Economic development of Eastern Europe in the long run
Berlin summer school
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Business cycles:

Concepts, measurement, case studies

Dr Matthias Morys (University of York)

Why bother about business cycles? I

- Complacency of the Great Moderation period c. 1982-2007
- Fluctuations in key macroeconomic time series (Y, I, C, π) had been reduced to the point that cycles seemed to belong to the past
- Widely held idea among economists and policy-makers
- Gordon Brown, UK Chancellor of the Exchequer (and later UK prime minister, 2007-2010), in his Budget Statement to the House of Commons (21st March 2007)

- 2008Q3: onset of the "Great Recession": most severe peacetime recession since the 1930s
- Latvia: 21.0% (2008-2010), Greece 23.6% (2008-2013)
- Dis-synchronisation of euro area business cycles since 2008/09 makes common monetary policy more difficult

- 1930s Great Depression was the most traumatic event in US history

Why bother about business cycles? II

- "For well over a century, business cycles have run an unceasing round. They have persisted through vast economic and social changes; they have withstood countless experiments in industry, agriculture, banking, industrial relations, and public policy; they have confounded forecasters without number; belied repeated prophecies of a 'new era of prosperity' and outlived repeated forebodings of 'chronic depression'." (Arthur Burns 1947)

Business cycles and modern macroeconomics

- Research was initially empirics without theory but this quickly changed (Juglar, 1862, Kondratiev, 1925)
- The Great Depression changes the picture
- Keynesian economics – with its emphasis on countercyclical monetary and fiscal policies – promised to tame the cycle
- The end of Keynesianism comes with the 1970s stagflation

We ignore business cycles at our own peril

Outline of my seminar

- Business cycles: definition and measurement

- Business cycle analysis for multiple time series: dynamic factor models and related approaches

- Case study: "The emergence of a European region: Business cycles in South-East Europe from political independence to World War II"

    (joint work with Prof. Martin Ivanov, Bulgarian Academy of Sciences)

Business cycles: definition and measurement

- Most of the early research was conducted under the aegis of the NBER
- NBER Business Cycle Dating Committee

- Burns&Mitchell, Measuring business cycles (1946: 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 wary from more than one year to ten or twelve years."

- Business cycles as a feature of post-agricultural economies
- Aggregate economic activity / in many economic activities
- Cycle: expansion & contraction/recession
- duration

Definitional issues: business cycles as a phenomenon of post-agricultural economies?

- "business" cycle: *nomen est omen*
- agricultural cycles exist but they largely depend on weather conditions (Craig and García-Iglesias, 2010; Solomou 1998)
- Agricultural production vs. agricultural prices
- Refutes indirectly an argument often levelled against dynamic factor methodology
- Will return to this issue under (3)

Definitional issues I: "aggregate economic activity / in many economic activities"

No exclusive focus on GDP: why?

- early days of national accounting
- share of agriculture might be large and distort the picture
- We might miss an important dimension (stylized facts literature)

What to use instead of / in addition to GDP?

- NBER / CEPR: aggregate employment, industrial production
- Example: GDP data suggests that euro area has been in expansion since 2013Q1 ←→ CEPR business cycle committee (June 2014): other indicators do not suggest the euro area has exited the recession (since 2011 Q3)
- Burns&Mitchell (1946): pig iron production, locomotive orders, bank clearings
- The exact choice of time series is often the bone of contention

Definitional issues I: aggregate economic activity (con't)

Great deal of controversy, 4 stages of the academic discussion

- 1930s and 1940s NBER research: many indicators but loose theoretical underpinning
- In the absence of computers, procedures involved (in particular to determine turning points) were deemed too discretionary

- 1950s, 1960s: modern macroeconomics emerges and suggests a limited number of well defined indicators (Y, I, C etc.)
- "stylised facts" - literature

- 1970s: renewed interest in the earlier research, as computational limitations ease
- Factor models (static and dynamic), principal component analysis

- Today: highly eclectic approaches

Definitional issues: cycle: expansion & contraction

Figure 3.1. Business Cycle Peaks and Troughs

Each cycle has two phases: a recession phase (from peak to trough) and an
expansion phase (from trough to the next peak).
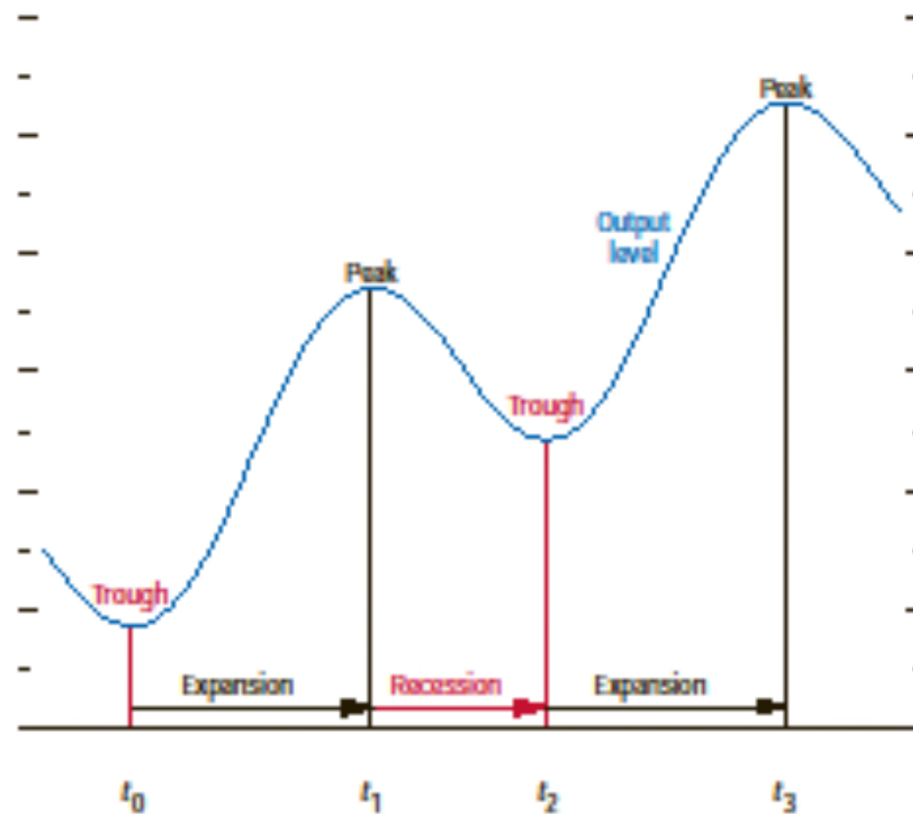
Source: IMF staff calculations.

Definitional issues: cycle: expansion & contraction

Minimalist concept of "cycles": an expansion followed by a contraction

- Cyclical state variables are binary:

    $S_t = 1$ expansion $S_t = 0$ contraction

- No regular / symmetric features required (Greek κύκλος = circle)
- Positive trend growth: expansions will tend to be longer than contractions

Dating rules transform y_t into S_t

Yearly data: calculus rule

- turning points are local extrema (peak; local maximum; trough: local minimum)

    Expansionary phase: from trough to peak

    Recessionary phase: from peak to trough

Quarterly data: Two Quarters Rule

Applying the calculus rule would result in too many turning points

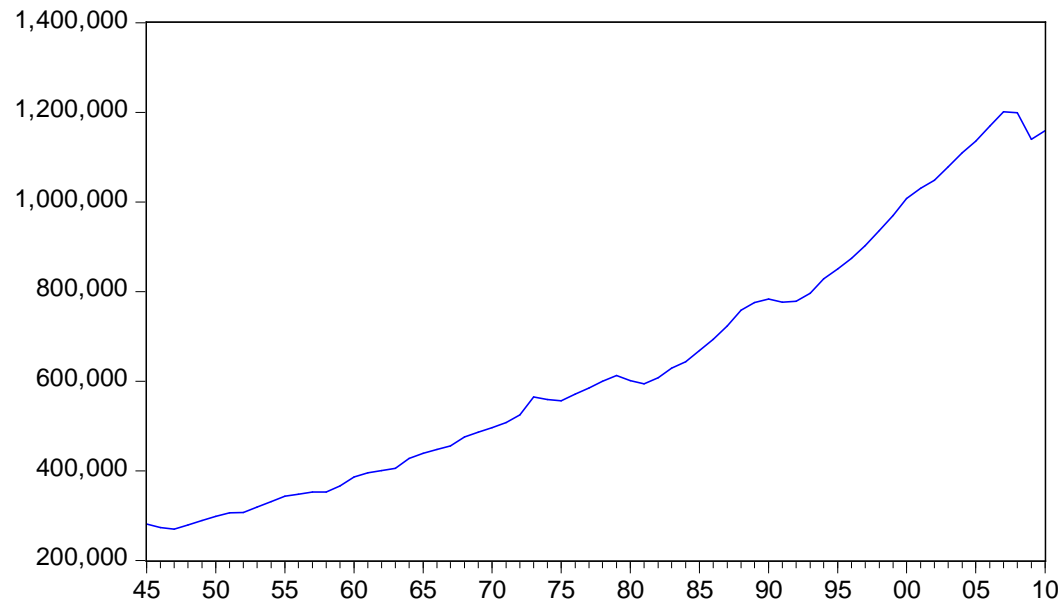Two quarters of negative (positive) growth initiate a recession (expansion)

$S_t = 1$ if ($\Delta y_t > 0$, $\Delta y_{t+1} > 0$ I $S_{t-1} = 0$)

$S_t = 0$ if ($\Delta y_t < 0$, $\Delta y_{t+1} < 0$ I $S_{t-1} = 1$)
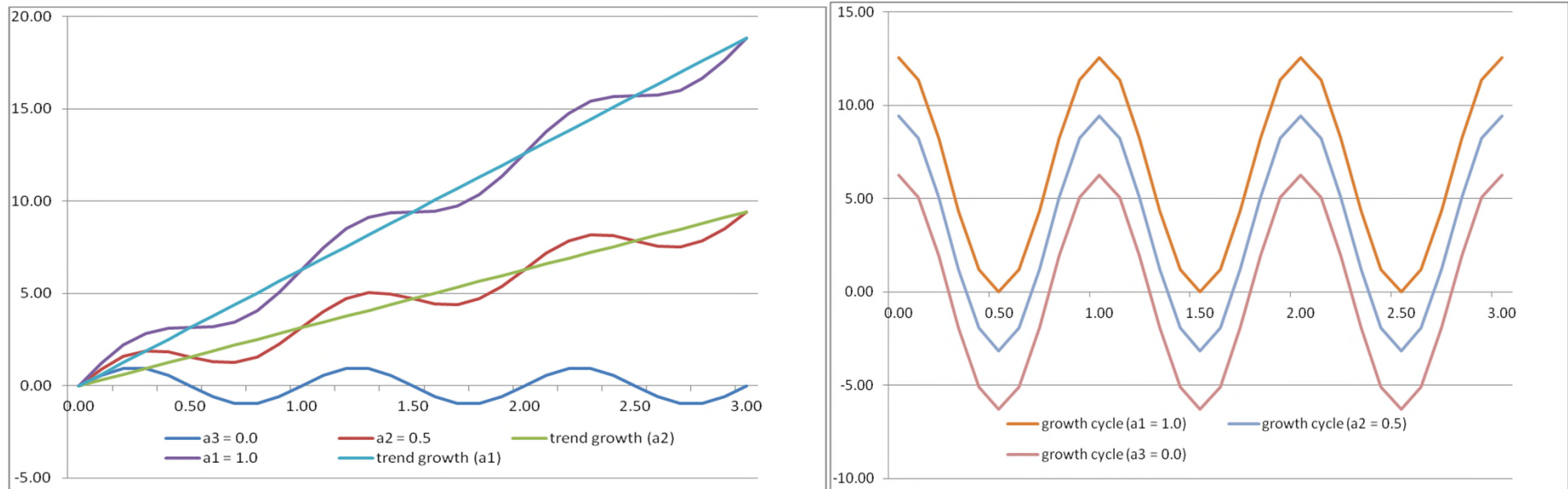
$S_t = S_{t-1}$ otherwise

Definitional issues: duration

- Cycle length of no more than 12 years
- 1870-1913: 4.9 years; 1918-1939: 5.5 years
- Strong trend growth after WWI results in long cycles
- Example: UK 1947-1973: only one recession (1957-58)

British GDP level cycles, 1945-2010. (Morys 2014)

Level cycles versus growth cycles

Level cycles

growth cycles (1ˢᵗ derivate)

$f(x): [0, 3] \rightarrow R, f(x) = a\,(2\pi x) + \sin(2\pi x)$

Definitional issues: duration (con't)
Classical cycles (level cycles) versus growth cycles
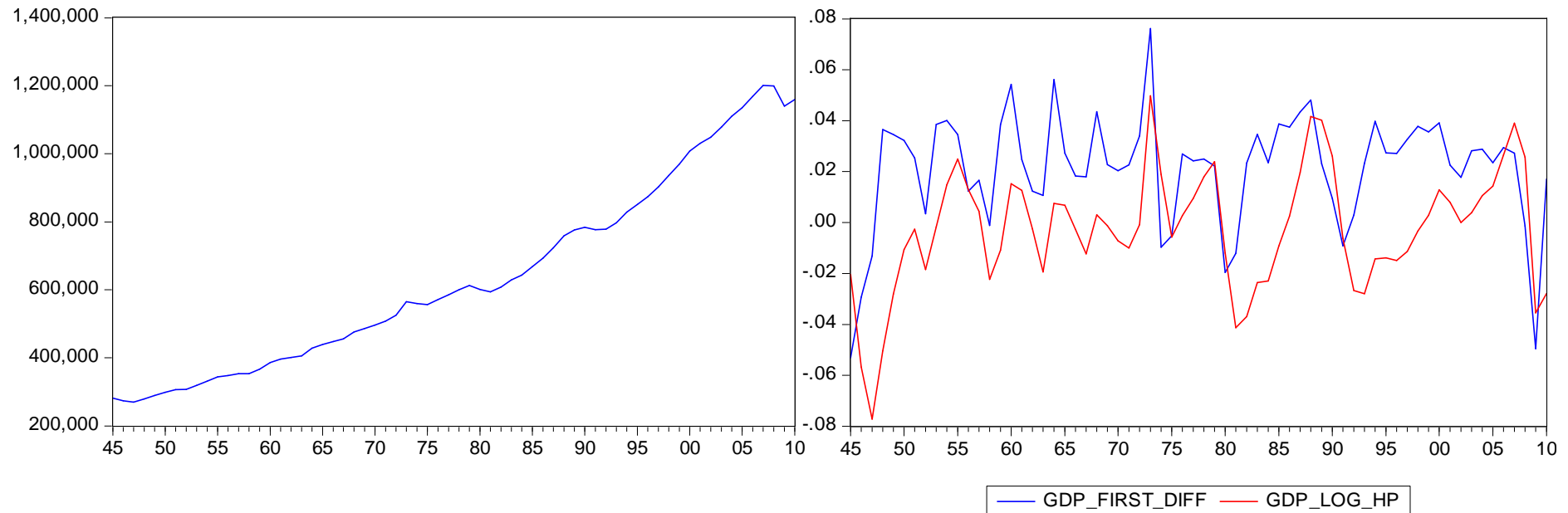
British GDP level cycles versus growth cycles, 1945-2010. (Morys 2014)

- Most current research is on growth cycles
- Depends on the question and the time-period
- Growth cycles better suited to understand relationship between output, inflation and unemployment
- Interwar period: level cycles
- 1950-1973: growth cycles

Definitional issues: duration (con't) Classical cycles (level cycles) versus growth cycles

- Growth cycles require filtering techniques
- decomposition of permanent and transitory component
- can be done in more than one way…
- First differences, Hodrick-Prescott, Baxter-King
- Übele&Ritschl (2009) versus Metz (2009)
- What is a practical solution to the issue of filtering?
  - Not do research at all?
  - Become an econometrician?
  - Not worry at all?
  - A middle way

Business cycles: measurement issues

Indicators pertaining to the business cycle *of individual countries*

- **Duration**: length of time between peak and trough (and vice versa)
- **Amplitude**: percentage change between adjacent turning points
    = "accumulated output loss" and "accumulated output gain"
- **Depression**: accumulated output loss > 10% (IMF 2009)
- Depressions are very rare and often confined to war and immediate post-war: UK 1918-1921 and 1943-47 (Morys 2014)
- **Recovery period**: time between peak and by when this level is achieved again

Indicators of synchronisation between cycles *of different countries*

- Growth cycles: Pearson's correlation coefficient
- Level cycles:

    Peason's correlation coefficient is NOT suited (non-stationarity)

    Concordance index: amount of time 2 countries spend in same phase (Harding&Pagan 2006)

    One should not read too much into high numbers of the concordance index in case of high trend growth (e.g., Craig&Fisher 1997)

    If synchronisation is main focus, then growth cycles need to be studied

Dynamic factor models I

- We have so far assumed that we have one specific time series we can interpret as the "business cycle"
- This will often not be the case

    GDP data might not be available / not be of good quality

    GDP estimates from production, expenditure and income might differ (2001 and 2007-9 US recession)

    GDP might not be our preferred indicator

- Alternatively, we might simply want to have an additional time series for business cycle analysis (stylized facts literature)
- These issues are of particular relevance for Central, East and SE Europe
- Poor GDP data but abundance of other statistical material

- Dynamic factor models draw on a multitude of time series to generate a new one (and potentially more than one)
- Similarities to principal component analysis
- Similarities but also differences to the original NBER approach

    (multitude of time series but used differently; level vs. growth cycles)

Dynamic factor models II

- Pioneered by Geweke (1977)
- currently most strongly associated with Stock and Watson (in many papers, mostly co-authored), Otrok and Kose (in many papers, often co-authored)

- The approaches differ principally in:
  whether specific factors are extracted only for sub-groups
  of time series (Kose et al. (2003))
  the estimation technique
  Stock&Watson (1989):   classical estimation
  Otrok&Whiteman (1998): Bayesian estimation

- Economic history contributions: Aiolfi et al. (2011), Ritschl et al. (2008), Sarferaz&Übele (2009), Übele (2010)

Dynamic factor model

Static factor model

(1) y_t = λ_0 + λ f_t + ε_t

   (n x 1)   (n x 1)   (n x o) (o x 1)   (n x 1)

(2) y_{it} = λ_{0i} + λ_i f_t + ε_{it}

   (1 x 1)   (1 x 1)   (1 x o) (o x 1)   (1 x 1)

$\underbrace{\qquad\qquad}_{\text{common component}}$ $\underbrace{\qquad}_{\text{idiosyncratic component}}$

Dynamic factor model: allowance for dynamic properties

(3) f_t = Φ_1 f_{t-1} + Φ_2 f_{t-2} + … + Φ_p f_{t-p} + ζ_t

   (o x 1)   (o x o) (o x 1)   (o x o) (o x 1)   (o x o)   (o x 1) (o x 1)

(4) ε_{it} = φ_{i1} $\varepsilon_{i,t-1}$ + φ_{i2} $\varepsilon_{i,t-2}$ + ... + φ_{iq} $\varepsilon_{i,t-q}$ + η_{it}

   (all variables are scalars)

f_t follows VAR(p) process, ε_{it} AR(q) process

How many factors to extract?

this issue is similar to principal component analysis:
how many principal components?

Bai&Ng (2002) offer a statistical test

careful interpretation required if more than one factor is extracted (e.g., Aiolfi et al. (2011))

Extracting factors only for sub-groups of time series?

Kose et al. (2003) differentiate between global, regional and country-specific factors

NB: this is different from how many factors to extract

Classify n time series into categories:

global – regional – country factors

interest rates - trade

The emergence of a European region: Business cycles in South-East Europe from political independence to World War II

Dr Matthias Morys (University of York)
Prof. Martin Ivanov (Bulgarian Academy of Sciences)

2 aims of our research

Introduce new economic history to South-East Europe
- = quantitative economic history / cliometrics
    (from Κλειώ, the muse of history in Greek mythology)
- often comparative ("Why is country A rich but B poor?")
- SEE economic history so far is descriptive and country-specific
- Lampe&Jackson 1982, Palairet 1997: partial exceptions

Is SEE a "region" from perspective of business cycle research?

The Balkans (= SEE): reality or imagination?

English traveller entering Ottoman Bosnia from Habsburg Croatia in 1875 "began to realise in what a new world we were. The Bosniacs themselves speak of the other side of the Sava as "Europe" and they are right; for to all intents and purposes **a five minutes' voyage transports you into Asia**."

- Perception that the Balkans are different – from W. Europe but also other parts of Eastern Europe – is well and alive (Todorova 2009)
- Idea is captured by acronym CESEE: Central, East & South-East Europe

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Is SEE a "region" from perspective of business cycle research?

Contribute to the academic debate on historical business cycles by using a well-suited peripheral region
("peripheral" in the sense of economically backward)
- Continuous data for 5 neighbouring countries since 1870s
- Austria(-Hungary), Bulgaria, Greece, Romania, Serbia/Yugoslavia
- SEE has more countries than Scandinavia (4), Iberia (2) or Central & Eastern Europe (1) which go back to late 19th century

Business Cycles in Historical Perspective

- "Business cycle paradox": Research on market integration suggests high degree of business cycle synchronisation but it cannot be detected in the data
- Example: First Age of Globalisation (1870s-1913): product and factor markets were highly integrated & quasi-universal fixed XRs (Daudin&Morys&O'Rourke 2010)

- BUT Research on business cycles finds low correlation of GDP growth / de-trended GDP

Example: Research on core countries 1870s - 1913

Source	Average bilateral correlation	Countries	Time frame	Statistical method: correlation of
Backus&Kehoe (1992)	0.03	England, Germany	1870-1913	de-trended GDP
Artis et al. (2011)	0.09	England, France, Germany	1880-1913	de-trended GDP
Bordo&Helbling (2011)	0.04	US, E, F, G, CH, Netherlands	1880-1913	GDP growth rates
Bordo&Helbling (2011)	0.09	F, G, CH, Neth. (European core)	1880-1913	GDP growth rates

• equally low correlation for SEE if reliant on GDP (Austria-Hungary: Schulze 2000, Bulgaria: Ivanov 2012, Greece: Kostelenos et al. 2007, Romania: Axenciuc 2012)

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- Two ways to solve the business cycle paradox:
  (a) correlation between business cycle synchronization and market integration not necessarily positive (Krugman 1993): trade integration → regional specialization → reduced output synchronization due to industry-specific shocks
  (b) business cycle paradox as a figment of poor GDP data

What time series are we drawing on?

All sorts of time series contain information on business cycles

- Burns&Mitchell (1946): locomotive orders, pig iron production, bank clearings

- In recessions women buy more lipsticks but fewer clothes…

- … and men replace their underwear less frequently

  (former Fed Chairman Alan Greenspan collected such "heterodox" data according to *The Economist* 29th July 2011)

Our (more conservative) approach: 20 time series for each country: identical across countries & theoretically underpinned

1. *Output indicators*: agriculture; communication; industrial output; mining; construction; transportation; fixed investment
2. *Fiscal indicators:* government expenditure & revenue
3. *Financial indicators*: M0, M3, CPI, short term interest rate
4. *Trade indicators*: terms of trade, real effective xr, exports, imports
5. *Other indicators*: external spread, real wage, population

time series are ideally in units of weight, volume, kilometres etc.

Sources: data mostly taken from Statistical Yearbooks and from a forthcoming data publication from SEE central banks

Documenting and explaining business cycles
South-East Europe, 1875-1941

1. Was there a common SEE business cycle?
2. Was there business cycle synchronisation with England, France and Germany (European core countries)?
3. How do we account for different levels of business cycle synchronisation across countries and over time?

Questions (1) and (2) rely on DFA business cycles

Question (3) relies on

   a. regression analysis: was synchronisation driven by trade or by interest rate linkages?

   b. supportive evidence from trade (trade openness), monetary history (exchange-rate system in particular), infrastructure and geography

Are the results plausible?
# Correlation of underlying time series with the business cycle 1875-1913

	Austria-H.			Bulgaria			Greece			Romania			Serbia			Ø
Sectoral indicators																
agriculture	-1	27	-1	20	20	0	-35	-35	0	28	41	1	8	34	2	4
communication	-24	-29	2	64	64	0	43	43	0	34	34	0	73	73	0	38
industry	63	63	0	44	44	0	23	23	0	44	55	-1	56	56	0	46
mining	53	53	0	13	13	0	14	41	-1	14	30	-1	42	42	0	27
construction	36	36	0	69	69	0	33	33	0	24	42	-1				41
transportation	76	76	0	59	59	0	13	42	1	65	65	0	59	59	0	54
fixed investment	56	56	0	41	41	0				12	12	0	55	55	0	41
Fiscal indicators																
gov. expenditure	-13	23	-2	-21	-21	0	-9	37	2	-27	-27	0	57	57	0	-3
gov. revenue	4	56	-2	-29	-29	0	14	12	2	34	34	0	56	56	0	16
Financial indicators																
narrow money (M0)	54	54	0	1	16	1	88	88	0	94	94	0	19	44	1	51
broad money (M3)	26	42	1	0	15	2	87	87	0	94	94	0	17	44	-1	45
CPI	67	67	0	-9	40	-1	5	36	-1				23	40	-1	22
short term interest rate	55	55	0	0	32	2	14	14	0	-56	-56	0	-15	34	-2	0
Trade indicators																
terms of trade	38	39	1	45	45	0	39	39	0	27	27	0	-20	35	-2	26
real effective xr	-38	-38	0	4	-39	-1	23	23	0	19	19	0	12	12	0	4
exports	55	55	0	36	36	0	29	29	0	32	40	1	12	39	-1	33
imports	59	59	0	35	35	0	44	44	0	64	64	0	17	33	-1	44
Other indicators																
External spread	11	34	-1													
Real wage				0	19	-2										
Population	23	23	0				12	12	0	8	14	-1				

Business cycles of Austria-H., Romania and Greece

1881 - 1913
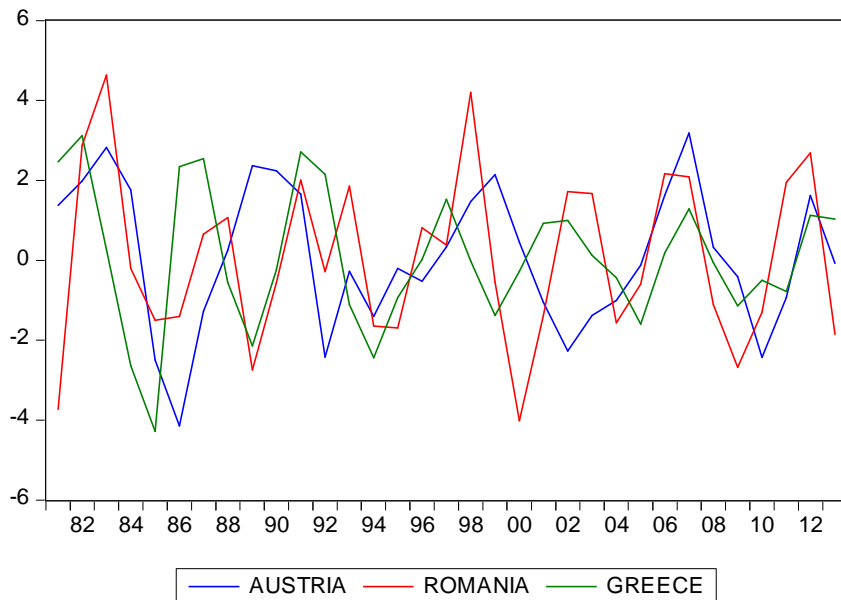
1903 - 1913
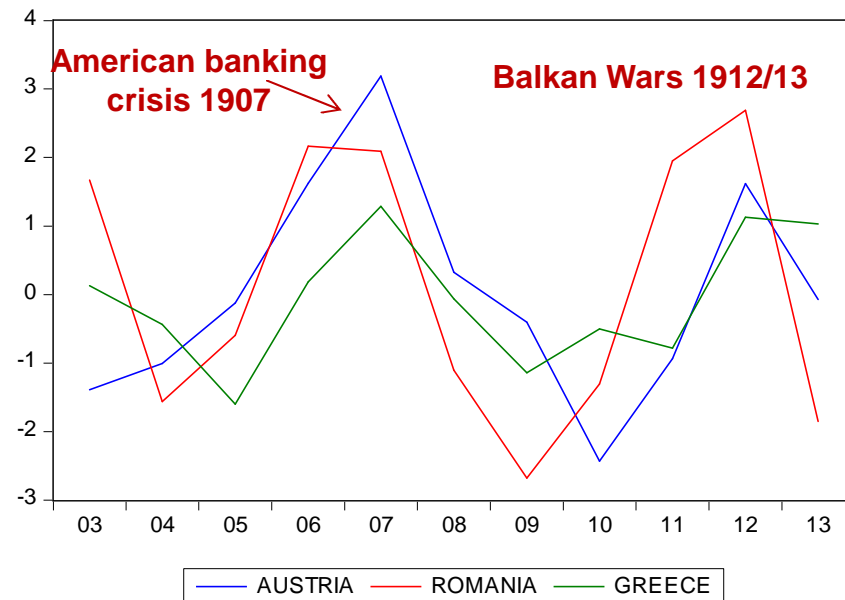
We recognise upswings and downswings well-documented for other countries
- Long upswing in the early 1900s
- Interrupted by the American Banking Crisis of 1907
- Another upswing in the 1910s

Confirms qualitative evidence on SEE countries (Lampe&Jackson 1982)

Business cycle correlations 1875 – 1913 by country pairs: Full period, 1893-1913, 1903-1913

	AH	Gr	Ro	Se	Bu	E	F
Greece	0.06 0.23 0.60 *						
Romania	0.30 * 0.31 0.51	0.26 0.33 0.45					
Serbia	0.34 * 0.55 ** 0.87 ***	0.27 0.22 0.76 **	0.19 0.32 0.64 **				
Bulgaria	0.34 * 0.28 0.03	-0.07 -0.25 -0.45	0.27 0.37 * 0.22	0.42 ** 0.25 0.15			
England	0.67 *** 0.49 ** 0.45	0.25 0.37 0.49	0.13 0.07 0.29	0.24 0.09 0.36	-0.07 -0.29 -0.55 *		
France	0.78 *** 0.85 *** 0.88 ***	0.23 0.12 0.59 *	0.17 0.19 0.56 *	0.48 ** 0.46 ** 0.70 **	0.25 0.08 -0.19	0.78 *** 0.66 *** 0.73 **	
Germany	0.84 *** 0.83 *** 0.78 ***	0.08 0.25 0.57 *	0.19 0.23 0.59 *	0.34 * 0.42 ** 0.73 **	0.18 0.07 -0.18	0.81 *** 0.77 *** 0.84 ***	0.81 *** 0.86 *** 0.87 ***

Documenting business cycles: 1875-1913

Key findings

- Business cycle integration starts at high levels and increases over time

- Holds within SEE and vis-à-vis core

- Median correlation from early period to last decade increases from 0.27 to 0.56 (changes are statistically significant)

- Provides first evidence for business cycle synchronisation for a peripheral region before World War I (cf. Bordo&Helbling 2011, Artis et al. 2011)

But:

- intra-core synchronization levels higher (average correlation: 0.80)

- business cycle radiating from the European core countries in which SEE countries increasingly participate (in other words, no regional cycle)

"geography of synchronisation"

- Austria-Hungary and Serbia (Western Balkans) more strongly synchronized, followed by Romania, Greece, Bulgaria (in that order)

Explaining business cycles: 1875-1913

Synchronisation through trade or finance? (Calderon et al. 2007)

$$\rho(y_i, y_j)_\tau = \alpha + \beta\, t_{i,j,\tau} + \gamma\, i_{i,j,\tau} + \delta\, g_{i,\tau} + u_{i,j,\tau}$$

$\rho(y_i, y_j)_\tau$ — cyclical correlation between i and j over time period τ

$t_{i,j,\tau}$ — trade intensity between i and j in period τ

$i_{i,j,\tau}$ — bilateral correlation of short-term interest rates over period τ

$g_{i,\tau}$ — dummy variable for gold standard adherence

Option 4: country-pair fixed effects & period fixed effects						
	Scenario 1: coefficients α, β		Scenario 2: coefficients α, β, γ		Scenario 3: coefficients α, β, γ, δ	
	LS	IV	LS	IV	LS	IV
α : intercept	0.54 ***	0.87 ***	0.81 ***	1.03 ***	0.83 ***	1.07 ***
β : trade	0.02	0.11 ***	0.08 ***	0.15 ***	0.09 ***	0.16 ***
γ : interest rate			-0.04	-0.05	-0.04	-0.05
δ : gold					-0.03	-0.04
R^2	0.59	0.55	0.65	0.63	0.65	0.63

Synchronisation through trade also explains

- why SEE participates in a pan-European business cycle (intra-regional trade for any SEE-5 country remains below 10% throughout the period)

- different synchronisation levels of SEE-5: Bulgaria trades least as a result of location, poor infrastructure and political obstruction
    Bulgaria:
    - to the North: first Danube bridge built only in 1954 (Giurgiu 2007)
    - to the South: late Ottoman Empire prevents development of infra-structure to maintain control over Macedonia (Deyanov 2005)
    - forced to develop its trade with W. Europe along 1st century AD *via diagonalis* connecting Belgrade, Sofia, Edirne and Istanbul
    - rail link along this path only in 1888 (Orient Express)

- why cyclical synchronisation was low compared to other peripheries (Morys&Enflo 2013): SEE has the lowest openness ratios in Europe in 1913: Bulgaria (16.3%) versus Finland (45.1%) and Portugal (45.8%)

Interwar period: contradictory expectations?

Factors suggesting a decrease of synchronization
- de-globalization (in particular reduction in trade and capital flows)
- currency instability (interwar gold standard only from 1925 to 1931)

Factors suggesting an increase of synchronization
- Great Depression as "global shock" (Backus&Kehoe 1992, Basu&Taylor 1999)
- formation of trade areas & currency blocs could increase *regional* synchronization

SEE: border changes after WW I might increase synchronization
- Yugoslavia, Romania gain at the expense of Austria, Hungary and Bulgaria
- established trade relationships and bank lending continue even if in different countries after WW I (Aleksic 2009 for the Yugoslav case)

3 important factors according to Ritschl&Straumann (2010)
- development of bilateral trade patterns
- WW I: wartime recession (standard case) versus wartime boom (mainly neutral countries but also UK for instance)?
     wartime recession followed by peak 2 – 3 years after end of war
- tying to (in the 1920s) and untying from (in the 1930s) the gold standard

SEE business cycles 1919-1941

Key findings

- regional cycle: increased synchronisation intra-SEE & reduced vis-à-vis core
- core countries: only Germany is well synchronised (in particular after 1929)
- Greece slightly less synchronised than Austria, Bulgaria, Romania, Yugoslavia

Synchronisation through trade (as before WW I)

- Trade openness ratios increase: protectionist policies are overcompensated by better transport infrastructure & increase in shared borders after Balkan Wars 1912/13
- hey-day of intra-Balkan trade:

    Greece: triples its trade with Bulgaria, Romania, Yugoslavia

    Austria trades more with the 4 Balkan countries than Austria-Hungary did

The role of England, France, Germany

- Germany becomes step-by-step most important trading partner of SEE-5: 1910s for Bulgaria, Romania and Serbia; late 1920s / early 1930s for Greece
- economic rise of Germany in SEE is a longer drawn out process than most standard accounts on the 1930s acknowledge (Neal 1979, Kaiser 1981, Feinstein et al. 2008)

Why is Greece (slightly) less synchronised?
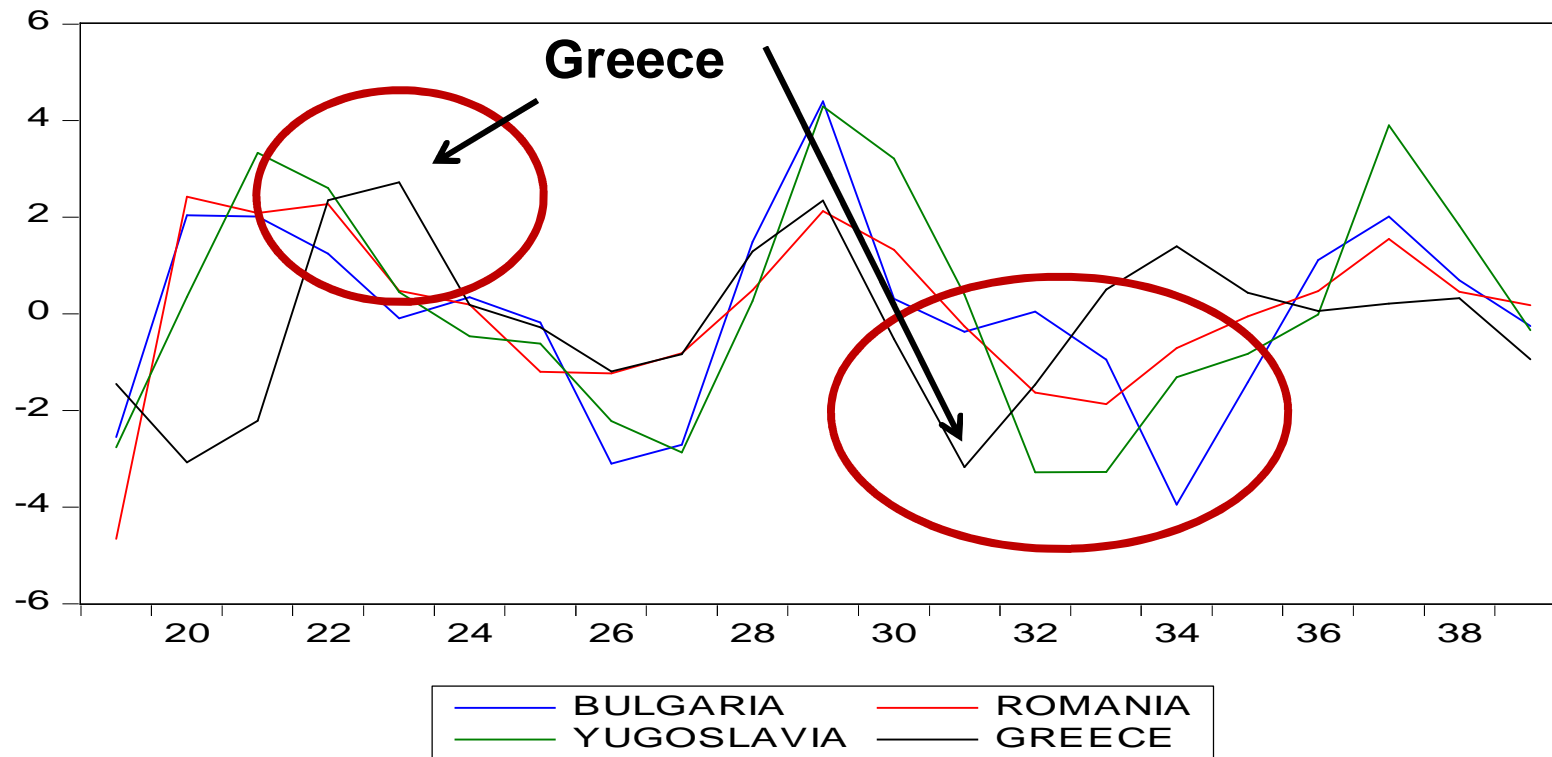
Greece shares trade story but not other two factors seen as important for interwar synchronisation (Ritschl&Straumann 2010):

- Greek-Turkish War (1919-1922): shifts 1st peak to 1923
- Early departure from gold (1932) ←→ other 4 SEE countries adopt deflationary policies cum foreign exchange controls
- Case study evidence in line with Eichengreen&Sachs (1985): early departure from gold helps economic recovery

Summary

Academic debate on historical business cycles

- First study to document business cycle synchronisation for an economically backward part of the world economy before WW I
- Extends and complements recent findings which have focused on the core economies of England, France and Germany

Economic history of South-East Europe

- 1870s – 1913: SEE countries increasingly participate in a business cycle emanating from England, France and Germany and transmitted by trade
- Interwar period: SEE countries form a regional business cycle again largely based on trade
- SEE countries successfully integrated into the wider European economy between the Congress of Berlin (1878) and the eve of World War II
- The role of countries from outside the region remains important: initially England, Germany, France (in that order) but increasingly Germany