Global and Developing Country Business Cycles

Eri Ikeda

520645-L-bw-Ikeda
Processed on: 30-7-2018

The dissertation is part of the research programme of CERES, Research School for Resource Studies for Development.

The research was partially funded by the Japan-IMF Scholarship Program for Advanced Studies (JISP).

ISBN
978-90-6490-084-6

GLOBAL AND DEVELOPING COUNTRY BUSINESS CYCLES

CONJUNCTUURCYCLI OP WERELDSCHAAL EN IN ONTWIKKELINGSLANDEN

to obtain the degree of Doctor from the
Erasmus University Rotterdam
by command of the Rector Magnificus

Prof.dr. R.C.M.E. Engels

and in accordance with the decision of the Doctorate Board

The public defence shall be held on
Monday 24 September 2018 at 16.00 hrs

by

Eri Ikeda
born in Hokkaido, Japan

International
Institute of
Social Studies

520645-L-bw-Ikeda
Processed on: 30-7-2018

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

Contents

List of Tables, Figures and Appendices

Tables

Figures

Appendices

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

Acknowledgements

First and foremost, my very special, deepest, and heartfelt thanks goes to Dr. Howard Nicholas, who is the main supervisor of this thesis, and the best teacher and mentor anyone could wish to have. During my years of working with Howard, he has helped me to think more logically, critically and objectively, as well as to try and understand more deeply the phenomena being studied. In short, he helped me to become an independent researcher, with confidence in my analytical ability. He has shown always been patient, encouraging, stimulating and constructive in his supervision of my thesis work. I can never thank him enough.

I also would like to thank Prof. Peter van Bergeijk for being my promotor, and for the considerable support that he has provided at various stages of my PhD journey, both in terms of academic feedback and advice in overcoming the numerous technical hurdles that all who undertake the long and arduous PhD journey must navigate.

My heartfelt thanks also goes to Prof. Arjun Bedi, for the support and encouragement he gave me throughout the entirety of my period of study at the ISS, both before and during my PhD work. I will always remember his classes on econometrics for helping me to overcome my fear of the subject, as well as his readiness to answer an endless series of technical questions during the latter stages of my PhD.

I need to extend a special thank you to all my discussants at the DDS, PFS, and FDS. They have all played an important role in the development of my thesis. Their critical comments and recommendations have been very important in shaping the thesis and improving its content. I would like to make particular mention of the inputs and advice provided by Dr. Servaas Storm in TU Delft, who has been involved with my work from the design stage. I would also like to mention the advice and support provided by Prof. Irene

van Staveren, Prof. Rolph van der Hoeven, Dr. Elissaios Papyrakis, Dr. Matthias Rieger, Dr. John Cameron, as well as a number of my PhD colleagues, including Shigehisa Cape Kasahara, (Dr.) Selwyn Moons, Mai Lan Nguyen and Emile Smidt, who read and discussed with me large parts of my work at various stages. My deepest gratitude to you all.

Thanks also go to:

- Prof. Ryosei Kokubun, Prof. Fengshi Wu, and Mr. Hideaki Oda who have all encouraged me at various points in time to begin this long, and somewhat unexpected, academic journey.
- Other academic staff members and researchers whom I have met at different times and on different occasions, including those I met during my course work at the ISS, the workshops organized by CERES, the Development Dialogue, and the various seminars and conferences I have attended. Thank you for your generosity in sharing your knowledge with me.
- The Japan-IMF scholarship that provided me with financial security for over two years, and the opportunity to work at the IMF as an intern for a period of three months. My supervisor Dr. Yiqun Wu and other team members in the Asia Pacific division at the IMF who supported and encouraged during this period of time.
- Peter, Howard and Katherine for the TA positions, and the ISS and EUR trust funds for their support to attend conferences, all of which contributed to sustaining me financially during the period of my PhD study.
- Various administrative staff members who at one time or another have provided me with invaluable support. A special thanks in this regard to Ank van der Berg, Susan Spaa, PhD secretariat (Dita Dirks, Paula, Grace, Frans, Nalini and others), logistics (John and Robin), receptionists and security staff (Charmaine, Andre, Gita), EDEM (Annet), librarians (Saskia, John and colleagues), secretariat members, TLST (Lubna and colleagues), IT staff, marketing staff (Sandra, Jane), welfare office (Martin, Eef, Cynthia), finance, cleaning staff members, canteen staff members, and other administrators with whom I have interacted.
- The staff of the butterfly bar, Sandy and Dineke (not forgetting Farah), who provided a special atmosphere in a very special place where stressed students such as myself could unwind, complain, let their hair down, and connect with people inside and outside of the ISS. You are life-savers.

- To all my good friends who have accompanied and supported me during the good and bad times. I won't forget the precious time that I have especially shared with Beatriz, Binyam, Blas, Brandon, Cape, Chi, Chia, Ching, Ela, Ekaterina, Emile, Eunjung, Farzane, Fasil, Johan, Juan David, Karla, Kenji, Maria Gabriela, Maki, Maria Jose, Michela, Ome, Radha, Renata, Saeko, Sue, Tamara, Tefera, Tsyegaye, Yazid, Yunan, Zemzem, Zuleika, and all my other friends who I could not list here.
- To Paula Bownas who is responsible for editing this thesis, and who has given me continuous support and encouragement during my time at the ISS. Thank you Paula for agreeing to edit my work.
- To Nicolien a special thank you for being a mother in Holland, and always taking care of me when I needed it.

Last but not least, I would like to express my sincere appreciation to my family in Japan who have always supported and encouraged their wayward daughter to pursue her dream of enhancing her knowledge and pursuing the path which she chose.

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.

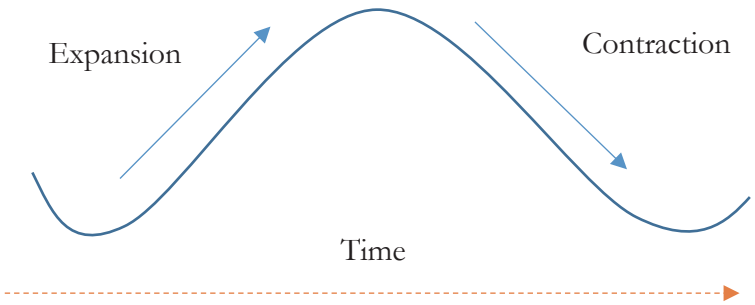
1 Introduction

"Analyzing business cycles means neither more nor less than analysing the economic process of the capitalist era…. Cycles are not, like tonsils, separable things that might be treated by themselves, but are, like the beat of the heart, of the organism that displays them". (Schumpeter, 1939, p. v)

1.1 Background and statement of research issue

The phenomena of business cycles[1] can be defined as alternating periods of expansionary and contractionary economic activity (see Figure 1.1).

Figure 1.1
Generic cycle



1/ The label for the Y axis of this Figure depends on the variable used to depict business cycle activity. The most common is the real GDP growth rate.

2/ Generic cycles refer to the abstract or general characterisation of cycles. See the section 1.2.2 for further elaboration.

The study of these phenomena has a long history,[2] with periods of renewed interest typically following major economic and/or financial crises.

A case in point is the severe economic and financial crisis experienced by most economies between 2007 and 2009. This has rekindled interest in business cycle research in both policy and academic circles in many countries. Indeed, up until this crisis, and certainly for much of the 1990s and the first part of the 2000s (the period often referred to as the 'Great Moderation'), there was something of a decline in interest in these phenomena, with many claiming the taming and death of the cycle, as a result of various structural changes in the economy and successful government interventionist (or even liberalisation) policies.[3] Many prominent economists declared the success of mainstream macroeconomic thinking in tackling the repeated episodes of depression and recession (see Krugman, 2009). To quote one prominent economist, Olivier Blanchard, on the eve of the 2008 financial crisis: "the state of macro is good" (2008, p. 2), while the renowned U.S. economist Robert Lucas (2003, p. 1) boasted that the "central problem of depression prevention has been solved, for all practical purposes, and has in fact been solved for many decades".

It is not only academics that are starting to become aware of the importance of studying business cycles, but also, and perhaps more importantly, policy makers. Specifically, there appears to be a growing awareness among policy makers that the success or failure of their economic policies depends to a large extent on their understanding of business cycle phenomena, at both the national and global levels. For example, former chair of the U.S. Federal Reserve (FED), Ben S. Bernanke, stated in a speech of 31 August 2012: "because of various unusual headwinds slowing the recovery, the economy needs more policy support than usual at this stage of the cycle"; for the implementation of monetary policy and forward guidance (Bernanke, 2012).[4]

Most research on business cycles has focused on the advanced countries, especially the United States, Europe and Japan.[5] Little, if any, attention has been paid to the analysis of similar cycles in developing countries. Indeed, it is fair to say that the study of business cycles in developing countries remains rudimentary. There are, however, signs that this is now changing, at least in part because of the growing importance of many of these economies, most notably China, in the global economy. Rediker et al. (2016, p. 14) argue in this regard, "[o]ne thing is increasingly certain: China can no longer argue that it is a passive recipient of the policy choices made by others. The impact of Chinese policies are [sic] now felt globally".

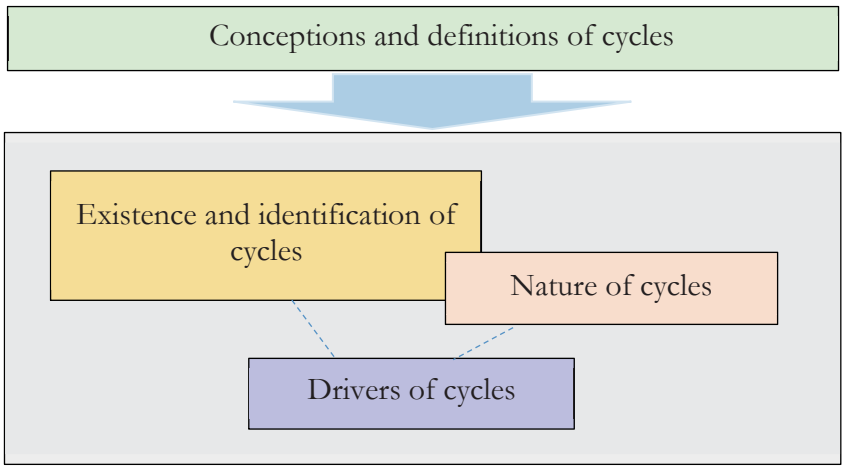
The Chair of the U.S. Federal Reserve at the time, Janet Yellen, stated in a recent speech on the outlook for the U.S. economy that "[o]ne concern pertains to the pace of global growth, which is importantly influenced by developments in China" (Yellen, 2016; see also Yellen, 2015a). The financial journalist Ruchir Sharma (2014) comments "[w]hen the U.S. sneezes, the world catches a cold, an old saying goes. But now it's China's health that matters most". The following study seeks to contribute to filling this lacuna in our understanding of cycles in developing countries and, in the process, to aid the development of the general corpus of knowledge in the field of business cycle research.

1.2 Structure of research

1.2.1 Areas of research

The research has three major elements: conceptions and definitions of cycles; the existence and identification of cycles combined with a consideration of their nature; and the drivers of cycles in developing countries in the context of the global economy (see Figure 1.2 below). A pivotal element in the research is seen as the first of these, since it will be argued that the conception and definition of cycles conditions certain understandings of their existence, identification, nature and drivers.

Figure 1.2
Areas of Research



1.2.2 Cycle typologies

Various names for, and typologies of, cycles will appear throughout the thesis. The cycles which the present study will focus on are what may be referred to as the global, sub-global, and individual country cycles. Understanding of these cycles will be based on a prior understanding of what can be referred to as the generic cycle.

The generic cycle is an abstract conceptualisation of the cycle, which provides the foundations for understanding all observable cycle phenomena, i.e., cycles in individual countries, in clusters of countries, and at the global level. Although observed cyclical phenomena may vary over time and location, it is argued that they all share certain common characteristics; those depicted by the generic cycles. Indeed, all explanations of cycles are either explicitly or implicitly founded on one or another conceptualisation of a generic cycle. The conception of the generic cycle used in the present study will be developed on the basis of a critique of various implicit or explicit conceptualisations of such cycles found in the mainstream literature. Confusion often arises between these conceptualisations and the analysis of actual cycles in capitalist economies since the former have traditionally been based on the latter; typically on actual cycles in the most advanced economies (viz., the U.S. in more recent times and the U.K. in the early epochs of capitalist development) as generic representatives of capitalist economies (see the further elaboration on this point in chapter 2, section 2.2).

The global cycle is that cycle which is deemed as pertaining to the actual movement of the global economy — aggregate economic activity at the global level. It will be argued that such cycles can be said to exist if it can be shown that economic activity in the majority of countries comprising the global economy move in a synchronised manner. Sub-global cycles are those deemed to pertain to various groupings or clusters of countries comprising the global economy. The groupings considered of importance in the present study are those relating to developing countries. Individual country cycles are cycles pertaining to particular countries. Like global and sub-global cycles, an understanding of these cycles needs to be founded on a conceptualisation of the generic capitalist cycle. The individual country cycles which will be the focus of the present study are those pertaining to so-called developing countries and not, as is more often the case, the advanced economies.

1.3 Research objectives, questions and working hypotheses

1.3.1 Research objectives

The main objective of the research is to ascertain whether business cycles can be said to exist in developing countries (to identify them) and, if so, to establish whether these are fundamentally driven by external (global) forces.

The sub-objectives addressed in the context of addressing this major objective are:

1) To critically review the existing conceptions and definitions of business cycles, with a view to informing the study of cycles (as opposed to fluctuations) in developing countries.
2) To establish whether business cycles exist at the global, sub-global and individual developing country levels.
3) To identify the nature of business cycles experienced by different developing countries (especially timing of the occurrence, duration and amplitude).
4) To identify the drivers of global and developing country business cycles. The objective is limited, with regard to the former, to identifying the most important countries driving global business cycles, and, with regard to the latter, to the extent and manner in which business cycles in developing countries are conditioned by global business cycles.

1.3.2 Research questions

The major research question, which follows from the research objective stated in the previous section, is whether business cycles can be said to exist in developing countries, and, if so, what are their main drivers. The sub-questions which expand on this major research question are:

1) What are the existing conceptions and definitions of business cycles? Are these conceptions and definitions up to the task of facilitating an understanding of business cycle phenomena in general, and in particular such phenomena at the global and individual developing country levels? If not, are there alternative conceptions and definitions which are better suited to the task?

2) What are the existing methods of identifying business cycles? Do they enable us to establish the existence of business cycles in general, and more especially at the global and individual developing country levels? If not, are there alternative methods which might be better suited to doing so?
3) Does the nature of business cycles in developing countries differ in any fundamental sense from those in the advanced economies and are there differences between the developing countries themselves?
4) Can one establish the main country drivers of the global and developing country business cycles? Are the advanced ('high-income') economies the major drivers of the global business cycles? To what extent are cycles in developing countries conditioned by global business cycles, and are there differences between different types of developing countries in terms of their movement with the global business cycles?

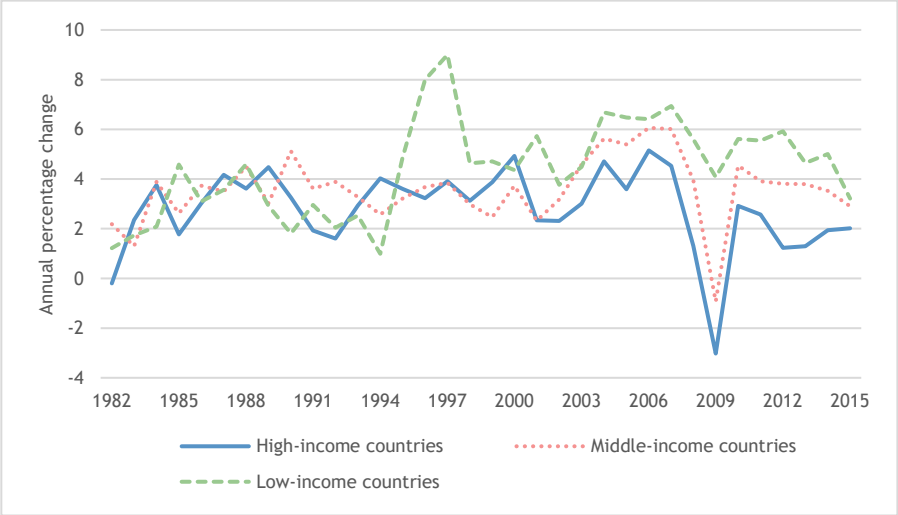
1.3.3 Working hypotheses

A number of tentative or working hypotheses were used to guide the research. These hypotheses pertained to what are considered to be important points of contention in the literature on the conceptualisation, identification and operation of business cycles at the global level and individual country levels. They may be listed as follows:

1) Cycles are recurrent, non-periodic and non-symmetric alternating periods of expansion and contraction in economic activity.
2) Given point 1) above, the identification of business cycles cannot be based on the mechanical application of rigid mathematical formula.
3) Cyclical patterns are evident in a growing number of developing countries, as is their increasing synchronisation with the leading global economies and one another (see Figure 1.3). Hence, the phenomena of global and individual (developing) country business cycles can be said to exist.
4) The nature of business cycles in developing countries varies depending on their trend growth rates, economic structures, and levels of development.

5) The main drivers of global business cycles are cycles in global manufacturing activities, and the main drivers of cycles in the developing countries are cycles in the global economy.

Figure 1.3
Increasing synchronisation of cycles (average non-weighted real growth rates), 1982-2015



Source: World Bank WDI, author's calculation, Data accessed 1 February 2017.

1.4 Approach and research methodology

1.4.1 Approach

The approach adopted will comprise, firstly, a critical review of the literature on conceptions of cycles, methods of their identification, and their drivers; secondly, a presentation of an alternative conception of cycles and corresponding method for their identification (at the generic, global and individual country levels); and, lastly, an alternative view of their drivers (at the global and individual developing country levels).

The literature reviewed is for the most part that deemed to be the orthodox or mainstream literature on business cycles. Much of this can be argued to fall under the umbrella of the so-called Neoclassical school of

thought,[6] notwithstanding the fact that some of these explanations of cycles are regarded as standing outside of this school, as with the U.S. NBER approach (see chapter 2 for an elaboration).[7] The critical aspect of the review will be in terms of theoretical logic and supporting empirical evidence of the mainstream cycle analyses, which will be informed to a certain extent by ontological and epistemological perspectives stemming from the Heterodox school of thought (see section 1.4.2 below).[8]

The starting point of the literature review will be conceptions of business cycles. Most attention is paid to mainstream conceptions of generic cycles, since these are of necessity the foundation of conceptualisation of other cycles, viz., global and developing country cycles, but attention is also paid to conceptualisation of the latter. This will be followed by a review of mainstream literature on methods to be used in the identification of cycles, and, by implication, in the establishment of their existence. The literature reviewed spans methods used in the identification of cycles in general and global and individual country cycles in particular. The final part of the literature review then considers literature on drivers of cycles at the global and individual country levels. The focus of the literature pertaining to drivers of global cycles is the country drivers of global cycles, and the focus of the literature pertaining to drivers of cycles in developing countries is the extent to which exogenous forces can be considered to be the major drivers of these cycles.

The literature review is used as a basis for the development of alternative conceptions of cycles, methods for their identification, and determination of their drivers — the drivers of global cycles, and cycles pertaining to developing countries. In the development of the alternative approach, particular attention is paid to the alternative conception of cycles. It is this that informs the development of the alternative method of cycle identification and explanation of the drivers of global and developing country cycles.

1.4.2 Ontological and epistemological stance

One reason why there is no consensus in the explanation of business cycles is obviously the different ontological and epistemological starting points of those seeking to explain these phenomena. Broadly speaking, one can identify two different starting points; the Neoclassical and Heterodox approaches.

The Neoclassical approach perceives the economic system to be one constituted by utility-maximising individuals engaged in exchange with one another with a view to maximising their individual satisfaction. Economic phenomena are understood in terms of the alleged behaviour of individuals. This behaviour is argued to result in an essentially stable economic system which tends towards balance in terms of supply and demand — that is, it tends towards equilibrium. Hence, the existence of recurrent cycles, as the product of the workings of the economic system, is denied. What is admitted is random disturbances or temporary imbalances in demand and supply arising from unanticipated exogenous shocks to the system and resulting in information deficiencies on the part of individuals. To the extent that these disturbances are seen as recurring, they are perceived to be either deterministic or stochastic regularities (so-called event regularities) (see Downward, 2002; Lawson, 1997, 2003; Lawson in Hirsch and DesRoches, 2009). Whatever disturbances occur in the system as a result of the above-mentioned shocks, they are seen as being eliminated either instantly or over a relatively short period of time by the activities of the utility-maximising individuals once they acquire the necessary information (see Friedman, 1968).[9]

The corresponding epistemological stance of this approach — the orthodox or mainstream Neoclassical approach — is referred to as logical positivism, meaning that confirmation of its perceptions of economic phenomena is through the lenses of various empirical methods, and mathematical and econometric models (see, for example, Friedman, 1966, p. 4; Gorton, 2012). Crucially, the empirical verification of reality is seen as not requiring a logical or empirical verification of underlying assumptions — i.e., ontological foundations.

The Heterodox or non-mainstream school comprises a number of different sub-schools of thought, including the post-Keynesian and Marxist schools, that are united in their opposition to the ontological and epistemological perspectives of the Neoclassical approach. Although it cannot be argued that there is an agreed ontology among adherents of the Heterodox school, there is general agreement that the workings of the system cannot be understood on the basis of the alleged hedonistic behaviour of individuals, nor can the economic system be seen as inherently stable and tending towards equilibrium as a result of this behaviour. Instead, the system needs to be understood as constituting many and varied social groups,

whose interactions are based on economic, social and political power involving, among other things, conflicts over the processes of production and distribution, and resulting in an essentially unstable economic system tending towards alternating periods of balance and imbalance. Accordingly, for the Heterodox approach, cyclical economic phenomena are seen as both recurrent and inherent to the functioning of the economic system, although there is disagreement between the different sub-schools as to whether such cycles are integral to this functioning.

While there is little agreement among Heterodox economists with respect to the appropriate epistemological approach to be adopted in analysing economic phenomena, there does appear to be something of a consensus in their rejection of the logical positivist method of Neoclassical approaches, on the grounds that assumptions underlying economic theories need empirical validation. This rejection of the logical positivist method notwithstanding, adherents of the Heterodox approach who study business cycles nevertheless agree on the need to adopt a positivist methodology. The present research favours the ontological and epistemological stances which correspond to the Heterodox approach described above, particularly as these relate to the study and understanding of business cycles. It is these stances which inform the criticisms of the mainstream approaches and provide the basis for the alternative theories, data selection, and empirical methods utilised in this study.

Table 1.1
Different views on cycles

Schools of thought	Ontology	Epistemology
Orthodox/ Mainstream	Closed system, Inherently stable	Logical positivism
Heterodox	Open system, Inherently unstable	Positivism

1.4.3 Empirical methodology

Regardless of the school of thought, there is a clear preference among those analysing business cycles for a deductive rather than inductive approach, making use of a variety of quantitative methods. Differences between analysts in terms of the particular methods adopted stem from an

explicit or implicit adherence to one or another of the above mentioned epistemological approaches.

Those adopting mainstream logical positivist approaches typically make use of mathematical models and econometric methods, with many who adopt these methods seeing explanation and statistical estimation as formally equivalent (Downward and Mearman, 2003, p. 112). Perhaps one of the most explicit in this regard is the increasingly popular Vector Auto Regression (VAR) method which is quite explicitly a-theoretic in nature.[10]

The Heterodox approach, in contrast, places particular emphasis on theoretical reasoning when undertaking empirical analyses. It refutes the idea that mathematical models can be useful in the identification of business cycles in the manner of Neoclassical approaches given their [Heterodox] very different conception of cycles; as non-regular and recurrent movements in economic activity. This is because most (empirically testable) mathematical models typically assume, and indeed must assume, that cycles, if they exist, recur with a fixed periodicity and symmetry. For the most part, adherents of the Heterodox approach see no reason for an exclusive reliance on econometric methods in either the identification of cycles or the explanation of their drivers, while at the same time not eschewing their usefulness alongside other statistical methods — such as exploratory data analysis (EDA).[11] Once again, the emphasis placed by adherents of the Heterodox approach when using these methods is on prior theoretical reasoning.[12] The following statement by A. Loveday in his preface to Jan Tinbergen's book on business cycles (1939, p.6) perhaps best captures Heterodox thinking in this regard:

The system of analysis employed cannot do more than submit preconceived theories to statistical test. The economist, and not statistician, must in the first place indicate what, in the light of logical reasoning from ascertained facts, would appear to be the provable causal relations.

In keeping with this emphasis on theoretical reasoning, and following the work of McCloskey (1983) and others, Heterodox economists take close account of the *economic* significance of the results of econometric analyses, and not simply their *statistical* significance (see also Ziliak and McCloskey, 2008).

1.4.4 Data

The data used for the study are entirely macroeconomic in nature. They are drawn mostly from the World Bank's World Development Indicators database (WDI) to ensure as much consistency as possible given the large array of countries included in the study. These data are supplemented by those drawn from other international organisations such as the International Monetary Fund (IMF), and the Organisation for Economic Co-operation and Development (OECD), as well as various national sources such as central banks (e.g., U.S. Federal Reserve) and statistics bureaus as and when necessary. It is important to note that the availability of relevant macroeconomic data varies between countries and their levels of development. Thus, as is to be expected, longer series of relevant data are more readily available for advanced than for developing countries; there are also considerable differences between individual developing countries. For advanced countries relevant data for the present study are available from as far back as the early 1960s, while for a majority of developing countries they are only available from the 1970s or even the 1980s onwards, depending on the variables concerned.[13] Data for the global economy and country groupings based on the levels of development and structure of the economy are constructed using appropriate aggregation methods (see section 1.4.5 below and chapters 4 and 5 for the details).

As has been the case with most empirical studies of business cycles, considerable use will be made of Gross Domestic Product (GDP) data, particularly GDP at current market prices, current U.S. dollars, and constant local currency units.[14] Also, as with other studies, considerable attention will be paid to economic growth rates, since these are seen as pivotal for identifying and analysing cycles. GDP data series are used in the present study in spite of the many known problems arising from the construction of these data, ranging from the omission of large parts of the economic activity of countries to outright fraud in surveys and estimates used in their construction. These problems are particularly evident in the data of developing countries,[15] which are seen as nowhere near as reliable and comprehensive as for the advanced countries (see, for example, Jerven, 2013;[16] Hornby et al., 2017[17]). There have been attempts to overcome some of these problems through the use of GDP proxies such as electricity consumption, cement usage, levels of imports, etc., but these can in no way be taken as a substitute for the actual GDP data series (see also, for example, Khan, 2016). Rather, large divergences between the actual series

and the proxies are typically seen as pointing to the need for some caution and circumspection in the interpretation of findings based on these data.

The frequency of data used for the empirical work in this research is for the most part annual, except those in the literature review and one section in the chapter on drivers of cycle (chapter 5, section 5.2). This is simply because of the longer and wider coverage of annual data as compared to those of shorter frequencies, especially in the case of developing countries.[18] It is certainly recognised that use of higher frequency data allows the researcher to capture macroeconomic developments taking place much earlier than is possible with the use of lower frequency data, but it is considered that the lack of availability of longer periods for these data, especially for developing countries, outweighs these benefits. The use of quarterly data used in the literature review is, incidentally, to permit an assessment of the findings of studies of cycles in the U.S. economy using this frequency of data.

1.4.5 Country classifications and selection

Since considerable attention is paid to the global economy as a composite in this research, the question arises as to how this composite is to be derived. Although data on the global economy as a composite are available from certain of the above mentioned international data sources (typically under the label of 'world' composite), the manner of their construction does not entirely suit the purposes of the present study — hence the construction in this study of alternative global economy composites. One problem faced in this construction has been the availability of data. As noted above, data availability varies between countries according to their levels of development. The solution adopted in the present study is to include as many countries as possible assuming that the omitted countries will have little or no bearing on the resulting composites and analytical results derived from their use.

As should already be apparent, an important distinction in the present study is between so-called advanced (developed) and developing (emerging) economies. As a number of researchers have commented, it is not entirely clear where one should draw the line between advanced/developed and developing/emerging countries (see Nielsen, 2011; Khokhar and Serajuddin, 2015). Since the precise demarcation line between advanced/developed and developing/emerging countries is of little consequence for the analysis undertaken here, this study will adopt

the conventional and widely used classifications of these groupings provided by the World Bank. Specifically, the countries classified as high-income by the World Bank are considered to be the advanced or developed countries, and the non-high-income countries (i.e., middle- and low-income countries) as the developing countries. [19] The added justification for using these classifications is that they are widely used in other similar studies.

Distinctions are also drawn in the present study between groupings of developing countries based on income levels and economic structures. The income levels considered important are those classified as middle- and low-income in the data provided by the World Bank. The economic structures considered important in the present study are those pertaining to the sub-components of GDP. These are typically seen as agriculture, industry and services, with important distinctions between sub-components of these aggregates, including that between the manufacturing and non-manufacturing sub-components of industry. Since these distinctions are not systematically used to organise the country data provided by the World Bank and other organisations noted above, they are constructed as and when required in the present study. Particular attention is paid to the sub-components which form the basis for important exports of developing countries (viz., manufactures, food, agricultural raw materials, fuel and metals).

1.5 Scope and limitation of the research

A number of caveats must be noted with respect to the present study. First of all, its focus is exclusively on the phenomenon of the business cycle and not macroeconomic phenomena in general. While it is recognised that the two are linked, it is felt that locating the analysis of cycles in the broader corpus of macroeconomy will result in an unnecessary digression.

Second, although there are no doubt considerable differences between the various sub-schools comprising the Heterodox approach, including in respect of their understandings of business cycles, they are treated as one homogeneous grouping for the purposes of this study, since the aim is to derive certain fundamental shared elements of an alternative (to the mainstream) approach to the understanding of cycles at the global, sub-global and individual country levels for reasons given above. It is felt that such divisions that exist between the sub-schools in the Herodox camp

with respect to the analyses of cycles are of no consequence for the purposes of the present study.

Third, reference has already been made above to the data limitations faced by studies such as the present one, which are concerned with the macroeconomic dynamics of developing countries, but this warrants repeating here. Specifically, it is important to note that such limitations in terms of the quality of data provided by many developing countries make it necessary to be cautious about drawing hard and fast conclusions from analyses of these data.

Fourth, although the literature on business cycles identifies cycles of many different time durations, ranging from the long wave of 60 years to the inventory cycle of 2–3 years, the present study will focus on what has been referred to as the Juglar cycle — the duration of which is seen to be some 7–11 years (see Schumpeter, 1939).[20] This is because the existence of the Juglar cycle is accepted by most cycle economists, and tends to be the focus of most research on the subject. This is not to deny the existence of other cycles, most notably the so-called long wave or K-wave, named after the Russian economist, Nicolai Kondratieff, who is credited with its discovery by those subscribing to its existence.[21]

Fifth, the explanation of the drivers of cycles in the present study has a somewhat different focus from the majority of explanations of such drivers. Specifically, no attempt is made to determine the drivers of cycles in general, i.e., the cause of generic cycles, which is the traditional focus of most studies of drivers of cycles in both the mainstream and Heterodox literature (see Ikeda, 2012 for a review of these studies).[22] Rather, the focus of this thesis is the country drivers of global cycles (viz., which countries are the most important drivers of the global cycle and why?), and the external drivers of cycles in developing countries. The reason for this focus is its perceived theoretical and policy importance (see chapter 6, section 6.4).

Sixth, consideration of the consequences of cyclical movements will be limited to the impact of the movement of global cycles on cycles in developing countries. Although it is recognised that such cycles have considerable significance for understanding socio-economic phenomena such as poverty, employment, living standards, welfare expenditures by governments and the like, these will not be addressed in the present study.

Finally, although the research has certain obvious implications for the development of business cycle indicators (i.e., lead, lag and coinciding indicators), the study will not touch on this aspect, since it is felt that it would not contribute anything to the core focus of the research.

1.6 Structure of the thesis

The chapter following this introduction will undertake a broad review of the relevant literature on business cycles. As was indicated above, the relevant literature is that pertaining to the general conception of generic cycles and their identification as well as the drivers of global and developing country cycles. The review attempts to highlight weaknesses of existing theories with a view to developing an alternative approach. Particular emphasis is placed on what is seen as the mistaken conceptualisations of cycles in the standard mainstream literature and how these tend to inform methods used for the identification of cycles and the explanation of their drivers. Against this backdrop, chapter 3 will develop an alternative conception of the cycle and method for its identification. The methodology to identify cycles will then be used in chapter 4 to identify global cycles as well as cycles pertaining to groupings of developing countries and individual developing countries. Implicit in this methodology is the notion that cycles in clusters of countries and individual countries need to be understood with reference to the global cycle, being conditioned by the latter. Chapter 5 then attempts to determine the major country drivers of the global cycles and the extent to which individual developing country cycles are driven by forces driving global cycles. It will be shown that the key drivers of the global cycles are not the large economies *per se* but the large manufacturing economies. A clear implication to be derived from the data is the significance of the role of China as one of the most important drivers, if not the major driver, of the global cycle. It will also be shown that the key drivers of cycles in developing countries are external to these economies, as manifest in the importance of trade in the movement of cycles in these countries. An econometric Appendix is added to support the exploratory data findings presented in chapter 5. The final chapter then draws together the major findings and key contributions of the research, discusses their theoretical and policy implications, and considers the directions in which further research might be developed.

Notes

[1] In this thesis, the terms 'business cycles' and 'economic cycles' are used interchangeably. The term 'cycles' is used as a short form of both of these. 'Business cycles' is the more widely used of the two in the academic literature because business is typically seen as the main driver of the cyclical process. Given that the present thesis aims to study cycles in general economic activities, such cycles will be referred to as economic cycles.

[2] The pioneers in the study of business or economic cycles include William Stanley Jevons and Karl Marx. Important figures in the subsequent development of cycle analyses include Arthur Burns, Wesley Mitchell, Joseph Schumpeter, Jan Tinbergen, and Hyman Minsky to name just a few.

[3] See, for example, Bernanke (2004).

[4] Similarly, in a recent commentary on the state of the U.S. economy, Janet Yellen (2015b), stated that: "…because, I noted in my remarks, the recovery from the financial crisis has been very slow. … This [cycle]…may turn out to be a very different cycle than past cycles" (2 December 2015).

[5] These studies have typically focused on the causes of the observed cycles, as well as their frequency and amplitudes.

[6] The major sub-schools of Neoclassicals in areas of the business cycle research in the present study are taken as the real business cycle (RBC) approach, the equilibrium business cycles (EBC) approach, the Monetarist approach, and the Austrian business cycle (ABC) approach.

[7] This research will use the terms 'orthodox' and 'mainstream' interchangeably with both referring to a basic adherence to Neoclassical thinking.

[8] There appear to be no concrete consensus as to what comprises Heterodox economics and who constitutes such a group (see, for example, Colander, 2000; Chang, 2014; Lavoie, 2014). In this research, the label is used to refer to those who do not belong to the Neoclassical school of thought. The largest groups within the Heterodox school can be said to be the post-Keynesians (including Sraffians) and Marxists (see Nicholas, 2011).

[9] For the orthodox approach, social reality is seen as comprising a system made up of hedonistic, rational individuals acting entirely independently of one another on the basis of (almost) complete information about the world around them (see Lawson, 1997, 2003; Palermo, 2007). This approach is also described by its critics as depicting a Robinson Crusoe world of 'individuated individuals' (see Carver, 1975; Marx, 1981).

[10] This is not to say that all those who adopt such empirical methods pay no heed to theory. The prominent Nobel prize winning Dutch economist, Jan Tinbergen,

who is famed for his pioneering work in the econometric analysis of business cycles, was well aware of the pivotal importance of theory when applying econometric methods.

[11] For more details on EDA, see Erickson and Nosanchuk (1979) and NIST/SEMATECH (n.d.).

[12] Many perceive the danger of the blind application of results obtained by econometric methods when it comes to understanding the real economy and making policy decisions. For example, former Chair of the FED, William McChesney Martin, noted: "[w]e have fifty econometricians working for us at the Fed…. The danger with these econometricians is that they don't know their own limitations, and they have a far greater sense of confidence in their analyses than I have found to be warranted…. The flaws in these analyses are almost always imbedded in the assumptions upon which they are based. And that is where broader wisdom is required, a wisdom that these mathematicians generally do not have" (McCormack, 2013, p. 56).

[13] Although Angus Maddison (The Maddison Project; see website link in the References) provides long historical data series on real GDP growth for several countries, it was decided not to use these data here for the following reasons. Firstly, the country coverage is not as extensive as in the World Bank data which are used. Secondly, the data only extend up to 2010, and therefore do not cover important post-2010 developments, which point to the increasingly prominent role of the Chinese economy in driving the global economy.

[14] Real GDP growth rates are preferred by most analysts to alternative GDP variables such as GDP per capita when studying cyclical movements in the economy; the former are seen as better able to capture the growth dynamics of an economy while the latter are seen as more appropriate for studies of living standards.

[15] It should be noted, however, that the reliability of data is not only a developing country problem. The business economist John Williams has a website dedicated to questioning basic macroeconomic data provided by the U.S. government and providing alternative data series (John Williams' Shadow Government Statistics: see website link in the References). The problem, as Williams sees it, is the so-called hedonistic data adjustments made by the U.S. authorities.

[16] This contains an extensive discussion of the problems with GDP data compiled by the authorities in a number of African countries.

[17] The former Chinese premier, Li Keqiang, admitted that the macroeconomic data provided by the Chinese authorities are unreliable, and that he himself relied more on variables such as electricity consumption as a proxy for economic growth. A recent scandal over data provided by the authorities in Liaoning province further illustrates the problem (see Wildau, 2016a).

[18] For example, the IMF provides quarterly real GDP data for around 80 countries but for a relatively shorter time period than with the annual data, and for relatively fewer developing countries than those covered by the annual data of the World Bank.

[19] For the World Bank, "there is no longer a distinction between developing countries (defined in previous editions as low- and middle-income countries) and developed countries (previously high-income countries)" (blog post by Fantom et al., 2016).

[20] Schumpeter (1939) proposed the classification of cycles into four generic types depending on their duration and causes. These are: the Kitchen (3–5 years, inventory), the Juglar (7–11 years, fixed investment), Kuznets (10–15 years, infrastructure), and the Kondratieff cycle (40–60 years, structural change, technological advancement etc.).

[21] Some have argued that there are five long cycles (see, for example, Mandel, 1995[1980]).

[22] Although developments in the FIRE (finance, insurance, and real estate) sector can most certainly be argued to have important consequences for an understanding of cyclical movements in aggregate output (e.g., triggering turning points and aggravating movements in certain of these cycles), these are seen as for the most part of secondary importance given the specific objectives of the study — to provide an understanding of the nature and country drivers of cycles in developing countries.

2 Literature review

2.1 Introduction

This chapter aims to critically review the existing literature on business cycles to ascertain the current state of knowledge on business cycles, including its shortcomings and gaps, with a view to laying the foundations for the extension of this analysis to the study of cycles at the global level and in developing countries. As indicated in chapter 1, the focus of review will be the mainstream or orthodox Neoclassical literature that dominates the academic literature on business cycles.

The particular concern of this review is the literature pertaining to three types of business cycles: generic, global and individual country cycles. The literature considered to be of particular relevance is that on the basic conception of cycles, their identification (establishment of existence), and their drivers. The analysis begins with the conception of cycles, because researchers studying business cycles have used — either explicitly or implicitly — a wide variety of conceptualisations, with the particular conceptualisations used conditioning to a large extent the outcomes of their analyses. This is followed by a consideration of the literature on cycle identification which includes an assessment of the data used, variables selected, methodologies applied, and empirical results obtained. The discussion of the generic cycle literature will make use of relevant U.S. data[1] as and when required since these data are typically the most frequently used in studies of such cycles. The last part of the chapter is a consideration of drivers of global and individual developing country cycles. The focus of the literature on global drivers is limited to that pertaining to the country driver or drivers of global cycles. Particular attention is paid to the literature which looks at whether global cycles are to be understood as driven by the advanced countries *per se*, and especially the U.S. The focus of the

literature on developing country drivers is on whether cycles in developing countries, if they can be deemed to exist, are driven by internal (domestic) or external forces. Again, it will be shown that the answer to this question is very much tied up with the way that cycles are conceptualised in the first place.

2.2 Conception of cycles

Most of the literature on conceptualising cycles has tended to focus on generic cycles, with the conceptions of cycles pertaining to individual countries being those of advanced countries, particularly the U.S. However, given the particular concerns of the present study, attention needs also to be paid to the conceptualisation of cycles at both the global and individual developing country levels. Of particular note with respect to the latter, and indeed throughout much of the following study, is the distinction to be drawn between cycles and fluctuations.

2.2.1 Generic cycles

The review of the literature on cycles needs to begin with the conception of the generic cycle. The conceptualisation of the generic cycle, as noted above, refers to the general conceptualisation of cycles in capitalist economies without reference to any particular concrete form that it might assume. This is considered to be an important point of departure because such a conceptualisation is seen as the foundation for the understanding of how actual cycles are conceived and explained. This is not to deny that the conception and explanation of generic cycles are informed by observation and analyses of actual cycles. Indeed, it cannot be denied that the general conception of most economic phenomena is based on actual observations, without implying that what is being analysed is the particular phenomenon being observed.[2] In fact, the general practice, irrespective of the particular school of thought, has been to use cycle phenomena in the most advanced economy for this purpose. Hence, early cycle analyses made use of observations and analyses of cycles pertaining to the British economy (see, for example, Marx, 1981) while more recent analyses (those from the mid-20th century onwards) have tended to make use of cycle phenomena pertaining to the U.S. economy. That is to say, the use of data pertaining to actual economies for the conception and analyses of generic cycles should not be taken as implying that what is being conceptualized

and analysed is the cycle pertaining to the particular advanced economy rather than the cycle pertaining to capitalist economies *per se*.

The general consensus in the literature is that a business cycle is to be conceived of as an expansion in economic activities followed by a contraction, or *vice versa*. Perhaps one of the best-described such conceptualisations of the business cycle is provided by Moore (1961, pp. 45–46):

> … the alternating periods of expanding and contracting economic activity defined as business cycles were characterized by a *system* of relations among different factors or aspects of economic activity… the system as a whole was extremely complex, both from a statistical and an economic point of view.

For the majority of modern scholars, typically mainstream economists, business cycles are best described as random **fluctuations** in economic activities. This conception contains no implication of any periodicity. As a result, the term business 'cycle' is argued by some of these scholars to be a misnomer (see, for example, Prescott, 1986; Zarnowitz, 1992, p. 22; Knoop, 2010). The well-known mainstream economist Robert Lucas (1977, p. 10) is quite explicit in this regard, arguing that "attempts to document and account for regular cyclical movements need not be connected in any way to a presumption that such movements are an inevitable feature of capitalist economies". Rather, cycles are seen as the result of shocks that hit the economy in a random manner resulting in its temporary deviation from an equilibrium, full-employment, growth path. Romer (n.d.) explains:

> Just as there is no regularity in the timing of business cycles, there is no reason why cycles have to occur at all…. Business cycles do occur, however, because disturbances to the economy of one sort or another push the economy above or below full employment.

One of the tacit assumptions of the conception of cycles as random fluctuations is that the trend growth of the economy is independent of cyclical movement — there is no 'path dependency' of the trend on the short-run movement in economic growth.[3] Specifically, it is assumed that the cyclical movement of the variable has no bearing on its long-term trend, and the expansion and contraction are defined as relative to the trend movement. Indeed, it is for this reason that the cycle is often referred to as a 'deviation cycle' (see the seminal work by Mintz, 1969, 1972).[4]

These deviation cycles are also known as 'growth cycles'[5] (see further elaboration in section 2.3).[6]

Evidence provided by organisations such as the National Bureau of Economic Research (NBER) and Economic Cycle Research Institute (ECRI) cast doubt on this notion that the alternating periods of expansions and contractions in economic activity can be seen as non-recurrent, symmetric, and the result of random shocks. The NBER, in particular, provides a considerable amount of evidence for such recurrence, documenting the existence of 33 cycles in the United States since the mid-1850s, with an average periodicity of some 4–6 years (see NBER, 2010a).[7] The problem for mainstream academics is that the implications to be derived from this type of evidence contradict some basic tenets of their views on how capitalist economies work, such as the notion that these economies are essentially in equilibrium unless disturbed by shocks.

Some mainstream cycle economists do acknowledge the existence of recurrent cycles, even if only tacitly.[8] They typically follow the pioneering work of two U.S. economists, A.F. Burns and W.C. Mitchell, who were in fact largely responsible for the research of the NBER referred to above. On the basis of their research, Burns and Mitchell conceived of the phenomena associated with cycles as recurrent and non-periodic. Their definition is one of the most frequently cited conceptualisations of the business cycle. For Burns and Mitchell (1946, p.3):

> Business cycles are a type of fluctuation found in the aggregate economic activity of nations that organize their work mainly in business enterprises: a cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general recessions, contractions, and revivals which merge into the expansion phase of the next cycle; this sequence of changes is recurrent but not periodic; in duration business cycles vary from more than a year to ten or twelve years; they are not divisible into shorter cycles of similar character with amplitudes approximating their own.

This conception of the cycle is referred to in the literature as the 'classical cycle' conception,[9] because of its similarity with the conceptualisations of the Classical economists, such as Karl Marx.[10] For Marx, as for Burns and Mitchell, cycles are recurrent and have no fixed periodicity. Rather, their periodicity holds in a loose sort of way. In fact, for Marx

(1969[1865], online archive), "capitalistic production moves through certain periodical cycles. It moves through a state of quiescence, growing animation, prosperity, overtrade, crisis, and stagnation". A number of Marxist scholars have understood Marx's conceptualisation of cycles to be distinct from (random) economic fluctuations. In discussion with the Japanese Marxist Samezo Kuruma (1972, online archive) one scholar argued:

> The common expression 'business *fluctuation*' or 'economic *fluctuation*' differs from the term 'business *cycle*.' In the case of 'fluctuation', the emphasis is merely on a change — it could be either an arbitrary change or a necessary or regular one — whereas in the case of 'cycles' we are dealing with a regular expression of this 'fluctuation'.

The classical cycle conception of Burns and Mitchell, unlike the cycle conceptions of Marx and Keynes,[11] lacks any underlying theoretical framework explaining why and how cycles can be conceived of as recurrent (and of a fixed periodicity in the case of Keynes). It is this lacuna that allows researchers from the orthodox Neoclassical approach to adopt the conception of cycles of Burns and Mitchell while continuing to adhere to their conceptualisations of capitalist economies as essentially in equilibrium. Specifically, it allows them to implicitly, if not explicitly, conceive of recurrent cycles as the product of repeated, regular and persistent exogenous shocks. The famous Neoclassical mathematical economist, Tjalling Koopmans (1947, p. 172), argued that the work of Burns and Mitchell on cycles amounted to "measurement without theory" as "the book [by Burns and Mitchell] is unbendingly empiricist in outlook…".

One could argue that the lack of clarity with regard to the underlying theoretical framework of Burns and Mitchell stems from its endorsement of one or another form of Marx's and Keynes's conceptualisations of capitalist economies — as inherently unstable, with cycles being the manifestations of the workings of such economies. This notion that cycles are the product of the internal workings of an inherently unstable economic system is something which would have been unacceptable to either Burns or Mitchell at the time of the development of their analytical approach, and even more so to their sponsors at the NBER.[12] It is for this reason, more than any other, that the work of Burns and Mitchell is referred to as 'modern classical cycle' in this research, for the express purpose of differentiating it from that of Classical theorists, especially Marx, and their modern descendants such as Keynes.

2.2.2 Global cycles

It is fair to say that research on the phenomenon of global cycles is sparse, with no explicit conception of such cycles. One reason for this is that, until recently, there appeared to be no evidence supporting the existence of such a phenomenon. The first thing of note about the few studies of global cycles which can be found in the literature is that terms 'global cycles', 'world cycles' and 'international cycles' are often used interchangeably (see, for example, Canova and Dellas, 1993; Cookie et al., 2015). To the extent that global cycles are conceived of, this is in terms of a synchronised movement in economic activity of several countries. For example, according to Canova and Dellas (1993, p. 23), "[t]he term 'world' or 'international' business cycle refers to the existence of common elements in aggregate cyclical behaviour across countries". Similarly, Kose et al. (2003a, p. 1216) ask: "[i]s there a *world business cycle*? Recent studies have indeed provided evidence that there are many cross-country links in macroeconomic fluctuations".

The countries whose co-movement is taken as constituting a global or world cycle are typically the large advanced countries, especially the G7[13] (see, for example, Gregory et al., 1997; Bordo and Helbling, 2003, 2010; Aruoba et al., 2011; Berge, 2012; Bernaji et al., 2012; Diebold and Yilmaz, 2015). A few studies have sought to identify global cycles with the co-movement of larger clusters of countries, including a number of developing countries. However, they have not conceived of these as global cycles as such, in the sense of such cycles having an existence which is independent of their constituent parts (countries) (see, for example, Kose et al., 2003a, 2008a; IMF, 2007b; Kose et al., 2008b). This is not to say that certain economies and clusters of economies do not have a considerable influence on the movement of all other economies.

In all such studies, global cycles are seen as any synchronised, random fluctuations in economic activity in these countries, which are the result of random or persistent shocks. In some studies, the shocks are seen as 'common' shocks (see, for example, Canova and Dellas, 1993; Kose et al., 2008a; Bernaji et al., 2012). In other studies, the shocks are seen as those impacting on one country which are directly and simultaneously transmitted to other countries, with the extent and nature of the transmission depending on relative size and the degree of openness of the countries concerned, often in the form of so-called 'spillover' effects (see Canova and Dellas, 1993; IMF, 2007a). For these studies, the global impulses are seen

as emanating from the large advanced economies, or even one economy — the U.S. Discussion of this point will be taken up below in considering the literature on the alleged drivers of global cycles.

A further problem with the mainstream approaches to the conceptualisation of global cycles, in addition to those noted above, is their conception of the global economy as **interlinked** rather than **integrated** economies (see also Daly, 1999, for the differentiation of internationalisation and globalisation). Interlinked economies are those whose reproduction is independent of one another, but that enter into trade and capital flow relations with one another. Integrated economies are those whose reproduction processes are essentially dependent on one another. Hence, for mainstream approaches and the existing studies adopting these approaches, global cycles can only be conceived of as non-recurrent, random fluctuations of clusters of inter-linked economies, and not as recurrent, synchronised cycles in *all or most of* the countries comprising the global economy, with degrees of synchronisation varying depending on all manner of factors. Indeed, it is this implicit mainstream conceptualisation of capitalist economic systems which has precluded the more extensive study of global cycles as the result of forces emanating from the functioning of the global system itself.

2.2.3 Individual country cycles

Most studies of cycles in individual countries[14] are of advanced economies, particularly the U.S., Europe and Japan, with conceptualisations being the sort of generic conceptualisations noted above. Indeed, the generic conceptualisations of cycles discussed above are for the most part based on the observations of economic activities in the U.S. (see Burns and Mitchell, 1946; Mintz, 1969; Prescott, 1986). That is to say, whatever the country, cycles are conceived of as random or recurrent fluctuations in economic activity. Studies on the developing countries also follow this trend, with, as in the general case, a few exceptions which take as their point of departure the notion of recurrent fluctuations.

The problem with this prevailing conceptualisation is that no distinctions are drawn between cycles and fluctuations, since any and all fluctuations in economic activity are regarded as constituting cycles. Moreover, differences in characteristics of countries are not taken into account, such as levels of development, structures of production and the extent and na-

ture of the country's integration into the global economy. The consequence of this is that it leads to the misidentification of cycles and a misunderstanding of their drivers because these countries are seen as somewhat independent of the underlying global cyclical forces. With regard to the former, it leads for example to 'double-bottoms' being mistakenly seen as two separate cycles, and many more cycles being identified for developing than for advanced economies. With regard to the latter, it leads to *ad hoc*, *ex post*, explanations of the drivers of individual cycles.

2.3 Identification and existence of business cycles

The identification of cycles typically builds on certain implicit or explicit conceptualisations of the cycle, with most approaches being based on the sorts of mainstream conceptualisations referred to above. The aim of this section is to review the mainstream literature on the identification of cycles, with a view to highlighting its shortcomings and drawing implications for the development of a different approach founded on an alternative conceptualisation of the cycle. As with section 2.2, the review will begin with the mainstream literature on generic cycles, and then proceed to a consideration of global and individual country cycles. For the identification of individual country cycles, the emphasis will be on developing country cycles.

2.3.1 Generic cycles

The methods most widely used in the identification of cycles are the growth cycle and the modern classical cycle approaches, with a few adopting the so-called growth rate cycle approach. The differences between these approaches pertain to: the data used; the manner in which these data are transformed; the derivation of the cyclical component of the data series; the identification of turning points in cycles; and the depiction of the nature of the cycles (in particular, duration and amplitude). What follows will be a critical review of these various elements of the methods used with a view to laying the foundations for the construction of an alternative methodology for cycle identification, which is consistent with an alternative conception of the cycle. As noted, most identification methods in the literature are constructed using data on the U.S. economy. The key variable used is real Gross Domestic Product (GDP). Many justifications are provided for its use including the fact that it best captures aggregate economic activity. However, there are a number of well-known problems with this

variable which have cast doubt on its usefulness in this regard. These range from the omission of large parts of the economic activity of countries, to outright fraud in surveys and estimates used in the construction of the data (see, for example, Jerven, 2013; Krishnan and Rastello, 2015). The well-known problems with this variable, as well as its unsuitability for capturing turning points, have led some researchers — mostly those identified with the modern classical approach to the study of cycles — to use composites of different variables such as employment, real income, consumption, investment, savings and industrial production etc., instead of using a single variable (see, for example, NBER, 2010b). The problem with the use of various composites, or even proxies of economic activity other than real GDP, is that there is no consensus as to the set of variables or proxies to be used. Even the NBER does "not have a fixed definition of economic activity" (ibid.). To a large extent, this is of course a result of the above-mentioned absence of an explicit theoretical framework (see also Koopmans, 1947; Kydland and Prescott, 1982). It also warrants noting that for many countries, data on most of the variables used in the NBER composite are, in any case, not available.

There are also divergences among those using real GDP growth for identification. These include its frequency and transformation. With regard to the frequency of the data, some studies use quarterly and monthly data, while others use annual data. For many developing countries, only annual data are available for any appreciable length of time. Perhaps even more problematic, especially when trying to compare and evaluate identification methods, is the vast array of data transformations used. Some approaches, such as the growth cycle and modern classical cycle approaches, use natural logarithms of absolute real GDP (see, for example, Baxter and King, 1995; Hodrick and Prescott, 1997; Harding and Pagan, 2002a). Filters are then applied to make the data stationary, and the latter are smoothed further by the application of moving averages (see, for example, Bry and Boschan, 1971; Hodrick and Prescott, 1997). The growth rate cycle approach uses growth rates of real GDP at constant prices, with these rates smoothed to eliminate noise factors (see Friedman and Schwartz, 1975; Zarnowitz and Ozylidrim, 2006). Smoothing methods can also vary, but, according to Layton and Moore (1989, p. 380), tend to be based on the ratio of the current value of the series to its average during the previous periods (e.g., 12 months average for monthly, four quarters average for quarterly) and raised to a certain power depending on the weight to be

given to most recent observations (e.g., 12/6.5 for monthly and 4/2.5 power for quarterly).

A fundamental problem with the various cyclical identification approaches is the techniques used for separating cyclical from trend components. One of the most popular techniques for this is the application of a filter (see Cooley and Prescott, 1995; Zarnowitz and Ozyildirim, 2006).[15,16] The most commonly and widely used filter is the so-called Hodrick-Prescott (HP) filter, closely followed by the so-called Band-Pass (BP) filter.[17] The HP filter has the following form (Hodrick and Prescott, 1977, p. 3);

$$y_t = c_t + g_t \qquad \text{for t = 1,…,t}$$

$$y_t = Min \left\{ \sum_{t=1}^{T} c_t^2 + \lambda \sum_{t=1}^{T} [(g_t - g_{t-1}) - (g_{t-1} - g_{t-2})]^2 \right\} \tag{2.1}$$

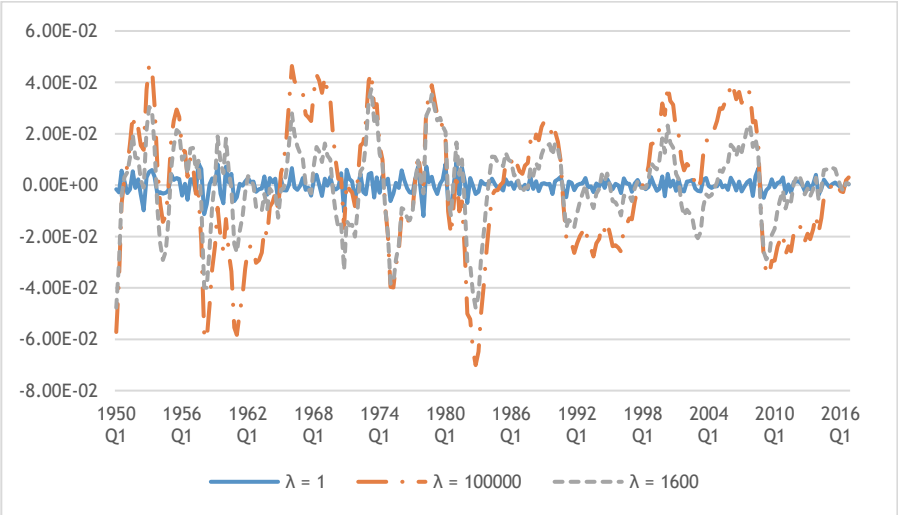
where y_t is a given time series;
- g is growth component;
- c is cyclical component;
- t is time;
- λ is a smoothing parameter.

The first term (c_t^2) of the above equation expresses $(y_t - g_t)^2$, which is the sum of squared deviations that penalises the cyclical components, and the second term is a multiple of the sum of the squares of the trend component's second differences.

The basic problem with the application of these sorts of filters to separate out the cyclical from the trend components is the value to be ascribed for smoothing of the data. This value is referred to as Lambda or 'λ' in the above equation.[18] In most studies of cycles in the U.S. economy using quarterly data this value is typically set at 1,600, and 6.25 when using annual data (see Hodrick and Prescott, 1997; Ravn and Uhlig, 2002). Yet, it is admitted that the value assigned to this variable is somewhat arbitrary, and that "[t]here is no single correct way to represent these components" (Cooley and Prescott, 1995, p. 27). The problem this gives rise to is illustrated by Figure 2.1 below. This Figure plots quarterly U.S. growth rate data using different values of Lambda, i.e., 1 and 100,000 together with the standard quarterly value of 1,600. The resulting cycles generated show that the lower the Lambda values the lower the amplitudes of the cycles

and the greater their frequencies. Or, to put it another way, the lower the Lambda values, the less the cyclical components are penalised, i.e., the less smooth the cycle.

Figure 2.1
Different parameter value of cycles



A corresponding problem with cycle identification for those using the above techniques is the use of resulting cycle peaks and troughs in order to date cycles. Typically the peak is seen as the point just after which the contraction (and recession) starts, and the trough as the point preceding the expansion phase when an economy gets out of recession and starts to expand again. Obviously what constitute peaks and troughs in the filtered cycles will depend on the Lambda parameter values used for de-trending the data. Hence, there will be a considerable variation in dating between researchers depending on the values used.

Unlike the growth cycles, those adopting modern classical and growth rate cycle methods do not use trends as points of reference in their identification of cycles, but rather turning points. The main methods used by these approaches are referred to as non-parametric and algorithmic approaches.[19] Probably one of the best known of these approaches is the model-free approach, typically used by the NBER for dating of the U.S.

cycles. It is so-called because the decision for identifying cycles is made in the final instance by a consensus of members of a cycle-dating committee. One of the weaknesses of this methodology is its subjective nature, with dates even differing between committee members. As a consequence it is seen as "neither transparent nor reproducible" (Chauvet and Piger, 2003, p. 47; see also Bry and Boschan, 1971, p. 2). Another weakness of the method is that it is seen as requiring complicated and analytically demanding procedures (see Rand and Tarp, 2002; Male, 2010a).

Two alternative, less subjective and/or analytically demanding model-free approaches to cycle identification are the so-called BB procedure developed by Bry and Boschan (1971, p. 21) and the BBQ (Bry and Boschan Quarterly) algorithm developed by Harding and Pagan (2002a, 2006) based on the work of Bry and Boschan (1971) for quarterly data analysis. Bry and Boschan (1971) aimed to follow and simplify the complex criteria laid down in the model-free approach of NBER by providing a "simple, robust, as transparent as possible and replicable" algorithmic approach (Harding and Pagan, 2002b, p. 1682). Some approaches combine this method of cycle identification with subjective judgements to remove 'false' turning points (see, for example, Layton and Moore, 1989).

A second major problem with certain of the mainstream methods of cycle identification described above is the imposition of cycle symmetry in the course of their application, specifically the application of filters.[20] In fact, it is recognised in the literature on cycle identification methods that such impositions of cycle symmetry cause the duration of the identified cycle phases to be very different from those identified with methods which do not impose such a symmetry (see also Zarnowitz, 2007). For example, growth cycle methods typically impose such symmetry, while modern classical cycle methods do not, resulting in very different cycle durations identified by each. Table 2.1 summarises the average duration of different cycle phases for the U.S. economy over the period Q1 1950 to Q4 2016 using the two approaches. It shows a considerable divergence in the time duration of the identified cycles depending on whether or not the filters used impose symmetry. Thus, the HP filter method which imposes cycle symmetry shows an average cycle duration of 3 quarters from peak to trough while the BBQ method which does not impose any symmetry shows an average cycle duration of some 23 quarters.

Table 2.1
Average duration of cycles in quarters

Methodology	Peaks to troughs	Troughs to peaks
HP filter	10	13
BBQ	3	26

In most identification methods, various *ad hoc* rules are adopted to prevent the identification of pseudo turning points. Thus, in the application of HP and BP filters a certain time period for cycle duration is set (3–5 or 4–6 years for HP filters, and 6–32 quarters for BP filters — see, for example, Baxter and King, 1995; Cooley and Prescott, 1995), with these time periods changing depending on the countries being studied. The BBQ approach, too, generally imposes various controls, so-called censoring rules, to achieve the same results. One of the most important of these rules is the specification of the duration of cycles. For example, the movement of economic variables in a certain direction needs to be longer than 5 months or 2 quarters to constitute a given phase of a cycle, and a minimum of 15 months or 5 quarters for the completion of both up and down phases (see Harding and Pagan, 2006). These rules in fact introduce a loose periodicity into the model, which in turn excludes the possibility that cycles might exhibit durations greater or less than those periods. Harding and Pagan (ibid., p. 4) have argued that the rules are not always necessarily imposed because their rigidity make it "much harder to formally analyse the statistics produced".

It has been recognised in the literature on cycle identification that different approaches give rise to different numbers of cycles identified for the same time period. Zarnowitz (2007, p. 4) notes that in studies of cycles of the U.S. economy between 1948 and 1960, those using the growth cycles approach were found to identify many more cycles than those using the (modern) classical cycle approach. The reason for the large number of cycles identified by the growth cycle approach is its underlying conception of cycles as any alternating sequence of expansionary and contractionary economic activity. The even greater frequency of the identified cycles by the growth rate cycle approach is due additionally (i.e., in addition to the underlying conceptualisation of the cycle as any fluctuation in economic activity) to the use of growth rates — growth rates being more sensitive to all manner of random events (see Zarnowitz and Ozyildirim, 2006). The

nature of the problem can also be appreciated through the application of the various cycle methods referred to above to U.S. data for the period Q1 1950 to Q4 2016. What this shows is that, while the application of modern classical cycle methods leads to the identification of 9 cycles over this period, that of the growth cycle approach leads to the identification of 11 cycles,[21] and the growth rate cycle approach to 26 cycles.

It needs to be noted that this identification of frequent cycles contradicts the underlying conception of the economy as fundamentally stable. While shocks could be understood to have a bearing on certain fluctuations in developing countries, since their economic system is unstable and uncertain, it is difficult to make sense of how and why regular fluctuations occur in advanced economies, especially economies as large and developed as the U.S. This begs the question whether or not these cycles are inherent to the workings of the system.

A final observation regarding the various mainstream methods of cycle identification is that they seem to be at odds with the implicit conception of cycles underlying their analyses, i.e., cycles as random and non-regular movements in economic activity. Specifically, it is apparent that many of these identification methodologies assume that cycles are recurrent and occurring at regular intervals, notwithstanding the fact that fluctuations/cycles are deemed to emanate from random shocks. For example, in his study of growth cycles in advanced economies, Prescott (1986, p. 10) stated that "we follow Lucas (1977, p. 9) in defining business cycle phenomena as the recurrent fluctuation of output about trend.…". Similarly, when reviewing fluctuations in the real GNP (Gross National Product) of the U.S. economy in the post-Korean war period, Kydland and Prescott (1990, p. 9) refer to the "consistent patterns in these numbers as business cycle *regularities*". In fact, the HP and BP filters which are applied to the data by growth cycle analysts are designed to find a regularity in their occurrence, which also implies their recurrence. Hodrick and Prescott (1997 p. 2) argue that their filter is designed to find "some interesting regularities". Similarly, the BP filter is designed to "extract a specified range of periodicities" (Baxter and King, 1995, p. 3) in the observed variables. In such a system, either deterministic or stochastic regularities in terms of the occurrence of events, including those arising from certain assumed underlying causal relationships, are presupposed. These are so-called event regularities (see Lawson, 1997, 2003; Downward, 2002; Lawson in Hirsch and DesRoches, 2009, pp. 104-5). From the ontological

point of view, a number of authors, mostly from the Heterodox school of thought, have questioned the existence of event regularities of the type implied by growth cycle studies. Tony Lawson (2012, p. 4) has argued that such regularities are usually either "*a prior* constructions or *a posterior* observations" in mathematical modelling.

2.3.2 Global cycles

Compared with generic cycle identification, there is a relative dearth of studies on global cycle identification. Of course, in part, and as mentioned above, there is no consensus regarding the existence of such a phenomenon. To the extent that there are such studies of this phenomenon, the focus tends to be on the synchronisation of individual country cycles.

Most studies of global (and international) cycles use real GDP data since these data are widely available for all countries. A few studies use other variables including industrial production, consumption, retail sales etc., attempting to capture the movement of aggregate economic activities as is the case of the NBER's identification of the U.S. cycles (see, for example, Kose et al., 2008a; Aruoba et al., 2011). However, this is not the common practice in studies of global cycles quite simply because these data are not readily available for all countries.

The countries included in global cycle identification studies vary across studies in terms of number, geographic coverage and nature of the countries included (see, for example, Gregory et al., 1997; Kose et al., 2003a; Kose et al., 2008a, 2008b; Aruoba et al., 2011; Berge, 2012; Bernaji et al., 2012; Diebold and Yilmaz, 2015). The number of countries ranges from a few to around 100. The majority of studies typically include one or more of the G7 economies in their analysis, and largely neglect developing countries. Where developing countries are brought into the analysis, they are for the most part what are referred to as middle-income developing countries. Little or no attention is paid to the particular characteristics of the countries included in the analyses.

The majority of studies typically use non-aggregated data for each country. Very few studies develop composite series, and where they do, these are typically weighted series with weights based on GDP at market prices or purchasing power parities. As in the case of generic cycles, cycles are typically identified through the construction of trends or the derivation of cycle turning points (see, for example, Bordo and Helbling, 2003).

What is readily apparent is that the methodologies adopted to identify global (and international) cycles are, as with generic cycles, quite varied. They can be classified into the following four types. The first, and the simplest, identification method of global cycles is the level of growth rates in composited series. The cycle dates, especially global contractions, are defined relative to a certain threshold of the growth rates, with the most widely used threshold level being 3% (see IMF, 2002; The Economist, 2008; Davis, 2009).[22]

A second identification method, and one favoured by increasing numbers of researchers, uses econometric models to identify the cycle. Particular favourites among such models are the factor models, including the dynamic factor model and Bayesian dynamic latent factor model (see, for example, Gregory et al., 1997; Kose et al., 2008a).[23]

A third identification method involves the discovery of synchronised turning points across several countries. This is, obviously, an extension of the modern classical cycle identification approach using BB/BBQ methods. One of the most extensive studies of the global cycle using this method is by Bernaji et al. (2012). This study attempted to establish 'world synchronised' business cycle dates by identifying cycle turning points in aggregated data series pertaining to a cluster of countries, and in a single series in a form of a composite index — the so-called world coincident index. Another similar identification method, which also attempts to identify synchronised cycles by identifying turning points, makes use of a so-called concordance index. Although this method does not formally claim to be identifying global cycles, it is widely used to establish the degree of synchronised movements of similar variables in different countries (see Harding and Pagan, 2002a, p. 370; Nadal-De Simone, 2002; Bordo and Helbling, 2003; Moneta and Rüffer, 2006). In this regard, it is similar to the well-known Pearson correlation contingent coefficient.

A fourth methodology, which also does not purport to identify a global cycle, but does attempt to identify cyclical co-movements between countries, is one which uses correlations (see, for example, Baxter and Stockman, 1989; Backus et al., 1992; Bergman et al., 1998; Agénor et al., 2000; Heathcore and Perri, 2002; Bordo and Helbling, 2010; Rand and Tarp, 2002). Correlations can be regarded as positive and negative, and sometimes expressed as pro-cyclical/synchronised (and positive when the movement is together), countercyclical/decoupling (and negative when

the variables move in opposite directions) and a-cyclical (when there is no correlation).

What emerges from these studies is a general consensus that global cycles, at least in the sense of synchronised movements of countries, do exist (see, for example, Gregory et al., 1997; Bordo and Helbling, 2003, 2010; Aruoba et al., 2011). However, the majority of studies see major fluctuations in the extent of synchronised movements between countries, especially among the advanced countries (see, for example, Kose et al., 2008b; Mumtaz et al., 2011).[24] In addition, those studies that identify the existence of global cycles generally tend to focus their studies on the co-movement of advanced country economies. Indeed, when it comes to developing countries, there is generally no consensus regarding their synchronised movement with other countries, even the advanced countries. Thus, while Agénor et al. (2000) and Male (2010a) conclude that advanced and developing country cycles move in a near synchronised way, Kose et al. (2003b, 2008b) suggest that they are largely independent of one another (see also Du Plessis, 2006; He and Liao, 2012; Poměnková et al., 2014). There are also mixed results for movements of developing countries in certain regions. A number of studies deny any synchronised movement of countries in the Latin American region (see, for example, Mejía-Reyes, 2000; Aiolfi et al., 2006), while a number of studies suggest the existence of synchronisation in the East Asian region[25] (see, for example, Moneta and Rüffer, 2006; Imbs, 2011). There are several obvious reasons for the different results obtained by different studies. Aruoba et al. (2011, p. 7) note some of these, including "country coverage, sample periods, aggregation methods used to create country groups, and econometric methods employed in the case of advanced countries studies". Another important reason could be the different aims of the research. Most of the studies in which synchronisation is analysed are not fundamentally about synchronisation, but about the explanation of other phenomena, including the transmission of economic impulses between countries.

Many of the problems with the methods used for the identification of global cycles are the same as those noted with regard to their use in the identification of generic cycles. There are, however, additional problems with these methods which merit mentioning. Firstly, many studies use only limited numbers of countries in their analyses, and give weight to the largest of these in their samples. Second, there is a marked absence of the use

of composite data series. The use of the latter is important because it suggests that the phenomenon being studied is one of an integrated whole. For example, if a global cycle can indeed be deemed to exist such that the economies of all or most countries comprising the global system move in the same direction at the same time, this should be evident from the movement of an appropriately constructed composite indicator, such as the non-weighted real growth of all economies comprising the global system. Third, there appears to be no strong association between the underlying conception of global cycles and the methodology used for their identification, in much the same way as is the case with generic cycles. That is to say, the empirical methods used to identify global (or international) cycles assume the synchronised cyclical movements of countries and the recurrence of this movement, even though the implicit view of cycles underlying most of these analyses is that cycles are the product of random, country-specific shocks. Fourth, the methodologies do not allow for structural change in the global economy over time.

There are also a number of specific problems with the preceding methods which need to be noted here. Firstly, with regard to the simple growth rate approach, there appears to be no theoretical justification for the use of 3% as the threshold rate. A number of authors have pointed to the arbitrariness of this type of approach and questioned the identification results based on it (see Bernaji et al., 2012). Second, the econometric approach makes cycle identification insensitive to structural changes in the global economy and shifts in the relative size and economic power of the countries included in the analyses. Third, the problems associated with the identification of turning points in generic cycles emanating from the different Lambda values used are compounded when it comes to global cycles, since the countries that are included in what is perceived to be the global economy also vary quite considerably between researchers. Lastly, the use of correlation coefficients in the identification of the synchronised movements of countries over short periods of time needs to be handled with a certain degree of caution since they tend to be very sensitive to short- and medium-term deviations between series (see Gayer, 2007).

2.3.3 Individual developing country cycles

Those studies that seek to identify cycles in individual developing countries typically adopt one or other of the approaches and corresponding methodologies discussed with regard to the identification of the generic

cycle. The most common of these are the growth cycle and modern classical cycle approaches and their corresponding methodologies to identify cycles, viz., the HP/BP filters, and BB/BBQ approaches, respectively.

The data used for the identification in most individual country cycle studies are real GDP. A few studies have used other measures of real economic activity such as those used by the NBER and others proxies for GDP such as industrial production (see, for example, Agénor et al., 2000; Calderón and Fuentes, 2011; Du Plessis, 2006; Male, 2010b). The justification for use of industrial production comes from the fact that countries which have a proportionately larger agricultural sector tend to have more volatile movements in their GDPs due to the influence of exogenous factors such as weather on the growth of these sectors, thus distorting the cyclical picture which emerges from using GDP (see also Rand and Tarp, 2002; Male, 2010a). Some studies which use real GDP also use other variables as a sort of check on the tendencies depicted by trends in real GDP. These other variables include consumption expenditure, industrial production, net exports, interest rates, the trade balance, etc. (see, for example, Stockman, 1990; Agénor et al., 2000; Rand and Tarp, 2002; Neumeyer and Perri, 2005; Dabla-Norris et al., 2010).

The number of developing countries chosen for cycle identification varies between studies. Most studies cover less than half of developing countries. The criterion for the selection of countries to be studied is primarily the availability and quality of data. Additional criteria include, for example, size, income level, openness, stability and investability (see Agénor et al., 2000; Calderón, 2007; Moneta and Rüffer, 2006; Aguiar and Gopinath, 2007). As a consequence, country and regional coverage is far from balanced, with countries from the Asian and Latin American regions featuring most prominently in cycle studies of developing countries. In recent years, there have been increasing attempts to include developing countries from other regions in cycle studies (see, for example, Kose et al., 2003b; Kose and Prasad, 2010; Cashin et al., 2012 for MENA countries). It is also apparent, as noted earlier, that most studies focus on middle- and high-income, as well as more industrialised, countries with the presumption being that cycles exist in these countries. It is noteworthy that studies on developing countries often exclude large, important developing economies, such as China and Russia, due to availability of data and perceptions that these economies do not behave like normal market economies. One problem with the nature of the coverage of countries in cycle studies

of developing countries is the perception that those chosen can be seen as representative of all developing countries, or at least those found in a given region (see, for example, the title of the study by Aguiar and Gopinath, 2007).

In the literature on the nature of cycles in developing countries, most attention is paid to the amplitude or volatility of cycles, i.e., the deviation from the trend after the shocks have been deemed to have hit the system.[26] The amplitude of cycles is generally obtained by the different methodologies related to the identification approach. For those adopting a growth cycle approach, the standard practice is the application of filters and the computation of the standard deviations for the resulting data (see, for example, Agénor et al., 2000; Rand and Tarp, 2002; Aguiar and Gopinath, 2007) or the application of various statistical methods to analyse the raw data directly (see, for example, Kose et al., 2003a, 2003b;[27] Neumeyer and Perri, 2005). Amongst those following the modern classical cycle approach, some make use of the concordance index referred to above, which measures the change in economic activity in complete cycles — see Du Plessis (2006) and Male (2010a) — while others take the difference between phases — trough (peak) to peak (trough) — Calderón and Fuentes (2011) — to identify cycles.

Regardless of differences between studies in terms of the choice of countries, time periods and variables, most growth cycle studies find that cycles in developing countries are more volatile than in advanced countries (see Agénor et al, 2000; Cashin, 2004; Neumeyer and Perri, 2005; Aiolfi et al., 2006; Du Plessis, 2006; Male, 2010a). A number of studies have also found that volatility of some developing countries has declined as they have become more integrated into the global economy. For example, the study by Kose et al. (2003a) found that, for the period 1986–2002, the volatility of a number of developing countries in terms of output, investment and consumption declined as a result of their increased integration into the global economy. A few studies also point to regional differences. Male (2010a), for example, shows that the amplitude of cycles in Asian countries during the expansion phase is greater than in other regions, and their contractions relatively smaller, while Calderón and Fuentes (2011) show the contractions in Asian countries to be greater than in Eastern Europe and Latin America.

One problem shared by all studies is with respect to the quality and availability of the requisite data — hence the tendency of some researchers

to substitute industrial production for GDP data. However, there are good reasons to doubt whether industrial production reflects aggregate economic activity (see NBER, 2010b). Moreover, there is a tendency for those researchers using industrial production to choose more industrialised developing countries to test for the existence of cycles, thereby biasing their sample and distorting the general findings of their research on developing countries.

Another problem which afflicts most of the studies seeking to identify cycles in developing countries is that little or no attention is paid to distinctions between these countries in terms of their structures of production, viz., the extent of their dependence on agriculture, services, raw material production and the like. In this context, a number of researchers studying the nature of cycles in developing countries tend to give the impression that the results of their studies of a selection of developing countries are applicable to all developing countries without qualification.[28]

In identification studies using HP and/or BP filters, little or no attention is paid to the derivation of the appropriate parameter value for the de-trending of the data, say with reference to the particular characteristics of the developing country being studied, and changes in these characteristics over time. As a result, the entire cycle identification exercise looks suspiciously like a data-fitting exercise, especially given the absence of a reference cycle. Moreover, it is not often recognised in studies using these filters that the choice of one or other filter biases the identification results in one direction or another. Specifically, the use of the HP filter biases the identification results in favour of high volatility, while the BP filter does the opposite. Thus, as Agénor et al. (2000) explain, the use of the HP filter gives rise to higher cycle amplitudes because it tends to eliminate low-frequency cycle variations, and, since the BP filter takes out high-frequency cycle variations, the estimated volatility it gives rise to is smaller than that of the HP filter.

A major problem with the application of the BB/BBQ method in the identification of cycles in developing countries is that it causes analysts to miss cycles in those developing countries which are experiencing rapid economic growth, and/or to mistake fluctuations for cycles in these countries. The source of the problem is, on the one hand, the use of censoring rules leading to a missing of turning points, and, on the other hand, the absence of any clear-cut criteria for distinguishing between recessions and slowdowns. Du Plessis (2006) recognises these problems and seeks to

overcome them by eliminating the trend component in fast-growing economies in the manner of Harding and Pagan (2001). However, as discussed in the generic cycle section, the trend component should be seen as a part of the identification. For the study of the nature of cycles, in particular for the amplitude, due to the censoring rules, the BB/BBQ method rules out smaller than usual movements in cycles (see Zarnowitz, 1991, p. 10). Also, it is apparent the amplitudes derived will change if the selected turning points are varied. This in turn implies that the identification process (and the definition of cycles underlying this) already conditions findings on the nature of cycles.

In most studies of the nature of cycles in developing countries no explanation is provided for why duration and amplitudes of cycles should be of a certain magnitude, why and how they might change over time, why they would be greater than those in advanced countries and whether (and how) the differentials might change over time. What we are left with is a series of empirical observations with various *ad hoc* explanations attached.

An important omission in approaches used to identify cycles in developing countries is that they pay no heed to the global cycle as the point of reference for their identifications. Indeed, developing country cycles are only identified with reference to an idealised advanced country cycle (see, for example, Agénor et al., 2000; Male, 2010a). This seems at odds with the observed reality of cycles in developing countries being fundamentally conditioned by global forces, albeit largely dominated by advanced countries.

Finally, studies attempting to identify cycles in developing countries, like those attempting to identify generic and global cycles, tend to overlook or disregard their implicit conceptualisations of cycles as the result of random shocks. Thus, many of these studies conceive of the timing, duration and amplitudes of cycles as similar notwithstanding the fact that they are hypothesised (implicitly or explicitly) as resulting from random shocks.

2.4 Drivers of cycles

The purpose of this section is to consider literature on the drivers of cycles,[29] and in particular the country drivers of global cycles as well as the internal versus external drivers of cycles in developing countries. The literature to be reviewed regarding the country drivers of global cycles is

basically that literature which accepts the existence of the phenomenon of the global (or international) cycle and seeks to explain its drivers in terms of the key country or countries responsible for its movement. The literature to be reviewed with respect to the drivers of cycles in developing countries is that which focuses on the debate over whether these drivers can be considered to be fundamentally domestic or external to the developing country being analysed.

2.4.1 Global cycles

Following the general mainstream view of shocks as the drivers of cycles, it should come as no surprise that most studies of global cycles tend to emphasise the role of external shocks (shocks emanating from outside of the system) in generating these cycles.[30] The shock which triggers global cycles is perceived to be either a common shock affecting all countries at the same time and in the same manner, or a specific shock that hits one or several large economies and is then transmitted to the other economies. Most studies accept that globalisation has increased the interconnectivity between countries, and, therefore, the speed of transmission of shocks between countries, with the trade channel being singled out as one of the main transmitters of shocks (see, for example, Frankel and Rose, 1998; Kose et al., 2008a). Indeed, there is an ongoing debate in the literature about whether recent increases/decreases in global trade have had a bearing on the extent and speed of transmission of cycle impulses between countries (see, for example, Krugman, 1991, 1993; Kose and Reizman, 1999).

The majority of studies explain global cycles as resulting from shocks emanating from the advanced economies, especially the U.S., and transmitted to other countries via various channels, especially the above mentioned trade channel. Many studies either find that the global cycle is indeed driven by cycles in the advanced economies, particularly the U.S., or simply assume this to be the case. For example, Kose et al. (2003a, p. 1229) find: "because the world factor is identified by a positive factor loading for U.S. output growth, there is a sense in which what is good for the United States is good for the world". Krugman (2016) argues that recessions in the U.S. appear to transmit to other countries, while a number of authors have questioned whether the U.S. alone can be held responsible for global expansions and contractions in an era when the balance of economic power appears to be shifting away from it (see, for example, Bernaji

et al., 2012). What is perhaps even more contentious is the nature of the alleged shocks hitting the advanced economies in the first place. In fact, a wide array of shocks are employed in different studies to explain shocks emanating from the advanced economies and transmitted to the global economy including, for example, productivity, and fiscal and monetary shocks.

One problem with the above explanation of drivers of global cycles is the notion that global cycles, like cycles in general, can be seen as random events. Indeed, the apparent recurrence and certain periodicity of these cycles belie the view that they can be seen as random events, the product of exogenous shocks to the system, whether these are common or emanate from the dominant economies. One consequence of the shocks approach is that it has given rise to all manner of *ex post* explanations of global cycles, without much theoretical rationale or logical consistency in the explanations. Thus, while certain global cycles are attributed to shocks such as major changes in oil prices, similar such shocks occurring at other points in time are (implicitly) seen as not having similar global cycle consequences — but without any explanation being offered as to why. Similarly in the case of shocks allegedly emanating from advanced countries: these are sometimes seen as due to excessive expansions in money stock and at other times as productivity changes or fiscal excesses, without any explanation as to why similar shocks occurring at other periods of time do not generate similar cyclical movements in the economies in question and the global economy.

A further drawback of the shocks approach to the explanation of cycles is that it tends to deter any analysis into the dynamic elements of GDP which drive it. Specifically, it discourages consideration of the importance of industry, and specifically manufacturing, in driving GDP, and, therefore, global manufacturing in driving global GDP. For many non-mainstream economists, manufacturing is of pivotal importance in explaining both the trend and cyclical movement of GDP. A number of these economists take as their point of departure the work of the great Cambridge (U.K.) economist, Nicholas Kaldor. Kaldor developed what has come to be known as Kaldor's growth laws in which he associated rapid economic growth with a rapid growth of the manufacturing sector (Kaldor, 1966; see also Verdoorn, 1949; Thirlwall, 1983, 1986; McCombie, 2006; McCausland and Theodossiou, 2012). The implication of this for understanding the country drivers of global GDP is that emphasis should be

placed on the growth of the largest manufacturing producers in the global economy and not simply the largest economies *per se*, although there should be a considerable overlap between the two.[31] It is important to note that although for most countries the service sector accounts for a much larger share of aggregate GDP than manufacturing, this does not mean that this sector is the principal driver of economic growth.[32] Indeed, as Kaldor (1966, 1967) has shown, the contribution of this sector to growth is proportionately much smaller than its relative share of GDP, suggesting that causality runs from manufacturing to service sector growth and not *vice versa*.

2.4.2 Individual developing country cycles

It should also cause little surprise to learn that the majority of studies of drivers of cycles in individual countries also focus on shocks as the source of these cycles. Needless to say, there is little or no consensus as to the exact shocks which can be considered to drive the cycle, or even whether these emanate from within or outside of the country in question. Examples of the shocks identified include: productivity shocks (Kydland and Zarazaga, 2002; García-Cicco et al., 2010); commodity price shocks (Collier and Gunning, 1999); terms of trade shocks (Mendoza, 1995; Kose and Reizman, 1999; Broda, 2004; Hoffmaister and Roldos, 1997); and natural disasters (Hochrainer, 2009). Some authors distinguish between internal (domestic) and external (global or international) shocks, permanent and transient shocks, country- and industry-specific shocks, and real and monetary shocks (see, for example, Chang et al., 2002; Ahmed et al., 2005; Edwards, 2006; Raddatz, 2007; Al-Jawarneh and Sek, 2012).

For shocks to developing countries seen as emanating from the global economy, the emphasis is placed on certain individual, or groupings of, advanced countries, with the transmission channel being for most part the trade channel. Studies emphasising external shocks sometimes refer to domestic cycles as 'imported business cycles' (see Canova and Dellas, 1993). These studies focus on large advanced economies as the main drivers of cycles in the developing countries (see, for example, Dornbusch, 1985; Calvo et al., 1993). As noted above, particular emphasis is placed on the U.S. as the main driver of cycles in developing countries, and on the various mechanisms by which U.S. cycles are transmitted to the rest of the world, especially developing countries (see Ahmed, 2003; Boschi and Girardi, 2008; Burnstein et al., 2008; Canova, 2005; Comin et al., 2009; Male,

2010a). The reason for the emphasis on the U.S. is its size, being the largest economy in the world. With the rise of China, an increasing number of studies are focusing on its role as a driver of cycles in developing countries (see, for example, Cesa-Bianchi et al., 2012; Duval et al., 2014). Notwithstanding the above, the majority of studies of cycles in developing countries argue that international and global factors are relatively small in comparison to the domestic factors that drive these cycles (see, for example, Kose et al., 2008a; Al-Jawarneh and Sek, 2012).

Most research into drivers of cycles in developing countries, like that on their identification, focuses on Asian and Latin American economies (especially Mexico). The selected countries are unevenly distributed, chosen mainly for data availability and the interest of the researchers, as noted above. Given that the majority of studies are undertaken with the primary aim of identifying the transmission channels of cycle impulses from advanced to developing countries, the selection of countries tends to be biased in favour of those which have strong links with the advanced economies of interest.

The methodologies applied for identifying the drivers of developing country cycles are, for the most part, econometric. These include multivariate time varying models, Vector Auto Regression (VAR) models (including panel and structural VARs), simple OLS models, dynamic factor models, etc. The variables selected for these studies, unlike those for the identification of cycles, differ quite widely, as do, predictably, the time periods chosen.

The first problem with most of the mainstream studies of the drivers of cycles in developing countries is that these drivers are seen as independent of the movement of the global economy. Specifically, while many studies of the drivers of cycles in developing countries point to the importance of the movement of the large economies such as the U.S. and, more recently, China, few, if any, pay attention to the movement of the global economy — i.e., to global cycles. This is, of course, in part because of the absence of a concept of the global economy, but also, and more fundamentally, because it militates against the underlying mainstream explanation of cycles — random shocks.

The second problem with studies of the drivers of cycles in developing countries, as the result of shocks, is that this view of drivers is at odds with the methods used for their identification. Specifically, and as noted above, in many cases these methods assume the cycles to be recurrent and not

the product of random shocks (see the discussion of cycle identification above). Moreover, while there can be no doubting that the economic dynamism of developing countries is more susceptible to shocks than, say the advanced economies, empirical evidence presented below suggests that these countries experience cyclical patterns of growth independent of those caused by random, country-specific shocks.

The third problem, following from the second, is that the shocks approach makes it difficult to distinguish between domestic and external (shock) drivers of cycles in developing countries. The result is that different studies end up with different menus of drivers of cycles (i.e., the different types of shocks discussed above) which tend to be largely *ad hoc* and dependent on the particular factors deemed important by the individual researcher.

Lastly, while a few studies of the drivers of cycles in developing countries do certainly take into account differences in the characteristics of the developing countries (see, for example, Baxter and Kouparitsas, 2004), most do not. Moreover, those that do take account of differences in the characteristics of developing countries do not see their drivers as fundamentally emanating from the global economy — the global cycle.

2.5 Chapter summary

This chapter has reviewed the literature pertaining to the three aspects of business cycles; their conceptualisation, identification and drivers. These aspects of cycles were considered in the context of generic, global and developing country cycles. The main findings of each section are as follows.

The first section of the chapter dealt with the conceptualisation of cycles. It began with a review of basic conceptions of the cycle, i.e., generic cycles. Most researchers agree that at its core such a conception is one of periods of expansion followed by contraction in economic activity, and *vice versa*. It was argued that the general mainstream view of such alternating periods of expansion and contraction is that they are random and non-recurrent. Some mainstream approaches, most notably the so-called modern classical approach, dissents from this view, arguing, in keeping with the overwhelming evidence, and even methods used to identify cycles, that such fluctuations are recurrent and have a certain periodicity. However, they stop short of arguing, in the manner of Classical economists, that

such cycles in economic activity are inherent to the system, leaving open the possibility of seeing them as the product of repeated shocks.

Although there are only a limited number of studies conceiving of global cycles, most of these tend to be based on mainstream approaches and, accordingly, conceive of these cycles as random, synchronised fluctuations in economic activity in a number of countries. The problem, as in the general case of cycles, is that the evidence points to recurrent synchronised fluctuations in economic activity in several countries.

Most conceptions of cycles in developing countries tend to see these, in accordance with views of generic cycles, as random fluctuations in economic activity. It was admitted that this actually accords with the empirical evidence pointing to the large number of random movements in economic activity in many of these countries. However, what was argued here is that this conception fails to distinguish between fluctuations and cycles, with the latter necessarily having to be conceived of with reference to the global cycle.

Table 2.2
Classification of generic cycles for the purposes of identification

Conception	Random fluctuations	Recurrent fluctuations
View	Relative (to trend) expansion/contraction	Absolute expansion/contraction
	Long-term	
Methodology	Filters (HP, BP)	BB/BBQ, Model-free
Type of cycle	Growth cycles	Classical cycles, Growth rate cycles (variant)

The second section of the chapter reviewed the mainstream literature on the identification of cycles. The important approaches to the identification of generic cycles were argued to be the growth, modern classical, and growth rate cycle approaches. Each of these adopts a different methodology to actually identify cycles. The growth cycle approach adopts HP and BP filters while the modern classical and growth rate cycle approaches use BB/BBQ methods (see Table 2.2). Most approaches use real GDP for identification notwithstanding the known problems with this variable,

simply because it remains the best available single variable which captures general economic activity. Many approaches use data transformations and smoothing techniques which, it was argued, eliminate and distort crucial information contained in the actual data. Most approaches identify cycles with respect to trends. Among these, some use filters to separate cyclical from trend movements, others use linear estimation techniques to identify trends. Yet other approaches, e.g., the modern classical approach, identify cycles by identifying cycle turning points. It was argued that there are a number of problems with both approaches, including the large numbers of cycles observed relative to the official NBER reference cycles and, perhaps most fundamentally, the fact that the approaches tacitly assume cycles to be recurrent in contrast to the underlying conceptions of cycles as random events. It was also argued that there are a number of specific problems associated with each of the identification approaches, the most important of which is that a number of them (those using filters) impose a certain symmetry on cycles.

The methodology to identify global cycles is quite eclectic. This is largely due to the lack of a clear conception of global cycles. The majority of existing studies typically attempt to identify synchronisation between the selected economies as the representation of global cycles. Thus, the review of literature focused on the four main methodologies for the identification of synchronisation; the level of growth, econometrics, turning points identification, and correlation analysis. The countries included in global cycle identification vary across studies, and many typically identify the cycles between the advanced economies.

The chapter argued further that, compared to the numbers of generic cycle identification studies, there is a relative dearth of those seeking to identify global cycles. Those that do, focus on the synchronisation of cycles between different countries, mostly advanced countries. The data used in most such studies are GDP data, largely because of issues of availability and comparability. The identification approaches adopted are quite varied and include — apart from those used for the identification of generic cycles noted above — the identification of co-movements between countries. A consensus can be observed across these studies that there is indeed a certain degree of synchronisation between cycles of different countries, but that this is for the most part between the advanced countries, and that the extent of synchronisation tends to vary over time. It was

argued that many of the problems noted with respect to generic cycle identification also apply to the studies of global cycle identification, since similar cycle identification methods have been used. Of particular note in this regard is, once again, the conception of global cycles as recurrent, notwithstanding the implicit conception of these cycles as random and non-recurrent. Other major problems to be noted with respect to global cycle identification are the bias in favour of large countries in these studies, and the absence of any composite data series in the identification procedures.

While studies seeking to identify cycles in developing countries are less common than those for advanced economies, a number of them do exist in the literature on cycles. In these studies, developing countries are typically considered in clusters, with the clustering mostly done according to geographic regions, viz., Latin America, South East Asia, etc. The data are mostly GDP data, but a few studies use GDP proxies such as industrial production, due to the perceived problems with GDP data for many developing countries. The particular cycle identification methods adopted are either the growth cycle or modern classical cycle identification approaches and corresponding methods referred to above. The focus of the identification of cycles tends to be the amplitudes of cycles, with most studies finding the amplitudes of cycles for developing country economies to be greater than those of the advanced country economies. Aside from the problems with these approaches already noted above in the context of the generic cycle identification, the additional problems noted with respect to the identification of cycles in (clusters of) developing countries include: the dubious nature of the GDP proxies adopted; the non-representative nature of the countries included in the clusters; the arbitrariness of the parameter values for studies using filters; the failure of the BB/BBQ methods to identify cycles in strong growth environments; and the failure of most studies to recognise the importance of the particular structural characteristics of different developing countries for cycle identification — characteristics such as level of development and structure of production. This last problem is also evident in the few studies attempting to identify cycles in individual developing countries.

The third and last section of the literature review focused on the drivers of global and developing country cycles, limiting this focus to, on the one hand, the country drivers of global cycles, and, on the other hand, the extent to which cycles in developing countries can be said to be domestically as opposed to externally driven.

It was noted that most mainstream studies of drivers of global cycles see these, as one might expect, to be the product of shocks, with these shocks being either common shocks affecting all countries at the same time and in the same way, or shocks hitting the advanced countries, particularly the U.S., and then being transmitted to all other countries. It was further noted that most of the literature has tended to favour the second of these two explanations of the drivers of the global economy. It was argued that, as in the generic cycle case, the fact that most studies seeking to identify global cycles appear to accept their recurrence as a matter of fact, belies the notion that they can be the result of random shocks. It was further argued that one of the side effects of the shock explanation of the drivers of global cycles (and, indeed, cycles in general) is a failure to investigate further the dynamic element of the GDP composite which drives it, notably manufacturing production.

The chapter argued that, as with generic and global cycles, the drivers of developing country cycles are seen in the mainstream literature as one variety or other of shock, with no clear consensus emerging as to what these shocks might be. Some studies emphasise external shocks, usually emanating from one or another advanced country, while others stress country-specific domestic shocks, with a wide variety of such shocks being cited. The common focus of all these studies is on the transmission mechanisms, and not the drivers as such. However, even with regard to these mechanisms, there is no real agreement as to what they might be.

Further to this, one problem noted with the shocks approach, as with the explanation of drivers of the global economy, is that it contradicts the evidence provided by many of the same studies of recurrence and a certain periodicity of such cycles, corresponding to recurrent cycles in the advanced countries. A second problem is that the shocks approach makes it difficult to distinguish between drivers of cycles as opposed to fluctuations, and, with regard to the former, between domestic and external drivers of cycles. The result of this is that many, if not most, studies of drivers of cycles in developing countries end up with long lists of such cycles, with little or no theoretical logic for their inclusion or prioritisation, and no reference to the movement of global cycles.

Notes

[1] The data were accessed on 7 June 2017. The growth rate data used in this chapter were downloaded from the IMF data base; the name of the variable is 'Gross Domestic Product, Real, Reference chained, seasonally adjusted, Annualized Rate, National Currency'.

[2] It may, for example, be observed that the founders of both Classical and modern Neoclassical commodity price theory claim to have arrived at their conceptions of how markets work from their empirical observations of how commodity prices are formed and move in various product markets. See, for example, Marx Capital III for the Classical approach (Marx, 1981), and Menger (2007[1871]) for the Neoclassical.

[3] For more details on the notion of path dependency, see Kaldor (1934), Robinson (1974) and Setterfield (1998).

[4] Zarnowitz (1992, p. 232) suggests: "[t]here is much support for the notion that business fluctuations are just random deviations from growth trends".

[5] Although the term 'growth' is frequently seen as pertaining to output growth (i.e., typically real GDP), it is called a 'growth cycle' because of the view of business cycle theorists that "*growth* and *fluctuations* are not distinct phenomena to be studied with separate data and different analytical tools" (Cooley and Prescott, 1995, p. 4; see also Prescott, 1986).

[6] Studies on such fluctuations have increased significantly in number and influence over the last 30 years in the area of business cycle studies.

[7] In 2012, ECRI recorded 47 cycles in the previous 222 years (see ECRI, 2012).

[8] It is widely accepted that there is a regularity in the movements of many macroeconomic variables (see, for example, Zarnowitz, 1992).

[9] In the present study, this type of cycle is referred to as the modern classical cycle to differentiate it from cycle conceptions of the Classical economists such as Karl Marx (see the elaboration of this point below).

[10] It is often overlooked that Marx is one of the founders of business cycle theory (see Sherman, 1967; Kuruma, 1972).

[11] In his study on the trade cycle, Keynes adopts a similar definition and conceptualisation of the cycle to that of Burns and Mitchell, except that he places particular emphasis on "the regularity of time-sequence and of duration" (Keynes, 1957[1936], p. 313). Subsequent post-Keynesian analyses have tended to discard this aspect of Keynes's cycle conceptualisation and returned to more Classical conceptualisations.

[12] There is good reason to believe that this lack of clarity in the conceptualisation of cycles by Burns and Mitchell was the product of a certain amount of political

pressure, given the close proximity of both, especially Mitchell, to the U.S. administration (see, for example, Friedman, 2014).

[13] These are the U.S., Canada, Japan, Italy, Germany, France, and the U.K.

[14] Such cycles are referred to as national and/or domestic cycles in the literature.

[15] This is also referred to as the 'decomposition' of time series.

[16] A similar, though less popular, technique is the so-called phase average trend or PAT (see Zarnowitz and Ozyildirim, 2006).

[17] Variations of these filters are, for example, the so-called Henderson, Kalman, and Blanchard filters.

[18] This value penalises the variability in the trend components.

[19] There are, however, other approaches which need to be noted, including parametric approaches such as the Markov-Switching model (see, for example, Hamilton, 1989).

[20] To put this into some perspective, it warrants repeating that NBER data and analyses show that cycles are asymmetric and recurrent.

[21] Although the peaks and troughs used for cycle identification in the growth and growth rate cycles are subject to debate, changes in the criteria for their identification do not fundamentally alter the conclusions with respect to the differences in numbers of cycles identified by the different approaches.

[22] A similar study has been conducted by the UBS (Union Bank of Switzerland), setting the threshold at 2.5% of the growth rates (see The Economist, 2008; Davis, 2009).

[23] Variations of the factor model include the dynamic latent factor model (Kose and Prasad, 2010), the generalised dynamic factor model (see Forni et al., 2000), dynamic Markov-Switching model (see Kaufmann, 2000), and the dynamic factor model with time varying parameter (see Del Negro and Otrok, 2008). These are not used for global cycle identification as such but rather the synchronisation between countries and variables.

[24] See also, for example, Artis and Okubo (2008), Koopman and Azevedo (2008), Afonso and Sequeira (2010), Bordo and Helbling (2010), and Aruoba et al. (2011).

[25] Although they differ in their understanding of the starting period of synchronisation. For example, Imbs et al. (2011) see the spark in Asia only since 2008 Q3.

[26] It is worthy of note that researchers on growth cycles rarely refer to the 'amplitude' of cycles.

[27] Kose et al. (2003a) do not explain what types of cycle they employ in their study.

[28] A few authors have cautioned that country specificity is important for understanding the nature of cycles. For example, Zarnowitz (1991, pp. 8–9) states in this

regard that "[t]he nature of business cycles depends on, and changes with, the major characteristics of the economy, society, and polity".

[29] There is a large debate in the existing literature as to whether the cycles are caused by exogenous or endogenous factors. Although this is beyond the scope of the present research (see also section 1.5 above), it does recognise the important contributions that have been made by a number of economists in this area, such as Jevons (1878), Frisch (1967[1933]), Tinbergen (1939), Kaldor (1940), Goodwin (1967), Marx (1981) etc.

[30] For the general definition, see, for example, Gabisch and Lorenz (1987, p. 77). It is typically said that one of the earliest recognised shocks is climate shock, by William Stanley Jevons.

[31] There are large numbers of studies that attempt to apply Kaldor's growth laws to the developing countries (see, for example, Necmi, 1999; Wells and Thirlwall, 2003; Dasgupta and Singh, 2005; Nicholas, 2005; Storm and Naastepad, 2005). These studies are often associated with extensive discussions of structural changes of the economies, particularly the shift from agriculture towards industry (see, for example, Lewis, 1955; Prebisch, 1984; Lakhera, 2016).

[32] For example, Japan's service sector was around 70% of GDP in 2016 (see World Bank WDI data accessed 12 September 2017), while their macroeconomic policies typically focus on industrial production and currency devaluations to promote manufactured exports.

3 Alternative Conceptions and Methods of Identifying Business Cycles

3.1 Introduction

This chapter aims to develop an alternative (to mainstream) conception of business cycles and a corresponding methodology for their identification. The two must go hand in hand: an alternative conception of cycles demands an alternative methodology for their identification, since the former is implicit in the latter.

The cycles of concern in the present chapter are what have been referred to above as generic cycles, global cycles, cycles pertaining to clusters of developing countries, and those pertaining to individual developing countries. The alternative conceptualisation of generic cycles will provide the basis for the conceptualisation of the other three. The methodology which will be developed with respect to the generic cycles provides the basis for the identification of the global cycles, and both of these in turn provide a basis for the identification of cycles pertaining to clusters of developing countries as well as individual developing countries.

The chapter is divided into two parts. The first part is concerned with the development of alternative conceptualisations of the above-mentioned cycles, while the second part is concerned with the development of an alternative methodology for the identification of these cycles. It warrants repeating that the methodology for the identification of cycles needs to be understood in the context of the prior alternative conceptualisations of cycles.

3.2 Developing alternative conceptions of cycles

3.2.1 Generic cycles

The alternative conception of generic business cycles stems from the Heterodox approach referred to in chapter 1, which was implicit in the criticisms of mainstream Neoclassical conceptions reviewed in chapter 2. It needs to be emphasised that, notwithstanding these criticisms, the alternative conception of generic cycles uses those elements of existing mainstream Neoclassical conceptions of such cycles which are deemed to be acceptable, and builds on these in a manner which is argued to be consistent with the alternative methods and approach to the study of economic phenomena outlined in chapter 1.

The alternative conception of generic cycles begins with the core conception of such cycles in the literature as comprising alternating periods of economic expansion and contraction. The criticisms of the orthodox conceptions of generic cycles suggest that the alternative conception needs to recognise that the alternating periods of expansion and contraction should be conceived of with reference to long-term trend movements in the economy. That is to say, the expansion/contraction phase is not the absolute expansion/contraction in economic activity conceived of by modern classical cycles, but rather one of relative expansion/contraction, i.e., relative to the trend. At the same time, and in contrast with most orthodox conceptions, the trend should not be seen as separate from the cyclical movements but rather as determined by these — as their average. There should therefore be an emphasis on the importance of the use of non-linear as opposed to linear trends — the use of linear trends being common in orthodox cycle identification methods, especially of growth cycles. To the extent that such non-linear trends have been conceived of in cycle analyses, they have typically been with reference to longer-term cyclical movements in the economy; so-called long cycles. In this context the present study takes the view that, while the trend matters, an elaboration of its determinants would require an unnecessary digression into a discussion of, among other things, the existence of long cycles. Rather, the point to be made here with regard to the conception of the cycle is that the cyclical movement of the economy needs to be understood as conditioned by long-run economic trends, however these might be determined, while at the same time recognising that the former has a bearing on the

latter. This points to the importance of what some economists have referred to as the **path dependency** of trend movements in the economy (see, for example, Kaldor, 1934; Robinson, 1974; Setterfield, 1998).

The alternative conception of the cycle also needs to recognise that the cycle is recurrent but not periodic or symmetric. That is, cycles recur but not on the basis of any fixed periodicity or according to any particular amplitudes. The fact that cycles are recurrent suggests they need also to be seen as endogenous to the functioning of the economic system — the product of forces which are endogenous to the working of the system and not the result of random economic shocks. This is not to deny that exogenous shocks can have a bearing on cycles, since quite clearly they do. Rather, they cannot be seen as triggering *repeated* cycles, even though they can be seen as triggering major upward or downward movements in cycles at isolated moments in time. In fact, their significance for the movement of the cycle needs to be understood as depending on the juncture of the cycle at which they occur. For example, a negative exogenous shock to the system (in the form of exceptionally bad weather, for instance) would have a more muted downward influence on economic growth if it occurred in the middle of the cycle than if it occurred towards the latter stages, i.e., as the cycle matures. Similarly, a budget deficit or lower interest rates could be argued to have a bigger stimulus effect if implemented in the early stages of an economic recovery than if implemented at the end of a long period of economic expansion. In fact, the difference in timing of the implementation of such policies will most likely have very different economic consequences apart from that on economic growth, most notably with respect to inflation.

That cycles are conceived of as not periodic or symmetric means that no two cycles can be seen as being identical. This should not, however, be interpreted as the result of cycles having different root causes — different exogenous shocks; rather, it is because the actual recurrent cyclical movement of the economy is conditioned by very different factors at different points in time, including the state of the economy, economic policies, etc.

Lastly, and as implied by the preceding, cycles need to be distinguished from fluctuations and general disturbances or noise effects. Fluctuations are random, non-recurrent, alternating periods of expansion and contraction, or *vice versa*. They are the product of exogenous shocks to the system. Cycles do not preclude the phenomena of shocks, much as they do not preclude the latter having a bearing on them. Moreover, although shocks

have a bearing on cycles, the cycles in turn condition the shocks. That is, fluctuations are logically of a shorter time duration than cycles, while possibly having a greater amplitude and being less symmetric than cycles. Just as the nature of shocks can vary, so can the resulting economic fluctuations generated by them. However, all things being equal, their consequences for the cyclical movement of the economy will depend on the particular cyclical juncture at which they occur. Similar magnitudes of shocks will result in larger or smaller fluctuations with corresponding upside or downside biases (i.e., a greater upward or downward movement than the preceding downward or upward movement) depending on the phase of the cycle in which they occur. As noted in chapter 2, one consequence of the association of fluctuations with cycles in the orthodox literature is the tendency to mistake a 'double-dip' recession for two distinct cycles. Another is the tendency to mistakenly identify any downward movements in the economy with a cyclical downturn. More generally, it is to see cycles where none exist. Such misperceptions, it was noted in chapter 2, have serious implications for policy and business decision making. Noise effects, in contrast, are inherent to most macroeconomic activity, and are manifest in most macroeconomic data series including growth rate series. They are readily differentiated from cycles, and even fluctuations, due to their relatively short periodicity and low amplitudes. They are even allowed for in standard regression analyses, by testing for the existence of non-determinate relationships.

Although general conceptualisations of cycles, particularly non-mainstream ones, also attempt to conceptualise particular phases of cycles, including so-called crisis phases, the present study does not seek to do this since, as noted above, even if one is able to unambiguously conceptualise the different phases of cycles, including their crisis phases, their identification would tend to be quite problematic. The reason for this, as the literature review makes clear, is that once it is accepted that cycles are non-regular and non-symmetric, it is unclear that particular phases of cycles can be expected to repeat in the same manner, or even repeat at all.

Figure 3.1 and Figure 3.2 depict the various elements of the alternative conception of the cycle referred to above. Figure 3.1 shows the alternating periods of expansion and contraction phase, its movement around a trend, and its non-symmetric nature. The expansion phase (the white shaded area) begins at the point where the growth rate goes above the non-linear

trend and is shown by the area to the right of the green dot. The contraction phase (the light beige shaded area) starts when the growth rate falls below the trend and is shown by the area to the right of the pink dot. The expansion phases of cycles are conceived of as being typically longer than the contraction phases, but how much longer will depend on the underlying trend. The expansion and contraction phases are shown as themselves comprising sub-phases pertaining to growth rate accelerations/decelerations and subsequent decelerations/accelerations. This means the expansion phase consists of acceleration and deceleration sub-phases. The contraction phase is similarly divided into a growth rate deceleration phase followed by an acceleration phase. The deceleration sub-phase could end with a protracted recession or even an abrupt rupture in the system (a sudden fall in the growth rate), typically referred to as a crisis.

Figure 3.2 illustrates the difference between cycles (solid line) and fluctuations (dotted line), with the latter shown as conditioned by the former. Of note in this regard is that the upward part of the fluctuation labelled as 1-a is shown as occurring in the upward phase of the cycle and as being greater than the ensuing downward movement of the fluctuation labelled as 1-b, while the downward portion of the fluctuation labelled as 2-a is shown as occurring in the upward phase of the cycle and as being smaller than the ensuing downward movement of the fluctuation labelled as 2-b. This Figure also depicts the existence of so-called 'double-dip' growth rate movements at the trough of the cycle, which is a short-lived recovery as a part of contraction and often leads to confusion with respect to the use of turning points in the identification of cycle bottoms (see below).

Figure 3.1
The alternative conception of generic cycles

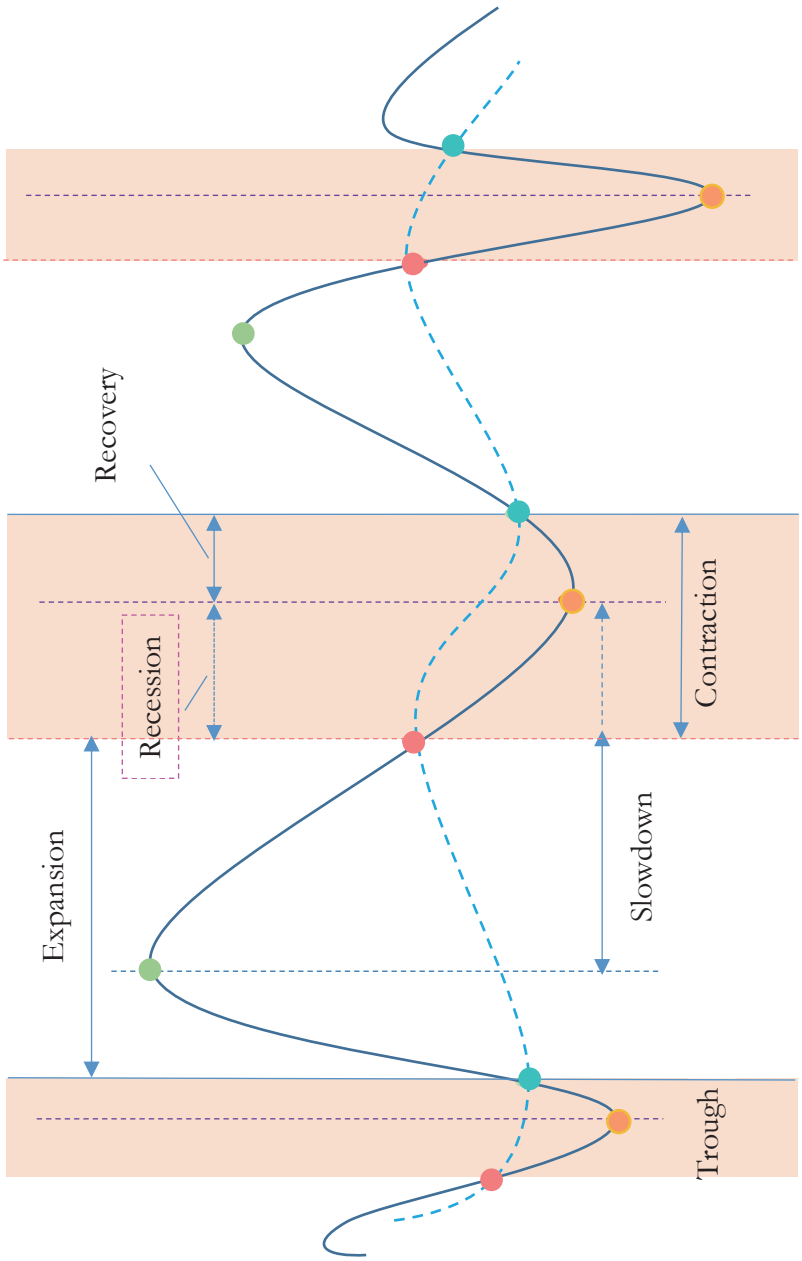
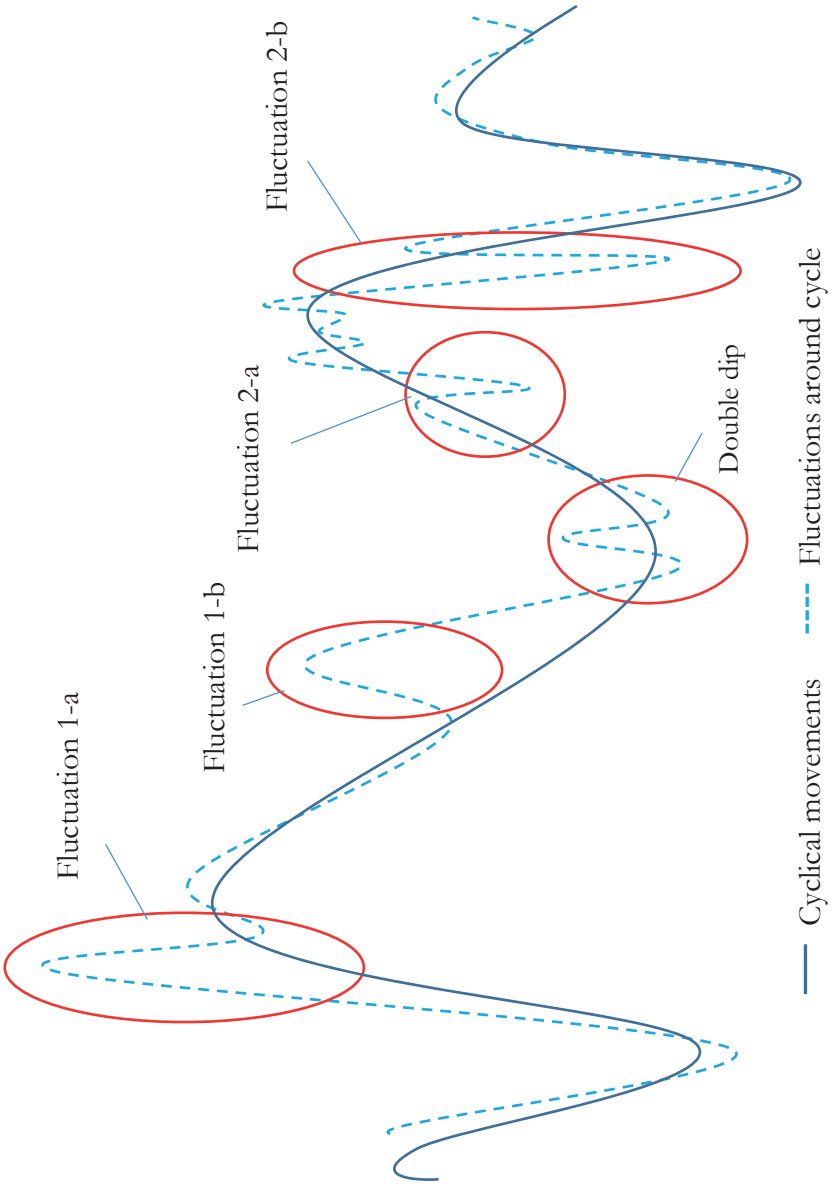


Figure 3.2
Fluctuations and cycles



3.2.2 Global cycles

As noted in the preceding chapter, there are few conceptualisations of global cycles in the literature, notwithstanding the observed synchronised cyclical movement of different economies and groups of economies — hence, the need for such a conceptualisation. Given the dearth of literature on the global cycle, its conceptualisation, unlike that of the generic cycle, cannot be based on an explicit critique of corresponding mainstream conceptualisations, but should instead be informed by an extension of the above alternative conceptualisation of generic cycles.

Obviously, the point of departure for the conceptualisation of global cycles should be the synchronised and recurrent, but non-periodic and non-symmetric, expansion and contraction of economies comprising the global economic system. In a similar manner to the conceptualisation of the generic cycle, the expansion and contraction phases of the global economic cycle should be conceived of with reference to long-run trend movements in the global economy, and the source of these cycles seen as endogenous to the functioning of the global economy. Although the global economy can most certainly be accepted as comprising individual countries, and its movement even dominated by certain of these (see below), it needs to be understood as having an existence which is independent of its constituent countries; as such, it is seen as exerting an influence on all of these countries, albeit to different degrees depending on their size, structure, level of development and integration into the global economic system. As the literature review makes clear, the growth of the global economy should be seen as dominated by the growth of the largest manufacturing economies and not the largest economies in terms of their size *per se*. What constitutes the largest manufacturing economies in the global economy has been undergoing a considerable change in the recent past with the rise of the Japanese, South Korean and Chinese economies, as global manufacturing powerhouses, displacing the more traditional manufacturing powerhouses — the U.S. and European economies.

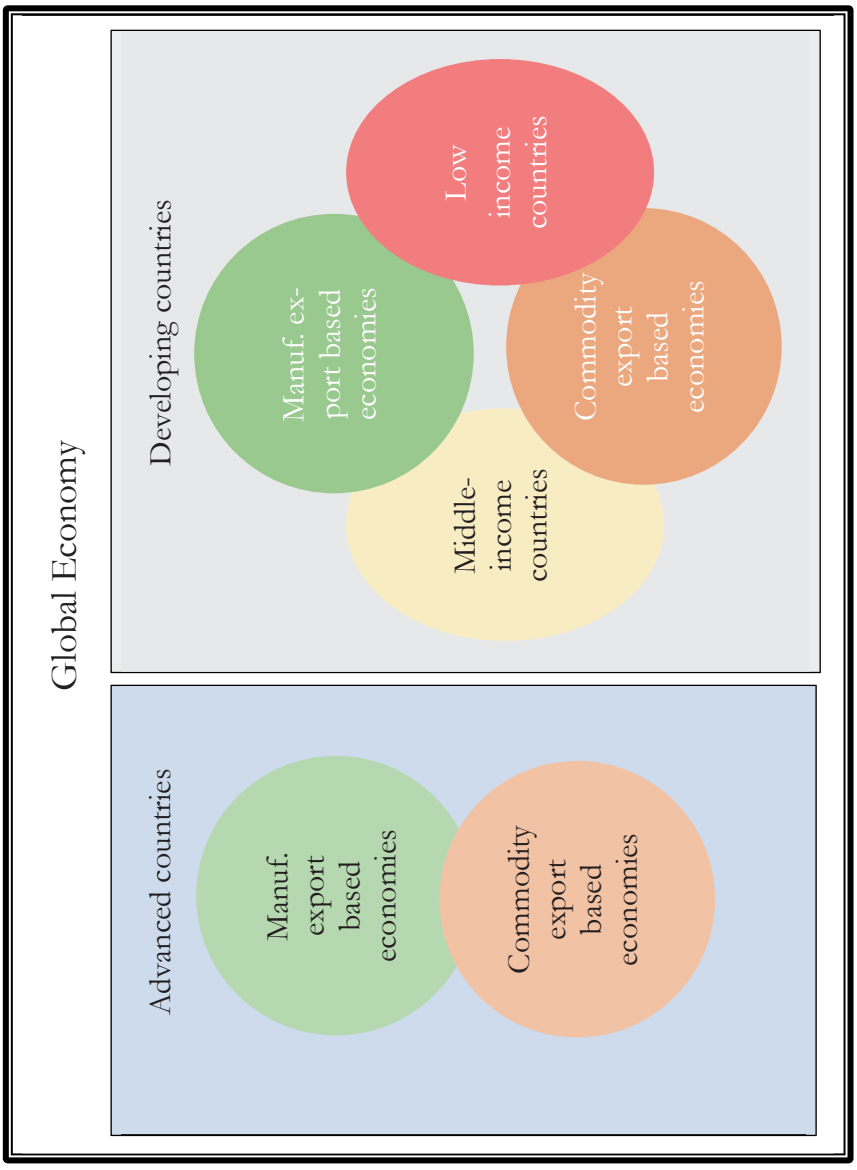
As in the generic case, so too in the case of the conception of the global cycles: their conception is not intended to preclude the existence of fluctuations resulting from shocks having a bearing on the cyclical movement of the global economy, although, as with the generic case, these fluctuations need to be seen as conditioned by the movement of the cycles — the global cycles. For example, large negative shocks to large (manufacturing) economies can be expected to have only a muted negative impact on

the expansion of the global economy when they occur in the upward leg of the expansion phase of the global economy, while having a considerably greater negative impact if they occur either towards the latter phases of the expansion phase or at the early stages of the contraction phase of the global economy. A case in point was the devastating Tsunami that struck Japan in 2011 and its muted consequence for the expansion of the global economy at that juncture.

3.2.3 Cycles pertaining to groupings of countries

The preceding section suggests that one might expect to more readily observe cycles pertaining to groupings of countries in the global economy, especially groupings of developing countries. This is because the aggregation of countries would reduce the 'noise effect' of random individual country growth rate fluctuations. The most appropriate basis for clustering of countries, i.e., those belonging to the global economic system, is arguably their level of development, economic structure, and extent and nature of integration into the global economy. One would expect more advanced, diversified, manufacturing economies to move more closely in sync with the global cycles than less advanced, raw material producers, with the latter also prone to many more fluctuations than the former. Figure 3.3 below depicts the perceived relationship between the cyclical movement of the global economy and that of various groupings of economies within it.

Figure 3.3
Conceptualisation of global economy



3.2.4 Individual country cycles

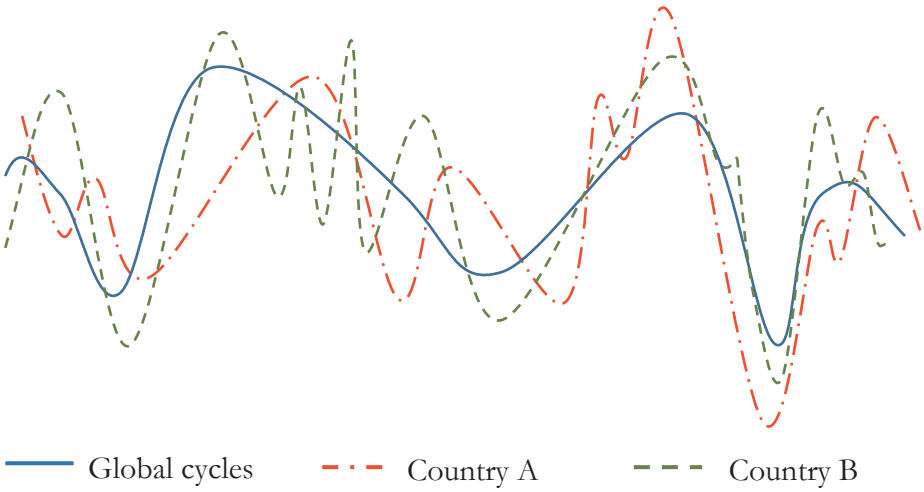
While the conceptualisation of individual country cycles too needs to be based on the earlier alternative generic cycle conceptualisation, their particular conceptualisation should be with reference not only to global cycles but also to the particular characteristics of the country under consideration. That the conceptualisation of individual country cycles needs to be with reference to global cycles logically follows from the view of global cycles as constituting the synchronised cyclical movement of economic growth of all or most countries comprising the global economic system. If such global cycles can be deemed to exist, then it follows logically that the movements of the individual country cycles must be with reference to such cycles. This means that periods of expansion and contraction of real GDP growth of individual countries should be seen with reference to periods of expansion and contraction of the global economy and most of the countries comprising it. That the conceptualisation of individual country cycles needs to pay heed to the particular characteristics of the country concerned is self-evident and needs little further elaboration. The particular characteristics deemed important can be summarised as their levels of development, their economic structures and the extent and nature of their integration into the global economy.

Like global cycles, individual country cycles are non-periodic, non-regular and non-symmetric. They too need to be seen as the result of endogenous forces — that is, endogenous to the functioning of the global economic system of which they are a part — notwithstanding the fact that they can be subject to exogenous shocks giving rise to fluctuations independent of these cycles. The susceptibility of individual countries to exogenous shocks, and the resulting divergence of their growth paths from those corresponding to that of the global economy, should be seen as depending on the nature of the shocks and the particular characteristics of the economies concerned. Less developed economies specialised in the production of a few raw materials can be expected to be more susceptible to exogenous shocks and resulting divergences of their growth paths from that of the global economy than more developed, diversified, manufacturing-based economies.

Figure 3.4 depicts the cycles of two hypothetical countries, A and B. Although these two countries are depicted as having different cyclical movements and as being subject to a number of shocks, their cyclical movements are depicted as being conditioned in the final instance by

global cycles. Thus, the troughs of the cycles in A and B are shown to roughly coincide with those of the global economy and the amplitudes of the fluctuations they experience are shown to be conditioned by the particular phases of the global cycles in which they occur.

Figure 3.4
Global and individual country cycles



3.3 Alternative identification method

3.3.1 Generic cycles

The alternative method of cycle identification, like the alternative conceptualisation of the cycle, begins with generic cycles, and is based on the critical appraisal of the relevant mainstream literature undertaken in chapter 2. The first implication of this critical appraisal for the alternative method of identification of cycles is, as for the mainstream literature, the importance to be attached to GDP at constant prices as depicting the state of an economy, and notwithstanding the well-known deficiencies associated with its construction, especially for poor countries with limited resources for statistical surveys (see the discussion on this point in chapters 1 and 2). However, in contrast with much of the mainstream literature reviewed, it is the rate of change in this variable that is considered to be

important for cycle identification and not its absolute value. This is because, as argued in the literature review, the real GDP growth rate is better able to capture various cycle junctures than any other macroeconomic variable, and is more readily available for longer time periods than any other comparable variable for most countries. It needs to be stressed that particular importance is accorded to the non-transformed real GDP growth rate in the process of cycle identification since transformations of these data make it difficult to interpret their trend movements and use them in the construction of various required composites.

The second implication to emerge from the review of the mainstream literature on cycle identification in the preceding chapter is the importance of trends in the real GDP growth rate and the particular manner of their derivation. While much of the literature either implicitly or explicitly recognises the importance of deriving trends in the identification of cycles, the critical review of this literature argued that such trends should not be captured by any form of linear or parametric estimation method. Rather, the most appropriate method was argued to be long-run moving averages, with the time period well in excess of the duration of the average cycle and a higher weight given to more recent observations in order to provide an early indication of marked trend changes. A simple moving average is arguably one such method that meets these criteria. The major theoretical issue involved in its construction is the appropriate time period for the construction of the moving average. For the purposes of the present study this will be taken to be the average duration of the cycles, especially global cycles, over the period under consideration.[1]

The third and final implication to be derived from the critical review of the literature in the preceding chapter is that the use of cycle *maxima* and *minima* turning points for cycle identification, even in *ex post* cycle identification, is misleading. This is because the time period following cycle *maxima* and *minima,* before the cycle turns down or up, can greatly vary. Indeed, it was noted in the literature review that the use of such turning points for *ex ante* cycle identification has led to many instances of 'false' tops and bottoms being identified. That turning points cannot be used for *ex ante* identification does not, however, mean they cannot be used for *ex post* identification purposes. They can, but this should be for the purposes of identifying the duration of cycles. For this purpose, the *ex post* identification of cycle bottoms as troughs appears to be the most useful, especially

since there is no intention in the present research to identify the beginnings of recessions and/or recoveries.

3.3.2 Global cycles

As with the conceptualisation of the global cycle, so too with its identification: the absence of any appreciable amount of mainstream (and even non-mainstream) literature on this makes it difficult to develop an alternative identification of such a cycle on the basis of a critical appraisal of the relevant literature. Instead, as with the case of the conceptualisation of the global cycle, the development of an alternative identification method for this cycle needs to be informed by an appropriate extension of the preceding alternative methodology used to identify generic cycles.

The first implication to be derived from the alternative identification of generic cycles for the identification of global cycles is that it should make use of real GDP growth rates. In this case, it should be the synchronised growth rates between countries in the form of a **non-weighted** composite of real GDP growth rates of a majority of countries comprising the world economy, i.e., simple average of the growth rates of all countries. In theory, attention should be paid to potential distortions caused by missing or manipulated data (by splicing or interpolation) in the construction of the aggregate series. In practice, however, this would make the whole exercise quite unmanageable, and will not be attempted in the present study.

A second implication to be derived from the alternative identification of generic cycles for the identification of global cycles is that the latter should be done with reference to trend movements in the global economy. As with the identification of generic cycles, the trend should be constructed using moving averages and not linear estimation techniques. Also as with the identification of generic cycles, the time period for the moving average should be in excess of one cycle.

A third implication which arises from the alternative generic cycle identification for the identification of the global cycle is the *ex post* identification of this cycle on the basis of troughs. Drawing distinctions between groupings of countries, and recognising the importance of higher-income manufacturing economies for the movement of the cycle, could provide an early indication of global cycle tops and bottoms, but with the caveat noted above.

3.3.3 Cycles pertaining to groupings of countries

The last point made in the preceding section highlights the usefulness of identifying cycles pertaining to groupings of developing countries, which could further aid the identification of cycles of individual developing countries belonging to these groupings. Specifically, as noted above, the developing country groupings should be based on level of development, structure of production, and nature of integration into the global economy. The levels of development can be seen as captured by *per capita* income levels, with the usual distinctions between high-, middle- and low-income groups providing a first approximation basis for the identification of different levels of development. Some further breakdown of the middle-income category can also prove useful. The structures of the economies of developing countries that matter in capturing cyclical movements are the structures of their production and corresponding exports. In terms of their structures of production, what is important for developing countries is the extent of their dependence on primary commodity as opposed to manufacturing production. These production structures are seen as reflected in the structure of their exports, i.e., the extent of their dependence on commodity exports as opposed to manufactures. The extent and nature of integration of developing countries into the global economy is seen as similarly captured by the degree of dependence of the economy in question on exports. While it is recognised that other proxies of the extent of integration of a developing country into the global economy could be considered, such as the degree of its reliance on external savings to finance investment, it is felt this would introduce an unnecessary degree of complexity into the analysis.

As with the identification of global cycles, the starting point for the identification of cycles in groupings or clusters of developing economies is the construction of non-weighted real GDP composite growth rates of these clusters. The reference cycle should be taken as the global cycle, given by the movement of weighted global GDP growth rates. Divergences in trend movements in the growth rates of the unweighted clusters of developing economies in relation to trend movements in weighted global GDP growth rates could be interpreted as reflecting structural changes in the latter.

As will be argued below, the identification of cycles of groupings of developing countries can further assist the important distinction to be drawn between cycles and fluctuations in particular countries, especially

developing countries which are more prone to the latter. This is because such an identification would make more evident movements in real GDP growth rates of a country which correspond to cyclical movements since they can be seen as also corresponding to those of other developing counties with similar characteristics, i.e., as corresponding to the cyclical movement of the relevant cluster, notwithstanding the divergence of these cyclical movements from those pertaining to the global economy.

3.3.4 Individual developing country cycles

The key elements required for an alternative identification of individual developing country cycles follow logically from those noted earlier with reference to the identification of generic cycles. However, this identification also needs to take into account the critical review of the literature on the identification of individual country cycles in chapter 2.

It follows from the alternate identification of generic cycles that the key variable to be used in individual country cycle identification is the non-smoothed real GDP growth rate. Although, as mentioned above, there should be awareness of possible shortcomings in the construction of real GDP growth rate series in different countries, especially certain developing countries, this does not warrant the use of proxy variables for real GDP growth for reasons also given above.

It also follows from the critical review of mainstream literature on individual cycle identification that the identification of individual developing country cycles needs to be with reference to global cycles, while allowing for differences in the characteristics of the individual countries under consideration. The most appropriate method for identifying individual country cycles with reference to global cycles is arguably one of a visual inspection of the data, supplemented by simple correlation analysis. The added value of the correlation analysis is that it provides some idea of the degree to which the movement of the individual country cycle coincides with that of the global cycle.

As noted at the end of the previous section, an important by-product of the identification of individual country cycles in the context of the movement of global cycles is that it aids the distinction between fluctuations and cycles. Reference to global cycles is particularly important when looking at cycles in developing countries because, as noted above, it helps distinguish such cycles from fluctuations in their growth rates induced by

country-specific shocks — to which they are generally quite prone. Taking into account the particular characteristics of the economy of a country permits an understanding of divergences in the movements of their cycles from those of global cycles. Individual country characteristics can also explain divergences in trend growth rates between the two. Specifically, they could help explain relatively strong/weak expansions and weak/strong contractions in growth rates of the individual developing country. They could, for example, explain the relatively stronger expansion and weaker contraction phases of middle-income, diversified, export-oriented manufacturing economies such as China, and the relatively weaker expansion and stronger contraction phases of low-income, specialised, raw material producers such as many sub-Saharan African countries. Individual country characteristics could also explain divergences in timing of expansion and contraction phases of different countries. One might, for example, expect raw material producers to experience earlier expansion phases than manufacturers, and to follow the latter in downturns. Individual country characteristics could also explain greater amplitudes in cycles and numbers of fluctuations experienced by developing countries, both with respect to global cycles and one another. Again, one would expect low-income, highly specialised, raw material producers to experience cycles of greater amplitude (involving many more fluctuations) than higher-income, diversified, manufacturing economies.

3.4 Chapter summary

This chapter has attempted to develop an alternative conception of business cycles and corresponding methodology to identify these. The business cycles considered were generic cycles, global cycles, cycles pertaining to sub-groupings of developing countries, and cycles pertaining to individual developing countries.

The chapter began by developing an alternative conception of generic cycles based on the critical literature review in chapter 2. It argued that generic cycles need to be conceived of, first and foremost, as recurrent periods of expansion followed by contraction in economic activity, and *vice versa*, and conditioned by long-term, non-linear trends in this activity — which are to be conceived of as averages of the cycles. These recurrent expansions and contractions need also to be seen as non-periodic and non-symmetric in terms of their occurrence, duration and amplitude. Cycles are to be differentiated from random fluctuations in economic activity

caused by exogenous shocks, with fluctuations seen as having a bearing on cyclical movements although also fundamentally conditioned by them. This conception of generic cycles was then extended to the global level to conceive of a global economic cycle. Such a cycle was conceived of as comprising synchronised cyclical movements of all economies making up the global economy. The cyclical movement of the global economy was then conceived of as comprising the cyclical movement of clusters of economies, with the bases for these clusters seen as certain common economic characteristics. The clusters of particular concern in the present study are those pertaining to developing countries and the bases for these are the levels of development, structures of the economies, and the extent and nature of their integration into the world economy. Economic cycles pertaining to these clusters are seen as comprising the synchronised movement of the economies making up these clusters. Finally, economic cycles of individual developing countries were then conceived of in the manner of generic cycles but with reference to global economic cycles and the clusters of developing countries referred to above, and allowing for the specific economic characteristics of the individual countries concerned.

The second part of the chapter sought to develop an alternative method of identifying cycles based on the preceding alternative conceptualisations. It was argued that, notwithstanding its many known problems, the appropriate variable for identifying the cycle is the real GDP growth rate. As with most other studies, cycle identification was argued to require the conceptualisation of a trend. However, in contrast to the standard practice in such studies, the appropriate trend was conceived of as a moving average since this serves to highlight the importance of a path-dependency understanding of the trend. Cyclical dating was considered to be important for a number of reasons; however, this could not be done on an *ex ante* basis and using both peak and trough indicators. Rather, the preferred approach is what is referred to as trough-to-trough. The alternative generic identification methodology was then extended to identify global cycles, cycles pertaining to groupings of countries, and individual country cycles. For global cycles the important development in their identification was the use of non-weighted, aggregated, real GDP growth rates. It was argued that a synchronised co-movement of real growth rates in a majority of countries which corresponds to the growth rates of weighted real global GDP suggests the existence of global cycles. Extending this logic to the case of cyclical movements of clusters of developing countries would, it

was argued, then serve as the basis for the identification of cycles pertaining to them. Specifically, cycles pertaining to clusters could be identified if it could be shown that there is a synchronised co-movement of the real GDP growth rates of countries comprising these clusters and that this corresponds to the movement of weighted real global growth rates. Finally, it was argued that cycles of individual developing countries could, and should, then be identified with reference to the preceding two cycles — i.e., global cycles and cycles pertaining to particular clusters of developing countries. Reference to global cycles and cycles pertaining to clusters of developing countries in the identification of individual country cycles would, it was further argued, aid distinctions between cycles and fluctuations. Table 3.1 summarises the key elements of this alternative methodology for identifying cycles pertaining to the global economy, clusters of economies and individual economies.

Table 3.1
Key elements for an alternative cycle identification methodology

	Global cycles	Global benchmark cycles	Clusters of developing countries	Individual developing countries
Aggregation	Yes: Non-weighted	Yes: Weighted	Yes: Non-weighted	No
Unit of analysis	All countries		Country clusters (level of development and export structure)	Individual country
Reference	N/A	Global cycles	Global benchmark cycles	Global benchmark cycles and cycles in clusters of developing countries
Variable	Non-smoothed real growth rates			
Trend	Non-linear trend: Moving average			
Main methodology	Troughs, Trend	Troughs, Trend, Correlation		

Notes

[1] The exponential moving average (EMA) provides an earlier indication of turning points when used in conjunction with data of a higher frequency (i.e., quarterly, monthly, and daily) since it attaches greater weight to more recent data. For annual data virtually no difference is observed between the exponential and simple moving average, hence the use of the latter in the present study which is based on annual data.

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

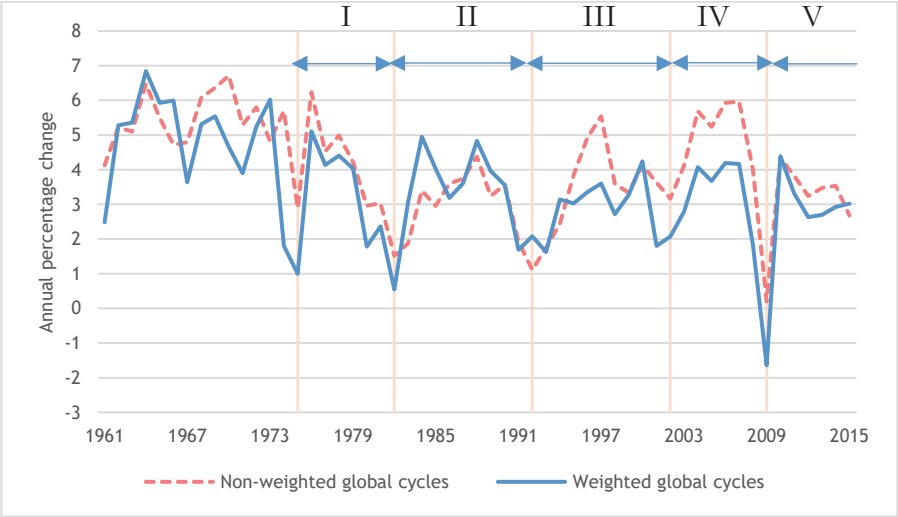
The aim of this section is to apply the methodology developed in the previous chapter to identify global cycles. It does so using real GDP data provided by the World Bank for 199 countries and economies for the period 1961–2015 (these and all other data used in this chapter were accessed on 1 February 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

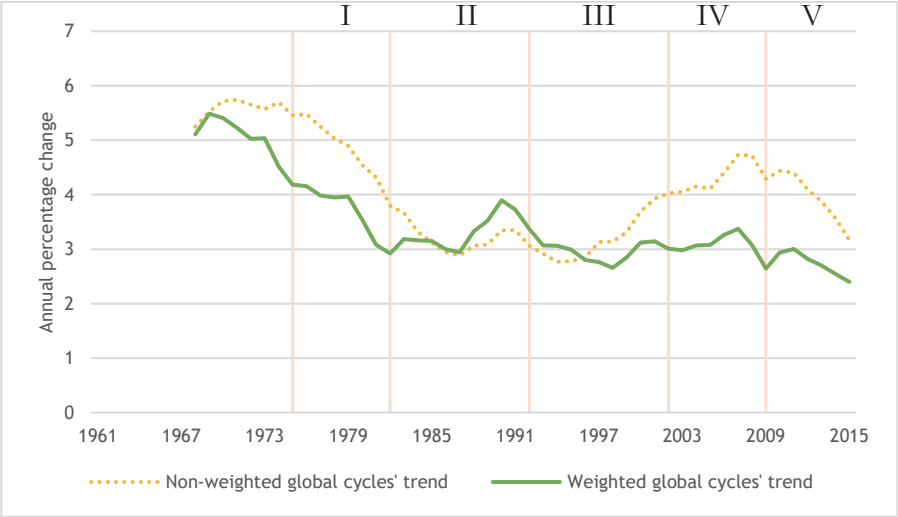
below). Taking the period of each cycle as a trough-to-trough measurement, these data show four complete cycles over this period (labelled as I to IV in Figures 4.1a and 4.1b) and one unfinished cycle beginning in 2009 (cycle V in Figures 4.1a and 4.1b). The precise dates for each cycle are given in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

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



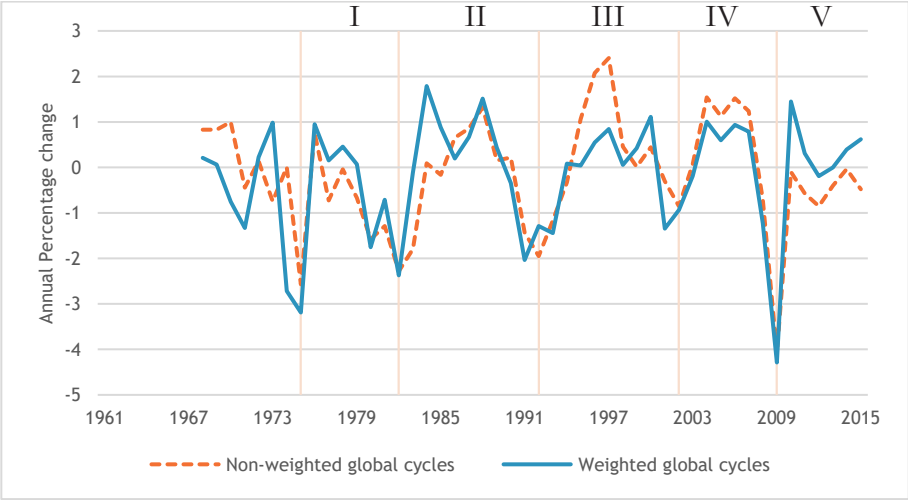
Source: World Bank WDI, author's calculation.

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).

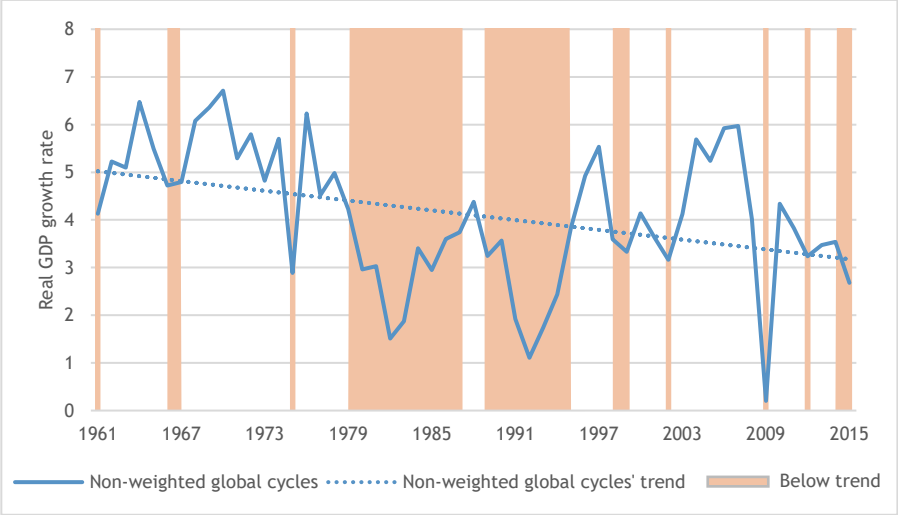
Table 4.1b
Global cycle identification: Amplitudes, 1975-2015

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).

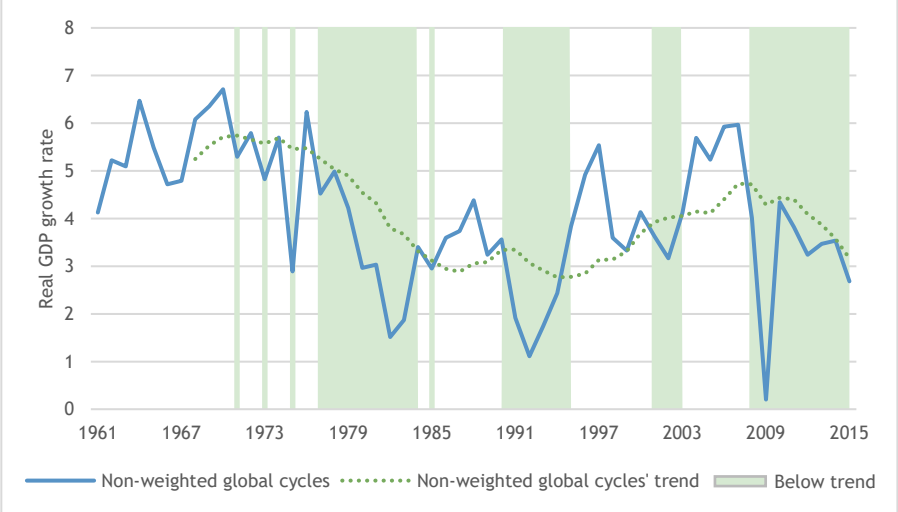
One last point to be made in the context of the identification of the global cycle is the importance to be accorded to the non-linear estimation of the trend.[2] To begin with, the shape of the linear trend by definition depends on the starting date of the data. Thus, while the trend depicted by taking 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.

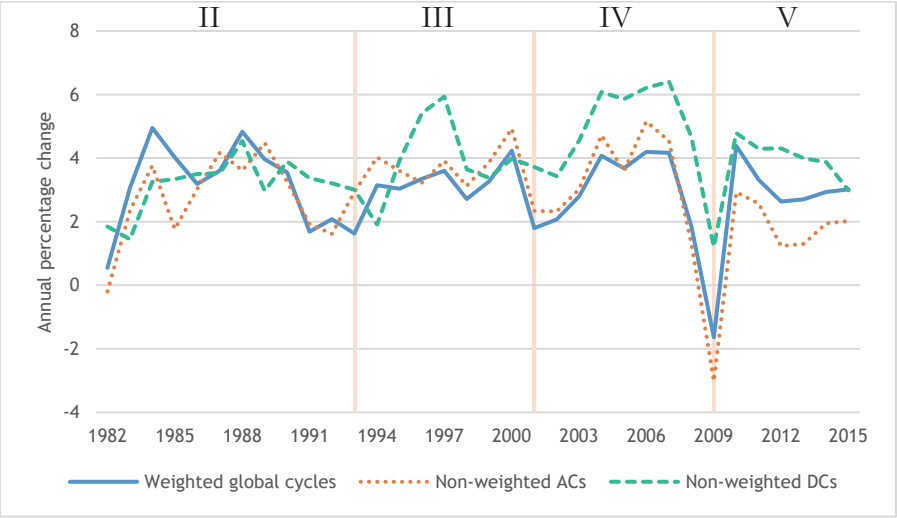
Firstly, the cyclical growth rate movements of the advanced and developing countries are closely synchronised with those of the global economy. The correlation coefficients for the synchronisation of the growth rates of these clusters of economies with those of the global economy are 0.9 and 0.76, respectively, 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,

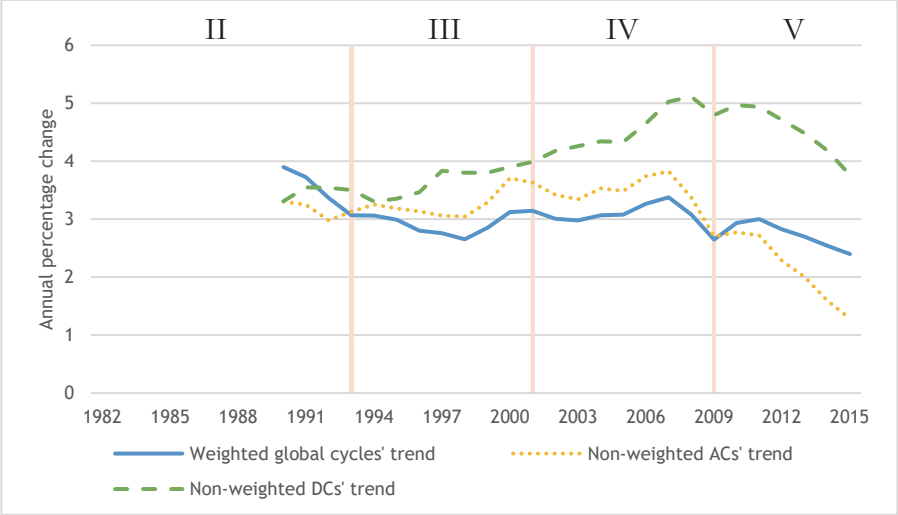
cycle amplitudes for advanced countries appear to be greater than for developing countries.[8]

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.

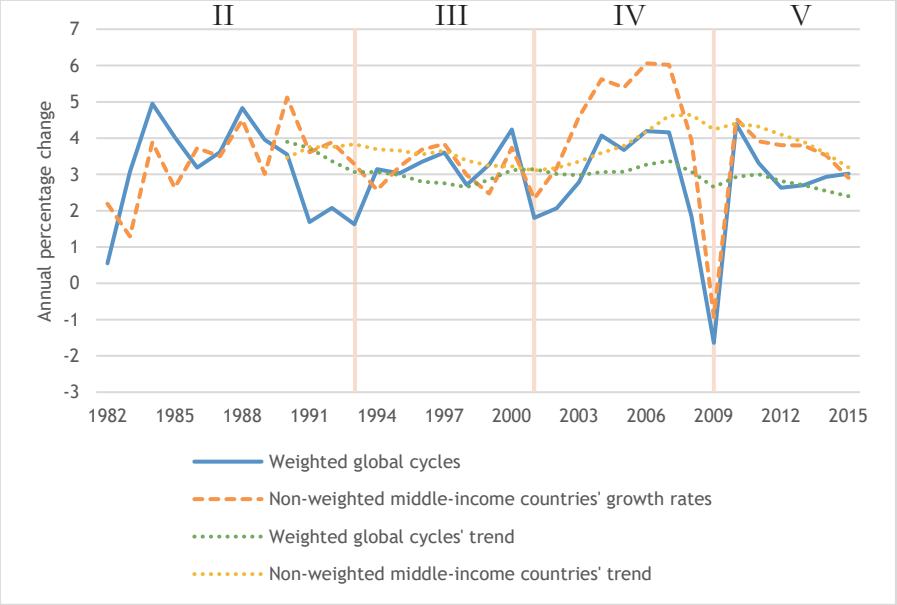
2/ The correlation is with respect to the weighted global cycles and applies to values provided in all tables below in this chapter.

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.

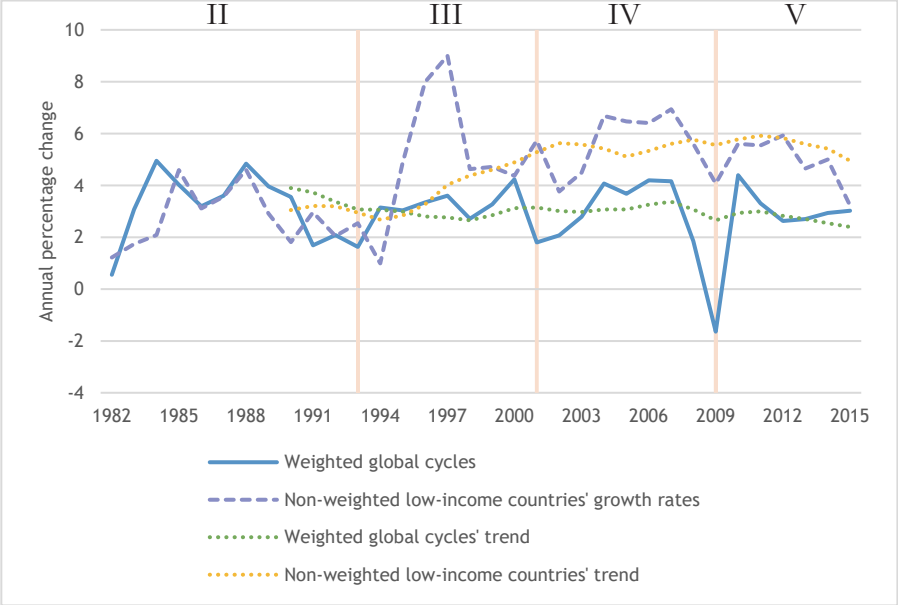
Table 4.4
Identification of cycles in middle-income countries, 1982-2015

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

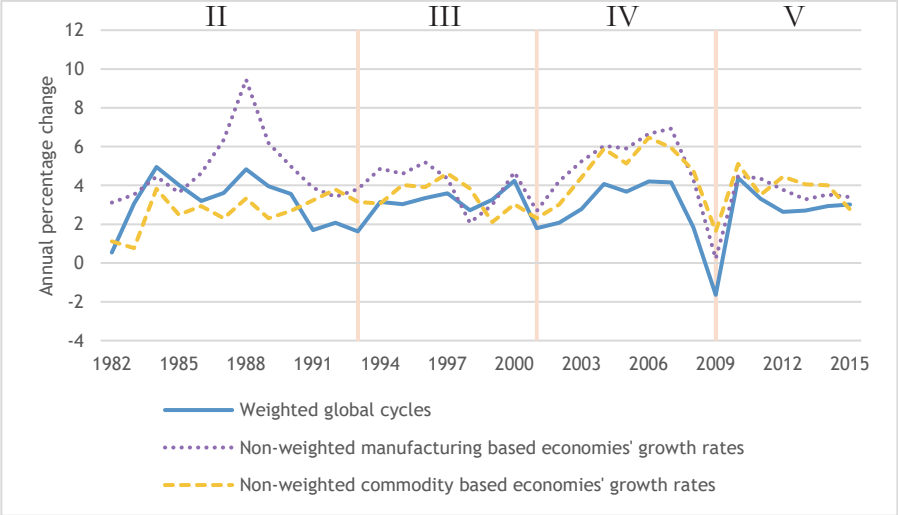
		1983	1994	2002	2010
Manufacturing based		13	33	47	39
Commodity based					
	Food	35	33	37	38
	Fuel	16	10	18	22
	Metals	8	5	10	11
	ARM	1	1	5	2
	Sub-total commodity based	60	49	70	73
Total		73	82	117	112
N/A[1] in DCs		50	77	33	32

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.

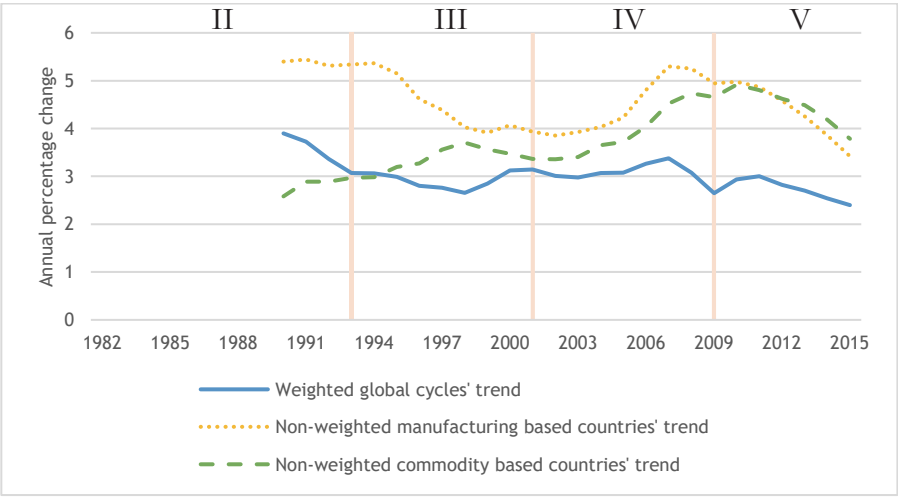
The first thing to note is that the troughs of both manufacturing- and commodity-based economies only coincide with those of the global cycles in cycle IV (2001–09). Secondly, it is apparent that the cyclical movements of the clusters of developing countries are increasingly synchronised with those of 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



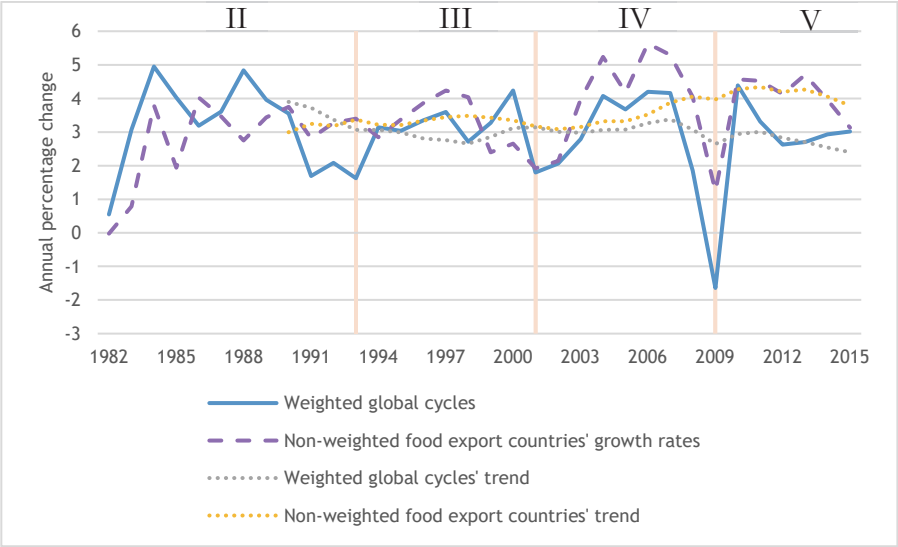
Source: World Bank WDI, author's calculation.

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.

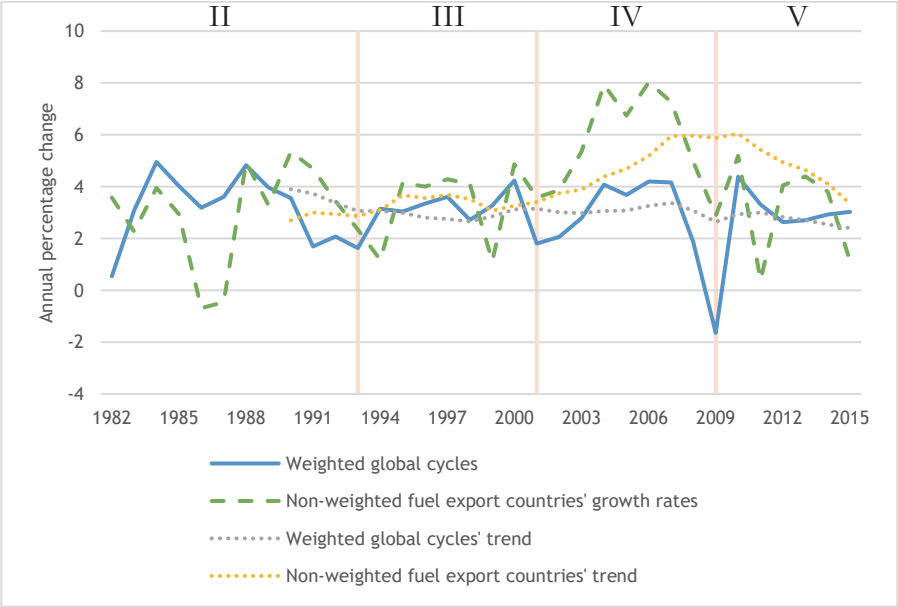
Table 4.8
Identification of cycles in food-export developing countries, 1982-2015

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



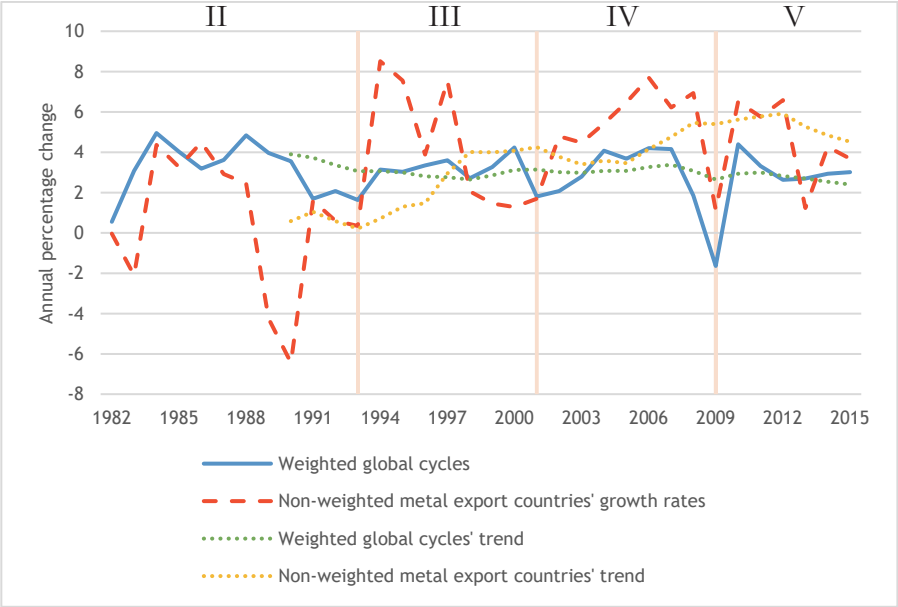
Source: World Bank WDI, author's calculation.

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).

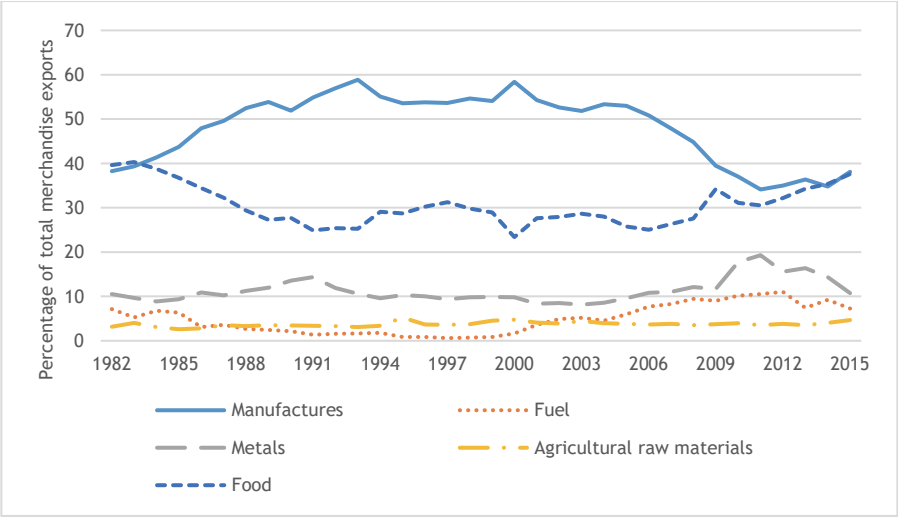
Table 4.11
Economic characteristics of selected countries

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



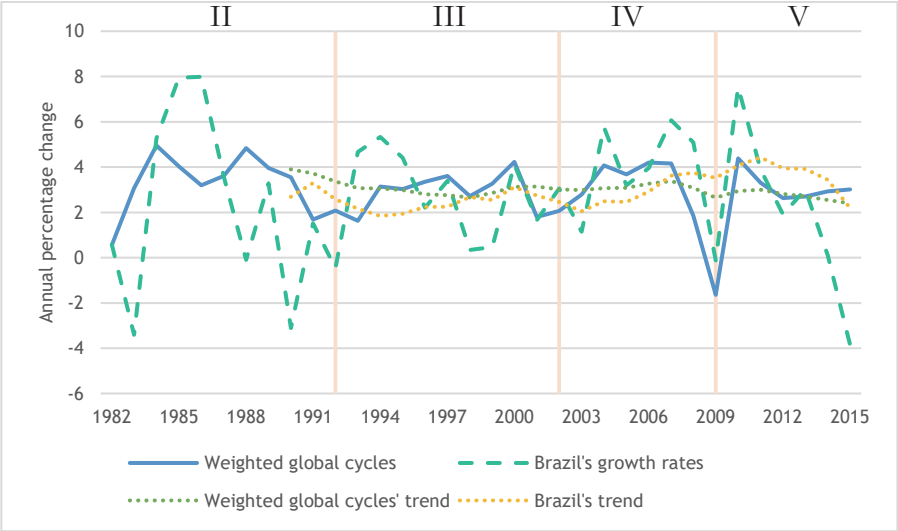
Source: World Bank WDI.

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



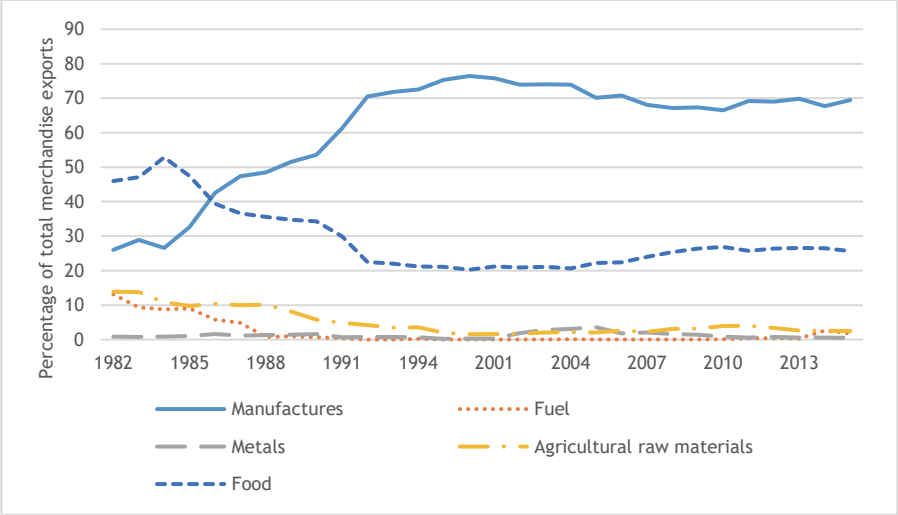
Source: World Bank WDI, author's calculation.

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

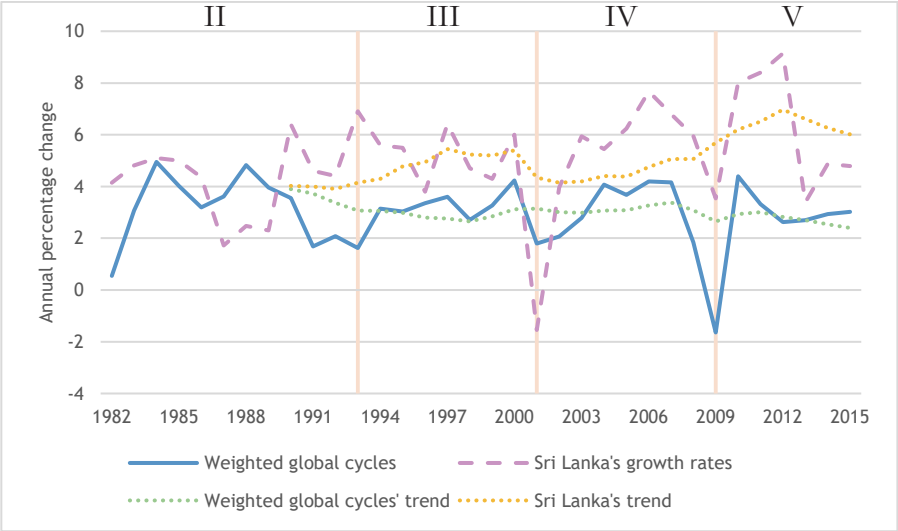


Source: World Bank WDI.

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.

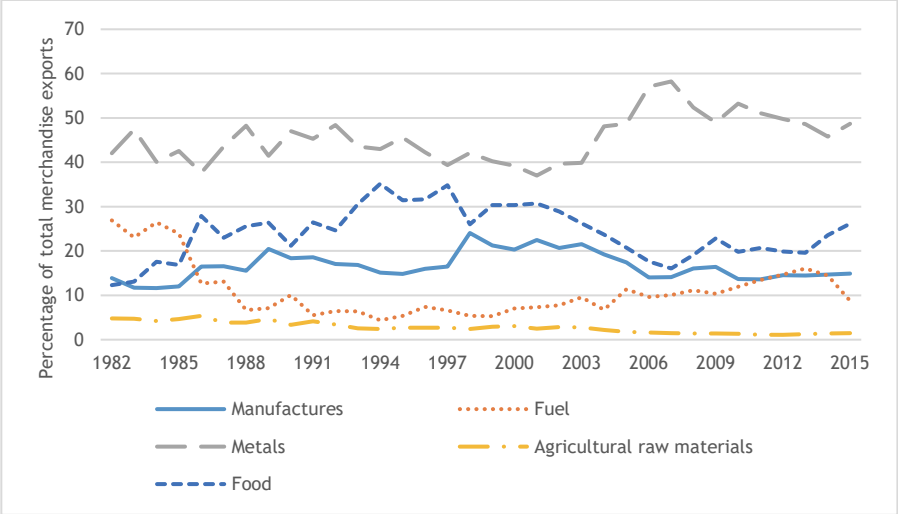
Table 4.13
Identification of cycles in the Sri Lankan economy, 1982-2015

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



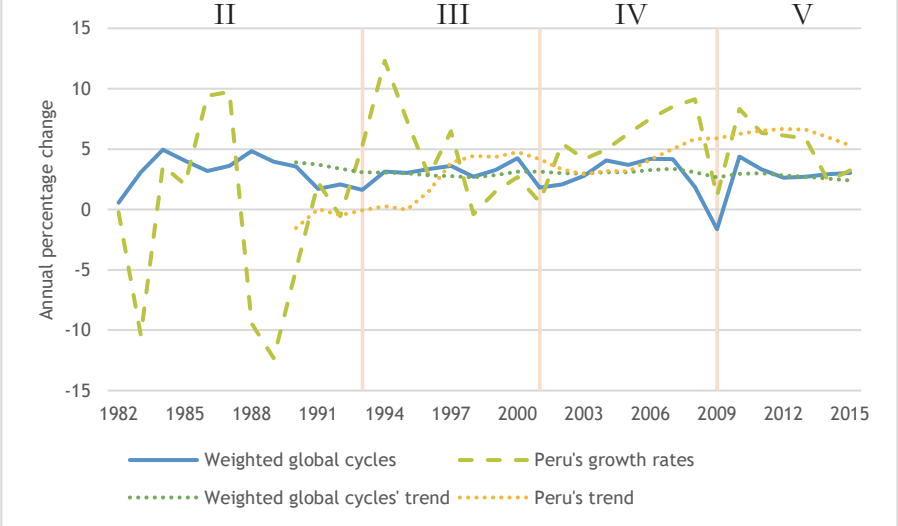
Source: World Bank WDI.

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.

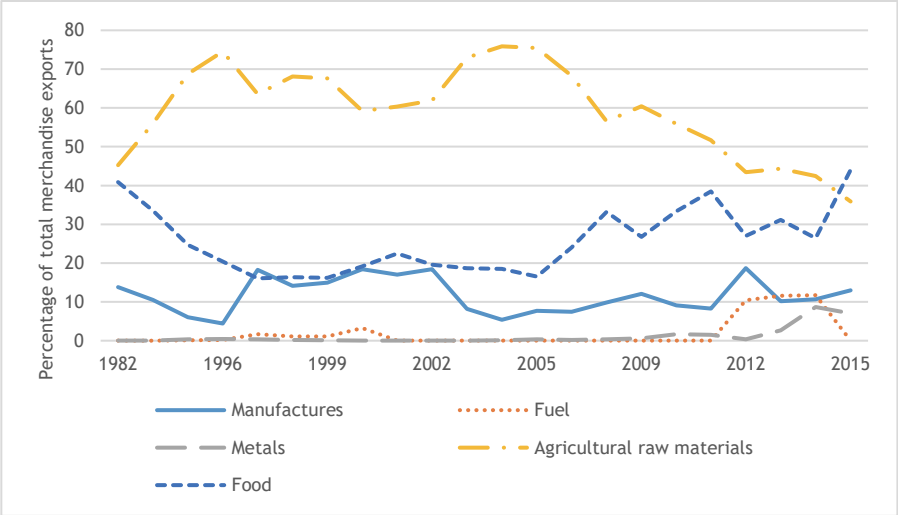
Table 4.14
Identification of cycles in the Peruvian economy, 1982-2015

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



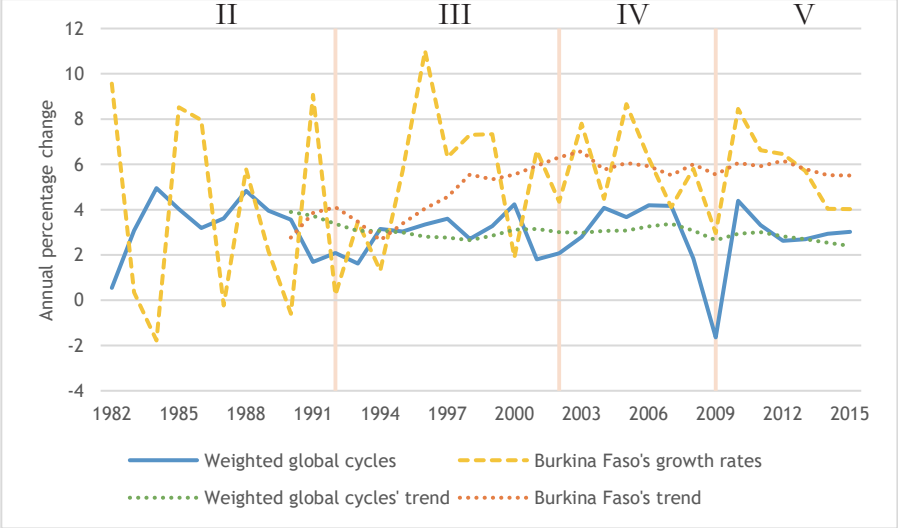
Source: World Bank WDI.

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 between 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.

5 Drivers of Business Cycles

5.1 Introduction

The aim of this chapter is to investigate the drivers of cycles in the global economy, for groupings of developing countries, and for individual developing countries. The particular focus of the drivers of global cycles is what might be referred to as their country drivers — those countries which exert the greatest influence on the movement of the global economy.[1] From the literature review above, it should be apparent that the concern here is to establish whether the countries which drive the global economy are the large economies *per se,* or, more specifically, the large manufacturing economies. For the groupings of developing countries and individual developing countries, the aim is to investigate whether cycles in their economic growth rates are driven by cycles in global economic growth rates. To be precise, the aim is to establish whether cycles in the global economy are the main drivers of cycles in these economies. This relates to the discussion in the literature as to whether cycles in developing country economies can be considered to be mostly internally or externally driven, with the former being identified with random domestic shocks and the latter with the movement of the global economy, i.e., global cycles.

The chapter is divided into three parts corresponding to the abovementioned objectives. The first part considers the country drivers of the global cycles, the second part analyses the drivers of cycles pertaining to groupings of countries, and the third part looks at the drivers of cycles of individual developing countries, paying particular attention to the importance of cyclical movements in the global economy as the major drivers of such cycles.

The growth rates of groupings of economies are taken to be the weighted averages of countries comprising the grouping or clusters. The

growth rates are based on non-smoothed real GDP data provided by the World Bank. The groupings of countries are composited in the same manner as in the previous chapter (see section 4.3 above).

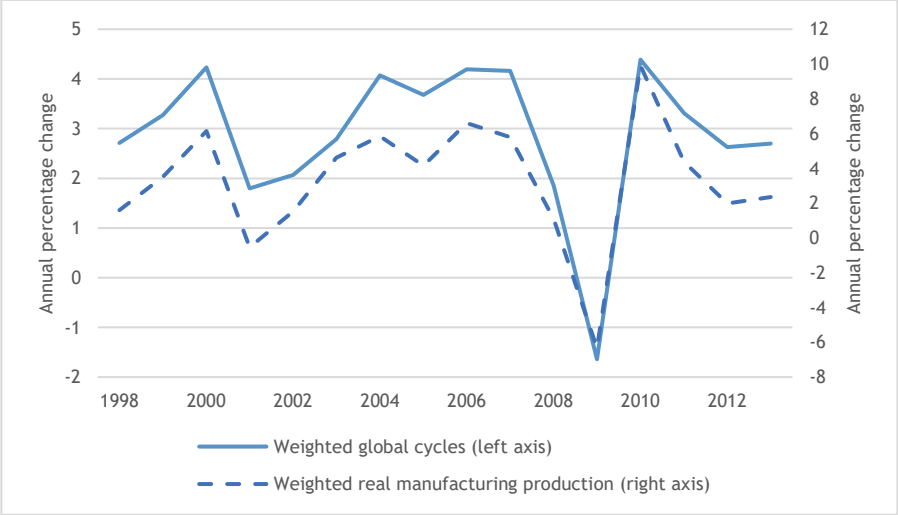
The empirical methods used to investigate the drivers of cycles in this chapter will comprise exploratory data and econometric (Ordinary Least Squares and Panel Data Regressions) analyses. Most weight will be given to the exploratory data analyses for reasons given in chapter 1, but some weight will also be accorded to the results obtained by means of econometric analyses to support the exploratory data findings. The results and discussion of the econometric analyses are presented in detail in a separate appendix (Appendix 5.5). These results will be referred to in the main text where it is deemed appropriate.

5.2 Country drivers of global cycles

This section addresses the issue of the country drivers of global cycles. The global cycles to be explained are those depicted by growth rates of weighted global GDP at constant prices.

It was argued in chapters 2 and 3 that a crucial element missing from standard accounts of the drivers of cycles in general, and global cycles in particular, is the importance that should be accorded to manufacturing production (and exports of manufactured products). Figure 5.1 is a plot of the annual growth rates of global GDP at constant prices and real manufacturing production growth between 1998 and 2013.[2] These data appear to confirm the hypothesised importance ascribed to manufacturing as the most important driver of real GDP growth. Further support of this observed relationship is provided by the results of bivariate OLS regression (see Appendix 5.5, section 1 on global cycles and global manufacturing). The important point to note about the regression results is the value of the parameter estimate for the manufacturing variable. This suggests that the contribution of global manufacturing growth is considerably greater than what would be suggested by the proportion of global GDP that it accounts for. Interestingly, the parameter value is very similar to that obtained by Kaldor in his seminal study of the relationship between real GDP growth and growth of manufacturing value added for a selection of some 12 advanced economies (see Kaldor, 1966, 1967).

Figure 5.1
Weighted global real GDP and manufacturing production growth, 1998-2013

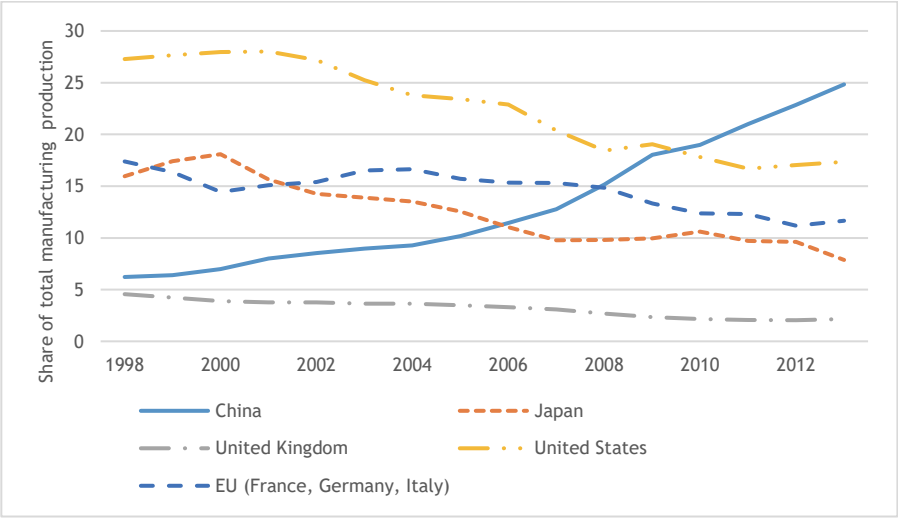


Source: World Bank WDI, author's calculation.

What the preceding suggests is that the major driver of the global economy and global cycles in particular is not the growth of, or cycles in, the largest economies *per se* but rather the growth of, and cycles in, the largest manufacturing producers. Figure 5.2 provides data on who these producers are. Specifically, it depicts the global manufacturing share of the largest manufacturing economies. It shows that, until recently, the largest manufacturers — i.e., the U.S., EU, the U.K. and Japan — have also been the largest economies in terms of GDP size. Indeed, up to around 2009/10, the largest manufacturer was also the largest economy in the world; the U.S. economy. However, from this date onwards, China surpassed the U.S. as the largest manufacturing economy, notwithstanding the fact that its economy is still smaller than that of the U.S. in terms of absolute GDP (in current US dollars).[3] What Figure 5.2, in conjunction with Figure 5.1, suggests is that, contrary to assumptions made in many studies of the drivers of the global economy, it is no longer the U.S. but China that appears to be at the helm of the global economy. It is China, as the largest manufacturer, that is currently the main driver of global economic cycles. Indeed, the divergence of the cycles of nearly all developing countries and many advanced countries from that of the U.S. economy over the course

of the most recent global cycle could well be indicative of precisely this shift in the global economic dynamic.

Figure 5.2
Shares of global manufacturing (value added), 1998-2013



Source: World Bank WDI, author's calculation.

Although it is certainly too early to definitively conclude that China has assumed the role of the principal driver of the global economy, further evidence that this may well be the case at the present juncture comes in the form of correlation coefficients for the co-movement of global cycles and growth rate cycles of selected individual large (manufacturing) economies. These data are presented in Figures 5.3a and 5.3b. The difference between the two Figures is that the former (5.3a) uses the non-weighted global GDP growth rate series and the latter (5.3b) uses the weighted global GDP growth rate series. What both Figures suggest is that, while the advanced countries, particularly those responsible for most manufactured exports, could be said to have been the major drivers of the global economy up to cycle IV (i.e., until 2009), from the commencement of the present cycle, this role appears to have shifted to China. Interestingly, and reinforcing the point made above, in the most recent cycle, the degrees of correlation between the dominant global manufacturers and the global cycles appear to have changed compared to the recent past. Specifically, the

data appear to show that the correlation between the growth of China's real GDP and global GDP is rising while those between all other large manufacturers and the global economy is falling. Indeed, it is this shift that perhaps explains the observed divergence from 2009 onwards of both weighted and non-weighted global GDP growth rates from the growth rates of many clusters of developing countries shown in the previous chapter (see Figures 4.1a, b, c in the previous chapter).

Figure 5.3a
Correlation of selected economies with non-weighted global cycles, 1983-2015

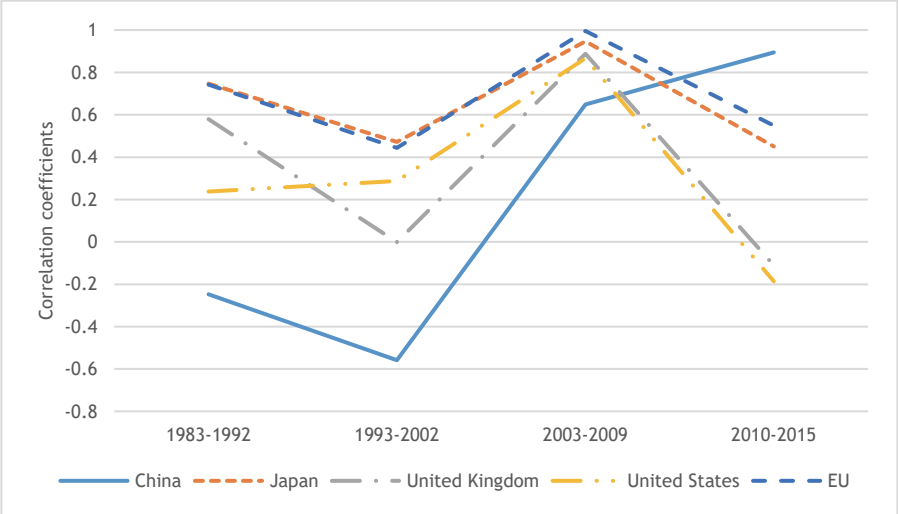
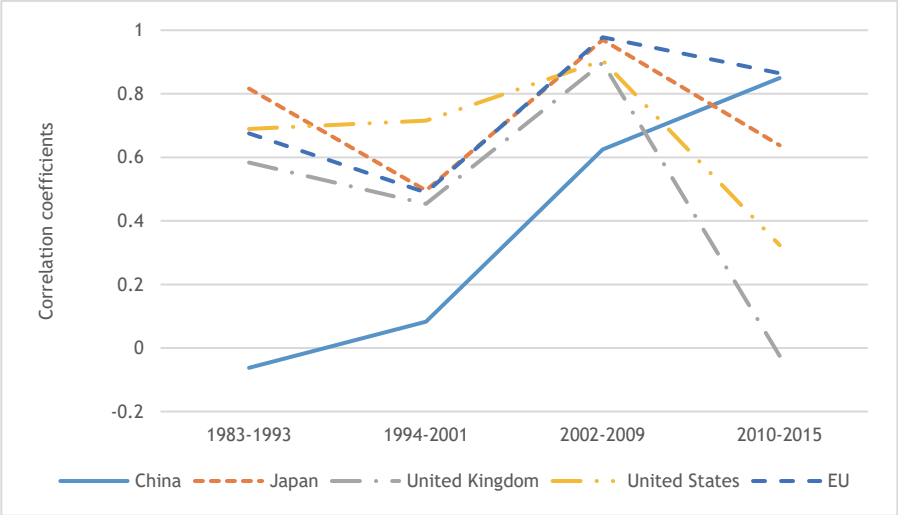
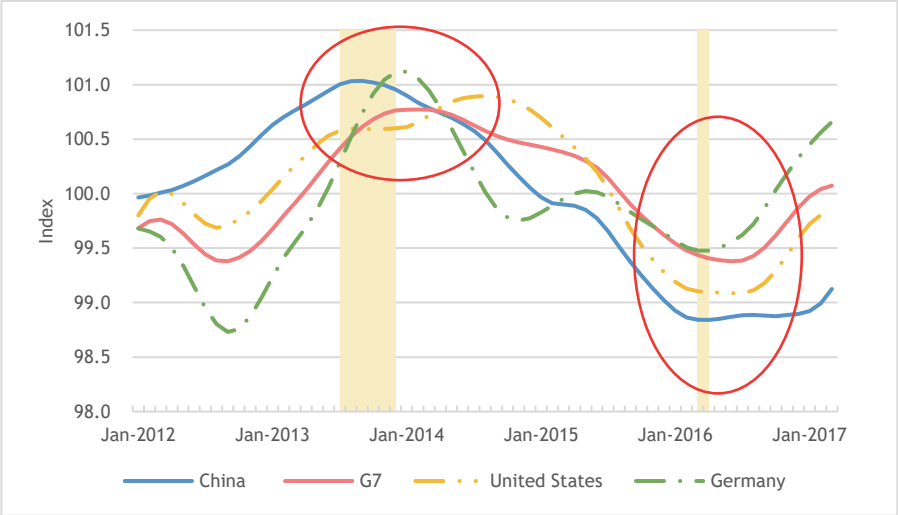


Figure 5.3b
Correlation of selected economies with the weighted global cycles, 1983-2015



More evidence of China as the major country driver of global cycles, particularly since 2009, comes in the form of the recent massive fiscal and credit expansion undertaken by the Chinese authorities to revive their flagging economy, which translated into a major boost to all other major economies.[4] Monthly leading indicators data provided by the OECD (see Figure 5.4) appear to show that this stimulus resuscitated not only the Chinese economy, but also the global economy as a whole. Of particular note in Figure 5.4 is the prior movement of the leading indicators of the Chinese economy as compared with those for the G7 group of countries as a whole, not only with respect to their recovery but also the preceding downward movement (see shaded areas).[5,6] The point that needs reiterating in this context is that, like all economies comprising the global economic system, China too is impacted by the movement of the global economy, notwithstanding the fact that it may now be considered to be one of the major drivers of the latter, if not its principal driver.

Figure 5.4
Leading composite indicators for the G7 countries, China, the U.S. and Germany, Jan 2012-Mar 2017



Source: OECD. Data accessed 13 May 2017.

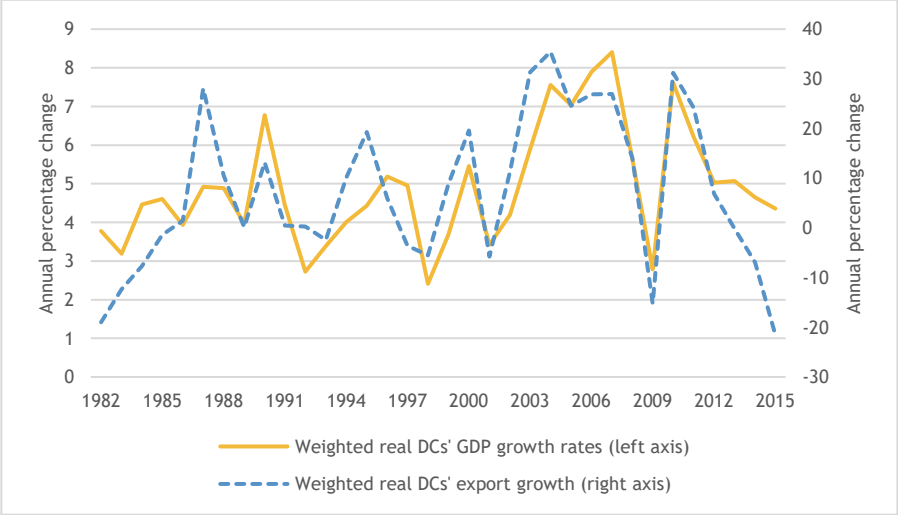
5.3 Drivers of cycles in clusters of economies

This section investigates the drivers of cycles in various clusters of developing economies. As with the identification of cycles in the previous chapter, particular attention is paid to the level of development and structure of economy in the construction of the clusters. Following from the literature review, and in particular the growth theory advanced by Kaldor, as well as the earlier analysis in the present chapter, the aim is to show the importance of merchandise exports in driving economic growth and, therefore, cycles in these clusters of developing countries. The country composition of each of the clusters is given in Appendix 4.3 below. The compositions of these clusters are modified at the troughs of each of the global cycles to reflect the changing structures of the individual developing countries, in the same manner as with the identification of cycles in the previous chapter.

The first cluster that needs consideration is one comprising developing countries as a whole. The analysis of the link between real GDP and export earnings growth rates of this aggregate cluster of developing countries will serve as a benchmark for the analysis of similar links pertaining to

various sub-clusters of developing countries. Figure 5.5 is a plot of the growth rates of weighted real GDP and weighted real total merchandise exports for developing countries over the period 1982 to 2015 (i.e., cycles II to V of the global reference cycles). What the Figure shows is that, in general, the two series move together, and that when they do not, exports lead economic growth. The correlation coefficient for the co-movement of the two series over the whole period is 0.73 (see Table 5.1), with higher correlation coefficients for the co-movement of the two series in cycle IV (2001–09) and the unfinished cycle V (2009–15). The implied positive impact of the export growth of developing countries on their economic growth is further supported by OLS and panel regression analyses (see Appendix 5.5, section 2). It may be seen from these results that the OLS parameter estimates are of the expected magnitudes given the mean values of the two variables, and the statistical fit of the relationship improves when considering fixed time effects in the panel regression.

Figure 5.5
Weighted real merchandise export and GDP growth rates of developing countries, 1982-2015



Source: World Bank WDI, FED, author's calculation.

Table 5.1
Correlation coefficients for the co-movement of weighted real merchandise export and GDP growth rates in developing countries, 1983-2015

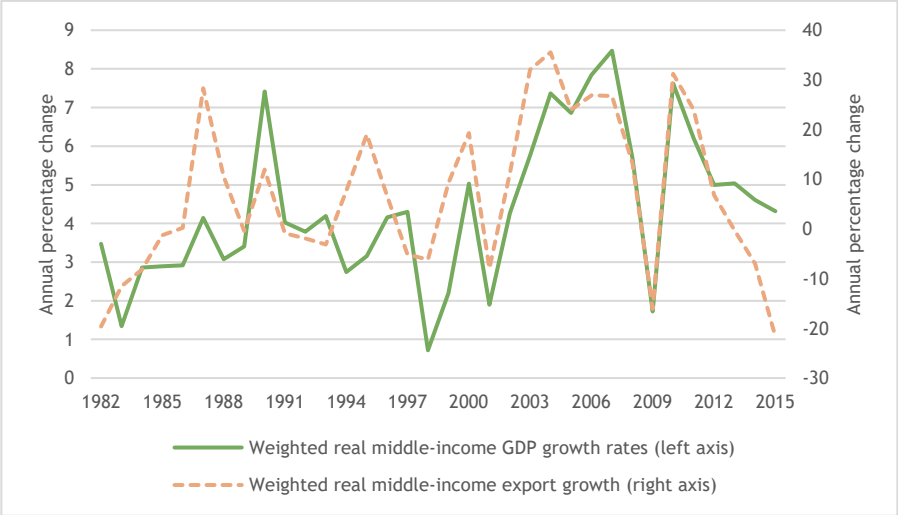
1983–1993	1994–2001	2002–2009	2010–2015	Average
0.58	0.55	0.86	0.93	0.73

5.3.1 Level of development

The first sub-clustering of developing countries that requires consideration is that based on the level of development. As in chapter 4, the levels of development are depicted by per capita GNI levels with the important distinction for the current study being that between middle- and low-income developing countries (see the country composition in Appendix 4.3).

Figure 5.6 is a plot of the growth rates of weighted real GDP and weighted merchandise exports in constant U.S. dollars for middle-income developing countries over the period 1982 to 2015. It shows a similarly close relationship between the two series to that observed between exports and economic growth for developing countries as a whole (Figure 5.5). That is to say, the two series are for the most part synchronised with one another, and, where they are not, exports can be seen to lead economic growth. Confirmation of this relationship comes in the form of the correlation coefficient for the co-movement of the two series over the full period (see Table 5.2), which is almost the same as that for the movement of the two variables for developing countries as a whole (Table 5.1). OLS regression results provide further support for the hypothesised relationship between export and economic growth for this cluster of developing countries (see Appendix 5.5, section 3-a). The estimated parameter value for the independent variable, export growth, is 0.093 (see equation A12 in Appendix). The value of the obtained parameter value is considerably higher than for the aggregate developing country bivariate OLS regression of the same relationship (0.079, see equation A4 in Appendix). As noted in the Appendix, the economic significance of this is arguably because middle-income developing countries tend to be more integrated into the global system and, given their higher levels of development, less subject to random fluctuations than low-income developing countries.

Figure 5.6
Weighted real merchandise export and GDP growth rates of middle-income developing countries, 1982-2015



Source: World Bank WDI, FED, author's calculation.

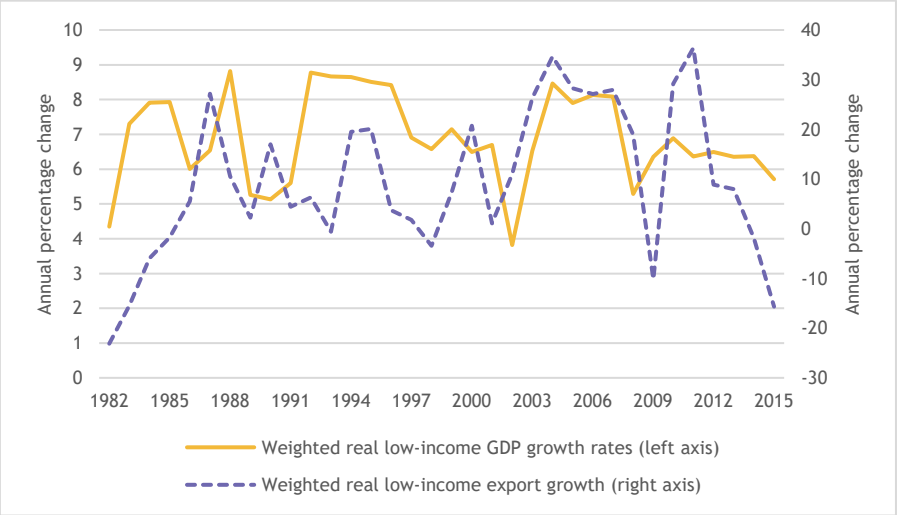
Table 5.2
Correlation coefficients for the co-movement of weighted real merchandise export and GDP growth rates in middle-income developing countries, 1983-2015

1983–1993	1994–2001	2002–2009	2010–2015	Average
0.51	0.51	0.88	0.93	0.71

The relationship between economic growth and export growth of low-income countries is, as already suggested, less apparent than for the middle-income countries discussed above. This can be seen from Figure 5.7, which is a plot of the two variables for this cluster of developing countries. The lower degree of synchronisation for the low-income countries as compared to the middle-income countries is only to be expected, given the typical fragile structures of their economies and the resulting greater propensity of these to be influenced by random domestic shocks.[7] Further evidence for the weaker relationship between export and economic growth of low-income developing countries relative to the middle-income

countries comes in the form of OLS regression analyses, the results of which are presented in Appendix 5.5 (see section 3-b). The parameter estimate for the impact of the independent variable (export growth) on the dependent variable (economic growth) is relatively low and statistically insignificant. The introduction of lags and dummies to allow for odd years does not raise the parameter value or improve its significance.

Figure 5.7
Weighted real merchandise export and GDP growth rates of low-income developing countries, 1982-2015



Source: World Bank WDI, FED, author's calculation.

Table 5.3
Correlation coefficients for the co-movement of weighted real merchandise export and GDP growth rates in low-income developing countries, 1983-2015

1983–1993	1994–2001	2002–2009	2010–2015	Average
-0.28	0.46	0.57	0.73	0.37

5.3.2 Structure of the economy

The second sub-clustering of developing countries to be considered is those based on the structure of the economy. As in chapter 4, the clusters

considered most appropriate are with respect to the major type of export: manufactures, food, fuel, and metals (see Appendix 4.4 for the country compositions of each groups).

Figure 5.8 presents a plot of growth rates of weighted real GDP and manufacturing exports in constant U.S. dollars for a cluster of manufacturing export economies. The Figure shows a fair degree of synchronisation between the two series; where this is not the case, export earnings growth leads economic growth. As can be seen from the Figure, such lead–lag relationships are evident in 1987–88, 1992–98, and 2003–04. Table 5.4, which provides correlation coefficients for the co-movement of the two variables, reinforces the impression of the close synchronisation of their movement, especially in the recent period. The high degree of co-movement of the two variables should also not be surprising, given the considerable weight of China in this cluster (i.e., 50% to 60% of the total) and the well-known export basis of its manufacturing-led economic growth process (see Hausmann et al., 2007; Rodrik, 2007).

OLS regression results presented in the Appendix also support the contention that the real GDP growth of the manufacturing-based cluster of economies is considerably influenced by its export growth, although it should perhaps be noted that the estimated parameter value for the dependent variable (0.055) is lower than that for the regression of total merchandise export growth on total real GDP growth for all developing countries (0.079) (see equations A.17 and A.4 in Appendix 5.5). In terms of economic significance, this suggests that the growth rates of manufacturing exporters is likely to be less sensitive to export earnings than in the case of commodity exporters. The introduction of lags into the regression analysis did not have any appreciable consequences for the results (see equation A18, Appendix 5.5).[8]

Figure 5.8
Weighted real manufacturing export and GDP growth rates of manufacturing-based developing countries, 1982-2015

Source: World Bank WDI, FED, author's calculation.

Table 5.4
Correlation coefficients for the co-movement of weighted real manufacturing export and GDP growth rates in manufacturing-based developing countries, 1983-2015

1983–1993	1994–2001	2002–2009	2010–2015	Average[1]
0.39	0.65	0.64	0.90	0.61

1/ The weight for the computation of the weighted average is based on the duration of benchmark global cycles.

Figure 5.9 is a plot of the growth rates of weighted real GDP and commodity exports in constant U.S. dollars for a cluster of commodity-exporting developing countries. The Figure shows that up to the early 2000s the degree of synchronisation between the two data series is quite low but rises appreciably from this date onwards. Confirmation of this is given by the correlation coefficients for the various cycles covering the period as a whole. For cycles prior to the early 2000s, the correlation coefficients are

quite low, but rise thereafter (see Table 5.5). The increased synchronisation of the two variables suggests commodity-based economies became more enmeshed in the global economic system and more dependent on their export earnings.

OLS regression results also provide support for the hypothesised relationship between export earnings and economic growth for the commodity-producing developing countries. The parameter value for the estimated relationship in the commodity-producing developing countries is, as expected, higher than in the case of manufactures: 0.063 as compared with 0.055 (see equations A.19 and A.17 in Appendix 5.5). The higher expected parameter value is because the parameter value for the corresponding relationship for all developing countries was shown to be greater than for manufacturing developing countries above. These results support those found in the literature pointing to growth rates of exporters of primary commodities being more sensitive to export earnings than those of exporters of manufactures due, on the one hand, to their greater dependence on the export earnings and, on the other hand, to the greater volatility in the prices of these products.[9]

Figure 5.9
Weighted real commodity export and GDP growth rates of commodity-based developing countries, 1982-2015

Source: World Bank WDI, FED, author's calculation.

Table 5.5
Correlation coefficients for the co-movement of weighted real commodity export and GDP growth rates in commodity-based developing countries, 1983-2015

1983–1993	1994–2001	2002–2009	2010–2015	Average
0.01	-0.33	0.90	0.93	0.31

Finally, plots of the weighted average real GDP and export growth for sub-clusters of commodity-exporting developing countries are given in the Appendices (see 5.1 to 5.3). These suggest some variation in degrees of synchronisation between economic and export growth rates between the sub-clusters, which is confirmed by correlation coefficients for the co-movements of these variables for each cluster (see Table in Appendix 5.4). These Figures and Tables (see Appendix 5.1 to 5.4) suggest the weakest synchronisation to be for food exporters and the strongest for fuel exporters. This is to be expected given, on the one hand, the vagaries of natural conditions for the former, and, on the other, the degree of specialisation typically associated with the latter group of countries.

5.4 Drivers of cycles in the selected countries

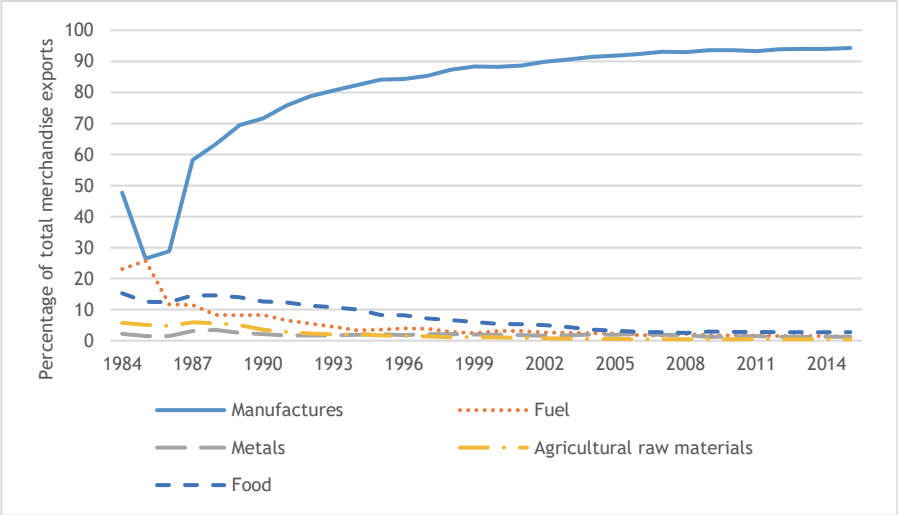
The aim of this section is to consider a number of individual developing countries with a view to further illustrating the points made above with regard to the drivers of clusters of these countries; that is, their cycles are driven largely by external (in a geographic sense) forces as manifest in the importance of export growth in explaining economic growth — export growth being linked to global economic growth.

The countries chosen for this purpose are China, Brazil, Peru and Burkina Faso. The criteria adopted to select these countries are the same as those used to select the countries for the purposes of the identification of cycles in particular countries in chapter 4. China is chosen as the representative of a middle-income manufacturer instead of Sri Lanka because of the importance accorded it as a major driver of the global cycle.

The first country to be considered then is China. As Figure 5.10 below shows, China was primarily a commodity exporter up to the second part of the 1980s, from which point it shifted rapidly to being a manufacturing exporter. By the early 2000s, manufactures came to account for around 90% of total Chinese exports. Along with this shift came a surge in China's

economic growth rate, taking it from the status of a low-income to a (upper) middle-income developing country by 2010.

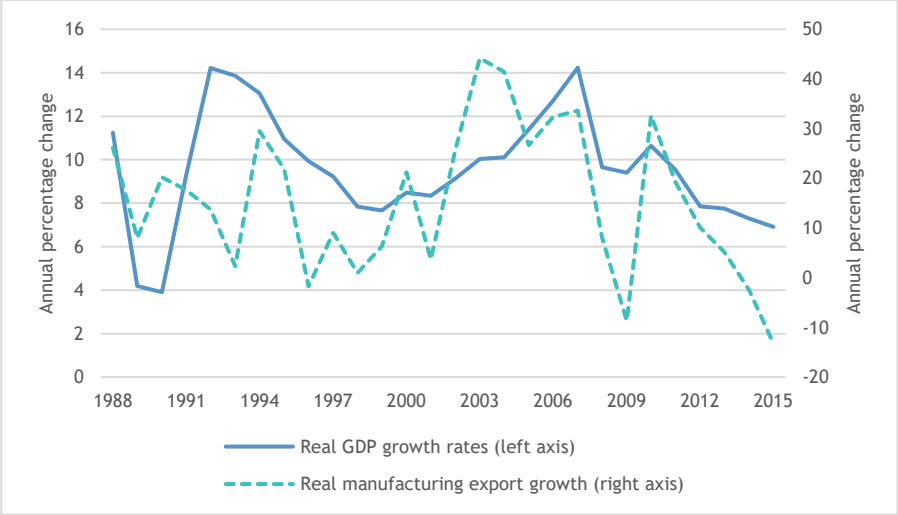
Figure 5.10
Export structure of the Chinese economy, 1984-2015



Source: World Bank WDI.

Figure 5.11 is a plot of the growth rates of real GDP and manufacturing exports in constant U.S. dollars between 1988 and 2015. It may be seen that the trends and troughs of the export and economic growth rates coincide especially from the beginning of cycle V (i.e., 2009), and, as for other developing countries, where they do not coincide, the former leads the latter. For example, the trough of real growth rates in 1999 is preceded by that of real manufacturing growth in 1996. The average correlation coefficient for the co-movement of the two variables is 0.41. It can be argued that the degree of synchronisation between these two variables is what one might expect of an economy with the particular characteristics of the Chinese economy; i.e., a middle-income, export-oriented, manufacturing economy. What is striking about the post-2009 period is the weakening of Chinese economic growth accompanying the weakening of the growth of its earnings from the export of manufactures, confirming the importance of the latter for the former shown in the country cluster analysis above.[10]

Figure 5.11
Real GDP and export growth rates for the Chinese economy, 1988-2015



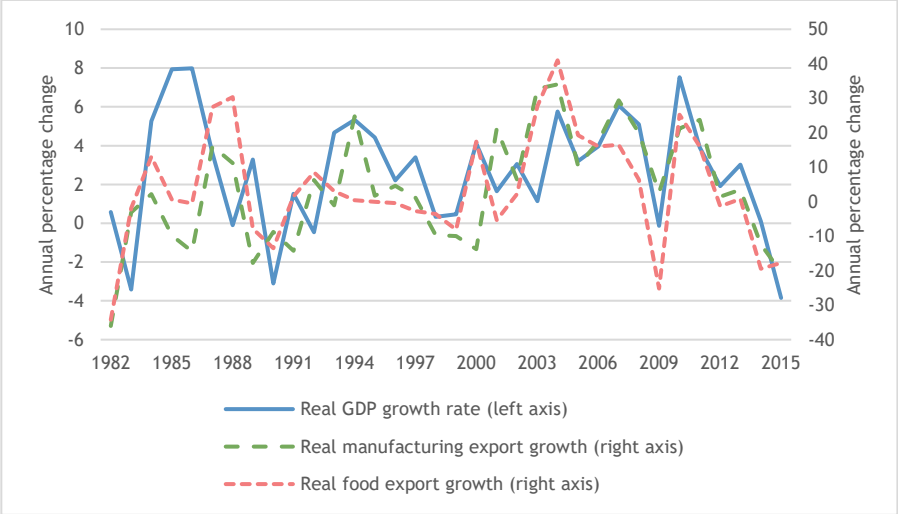
Source: World Bank WDI, FED, author's calculation.

The second country to be considered is Brazil. The nature of Brazil's economy has also been alluded to in chapter 4 in the course of the identification of cycles in its economic growth rate. It was noted there that, while for most of the period from 1982 to 2015, Brazil can be regarded as largely an exporter of manufactures, food exports over this period were also considerable (see Figure 4.11). Moreover, during this period, Brazil shifted from being classified as a lower middle-income country to being considered an upper middle-income country, in a similar fashion to Peru (see below). Hence, given the conclusions drawn from the earlier country cluster analysis, one would expect to see a fairly high level of synchronisation between Brazil's export and economic growth rates.

Figure 5.12 is a plot of real GDP and export growth rates for the Brazilian economy over the period 1982–2015. What is quite evident from this Figure is the lead–lag relation between exports and economic growth until the 2000s. The correlation coefficients for the co-movement of real GDP with constant U.S. dollar manufacturing and food export growth (in constant U.S. dollars) are 0.35 and 0.45 respectively, for the period 1982–2015, and 0.74 for both variables from 2001 onwards. These coefficients

indicate, as expected, a degree of synchronisation between export and economic growth which is relatively higher than the average for non-manufacturing developing countries.

Figure 5.12
Real GDP and manufacturing and food export growth rates of the Brazilian economy, 1982-2015



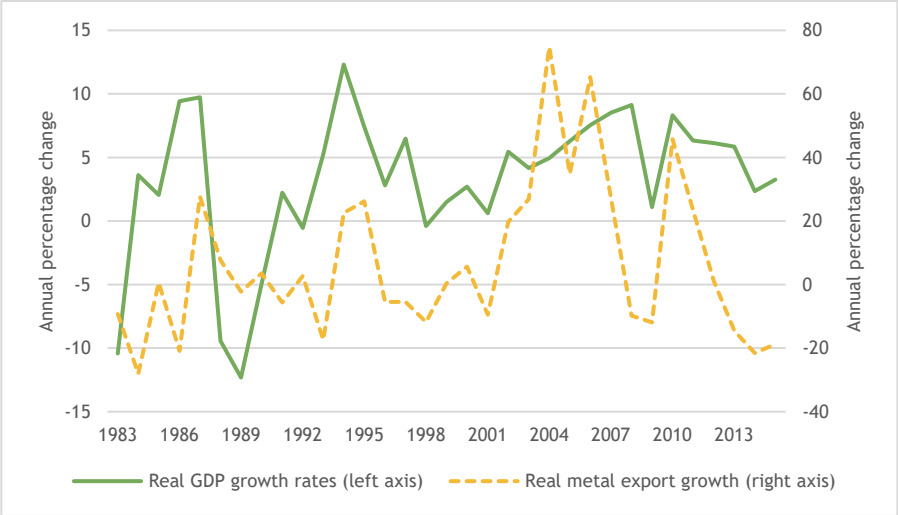
Source: World Bank WDI, FED, author's calculation.

The third country to be considered is Peru. Peru is a commodity exporter of primary metals. Over the period under consideration, Peru shifted from being classified as a lower middle-income country to being an upper middle-income country.

Figure 5.13 is a plot of real GDP and constant U.S. dollar export growth rates for the Peruvian economy over the period 1983–2015.[11] It may be seen from this Figure that for most of the period, Peru's economic growth is synchronised with its export growth, with some alternation between the two variables in terms of their lead–lag relationship until 2009, after which they were entirely synchronised. The correlation coefficient for the co-movement of economic and export growth is 0.3 until 2009, but jumps to 0.8 in the period after 2009. As would have been expected,

this coefficient is higher than for a country with the economic characteristics of Burkina Faso, but, surprisingly, it is also greater than for developing country metal exporters in general. It could be argued that Peru's greater level of development as compared to other metal exporters (suggesting a more diversified and globally integrated economy) explains the difference.

Figure 5.13
Real GDP and export growth rates of the Peruvian economy, 1983-2015

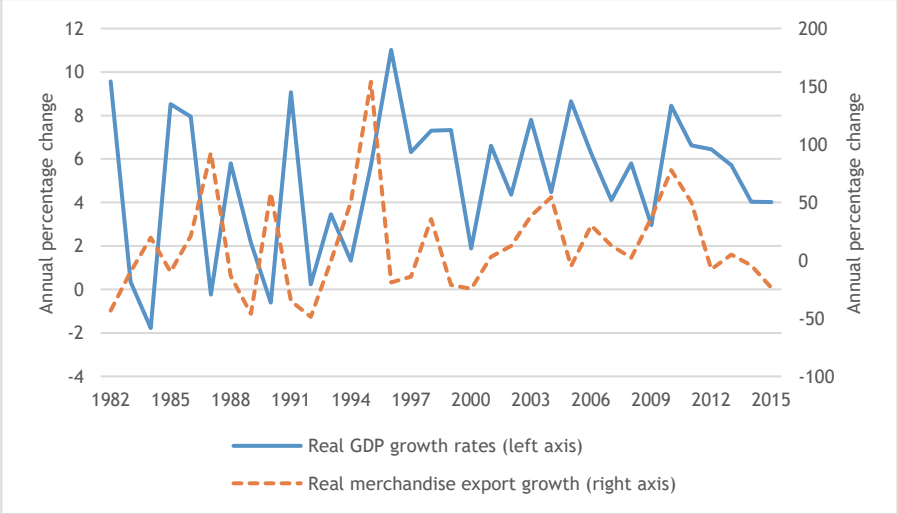


Source: World Bank, WDI, FED, author's calculation.

The last country to be considered is Burkina Faso. As already indicated in the previous chapter, Burkina Faso is a low-income country that has traditionally been dependent on the export of agricultural raw materials. Figure 4.17 in the previous chapter showed that for much of the period from 1982 to 2015, these exports accounted for well over 50% of total exports. From what was argued above, in terms of the characteristics of the economy, there is unlikely to be a strong relation between its economic and export growth, with the former being influenced by all manner of domestic shocks, including the vagaries of the weather.

Figure 5.14 is a plot of growth rates of real GDP and merchandise exports in constant U.S. dollars for the Burkina Faso economy over the period 1982–2015.[12] As expected, there is a relatively poor degree of synchronisation of the two variables for the period as a whole. In general, export growth seems to lead economic growth, although, as with other primary commodity exporters, there is a greater degree of synchronisation of the two variables in the more recent period. The contemporaneous correlation coefficient for the co-movement of the two variables for the period as a whole is minus 0.08. This is even lower than for the cluster of low-income countries as a whole. As noted earlier, the low degree of synchronisation should not be taken to mean that movements in global growth rates have no bearing on those of the economy of Burkina Faso. Rather, the noise effects of numerous shock-induced growth fluctuations make it difficult to decipher cyclical movements in economic growth — i.e., those movements in domestic economic growth which are conditioned by the movement of global growth.

Figure 5.14
Real GDP and export growth rates of the Burkina Faso economy, 1982-2015



Source: World Bank WDI, FED, author's calculation.

5.5 Chapter summary

This chapter has attempted to identify the country drivers of global cycles and establish the extent to which cycles in developing economies are driven by external factors.

The main finding of the chapter with respect to the first of the two objectives, was that the country drivers of global cycles are the large manufacturing economies, particularly those accounting for the major share of global manufactured exports. This contradicts the traditional view that it is the cycles of the large economies *per se*, particularly the U.S. economy, that condition global cycles. It was argued that although the distinction has been of little consequence for much of the period covered by the present study, since for most of this period the advanced economies were also the dominant manufacturers, it started to assume increasing importance in more recent years with the rise of China — while still a developing country — to becoming the dominant global manufacturing economy. While it is too early to draw any definitive conclusions in this regard, there are already a number of signs of the increasing influence of China's economy. One of the clearest of these is the observed weakening of growth rates of most developing and many advanced economies along with that of the Chinese economy in the period 2011–15, notwithstanding the relatively stable growth of the U.S. economy over this period.

The main finding with respect to drivers of cycles in developing countries was that they are largely external to these economies, contrary to traditional thinking. It was argued that the evidence for this should come in the form of the link between export growth and economic growth of the domestic economy, with trade being seen as the major channel through which most developing economies have been linked to the global economy up to the present. The empirical evidence in support of the existence of such a relationship was considered, first at the aggregate level of developing countries as a whole, and then at successively disaggregated levels, ending with individual country studies.

As one might expect, the clearest evidence for the existence of the hypothesised relationship was found when considering all developing countries as a composite. It was shown that there is a close relationship between the non-weighted growth rates of real GDP and exports of all developing countries and, where the movement of the two is not synchronised, it is export growth that leads economic growth. This relationship was shown

to hold, to differing degrees, when it was considered in the context of different clusters of developing countries based on different levels of development (per capita income) and structures of production (or structures of exports to be precise). With regard to levels of development, it was shown that the relationship between the two variables was relatively stronger for middle-income countries as compared with low-income countries, and also somewhat stronger for exporters of manufactures as compared with primary commodities. It was noted that most exporters of manufactures tended to be middle-income countries, although the latter are not the same as the former.

The analysis of the drivers of cycles in individual developing countries sought to expand on the findings of drivers of cycles pertaining to clusters of developing countries. Four countries were chosen as broadly representative of the characteristics of developing countries used to construct the composites. The countries chosen were China, Brazil, Peru and Burkina Faso. China was chosen as a representative of exporters of manufactures, Burkina Faso and Peru as representatives of commodity exporters (agricultural raw materials and metals, respectively), and Brazil as a sort of hybrid of the two — an exporter of both manufactures and commodities. The distinction between Burkina Faso and Peru with respect to their levels of development was also taken into consideration. Specifically, while both are commodity exporters, Peru is a middle-income developing country and Burkina Faso a low-income developing country. As was to be expected, the relation between growth rates of exports and real GDP was shown to be stronger for China and Brazil than Peru and Burkina Faso, with that for China being stronger than that for Brazil (i.e., the relationship between exports and growth was stronger for the exporter of manufactures than for the hybrid exporter of manufactures), and that for Peru stronger than that for Burkina Faso (i.e., the relationship between exports and growth was stronger for a middle-income country compared to a low-income country, although the different nature of metals compared to agricultural raw materials may have also had some bearing).

Notes

[1] It is important to reiterate the point made in the Introduction to this study; that the aim of this chapter is not to explain the causes and transmissions of cycles in general.

[2] Data pertaining to real manufacturing production in the Chinese economy are not provide by the World Bank; these data therefore had to be computed by the author drawing from the raw data provided by the World Bank (data accessed 17 April 2017).

[3] Author's calculation based on World Bank data (data accessed 1 February 2017).

[4] Evidence for the expansionary policies implemented by the Chinese authorities has been provided by a number of business economists (see, for example, Wildau, 2016b; Davis, 2017).

[5] Recent data suggest that among the advanced countries the EU as a block, and Germany in particular, has come to be most closely aligned to the Chinese economy. For example, the correlation coefficients for the growth rates of the EU, Japan and the U.S. economies with that of the Chinese economy over the period covered by cycle V are 0.69, 0.51, and minus 0.13, respectively.

[6] It can justifiably be argued that the Chinese economy is in turn dependent on demand from the advanced countries, particularly the U.S., for its export and real GDP growth. However, the point that is being made here is that notwithstanding where the demand for its products is coming from, as the largest manufacturer it appears to have the biggest influence on the growth of global GDP as a whole, and, most importantly, on the growth of the vast majority of (developing) countries making up the global economy. This is perhaps best evidenced by the post-2011 period when the growth rates of most developing countries fell with that of the Chinese economy, notwithstanding the relatively stable growth of the U.S. economy.

[7] Of note, however, is the increased synchronisation between export and GDP growth for the low-income cluster of countries in the more recent period, i.e., from the beginning of cycle IV onwards (see also Table 5.3). It could be argued that this is the result of their increasing integration into the global economy and rapid development of many of the countries comprising this cluster.

[8] The relatively higher magnitude of the parameter value is due to the greater volatility of export growth without having any implication for the relative significance of the relationship

[9] Although the greater volatility in the prices of commodities can be attributed to some extent to the speculative activity of commodity traders, there can be little doubt that for the most part, and over the longer term, it has to do with their relative inelasticity of supply.

[10] See note 6 above.

[11] 1982 data are not available.

[12] Total merchandise exports are taken as the proxy for the export of agricultural raw materials for Burkina Faso. This is because data for the latter are only available after 1996, and even then with some missing years.

6 Summary, conclusions, policy implications and avenues for future research

6.1 Introduction

The aim of this final chapter is fourfold: firstly, to summarise the key findings of the research with respect to the major research objectives and questions posed at the outset (see chapter 1, section 1.3); secondly, to indicate its contribution to the already considerable and rapidly expanding corpus of literature on the subject; thirdly, to draw out clearly certain theoretical and policy implications of the research for the understanding of cycles, especially those at the global and developing country levels; and lastly, to provide a number of suggestions for possible future directions of research on the subject.

6.2 Main findings of the research

The research objectives and questions posed at the outset of the research indicated the focus of the study to be: the conceptualisation of cycles and how this informs the study of cycles in developing countries; and the identification, nature and drivers of cycles at the global, sub-global and individual developing country levels. The major findings of the study will be summarised with respect to each of these in turn.

6.2.1 Conception of cycles

In the discussion of the basic conception of cycles, it was argued that these need to be understood as recurrent but non-regular (i.e., non-periodic) and non-symmetric alternating sequences of expansionary and contractionary economic activity. These sequences need to be seen as conditioned by long-term trends in economic activity (and, in turn, as conditioning the

long-term trends in this activity), as well as being the product of the workings of the economic system and integral to it. It was argued that this conception is fundamentally different to that of orthodox mainstream studies, which typically see cycles as non-recurrent random fluctuations in economic activity resulting from various and varied 'shocks' to the system which are exogenous to its workings and have no bearing on any long-term trends in this activity. It was further argued that the alternative conception accepts the fact that such shocks exist, but posits that they cannot be seen as the triggers of repeated cycles. Indeed, it was noted that, for many orthodox economists, this conceptualisation of cycles as fluctuations results in a denial of the existence of cycles. It was further noted that, somewhat paradoxically, the implicit conception of cycles underlying many mainstream cycle identification methods is that of recurrent and even symmetric fluctuations in economic activity that are, by implication, endogenous to the system rather than random fluctuations which are exogenous to it.

The alternative generic conception of cycles was then used as a basis for conceptualising global cycles, cycles pertaining to groupings of countries, and individual (developing) country cycles. It was argued that: a) global cycles should be seen as the synchronised, alternating, recurrent, but non-periodic and non-symmetric movements in economic activity of all or most countries comprising the global economy; b) cycles pertaining to groupings of countries should be seen as synchronised, alternating, recurrent, but non-periodic and non-symmetric movements in the economic activity of all or most countries comprising these clusters; and c) cycles in individual countries should be seen as alternating, recurrent but non-periodic and non-symmetric movements in the economic activity of these economies.

6.2.2 Existence and identification of cycles

The alternative conception of the cycle, together with the critique of mainstream cycle methods of cycle identification, were used as a basis for the development of an alternative method for cycle identification. The main criticism of mainstream cycle identification methods was their implicit presumption of regularity and symmetry in the cycles to be identified, contrary to the evidence of cycles being non-regular and non-symmetric. The alternative conceptualisation of the cycle and the criticism of mainstream methods of cycle identification suggested the need for the development

of alternative, less deterministic and mechanical methods for cycle identification. The alternative proposed was the use of real GDP growth rates, non-linear trends and cycle troughs in these growth rates for the identification of generic cycles. Emphasis was placed on the use of non-linear trends to emphasise the importance of path dependency in the identification of cycles as alternating periods of expansion and contraction in economic activity with respect to a longer-term (path-dependent) trend. Attention was drawn to the importance of not identifying cycle peaks and troughs with the use of mathematical *maxima* and *minima*, respectively, since periods of economic strength and weakness were seen as likely to continue for varied periods of time after cycle *maxima* and *minima* were reached, leading to a confusion of cycles with fluctuations.

The alternative methods for the identification of generic cycles were then extended to provide a methodology for the identification of cycles at the global, sub-global and individual developing country levels. For the identification of global and sub-global cycles, it was argued that it is necessary to show, firstly, that there are cycles in aggregate economic activity at these two levels (taking the weighted average growth rates of the countries comprising the clusters, in the case of sub-global cycles) in accordance with the alternative criteria developed for the identification of cycles in general; and, secondly, that these cycles correspond to the synchronised cyclical movements in the individual countries comprising the clusters (taking the non-weighted average growth rates of the countries comprising the clusters). It was argued that the identification of individual country cycles should be with reference to the identified global cycles (based on weighted averages of the country components) and cycles of the sub-cluster of countries sharing the economic characteristics of the country concerned. Reference to global and sub-global cycles in the individual country cycle identification would, it was further argued, aid distinctions between cycles and fluctuations.

Using these alternative methods of cycle identification, global cycles were shown to exist. Specifically, the cyclical growth rates of aggregate non-weighted real GDP of all countries comprising the global economy were shown to move together with cyclical growth rates in aggregate weighted real GDP of these countries, although some divergence in the two series was noted in recent years. Cycles were then identified in the groupings of advanced and developing countries. As one would expect, the cycles of advanced (high-income) economies as a cluster were found

to be more closely synchronised with the global cycles than those of developing countries, although the synchronisation of the latter with the global cycles was also found to be quite close. Against this backdrop, cycles were identified for different sub-groupings of developing countries based on levels of development and economic structures. It was argued that these characteristics need to be taken into account when identifying cycles, since they can be expected to have a considerable bearing on the cyclical movement of these economies. It was found, as one might also have expected, that middle-income, manufacturing economies are more synchronised with the global cycle than low-income, raw material producers. It was, in fact, noted that cycle identification in the latter group was often difficult due to the greater susceptibility of their growth rates to the impacts of all manner of random (domestic) shocks. Cycles in individual countries were then identified to further illustrate the importance of taking into consideration the global cycles as the reference cycles and the specific economic characteristics of the country concerned. The individual countries chosen were Brazil, Sri Lanka, Peru and Burkina Faso. It was shown that cycles in all of these countries could be identified to one degree or another with reference to the global cycles, with the degree being dependent on the particular economic structure of the country (and its evolution over the time period under consideration).

6.2.3 Drivers of global and individual cycles

Although potentially vast, the discussion of the drivers of cycles was limited to the country drivers of the global cycles, and the extent of the influence of the latter on cycles in developing countries.

It was found that, contrary to common perceptions, the major country drivers of global cycles have not been the largest advanced economies *per se* but rather the largest manufacturing economies. Although for most of the time period under consideration, the two could be taken as synonymous, at certain junctures there is an important distinction to be made between the two. Presentation of the relevant data in the form of charts and tables, as well as econometric analyses (the results of which are provided in Appendix 5.5), were used to support this argument. The particular significance of the distinction was argued to be best understood in the context of the recent rise of China as the global manufacturing powerhouse, notwithstanding its developing country status, and the implications this appears to be having on our understanding of the dynamics of the

global economy. Specifically, it was argued that there is a growing body of evidence suggesting that the movements of global cycles are increasingly more in tune with the movement of the Chinese economy, which has become the largest manufacturing producer, than with the large advanced country economies, e.g., the U.S. or Europe. This link was argued to be most clearly evident in the period from around 2012 onwards, with the weakening of the Chinese economy in the period after 2013 seen to have a depressive effect on most developing country economies, in spite of the steady growth of the U.S. economy — traditionally seen as providing the major impetus to movements in the global economy.

The major driver of cycles in developing countries was shown to be the global economy and, in particular, impulses emanating from the external environment *via* trade channels. As in the case of the drivers of the global economy, empirical evidence was provided in the form of charts and tables as well as econometric analysis in the Appendix to chapter 5 (see Appendix 5.5). It was shown that, for all developing countries, there is a close relation between the weighted growth rates of real GDP and exports and, where the movement of the two is not synchronised, it is export growth that leads economic growth. This relationship was then shown to hold, to differing degrees, when developing countries are broken down into different clusters based on different levels of development (per capita income) and structures of production (or structures of merchandise exports to be precise). It was shown that the relationship between the two variables was strongest for middle-income manufacturing economies, noting that most exporters of manufactures tend to be middle-income countries.

The analysis of the drivers of cycles in individual developing countries was undertaken to expand on the findings of drivers of cycles pertaining to clusters of developing countries. The countries chosen were China, Burkina Faso, Peru and Brazil. As expected, the relation between growth rates of exports and real GDP was shown to be stronger for middle-income manufacturing economies such as China and Brazil than for low-income raw material producers such as Burkina Faso, and even a middle-income raw material producer like Peru.

6.3 Key contributions

The study can be argued to make a number of important contributions to the literature on business cycles in general, and that on global and developing country cycles in particular. These contributions can be listed as follows.

The first contribution is the alternative conception of cycles, and the distinction to be drawn between cycles and fluctuations. It was argued that the alternative conception of cycles and the implied distinction between cycles and fluctuations have far-reaching and profound consequences for their identification and the explanations of their drivers.

The second contribution to the literature on business cycles is the proposed alternative method for their generic identification, founded on the alternative conception noted above. This method eschews the use of filters and the like in favour of a less technically robust but more qualitatively informed method. It was shown that this alternative method of identification, and in particular the use of non-linear trends in identification, implicitly recognises cycles as path dependent and not movements around an independent trend.

The third contribution to the literature on business cycles is the method proposed for the identification of global (and sub-global) cycles: that is, the use of non-weighted aggregate growth rates of countries comprising the global economy. Most studies take weighted average growth rates, with weights being assigned on the basis of country size.

The fourth, and related, contribution is the actual identification of global cycles (and sub-global cycles) using non-weighted growth rates. An important implication of this finding is that it indicates the existence of a global gravitational economic force operating on all economies, regardless of the sizes of economies, including the advanced economies.

The fifth contribution of the study to the literature is the importance ascribed to manufacturing economies as the drivers of the global cycles. This contribution is founded on the somewhat unfashionable and nowadays unconventional view that it is the growth of the manufacturing sector which typically drives economic growth. It was noted in the context of the presentation of the econometric evidence pertaining to the relationship between economic growth and manufacturing growth that the parameter

estimates were found to be remarkably similar to those derived by Nicholas Kaldor in his seminal work on the relationship for 12 industrial countries (see Kaldor, 1966, 1967).

The sixth and last contribution to be noted is the importance to be ascribed to global cycles in understanding the movement of cycles in developing countries, with differences between the movement of developing country cycles in relation to the global cycles being dependent on levels of development and the structures of the countries' economies.

6.4 Theoretical and policy implications

The study also has a number of important theoretical and policy implications which warrant some elaboration here. These follow from the findings regarding the conception, identification and drivers of cycles at the global and developing country levels summarised above.

6.4.1 Theoretical implications

The first theoretical implication of the preceding study is that it serves to reinforce the standard Heterodox view of the capitalist economic system as inherently unstable. Specifically, it suggests — as Heterodox economists have long argued — that the recurrent cycles in economic growth rates (and other macroeconomic phenomena) result from the normal functioning of the system, although there are disagreements within the Heterodox camp over whether the periodic crises accompanying these cycles in economic growth rates are necessary for the functioning of the system. This brings into question the basic validity of many mainstream macroeconomic analyses and models, even those which accept the existence of cycle phenomena, since they are all premised in one way or another on the assumption of stable economic growth as the normal state of affairs. It suggests that these analyses and models paint an essentially misleading picture of the capitalist economy.

A second theoretical implication of the study is the need for a distinction to be drawn between cycles and random fluctuations.

The third theoretical implication to be drawn from the study is the importance to be attached to the global macroeconomic environment when analysing and projecting macroeconomic trends in the global economy. It was shown that cyclical trends in growth rates of most countries comprising the global economy tend to move together, suggesting that the global

economy is exerting some sort of gravitational force on all its constituent countries. Many mainstream and Heterodox analyses and models of the macroeconomic dynamics of economies pay little or no heed to this global gravitational force, and those that do tend to accord it only a marginal significance. That is to say, these analyses and models are failing to spot the elephant in the room.

The fourth theoretical implication that needs to be drawn from the study is the importance of manufacturing production in general, and large manufacturing-based economies in particular (and most notably China in the recent past), in driving the cycles in global economic growth. Evidence suggests that manufacturing economies are more cyclical than commodity-exporting economies because they are more income elastic than the latter. Although there are a large number of studies that attest to the importance of manufacturing production in driving economic growth in individual countries and even clusters of countries, there are few if any that extend this to the global economic setting and the global economic growth cycle. Indeed, most attention is typically paid to cyclical movements in global aggregate demand and to aggregate demand in the large advanced economies, without any reference to the cyclical movements in global output of any particular sector. What the preceding study suggests is that, even if the focus is on the movement of global aggregate demand, it needs to be linked to corresponding movements in global manufacturing production and manufacturing-based economies in order to better understand the dynamics of global economic cycles (and the co-movement of growth rates of large numbers of economies). It is only this focus on manufacturing production that enables one to fully appreciate the fall in growth rates of the majority of developing countries in the period 2011–15, a period when the largest producer of manufactured commodities, China, experienced a protracted fall in its growth rate. China, as the largest producer of manufactures, is also the biggest buyer of raw materials, which are the mainstay of most developing countries. This explains the correlation between the fall in economic growth of the Chinese economy and that of these other economies.

The fifth theoretical implication to be derived from the preceding study is that developing countries also experience cycles (as opposed to random fluctuations) in their economic growth and that these cycles need to be understood with reference to the global economic cycle. This is in stark contrast to most mainstream views and analyses of growth processes in

developing countries, which tend to see any cyclical phenomena as fluctuations in aggregate output which are largely the result of random domestic shocks — even when the importance of trade and capital flows for the domestic economy are formally acknowledged. This is evidenced by typical central bank and finance ministry reports in most developing countries where there is scarcely a reference to the global economic environment, except perhaps in a global crisis situation.

6.4.2 Policy implications in developing countries

The policy implications arising out of the study follow to a large extent, as one would expect, from the theoretical implications. To begin with, the study suggests that policy makers need to be more circumspect in their use of so-called Dynamic Stochastic General Equilibrium (DSGE) models, the models typically favoured by policy makers the world over, when making policy decisions. Although there is considerable variation among the models used in different countries, all these models typically assume the economic system to be largely stable, and certainly not characterised by recurrent cycles. Although there is circumstantial evidence that some policy makers acknowledge the existence of recurrent cycles — for example, those belonging to the U.S. Federal Reserve — it is unclear to what extent this compensates for the prognoses and forecasts generated by the DSGE models they also rely on.

Secondly, the study suggests that policy makers, especially those in developing countries, should pay considerably more attention than they do at present to developments in the global economy when formulating macroeconomic policy. For example, when setting domestic growth targets and associated policies, policy makers would do well to pay heed to the current and projected global economic growth environment in order to avoid the possible adverse budgetary consequences of a major error in forecasts. The same can be said for inflation. There is now considerable evidence to show that inflation trends for most countries in the world are broadly similar, suggesting that in this case, too, external forces are at work and need to be taken into account when setting inflation targets and devising corresponding inflation policies.

Thirdly, the observed increasing synchronisation of cycles suggests a need for greater macroeconomic policy coordination at the international level with a view to increasing stability in the global economy, especially among those countries which can be deemed to lie at the epicentre of the

global economy — large manufacturing-based economies and those accepted as issuers of world money. This increasing coordination is already in evidence with respect to monetary policies, but is also key with respect to fiscal policies.

Fourthly, the study suggests that an important distinction needs to be made by policy makers between cycles and fluctuations, with the significance of this distinction for policy varying between advanced and developing countries. With respect to cycles, there is justification for the adoption of *ex ante* coordinated **countercyclical policies**[1] in the advanced countries and *ex post* **mitigating policies** in the developing countries, with the exception of China. With respect to fluctuations resulting from random shocks, there can only be *ex post* mitigating policies, whether in the advanced or developing countries. The *ex post* mitigating policies adopted in developing countries might include circumspect fiscal policies and a moderately accommodative monetary policy stance along with the strengthening of social safety nets to cushion somewhat the damaging consequences of a global slowdown or random domestic shock. Obviously the space for individual countries to adopt such mitigating policies will depend on the particular situation of the country in terms of government debt, foreign exchange reserves, etc.

6.5 Future research possibilities

The preceding research has a great many implications for future research. The following are perhaps the most important of these. First, it suggests the need for an explanation of the trend element in cycle identification, possibly through the integration of the Juglar cycle analysis, which has been the focus of the present study, with what has been referred to as 'long-wave (-cycle)' analysis in the manner suggested by Joseph Schumpeter in his classic study of business cycles (1939; see also chapter 1). Such an extension of the analysis would be particularly important for the identification of cycles in the advanced economies and at the global level, and consistent with the notion of path dependency in the derivation of growth rate trends.

Another direction in which the study could be extended is through the identification of cycle phases, particularly those preceding major turning points. A particularly promising line of research which accords with the identification methods favoured in the present study would be on what

have been referred to as lead, coincident and lag indicators. Composites of such indicators are available for certain advanced countries, most notably the U.S. and Europe,[2] but few, if any, exist for global cycles as a composite. One of the problems with extending the existing indicators used in identification of cycles of advanced economies to the global level is that the theoretical basis for the construction of the composites is lacking. Clearly, this is something that will have to be delved into as part of any attempt to develop indicators for the identification of global cycle phases.

The study also suggests that more work needs to be done on the drivers of cycles, and in particular the transmission of cyclical impulses from the dominant economies to the developing economies. One question which needs more attention in this regard is why the movement of the Chinese economy appears to have such a disproportionate impact on the cyclical movement of most developing countries. Another is the nature of the transmission mechanisms from the advanced to the developing countries, and whether other financial flows, apart from those linked to trade in goods and services, have a bearing on the linkages between the advanced and developing countries.

Lastly, the study suggests that more work is needed on policy, and in particular the possible mitigating measures that could be taken by developing countries in a global cycle downturn. Traditionally, and as noted above, business cycle analysts have pointed to the relevance of cycle analyses for countercyclical measures. However, as was argued above, for developing countries the policy focus should be one of 'battening down the hatches'. For fiscal policy, this would mean considering the staggering or delaying of capital expenditures, delaying expansions in employment of government personnel, etc. In terms of monetary policy, it might mean providing more liquidity (or lengthening the time period of repurchase agreements) and concessional loan facilities for strategic (export-oriented) sectors. Equally important are the policies which strengthen social safety nets safeguarding those sections of the population on low incomes that are most vulnerable to a possible downturn in the global economy.

Notes

[1] As discussed in chapter 1, there are debates within the Heterodox schools of thought over the impact of business cycles and the related role of government, although they all agree on the ontological position that recurrent cycles are seen as the norm. The main difference can be said to be that between post-Keynesians and Marxists. Some, especially the post-Keynesian school of thought, deny that cycles are necessary to the functioning of the economic system; cycles are therefore understood to be manageable or even preventable with appropriate government interventions. For this group, the natural policy recommendation would be the implementation of countercyclical policy.

[2] See the existing indicators provided by Conference Board, ECRI, and European Commission as examples (see website links in Reference).

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	

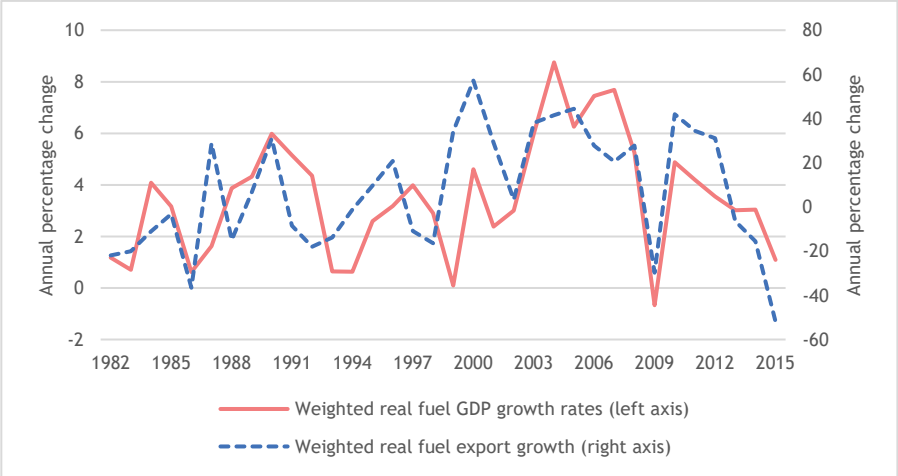
		Grenadines, Sudan, Suriname, Uganda, Zimbabwe		

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

Appendix 5.1
Weighted real food export and GDP growth rates of food-based developing countries, 1982-2015

Source: World Bank WDI, author's calculation.

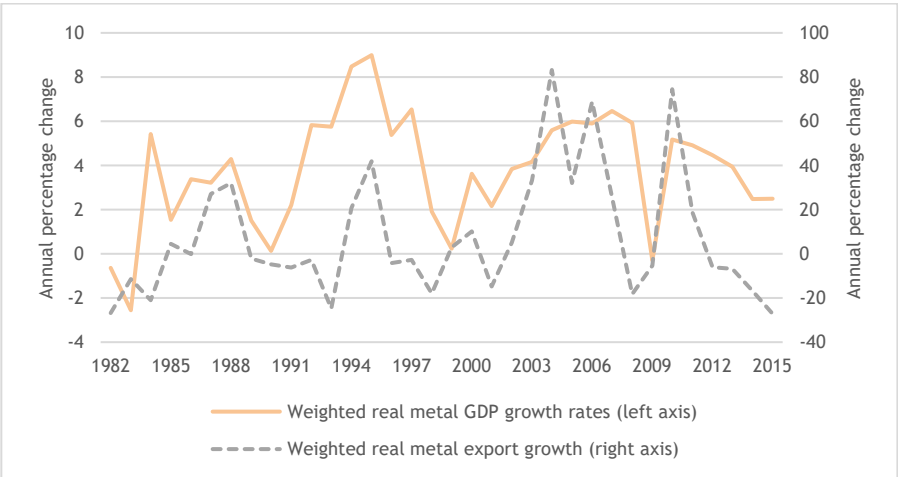
Appendix 5.2
Weighted real fuel export and GDP growth rates of fuel-based developing countries, 1982-2015



Source: World Bank WDI, author's calculation.

1/ Export data for 1994 and 2001 are smoothed to correct for distortions caused by extreme movements in the data for Bahrain and Sudan.

Appendix 5.3
Weighted real metal export and GDP growth rates of metal-based developing countries, 1982-2015



Source: World Bank WDI, author's calculation.

Appendix 5.4
Correlation coefficients for the co-movement of weighted real merchandise export and GDP growth rates in sub-clusters of commodity-based developing countries, 1983-2015

	1983–1993	1994–2001	2002–2009	2010–2015	Weighted average
Food	0.29	0.18	0.48	0.35	0.32
Fuel	0.42	-0.52	0.88	0.95	0.44
Metals	-0.01	0.72	0.42	0.79	0.42

1/ The correlation coefficients are obtained on the basis of non-smoothed data.

Appendix 5.5
Econometric analysis of the drivers of business cycles

This Appendix presents the results of econometric analyses with a view to supporting (or otherwise) the exploratory data findings of chapter 5 with regard to the drivers of business cycles. Although the weaknesses of the use of such empirical methods in business cycle analyses were noted in chapters 1–3, it is felt that, when used in conjunction with the exploratory data analysis of chapter 5, they could serve to strengthen the findings of that chapter.

The structure of the presentation of the results of the econometric analysis in this Appendix largely follows the structure of the exploratory data analysis in chapter 5. Specifically, it will be organized into three sections: the first looks at econometric evidence pertaining to the relationship between cycles in economic and manufacturing production growth in the global economy; the second looks at the econometric evidence pertaining to the relationship between cycles in economic and export growth of all developing countries; and the third the econometric evidence pertaining to the relationship between cycles in economic and export growth of clusters of developing countries. The relevant model specifications, data, results and their interpretation will be elaborated on in each section below. The software used to derive the econometric estimation results is STATA SE version 12.

(1) Global cycles and global manufacturing

The analysis in chapter 5 found that the growth of global manufacturing production drives global GDP growth (see Figure 5.1). This relationship is tested using time series regression methods and data for the period 1998 to 2013. The data of concern for this analysis are the same as those presented in Figure 5.1, i.e., weighted non-smoothed real global manufacturing production growth rates and weighted global real GDP growth rates over the time period 1998–2013. The descriptive statistics for the two variables presented in Table A.5.1 below show that the movement of the manufacturing variable is greater than that of economic growth for both expansion and contraction phases (see the obtained minimum and maximum values) while the difference in their mean values is relatively small.

Table A.5.1
Descriptive statistics, real global growth rates and manufacturing growth

	Mean	SD	Min	Max
Real global growth rates	2.89	1.49	-1.64	4.39
Real global manufacturing growth	2.05	2.22	-3.75	9.90

Before estimating the relationship between the two variables in the form of a model, it is important to test for their stationarity to avoid the problem of spurious regression. Since the data are already in the form of first differences, i.e., growth rates, the two variables are assumed to be stationary. This can be confirmed from a visual inspection of the data, i.e., an inspection of the correlogram, and an augmented Dickey-Fuller (ADF) test. The purpose of the ADF test is to see whether these variables exhibit unit root processes, as with the case of the random walk without drift (no constant and no time trend). The results of the ADF test are given in Table A.5.2 below. They suggest that the null hypothesis can be rejected at the 95% level for the real global growth rates and at the 99% level for the real manufacturing production growth rates. That is to say, these two series are stationary, given that the obtained test statistics are smaller than their critical values.

Table A.5.2
Test statistics, real global growth rates and manufacturing growth

	Test statistics	Critical value			Number of Obs.
		1%	5%	10%	
Real global growth rates	-3.538	-3.750	-3.000	-2.630	16
Real global manufacturing growth	-4.216				

The method chosen for testing the relationship between the two variables is Ordinary Least Squares (OLS), and the specification of the model to be tested is informed by the theory and empirical analyses in chapters 2 and 5. The relationship to be tested is the functional dependence of global real GDP growth (Υ) on global manufacturing growth (X). α is the constant term, and since the relationship being tested is a non-determinate one, an error term, μ, is added (these two terms are used for all the equations below).

$$\Upsilon_t = \alpha + \beta \mathrm{X}_t + \mu \quad \text{(A.1)}$$

The estimation results for the OLS estimation of this relationship with the standard error in the bracket is as follows;

$$\Upsilon_t = \underset{(0.160)}{1.57} + \underset{(0.053)}{0.64}\mathrm{X}_t,\ R^2 = 0.91, N = 16 \quad \text{(A.2)}$$

These results show the parameter estimate to be 0.64 and significant at the 99% level. This means that a 1% rise in global manufacturing growth can be argued to give rise to a 0.64% increase in global real GDP growth. To put this parameter value into some sort of context, it suggests the contribution of manufacturing to real GDP growth is considerably higher than its weight in GDP would suggest. Indeed, it may be seen to be considerably higher than the relative and absolute contribution of the services sector, which accounts for some 70% of value added during this period.[1] The R-squared for the co-movement of the two variables is 0.91, suggesting a high degree of explanatory power of the estimated equation. What

is particularly startling about this result is its similarity to the results obtained by Kaldor (1966, p. 5). His study was of the relationship between real GDP growth rates and manufacturing growth rates of 12 advanced countries between 1953–54 and 1963–64. Kaldor's parameter estimate for this relationship was 0.61.

(2) Merchandise export growth of developing countries (DCs) as a whole and their real GDP growth

Another important finding of chapter 5 is that the growth impetus of the developing countries comes mainly from the advanced economies and is manifest in the relationship between the growth rates of these economies and their merchandise exports. To further investigate this relationship, simple OLS time series regression and panel data regression methods were used. The OLS method was used to support the finding of the apparent long-run relationship between the two variables (depicted in Figure 5.5), and panel data regression methods were used to allow for heterogeneity in the years and countries included in the regression analysis.

The OLS estimation follows the sequence adopted in the previous section. The data used for the analysis are those depicted in Figure 5.5: the non-smoothed weighted real GDP growth rates and export growth rates of developing countries between 1983 and 2015 for which data are available. The descriptive statistics pertaining to these two series are presented in Table A.5.3 below. This table shows that the degree of movement in export growth in the DCs is larger than the growth rates of the DCs. In terms of the mean, the movement of the latter is double the former, while the minimum value of the latter is more than 10 times greater and its maximum value around 4 times greater.

Table A.5.3
Descriptive statistics, real global growth rates and export growth in DCs

	Mean	SD	Min	Max
DCs real growth rates	4.94	1.54	2.41	8.40
DCs real export growth	8.12	14.93	-21.55	35.44

The estimation procedure begins with stationarity checks for the variables, i.e., the ADF test of these two series. The test statistics provided in Table A.5.4 suggest that the null hypothesis can be rejected and both series are stationary at 95% level.

Table A.5.4
Test statistics, real global growth rates and export growth in DCs

	Test statistics	Critical value			Number of Obs.
		1%	5%	10%	
DCs real growth rates	-3.659	-3.702	-2.980	-2.622	33
DCs real export growth	-3.345				

The regression equation to be estimated by OLS has as the dependent variable the real growth rates of developing countries (Υ_t) and the independent variable the growth rates of their exports in constant dollars (X_t);

$$\Upsilon_t = \alpha + \beta \mathrm{X}_t + \mu \quad \text{(A.3)}$$

The estimation result obtained is;

$$\Upsilon_t = 4.30 + 0.079\mathrm{X}_t,\ R^2 = 0.59, N = 33 \quad \text{(A.4)}$$
$$(0.200)\ (0.012)$$

The parameter estimate is 0.079, which is consistent with the relative proportions of the respective means of the two variables shown in Table A.5.3 above. This estimate is significant at the 99% level and confirms the positive relationship between economic growth and export growth of DCs. The R-squared is a respectable 0.59.

Two modifications of the preceding model were tested to see if they improved the goodness of fit. The first introduces a lag into the hypothesised relationship since such a lead–lag relationship appears to be particularly evident in the period prior to 2000, especially during the 1990s. The regression equation to be estimated is;

$$\Upsilon_t = \alpha + \beta_0 \mathrm{X}_t + \beta_1 \mathrm{X}_{t-1} + \mu \quad \text{(A.5)}$$

The second model includes a dummy variable with a value of 1 for the period between 1992 and 1997, to account for the break in the contemporaneous relationship over this period (see Equation A.6). The regression equation of this model to be estimated is given by;

$$\Upsilon_t = \alpha + \beta_0 X_t + \beta_1 D_i + \mu \quad \text{(A.6)}$$

The respective OLS estimation results of these two models are as follows;

$$\underset{(0.223)\ (0.014)\ (0.014)}{\Upsilon_t = 4.21 + 0.072X_t + 0.018X_{t-1}}, Adj\ R^2 = 0.56, N = 33 \quad \text{(A.7)}$$

$$\underset{(0.215)\ (0.012)\ (0.445)}{\Upsilon_t = 4.45 + 0.077X_t - 0.71D_i}, Adj\ R^2 = 0.59, N = 33 \quad \text{(A.8)}$$

The estimation results of the coefficients of export growth of the two models, i.e., 0.072 and 0.077, are similar to that of the original model (see A.3 above). Both estimates are significant at the 99% level. Yet, neither additional variable in either of the models is significant at even the 90% level. Thus, the model specification of A.3 is considered to be the preferred specification.

For the corresponding panel data analysis, the pooled panel consists of the year, the weighted GDP growth rates, and the weighted merchandise export growth for available countries. The panel is deemed to be unbalanced as there are missing data and the numbers of observations are not the same across the panel variables. In order to avoid losing many observations by balancing the panel, and since the source of attrition is evident, it is felt that there are certain advantages to using the unbalanced panel for this estimation. There are a total of 4,664 observations with 33 annual observations between 1983 and 2015 for each of the 168 countries, and each series misses some observations due to the attrition noted above (see Table A.5.5). As with the time series data, the movement of the real export growth can be seen to be larger than that of the real growth rate, while the ratio of the two differs depending on mean, minimum and maximum.

Table A.5.5
Descriptive statistics, year, real global growth rates and export growth in DCs

	Num-ber of Obs.	Mean	SD	Min	Max
Year	4,664	N/A			
DCs real growth rates	4,294	0.46	0.26	-2.73	5.10
DCs real export growth	4,577	-2.73	6.41	-17.29	15.98

The model estimated with the panel data is the fixed effects regression model, and the specification of the model is described as follows;

$$Y_{it} = \lambda_1 + \lambda_2 D_{84} + \lambda_3 D_{85} \ldots + \lambda_{32} D_{15} + \beta X_{it} + \mu_{it} \quad \text{(A.9)}$$

where

$$\mathrm{i} = \text{ cross sectional unit}$$
$$\mathrm{t} = 1,2,\ldots.,32$$
$$\mathrm{D} = \text{ Dummy}$$
$$\lambda_{2\ldots}\lambda_{32} = \text{differential intercept coefficient}$$

This model allows for country and time fixed effects. The former is considered to be already taken into account given the use of growth rates, and the latter is dealt with by introducing time dummy variables for each year. The base year of this analysis is 1983. The dummy variable of that year is omitted from the estimation, and the other years take the value of 1 for each year (see Gujarati, 2004, p. 643–44). The regression equation with the estimated results is as follows;

$$
\begin{aligned}
Y_{it} = {} & \underset{(0.110)}{4.24} + \underset{(0.008)}{0.31X_{it}} + \underset{(0.039)}{0.88D_{84}} - \underset{(0.114)}{4.25D_{85}} - \underset{(0.143)}{5.44D_{86}} - \underset{(0.161)}{6.15D_{87}} \\
& - \underset{(0.076)}{2.69D_{88}} - \underset{(0.032)}{0.17D_{89}} - \underset{(0.102)}{3.73D_{90}} - \underset{(0.763)}{2.71D_{91}} - \underset{(0.478)}{1.40D_{92}} \\
& - \underset{(0.053)}{1.64D_{93}} - \underset{(0.074)}{2.60D_{94}} - \underset{(0.084)}{3.01D_{95}} - \underset{(0.086)}{3.04D_{96}} - \underset{(0.030)}{0.04D_{97}} \\
& - \underset{(0.098)}{3.62D_{98}} - \underset{(0.105)}{3.96D_{99}} - \underset{(0.064)}{2.24D_{00}} - \underset{(0.085)}{3.06D_{01}} - \underset{(0.126)}{4.78D_{02}} \\
& - \underset{(0.179)}{6.90D_{03}} - \underset{(0.151)}{5.75D_{04}} - \underset{(0.094)}{3.48D_{05}} - \underset{(0.148)}{5.63D_{06}} - \underset{(0.166)}{6.33D_{07}} \\
& - \underset{(0.047)}{1.43D_{08}} - \underset{(0.164)}{6.29D_{09}} - \underset{(0.124)}{4.66D_{10}} - \underset{(0.108)}{4.66D_{11}} - \underset{(0.123)}{4.66D_{12}} \\
& - \underset{(0.091)}{3.35D_{13}} - \underset{(0.505)}{1.59D_{14}} - \underset{(0.037)}{0.86D_{15}}, R^2 = 0.27, \mathrm{N} = 4240 \qquad \text{(A.10)}
\end{aligned}
$$

The estimated parameter value for export growth is significant at the 99% level. The interpretation of this parameter value is that a growth of export earnings of DCs by 1% leads to a 0.31% rise in their real GDP growth rates. It is of note that this parameter estimate is roughly 3.8 times higher than that of the time series analysis. The relatively higher parameter value is arguably due to the elimination of a large part of the deviations between the two series by accounting for fixed effects. All individual time dummies, except for those pertaining to 1997, are also statistically significant at the 99 % level. The restricted F-test value shows that the model can be considered to be correctly specified. Even though the R-squared is considerably lower than for the simple OLS model, it could be argued that the panel data analysis provides further confirmation of the hypothesised relationship between real GDP and export growth rates of developing countries.

(3) Real GDP and export growth rates of groupings of developing countries

This section discusses the econometric evidence pertaining to the relationship between real GDP and export growth which is argued to exist to one degree or another for various groupings of developing countries. This evidence can be seen as providing confirmation of the results obtained in chapter 5 from exploratory data analysis. The data used for the econometric analyses are those used in the analyses of the corresponding relationships in chapter 5. It should be recalled that the data used for that analysis are non-smoothed, weighted real GDP and export growth for each cluster. The first of the clusters of developing countries to be considered are those based on income levels. This will be followed by clusters based on the structures of economies.

a. Growth of middle-income countries and their export growth

The grouping of developing countries based on level of development was divided into middle- and low-income countries. The first of these two groupings to be considered then is the middle-income developing countries. The model to be estimated is the hypothesised relationship between real weighted GDP growth rates of middle-income developing countries (Υ_t) and their weighted real export growth rates (X_t),

$$\Upsilon_t = \alpha + \beta \mathrm{X}_t + \mu \quad \text{(A.11)}$$

The descriptive statistics for these two variables are given in Table A.5.6. They show that the mean of the export growth rates of developing countries is nearly double that of their real GDP growth rates, while the ratio of the respective standard deviations is more than 7 times as great. The results of the ADF test for the two variables are shown in Table A.5.7. These results confirm the stationarity of the real growth rates at the 99% and the real merchandise export growth rates at the 95% level.

Table A.5.6
Descriptive statistics, real growth rates and export growth in middle-income countries

	Mean	SD	Min	Max
Middle-income countries real growth rates	4.39	1.99	0.72	8.47
Middle-income countries export growth	7.67	15.17	-21.66	35.55

Table A.5.7
Test statistics, real growth rates and export growth in middle-income countries

	Test statistics	Critical value			Number of Obs.
		1%	5%	10%	
Middle-income countries real growth rates	-3.767	-3.702	-2.980	-2.622	33
Middle-income countries export growth	-3.376				

The OLS estimation of A.11 gives the following results;

$$\Upsilon_t = 3.68 + 0.093\mathrm{X}_t,\ R^2 = 0.50, N = 33 \quad \text{(A.12)}$$
$$(0.280)\ (0.017)$$

The results indicate an estimated parameter value of 0.093, which is statistically significant at 99% level. The obtained parameter value is higher than that for the regression of the same variables for all developing countries.[2] This is arguably because middle-income developing countries are less subject to random shocks and resulting growth fluctuations than low-income economies, such that export growth explains relatively more of the variation in economic growth than would be the case in low-income developing countries which are more subject to these shocks and corresponding random growth fluctuations.

b. Growth of low-income countries and their export growth

The second of the clusters of developing countries based on income levels to be considered is those classified as low-income countries. The model to be estimated is the hypothesised relationship between real weighted GDP growth rates of these low-income developing countries (Υ_t) and their weighted real export growth rates (X_t);

$$\Upsilon_t = \alpha + \beta X_t + \mu \quad \text{(A.13)}$$

The descriptive statistics for these two variables are given in Table A.5.8. They show similar ratios of means and standard deviations for export growth rates and real GDP growth rates as for middle-income countries. The results of the ADF test for the two variables are given in Table A.5.9. They confirm the stationarity of the real growth rates at the 99% and the real merchandise export growth rates at the 95% level.

Table A.5.8
Descriptive statistics, real growth rates and export growth in low-income countries

	Mean	SD	Min	Max
Low-income countries real growth rates	6.97	1.26	3.82	8.82
Low-income countries export growth	10.58	14.22	-15.66	36.38

Table A.5.9
Test statistics, real growth rates and export growth in low-income countries

	Test statistics	Critical value			Number of Obs.
		1%	5%	10%	
Low-income countries real growth rates	-3.753	-3.702	-2.980	-2.622	33
Low-income countries export growth	-3.537				

The OLS estimation of A.13 gives the following results;

$$\underset{(0.276)\ (0.016)}{\Upsilon_t = 6.85 + 0.015\mathrm{X}_t,\ R^2 = 0.02,\ N = 33} \quad \text{(A.14)}$$

The results show the parameter estimate to be not statistically significant at an acceptable level of significance. It could be argued that this is because of the considerable fluctuations in export growth in the pre-2002 period and corresponding changes in the contemporaneous relationship between the two variables, as shown in Figure 5.7. To allow for these, a lagged independent variable and dummy variables were added but without any improvement in the statistical significance of the hypothesised relationship.

The regression equation A.13 was also re-estimated with data for the period after 2002 when it can be seen from Figure 5.7 that the two series started to move more closely together. The results are presented below;

$$\underset{(0.430)\ (0.019)}{\Upsilon_t = 6.02 + 0.037\mathrm{X}_t,\ R^2 = 0.25, N = 14} \quad \text{(A.15)}$$

These results show that the parameter value rises appreciably, but is only statistically significant at the 90% level, and the R-squared continues to be quite low. What these results could be interpreted as suggesting is that while low-income countries might be more dependent on exports for their economic growth, they are more affected by random shocks than the middle-income countries.[3]

c. Growth of manufacturing export-based developing countries and their export growth

The second clustering of countries to be considered is that pertaining to different structures of developing country economies. As chapter 5 made clear, the main distinction to be made in this regard is between manufacturing export-based and commodity export-based developing economies. The first of these two to be considered is manufacturing export-based economies.

The model to be estimated is the hypothesised relationship between real weighted GDP growth rates of these manufacturing export developing countries (Υ_t) and their weighted real export growth rates (X_t);

$$\Upsilon_t = \alpha + \beta X_t + \mu \quad \text{(A.16)}$$

The descriptive statistics for these two variables are given in Table A.5.10. They show similar ratios between means and standard deviations for the two series as those shown for the series based on income levels. The results of the ADF test for the two variables are shown in Table A.5.11. They confirm the stationarity of the real growth rates at the 99% level and the real manufacturing export growth rates at the 95% level.

Table A.5.10
Descriptive statistics, real growth rates and manufacturing export growth in manufacturing-based developing countries

	Mean	SD	Min	Max
DCs manufacturing-based economies real growth rates	6.28	1.43	2.50	9.66
DCs manufacturing-based economies real export growth	10.15	13.69	-14.26	37.85

Table A.5.11
Test statistics, real growth rates and manufacturing export growth in manufacturing-based developing countries

	Test statistics	Critical value			Number of Obs.
		1%	5%	10%	
DCs manufacturing-based economies real growth rates	-4.016	-3.702	-2.980	-2.622	33
DCs manufacturing-based economies real export growth	-3.480				

The OLS estimation of A.16 gives the following results;

$$\underset{(0.268)}{\Upsilon_t = 5.71} + \underset{(0.016)}{0.055X_t},\ R^2 = 0.28, N = 33 \quad \text{(A.17)}$$

The estimated parameter value is shown to be statistically significant at the 99% level. The coefficient is smaller than the estimated parameter value for the regression of total merchandise export growth on total real GDP growth for all developing countries (see equation A.4 above). This suggests that real GDP growth rates of commodity producers are likely to be more sensitive to their export growth rates than is the case for manufacturers — as is often argued in the literature on development.[4]

Since Figure 5.8 in chapter 5 suggests that there might be a lead–lag relationship between the two series during the 1990s which may have resulted in a lower parameter value for the contemporaneous relationship, a lagged dependent variable was introduced into the model. The model tested is then;

$$\Upsilon_t = \alpha + \beta_0 X_t + \beta_1 X_{t-1} + \mu \quad \text{(A.18)}$$

The OLS estimation of this model gives the following results;

$$\underset{(0.287)}{\Upsilon_t = 5.40} + \underset{(0.016)}{0.051X_t} + \underset{(0.017)}{0.027X_{t-1}},\ Adj\ R^2 = 0.34 \quad \text{(A.19)}$$

The results show that the parameter value of the lagged independent variable is not significant, while that of the contemporaneous independent variable continues to be significant, but of a lower value. Importantly, the adjusted R-squared rises to 0.34 suggesting an improvement in the explanatory power of the model.

d. Growth of commodity export-based developing countries and their export growth

The second of the clusters of developing countries based on the structures of their production (exports) to be considered is those classified as commodity exporters. The model to be estimated is the hypothesised relationship between real weighted GDP growth rates of these commodity-exporting developing countries (Υ_t) and their weighted real export growth rates (X_t);

$$\Upsilon_t = \alpha + \beta X_t + \mu \quad \text{(A.20)}$$

The descriptive statistics for these two variables are given in Table A.5.12. They show somewhat higher ratios of mean export growth rates of these developing countries to their real GDP growth rates as compared with those for manufacturing exporters. The results of the ADF test for the two variables are shown in Table A.5.13. These results confirm the stationarity of the real growth rates at the 99% level and the real commodity export growth rates at the 95% level.

Table A.5.12
Descriptive statistics, real growth rates and commodity export growth in commodity-based developing countries

	Mean	SD	Min	Max
DCs commodity-based economies real growth rates	3.58	2.16	-1.13	8.13
DCs commodity-based economies real export growth	6.61	20.1	-38.02	43.82

Table A.5.13
Test statistics, real growth rates and commodity export growth in commodity-based developing countries

	Test statistics	Critical value			Number of Obs.
		1%	5%	10%	
DCs commodity-based economies real growth rates	-3.932	-3.702	-2.980	-2.622	33
DCs commodity-based economies real export growth	-3.097				

The results for the OLS regression of the real growth rates of commodity-producing countries on their export growth rates are as follows;

$$\underset{(0.323)}{\Upsilon_t = 3.17} + \underset{(0.016)}{0.063\mathrm{X}_t},\ R^2 = 0.34, N = 33 \quad \text{(A.21)}$$

The obtained statistically significant coefficient of 0.063 is higher than that of the manufacturing-based developing economies.[5] This result suggests, as already concluded above, that GDP growth rates of commodity-based exporters are more sensitive to their export growth than manufacturing-based exporters. This confirms general perceptions of Heterodox development economists, that supply tends to be relatively price inelastic for commodity producers (see, for example, Kenyon, 1979). It should be noted that the introduction of a lagged independent variable did not improve the explanatory power of the model.

Notes

[1] Based on the author's calculation with the value added of different sectors at current U.S. dollar prices.

[2] The comparison of the parameter values is formally premised on a prior simple t-test of the statistical significance of the mean difference between the parameter estimates. This test confirms, as one would expect given that manufacturing countries are a sub-set of all developing countries, that the mean difference is statistically different from zero. Although it is recognised that there are more robust tests available (e.g., use of a condition variable) it is felt that these are unwarranted given the above-mentioned fact that manufacturing countries are a sub-set of all developing countries and the *a priori* economic reasoning used in the formulation of these and other regressions undertaken in this section.

[3] See note 2 in this Appendix for the testing method. The statistical significance is confirmed in this test as well.

[4] See note 2 in this Appendix for the testing method. The statistical significance is confirmed in this test as well.

[5] See note 2 in this Appendix for the testing method. The statistical significance is confirmed in this test as well.

References

Afonso, A. and Sequeira, A. (2010) 'Revisiting business cycle synchronisation in the European Union', Technical University of Lisbon, Working paper, WP 22/2010/DE/UECE.

Agénor, P-R., McDermott, C.J. and Prasad, E.S. (2000) 'Macroeconomic fluctuations in developing countries: Some stylized facts', *World Bank Economic Review*, 14(2), 251-85.

Aguiar, M. and Gopinath, G. (2007) 'Emerging market business cycles: The cycle is the trend', *Journal of Political Economy*, 115(1), 69-102.

Ahmed, S. (2003) 'Sources of economic fluctuations in Latin America and implications for choice of exchange rate regimes', *Journal of Development Economics*, 72(1), 181-202.

Ahmed, S., Ara, I. and Hyder, K. (2005) 'How external shocks and exchange rate depreciations affect Pakistan? Implications for choice of an exchange rate regime', *MPRA working paper*, no. 16247.

Aiolfi, M., Catão, L. and Timmermann, A. (2006) 'Common factors in Latin America's business cycles', *International Monetary Fund*, Working paper, WP/06/49.

Al-Jawarneh, A. and Sek, S.K. (2012) 'The impact of external shocks on business cycle fluctuation in several developed Asian countries', *Applied Mathematical Sciences*, 6(65), 3209-223.

Artis, M. and Okubo, T. (2008) 'Globalization and business cycle transmission', *University of Manchester*, Discussion paper, no. 110.

Aruoba, S.B., Diebold, F.X., Kose, M.A. and Terrones, M.E. (2011) 'Globalization, the business cycle, and macroeconomic monitoring', *International Monetary Fund*, Working paper, WP/11/25.

Backus, D.K., Kehoe, P.J. and Kydland, F.E. (1992) 'International real business cycles', *Journal of Political Economy*, 100(4), 745-75.

Baxter, M. and King, R.G. (1995) 'Measuring business cycles approximate band-pass filters for economic time series', *National Bureau of Economic Research*, Working paper, no. 5022.

Baxter, M. and Kouparitsas, M.A. (2004) 'Determinants of business cycle comovement: A robust analysis', *Federal Reserve Bank of Chicago*, Working paper, no. 2004-14.

Baxter, M. and Stockman, M.J. (1989 'Business cycles and the exchange-rate regime: Some international evidence', *Journal of Monetary Economics*, 23(3), 377-400.

Bernaji, A., Layton, A.P. and Lakshman, A. (2012) 'Dating the "world business cycle"', *Applied Economics*, 44, 2051–63.

Berge, T.J. (2012) 'Has globalization increased the synchronicity of international business cycles?', *Federal Reserve Bank of Kansas City*, Economic Review, Third Quarter, 5-39.

Bergman, U.M., Jonung, L. and Bordo, M.D. (1998) Bergman, U.M., Jonung, L. and Bordo, M.D. (1998) 'Historical evidence on business cycles: The international experience' in Fuhrer, J. and Schuh, S. (eds.) Beyond Shocks: What Causes Business Cycles? Federal Reserve Bank of Boston Conference Proceedings, Conference Series no.42 (Boston: Federal Reserve Bank of Boston), pp. 65-113.

Bernanke, B.S. (2004) 'The Great Moderation', Remarks by the Governor, at the Meetings of the Eastern Economic Association, *Board of Governors of the Federal Reserve System*, 20 February 2004, Washington D.C., Available at https://www.federalreserve.gov/boarddocs/speeches/2004/20040220/ [Retrieved 10 April 2017]

Bernanke, B.S. (2012) 'Monetary policy since the onset of the crisis', Speech at the Federal Reserve Bank of Kansas City Economic Symposium, Jackson Hole, Wyoming, *Board of Governors of the Federal Reserve System*, 31 August 2012, Washington D.C., Available at https://www.federalreserve.gov/newsevents/speech/bernanke20120831a.htm [Retrieved 22 May 2017]

Blanchard, O. J. (2008) 'The state of macro', *National Bureau of Economic Research*, Working paper, No. 14259.

Bordo, M.D. and Helbling, T. (2003) 'Have national business cycles become more synchronized?', *National Bureau of Economic Research*, Working paper no. 10130.

Bordo, M.D. and Helbling, T. (2010) 'International business cycles synchronization in historical perspective', *National Bureau of Economic Research*, Working paper, no. 16103.

Boschi, M. and Girardi, A. (2008) 'The contribution of domestic, regional and international factors to Latin America's business cycle', *Australian National University*, CAMA Working paper, October, 33.

Broda, C. (2004) 'Terms of trade and exchange rate regime in developing countries', *Journal of International Economics*, 63, 31-58.

Bry, G. and Boschan, C. (1971) *Cyclical analysis of time series: Selected procedures and computer programs* (New York: National Bureau of Economic Research).

Burns, A.F. and Mitchell, W.C. (1946) *Measuring Business Cycles* (New York: National Bureau of Economic Research).

Burnstein, A., Kurz, C. and Tesar, L. (2008) 'Trade, production sharing, and the international transmission of business cycles', *Journal of Monetary Economics*, 55, 775-95.

Calderón, C. (2007) 'Trade, specialization and cycle synchronization: Explaining output comovement between Latin America, China and India', *World Bank*, Working paper, No. 66621.

Calderón, C. and Fuentes, J.R. (2011) 'Characterizing the business cycles of emerging economies', *Instituto de Economia*, Second version, No. 371.

Calvo, G.A., Leiderman, L., and Reinhart, C.M. (1993) 'Capital inflows and real exchange rate appreciation in Latin America: The role of external factors', *International Monetary Fund*, Staff papers, 40(1), 108-51.

Canova, F. (2005) 'The transmission of U.S. shocks to Latin data', *Journal of Applied Econometrics*, 20, 229-51.

Canova, F. and Dellas, H. (1993) 'Trade interdependence and the international business cycle', *Journal of International Economics*, 34, 23-47.

Carver, T. (1975) *Karl Marx: Texts on Method* (Oxford: Basil Blackwell).

Cashin, P. (2004) 'Caribbean business cycles', *International Monetary Fund*, Working paper, WP/04/136.

Cashin, P., Mohaddes, K. and Raissi, M. (2012) 'The global impact of the systemic economies and MENA business cycles', *International Monetary Fund*, Working paper, WP/12/255.

Cesa-Bianchi, A., Pesaran, M.H., Rebucci, A. and Zu, T.T. (2012) 'China's emergence in the world economy and business cycles in Latin America', *Bank of Canada*, Working paper, 2012-32.

Chang, H. (2014) *Economics: The User's Guide* (New York: Bloomsbury).

Chang, K., Filer, L. and Ying, Y-H. (2002) 'A structural decomposition of business cycles in Taiwan', *China Economic Review*, 13(1), 53-64.Chauvet, M. and Piger, J.M (2003) 'Identifying business cycle turning points in real time', *The Federal Reserve Bank of St. Louis*, March/April, pp. 47-62.

CODACE. (2010) 'Monthly chronology of the Brazilian business cycles', 10 December, Available at http://portalibre.fgv.br/lumis/portal/file/fileDownload.jsp?fileId=8A7C823326CD886101273EFADE404D30 [Retrieved 11 April 2017]

Colander, D. (2000) 'The death of Neoclassical economics', *Journal of the History of Economic Thought*, 22(2), 127-43.

Collier, P. and Gunning, J.W. (1999) *Trade Shocks in Developing Countries*, Vol 1 (Oxford: Oxford University Press).

Comin, D.A., Loayza, N., Pasha, F. and Serven, L. (2009) 'Medium term business cycles in developing countries', *NBER*, Working paper, No. 15428.

Cookie, D.A., Kose, M.A., Otrok, C. and Owyang, M.T. (2015) 'Regional vs. global: How are countries' business cycles moving together these days?', *The Regional Economist*, April, pp. 5-9.

Cooley, T.F. and Prescott, E.C. (1995) 'Economic growth and business cycles' in Cooley, T.F. (ed.) *Frontiers of Business Cycle Research* (Princeton: Princeton University Press), Chapter 1, pp. 1-38.

Dabla-Norris, E., Minoiu, C. and Zanna, L-F. (2010) 'Business cycle fluctuations, large shocks, and development aid: New evidence', *International Monetary Fund*, Working paper, WP/10/240.

Daly, H.E. (1999) 'Globalization versus internationalization – some implications', *Ecological Economics*, 31, 31-37.

Dasgupta, S. and Singh, A. (2005) 'Will service be the new engine of Indian economic growth?', *Development and Change*, 36(6), 1035-57.

Davis, B. (2009) 'What's a global recession?', *Wall Street Journal*, 22 April 2009, Available at https://blogs.wsj.com/economics/2009/04/22/whats-a-global-recession/ [Retrieved 10 May 2015]

Davis, G. (2017) 'China credit squeeze dents global growth', *Financial Times*, 7 May 2017, Available at https://www.ft.com/content/947e751f-c9d7-37f6-bf7b-8843da41e258 [Retrieved 10 May 2015]

Del Negro, M. and Otrok, C. (2008) 'Dynamic factor models with time-varying parameters: Measuring changes in international business cycles', *Federal Reserve Bank of New York*, Staff report, May, no. 326.

Diebold, F.X. and Yilmaz, K. (2015) 'Measuring the dynamics of global business cycle connectedness' in Koopman, S.J. and Shephard, N. (eds.) *Unobserved Components and Time Series Econometrics*: *Essays in Honor of Andrew C. Harvey* (Oxford: Oxford University Press), pp. 45-89.

Dornbusch, R. (1985) 'Policy and performance links between LDC debtors and industrial nations', *Brookings Papers on Economic Activity*, 2, 303-56.

Downward, P. (2002) 'Realism, econometrics and Post Keynesian economics' in Dow, C.S. and Hillard, J. (eds.) *Post Keynesian Econometrics, Microeconomics and the Theory of the Firm: Beyond Keynes*, Volume 1 (Cheltenham: Edward Elgar), pp. 481-500.

Downward, P. and Mearman, A. (2003) 'Critical realism and econometrics: Interaction between philosophy and Post Keynesian practice' in Downward, P. (ed.) *Applied Economics and the Critical Realist Critique* (London: Routledge), pp. 111-28.

Du Plessis, S.A. (2006) 'Business cycles in emerging market economies: A new view of the stylised facts', *University of Stellenbosch*, Stellenbosch Economic Working papers, 2/2006.

Duval, R., Cheng, K., Oh, K.H, Saraf, R. and Seneviratne, D. (2014) 'Trade integration and business cycle synchronisation: A reappraisal with focus on Asia', *International Monetary Fund*, WP/14/52.

Economic Cycle Research Institute (2012) 'Revoking recession: 48th time's the charm?', 9 May 2012, Available at https://www.businesscycle.com/ecri-business-cycle-definition [Retrieved 11 September 2013]

The Economist. (2008) 'The global slumpometer', *The Economist*, 6 November 2008, Available at http://www.economist.com/node/12553076 [Retrieved 17 April 2017]

Edwards, S. (2006) 'Monetary unions, external shocks and economic performance: A Latin American perspective', *International Economics and Economic Policy*, 3, 225-47.

Erickson, B.H. and Nosanchuk, T.A. (1979) *Understanding Data: An Introduction to Exploratory and Confirmatory Data Analysis for Students in the Social Sciences* (Milton Keynes: Open University Press).

Fantom, N., Khokhar, T., and Purdie, E. (2016) 'The 2016 edition of World Development Indicators is out: Three features you won't want to miss', *World Bank*, The DATA blog, 15 April 2016, Available at http://blogs.worldbank.org/opendata/2016-edition-world-development-indicators-out-three-features-you-won-t-want-miss [Retrieved 10 April 2017]

Forni, M., Hallin, M., Lippi, M., and Reichlin, L. (2000) 'The generalized dynaic-factor model: Identification and estimation', *Review of Economics and Statistics*, 82(4), 540-54.

Frankel, J. and Rose, A. (1998) 'The endogeneity of the optimum currency area criteria', *Economic Journal*, 108(449), 1009-25.

Friedman, M. (1966) 'The methodology of Positive economics', *Essays in Positive Economics* (Chicago: University Chicago Press), pp. 3-16, pp. 30-43, Available at http://www.sfu.ca/~dandolfa/friedman-1966.pdf

Friedman, M. (1968) 'The role of monetary policy', *American Economic Review*, 58, 1-17.

Friedman, M. and Schwartz, A.J. (1975) 'Money and business cycle', *The State of Monetary Economics* (New York: Arno Press), pp. 32-78.

Friedman, W.A. (2014) *Fortune Tellers: The Story of America's First Economic Forecasters* (Princeton: Princeton University Press).

Frisch, R. (1967[1933]) 'Propagation problems and impulse problems in dynamic economics' in *Economic Essays in Honour of Gustav Cassel*, 2nd edition (London: Frank Cass, George Allen & Unwin), pp. 171-205, reprinted.

Gabisch, G. and Lorenz, H-W. (1987) *Business Cycle Theory: A Survey of Methods and Concepts* (New York: Springer-Verlag).

García-Cicco, J., Pancrazi, R. and Uribe, M. (2010) 'Real business cycles in emerging countries?', *American Economic Review*, 100, 2510-31.

Gayer, C. (2007) 'A fresh look at business cycle synchronisation in the euro area', *European Commission*, Economic papers, September, No. 287.

Goodwin, R.M. (1967) 'A growth cycle' in Feinstein, C.H. (ed.) *Socialism, Capitalism and Economic Growth: Essays presented to Maurice Dobb* (Cambridge: Cambridge University Press), pp. 54-58.

Gorton, G.B. (2012) *Misunderstanding Financial Crises: Why We Don't See Them Coming* (London: Oxford University Press).

Gregory, A.W., Head, A.C. and Raynauld, J. (1997) 'Measuring world business cycles', *International Economic Review*, 38(3), 677-701.

Gujarati, D.N. (2004) *Basic Econometrics, Fourth edition* (New York: McGraw-Hill Companies).

Hamilton, J.D. (1989) 'A new approach to the economic analysis of nonstationary time series and the business cycle', *Econometrica*, 57(2), 357-84.

Harding, D. and Pagan, A. (2001) 'Extracting, using and analysing cyclical information', *MPRA*, 15.

Harding, D. and Pagan, A. (2002a) 'Dissecting the cycle: A methodological investigation', *Journal of Monetary Economics*, 49, 365-81.

Harding, D. and Pagan, A. (2002b) 'A comparison of two business cycle dating methods', *Journal of Economic Dynamics and Control*, 27, 1681-90.

Harding, D. and Pagan, A. (2006) 'Measurement of business cycles', *University of Melbourne*, Research paper, no. 966, June.

Hausmann, R., Hwang, J. and Rodrik, D. (2007) 'What you export matters', *Journal of Economic Growth*, 12(1), 1-25.

He, D. and Liao, W. (2012) 'Asian business cycle synchronization', *Pacific Economic Review*, 17(1), 106-35.

Heathcore, J. and Perri, F. (2002) 'Financial globalization and real regionalization', *National Bureau of Economic Research*, Working paper, No. 9292.

Hirsch, C. and DesRoches, C.T. (2009) 'Cambridge social ontology: An interview with Tony Lawson', *Erasmus Journal for Philosophy and Economics*, 2(1), Summer, 100-22.

Hochrainer, S. (2009) 'Assessing the macroeconomic impacts of natural disasters: Are there any?', *World Bank*, Policy Research Working Paper, 4968.

Hodrick, R.J. and Prescott, E.C. (1997) 'Postwar U.S. business cycles: An empirical investigation', *Journal of Money, Credit and Banking*, 29(1), 1-16.

Hoffmaister, A.W. and Roldos, J.E. (1997) 'Are business cycles different in Asia and Latin America?', *International Monetary Fund*, Working paper, WP/97/9.

Hornby, L., Zhang, A. and Pong, J. (2017) 'Fake China data: Was it just one province?', *Financial Times*, 13 March 2017, Available at https://www.ft.com/content/a5bf42e2-03cf-11e7-ace0-1ce02ef0def9 [Retrieved 10 April, 2017]

Ikeda, E. (2012) 'The causes of business cycles: An evaluation of mainstream views', *Centre Européen de Recherches Internationales et Stratégiques*, Master's thesis.

Imbs, J. (2011) 'What happened to the East Asian business cycle?', in Devereux, M., Lane, P., Park, C.Y. and Wei, S.J. (eds.) *The Dynamics of Asian Financial Integration* (Abingdon: Routledge), pp. 284-310.

International Monetary Fund (2002) 'Recessions and recoveries', *World Economic Outlook*, April.

International Monetary Fund (2007a) 'Spillovers and cycles in the global economy', *World Economic Outlook*, April.

International Monetary Fund (2007b) 'Chapter 5: The changing dynamics of the global business cycles', *World Economic Outlook*, October.

Jerven, M. (2013) *Poor Numbers: How We Are Misled by African Development Statistics and What To Do About It* (Ithaca: Cornell University Press).

Jevons, W.S. (1878) 'Commercial crises and sun-spots', *Nature*, 19(472), 33-37.

Kaldor, N. (1934) 'A classificatory note on the determinateness of equilibrium', *Review of Economic Studies*, 1(2), 122-36.

Kaldor, N. (1940) 'A model of the trade cycle', *Economic Journal*, 50(197), 78-92.

Kaldor, N. (1966) *Cases of the Slow Rate of Economic Growth of the United Kingdom* (London: Cambridge University Press).

Kaldor, N. (1967) *Strategic Factors in Economic Development* (Ithaca: Cornell University).

Kaufmann, S. (2000) 'Measuring business cycles with a dynamic Markov switching factor model: An assessment using Bayesian simulation methods', *Econometrics Journal*, 3(1), 39-65.

Kenyon, P. (1979) 'Pricing', in Eichner, A.S. (ed.) *A Guide to Post-Keynesian Economics* (New York: M. E. Sharpe), pp. 35-36.

Keynes, J.M. (1957[1936]) *The General Theory of Employment, Interest and Money* (London: Macmillan).

Khan, M. (2016) 'The truth behind China's manipulated economic numbers', *Telegraph*, 19 January 2016, Available at http://www.telegraph.co.uk/finance/economics/11930766/The-truth-behind-Chinas-manipulated-economic-numbers.html [Retrieved 10 April 2017]

Khokhar, T. and Serajuddin, U. (2015) 'Should we continue to use the term "developing world"?', *World Bank*, The DATA blog, 16 November 2015, Available at http://blogs.worldbank.org/opendata/should-we-continue-use-term-developing-world [Retrieved 10 April 2017]

Knoop, T.A. (2010) *Recessions and Depressions: Understanding Business Cycles*, 2nd edition (Santa Barbara: ABC CLIO).

Koopman, S.J. and Azevedo, J.V.E. (2008) 'Measuring synchronization and convergence of business cycles for the Euro area, UK and US', *Oxford Bulletin of Economics and Statistics*, 70(1), 23-51.

Koopmans, T.J. (1947) 'Measurement without theory', *Review of Economic Statistics*, 29(3), 161-72.

Kose, M.A., Otrok, C. and Whiteman, C.H. (2003a) 'International business cycles: World, region, and country-specific factors', *American Economic Review*, 93(4), 1216-39.

Kose, M.A., Otrok, C. and Whiteman, C.H. (2008a) 'Understanding the evolution of world business cycles', *Journal of International Economics*, 75(1), 110-30.

Kose, M.A., Otrok, C. and Prasad, E.S. (2008b) 'Global business cycles: Convergence or decoupling?', *Deutsche Bundesbank*, Discussion paper, Series 1: Economic Studies, No. 17.

Kose, M.A. and Prasad, E.S. (2010) 'Resilience of emerging market economies to economic and financial developments in advanced economies', *European Commission*, Economic papers, October, No. 411.

Kose, M.A., Prasad, E.S. and Terrones, M.E. (2003b) 'How does globalization affect the synchronization of business cycles?', *International Monetary Fund*, AEA papers and proceedings, May, pp. 57-62.

Kose, M.A. and Reizman, R. (1999) 'Trade shocks and macroeconomic fluctuations in Africa', *Journal of Development Economics*, 65(1), 55-80.

Krishnan, U. and Rastello, S. (2015) 'India economy data changes boost growth rate before Modi budget', *Bloomberg*, 30 January 2015, Available at http://www.bloomberg.com/news/articles/2015-01-30/india-economy-data-changes-boost-growth-rate-before-modi-budget [Retrieved 10 April 2017]

Krugman, P. (1991) 'Increasing Returns and Economic Geography', *Journal of Political Economy*, 99(3), 483-99.

Krugman, P. (1993) 'Lessons of Massachusetts for EMU' in Torres, F. and Giavazzi, F. (eds.) *Adjustment and Growth in the European Monetary Union* (Cambridge: Cambridge University Press), pp. 241-61.

Krugman, P. (2009) 'How did economists get it so wrong?', *New York Times*, 2 September 2009, Available at http://www.nytimes.com/2009/09/06/magazine/06Economic-t.html [Retrieved 1 April 2017]

Krugman, P. (2016) 'The economic fallout', *New York Times*, 11 November 2016, Available at https://www.nytimes.com/interactive/projects/cp/opinion/election-night-2016/paul-krugman-the-economic-fallout [Retrieved 1 April 2017]

Kuruma, S. (1972) 'Discussion of Marx's theory of crisis (part 1)', *Marx-Lexikon Zur Politischen Ökonomie Vol 6*, Translated by Schauerte, M., Online archive, Available at https://www.marxists.org/archive/kuruma/crisis-discussion1.htm [Retrieved 1 April 2017]

Kydland, F.E and Prescott, E.C. (1982) 'Time to build and aggregate fluctuations', *Econometrica*, 50(6), 1345-70.

Kydland, F.E and Prescott, E.C. (1990) 'Business cycles: Real facts and a monetary myth', *Federal Reserve Bank of Minneapolis*, Quarterly Review, Spring, 3-18.

Kydland, F.E and Zarazaga, C.E.J.E.M. (2002) 'Argentina's lost decade', *Review of Economic Dynamics*, 5, 152-65.

Lakhera, M.L. (2016) *Economic Growth in Developing Countries: Structural Transformation, Manufacturing and Transport Infrastructure* (Basingstoke: Palgrave Macmillan).

Layton, A.P. and Moore, G.H. (1989) 'Leading indicators for the service sector', *Journal of Business & Economic Statistics*, 7(3), 379-86.

Lavoie, M. (2014) *Post-Keynesian Economics: New Foundations* (Cheltenham: Edward Elgar).

Lawson, T. (1997) *Economics and Reality* (London: Routledge).

Lawson, T. (2003) *Reorienting Economics* (London: Routledge).

Lawson, T. (2012) 'Mathematical modelling and ideology in the economics academy: Competing explanations of the failings of the modern discipline?', *Economic Thought*, 1(1), 3-22.

Lewis, W.A. (1955) *The Theory of Economic Growth* (London: Allen and Unwin).

Loveday, A. (1939) 'Preface' in Tinbergen, J. (1939) *II Business Cycles in the United States of America 1919-1932* (Geneva: League of Nations).

Lucas, R.E. Jr. (1977) 'Understanding business cycles', *Carnegie-Rochester Conference Series on Public Policy*, 5, 7-29.

Lucas, R.E. Jr. (2003) 'Macroeconomic priorities', *American Economic Review*, 93(1), 1-14.

Male, R. (2010a) 'Developing country business cycles: Characterising the cycle', *University of London*, Working paper, 663, May.

Male, R. (2010b) 'Developing country business cycles: Revisiting the stylised fact', *University of London*, Working paper, 664, May.

Mandel, E. (1995[1980]) *Long Waves of Capitalist Development: A Marxist Interpretation* (London: Verso).

Marx, K. (1969[1865]) 'XIII. Main causes of attempts at raising wages or resisting their fall', in *Value, Price and Profit* (New York: International Co.), online archive, Available at https://www.marxists.org/archive/marx/works/1865/value-price-profit/ch03.htm#c12

Marx, K. (1981) *Capital: Volume III*, translated by Fernbach, D. (Harmondsworth: Penguin Books).

McCausland, W.D. and Theodossiou, I. (2012) 'Is manufacturing still the engine of growth?', *Journal of Post Keynesian Economics*, 35(1), 79-92.

McCombie, J.S.L. (2006) 'Kaldor, Nicholas (1908-1986)' in Clark, D.A. (ed.) *The Elgar Companion to Development Studies* (Cheltenham: Edward Elgar), pp. 299-304.

McCormack, R.T. (2013) *A Conversation with Ambassador Richard T. McCormack* (Xlibris).

McCloskey, D.N. (1983) 'The rhetoric of economics', *Journal of Economic Literature*, 21(2), 481-517.

Mejía-Reyes, P. (2000) 'Asymmetries and common cycles in Latin America: Evidence from Markov-Switching Models', *Economía Mexicana Nueva Época*, IX(2), 189-225.

Mendoza, E.G. (1995) 'The terms of trade, the real exchange rate, and economic fluctuations', *International Economic Review*, 36(1), 101-37.

Menger, K. (2007) *Principles of Economics*, Translated by Dingwall, J. and Hpselitz, B.F. (Auburn: Ludwig von Mises Institute), originally published in 1871.

Mintz, I. (1969) *Dating Postwar Business Cycles: Methods and their Application to Western Germany, 1950-67* (New York: NBER/Columbia University Press).

Mintz, I. (1972) 'Dating American growth cycles' in Zarnowitz, V. (ed.) *Economic Research: Retrospect and Prospect Vol 1: The Business Cycle Today* (New York: NBER/Columbia University Press), pp. 39-88.

Moneta, F. and Rüffer, R. (2006 'Business cycle integration in East Asia', *European Central Bank*, Working paper series, no. 671.

Moore, G.H. (1961) 'Leading and confirming indicators of general business changes', in Moore, G.H. (ed.) *Business Cycle Indicators, Volume 1: Contributions to the Analysis of Current Business Conditions* (Princeton: Princeton University Press), pp. 45-109.

Mumtaz, H., Simonelli, S. and Surico, P. (2011) 'International comovements, business cycle and inflation: A historical perspective', *Review of Economic Dynamics*, 14(1), 176-98.

Nadal-De Simone, F. (2002) 'Common and idiosyncratic components in real output: Further international evidence', *International Monetary Fund*, Working paper, WP/02/229.

National Bureau of Economic Research (2010a) 'US business cycle expansions and contractions', last update 20 September 2010, Available at http://www.nber.org/cycles.html [Retrieved 8 April 2017]

National Bureau of Economic Research (2010b) 'The NBER's business cycle dating committee', last update 20 September 2010, Available at http://www.nber.org/cycles/recessions.html [Retrieved 8 April 2017]

Necmi, S. (1999) 'Kaldor's growth analysis revisited', *Applied Economics*, 31(5), 653-60.

Neumeyer, P.A. and Perri, F. (2005) 'Business cycles in emerging economies: The role of interest rates', *Journal of Monetary Economics*, 52, 345-80.

Nicholas, H. (2005) 'Introduction: Putting industrialization back into development', *Development and Change*, 36(6), 1031-33.

Nicholas, H. (2011) *Marx's Theory of Price and its Modern Rivals* (Basingstoke: Palgrave Macmillan).

Nielsen, L. (2011) 'Classifications of countries based on their level of development: How it is done and how it could be done', *International Monetary Fund*, Working paper, WP/11/31.

Palermo, G. (2007) 'The ontology of economic power in capitalism: mainstream economics and Marx', *Cambridge Journal of Economics*, 31(4), 539-61.

Poměnková, J., Fidrmuc, J. and Korhonen, I. (2014) 'China and the world economy: Wavelet spectrum analysis of business cycles', *Bank of Finland*, Discussion papers, 5.

Prebisch. R. (1984) 'Five stages in my thinking' in Meier, G.M. and Seers, D. (eds.) *Pioneers in Development* (New York: Oxford University Press), pp. 175-91.

Prescott. E.C. (1986) 'Theory ahead of business cycle measurement', *Federal Reserve Bank of Minneapolis*, Quarterly review, Fall, 9-22.

Raddatz, C. (2007) 'Are external shocks responsible for the instability of output in low-income countries?', *Journal of Development Economics*, 84, 155-87.

Rand, J. and Tarp, F. (2002) 'Business cycles in developing countries: Are they different?', *World Development*, 30(12), 2071-88.

Ravn, M.O. and Uhlig, H. (2002) 'Notes: On adjusting the Hodrick-Prescott filter for the frequency of observations', *Review of Economics and Statistics*, 84(2), 371-80.

Rediker, D., Economy, E. and Levi, M. (2016) 'The geo-economic implications of China's changing growth strategy', in World Economic Forum *Geo-economics with Chinese Characteristics: How China's Economic Might is Reshaping the World*, January 2016, pp. 13-15.

Robinson, J. (1974) *History versus Equilibrium* (London: Thames Polytechnic).

Rodrik, D. (2007) 'Industrial development: Some stylized facts and policy directions' in United Nations *Industrial Development for the 21st Century: Sustainable Development Perspectives*, pp. 7-28.

Romer, C.D. (n.d.) 'Business cycles', The concise encyclopaedia of economics, *Library Economics Liberty*, Available at http://www.econlib.org/library/Enc/BusinessCycles.html [Retrieved 29 March 2017]

Schumpeter, J.A. (1939) *Business Cycles: A Theoretical, Historical and Statistical Analysis of the Capitalist Process*, first edition, Volume I (New York: McGraw-Hill Book).

Setterfield, M. (1998) 'History versus equilibrium: Nicholas Kaldor on historical time and economic theory', *Cambridge Journal of Economics*, 22(5), 521-37.

Sharma, R. (2014) 'Global markets catch the Chinese flu', *Wall Street Journal*, 14 October 2014, Available at https://www.wsj.com/articles/ruchir-sharma-global-markets-catch-the-chinese-flu-1413503014 [Retrieved 8 April 2017]

Sherman, H.J. (1967) 'Marx and the business cycle', *Science & Society*, A Century of Marx's "Capital", 31(4), 486-504.

Stockman, A.C. (1990) 'International transmission and real business cycle models', *American Economic Review*, 80(2), 134-38.

Storm, S. and Naastepad, C.W.M. (2005) 'Strategic factors in economic development: East Asian industrialization 1950-2003', *Development and Change*, 36(6), 1059-94.

Thirlwall, A.P. (1983) 'A plain man's guide to Kaldor's growth laws', *Journal of Post Keynesian Economics*, 5(3), 345-58.

Thirlwall, A.P. (1986) 'A general model of growth and development on Kaldorian lines', *Oxford Economic Papers*, New series, 38(2), 199-219.

Tinbergen, J. (1939) *Statistical Testing of Business-cycle Theories: 1919-1932. Business cycles in the United States of America*, Volume 2(Geneva: League of Nations).

Verdoorn, P.J. (1949) 'Fattori che regolano lo sviluppo della produttività del lavoro', L'Industria, 1, 3-10, translated by Thirlwall, A.P. (1988) 'Factors governing the growth of labour productivity' in Perkins, J.O.N., Van Hoa, T. and Ironmonger, D. (eds.) *National Income and Economic Progress* (London: Macmillan Press), pp. 199-207.

Wells, H. and Thirlwall, A.P. (2003) 'Testing Kaldor's growth laws across the countries of Africa', *African Development Review*, 15(2-3), 89-105.

Wildau, G. (2016a) 'China's statistics chief admits some economic data are false', *Financial Times*, 8 December 2016, Available at https://www.ft.com/content/0361c1a4-bcfe-11e6-8b45-b8b81dd5d080 [Retrieved 2 April 2017]

Wildau, G. (2016b) 'China deploys state enterprises to economic stimulus effort', *Financial Times*, 21 June 2016, Available at https://www.ft.com/content/3d10e5cc-3754-11e6-a780-b48ed7b6126f [Retrieved 10 April 2017]

Yellen, J.L. (2015a) 'The outlook for the economy', Speech at the Providence Chamber of Commerce, Providence, Rhode Island, *Board of Governors of the Federal Reserve System*, 22 May 2015, Available at

http://www.federalreserve.gov/newsevents/speech/yellen20150522a.htm [Retrieved 10 April 2017]

Yellen, J.L. (2015b) 'Federal Reserve Chair Janet Yellen says U.S. economy has "recovered substantially" and sees "continued economic growth"', Excerpts from Dr. Yellen's remarks, *The Economic Club of Washington D.C.*, 2 December 2015, Available at https://www.economicclub.org/sites/default/files/transcripts/Hon.%20Janet%20Yellen%20Economic%20Club%20Transcript.pdf [Retrieved 22 May 2017]

Yellen, J.L. (2016) 'The outlook, uncertainty, and monetary policy', Speech at the Economic Club of New York, New York, *Board of Governors of the Federal Reserve System*, 29 March 2016, Available at https://www.federalreserve.gov/newsevents/speech/yellen20160329a.htm [Retrieved 22 May 2017]

Zarnowitz, V. (1991) 'What is a business cycle?', *NBER*, Working paper, No. 3863.

Zarnowitz, V. (1992) *Business Cycles: Theory, History, Indicators, and Forecasting* (Chicago: University of Chicago Press).

Zarnowitz, V. (2007) 'Persistent business cycles and high economic growth: How to explain their long concurrence in modern capitalism', *Conference Board*, Economics Program Working Paper Series, EPWP #07-03, November.

Zarnowitz, V. and Ozyildirim, A. (2006) 'Time series decomposition and measurement of business cycles, trends and growth cycles', *Journal of Monetary Economics*, 53, 1717-39.

Ziliak, S.T. and McCloskey, D.N. (2008) *The Cult of Statistical Significance: How the Standard Error Costs us Jobs, Justice, and Lives* (Ann Arbor: University of Michigan Press).

Websites and databases

Conference Board 'Global business cycle indicators'
https://www.conference-board.org/data/bci.cfm

ECRI 'International Growth Rate and Business Cycle Chronologies'
https://www.businesscycle.com/

European Commission 'European Business Cycle Indicators'

http://ec.europa.eu/economy_finance/publications/cycle_indicators/

FED 'Foreign Exchange Rates'
https://www.federalreserve.gov/releases/h10/summary/indexb_m.htm

IMF data http://www.imf.org/en/Data

The Maddison-Project http://www.ggdc.net/maddison/maddison-project/home.htm (2013 version)

NIST/SEMATECH. (n.d.) *e-Handbook of Statistical Methods*, Online book
http://www.itl.nist.gov/div898/handbook/

OECD.Stat 'Composite Leading Indicators (MEI)'
http://stats.oecd.org/Index.aspx?DataSetCode=MEI_CLI

John Williams' Shadow Government Statistics
http://www.shadowstats.com/

World Bank Country and Lending Groups.
https://datahelpdesk.worldbank.org/knowledgebase/articles/906519

World Development Indicators (WDI)
http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators

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.