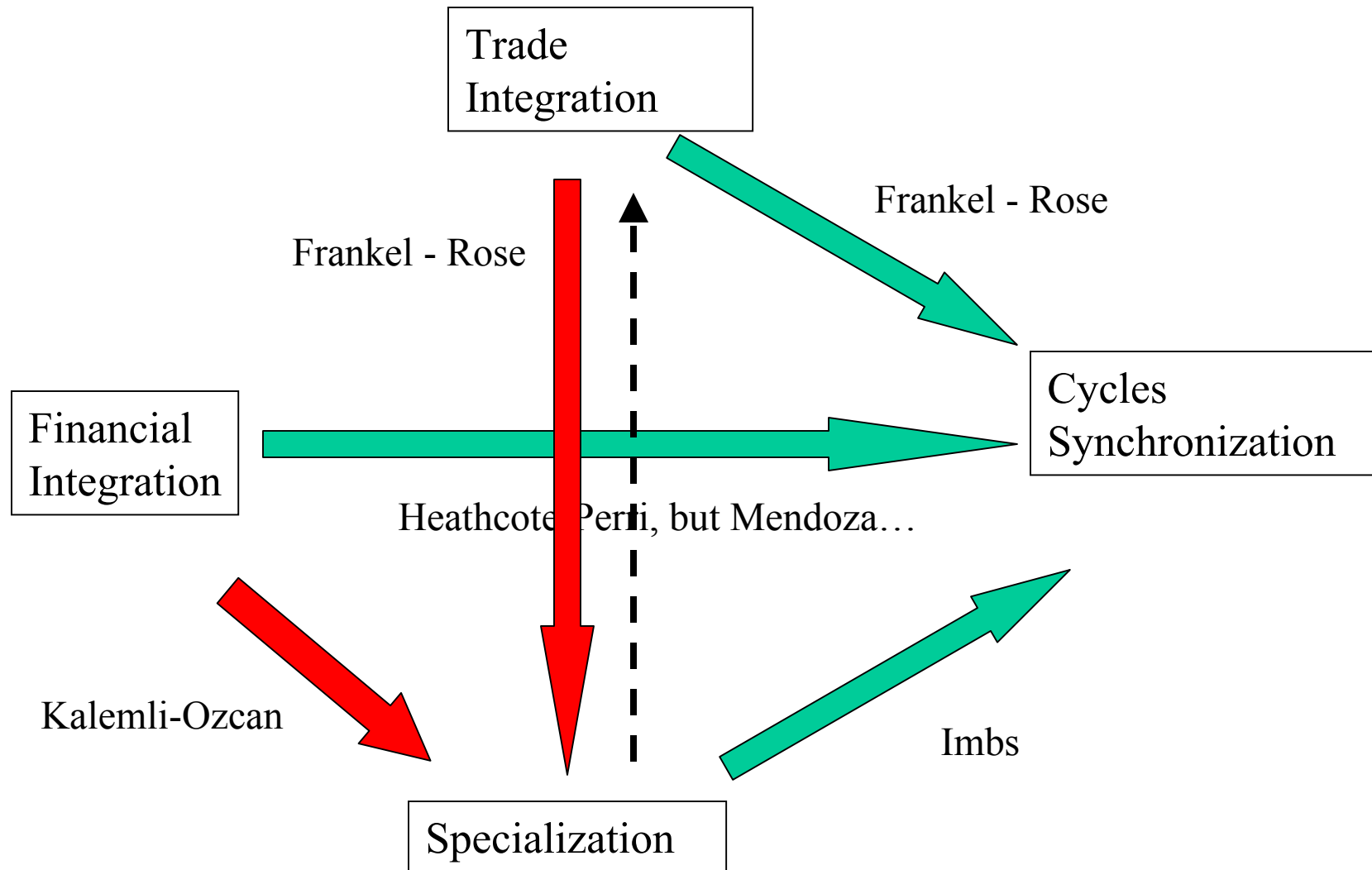


Trade, Finance, Specialization and Synchronization

Jean Imbs (LBS & CEPR)

Global Linkages Conference – Jan 30-31 2003

Literature Review



Simultaneity

- Direct and Indirect Channels
- Direct Effect vs. Indirect Specialization Effect of Trade.
- Direct Effect vs. Indirect Specialization Effect of Finance.
- Direct Effect vs. Indirect Trade- and Financed-induced Effects of Specialization.
- Decomposition of Trade effects into intra- and inter-industry

Data

- IFS – Quarterly GDP, 18 countries, 1980-2000.

Both cross-section and panel.

- BEA – Annual GSP, 50 States, 1977-2001.

Controls for effects of monetary policy, and “multilateral resistance”.

The System

$$\rho_{i,j} = \alpha_0 + \alpha_1 T_{i,j} + \alpha_2 S_{i,j} + \alpha_3 I_{1,i,j} + \varepsilon_{1,i,j} \quad (1)$$

$$T_{i,j} = \beta_0 + \beta_1 S_{i,j} + \beta_2 I_{2,i,j} + \varepsilon_{2,i,j} \quad (2)$$

$$S_{i,j} = \gamma_0 + \gamma_1 T_{i,j} + \gamma_2 I_{3,i,j} + \varepsilon_{3,i,j} \quad (3)$$

$$T_{i,j}^1 = \frac{1}{T} \sum_t \frac{X_{i,j,t} + M_{i,j,t}}{Y_{i,t} + Y_{j,t}} \quad T_{i,j}^2 = \frac{1}{2} \frac{1}{T} \sum_t \frac{(X_{i,j,t} + M_{i,j,t}) Y_t^W}{Y_{i,t} * Y_{j,t}}$$

$$S_{i,j} = \frac{1}{T} \sum_t \sum_n^N |s_{n,i} - s_{n,j}|$$

Financial Integration

- Across Countries: Index of Capital Account Restrictions (binary variable, summed pairwise)
- Across States: Risk Sharing Index.

$$\ln gsp_t - \ln dy_t = \alpha + \beta \ln gsp_t + \varepsilon_t$$

Estimates summed pairwise

Identification

- requires I_2 different from I_3 .
- Financial Integration indices part of I_1 and I_3 .
- I_2 includes: gravity variables (economic size, distance, language, border)
- I_3 includes: financial integration, GDP per capita in both economies, and the gap between the two.
- Estimations run with GMM to address heteroscedasticity.

Table 1A: Summary Statistics across Countries (153 obs)

	Mean	Min	Max	Std. Dev.
ρ_Q	0.227	-0.471	0.887	0.337
ρ_Y	0.226	-0.614	0.943	0.351
T^1	0.004	4.93×10^{-6}	0.074	0.008
T^2	0.237	0.001	5.149	0.482
S_{YB}	0.363	0.144	0.655	0.113
S_{Mfg}	0.472	0.149	0.842	0.127

Table 1B: Summary Statistics across States (1275 obs)

	Mean	Min	Max	Std. Dev.
ρ	0.266	-0.896	0.968	0.387
S	0.577	0.201	1.339	0.200

Table 2A: Unconditional Correlations across Countries

	ρ_Q	ρ_Y	T^1	T^2	S_{YB}	S_{Mfg}
ρ_Q	1.000					
ρ_Y	0.876	1.000				
T^1	0.324	0.329	1.000			
T^2	0.151	0.181	0.861	1.000		
S_{YB}	-0.451	-0.440	-0.145	0.051	1.000	
S_{Mfg}	-0.320	-0.335	-0.161	0.035	0.360	1.000

Table 2B: Unconditional Correlations across States

	ρ	S
ρ	1.000	
S	-0.279	1.000

Correlation		Trade	
-0.471	US - Israel	4.93×10^{-6}	Mexico - S.Africa
-0.427	Austria - Peru	8.76×10^{-5}	Australia - Peru
-0.417	Norway - France	1.07×10^{-4}	Peru - S.Africa
0.882	US - Canada	0.029	France - Belgium
0.885	Switzerland - Nlds	0.031	US - Canada
0.887	Austria - Canada	0.074	Nlds - Belgium
-0.896	Texas - S. Dakota	17.06	Vermont - Wyoming
-0.894	Conn. - S.Dakota	17.94	Vermont - S.Dakota
-0.808	Rhode Isl. - S.Dakota	18.92	Vermont - Alaska
0.964	Mass. - Maine	64.36	New York - Penn.
0.967	Florida - Maine	66.95	California - Texas
0.968	Florida - Virginia	67.54	California - New York

Specialization		Financial Integration	
0.144	Australia - Canada	0	Mexico - US
0.158	UK - France	0	Canada - US
0.159	Netherlands - Canada	0	Mexico - Canada
0.591	Japan - Israel	2	Italy - S.Africa
0.621	Finland - Belgium	2	UK - S.Africa
0.655	Mexico - Israel	2	Nlds - Japan
0.201	Indiana - Ohio	0.247	Nebraska - Virginia
0.231	Arizona - Florida	0.287	Kentucky - S.Dakota
0.242	Minnesota - Wisconsin	0.319	California - Rhode Island
1.295	DC - S.Dakota	1.506	Alaska - Wyoming
1.331	DC - Wyoming	1.554	Alaska - Louisiana
1.339	DC - Delaware	1.638	Alaska - New Mexico

Table 4: Equation-by-equation Estimations					
		(i) OLS	(ii) IV	(iii) OLS	(iv) IV
(1) Correlation ρ	T	0.091 (5.09)	0.144 (6.75)	0.052 (2.80)	0.069 (2.20)
	S			-0.373 (4.60)	-0.497 (2.62)
	K			-0.077 (1.76)	-0.081 (1.75)
	R^2	0.147	0.097	0.262	0.235
(2) Trade T	Distance	-1.036 (14.46)		-1.074 (13.34)	-0.937 (8.72)
	Border	-0.113 (0.35)		0.045 (0.12)	-0.124 (0.26)
	Language	0.507 (2.53)		0.622 (2.54)	0.508 (1.65)
	GDP Product	0.303 (7.58)		0.297 (6.39)	0.131 (1.78)
	S			-0.277 (1.14)	-2.343 (3.62)
R^2	0.672		0.683	0.507	
(3) Specialization S	GDP per capita Product	-0.224 (4.27)	-0.160 (2.70)	-0.223 (3.85)	-0.154 (2.37)
	GDP Gap	1.261 (2.73)	0.996 (2.07)	1.258 (2.61)	0.981 (1.96)
	T	-0.033 (1.54)	-0.077 (2.70)	-0.031 (1.39)	-0.075 (2.63)
	K			-0.100 (2.26)	-0.097 (2.15)
	R^2	0.256	0.235	0.249	0.226

Notes: Intercepts are not reported. All variables are in logs, excepted binary ones and correlation coefficients. The instruments in the IV estimations are the gravity variables and K . t-statistics between parentheses.

Table 5: Simultaneous Estimations					
		(i) SUR	(ii) TSLS	(iii) SUR	(iv) TSLS
(1) Correlation ρ					
	T	0.117 (6.60)	0.159 (7.56)	0.065 (3.53)	0.056 (1.82)
	S			-0.406 (5.11)	-0.602 (3.25)
	K			-0.078 (1.85)	-0.093 (2.03)
	R^2	0.135	0.064	0.257	0.207
(2) Trade T					
	Distance	-1.019 (14.67)	-0.973 (14.15)	-1.000 (13.06)	-0.786 (8.29)
	Border	-0.040 (0.13)	-0.017 (0.06)	0.086 (0.25)	0.118 (0.41)
	Language	0.584 (3.04)	0.604 (3.28)	0.666 (2.93)	0.597 (3.05)
	GDP Product	0.325 (8.47)	0.322 (8.67)	0.284 (6.50)	0.210 (3.22)
	S			-0.872 (3.79)	-2.715 (4.35)
	R^2	0.670	0.668	0.665	0.407
(3) Specialization S					
	GDP per capita Product	-0.171 (3.45)	-0.160 (2.90)	-0.226 (4.14)	-0.197 (4.01)
	GDP Gap	1.078 (2.47)	1.054 (2.36)	1.534 (3.38)	1.393 (3.48)
	T	-0.065 (3.13)	-0.086 (3.15)	-0.058 (2.74)	-0.064 (2.41)
	K			-0.100 (2.38)	-0.057 (1.53)
	R^2	0.245	0.225	0.231	0.227

Notes: Intercepts are not reported. All variables are in logs, excepted binary ones and correlation coefficients. The instruments in the TSLS estimations are the gravity variables, GDP product, GDP gap and K . t-statistics between parentheses.

Table 6: US States			
	(i) TSLS	(ii) TSLS	(iii) TSLS
(1) Correlation ρ			
\hat{T}	0.031 (13.74)	0.032 (14.09)	0.031 (13.84)
S		-0.351 (8.49)	-0.326 (7.64)
Risk Sharing		0.063 (2.28)	0.051 (1.86)
Size			-0.049 (3.51)
R^2	0.176	0.267	0.277
(3) Specialization S			
GDP per capita Product	-0.185 (17.22)	-0.206 (18.21)	-0.206 (18.23)
GDP Gap	0.400 (9.55)	0.405 (9.09)	0.404 (9.08)
\hat{T}	-0.033 (17.66)	-0.035 (17.96)	-0.035 (17.97)
Risk Sharing		0.050 (2.81)	0.050 (2.81)
R^2	0.628	0.624	0.624

Notes: Intercepts are not reported. All variables are in logs, excepted binary ones and correlation coefficients. Trade between states is a fitted value implied by a gravity model estimated on cross-country data; in particular, $\hat{T} = -1.355 * \ln(\text{Distance}) + 1.057 * \ln(\text{GDP Product}) - 0.635 * \ln(\text{Population Product}) - 29.834$. t-statistics between parentheses. Risk Sharing measures income insurance between US states, and reports the pairwise sum of β from the regression $\ln \text{GSP}_t - \ln y_t = \alpha + \beta \ln \text{GSP}_t$, where the cyclical component of all variables is isolated using the Baxter-King filter (except in (iv) and (v)). Size is measured by the pairwise discrepancy in GSP.

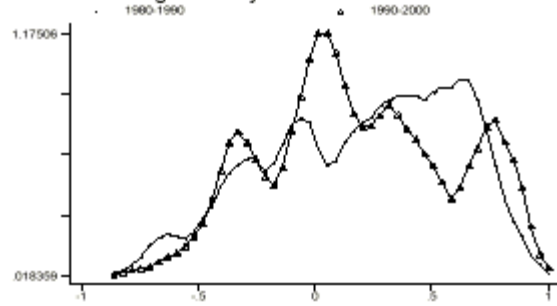
Table 7B: Channels to Business Cycles Synchronization - International Data

	Direct	Indirect
(1) Trade		
Intra-Industry Trade	-0.152 (0.096)	
Geographic Trade via Specialization	0.063 (0.019)	0.038 (0.058)
(2) Specialization		
Trade Induced	0.038 (0.058)	
Finance Induced	0.034 (0.162)	
Stages of Diversification via Trade	-0.530 (0.004)	-0.152 (0.096)
(3) Finance		
Financial Integration via Specialization	-0.093 (0.043)	0.034 (0.162)

Table 7C: Channels to Business Cycles Synchronization - Intranational Data

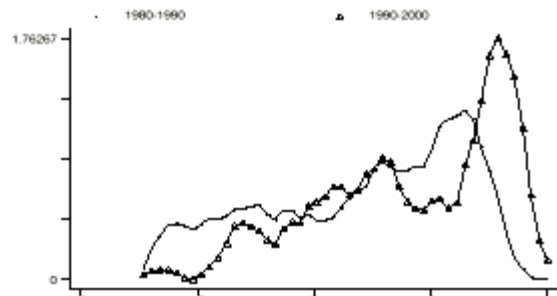
	Direct	Indirect
(1) Trade		
Intra-Industry Trade	N/A	
Geographic Trade via Specialization	N/A	0.020 (0.00)
(2) Specialization		
Trade Induced	0.020 (0.00)	
Finance Induced	-0.029 (0.01)	
Stages of Diversification via Trade	-0.694 (0.00)	N/A
(3) Finance		
Financial Integration via Specialization	0.140 (0.00)	-0.029 (0.01)

Figure 1: Cycles Correlations



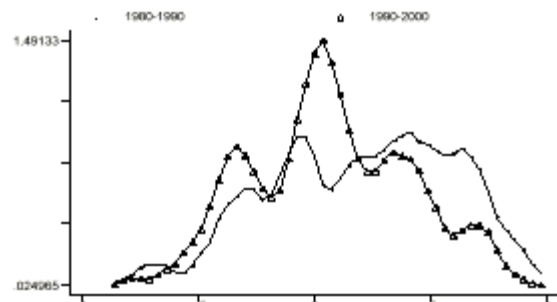
All Correlations - 24 countries, 1980-2000

	1980-1990	1990-2000
Mean	0.2209 (0.024)	0.1858 (0.024)
Std	0.275	0.275
Ho: Equal Means (P-value)		
Ho: Mean Increased	0.999	0.991
Ho: Mean Unchanged	0.991	0.330
Ho: Mean Decreased		



European Correlations - 24 countries, 1980-2000

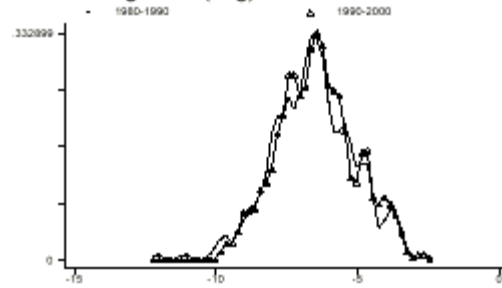
	1980-1990	1990-2000
Mean	0.2113 (0.045)	0.4034 (0.041)
Std	0.1	0.1
Ho: Equal Means (P-value)		
Ho: Mean Increased	0.000	0.000
Ho: Mean Unchanged	0.000	0.999
Ho: Mean Decreased		



Non-European Correlations - 24 countries, 1980-2000

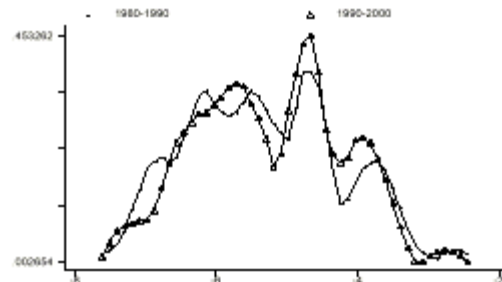
	1980-1990	1990-2000
Mean	0.196 (0.027)	0.070 (0.025)
Std	0.05	0.05
Ho: Equal Means (P-value)		
Ho: Mean Increased	0.995	0.901
Ho: Mean Unchanged	0.901	0.000
Ho: Mean Decreased		

Figure 4: (Log) Bilateral Trade



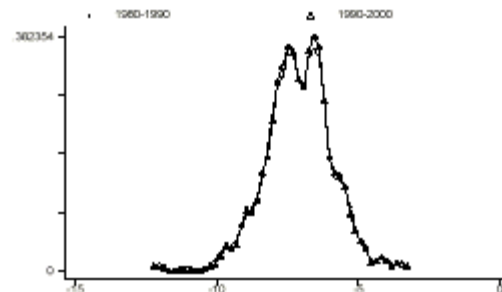
Bilateral Trade (log) - All 24 Countries, 1980-2000

	1980-1990	1990-2000
Mean	-4.562 (0.050)	-4.435 (0.051)
Std	0.276	0.276
Ho: Equal Means (P-value)		
Ho: Mean Increased	0.151	0.849
Ho: Mean Unchanged	0.332	0.849
Ho: Mean Decreased		



Bilateral Trade (log) - European Countries, 1980-2000

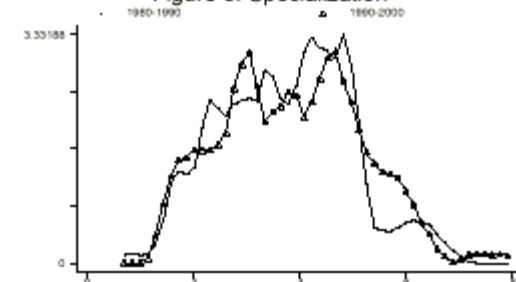
	1980-1990	1990-2000
Mean	-5.323 (0.112)	-5.252 (0.107)
Std	0.1	0.1
Ho: Equal Means (P-value)		
Ho: Mean Increased	0.324	0.649
Ho: Mean Unchanged	0.649	0.670
Ho: Mean Decreased		



Bilateral Trade (log) - Non European Countries, 1980-2000

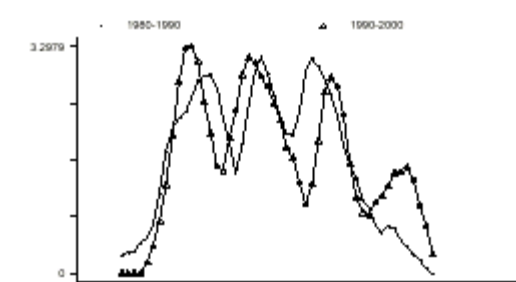
	1980-1990	1990-2000
Mean	-7.172 (0.091)	-7.021 (0.091)
Std	0.05	0.05
Ho: Equal Means (P-value)		
Ho: Mean Increased	0.108	0.892
Ho: Mean Unchanged	0.217	0.892
Ho: Mean Decreased		

Figure 3: Specialization



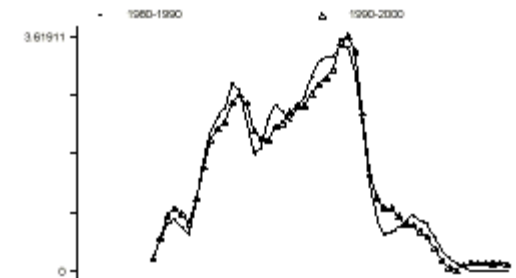
Specialization Indices - All 24 Countries, 1980-2000

	1980-1990	1990-2000
Mean	0.7155 (0.009)	0.3959 (0.010)
Std	0.171	0.171
Ho: Equal Means (P-value)		
Ho: Mean Increased	0.226	0.455
Ho: Mean Unchanged	0.455	0.774
Ho: Mean Decreased		



Specialization Indices - European Countries, 1980-2000

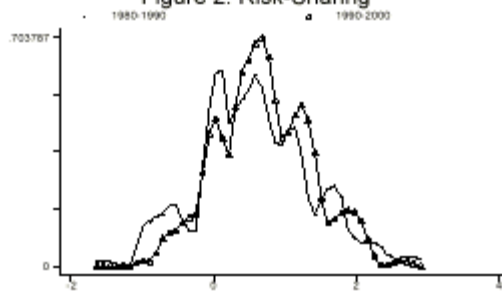
	1980-1990	1990-2000
Mean	0.3333 (0.011)	0.3576 (0.016)
Std	0.05	0.05
Ho: Equal Means (P-value)		
Ho: Mean Increased	0.174	0.349
Ho: Mean Unchanged	0.349	0.620
Ho: Mean Decreased		



Specialization Indices - Non-European Countries, 1980-2000

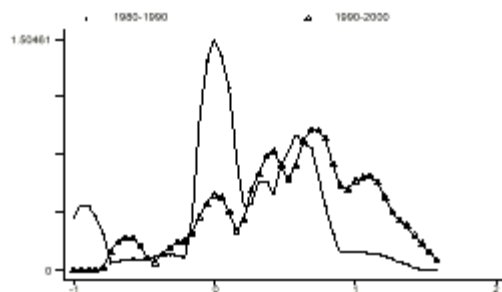
	1980-1990	1990-2000
Mean	0.3254 (0.011)	0.2285 (0.012)
Std	0.05	0.05
Ho: Equal Means (P-value)		
Ho: Mean Increased	0.398	0.757
Ho: Mean Unchanged	0.757	0.651
Ho: Mean Decreased		

Figure 2: Risk-Sharing



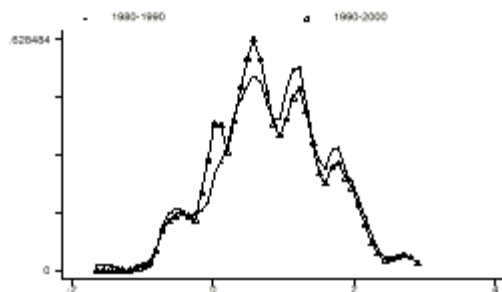
All Risk-Sharing - 24 Countries, 1980-2000

	1980-1990	1990-2000
Mean	0.5175 (0.054)	0.1012 (0.043)
Nobs	210	231
Ho: Equal Means (P-value)		
Ho: Mean Increased	0.635	
Ho: Mean Unchanged	0.671	
Ho: Mean Decreased		0.865



European Risk-Sharing - 24 Countries, 1980-2000

	1980-1990	1990-2000
Mean	0.1582 (0.056)	0.5616 (0.056)
Nobs	78	78
Ho: Equal Means (P-value)		
Ho: Mean Increased	0.688	
Ho: Mean Unchanged	0.993	
Ho: Mean Decreased		1.993



Non-European Risk-Sharing - 24 Countries, 1980-2000

	1980-1990	1990-2000
Mean	0.6254 (0.016)	0.1127 (0.056)
Nobs	132	153
Ho: Equal Means (P-value)		
Ho: Mean Increased	0.722	
Ho: Mean Unchanged	0.989	
Ho: Mean Decreased		0.278

Panel Results (2/3 periods)

Table 9: Panel Evidence					
		(i) RE	(ii) RE - TSLS	(iii) RE	(iv) RE - TSLS
(1) Correlation ρ					
T		0.059 (3.10)	0.096 (3.93)	0.021 (0.61)	0.047 (1.71)
S		-0.175 (2.45)	-0.048 (0.53)	-0.352 (3.07)	-0.581 (4.73)
K		-0.059 (1.71)	-0.081 (2.27)	0.006 (0.12)	0.050 (1.31)
Risk-Sharing		0.018 (0.51)	0.028 (0.77)	-0.002 (0.05)	0.091 (2.28)
R^2		0.152	0.156	0.160	0.180
Hausman Test		0.286		0.005	
(2) Trade T					
S		-0.047 (0.35)	-0.596 (2.92)	-0.227 (1.67)	-1.132 (4.90)
R^2		0.726	0.689	0.741	0.847
Hausman Test		0.900		0.180	
(3) Specialization S					
T		-0.028 (1.57)	-0.110 (5.20)	-0.081 (2.56)	-0.142 (5.40)
K		0.040 (1.44)	-0.032 (1.35)	0.013 (0.33)	0.018 (0.64)
Risk Sharing		0.000 (0.00)	0.035 (1.49)	0.001 (0.05)	0.052 (2.24)
R^2		0.218	0.241	0.195	0.270
Hausman Test		0.040	0.306	0.069	1.000

Panel Results (15 periods)

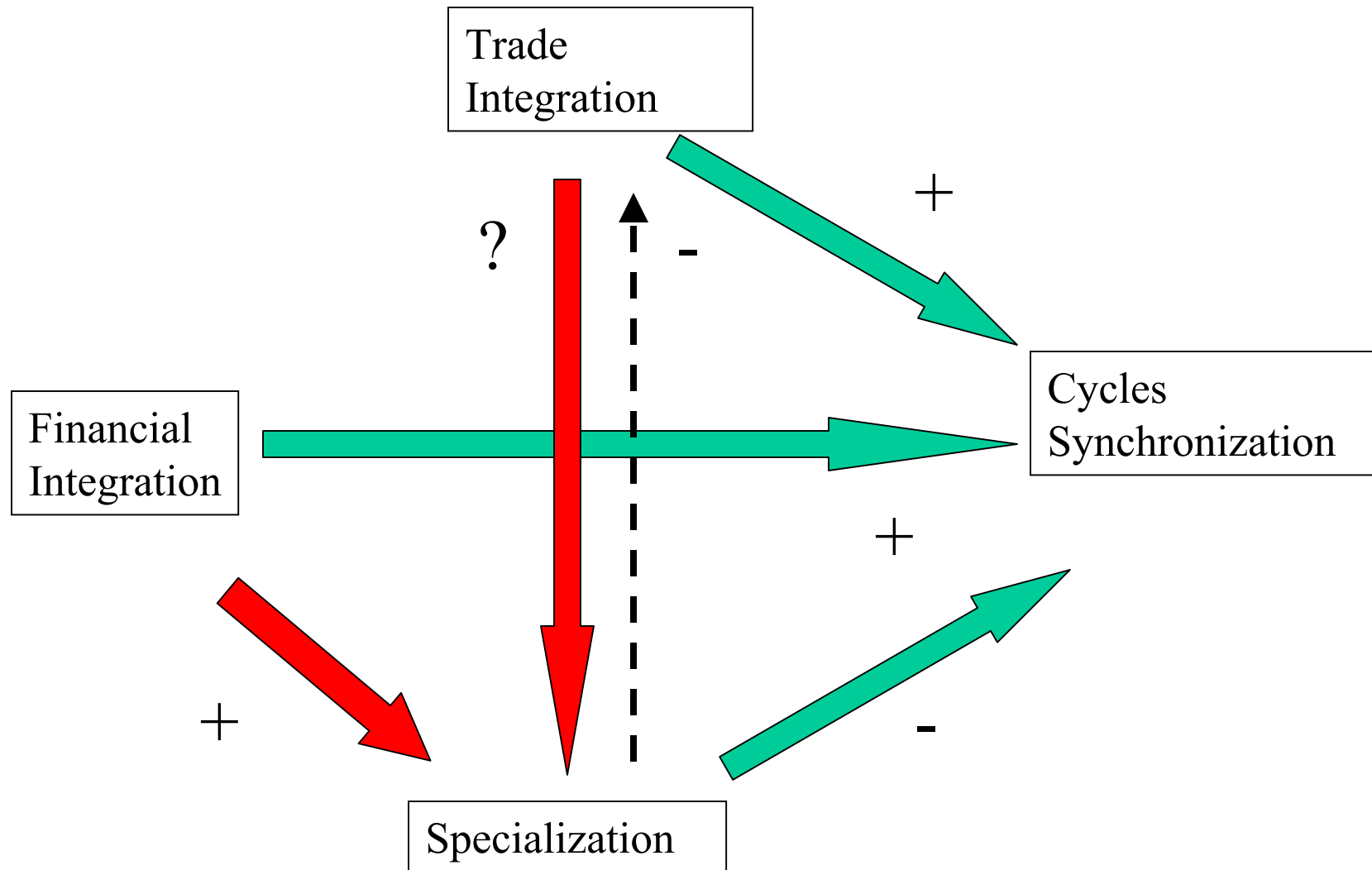
Table 10 : Panel Evidence based on 5-year rolling averages (15 periods)				
	(i) T_1 , YB	(ii) T_2 , YB	(iii) T_1 , UN	(iv) T_2 , UN
Correlation ρ				
T	0.066 (2.83)	0.051 (4.66)	0.072 (6.08)	0.057 (3.54)
S	-0.119 (0.86)	-0.365 (6.94)	-0.027 (0.39)	-0.319 (4.21)
Risk-Sharing	0.081 (5.95)	0.089 (6.79)	0.055 (4.72)	0.042 (3.64)
R^2	0.098	0.091	0.053	0.048
Hausman Test	0.075	1.000	0.999	0.005

Notes: Correlation coefficients are run over rolling 5-year windows, using twenty years of quarterly data on 24 countries. Bilateral Trade, Risk Sharing and Specialization Indices are measured yearly, and averaged over the corresponding 5-year periods, as are the time-varying gravity variables. All estimations are run with period-effects. In each estimation, T and S are instrumented using: the gravity variables, the index of risk-sharing, GDP per capita product and GDP gap. Specifications (i) and (iii) use T_1 to measure trade, while specifications (ii) and (iv) use T_2 . The first (last) two specifications use indices based on all sectors (manufacturing sectors only). The Hausman tests reports the P-value associated to the null hypothesis that estimates based on fixed-effects and random-effects are not systematically different. A low value rejects the null, suggesting (reported) estimates based on random-effects are not appropriate.

Robustness

- GMM
- Yearly vs. Quarterly
- Alternative measure of trade
- HP Filter
- Specialization in Manufactures only
- Controls for NER volatility, inflation differentials
- Controls for country sizes

Literature Review



Conclusion

- Results hold across countries, U.S States, over time, various aggregation levels, various measures of trade and financial linkages and various filters.
- Trade: both inter- and intra-industry. Effects of inter-industry trade qualitatively compatible with models. Important role for intra-industry trade. Little specialization effect.
- Specialization –and sectoral patterns– affect real cycle synchronization, over and beyond component induced by trade and financial integration.
- Financial integration results in more correlated cycles, even though induces specialization. Alternative measures (Chinn-Ito, Edison-Warnock, Kaminsky-Schmukler)