Cross Correlations: This appendix contains the more detailed discussion of the Cross Correlations for Section 5.3 in the manuscript.

5.3 Correlation between countires

Correlation between countries in the model arises from three sources: (i) f_t, the global factor, affects all countries, (ii) groups of countries load on the same g-group factor in equation (2) in the text, and (iii) countries might load on different g-factors, but these factors might load on the same h- group-of-group factor in equation (3). We summarize the resulting pairwise correlations by computing the posterior average population correlations between 50-year changes in $y_{i,t}$ and in c_t (the latter excluding covariability arising from f_t), where again the 50-year horizon is motivated by our interest in long-run covariability.

The average pairwise correlation between 50-year changes in log-per-capita-GDP is 0.59, the largest pairwise correlation is between France and the Netherlands (0.97) and the smallest is between Liberia and Bosnia and Herzegovina (0.29). The average pairwise correlation between the country-specific terms $c_{i,t}$ is, of course, much smaller (0.08); the largest of these is between France and the Netherlands (0.90), and this correlation is less than 0.01 for 38% of the countries.

While the sparse factor structure sets the correlation of 50-year changes in $c_{i,t}$ to zero for many of the country pairs, there are large pairwise correlations between some countries. It turns out that these pairwise correlations between the long-run idiosyncratic growth components defines natural groups, which we refer to as correlation groups. These correlation groups can be represented as non-directed networks, where the network edges are defined by the strength of the pairwise correlation.

The figures below plots the network formed by setting edges (unit values in the undirected adjacency matrix) to be 1 if the posterior mean of the correlation between $c_{i,t}$ and $c_{j,t}$ for countries i and j exceeds 0.25 and = 0 otherwise. The resulting network is fairly sparse with only 11% of the pairwise correlations exceeding 0.25. With this threshold, the network reduces to six separate correlation groups involving three or more countries, displayed separately in panels (a)-(f). Panel (e) shows four additional two-country groups.

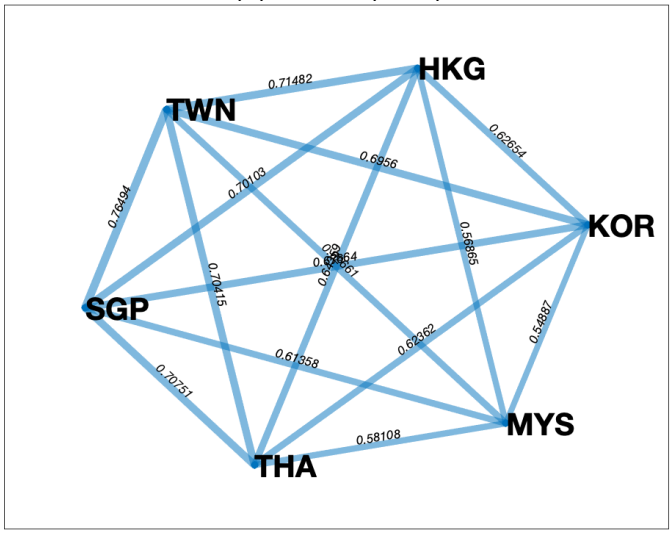
It turns out that these groups have natural interpretations that relate to their growth history over the 20th century. The first two groups ((a) and (b)) are Asian countries, where the first group grew rapidly during the 1960-1990 and the second group experienced more recent rapid growth. (Somewhat anomalously, Panama is also included in this latter Asian group.)

Group (c) is composed of former Soviet-bloc countries, group (d) are countries with Anglo-Saxon origins, group (e) includes 10 European countries, and group (f) contains 45 low- and middle-income countries, primarily in Africa and Latin America. Panel (g) shows four 2-country groupings, where Austria-Germany and Portugal-Spain have obvious geographic and cultural linkages, and Syria-Yemen suffered coincident civil wars. There are 24 countries that are isolates, not connected to any of these groups.[1]

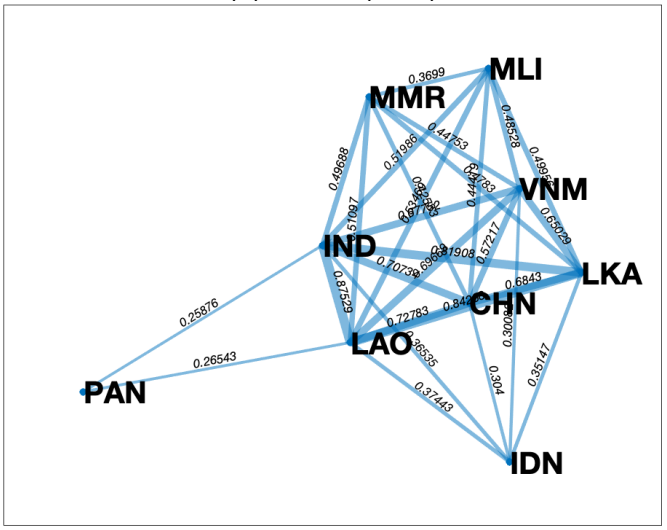
[1] There is little relationship between the pairwise correlations of $c_{i,t}$ and distance between countries. The simple correlation between the posterior mean of the $c_{i,t}$ - pairwise correlations and distance is -0.2; restricting the sample to countries with pairwise correlations greater than 0.25 leaves this unchanged.

Figure: Correlation group networks computed from pairwise correlations of $c_{i,t}$ (average pairwise correlation in parentheses)

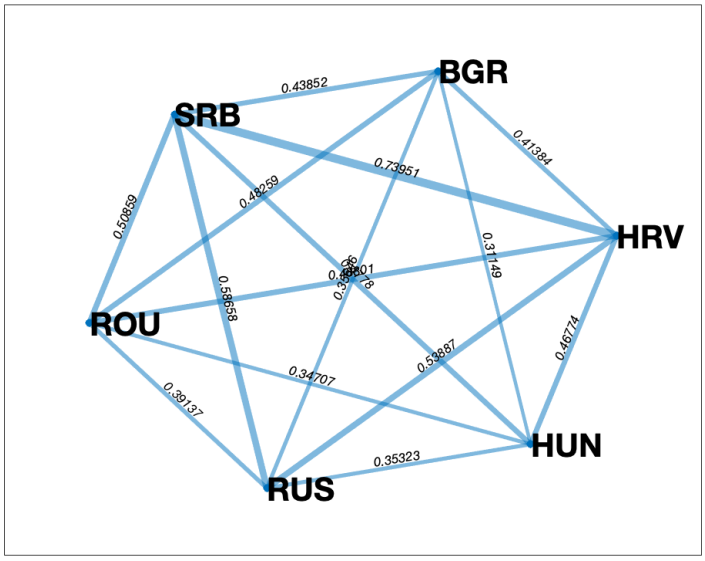
(a) Asia-1 (0.65)



(b) Asia-2 (0.51)



(c) Former Soviet-Bloc (0.66)



(d) Anglo-Saxon (0.45)

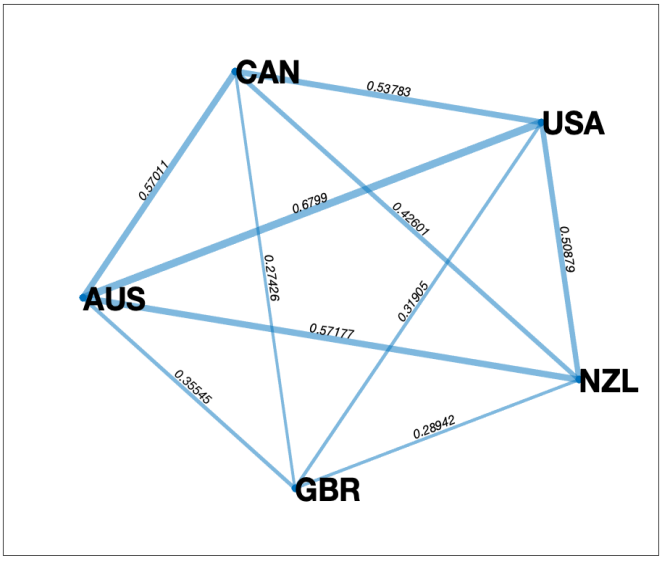
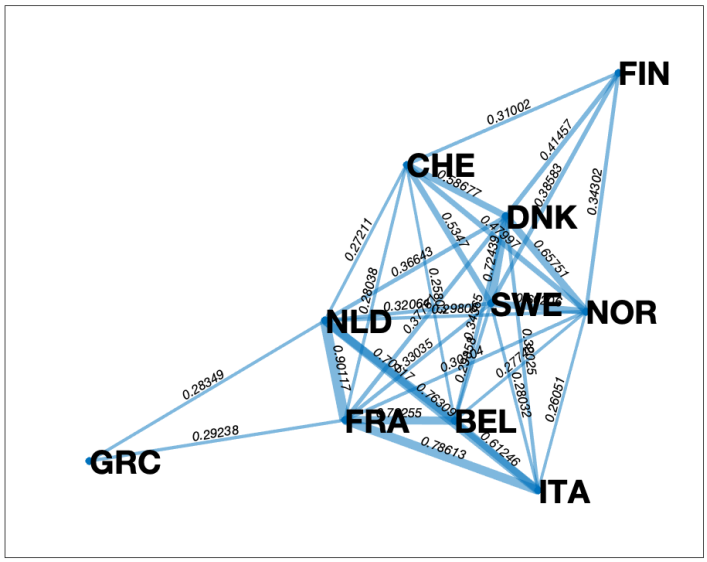
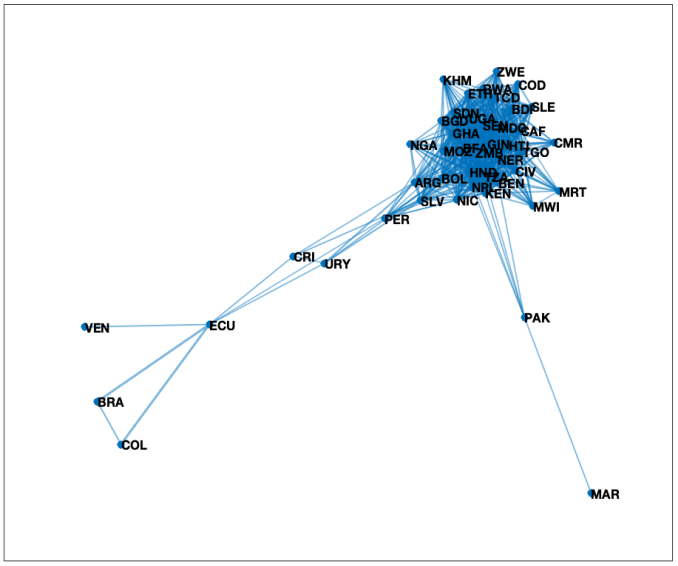


Figure (Continued)

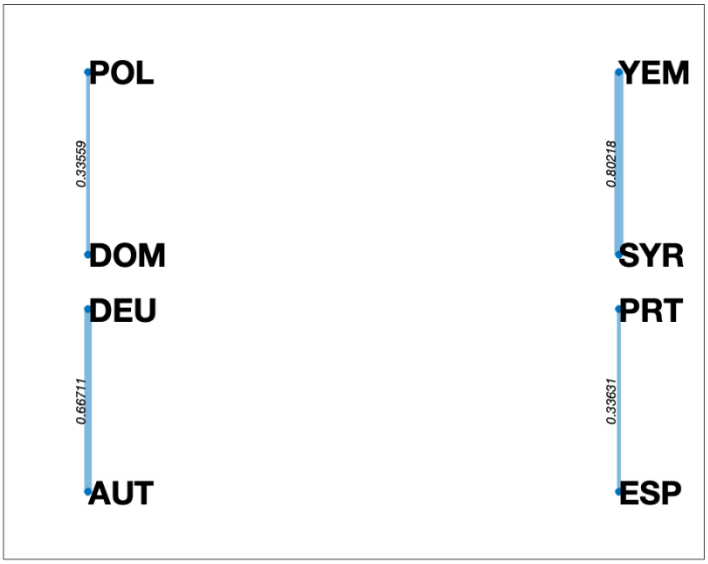
(e) Europe (0.45)



(f) Other low- and middle-income (0.35)



(g) Pairs



Notes: Pairwise correlations are shown on edges, except in panel (f).