

SUPPLEMENT

(Intended for Referees Information and not for Publication)

for

Price level convergence, purchasing power parity and multiple structural breaks in panel data analysis: An application to US cities

July 2008

1. Estimated coefficients for the response surfaces that approximates asymptotic critical values, the mean and the variance of the statistic. Constant with level shifts case.*
2. Estimated coefficients for the response surfaces that approximates asymptotic critical values, the mean and the variance of the statistic. Time trend with level and slope shifts case.*
3. Individual and panel data stationarity tests with multiple structural breaks. QPPP hypothesis, pairwise analysis.
4. Individual and panel data stationarity tests with multiple structural breaks. TQPPP hypothesis, pairwise analysis.
5. Individual and panel data stationarity tests with multiple structural breaks. Restricted QPPP hypothesis, pairwise analysis.
6. Individual and panel data stationarity tests with multiple structural breaks. Restricted TQPPP hypothesis, pairwise analysis.

* Details on the estimation of the response surfaces: All possible combinations of break fraction values have given 502 observations that are used to estimate the response surfaces. We have computed robust standard errors using the Newey and West (1994) estimator. The unreported parameters were found statistically significant at the 10% level. The adjusted coefficient of determination for all estimated functions is at least of 0.96.

Notes: ATL (Atlanta), BOS (Boston), CHI (Chicago), CIN (Cincinnati), CLE (Cleveland), DET (Detroit), HOU (Houston), KAN (Kansas City), LA (Los Angeles), MIN (Minneapolis), NY (New York), PHI (Philadelphia), PIT (Pittsburgh), POR (Portland), SF (San Francisco), SEA (Seattle), and SL (St. Louis). QPPP: Qualified Purchasing Power Parity; TQPPP: Trend Qualified Purchasing Power Parity. See the text for further details.

Table 1: Estimated coefficients for the response surfaces that approximates asymptotic critical values, the mean and the variance of the statistic. Constant with level shifts case.

	90%	95%	97.5%	99%	Mean	Var
$\hat{\beta}_{0,0}$	0.3180	0.4142	0.3925	0.4135	0.1638	0.0124
$\hat{\beta}_{0,1}$	0.0000	0.0000	0.0506	0.0835	0.0000	0.0000
$\hat{\beta}_{1,1}$	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0326
$\hat{\beta}_{1,2}$	-0.2115	-0.2562	-0.3486	-0.2617	-0.1013	0.0000
$\hat{\beta}_{1,3}$	0.0000	0.1327	0.1637	0.0000	0.0315	0.0100
$\hat{\beta}_{1,4}$	0.1078	0.0000	0.0000	0.2617	0.0000	0.0080
$\hat{\beta}_{1,5}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\beta}_{1,6}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\beta}_{1,7}$	-0.0523	0.0000	-0.1410	-0.6806	-0.0396	-0.0095
$\hat{\beta}_{1,8}$	0.0000	0.0000	0.0000	0.4984	0.0000	0.0000
$\hat{\beta}_{1,9}$	-0.0457	-0.0629	-0.1341	-0.1722	-0.0230	-0.0038
$\hat{\delta}_{1,1,2}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{1,1,3}$	0.3074	0.4048	0.5492	0.6388	0.1017	0.0373
$\hat{\delta}_{1,1,4}$	0.0000	0.1110	0.0000	0.3500	0.0428	0.0202
$\hat{\delta}_{1,1,5}$	-0.1318	-0.1562	0.0000	0.0000	-0.0535	0.0000
$\hat{\delta}_{1,1,6}$	-0.1241	-0.1212	0.0000	-0.8200	0.0000	-0.0132
$\hat{\delta}_{1,1,7}$	0.1079	0.0000	0.0000	0.2793	0.0350	0.0139
$\hat{\delta}_{1,1,8}$	1.3519	2.0211	2.4813	3.5871	0.4372	0.1585
$\hat{\delta}_{1,2,3}$	-0.4743	-0.6377	-0.8459	-1.1384	-0.2102	-0.0463
$\hat{\delta}_{1,2,4}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{1,2,5}$	-0.1864	-0.3702	-0.3016	-0.4393	-0.0561	-0.0213
$\hat{\delta}_{1,2,6}$	-0.1706	0.0000	-0.4026	-0.5002	0.0000	-0.0306
$\hat{\delta}_{1,2,7}$	0.0000	-0.2338	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{1,2,8}$	0.0000	0.0000	0.0000	0.0000	-0.0735	0.0000
$\hat{\delta}_{1,3,4}$	-0.3969	-0.5290	-0.6974	-0.9326	-0.1835	-0.0348
$\hat{\delta}_{1,3,5}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{1,3,6}$	0.0000	0.0000	-0.9757	0.0000	0.0000	0.0000
$\hat{\delta}_{1,3,7}$	0.0000	-0.6026	0.0000	0.0000	0.0000	-0.0510
$\hat{\delta}_{1,3,8}$	-0.2781	0.0000	0.0000	-1.0744	-0.1263	0.0000
$\hat{\delta}_{1,4,5}$	-0.3328	-0.4833	-0.6276	-0.7399	-0.1715	-0.0245
$\hat{\delta}_{1,4,6}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{1,4,7}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{1,4,8}$	-0.3640	-0.3682	-0.5796	-1.3195	-0.0785	-0.0416
$\hat{\delta}_{1,5,6}$	-0.3768	-0.5513	-0.4058	-0.4566	-0.1812	-0.0171
$\hat{\delta}_{1,5,7}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{1,5,8}$	0.0000	0.0000	-0.7565	-1.1760	0.0000	-0.0229
$\hat{\delta}_{1,6,7}$	0.0000	-0.5215	0.0000	0.0000	-0.1732	0.0000
$\hat{\delta}_{1,6,8}$	-0.3946	0.0000	-0.7563	0.0000	0.0000	0.0000
$\hat{\delta}_{1,7,8}$	0.0000	0.0000	0.0000	-1.7818	-0.2050	0.0000
$\hat{\delta}_{2,1,2}$	0.0000	0.0000	0.0000	-0.5857	0.0000	-0.0633
$\hat{\delta}_{2,1,3}$	-0.8872	-1.2364	-1.6728	-1.8857	-0.3107	-0.1107
$\hat{\delta}_{2,1,4}$	-0.2012	-0.5231	-0.4110	-1.1791	-0.1655	-0.0663
$\hat{\delta}_{2,1,5}$	0.0000	0.0000	-0.3676	-0.5616	0.0000	-0.0323
$\hat{\delta}_{2,1,6}$	0.0000	0.0000	0.0000	1.1417	0.0000	0.0000

Table 1: (Continued) Estimated coefficients for the response surfaces that approximates asymptotic critical values, the mean and the variance of the statistic. Constant with level shifts case.

	90%	95%	97.5%	99%	Mean	Var
$\hat{\delta}_{2,1,7}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{2,1,8}$	-2.2005	-3.2677	-4.3627	-6.9496	-0.6989	-0.2469
$\hat{\delta}_{2,2,3}$	1.0082	1.3366	1.8424	2.6704	0.4211	0.1082
$\hat{\delta}_{2,2,4}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{2,2,5}$	0.4319	0.8617	0.7916	1.2101	0.1407	0.0571
$\hat{\delta}_{2,2,6}$	0.4173	0.2648	0.8899	1.0250	0.0000	0.0661
$\hat{\delta}_{2,2,7}$	0.0000	0.2309	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{2,2,8}$	0.0000	0.0000	0.0000	0.0000	0.1765	0.0000
$\hat{\delta}_{2,3,4}$	0.9947	1.3891	1.8114	2.3930	0.4067	0.1005
$\hat{\delta}_{2,3,5}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{2,3,6}$	0.0000	0.0000	2.0550	0.0000	0.0000	0.0000
$\hat{\delta}_{2,3,7}$	0.0000	1.3068	0.0000	0.0000	0.0000	0.1089
$\hat{\delta}_{2,3,8}$	0.7606	0.0000	0.0000	2.6147	0.2675	0.0000
$\hat{\delta}_{2,4,5}$	0.9742	1.4390	1.7746	2.2133	0.4088	0.0887
$\hat{\delta}_{2,4,6}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{2,4,7}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{2,4,8}$	0.6984	1.0253	1.5085	2.5081	0.2218	0.0910
$\hat{\delta}_{2,5,6}$	1.1134	1.6487	1.7070	2.1400	0.4371	0.0842
$\hat{\delta}_{2,5,7}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{2,5,8}$	0.2712	0.3771	1.6263	2.4994	0.0997	0.0704
$\hat{\delta}_{2,6,7}$	0.4471	1.8408	0.8634	0.0000	0.4434	0.0699
$\hat{\delta}_{2,6,8}$	1.0031	0.0000	1.5508	1.3745	0.0000	0.0000
$\hat{\delta}_{2,7,8}$	0.4330	0.8616	1.1930	5.6104	0.5792	0.0714
$\hat{\delta}_{3,1,2}$	0.4481	0.6109	0.8055	1.6322	0.1888	0.1079
$\hat{\delta}_{3,1,3}$	0.7556	1.0893	1.4557	1.6525	0.2776	0.0959
$\hat{\delta}_{3,1,4}$	0.3398	0.6346	0.7013	1.2091	0.1842	0.0675
$\hat{\delta}_{3,1,5}$	0.2801	0.3629	0.6530	0.9358	0.1124	0.0524
$\hat{\delta}_{3,1,6}$	0.2861	0.3282	0.2173	0.0000	0.0455	0.0315
$\hat{\delta}_{3,1,7}$	0.0000	0.1859	0.2100	0.0000	0.0000	0.0000
$\hat{\delta}_{3,1,8}$	0.7909	1.1356	1.8252	3.1794	0.2616	0.0887
$\hat{\delta}_{3,2,3}$	-0.6315	-0.8159	-1.1488	-1.7719	-0.2556	-0.0717
$\hat{\delta}_{3,2,4}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{3,2,5}$	-0.3148	-0.6214	-0.6312	-1.0057	-0.1091	-0.0466
$\hat{\delta}_{3,2,6}$	-0.3004	-0.3588	-0.6027	-0.6349	0.0000	-0.0438
$\hat{\delta}_{3,2,7}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{3,2,8}$	0.0000	0.0000	0.0000	0.0000	-0.1217	0.0000
$\hat{\delta}_{3,3,4}$	-0.7158	-1.0186	-1.3130	-1.6867	-0.2719	-0.0779
$\hat{\delta}_{3,3,5}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{3,3,6}$	0.0000	0.0000	-1.3883	0.0000	0.0000	0.0000
$\hat{\delta}_{3,3,7}$	0.0000	-0.9056	0.0000	0.0000	0.0000	-0.0748
$\hat{\delta}_{3,3,8}$	-0.5237	0.0000	0.0000	-1.7924	-0.1905	0.0000
$\hat{\delta}_{3,4,5}$	-0.7371	-1.0872	-1.3054	-1.6792	-0.2787	-0.0743
$\hat{\delta}_{3,4,6}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table 1: (Continued) Estimated coefficients for the response surfaces that approximates asymptotic critical values, the mean and the variance of the statistic. Constant with level shifts case.

	90%	95%	97.5%	99%	Mean	Var
$\hat{\delta}_{3,4,7}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{3,4,8}$	-0.5237	-0.7763	-1.1542	-1.7241	-0.1723	-0.0670
$\hat{\delta}_{3,5,6}$	-0.8206	-1.1981	-1.4664	-1.8720	-0.2881	-0.0747
$\hat{\delta}_{3,5,7}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{3,5,8}$	-0.3567	-0.5129	-1.0628	-1.6140	-0.1359	-0.0584
$\hat{\delta}_{3,6,7}$	-0.5203	-1.3948	-0.9769	-0.1234	-0.2972	-0.0779
$\hat{\delta}_{3,6,8}$	-0.7044	-0.1261	-1.0164	-1.7337	-0.0302	-0.0086
$\hat{\delta}_{3,7,8}$	-0.5449	-1.0226	-1.3809	-3.7491	-0.3855	-0.0780
\bar{R}^2	0.98	0.98	0.97	0.97	0.99	0.96

Table 2: Estimated coefficients for the response surfaces that approximates asymptotic critical values, the mean and the variance of the statistic. Time trend with level and slope shifts case.

	90%	95%	97.5%	99%	Mean	Var
$\hat{\beta}_{0,0}$	0.2231	0.2927	0.3621	0.4208	0.1151	0.0029
$\hat{\beta}_{0,1}$	-0.0245	-0.0361	-0.0428	-0.0369	-0.0115	-0.0001
$\hat{\beta}_{1,1}$	0.1308	0.1615	0.1838	0.2110	0.0716	0.0018
$\hat{\beta}_{1,2}$	-0.1533	-0.1916	-0.2163	-0.2396	-0.0850	-0.0017
$\hat{\beta}_{1,3}$	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0003
$\hat{\beta}_{1,4}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\beta}_{1,5}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\beta}_{1,6}$	0.0240	0.0326	0.0479	0.0663	0.0127	0.0000
$\hat{\beta}_{1,7}$	0.0344	0.0528	0.0541	0.0000	0.0144	-0.0008
$\hat{\beta}_{1,8}$	-0.0883	-0.1183	-0.1405	-0.1825	-0.0383	0.0000
$\hat{\beta}_{1,9}$	0.0119	0.0201	0.0233	0.0000	0.0055	0.0000
$\hat{\delta}_{1,1,2}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{1,1,3}$	0.0211	0.0346	0.0000	0.0000	0.0075	0.0000
$\hat{\delta}_{1,1,4}$	0.0279	0.0424	0.0666	0.1023	0.0139	0.0000
$\hat{\delta}_{1,1,5}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{1,1,6}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{1,1,7}$	0.2381	0.3097	0.4076	0.4814	0.0999	0.0029
$\hat{\delta}_{1,1,8}$	-0.4682	-0.6462	-0.8579	-1.0847	-0.1924	-0.0080
$\hat{\delta}_{1,2,3}$	-0.1646	-0.2075	-0.2354	-0.2954	-0.0874	-0.0021
$\hat{\delta}_{1,2,4}$	0.0410	0.0612	0.0697	0.0986	0.0140	0.0000
$\hat{\delta}_{1,2,5}$	0.0587	0.0925	0.1125	0.0000	0.0200	0.0012
$\hat{\delta}_{1,2,6}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{1,2,7}$	-0.0317	-0.0533	-0.0904	0.0000	0.0000	0.0000
$\hat{\delta}_{1,2,8}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{1,3,4}$	-0.1662	-0.2099	-0.2410	-0.3101	-0.0843	-0.0020
$\hat{\delta}_{1,3,5}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{1,3,6}$	0.2063	0.2994	0.3730	0.3979	0.0000	0.0000
$\hat{\delta}_{1,3,7}$	0.0000	0.0000	0.0000	0.0000	0.0857	0.0019
$\hat{\delta}_{1,3,8}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{1,4,5}$	-0.1841	-0.2399	-0.2966	-0.3629	-0.0893	-0.0019
$\hat{\delta}_{1,4,6}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{1,4,7}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{1,4,8}$	0.2319	0.3405	0.4134	0.4199	0.0904	0.0010
$\hat{\delta}_{1,5,6}$	-0.2026	-0.2701	-0.2868	-0.3324	-0.0925	-0.0021
$\hat{\delta}_{1,5,7}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{1,5,8}$	0.1970	0.3234	0.3751	0.3840	0.0791	0.0000
$\hat{\delta}_{1,6,7}$	-0.1403	-0.1865	-0.1115	-0.1452	-0.0638	-0.0024
$\hat{\delta}_{1,6,8}$	0.1195	0.1656	0.0000	0.0000	0.0394	0.0000
$\hat{\delta}_{1,7,8}$	-0.2251	-0.2928	-0.2641	-0.3206	-0.1020	-0.0065
$\hat{\delta}_{2,1,2}$	0.0734	0.0572	0.0000	0.0000	0.0661	-0.0018
$\hat{\delta}_{2,1,3}$	-0.0546	-0.0834	0.0000	0.0000	-0.0201	0.0001
$\hat{\delta}_{2,1,4}$	-0.0676	-0.1010	-0.1532	-0.2210	-0.0334	0.0000
$\hat{\delta}_{2,1,5}$	-0.0039	0.0000	0.0000	0.0000	0.0000	0.0000

Table 2: (Continued) Estimated coefficients for the response surfaces that approximates asymptotic critical values, the mean and the variance of the statistic. Time trend with level and slope shifts case.

	90%	95%	97.5%	99%	Mean	Var
$\hat{\delta}_{2,1,6}$	-0.0031	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{2,1,7}$	-0.2724	-0.3599	-0.4773	-0.5591	-0.1125	0.0000
$\hat{\delta}_{2,1,8}$	0.9157	1.2884	1.6960	2.2588	0.3750	0.0123
$\hat{\delta}_{2,2,3}$	0.1655	0.1961	0.1662	0.2024	0.1004	0.0000
$\hat{\delta}_{2,2,4}$	-0.1050	-0.1560	-0.1809	-0.2410	-0.0343	0.0000
$\hat{\delta}_{2,2,5}$	-0.1392	-0.2195	-0.2665	0.0000	-0.0488	-0.0026
$\hat{\delta}_{2,2,6}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{2,2,7}$	0.0332	0.0569	0.0959	0.0000	0.0000	0.0000
$\hat{\delta}_{2,2,8}$	0.0846	0.1374	0.2041	0.0000	0.0211	0.0000
$\hat{\delta}_{2,3,4}$	0.1501	0.1806	0.1536	0.1971	0.0827	-0.0011
$\hat{\delta}_{2,3,5}$	0.0404	0.0584	0.0783	0.0000	0.0133	0.0000
$\hat{\delta}_{2,3,6}$	-0.4473	-0.6510	-0.8152	-0.7982	0.0000	0.0000
$\hat{\delta}_{2,3,7}$	0.0000	0.0000	0.0000	-0.0155	-0.1808	-0.0036
$\hat{\delta}_{2,3,8}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{2,4,5}$	0.1076	0.1300	0.1392	0.2381	0.0666	-0.0019
$\hat{\delta}_{2,4,6}$	0.0566	0.0838	0.1095	0.0000	0.0260	0.0000
$\hat{\delta}_{2,4,7}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{2,4,8}$	-0.4743	-0.6977	-0.8581	-0.8776	-0.1887	-0.0021
$\hat{\delta}_{2,5,6}$	0.1016	0.1130	0.0000	0.0000	0.0557	-0.0014
$\hat{\delta}_{2,5,7}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{2,5,8}$	-0.3349	-0.5619	-0.6353	-0.7068	-0.1335	0.0000
$\hat{\delta}_{2,6,7}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{2,6,8}$	-0.2754	-0.3930	-0.3280	-0.4854	-0.0878	0.0000
$\hat{\delta}_{2,7,8}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0071
$\hat{\delta}_{3,1,2}$	0.0481	0.0918	0.1644	0.1988	0.0000	0.0032
$\hat{\delta}_{3,1,3}$	0.0398	0.0577	0.0000	0.0000	0.0154	0.0000
$\hat{\delta}_{3,1,4}$	0.0401	0.0579	0.0808	0.1115	0.0216	0.0000
$\hat{\delta}_{3,1,5}$	0.0000	-0.0098	-0.0108	-0.0180	0.0000	0.0000
$\hat{\delta}_{3,1,6}$	0.0000	-0.0088	-0.0166	-0.0303	0.0000	0.0000
$\hat{\delta}_{3,1,7}$	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0035
$\hat{\delta}_{3,1,8}$	-0.4404	-0.6362	-0.8272	-1.1605	-0.1800	-0.0042
$\hat{\delta}_{3,2,3}$	-0.0499	-0.0523	0.0000	0.0000	-0.0382	0.0012
$\hat{\delta}_{3,2,4}$	0.0803	0.1197	0.1424	0.1784	0.0252	0.0000
$\hat{\delta}_{3,2,5}$	0.1046	0.1643	0.1999	0.0000	0.0378	0.0017
$\hat{\delta}_{3,2,6}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{3,2,7}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{3,2,8}$	-0.0987	-0.1600	-0.2401	0.0000	-0.0212	0.0000
$\hat{\delta}_{3,3,4}$	-0.0394	-0.0456	0.0000	0.0000	-0.0243	0.0024
$\hat{\delta}_{3,3,5}$	-0.0605	-0.0875	-0.1171	0.0000	-0.0205	0.0000
$\hat{\delta}_{3,3,6}$	0.3082	0.4505	0.5643	0.5051	0.0000	0.0000
$\hat{\delta}_{3,3,7}$	0.0000	0.0000	0.0000	0.0000	0.1215	0.0022
$\hat{\delta}_{3,3,8}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{3,4,5}$	0.0271	0.0439	0.0763	0.0000	0.0000	0.0032

Table 2: (Continued) Estimated coefficients for the response surfaces that approximates asymptotic critical values, the mean and the variance of the statistic. Time trend with level and slope shifts case.

	90%	95%	97.5%	99%	Mean	Var
$\hat{\delta}_{3,4,6}$	-0.0758	-0.1123	-0.1449	0.0000	-0.0360	0.0000
$\hat{\delta}_{3,4,7}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{3,4,8}$	0.3045	0.4491	0.5595	0.5618	0.1255	0.0012
$\hat{\delta}_{3,5,6}$	0.0558	0.0938	0.2057	0.2227	0.0161	0.0030
$\hat{\delta}_{3,5,7}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$\hat{\delta}_{3,5,8}$	0.1711	0.2941	0.3292	0.4025	0.0681	0.0000
$\hat{\delta}_{3,6,7}$	0.0856	0.1109	0.0000	0.0000	0.0409	0.0020
$\hat{\delta}_{3,6,8}$	0.1750	0.2587	0.3677	0.5253	0.0515	0.0000
$\hat{\delta}_{3,7,8}$	0.1905	0.2440	0.2149	0.3069	0.0867	0.0000
\bar{R}^2	0.99	0.99	0.99	0.99	0.99	0.99

Table 3: Individual and panel data stationarity tests with multiple structural breaks. QPPP hypothesis, pairwise analysis.

		$\hat{\eta}_{i,j}(\hat{\lambda}_{i,j})$	Critical values			$\hat{T}_{b,1}^{i,j}$	$\hat{T}_{b,2}^{i,j}$	$\hat{T}_{b,3}^{i,j}$	$\hat{T}_{b,4}^{i,j}$	$\hat{T}_{b,5}^{i,j}$	$\hat{T}_{b,6}^{i,j}$
			10%	5%							
ATL	BOS	0.019	0.062	0.073	1930	1944	1961	1990			
ATL	CHI	1.160	0.347	0.460							
ATL	CIN	0.032	0.086	0.105	1930	1949	1986				
ATL	CLE	0.069	0.131	0.166	1930	1979					
ATL	DET	0.052	0.082	0.101	1936	1949	1984				
ATL	HOU	0.016	0.102	0.129	1930	1973	1986				
ATL	KAN	0.024	0.057	0.066	1931	1946	1961	1985			
ATL	LA	2.129	0.354	0.474							
ATL	MIN	0.069	0.126	0.157	1930	1977					
ATL	NY	0.087	0.043	0.051	1927	1949	1961	1970	1980	1989	
ATL	PHI	0.070	0.186	0.241	1930	1943					
ATL	PIT	0.080	0.263	0.342	1930						
ATL	POR	0.050	0.152	0.199	1937	1992					
ATL	SF	0.033	0.062	0.074	1930	1959	1977	1991			
ATL	SEA	0.048	0.086	0.103	1930	1959	1992				
ATL	SL	0.103	0.102	0.129	1930	1943	1986				
BOS	CHI	0.051	0.094	0.118	1932	1947	1964				
BOS	CIN	0.021	0.061	0.072	1935	1948	1961	1989			
BOS	CLE	0.073	0.058	0.068	1938	1962	1979	1992			
BOS	DET	0.082	0.072	0.085	1941	1960	1988				
BOS	HOU	0.024	0.131	0.166	1938	1988					
BOS	KAN	0.060	0.115	0.142	1960	1988					
BOS	LA	0.072	0.255	0.338	1992						
BOS	MIN	0.021	0.143	0.185	1936	1989					
BOS	NY	0.027	0.128	0.162	1931	1979					
BOS	PHI	0.025	0.075	0.088	1945	1961	1988				
BOS	PIT	0.030	0.072	0.084	1944	1963	1988				
BOS	POR	0.057	0.118	0.147	1941	1986					
BOS	SF	0.070	0.106	0.129	1938	1978					
BOS	SEA	0.052	0.215	0.283	1938						
BOS	SL	0.022	0.071	0.084	1944	1963	1988				
CHI	CIN	0.105	0.055	0.063	1933	1954	1975	1989			
CHI	CLE	0.059	0.056	0.065	1933	1949	1968	1981			
CHI	DET	0.105	0.220	0.289	1985						
CHI	HOU	0.025	0.165	0.215	1975	1988					
CHI	KAN	0.094	0.073	0.086	1947	1964	1986				
CHI	LA	0.059	0.178	0.225	1975						
CHI	MIN	0.035	0.081	0.098	1932	1945	1974				
CHI	NY	0.025	0.093	0.117	1932	1948	1965				
CHI	PHI	0.030	0.059	0.068	1933	1948	1966	1979			
CHI	PIT	0.033	0.055	0.063	1933	1949	1964	1987			
CHI	POR	0.053	0.221	0.290	1936						
CHI	SF	0.033	0.075	0.088	1932	1962	1981				
CHI	SEA	0.052	0.100	0.126	1933	1976	1992				
CHI	SL	0.108	0.099	0.123	1933	1948	1990				
CIN	CLE	0.080	0.071	0.083	1938	1955	1981				

Table 3: (Continued) Individual and panel data stationarity tests with multiple structural breaks. QPPP hypothesis, pairwise analysis.

		$\hat{\eta}_{i,j}(\hat{\lambda}_{i,j})$	Critical values			$\hat{T}_{b,1}^{i,j}$	$\hat{T}_{b,2}^{i,j}$	$\hat{T}_{b,3}^{i,j}$	$\hat{T}_{b,4}^{i,j}$	$\hat{T}_{b,5}^{i,j}$	$\hat{T}_{b,6}^{i,j}$
			10%	5%							
CIN	DET	0.086	0.261	0.340	1930						
CIN	HOU	0.070	0.350	0.461							
CIN	KAN	0.099	0.062	0.075	1930	1946	1962	1976			
CIN	LA	0.148	0.347	0.460							
CIN	MIN	0.059	0.120	0.148	1960	1992					
CIN	NY	0.040	0.247	0.324	1990						
CIN	PHI	0.031	0.172	0.222	1930	1989					
CIN	PIT	0.077	0.044	0.049	1930	1945	1959	1976	1991		
CIN	POR	0.042	0.136	0.174	1942	1992					
CIN	SF	0.038	0.070	0.082	1939	1959	1986				
CIN	SEA	0.037	0.118	0.145	1957	1992					
CIN	SL	0.045	0.077	0.091	1930	1952	1983				
CLE	DET	0.058	0.137	0.176	1931	1982					
CLE	HOU	0.187	0.222	0.293	1985						
CLE	KAN	0.063	0.069	0.079	1938	1962	1982				
CLE	LA	0.132	0.240	0.316	1934						
CLE	MIN	0.032	0.112	0.141	1942	1962					
CLE	NY	0.053	0.221	0.292	1937						
CLE	PHI	0.041	0.072	0.084	1937	1963	1979				
CLE	PIT	0.067	0.070	0.081	1934	1959	1982				
CLE	POR	0.113	0.120	0.151	1963	1982					
CLE	SF	0.024	0.084	0.101	1931	1959	1992				
CLE	SEA	0.098	0.258	0.336	1992						
CLE	SL	0.077	0.119	0.152	1937	1983					
DET	HOU	0.060	0.105	0.133	1931	1975	1988				
DET	KAN	0.066	0.350	0.456							
DET	LA	0.184	0.221	0.290	1985						
DET	MIN	0.040	0.139	0.176	1931	1982					
DET	NY	0.084	0.165	0.215	1930	1988					
DET	PHI	0.094	0.163	0.212	1930	1987					
DET	PIT	0.054	0.145	0.185	1930	1983					
DET	POR	0.064	0.081	0.097	1932	1959	1991				
DET	SF	0.059	0.074	0.087	1931	1959	1984				
DET	SEA	0.073	0.080	0.097	1931	1959	1990				
DET	SL	0.031	0.183	0.238	1930	1992					
HOU	KAN	0.099	0.065	0.078	1947	1960	1974	1987			
HOU	LA	0.063	0.163	0.209	1974	1987					
HOU	MIN	0.081	0.044	0.050	1930	1945	1958	1973	1986		
HOU	NY	0.038	0.164	0.215	1975	1988					
HOU	PHI	0.021	0.162	0.214	1975	1988					
HOU	PIT	0.083	0.167	0.215	1975	1988					
HOU	POR	0.036	0.081	0.098	1942	1975	1992				
HOU	SF	0.100	0.061	0.072	1930	1958	1973	1986			
HOU	SEA	0.073	0.168	0.220	1932	1991					
HOU	SL	0.068	0.158	0.206	1974	1987					
KAN	LA	0.488	0.228	0.298	1986						

Table 3: (Continued) Individual and panel data stationarity tests with multiple structural breaks. QPPP hypothesis, pairwise analysis.

		$\hat{\eta}_{i,j}(\hat{\lambda}_{i,j})$	Critical values			$\hat{T}_{b,1}^{i,j}$	$\hat{T}_{b,2}^{i,j}$	$\hat{T}_{b,3}^{i,j}$	$\hat{T}_{b,4}^{i,j}$	$\hat{T}_{b,5}^{i,j}$	$\hat{T}_{b,6}^{i,j}$
			10%	5%							
KAN	MIN	0.067	0.118	0.150	1936	1982					
KAN	NY	0.391	0.242	0.322	1989						
KAN	PHI	0.176	0.116	0.141	1946	1989					
KAN	PIT	0.158	0.073	0.085	1946	1964	1982				
KAN	POR	0.026	0.135	0.171	1941	1991					
KAN	SF	0.047	0.061	0.072	1930	1943	1958	1986			
KAN	SEA	0.088	0.136	0.175	1939	1990					
KAN	SL	0.088	0.079	0.093	1947	1965	1992				
LA	MIN	0.084	0.086	0.105	1931	1957	1970				
LA	NY	0.039	0.083	0.101	1930	1951	1969				
LA	PHI	0.087	0.186	0.244	1979	1992					
LA	PIT	0.220	0.223	0.293	1986						
LA	POR	0.056	0.227	0.297	1936						
LA	SF	0.117	0.058	0.068	1932	1954	1968	1992			
LA	SEA	0.062	0.110	0.138	1932	1947	1992				
LA	SL	0.147	0.232	0.304	1987						
MIN	NY	0.071	0.044	0.050	1936	1950	1965	1978	1991		
MIN	PHI	0.059	0.079	0.093	1935	1965	1978				
MIN	PIT	0.050	0.082	0.098	1932	1945	1976				
MIN	POR	0.122	0.104	0.127	1942	1982					
MIN	SF	0.050	0.073	0.086	1942	1958	1986				
MIN	SEA	0.049	0.074	0.086	1942	1970	1990				
MIN	SL	0.042	0.089	0.111	1931	1969	1991				
NY	PHI	0.036	0.057	0.066	1931	1948	1966	1991			
NY	PIT	0.039	0.236	0.306	1988						
NY	POR	0.053	0.114	0.145	1942	1986					
NY	SF	0.077	0.073	0.086	1937	1952	1980				
NY	SEA	0.057	0.074	0.086	1941	1966	1979				
NY	SL	0.061	0.249	0.328	1990						
PHI	PIT	0.048	0.234	0.307	1988						
PHI	POR	0.069	0.211	0.273	1939						
PHI	SF	0.025	0.069	0.080	1938	1958	1980				
PHI	SEA	0.072	0.107	0.130	1938	1979					
PHI	SL	0.044	0.146	0.188	1937	1990					
PIT	POR	0.094	0.148	0.190	1938	1992					
PIT	SF	0.051	0.074	0.086	1932	1959	1986				
PIT	SEA	0.036	0.094	0.117	1937	1977	1992				
PIT	SL	0.075	0.119	0.155	1930	1943	1991				
POR	SF	0.025	0.075	0.087	1930	1958	1982				
POR	SEA	0.059	0.207	0.268	1982						
POR	SL	0.055	0.134	0.171	1942	1992					
SF	SEA	0.096	0.114	0.140	1931	1965					
SF	SL	0.094	0.073	0.086	1932	1960	1986				
SEA	SL	0.048	0.092	0.116	1938	1977	1992				

Table 4: Individual and panel data stationarity tests with multiple structural breaks. TQPPP hypothesis, pairwise analysis.

		$\hat{\eta}_{i,j}(\hat{\lambda}_{i,j})$	Critical values		$\hat{T}_{b,1}^{i,j}$	$\hat{T}_{b,2}^{i,j}$	$\hat{T}_{b,3}^{i,j}$	$\hat{T}_{b,4}^{i,j}$
			10%	5%				
ATL	BOS	0.049	0.020	0.022	1934	1951	1966	1982
ATL	CHI	0.032	0.088	0.109	1932			
ATL	CIN	0.026	0.045	0.053	1930	1977		
ATL	CLE	0.060	0.030	0.035	1930	1945	1979	
ATL	DET	0.026	0.035	0.042	1931	1944	1985	
ATL	HOU	0.026	0.031	0.036	1943	1978	1991	
ATL	KAN	0.041	0.027	0.031	1931	1957	1985	
ATL	LA	0.128	0.091	0.112	1930			
ATL	MIN	0.046	0.068	0.082	1943			
ATL	NY	0.017	0.027	0.030	1934	1951	1980	
ATL	PHI	0.047	0.027	0.030	1931	1954	1981	
ATL	PIT	0.041	0.053	0.064	1932	1986		
ATL	POR	0.017	0.034	0.040	1937	1977	1990	
ATL	SF	0.046	0.031	0.036	1932	1958	1992	
ATL	SEA	0.016	0.027	0.031	1945	1971	1985	
ATL	SL	0.052	0.054	0.065	1931	1986		
BOS	CHI	0.020	0.026	0.029	1932	1954	1979	
BOS	CIN	0.065	0.037	0.043	1956	1978		
BOS	CLE	0.034	0.039	0.046	1959	1980		
BOS	DET	0.031	0.025	0.028	1936	1958	1979	
BOS	HOU	0.027	0.021	0.023	1935	1950	1971	1984
BOS	KAN	0.043	0.026	0.030	1931	1956	1979	
BOS	LA	0.112	0.121	0.148				
BOS	MIN	0.049	0.027	0.030	1931	1956	1978	
BOS	NY	0.036	0.027	0.030	1944	1970	1991	
BOS	PHI	0.027	0.032	0.037	1930	1956	1992	
BOS	PIT	0.048	0.026	0.030	1932	1953	1978	
BOS	POR	0.015	0.023	0.026	1935	1950	1978	1992
BOS	SF	0.021	0.040	0.046	1959	1978		
BOS	SEA	0.039	0.021	0.023	1937	1955	1978	1992
BOS	SL	0.050	0.035	0.040	1951	1978		
CHI	CIN	0.021	0.041	0.047	1933	1975		
CHI	CLE	0.030	0.021	0.023	1933	1947	1968	1983
CHI	DET	0.035	0.021	0.023	1934	1947	1965	1982
CHI	HOU	0.017	0.041	0.047	1933	1975		
CHI	KAN	0.042	0.041	0.048	1931	1964		
CHI	LA	0.065	0.121	0.150				
CHI	MIN	0.026	0.029	0.033	1932	1956	1989	
CHI	NY	0.018	0.026	0.029	1932	1955	1979	
CHI	PHI	0.041	0.026	0.029	1933	1958	1979	
CHI	PIT	0.048	0.031	0.036	1932	1949	1986	
CHI	POR	0.017	0.024	0.027	1932	1947	1977	1990
CHI	SF	0.030	0.058	0.070	1932	1948		
CHI	SEA	0.042	0.033	0.038	1932	1947	1986	
CHI	SL	0.049	0.028	0.032	1933	1964	1988	
CIN	CLE	0.105	0.122	0.150				

Table 4: (Continued) Individual and panel data stationarity tests with multiple structural breaks. TQPPP hypothesis, pairwise analysis.

		$\hat{\eta}_{i,j}(\hat{\lambda}_{i,j})$	Critical values		$\hat{T}_{b,1}^{i,j}$	$\hat{T}_{b,2}^{i,j}$	$\hat{T}_{b,3}^{i,j}$	$\hat{T}_{b,4}^{i,j}$
			10%	5%				
CIN	DET	0.052	0.044	0.052	1936	1983		
CIN	HOU	0.029	0.056	0.067	1930	1986		
CIN	KAN	0.068	0.044	0.051	1931	1960		
CIN	LA	0.036	0.091	0.112	1930			
CIN	MIN	0.124	0.090	0.110	1931			
CIN	NY	0.030	0.035	0.041	1953	1978		
CIN	PHI	0.016	0.034	0.039	1948	1978		
CIN	PIT	0.031	0.045	0.052	1930	1976		
CIN	POR	0.013	0.043	0.051	1937	1983		
CIN	SF	0.035	0.039	0.046	1959	1979		
CIN	SEA	0.055	0.043	0.051	1937	1983		
CIN	SL	0.043	0.035	0.040	1949	1972		
CLE	DET	0.029	0.050	0.060	1931	1983		
CLE	HOU	0.017	0.041	0.049	1930	1976	1989	
CLE	KAN	0.023	0.021	0.023	1931	1944	1962	1982
CLE	LA	0.091	0.082	0.099	1934			
CLE	MIN	0.021	0.035	0.041	1930	1943	1983	
CLE	NY	0.025	0.021	0.024	1935	1959	1973	1986
CLE	PHI	0.020	0.030	0.035	1938	1974	1987	
CLE	PIT	0.052	0.041	0.048	1938	1982		
CLE	POR	0.014	0.052	0.061	1930	1983		
CLE	SF	0.034	0.039	0.045	1959	1983		
CLE	SEA	0.061	0.035	0.041	1930	1970	1983	
CLE	SL	0.055	0.042	0.049	1938	1983		
DET	HOU	0.032	0.029	0.033	1931	1947	1976	
DET	KAN	0.027	0.041	0.049	1931	1944	1959	
DET	LA	0.062	0.080	0.099	1935			
DET	MIN	0.029	0.030	0.035	1931	1947	1982	
DET	NY	0.036	0.023	0.026	1931	1958	1979	1992
DET	PHI	0.049	0.036	0.043	1937	1979	1992	
DET	PIT	0.029	0.078	0.095	1936			
DET	POR	0.051	0.090	0.111	1931			
DET	SF	0.040	0.026	0.030	1931	1958	1982	
DET	SEA	0.042	0.030	0.034	1931	1961	1975	
DET	SL	0.032	0.025	0.028	1936	1959	1982	
HOU	KAN	0.056	0.021	0.023	1931	1949	1970	1983
HOU	LA	0.056	0.028	0.032	1930	1960	1986	
HOU	MIN	0.034	0.035	0.040	1942	1976		
HOU	NY	0.018	0.021	0.023	1935	1950	1971	1984
HOU	PHI	0.017	0.021	0.023	1930	1950	1972	1985
HOU	PIT	0.018	0.041	0.048	1933	1976		
HOU	POR	0.012	0.038	0.044	1942	1982		
HOU	SF	0.014	0.034	0.039	1947	1975		
HOU	SEA	0.026	0.028	0.031	1947	1967	1980	
HOU	SL	0.043	0.029	0.033	1930	1958	1975	
KAN	LA	0.025	0.092	0.113	1930			

Table 4: (Continued) Individual and panel data stationarity tests with multiple structural breaks. TQPPP hypothesis, pairwise analysis.

		$\hat{\eta}_{i,j}(\hat{\lambda}_{i,j})$	Critical values		$\hat{T}_{b,1}^{i,j}$	$\hat{T}_{b,2}^{i,j}$	$\hat{T}_{b,3}^{i,j}$	$\hat{T}_{b,4}^{i,j}$
			10%	5%				
KAN	MIN	0.037	0.042	0.049	1930	1964		
KAN	NY	0.015	0.035	0.041	1930	1971	1986	
KAN	PHI	0.020	0.048	0.057	1930	1979		
KAN	PIT	0.045	0.041	0.048	1931	1964		
KAN	POR	0.039	0.022	0.025	1931	1945	1970	1983
KAN	SF	0.029	0.042	0.049	1930	1965		
KAN	SEA	0.036	0.022	0.025	1931	1945	1971	1984
KAN	SL	0.023	0.059	0.072	1931	1947		
LA	MIN	0.090	0.090	0.111	1930			
LA	NY	0.069	0.035	0.041	1930	1970	1983	
LA	PHI	0.047	0.121	0.148				
LA	PIT	0.100	0.120	0.148				
LA	POR	0.059	0.055	0.066	1930	1985		
LA	SF	0.037	0.091	0.111	1930			
LA	SEA	0.092	0.057	0.069	1930	1986		
LA	SL	0.115	0.081	0.099	1986			
MIN	NY	0.030	0.020	0.022	1935	1952	1972	1986
MIN	PHI	0.036	0.036	0.043	1931	1973	1987	
MIN	PIT	0.056	0.066	0.080	1930	1943		
MIN	POR	0.039	0.038	0.044	1942	1982		
MIN	SF	0.047	0.120	0.149				
MIN	SEA	0.030	0.045	0.055	1942	1990		
MIN	SL	0.019	0.041	0.047	1931	1966		
NY	PHI	0.047	0.027	0.031	1931	1951	1979	
NY	PIT	0.020	0.023	0.026	1932	1960	1973	1986
NY	POR	0.029	0.030	0.034	1936	1970	1983	
NY	SF	0.021	0.032	0.037	1933	1971	1987	
NY	SEA	0.027	0.029	0.033	1937	1971	1985	
NY	SL	0.050	0.035	0.040	1952	1979		
PHI	PIT	0.048	0.056	0.068	1973	1986		
PHI	POR	0.017	0.027	0.031	1931	1944	1978	1991
PHI	SF	0.068	0.121	0.149				
PHI	SEA	0.023	0.029	0.034	1937	1971	1985	
PHI	SL	0.031	0.053	0.063	1971	1987		
PIT	POR	0.015	0.022	0.024	1930	1946	1970	1983
PIT	SF	0.052	0.120	0.149				
PIT	SEA	0.046	0.033	0.038	1932	1970	1983	
PIT	SL	0.039	0.059	0.072	1933	1991		
POR	SF	0.031	0.036	0.043	1936	1978	1991	
POR	SEA	0.046	0.025	0.028	1935	1959	1981	
POR	SL	0.042	0.024	0.027	1930	1947	1977	1990
SF	SEA	0.058	0.092	0.113	1992			
SF	SL	0.042	0.068	0.082	1979			
SEA	SL	0.046	0.052	0.062	1937	1990		

Table 5: Individual and panel data stationarity tests with multiple structural breaks. Restricted QPPP hypothesis, pairwise analysis.

		Critical values								
		$\hat{\eta}_{i,j}(\hat{\lambda}_{i,j})$	10%	5%	$\hat{T}_{b,1}^{i,j}$	$\hat{T}_{b,2}^{i,j}$	$\hat{T}_{b,3}^{i,j}$	$\hat{T}_{b,4}^{i,j}$	$\hat{T}_{b,5}^{i,j}$	$\hat{T}_{b,6}^{i,j}$
ATL	BOS	0.269	0.342	0.47	1930	1945	1961	1980		
ATL	CHI									
ATL	CIN	0.256	0.356	0.478	1929	1950	1996			
ATL	CLE	0.498	0.485	0.66	1937	1996				
ATL	DET	0.096	0.526	0.725	1937	1947	1983			
ATL	HOU	0.372	0.275	0.362	1930	1976	1986			
ATL	KAN	0.068	0.361	0.481	1931	1946	1961	1985		
ATL	LA									
ATL	MIN	0.510	0.497	0.673	1931	1996				
ATL	NY	0.632	0.196	0.27	1930	1949	1961	1970	1980	1989
ATL	PHI	0.711	0.518	0.702	1926	1981				
ATL	PIT									
ATL	POR	0.335	0.485	0.661	1937	1996				
ATL	SF	0.659	0.224	0.298	1932	1959	1978	1996		
ATL	SEA	0.736	0.343	0.472	1937	1959	1996			
ATL	SL	1.287	0.423	0.576	1927	1943	1986			
BOS	CHI	0.154	0.401	0.54	1947	1963	1988			
BOS	CIN	0.107	0.24	0.326	1935	1962	1978	1988		
BOS	CLE	0.319	0.23	0.308	1938	1962	1979	1996		
BOS	DET	0.405	0.485	0.657	1928	1937	1985			
BOS	HOU	0.182	0.308	0.393	1977	1986				
BOS	KAN	0.623	0.575	0.774	1931	1987				
BOS	LA									
BOS	MIN	0.132	0.481	0.653	1937	1996				
BOS	NY	0.072	0.602	0.822	1931	1979				
BOS	PHI	0.140	0.421	0.579	1943	1961	1983			
BOS	PIT	0.199	0.396	0.533	1944	1963	1988			
BOS	POR	0.081	0.569	0.767	1942	1986				
BOS	SF	0.427	0.452	0.621	1943	1996				
BOS	SEA									
BOS	SL	0.169	0.369	0.504	1936	1963	1988			
CHI	CIN	0.057	0.263	0.355	1933	1949	1975	1989		
CHI	CLE	0.223	0.222	0.301	1934	1949	1981	1996		
CHI	DET									
CHI	HOU	0.091	0.32	0.413	1975	1986				
CHI	KAN	1.083	0.391	0.539	1948	1964	1982			
CHI	LA									
CHI	MIN	0.506	0.527	0.717	1933	1943	1968			
CHI	NY	0.271	0.443	0.599	1932	1948	1964			
CHI	PHI	0.166	0.26	0.351	1933	1948	1970	1979		
CHI	PIT	0.165	0.35	0.477	1933	1949	1964	1987		
CHI	POR									
CHI	SF	0.507	0.284	0.377	1926	1962	1996			
CHI	SEA	0.424	0.266	0.352	1939	1976	1996			
CHI	SL	0.632	0.445	0.615	1933	1948	1988			
CIN	CLE	2.032	0.441	0.605	1926	1938	1981			

Table 5: (Continued) Individual and panel data stationarity tests with multiple structural breaks. Restricted QPPP hypothesis, pairwise analysis.

		Critical values								
		$\hat{\eta}_{i,j}(\hat{\lambda}_{i,j})$	10%	5%	$\hat{T}_{b,1}^{i,j}$	$\hat{T}_{b,2}^{i,j}$	$\hat{T}_{b,3}^{i,j}$	$\hat{T}_{b,4}^{i,j}$	$\hat{T}_{b,5}^{i,j}$	$\hat{T}_{b,6}^{i,j}$
CIN	DET									
CIN	HOU									
CIN	KAN	0.977	0.281	0.383	1926	1946	1962	1973		
CIN	LA									
CIN	MIN	0.206	0.324	0.422	1969	1996				
CIN	NY									
CIN	PHI	0.028	0.535	0.729	1929	1990				
CIN	PIT	0.184	0.229	0.314	1930	1945	1959	1976	1994	
CIN	POR	0.098	0.511	0.694	1926	1941				
CIN	SF	0.368	0.294	0.393	1926	1959	1996			
CIN	SEA	0.476	0.364	0.489	1959	1996				
CIN	SL	0.409	0.352	0.483	1930	1959	1974			
CLE	DET	0.980	0.514	0.698	1926	1982				
CLE	HOU									
CLE	KAN	1.049	0.43	0.582	1926	1939	1981			
CLE	LA									
CLE	MIN	0.085	0.567	0.796	1942	1962				
CLE	NY									
CLE	PHI	0.264	0.262	0.349	1938	1980	1991			
CLE	PIT	0.250	0.251	0.332	1937	1982	1996			
CLE	POR	0.156	0.302	0.385	1983	1992				
CLE	SF	0.274	0.29	0.388	1926	1959	1996			
CLE	SEA									
CLE	SL	0.541	0.521	0.707	1926	1981				
DET	HOU	0.134	0.271	0.359	1931	1975	1996			
DET	KAN									
DET	LA									
DET	MIN	0.601	0.513	0.702	1926	1976				
DET	NY	0.583	0.586	0.812	1937	1986				
DET	PHI	0.785	0.579	0.788	1937	1987				
DET	PIT	0.649	0.587	0.802	1937	1958				
DET	POR	0.375	0.296	0.393	1926	1959	1996			
DET	SF	0.568	0.299	0.396	1926	1959	1996			
DET	SEA	0.572	0.291	0.393	1926	1959	1996			
DET	SL	0.315	0.501	0.678	1929	1938				
HOU	KAN	0.511	0.271	0.368	1947	1960	1975	1986		
HOU	LA	0.334	0.32	0.416	1975	1986				
HOU	MIN	0.288	0.182	0.239	1926	1943	1975	1985	1996	
HOU	NY	0.124	0.303	0.39	1978	1987				
HOU	PHI	0.137	0.304	0.392	1977	1986				
HOU	PIT	0.228	0.318	0.415	1975	1986				
HOU	POR	0.282	0.343	0.456	1960	1971	1989			
HOU	SF	0.505	0.184	0.242	1926	1958	1986	1996		
HOU	SEA	0.477	0.508	0.703	1926	1989				
HOU	SL	0.145	0.32	0.414	1975	1986				
KAN	LA									

Table 5: (Continued) Individual and panel data stationarity tests with multiple structural breaks. Restricted QPPP hypothesis, pairwise analysis.

		$\hat{\eta}_{i,j}(\hat{\lambda}_{i,j})$	Critical values			$\hat{T}_{b,1}^{i,j}$	$\hat{T}_{b,2}^{i,j}$	$\hat{T}_{b,3}^{i,j}$	$\hat{T}_{b,4}^{i,j}$	$\hat{T}_{b,5}^{i,j}$	$\hat{T}_{b,6}^{i,j}$
			10%	5%							
KAN	MIN	0.716	0.522	0.717	1926	1947					
KAN	NY										
KAN	PHI	0.411	0.431	0.584	1946	1996					
KAN	PIT	1.176	0.435	0.595	1926	1935	1946				
KAN	POR	0.310	0.453	0.629	1942	1996					
KAN	SF	0.634	0.282	0.378	1926	1941	1958	1996			
KAN	SEA	0.940	0.456	0.623	1942	1996					
KAN	SL	0.112	0.359	0.482	1926	1947	1995				
LA	MIN	0.395	0.312	0.423	1932	1970	1989				
LA	NY	0.102	0.282	0.366	1970	1979	1990				
LA	PHI	0.123	0.52	0.712	1926	1979					
LA	PIT										
LA	POR										
LA	SF	0.794	0.285	0.385	1943	1957	1969	1996			
LA	SEA	0.508	0.453	0.62	1926	1935	1986				
LA	SL										
MIN	NY	0.196	0.211	0.283	1926	1936	1969	1978	1987		
MIN	PHI	0.259	0.264	0.35	1937	1979	1989				
MIN	PIT	0.329	0.535	0.72	1934	1943	1970				
MIN	POR	0.212	0.594	0.815	1942	1982					
MIN	SF	0.412	0.293	0.397	1926	1958	1996				
MIN	SEA	0.340	0.331	0.453	1942	1970	1990				
MIN	SL	0.331	0.266	0.347	1926	1981	1996				
NY	PHI	0.340	0.264	0.351	1931	1948	1969	1978			
NY	PIT										
NY	POR	0.089	0.492	0.67	1926	1937					
NY	SF	0.388	0.322	0.428	1926	1952	1996				
NY	SEA	0.405	0.299	0.398	1952	1969	1978				
NY	SL										
PHI	PIT										
PHI	POR										
PHI	SF	0.557	0.293	0.392	1926	1958	1996				
PHI	SEA	0.507	0.521	0.713	1926	1978					
PHI	SL	0.226	0.3	0.38	1979	1988					
PIT	POR	0.387	0.502	0.677	1926	1937					
PIT	SF	0.513	0.289	0.39	1926	1959	1996				
PIT	SEA	0.403	0.261	0.351	1939	1978	1996				
PIT	SL	0.713	0.448	0.61	1930	1943	1991				
POR	SF	0.957	0.331	0.448	1926	1958	1982				
POR	SEA										
POR	SL	0.389	0.306	0.398	1974	1996					
SF	SEA	1.156	0.514	0.715	1926	1958					
SF	SL	0.799	0.34	0.457	1926	1957	1981				
SEA	SL	0.717	0.276	0.362	1926	1977	1990				

Table 6: Individual and panel data stationarity tests with multiple structural breaks. Restricted TQPPP hypothesis, pairwise analysis.

		Critical values						
		$\hat{\eta}_{i,j}(\hat{\lambda}_{i,j})$	10%	5%	$\hat{T}_{b,1}^{i,j}$	$\hat{T}_{b,2}^{i,j}$	$\hat{T}_{b,3}^{i,j}$	$\hat{T}_{b,4}^{i,j}$
ATL	BOS	0.064	0.085	0.110	1929	1951	1967	1989
ATL	CHI							
ATL	CIN	0.076	0.167	0.220	1927	1986		
ATL	CLE	0.176	0.118	0.156	1926	1945	1979	
ATL	DET	0.055	0.141	0.186	1926	1936	1984	
ATL	HOU	0.026	0.071	0.087	1930	1976	1986	
ATL	KAN	0.049	0.110	0.144	1931	1957	1985	
ATL	LA							
ATL	MIN							
ATL	NY	0.114	0.104	0.139	1927	1951	1978	
ATL	PHI	0.116	0.105	0.138	1926	1950	1980	
ATL	PIT	0.080	0.163	0.211	1926	1985		
ATL	POR	0.027	0.072	0.090	1937	1978	1990	
ATL	SF	0.101	0.122	0.160	1931	1958	1996	
ATL	SEA	0.046	0.071	0.089	1930	1971	1983	
ATL	SL	0.083	0.165	0.217	1926	1986		
BOS	CHI	0.181	0.099	0.128	1933	1954	1978	
BOS	CIN	0.040	0.138	0.177	1944	1977		
BOS	CLE	0.126	0.143	0.183	1943	1978		
BOS	DET	0.046	0.111	0.149	1931	1958	1987	
BOS	HOU	0.044	0.055	0.070	1926	1950	1975	1986
BOS	KAN	0.033	0.110	0.146	1926	1956	1988	
BOS	LA							
BOS	MIN	0.033	0.090	0.117	1926	1956	1978	
BOS	NY	0.107	0.092	0.119	1943	1970	1979	
BOS	PHI	0.056	0.124	0.165	1933	1956	1996	
BOS	PIT	0.102	0.100	0.132	1932	1953	1978	
BOS	POR	0.029	0.059	0.075	1926	1951	1978	1991
BOS	SF	0.047	0.142	0.184	1943	1978		
BOS	SEA	0.069	0.064	0.083	1938	1955	1978	1991
BOS	SL	0.042	0.176	0.237	1939	1988		
CHI	CIN	0.049	0.112	0.140	1933	1955		
CHI	CLE	0.066	0.089	0.117	1933	1947	1968	1991
CHI	DET	0.083	0.072	0.094	1928	1947	1965	1982
CHI	HOU	0.045	0.114	0.143	1975	1986		
CHI	KAN	0.135	0.124	0.161	1933	1962		
CHI	LA							
CHI	MIN	0.065	0.115	0.155	1933	1956	1987	
CHI	NY	0.039	0.095	0.125	1932	1955	1978	
CHI	PHI	0.087	0.090	0.116	1933	1958	1979	
CHI	PIT	0.067	0.121	0.160	1926	1949	1986	
CHI	POR	0.070	0.059	0.075	1926	1947	1977	1990
CHI	SF	0.063	0.106	0.131	1932	1948		
CHI	SEA	0.139	0.101	0.130	1933	1947	1970	
CHI	SL	0.072	0.102	0.134	1933	1964	1990	
CIN	CLE							

Table 6: (Continued) Individual and panel data stationarity tests with multiple structural breaks. Restricted TQPPP hypothesis, pairwise analysis.

		$\hat{\eta}_{i,j}(\hat{\lambda}_{i,j})$	Critical values		$\hat{T}_{b,1}^{i,j}$	$\hat{T}_{b,2}^{i,j}$	$\hat{T}_{b,3}^{i,j}$	$\hat{T}_{b,4}^{i,j}$
			10%	5%				
CIN	DET	0.073	0.104	0.125	1926	1936		
CIN	HOU	0.033	0.165	0.217	1926	1986		
CIN	KAN	0.080	0.135	0.174	1926	1962		
CIN	LA							
CIN	MIN							
CIN	NY	0.067	0.125	0.161	1951	1977		
CIN	PHI	0.069	0.161	0.214	1935	1978		
CIN	PIT	0.057	0.128	0.167	1930	1960		
CIN	POR	0.035	0.160	0.210	1926	1982		
CIN	SF	0.118	0.116	0.149	1961	1986		
CIN	SEA	0.078	0.175	0.226	1926	1996		
CIN	SL	0.116	0.127	0.167	1928	1958		
CLE	DET	0.051	0.171	0.225	1931	1982		
CLE	HOU	0.049	0.070	0.084	1926	1976	1986	
CLE	KAN	0.109	0.081	0.106	1931	1943	1962	1981
CLE	LA							
CLE	MIN	0.049	0.137	0.182	1931	1943	1980	
CLE	NY	0.061	0.069	0.090	1937	1956	1977	1986
CLE	PHI	0.045	0.076	0.097	1938	1974	1987	
CLE	PIT	0.076	0.161	0.214	1937	1980		
CLE	POR	0.092	0.158	0.206	1926	1982		
CLE	SF	0.105	0.124	0.160	1960	1979		
CLE	SEA	0.066	0.069	0.085	1926	1970	1982	
CLE	SL	0.055	0.168	0.218	1938	1983		
DET	HOU	0.080	0.110	0.145	1931	1947	1975	
DET	KAN	0.043	0.098	0.124	1931	1940	1959	
DET	LA							
DET	MIN	0.047	0.130	0.172	1931	1947	1982	
DET	NY	0.038	0.062	0.079	1931	1958	1979	1993
DET	PHI	0.110	0.075	0.093	1941	1979	1994	
DET	PIT							
DET	POR							
DET	SF	0.039	0.096	0.126	1931	1958	1982	
DET	SEA	0.123	0.075	0.095	1931	1959	1968	
DET	SL	0.044	0.074	0.093	1930	1959	1972	
HOU	KAN	0.070	0.082	0.107	1931	1949	1965	1985
HOU	LA	0.079	0.100	0.130	1926	1959	1986	
HOU	MIN	0.053	0.181	0.241	1931	1986		
HOU	NY	0.048	0.065	0.085	1926	1950	1971	1986
HOU	PHI	0.036	0.053	0.067	1926	1950	1976	1986
HOU	PIT	0.103	0.134	0.172	1950	1967		
HOU	POR	0.043	0.112	0.140	1970	1991		
HOU	SF	0.119	0.114	0.144	1974	1986		
HOU	SEA	0.081	0.086	0.110	1947	1971	1990	
HOU	SL	0.104	0.075	0.096	1926	1958	1974	
KAN	LA							

Table 6: (Continued) Individual and panel data stationarity tests with multiple structural breaks. Restricted TQPPP hypothesis, pairwise analysis.

		$\hat{\eta}_{i,j}(\hat{\lambda}_{i,j})$	Critical values		$\hat{T}_{b,1}^{i,j}$	$\hat{T}_{b,2}^{i,j}$	$\hat{T}_{b,3}^{i,j}$	$\hat{T}_{b,4}^{i,j}$
			10%	5%				
KAN	MIN	0.105	0.140	0.183	1926	1964		
KAN	NY	0.064	0.065	0.077	1926	1970	1979	
KAN	PHI	0.060	0.156	0.204	1926	1979		
KAN	PIT	0.117	0.129	0.168	1933	1964		
KAN	POR	0.051	0.067	0.087	1931	1942	1970	1983
KAN	SF	0.048	0.138	0.181	1926	1965		
KAN	SEA	0.046	0.070	0.090	1933	1942	1971	1983
KAN	SL	0.084	0.147	0.195	1926	1972		
LA	MIN							
LA	NY	0.106	0.068	0.084	1929	1970	1979	
LA	PHI							
LA	PIT							
LA	POR	0.090	0.123	0.158	1926	1952		
LA	SF							
LA	SEA	0.123	0.143	0.187	1933	1970		
LA	SL							
MIN	NY	0.089	0.067	0.088	1937	1952	1978	1987
MIN	PHI	0.077	0.071	0.086	1937	1982	1992	
MIN	PIT	0.063	0.109	0.134	1932	1943		
MIN	POR	0.113	0.154	0.203	1942	1982		
MIN	SF							
MIN	SEA	0.073	0.168	0.222	1942	1990		
MIN	SL	0.039	0.173	0.227	1932	1982		
NY	PHI	0.111	0.101	0.134	1929	1951	1977	
NY	PIT	0.041	0.061	0.079	1932	1960	1977	1986
NY	POR	0.044	0.084	0.108	1942	1971	1983	
NY	SF	0.026	0.080	0.099	1926	1971	1987	
NY	SEA	0.056	0.082	0.106	1941	1971	1984	
NY	SL	0.086	0.126	0.163	1952	1977		
PHI	PIT	0.059	0.113	0.141	1973	1986		
PHI	POR	0.051	0.062	0.079	1926	1942	1978	1991
PHI	SF							
PHI	SEA	0.064	0.078	0.099	1938	1971	1985	
PHI	SL	0.073	0.117	0.145	1978	1987		
PIT	POR	0.062	0.056	0.071	1926	1946	1971	1982
PIT	SF							
PIT	SEA	0.101	0.079	0.101	1938	1971	1983	
PIT	SL	0.037	0.191	0.254	1933	1991		
POR	SF	0.102	0.074	0.093	1942	1978	1990	
POR	SEA	0.066	0.093	0.121	1928	1959	1982	
POR	SL	0.060	0.062	0.079	1926	1947	1977	1991
SF	SEA							
SF	SL							
SEA	SL	0.060	0.156	0.205	1947	1991		