middle-income countries specialising in manufacturing and food exports; Sri Lanka as a low/middle-income country specialising in manufactured exports; Peru as a middle-income country specialising in metal exports; and Burkina Faso as a representative of low-income, ARM-exporting countries (see Table 4.11).

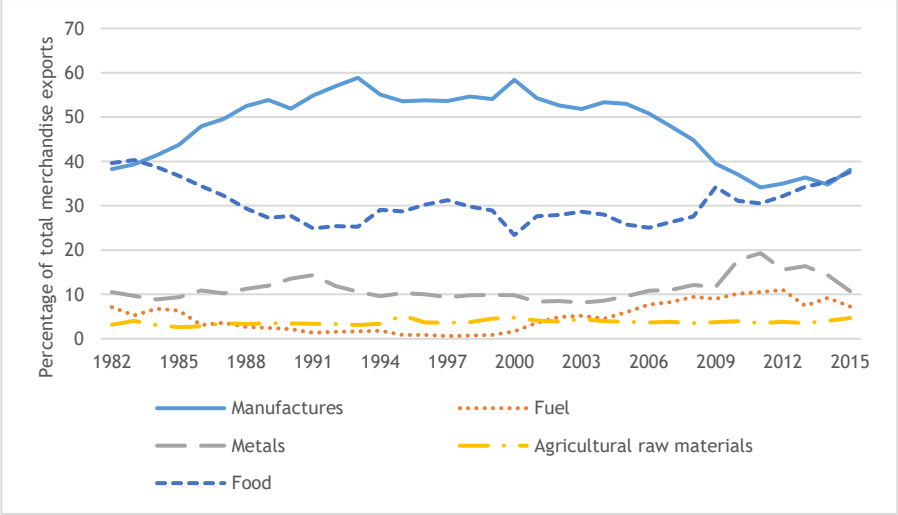
Table 4.11
Economic characteristics of selected countries

Country	Income level (per capita)	Economic structure	Region
Brazil	Middle	Commodity (Food)/Manufacturing	Latin America
Peru	Middle	Commodity (Metals)	Latin America
Sri Lanka	Low/ Middle	Commodity (Food)/Manufacturing	South Asia
Burkina Faso	Low	Commodity (ARM)	Sub-Saharan Africa

The first individual country cycle to be identified is that of Brazil. Brazil is defined as a middle-income country, which, between 1982 and 2015, has for the most part been located among the upper middle-income cluster of

countries, but also on occasion among the lower middle-income cluster (during cycle IV, 2001–09); see Appendix 4.3. The dominant merchandise export of Brazil has been manufacturing, with the relative importance of food and non-food components of manufacturing exports alternating over the period as a whole (see Figure 4.11). Although for much of the period Brazil should be seen as a non-food manufacturing export economy, it is taken as indicative of both non-food and food manufacturing clusters of economies, and should be seen as reflecting cyclical patterns associated with both these types of developing economies.

Figure 4.11
Brazil's export structure, 1982-2015



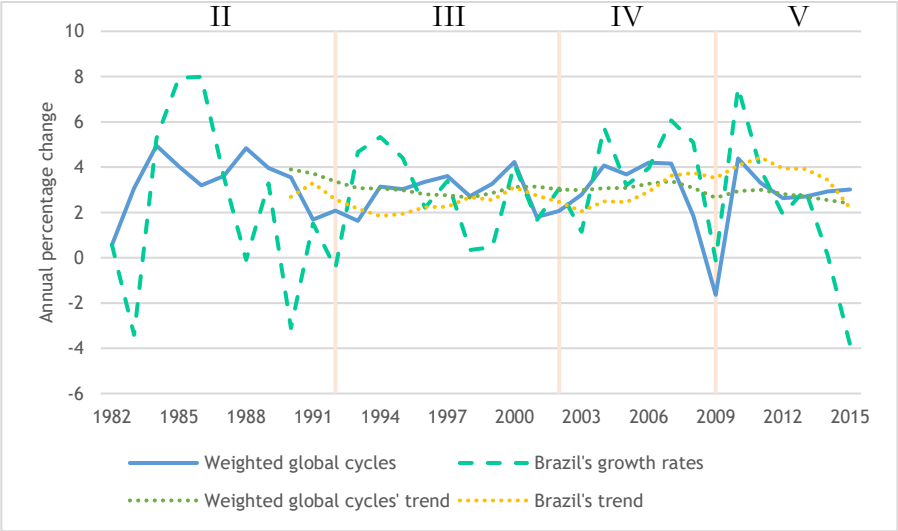
Source: World Bank WDI.

Figure 4.12 presents the real growth rates of the Brazilian economy alongside the (weighted) growth rates in the global economy, together with their respective non-linear trends for the period 1982–2015. The first thing to be observed is that the troughs of the Brazilian economy correspond to those of the global cycles. Related to this one can see (from Figure 4.12 and Table 4.12) a higher degree of synchronisation between cycles in the Brazilian economy and the global economy for the period as a whole than

is the case for the other individual developing economies (see below), although it must be acknowledged that the degree of synchronisation in the first cycle is quite weak (the correlation coefficient being 0.14). The higher degree of synchronisation of the Brazilian economy with the movement of the global economy (compared to the other three selected countries) is to be expected given its status as a middle-income manufacturing-based economy. Secondly, the amplitudes of cycles in Brazil are typically higher than those of the global cycles, and, as with the latter, vary between cycles (see Table 4.12). Lastly, it may be seen that trends in Brazil's cyclical growth rates are broadly similar to those of the global economy, suggesting that Brazil did not manage to successfully shift to become a high value-added manufacturing producer in the manner of, say, the East Asian economies.

It is noteworthy that the number of cycles identified using the methodology proposed in the chapter 3 is less that the number identified by Brazil's own cycle dating committee, the Brazilian Business Cycle Dating Committee (CODACE). According to the CODACE (2010), Brazil experienced eight cycles between 1983 and 2009, and is currently in its ninth cycle over the period under consideration.[11] This is more than double the number identified with reference to the global cycles above. For example, in the period of global cycle II (i.e., 1982–92), CODACE identified three cycles (trough to trough): 1983–88, 1988–91, and 1991–95. Closer inspection of these cycles, and a comparison of the corresponding growth rate cycles of Brazil and the global economy, suggest that they are more appropriately seen as fluctuations around cyclical movements rather than cycles *per se*. This once again illustrates the problems with approaches to cycle identification which see countries as, in effect, isolated islands rather than part of a larger whole.

Figure 4.12
Identification of cycles in the Brazilian economy, 1982-2015



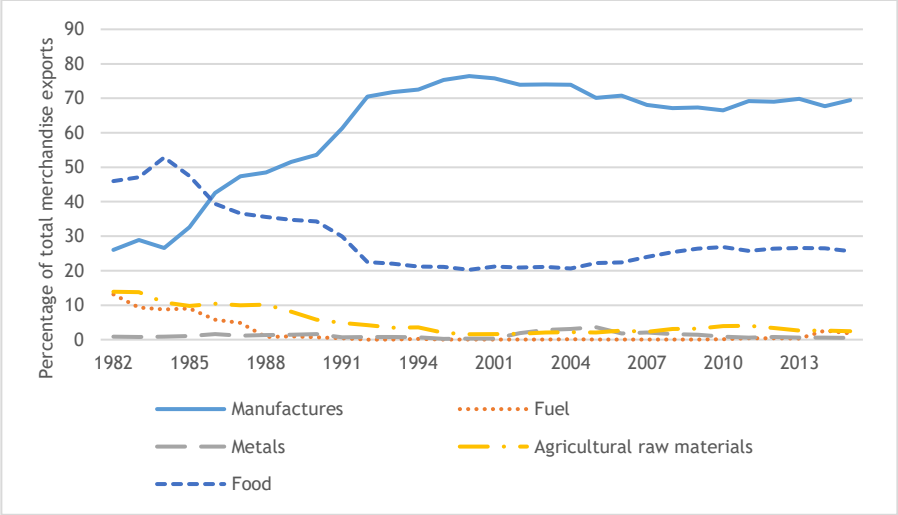
Source: World Bank WDI, author's calculation.

Table 4.12
Identification of cycles in the Brazilian economy, 1982-2015

Ref.cycle	Troughs	Amplitudes	Correlation
II	(1983-)1990	8.28	0.14
III	1998	5.83	0.40
IV	2009	6.92	0.72
V	(2015)	9.50	0.64
Avg.		7.63 (7.01)	0.48

The second country of concern for this section is Sri Lanka. Sri Lanka is regarded as a country specialising in manufactured exports for most of the period under consideration, and belonging to the category of low-income countries up to cycle III, when it shifts to the (lower) middle-income group (see Appendix 4.3). Prior to cycle III, Sri Lanka is regarded as a food-exporting country (see Figure 4.13).

Figure 4.13
Sri Lanka's export structure, 1982-2015

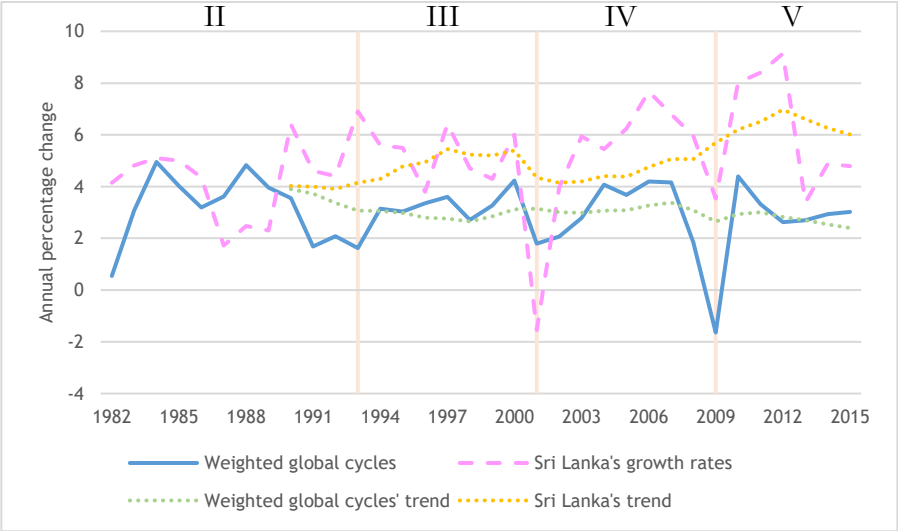


Source: World Bank WDI.

1/ The data from 1995–1998 are not available and are the author's own estimates.

Sri Lanka's real GDP growth rates and non-linear trends in these, along with those of the global cycles, are presented in Figure 4.14. What can be observed from the Figure is, firstly, the correspondence in cycle troughs and general synchronisation with the global cycle from cycle III (1993–2001) onwards. This increase in correspondence between cycles in the Sri Lankan and global economy begins with Sri Lanka's shift from being mainly a food exporter to being an exporter of manufactures (i.e., from cycle III onwards). Secondly, as one can expect from a lower middle-income developing country that still relies to a considerable extent on food exports, the amplitudes of the cycles in the Sri Lankan economy are higher than those for the global economy. Indeed, such amplitudes are consistent with those for other countries with similar economic structures (see above). Again, the amplitudes differ between cycles. Lastly, the trend movements of Sri Lanka's growth rates are similar to those pertaining to the global cycles but considerably higher than the latter from the beginning of cycle III onwards. This a phenomenon also observed in other middle-income, manufacturing-based developing economies (see Figure 4.5 and Figure 4.7 above).

Figure 4.14
Identification of cycles in the Sri Lankan economy, 1982-2015



Source: World Bank WDI, author's calculation.

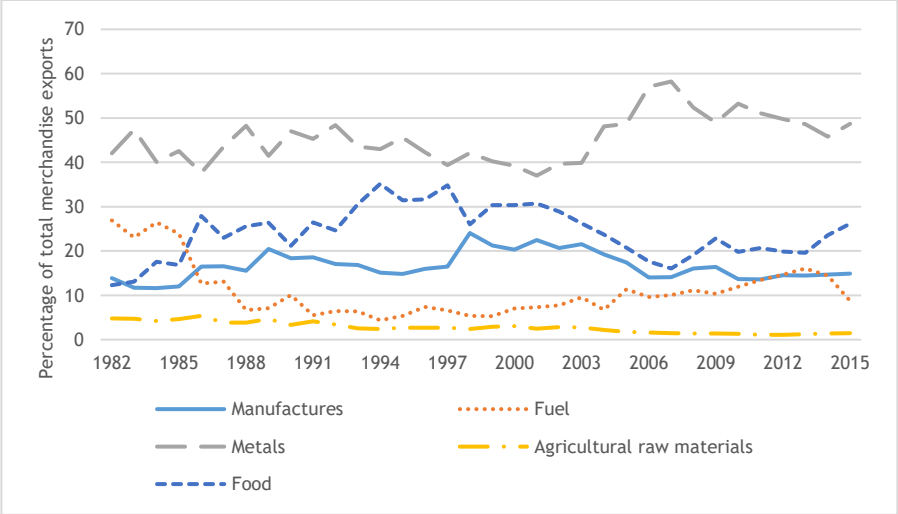
Table 4.13
Identification of cycles in the Sri Lankan economy, 1982-2015

Ref.cycle	Troughs	Amplitudes	Correlation
II	1987	2.26	-0.41
III	2001	7.19	0.82
IV	2009	5.07	0.79
V	(2015)	5.39	0.36
Avg.		4.98 (4.84)	0.39

Peru can regarded as representative of a middle-income, primary commodity (metal) producing, economy.[12] Peru's continued, and even increasing, reliance on metal exports is depicted in Figure 4.15, which plots the commodity composition of Peru's exports. What this figure shows is that metals have accounted for some 50% of export earnings of the Peruvian economy over the period under consideration, with food being the second

largest export earner, accounting for some 20% to 30% over the same period.

Figure 4.15
Peru's export structure, 1982-2015



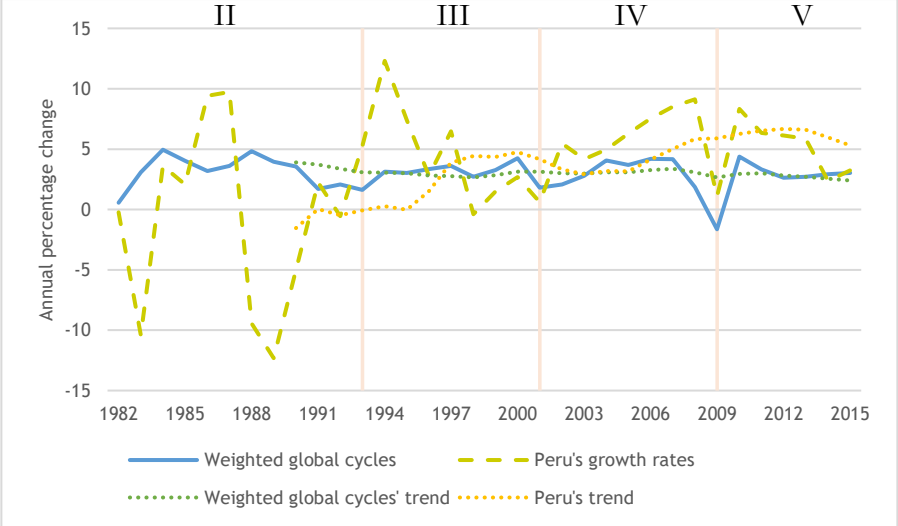
Source: World Bank WDI.

1/ The data for 1981 are missing and are the author's own estimates.

The growth rates of the Peruvian and global economies are presented in Figure 4.16, together with their respective non-linear trends. The first observation is that, as with metal exporters in general, the troughs of cycles in the Peruvian economy correspond to those of the global economy, and in fact tend to precede these. Given the tendency of cycle analysts to predict cycle downturns using metal prices and volumes, one could argue that the downturn in metal-based economies such as the Peruvian economy could be taken as an early warning of cyclical downturns in the global economy. A second, related, point to be made here is that degree of synchronisation of growth rates of the Peruvian economy and the global economy is low, although this appears to have risen more recently. The third observation that needs to be made is that the amplitudes of the Peruvian cycle, like those of metal exporters in general, are typically higher than the global cycles for the period as a whole (see Table 4.14). Lastly, while Peru's trend growth rates accord with global trend growth rates,

these trends have been notably higher than those for the world economy from cycle III onwards, and similar to those of other metal exporters (see Figure 4.10 above).

Figure 4.16
Identification of cycles in the Peruvian economy, 1982-2015



Source: World Bank WDI, author's calculation.

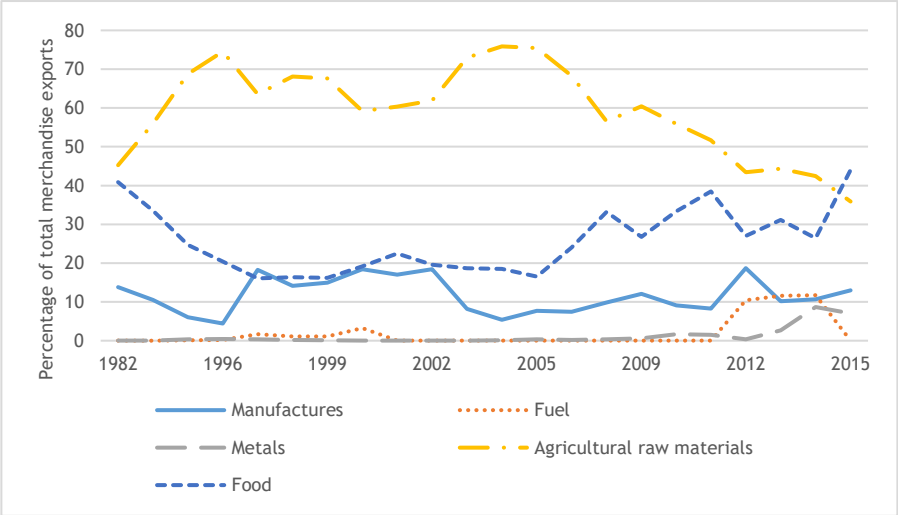
Table 4.14
Identification of cycles in the Peruvian economy, 1982-2015

Ref.cycle	Troughs	Amplitudes	Correlation
II	(1983)-1989	8.77	-0.26
III	1998	16.86	0.25
IV	2009	8.29	0.66
V	(2015)	5.70	0.58
Avg.		9.90 (11.31)	0.31

The last country whose cycle is to be identified is that of Burkina Faso. Burkina Faso is seen as a low-income country whose dominant export, for

most of the period under consideration, is agricultural raw materials, followed by food (see Figure 4.17). The reference cycle is taken to be the weighted global cycles alone, since there is no cluster of ARM economies. The relevant data are presented in Figure 4.18 and Table 4.15.

Figure 4.17
Burkina Faso's export structure, 1982-2015



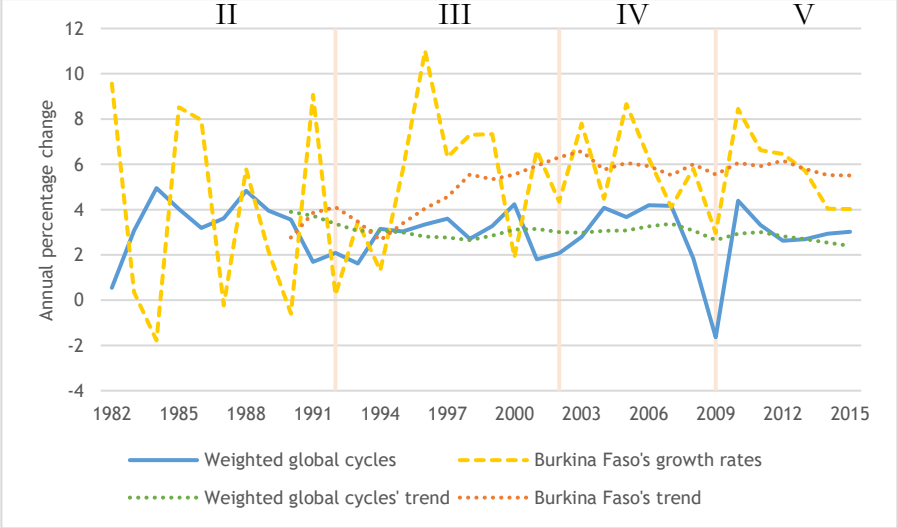
Source: World Bank WDI.

1/ The data for all sectors between 1984 and 1994, and for 2006, as well as for the fuel sector in 1976, are not available and are the author's own estimates.

What is evident from Figure 4.18 is that the growth rates of Burkina Faso appear to move independently of the global cycles for much of the period. This is because their movements have been mostly dominated by large random domestic fluctuations. As a consequence, it is difficult to discern cyclical troughs, even with reference to global cycles. Yet, as Figure 4.18 also shows, trend growth rates have largely moved with trend growth rates for the global cycles, and annual growth rates have started to become more synchronised with annual global growth rates from the beginning of cycle IV (2001–09), and possibly cycle III (1993–2001), onwards. In fact, a closer inspection of the data suggests that troughs for cycles in growth rates for the Burkina Faso economy can be associated with corresponding

troughs for the global economy with respect to cycles III and IV, and trend upward and downward movements in growth rates in the former with trend upward and downward growth rates in the latter (see, for example, cycle IV in Figure 4.18). The point here is that, irrespective of the number of fluctuations and their magnitudes, these fluctuations are conditioned in the final instance by the cycles in the national economy corresponding to those of the global economy. As one might expect, the amplitudes of these cycles are considerably higher than for the cycles pertaining to the global economy (see Table 4.15). The greater volatilities in the growth rates for the economy are observed in those periods when there are frequent and/or large fluctuations in the economy. It is of note that even though trend growth rates for the Burkina Faso economy have moved largely with those of the global economy, from the mid-1990s onwards these trends have been well below those for the global economy, in a similar manner to the trends followed by other low-income country clusters (see above).

Figure 4.18
Identification of cycles in the Burkina Faso economy, 1982-2015



Source: World Bank WDI, author's calculation.

Table 4.15
Identification of cycles in the Burkina Faso economy, 1982-2015

Ref.cycle	Troughs	Amplitudes	Correlation
II	(1992)	8.27	-0.20
III	1999	9.17	-0.29
IV	2009	4.62	0.46
V	(2015)	4.13	0.68
Avg.		6.55 (7.35)	0.16

4.5 Chapter summary

This chapter identified cycles at the global, sub-global and individual (developing) country levels, applying the alternative identification methods developed in chapter 3.

The existence of global cycles was established by comparing the movement of non-weighted with weighted aggregate global real GDP growth rates. Taking the latter as depicting growth in global economic activity (this economic activity being concentrated in countries with the highest GDP in U.S. dollar terms), four complete cycles and one incomplete cycle were identified for the period between 1982 and 2015. This was argued to be a remarkable finding, since it suggests that there is a global economic force acting on all economies, irrespective of their size. As expected, the duration between global cycle troughs varied as did their amplitudes. It was shown that a consideration of global growth rates with respect to non-linear trends provides a better indication of structural and other major shifts in the growth momentum of the global economy than when they are considered with respect to linear trends.

Against this backdrop, cycles were identified with respect to advanced and developing countries. Advanced countries were taken to be those countries classified as high-income by the World Bank in its GNI per capita rankings. Developing countries were taken to be those countries which are not included in this grouping. The main findings with respect to the identification of cycles in economic growth rates pertaining to these two groupings of countries were, as one would expect, that the former move more closely with the global cycles than the latter, but that the movement of the latter with the global cycles is nevertheless quite close.

The analysis then moved to the identification of cycles in developing countries. This identification began with the identification of cycles in broad clusters of developing countries. The sub-clusters considered to be important in this study were those based on income levels and economic structures. The sub-clustering of developing countries based on income levels corresponded to the World Bank classifications of middle and low-income countries. The sub-clustering of developing countries based on economic structures was linked to the export structures, since it was argued that exports typically provided the dynamic impulses for these economies. The export groupings seen as important were: food and non-food manufacturing, fuels, and metals. The main findings with respect to the identification of cycles in developing countries based on their income levels were as follows. Firstly, as one would expect, middle-income countries tend to have a higher degree of synchronisation with the global economy than lower-income countries. Secondly, the troughs of middle-income countries tend to accord more closely with those of the global economy than low-income economies. Related to this is the observation that although cycles in developing countries on the whole occur with a similar periodicity to that of the global cycles, this varies between cycles. Thirdly, cycle amplitudes for developing countries as a whole are higher than for the global economy, but particularly so for lower middle-income countries. Of note is the relatively lower cycle amplitudes for low-income countries, which is contrary to what one might expect, and notwithstanding the observed greater amount of growth rate fluctuations experienced by these economies.

The main findings with respect to the identification of cycles pertaining to clusters of developing countries based on their respective economic structures were as follows. The synchronisation of cycles in growth rates of all different categories of developing countries with the global economy tend to be generally the same, with perhaps a marginally higher degree of synchronisation in the case of fuel exporters. The troughs in cycles of manufacture-exporting countries tend to correspond most closely to the troughs in the global cycles, while those of other developing countries are sometimes earlier (e.g., metals). The amplitudes of cycles of manufacture exporters tend to be higher than the global economy while those for commodity exporters tend to be somewhat lower. Lastly, while the trend growth rates for all developing countries follow those of the global economy, trend growth rates of manufacturing developing countries tend to be

higher and commodity producing countries somewhat lower, especially food producers.

The identification of cycles for clusters of developing countries was followed by identification of cycles pertaining to individual developing countries. The countries were chosen with a view to further developing the preceding identification of cycles pertaining to clusters of developing countries. The data chosen for these studies were non-smoothed real GDP data, and the transformation chosen was the annualised rate of change in these data. The countries chosen as representative of different levels of development and different structures of production were Brazil, Sri Lanka, Peru and Burkina Faso. These economies were regarded as representative of middle- or low-income economies, or manufacturing or commodity-producing economies. What was commonly observed across these economies is that their growth rates can be seen to be to a greater or lesser extent cyclical, and to one degree or another corresponding to the global cycle. For the four developing countries considered, their cyclical movements were most in evidence from the early 2000s onwards, and their highest synchronisation with the global cycle occurred from cycle IV onwards. The cycles experienced by low-income countries tend to be in the context of numerous random fluctuations, especially seen in the cases of Burkina Faso and Sri Lanka. Even Brazil, as a middle-income manufacturer, was shown to have experienced many fluctuations distinct from the cyclical movement in its real economic growth rate. Perhaps the main differences in the fluctuations experienced by developing countries are between those experienced by middle-income manufacturers and low-income commodity producers. The former appear to be more conditioned by global cyclical movements than the latter. In fact, it may be seen that in the case of Sri Lanka, as exports shift from a commodity base towards a more manufacturing base, the fluctuations experienced are fewer in number and of a smaller magnitude. In general, it needs to be acknowledged that fluctuations make cycle identification more difficult, especially in the case of low-income commodity producers such as Burkina Faso. However, as has been shown in the case of this economy, cycle identification is both possible and necessary given the fact that cycles clearly condition the impact of shocks and resulting fluctuations in the economy. The individual country studies also showed cycle amplitudes to be higher for commodity producers than manufacturers, with, as expected, amplitudes varying be-

tween cycles. Lastly, the individual country studies confirmed the conclusions reached from the cluster analysis, that manufacturing exporters tend to have higher trend growth rates than commodity producers, with trend movements being more aligned to global growth rate trends.

Notes

[1] Differences in the numbers of countries included in the various clusters should not alter the results of the analysis. This is because all countries can be expected to move in more or less the same way given that they are part of the same global system — see the introduction to chapter 3.

[2] This also applies to the weighted series.

[3] It is recognised that other criteria have been used to cluster economies, including degree of openness and geographic location. However, it is felt that the criteria used in the present study are adequate given its purpose — to show how developing countries with similar economic structures tend to follow similar cyclical patterns with respect to global cycles.

[4] It is extended to 1983, which is the 1st year of cycle II.

[5] Changes in World Bank classifications of countries on the basis of their per capita income levels are allowed for at the beginning of each cycle. See Appendix 4.3 for details.

[6] A further distinction can be drawn between upper and lower middle-income countries on the basis of data provided by the World Bank, but it is felt that an identification of developing countries based on this distinction would add little to the analysis.

[7] Amplitude is calculated with reference to the global cycles as above and all similar calculations below.

[8] One explanation could be the relatively weaker growth performance of the advanced countries over this period and the corresponding larger magnitudes of falls in their growth rates during cyclical downturns.

[9] The relative preponderance of a particular type of export is given by calculating its percentage share in total merchandise exports (as given by the data from the World Bank's WDI).

[10] There could be other possible criteria for the country selection, such as trade ratio. This thesis does not specifically include the trade ratio as a part of country selection because of the assumption that all the countries are integrated in the global economy, regardless of the different extent of integration.

[11] The monthly and quarterly data provided by CODACE are translated into annual data.

[12] Although for most of the period Peru has been classified as a lower middle-income country, in 2009 it was reclassified as a higher middle-income country.

Appendices

Appendix 4.1
Numbers of countries included in weigted and non-weighted global cycles

Year	Number	Year	Number	Year	Number
1961	84	1981	138	2001	195
1962	86	1982	142	2002	197
1963	86	1983	146	2003	198
1964	86	1984	146	2004	198
1965	86	1985	149	2005	199
1966	94	1986	150	2006	199
1967	98	1987	152	2007	199
1968	100	1988	153	2008	198
1969	102	1989	155	2009	197
1970	102	1990	154	2010	194
1971	114	1991	166	2011	194
1972	115	1992	169	2012	192
1973	115	1993	173	2013	192
1974	115	1994	175	2014	187
1975	116	1995	180	2015	183
1976	120	1996	188		
1977	121	1997	189		
1978	126	1998	189		
1979	126	1999	190		
1980	127	2000	192		

Appendix 4.2
Level of development, country grouping threshold, GNI per capita in current U.S. dollars

Income level		1983 (1987)	1994	2002	2010
High		> 6,000	> 8,355	> 9,075	> 12,195
Middle	Upper middle	1,941–6,000	2,696–8,355	2,936–9,075	3,946–12,195
	Lower middle	481–1,940	676–2,695	736–2,935	996–3,945
Low		≤ 480	≤ 675	≤ 735	≤995

Source: World Bank, Analytical Classifications, Data accessed 1 May 2017.

1/ See World Bank's 'Historical classification by income in XLS format', available at https://datahelpdesk.worldbank.org/knowledgebase/articles/906519

Appendix 4.3
Country clusters based on income levels (changes from the previous cycles)

Income level	1983 (1987)–1993	1994–2001	2002–2009	2010–2015
ACs (High)	**Total (40)** American Samoa, Aruba, Australia, Austria, The Bahamas, Bahrain, Belgium, Bermuda, Brunei Darussalam, Canada, Channel Islands,	**Total (43)** **Added (8):** Andorra, Cayman Islands, Cyprus, French Polynesia, Liechtenstein, Macao SAR (China), Monaco, Portugal	**Total (55)** **Added (11):** Antigua and Barbuda, Bahrain, Barbados, Greece, Guam, Isle of Man, Rep. of Korea, Malta, New Caledonia, Puerto Rico,	**Total (70)** **Added (16):** Croatia, Curacao, Czech Republic, Equatorial Guinea, Estonia, Gibraltar, Hungary, Northern Mariana Islands, Oman,

	Denmark, Faeroe Islands, Finland, France, Germany, Greenland, Guam, Hong Kong SAR (China), Iceland, Ireland, Isle of Man, Israel, Italy, Japan, Kuwait, Luxembourg, Netherlands, New Zealand, Norway, Qatar, Saudi Arabia, Singapore, Spain, Sweden, Switzerland, United Arab Emirates, United Kingdom, United States, Virgin Islands (U.S.)	**Deleted (5):** American Samoa, Bahrain, Guam, Isle of Man, Saudi Arabia	San Marino, Slovenia **Deleted (0)**	Poland, Saudi Arabia, Sint Maarten (Dutch part), Slovak Republic, St. Martin (French part), Trinidad and Tobago, Turks and Caicos Islands **Deleted(1):** Antigua and Barbuda
DCs				
Upper middle	**Total (28)** Algeria, Antigua and	**Total (30)** **Added (13):** American	**Total (33)** **Added (16):** Belize,	**Total (53)** **Added (31):** Albania,

	Bermuda, Argentina, Barbados, Brazil, Cyprus, Gabon, Gibraltar, Greece, Hungary, Islamic Rep. Iran, Iraq, Rep. Korea, Libya, Macao SAR (China), Malta, New Caledonia, Oman, Panama, Portugal, Puerto Rico, Romania, Seychelles, St. Kitts and Nevis, Suriname, Trinidad and Tobago, Uruguay, Venezuela	Samoa, Bahrain, Chile, Czech Republic, Guam, Isle of Man, Malaysia, Mauritius, Mexico, Saudi Arabia, Slovenia, South Africa, St. Lucia **Deleted (11):** Algeria, Cyprus, Gibraltar, Islamic Rep. Iran, Iraq, Macao SAR (China), Panama, Portugal, Romania, Suriname, Venezuela	Botswana, Costa Rica, Croatia, Dominica, Estonia, Grenada, Latvia, Lebanon, Lithuania, Northern Mariana Islands, Palau, Panama, Poland, Slovak Republic, Venezuela **Deleted(12) :** Antigua and Barbuda, Bahrain, Brazil, Guam, Greece, Isle of Man, Rep. Korea, Malta, New Caledonia, Puerto Rico, Slovenia, South Africa	Algeria, Antigua and Bermuda, Azerbaijan, Belarus, Bosnia and Herzegovina , Brazil, Bulgaria, China, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, Islamic Rep. Iran, Jamaica, Jordan, Kazakhstan, Macedonia FYR, Maldives, Montenegro , Namibia, Romania, Russian Federation, Serbia, South Africa, St. Vincent and the Grenadines, Suriname, Thailand,

				Tunisia, Turkey **Deleted (11):** Belize, Costa Rica, Croatia, Czech Republic, Estonia, Hungary, Northern Mariana Islands, Oman, Saudi Arabia, Slovak Republic, Trinidad and Tobago
Lower middle	**Total (46)** Belize, Bolivia, Botswana, Cameroon, Chile, Colombia, Rep. Congo, Costa Rica, Côte d'Ivoire, Dominica, Dominican Republic, Ecuador, Arab Rep. Egypt, El Salvador,	**Total (65)** **Added (33):** Algeria, Angola, Belarus, Bulgaria, Cabo Verde, Croatia, Cuba, Djibouti, Estonia, Indonesia, Islamic Rep. Iran, Iraq, Kazakhstan, Dem People's	**Total (53)** **Added (10):** Albania, Armenia, Bosnia and Herzegovina, Brazil, China, Arab Rep. Egypt, Guyana, Honduras, South Africa, Sri Lanka **Deleted (22):** Angola,	**Total (56)** **Added (29):** Belize, Bhutan, Cameroon, Rep. Congo, Côte d'Ivoire, Georgia, Ghana, India, Indonesia, Kosovo, Lao PDR, Lesotho, Mauritania, Moldova,

	Fiji, Grenada, Guatemala, Honduras, Jamaica, Jordan, Kiribati, Lebanon, Malaysia, Mauritius, Mexico, Morocco, Nicaragua, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Samoa, Senegal, South Africa, St. Lucia, St. Vincent and the Grenadines, Swaziland, Syrian Arab Republic, Thailand, Tonga, Tunisia, Turkey, Vanuatu, Rep. Yemen, Zimbabwe	Rep. Korea, Latvia, Lithuania, Macedonia FYR, Maldives, Marshall Island, Fed.Sts. Micronesia, Moldova, Namibia, Northern Mariana Island, Panama, Romania, Russian Federation, Slovak Republic, Solomon Islands, Suriname, Turkmenistan, Ukraine, Uzbekistan, Venezuela, West Bank and Gaza **Deleted (14):** Chile, Rep. Congo, Côte d'Ivoire, Arab Rep. Egypt, Honduras, Malaysia,	Belize, Botswana, Costa Rica, Croatia, Dominica, Estonia, Grenada, Indonesia, Dem People's Rep. Korea, Latvia, Lebanon, Lithuania, Moldova, Northern Mariana Islands, Panama, Papua New Guinea, Poland, Slovak Republic, Solomon Islands, Uzbekistan, Venezuela	Mongolia, Nicaragua, Nigeria, Pakistan, Papua New Guinea, Peru, Sao Tome and Principe, Senegal, Solomon Islands, Sudan, Timor-Leste, Tuvalu, Rep. Yemen, Vietnam, Zambia **Deleted(26) :** Albania, Algeria, Belarus, Bosnia and Herzegovina, Brazil, Bulgaria, China, Colombia, Cuba, Dominican Republic, Ecuador, Islamic Rep. Iran, Jamaica, Jordan, Kazakhstan,

		Mauritius, Mexico, Nicaragua, Senegal, South Africa, St. Lucia, Rep. Yemen, Zimbabwe		Macedonia FYR, Maldives, Namibia, Peru, Romania, Russian Federation, South Africa, Suriname, Thailand, Tunisia, Turkey
Low	**Total (49)** Afghanistan, Bangladesh, Benin, Bhutan, Burkina Faso, Burundi, Cambodia, Central African Republic, Chad, China, Comoros, Dem Rep. Congo, Equatorial Guinea, Ethiopia, The Gambia, Ghana, Guinea, Guinea-Bissau,	**Total (64)** **Added (19):** Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Cameroon, Rep. Congo, Cote d'Ivoire, Arab Rep. Egypt, Eritrea, Georgia, Honduras, Kyrgyz Republic, Mali, Mongolia, Nicaragua, Senegal, Tajikistan,	**Total (64)** **Added (8):** Angola, Indonesia, Dem. People's Rep. Korea, Moldova, Papua New Guinea, Solomon Islands, Timor-Leste, Uzbekistan **Deleted (8):** Albania, Armenia, Bosnia and Herzegovina, China, Arab Rep. Egypt,	**Total (35)** **Added (0)** **Deleted (29):** Angola, Azerbaijan, Bhutan, Cameroon, Rep. Congo, Côte d'Ivoire, Equatorial Guinea, Georgia, Ghana, India, Indonesia, Lao PDR, Lesotho, Mauritania, Moldova, Mongolia, Nicaragua,

	Guyana, Haiti, India, Indonesia, Kenya, Lao PDR, Lesotho, Liberia, Madagascar, Malawi, Maldives, Mali, Mauritania, Mozambique, Myanmar, Nepal, Niger, Nigeria, Pakistan, Rwanda, São Tomé and Principe, Sierra Leone, Solomon Islands, Somalia, Sri Lanka, Sudan, Tanzania, Togo, Uganda, Vietnam, Zambia	Rep. Yemen, Zimbabwe **Deleted (4):** Indonesia, Maldives, Mali, Solomon Islands	Guyana, Honduras, Sri Lanka	Nigeria, Pakistan, Papua New Guinea, São Tomé and Principe, Senegal, Solomon Islands, Sudan, Timor-Leste, Uzbekistan, Vietnam, Rep. Yemen, Zambia
N/A[1]	**Total (54)** Albania, Andorra, Angola, Armenia, Azerbaijan, Belarus,	**Total (15)** **Added (1):** Gibraltar **Deleted (40):** Albania, Andorra,	**Total (12)** **Added (0)** **Deleted (3):** Palau, San Marino, Timor-Leste	**Total (3)** **Added (0)** **Deleted (8):** Curacao, Gibraltar, Kosovo,

	Bosnia and Herzegovina, British Virgin Islands, Bulgaria, Cabo Verde, Cayman Islands, Croatia, Cuba, Curacao, Czech Republic, Djibouti, Eritrea, Estonia, French Polynesia, Georgia, Kazakhstan, Dem. People's Rep. Korea, Kosovo, Kyrgyz Republic, Latvia, Liechtenstein, Lithuania, Macedonia FYR, Marshall Islands, Fed.Sts. Micronesia, Moldova, Monaco, Mongolia, Montenegro,	Angola, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Cabo Verde, Cayman Islands, Croatia, Cuba, Czech Republic, Djibouti, Eritrea, Estonia, French Polynesia, Georgia, Kazakhstan, Dem. People's Rep. Korea, Kyrgyz Republic, Latvia, Liechtenstein, Lithuania, Macedonia FYR, Marshall Islands, Fed.Sts. Micronesia, Moldova, Monaco, Mongolia, Namibia,		Montenegro, Serbia, Sint Maarten (Dutch part), St. Martin (French part), Turks and Caicos Islands

	Namibia, Nauru, Northern Mariana Islands, Palau, Russian Federation, San Marino, Serbia, Sint Maarten (Dutch part), Slovak Republic, Slovenia, South Sudan, St. Martin (French part), Tajikistan, Timor-Leste, Turkmenistan, Turks and Caicos Islands, Tuvalu, Ukraine, Uzbekistan, West Bank and Gaza	Northern Mariana Islands, Russian Federation, Slovak Republic, Slovenia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan, West Bank and Gaza		

1/ N/A indicates the numbers of countries where relevant data is not available.

Appendix 4.4
Country clusters based on economic structures (changes from the previous cycles)

Structure	1983 (1987)–1993	1994–2001	2002–2009	2010–2015
Manufacturing	**Total (13)** Bangladesh, Barbados, Cyprus, Hungary, India, Jamaica, Rep. Korea, Macao SAR (China), Malta, Nepal, New Caledonia, Pakistan, Portugal	**Total (33)** **Added (25):** Brazil, China, Croatia, Czech Republic, Dominican Republic, Haiti, Indonesia, Jordan, Latvia, Lithuania, Macedonia FYR, Malaysia, Mauritius, Mexico, Morocco, Philippines, Poland, Romania, Slovak Republic, South Africa, Sri Lanka, Suriname, Thailand,	**Total (47)** **Added (22):** Albania, Armenia, Belarus, Botswana, Bulgaria, Cabo Verde, Cambodia, China, Costa Rica, Dominica, El Salvador, Estonia, Lesotho, Lithuania, Mauritius, Mexico, Pakistan, Samoa, Senegal, Swaziland, Ukraine, Vietnam **Deleted(8):** Barbados, China, Haiti, Rep. Korea, Malta, Mauritius,	**Total (39)** **Added (6):** Bhutan, Bosnia and Herzegovina, Madagascar, Nepal, Togo, West Bank and Gaza **Deleted(14):** Armenia, Brazil, Cabo Verde, Croatia, Czech Republic, Estonia, Hungary, Indonesia, Jamaica, Poland, Senegal, Slovak Republic, South Africa, Swaziland

		Tunisia, Turkey **Deleted (5):** Cyprus, Macao SAR (China), New Caledonia, Pakistan, Portugal	Mexico, Nepal	
Commodity-based developing countries				
Food	**Total (35)** Argentina, Belize, Brazil, Colombia, Costa Rica, Côte d'Ivoire, Dominica, Dominican Republic, El Salvador, Equatorial Guinea, Fiji, Ghana, Greece, Guatemala, Honduras, Kenya, Kiribati, Madagascar, Malawi, Nicaragua, Panama, Paraguay, Philippines,	**Total (33)** **Added (9):** Burundi, Ecuador, Grenada, Moldova, Mozambique, Senegal, St. Vincent and the Grenadines, Sudan, Zimbabwe **Deleted (11):** Brazil, Côte d'Ivoire, Dominican Republic, Equatorial Guinea, Ghana, Philippines, Samoa, Sierra	**Total (37)** **Added (14):** Bolivia, Comoros, Côte d'Ivoire, Cuba, Ethiopia, The Gambia, Georgia, Guyana, Maldives, Sao Tome and Principe, Sierra Leone, Suriname, Tanzania, Togo **Deleted(10) :** Colombia, Costa Rica, Dominica,	**Total (38)** **Added (11):** Afghanistan, Antigua and Barbuda, Benin, Brazil, Cabo Verde, Jamaica, Kiribati, Kyrgyz Republic, Mauritania, Rwanda, Senegal **Deleted (10):** Bolivia, Cuba, Ecuador, Madagascar, Nicaragua, Sierra Leone, St. Lucia, Tanzania,

	Samoa, Seychelles, Sierra Leone, Solomon Islands, Sri Lanka, St. Kitts and Nevis, St. Lucia, Thailand, Tonga, Uruguay, Vanuatu	Leone, Solomon Islands, Sri Lanka, Thailand	El Salvador, Greece, Kiribati, Senegal, St. Kitts and Nevis, Sudan, Vanuatu	Togo, Zimbabwe
Fuel	**Total (16)** Algeria, Bolivia, Rep. Congo, Ecuador, Arab Rep. Egypt, Gabon, Indonesia, Libya, Malaysia, Mexico, Nigeria, Oman, Syrian Arab Republic, Trinidad and Tobago, Tunisia, Venezuela	**Total (10)** **Added (3):** Bahrain, Bhutan, Saudi Arabia **Deleted(9):** Bolivia, Ecuador, Indonesia, Libya, Malaysia, Mexico, Nigeria, Saudi Arabia, Tunisia	**Total (18)** **Added (11):** Azerbaijan, Cameroon, Colombia, Islamic Rep. Iran, Iraq, Kazakhstan, Nigeria, Russian Federation, Sudan, Syrian Arab Republic, Rep. Yemen **Deleted (3):** Bahrain, Bhutan, Rep. Congo	**Total (22)** **Added (8):** Angola, Bolivia, Rep. Congo, Ecuador, Indonesia, Libya, Myanmar, Suriname **Deleted (4):** Gabon, Oman, Saudi Arabia, Trinidad and Tobago
Metals	**Total (8)**	**Total (5)**	**Total (10)**	**Total (11)**

	Chile, Jordan, Liberia, Morocco, Papua New Guinea, Peru, South Africa, Togo	**Added (2):** Bolivia, Central African Republic **Deleted(5):** Jordan, Liberia, Morocco, Papua New Guinea, South Africa	**Added (7):** Guinea, Mauritania, Mongolia, Mozambique, Niger, Rwanda, Zambia **Deleted(2):** Bolivia, Central African Republic	**Added (6):** Armenia, Central African Republic, Namibia, South Africa, Tanzania, Zimbabwe **Deleted(5):** Guinea, Mauritania, Mongolia, Papua New Guinea, Rwanda
Agricultural raw materials	**Total (1)** Burkina Faso	**Total (1)** **Added (1):** Benin **Deleted (1):** Burkina Faso	**Total (5)** **Added (4):** Burkina Faso, Central African Republic, Kyrgyz Republic, Mali **Deleted (0)**	**Total (2)** **Added (0)** **Deleted (3):** Benin, Central African Republic, Kyrgyz Republic
N/A[1]	**Total (50)** Afghanistan, Antigua and Barbuda, Benin, Bhutan, Botswana,	**Total (77)** **Added (45):** Albania, American Samoa, Angola, Armenia,	**Total (33)** **Added (7):** Rep. Congo, Haiti, Kiribati, Nepal, Palau,	**Total (32)** **Added (13):** Cuba, Gabon, Grenada, Guinea, Kosovo,

	Burundi, Cambodia, Cameroon, Central African Republic, Chad, China, Comoros, Dem. Rep. Congo, Ethiopia, The Gambia, Gibraltar, Grenada, Guinea, Guinea-Bissau, Guyana, Haiti, Islamic Rep. Iran, Iraq, Lao PDR, Lebanon, Lesotho, Maldives, Mali, Mauritania, Mauritius, Mozambique, Myanmar, Niger, Poland, Puerto Rico, Romania, Rwanda, Sao Tome and	Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Burkina Faso, Cabo Verde, Côte d'Ivoire, Cuba, Djibouti, Equatorial Guinea, Eritrea, Estonia, Georgia, Ghana, Guam, Isle of Man, Kazakhstan, Dem. People's Rep. Korea, Kyrgyz Republic, Liberia, Libya, Marshall Islands, Fed.Sts. Micronesia, Mongolia, Namibia, New Caledonia, Nigeria, Northern Mariana	Timor-Leste, Vanuatu **Deleted (51):** Albania, Antigua and Barbuda, Armenia, Azerbaijan, Belarus, Botswana, Bulgaria, Burkina Faso, Cabo Verde, Cambodia, Cameroon, Comoros, Cote d'Ivoire, Cuba, Estonia, Ethiopia, The Gambia, Georgia, Guam, Guinea, Guyana, Islamic Rep. Iran, Iraq, Isle of Man, Kazakhstan, Kyrgyz Republic, Lebanon, Lesotho,	Mongolia, Montenegro, Papua New Guinea, Serbia, Sierra Leone, St. Lucia, Swaziland, Tuvalu **Deleted (14):** Afghanistan, Angola, Bhutan, Bosnia and Herzegovina, Rep. Congo, Equatorial Guinea, Ghana, Kiribati, Libya, Myanmar, Nepal, Bosnia and Herzegovina, Vanuatu, West Bank and Gaza

	Principe, Senegal, Somalia, St. Vincent and the Grenadines, Sudan, Suriname, Swaziland, Tanzania, Uganda, Vietnam, Rep. Yemen, Zambia, Zimbabwe	Islands, Pakistan, Papua New Guinea, Russian Federation, Samoa, Sierra Leone, Slovenia, Solomon Islands, Syrian Arab Republic, Tajikistan, Turkmenistan, Ukraine, Uzbekistan, West Bank and Gaza **Deleted (18):** Benin, Bhutan, Burundi, Central African Republic, China, Gibraltar, Grenada, Haiti, Mauritius, Mozambique, Poland, Romania, Senegal, St. Vincent and the	Maldives, Mali, Mauritania, Mongolia, Namibia, New Caledonia, Niger, Nigeria, Pakistan, Papua New Guinea, Puerto Rico, Russian Federation, Rwanda, Samoa, Sao Tome and Principe, Sierra Leone, Slovenia, Swaziland, Syrian Arab Republic, Tanzania, Vietnam, Rep. Yemen, Zambia	

		Grenadines, Sudan, Suriname, Uganda, Zimbabwe		

1/ N/A indicates the numbers of countries where relevant data is not available.

Notes

Curriculum vitae

Eri Ikeda (Hokkaido, Japan, 1981) obtained her Bachelor of Law degree from Keio University (Japan) in 2004. After graduating from Keio University, she worked for a short time as a consultant in the private sector, and studied at the Chinese University of Hong Kong (Hong Kong, China SAR), focusing on politics and development. In 2009, she obtained an MA in Development Studies at the International Institute of Social Studies (ISS), Erasmus University Rotterdam, the Netherlands. Her major at the ISS was in the area of Environment and Sustainable Development, and her research paper was on the subject of the impact of high oil prices on alternative energy resource development. After completing her MA studies at the ISS, Eri embarked on a further study programme at the Centre Européen de Recherches Internationales et Stratégiques (CERIS) in Belgium. It was during this time that she began her research into business cycles, writing a literature review on the subject for her final thesis. In October 2012, she started her PhD research at the ISS with the aim of further deepening her understanding of both business cycles and the global economy. During her study she was awarded a two-year scholarship from the Japan-IMF Scholarship Program for Advanced Studies (JISP), which also included an internship period at the IMF in Washington D.C. in the U.S. She is currently working as a full-time researcher at the Institute for Global Environmental Strategies (IGES) in Japan, specialising in international climate negotiations and energy policy, and preparing for the publication of a book and a number of articles on business cycles.