Fiscal Divergence and Business Cycle Synchronization: Irresponsibility is Idiosyncratic

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I. Motivation

- Business cycle synchronization (BCS) the critical OCA criteria (Mundell)

- Maastricht: fiscal discipline = actual euro entry

- Striking absence of overlap between Mundell and Maastricht

  – Fiscal policy only macro tool for stabilizing asymmetric shock

  – SGP implies more macro volatility?

I. Motivation (cont.)

- Is there an *indirect* connection between Mundell and Maastricht?
- Suppose fiscal policy itself is a source of shock, not a stabilizer.
  - In that case Maastricht (fiscal discipline) is indirectly consistent with Mundell (BCS)

I. Motivation (cont.)

- Everything hinges on whether fiscal policy *generates* or *responds* to shocks.
- Intuition:
  - fiscal irresponsibility is idiosyncratic
  - leads to instability (stop-go cycles)
- So discipline (fiscal convergence) can enhance BCS

I. Motivation (cont.)

- We calculate fiscal divergence for both **total** and **primary** balances
  - Total: Maastricht criterion
  - Primary: eliminates the effects of debt and interest rate convergence

- Stress: *level* of deficit has little to do with the pro- or counter cyclic stance of fiscal policy;

- Divergence/convergence of fiscal balances does not say anything about the <u>stance</u> of fiscal policy

II. Main Results

Using panels and cross-sections of 21 OECD countries and 115 countries of the world, we found:

1. Fiscal divergence reduces business cycle synchronization

2. Smaller *levels* of deficits/larger surpluses tend to be associated with more synchronized business cycles

3. Large deficits are associated with more volatile business cycles

III. Outline of the rest of the talk

- Empirical framework
- Results on
  - Fiscal convergence and BC synchronization
  - Deficit level and BC synchronization
  - Deficit level and BC volatility
- Conclusion

IV. Empirical framework

- Study the empirical linkages between persistent cross-country differences in the fiscal policy and business cycle synchronization (BCS), hence

  Measure of synchro = α + β*fiscal divergence + ε

- Strategy: calculate various measures of both the left and right hand sides, estimate, do various robustness checks

IV. Empirical framework *cont'd*

- Default OECD sample: 21 countries

- Wide sample: 115 countries

- Calculate and study all possible country-pairs, i.e. 21*20/2=210 for default OECD, and 115*114/2=6555 for wide sample

- Study four disjunct decades: 1964-73, 1974-83, 1984-93, 1994-2004

- Hence, e.g. for OECD, we have maximum of 4*210=840 observations

IV. Empirical framework *cont'd*

- Measure of BCS between countries i and j for decade τ:

- Step 1: detrend output of both i and j for the full period

- Step 2: calculate correlation coefficient for decade τ

$\Rightarrow$ Measurement error due to both steps (in the regressand, does not distort unbiasedness, blows up error variance)

- Methods of detrending: HP, differencing, BP + method of Alesina-Barro-Tenreyro

- Activity concepts: GDP, U, Industrial production

- Frequency of underlying data: annual & quarterly

IV. Empirical framework *cont'd*

Our measure of fiscal divergence:

- Using *total* balance + *primary* balance (% GDP)

Step 1: calculate **differences** between the annual fiscal balances of the two countries

Step 2: calculate the **absolute value** of Step 1.

Step 3: Calculate (disjunct) **decade averages** of Step 2

- Additional measures: (a) interchange Steps 2&3, (b) use squared deviations instead of absolute, i.e. standard deviation, (c) Deviation from Maastricht 3% deficit criterion

Trends in data: mean&median in decades
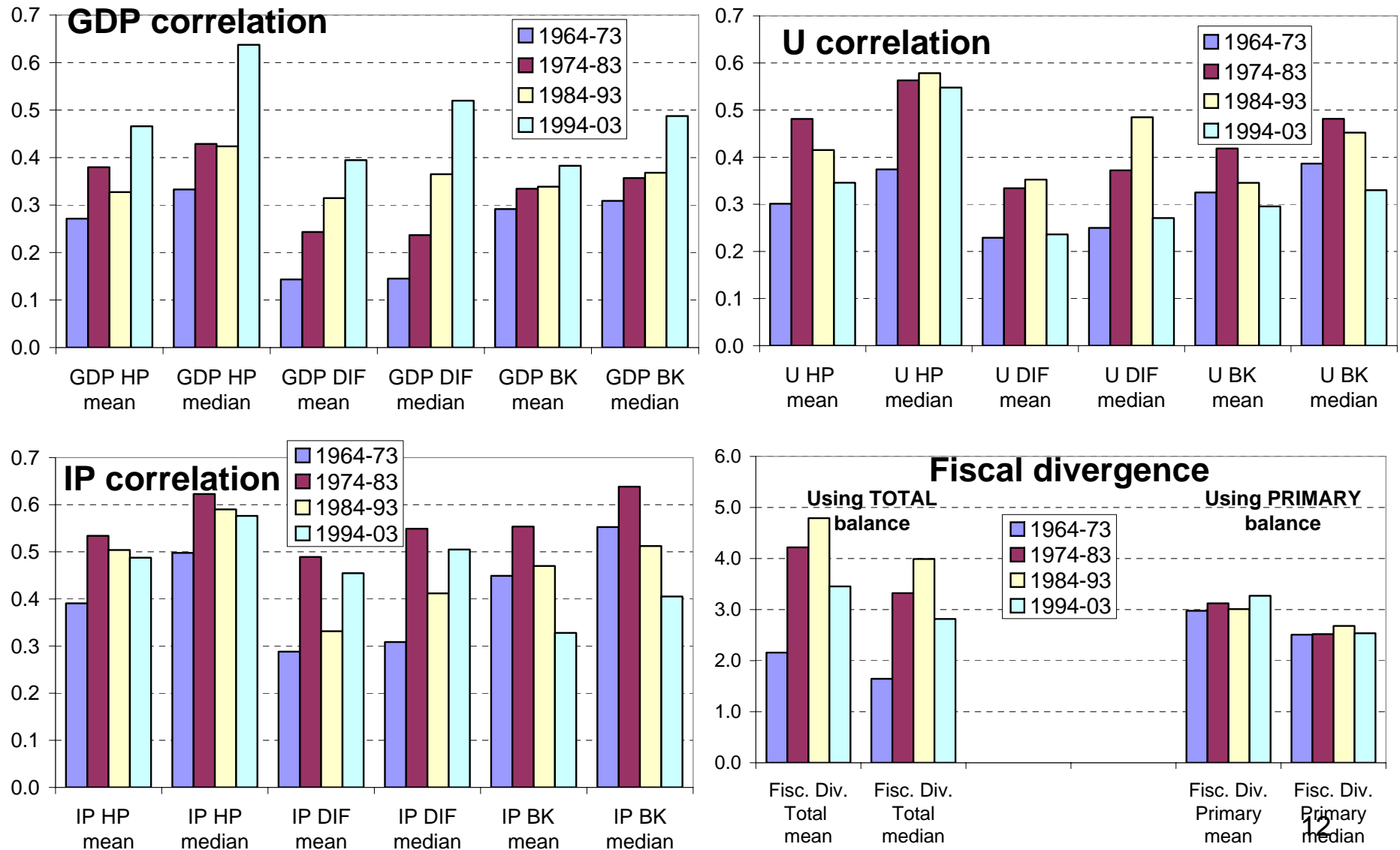
Trends in data, *cont'd*

$\Rightarrow$There is no uniform trend in key variables

- Moreover, period fixed effects are included in all specifications

- Our regeressions also work in cross-sections

$\Rightarrow$Results are not an artifact of 'independent parallel trends'

IV. Empirical framework, *cont'd*

- Nonlinearity could be an issue; not (yet) studied

IV. Empirical framework *cont'd*

- Fiscal divergence (FD) and BCS could be endogenous, i.e. some factors could effect the BCS-FD relationship not directly through FD (+FD could be measured with errors)

- Estimation: both OLS and IV

- Instruments: different revenue and expenditure components (% GDP), country-pair differenced and averaged over decades similarly to fiscal balance

IV. Empirical framework *cont'd*

- Sensitivity checks
  - Estimation: OLS, IV
  - Fixed effects
  - Different samples
  - Other controls (trade, gravity regressors, level of deficit)
  - Different measures of BCS and FD
  - Different IV sets

IV. Empirical framework *cont'd*

- We are also interested in

(A) the effects of the level of fiscal balance on BCS

  – Similar panel to what already described

(B) the effects of the level of fiscal balance on BC volatility

  – Annual (unilateral) panel: absolute value of the cycle regressed on the level of deficit

  – Decade (unilateral) panel: volatility is regressed on the level of deficit

  – (Unilateral) cross section for the full sample: volatility is regressed on the level of deficit

V. Results 1. Fiscal divergence and BCS – using TOTAL balance

	GDP HP-Filtered	GDP Differenced	Unemployment HP Filtered	Unemployment Differenced
Benchmark				
OLS	-.036** (.006)	-.024** (.005)	-.048** (.007)	-.028** (.006)
IV	-.16** (.04)	-.11** (.03)	-.15** (.04)	-.11** (.03)
With trade as additional regressor				
OLS	-.030** (.006)	-.018** (.005)	-.042** (.006)	-.022** (.005)
IV	-.09** (.02)	-.05** (.01)	-.06** (.02)	-.04** (.02)

V. Results 1. Fiscal divergence and BCS – using PRIMARY balance

	GDP HP-Filtered	GDP Differenced	Unemployment HP Filtered	Unemployment Differenced
Benchmark				
OLS	-.054** (.009)	-.044** (.007)	-.051** (.010)	-.027** (.009)
IV	-.152** (.036)	-.129** (.030)	-.186** (.042)	-.103** (.031)
With trade as additional regressor				
OLS	-.053** (.009)	-.042** (.007)	-.050** (.010)	-.026** (.008)
IV	-.102** (.036)	-.101** (.028)	-.149** (.042)	-.083** (.031)

V. Results
1. Fiscal divergence and BCS, cont'd

- Results are very robust to all sensitivity checks (Tables 1-2-3-A6)

- Both for the default OECD and for the wide panel as well

- Coefficient estimate is negative and significant using both OLS and IV

$\Rightarrow$ *Fiscal divergence reduces BCS*

	Total	Total with trade	Primary	Primary with trade
OLS	~ -.03	~ -.03	~ -.05	~ -.05
IV	~ -.12	~ -.06	~ -.15	~ -.10

➢ Discrepancy between OLS and IV is in the right direction, but somewhat large

V. Results
2. Level of fiscal balance and BCS

Average Budget Positions and Business
Cycle Synchronization

	GDP HP-Filtered	GDP Differenced
Primary balance OECD: IV	.11** (.03)	.09** (.03)
Primary balance OECD: OLS	.03** (.01)	.02* (.01)
Total balance 115 countries: OLS	.007** (.002)	.005** (.001)

V. Results
2. Level of fiscal balance and BCS, cont'd.

- Total balance: inconclusive results for default OECD sample (Table 4), significantly positive for wide sample (Table A6)

- Primary balance (available only for OECD): significant positive effects (Table 4)

⇒ *Smaller deficits/larger surpluses tend to be associated with more synchronized business cycles*

V. Results
3. Level of fiscal balance and BC volatility

Annual Panel Results (using 115 countries)

Regressand: abs. val. of	GDP HP-filtered	GDP Differenced
Common intercept only	-.057**	-.080**
	(.014)	(.016)
Year Effects	-.038**	-.072**
	(.014)	(.017)
Country Effects	-.058**	-.066**
	(.015)	(.019)
Year and Country Effects	-.038**	-.060**
	(.015)	(.019)

- Similar results were obtained for panels estimated on four 11-year long periods, and also for a cross-section estimation using data calculated from the full period of 1960-2003

V. Results
3. Level of fiscal balance and BC volatility, cont'd.

- OECD sample: inconclusive results
- Wide sample: significant result (Table 5)
⇒ *Large deficits are associated with more volatile business cycles*

VI. Conclusion

- Strong evidence that fiscal convergence is associated with business cycle synchronization

- Moreover, evidence that

  - reduced deficits (or higher surpluses) increase business cycle comovements, and

  - large deficits are associated with volatile cycles

- Reason: high deficits increase the likelihood that fiscal policy itself is a source of asymmetric shock: that is, irresponsibility is idiosyncratic

- Therefore, Maastricht helps synchronization, Maastricht overlaps Mundell

If question asked:

Uncertainty in regressand

Uncertainty in regressand

- Regressand in benchmark: correlation coefficients (CC) based on a decade of annual detrended data

- Two obvious sources of measurement error:

(1) Detrending

$\rightarrow$ we various filters (HP, BP, differencing) + Alesina-Barro-Tenreyro

(2) CC is calculated on 10 data points

Uncertainty in regressand *cont'd.*

- CC is calculated on 10 data points:

- Approx. s.e. of CC: 0.32 – very large compared to mean correlation, and also compared to regression coefficient estimates

- How serious this problem could be?

Uncertainty in regressand *cont'd.*

- We performed a simple check (not yet in the paper): Industrial Production (IP) is available at annual, quarterly and monthly frequency

- Calculate CC using three frequencies

- CC based on annual frequency, in principle, should have much larger variance than the other two $\Rightarrow$ it should show up in results
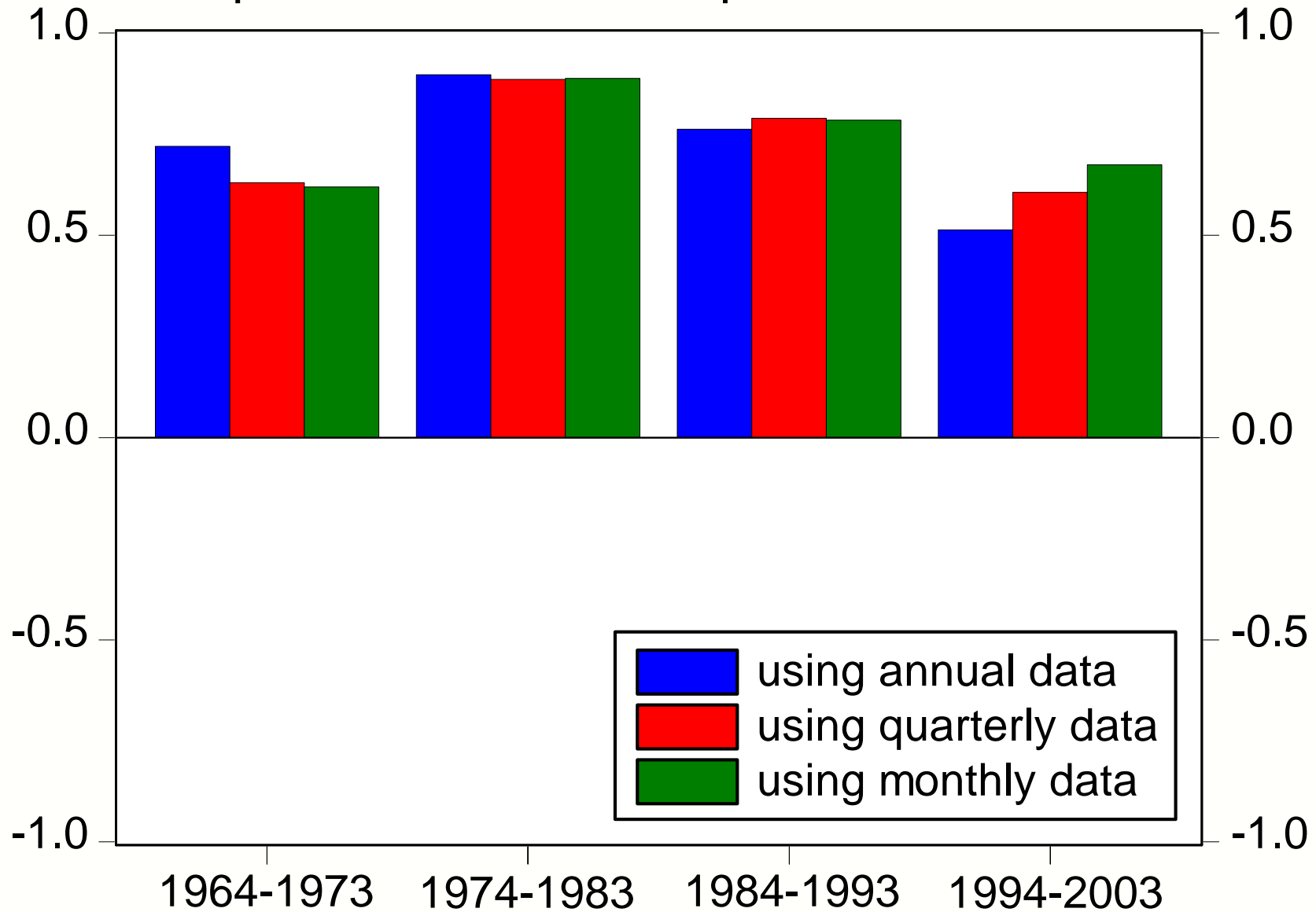
Uncertainty in regressand *cont'd.*

- 18 OECD countries $\rightarrow$ 153 country-pairs
- 153 pairs $\times$ 4 (disjunct) decades = 612 CC
- Each of the 612 CC could be calculated from annual or quarterly or monthly data
- Sample standard deviation of 612 CC (using BP):

  = 0.340 based on <u>annual</u> freq. (Mean: 0.445)

  = 0.312 based on <u>quarterly</u> freq. (Mean: 0.461)

  = 0.310 based on <u>monthly</u> freq. (Mean: 0.465)

- They all measure the same phenomenon, but the annual, being much more imprecise, should led to much more volatile CCs $\Leftarrow$ data does not support
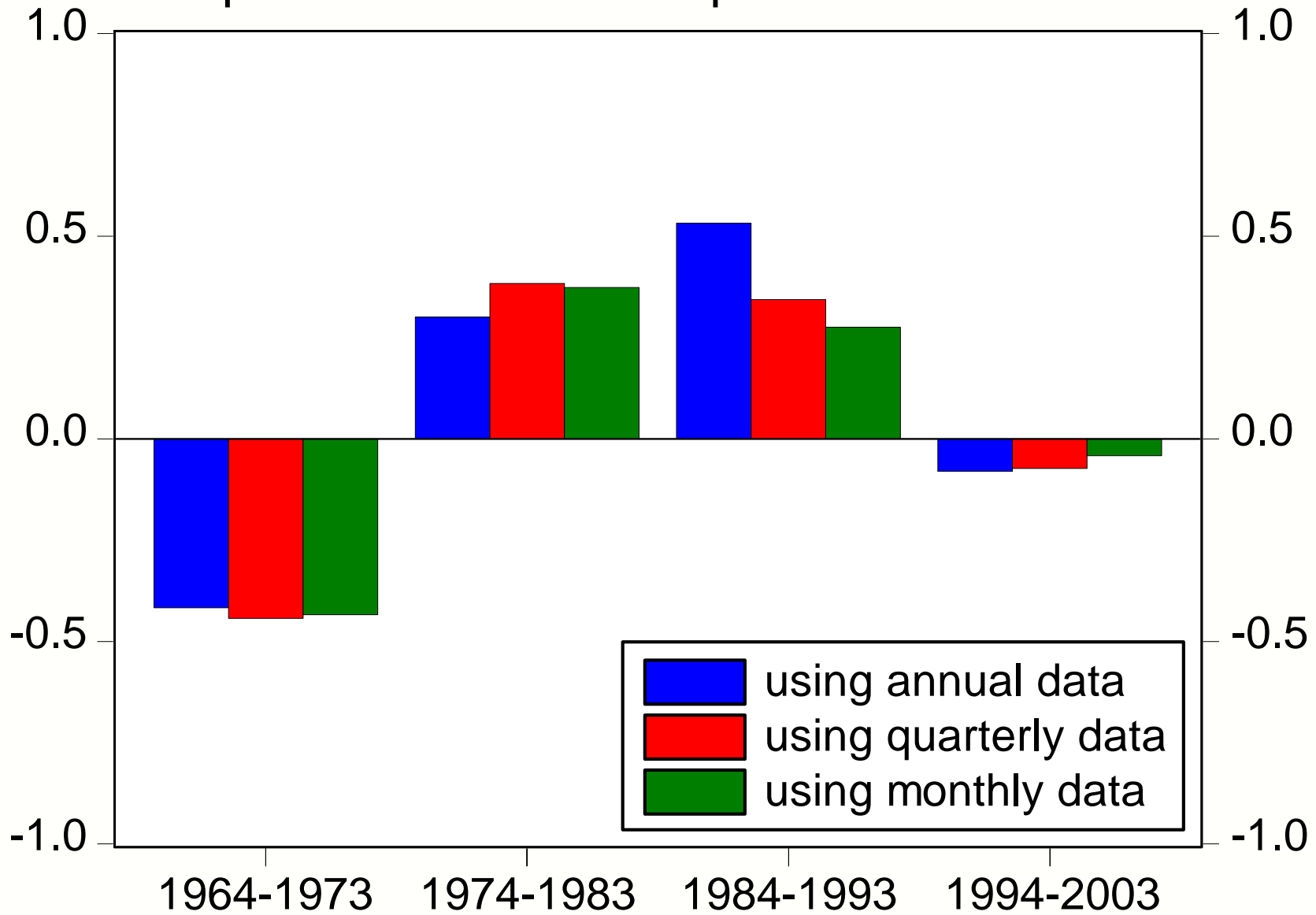
Uncertainty in regressand *cont'd.*

- Some further checks

  - As an example, simply plot 2 country pairs (France-Germany which correlate, Norway-Canada which does not correlate much)

  - Compare benchmark regression results

  - Regress CC on each other

Correlation between French and German band-pass detrended ind. prod. in four decades

Correlation between Norwegian and Canadian
band-pass detrended ind. prod. in four decades

Uncertainty in regressand *cont'd.*

- Compare benchmark regression results (OLS)

	Total balance		Primary balance	
	beta	se	beta	se
CC based on <u>monthly</u> data	-0.0276	0.0054	-0.0346	0.0063
CC based on <u>quarterly</u> data	-0.0269	0.0051	-0.0328	0.0062
CC based on <u>annual</u> data	-0.0250	0.0059	-0.0329	0.0072

Note: date set consists of 18 OECD countries (153 country pairs) for which IP is available at all three frequencies; four decades; period FE included

Uncertainty in regressand *cont'd.*

- Regress CC based on different frequencies on each other
- Question: *How much of the variance of the 'less precisely estimated CC' is explained by the 'more the precisely estimated CC'?*
- Answer: *Much*

	alpha	se	beta	se	R2
Annual on Monthly	-0.017	0.010	0.993	0.018	0.82
Annual on Quarterly	-0.016	0.010	1.003	0.016	0.84
Quarterly on Monthly	0.006	0.005	0.979	0.010	0.95

Note: a single intercept but no FE is included

Uncertainty in regressand *cont'd.*

Sum up:

0) error in the regressand (if unrelated to everything else) could simply blow up variance of regression error

1) error due to detrending $\rightarrow$ our results are robust to various filters

2) error due to correlation calculation $\rightarrow$ CC based on monthly (120 obs.), quarterly (40 obs.) and annual (10 obs.) data delivers almost identical results (although in theory there should be large differences in their standard errors)

If question asked:

Discrepancy between OLS and IV estimates

Discrepancy between OLS and IV estimates

- How large is the discrepancy?
- We reconsidered the instrument set and selected the most 'exogenous' ones. Both economic reasoning and econometric tests suggest that these are the following:
  - Labor taxes
  - Indirect taxes
  - Household taxes
  - Government non-wage consumption

Results with new IV set

	GDP HP-Filtered	GDP Differenced	Unemployment HP Filtered	Unemployment Differenced
Benchmark				
OLS	-.055** (.009)	-.040** (.008)	-.073** (.010)	-.045** (.008)
IV	-.104** (.045)	-.085** (.033)	-.208** (.048)	-.208** (.049)
With trade as additional regressor				
OLS	-.049** (.009)	-.033** (.007)	-.065** (.010)	-.038** (.008)
IV	-.082 (.059)	-.091** (.046)	-.094 (.058)	-.161** (.059)

Note: Labor taxes are available only for the second half of the sample, so all estimations are performed on this sample.

Discrepancy between OLS and IV estimates

- Recall that we measure the regressor (fiscal convergence) as

Step 1: calculate differences between the annual fiscal balances of the two countries

Step 2: calculate the absolute value of Step 1.

Step 3: Calculate (disjunct) decade averages of Step 2

- Much of the endogeneity has been taken out by this procedure

Discrepancy between OLS and IV estimates *cont'd*

- Suppose two countries are <u>initially not correlated</u>. An exogenous shock emerges (e.g. an oil shock)

$\rightarrow$ it leads to recessions in both economies, so correlation increases

$\rightarrow$ recessions blow up deficits in both countries

$\rightarrow$ but we calculate country-pair **difference** in deficits

$\Rightarrow$ Endogeneity remains only if deficits react differently to oil shock induced recessions. In this case fiscal divergence is associated with increased BC synchro: OLS parameter is biased upwards

Discrepancy between OLS and IV estimates *cont'd*

The twin-example:

- Suppose two countries are <u>initially highly correlated</u>. An exogenous shock emerges (e.g. an oil shock)

$\rightarrow$ it leads to recessions in both economies, so correlation remains high

$\rightarrow$ recessions blow up deficits in both countries

$\Rightarrow$ If deficits react differently to oil shock induced recessions, fiscal divergence is associated with unchanged BC synchro: OLS parameter is biased towards zero.

Discrepancy between OLS and IV estimates *cont'd*

- Indeed, both our OLS and IV estimates are negative and OLS is both larger and closer to zero (from below) than IV estimates, which could indicate endogeneity.

- However, the IV estimates (in absolute terms) are about 4-times larger. Our question: Can endogeneity explain this large discrepancy between OLS and IV estimates?

Discrepancy between OLS and IV estimates *cont'd*

Address the problem considering that

- The revenue and expenditure components relative to GDP are also depend on the cycle. IVs calculated from these series the same way as the regressand (i.e. the three steps indicated above)

- If endogeneity remained in deficit, it likely remained in IVs as well $\Rightarrow$ they are not valid instruments, both our OLS and IV estimates are biased

- If endogeneity was removed, then both OLS and IV are consistent, why such a large discrepancy?

Discrepancy between OLS and IV estimates *cont'd*

- The Hausman-test is of no use for this question, since it assumes that instruments are valid

- Possible explanation: our instruments are weak (i.e. not being highly correlated with the regressor)

- Stock-Yogo (2004) have shown that weak instruments can produced biased IV estimators and hypothesis tests with large size distortions

Discrepancy between OLS and IV estimates *cont'd*

Sum up:

- We have searched for good instruments but did not find. They could be endogenous as well, and they are also weak (correlation is low).

- OLS estimates are larger than IV, which could be the indication of either endogeneity or poor instruments.

- Both OLS and IV estimates seems to be highly significant, so we suspect that the true parameter is between them, with OLS being the upper bound (lower in absolute terms).

- Still, the question arises: Do we need IV?