

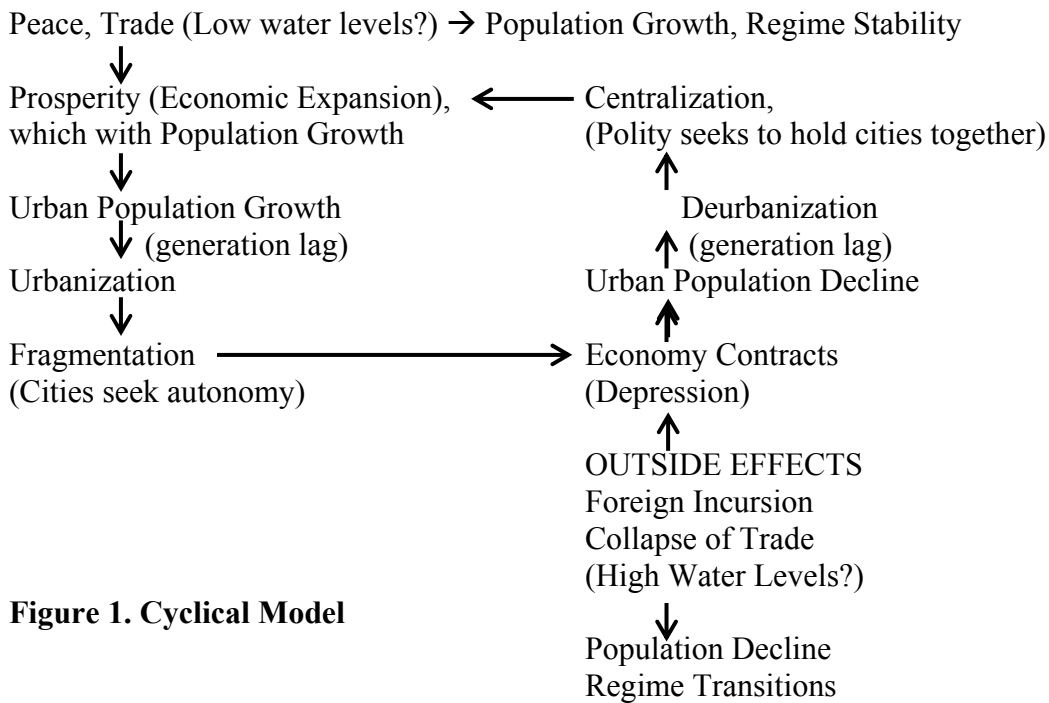
Comment on Thompson's

“Complexity, Diminishing Marginal Returns and Serial Mesopotamian Fragmentation.”

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Figure 5 and Table 3 for bivariate correlations show a cycle having an odd number of negative correlations among prosperity/depression, urbanization/deurbanization, and fragmentation/centralization. An interpretable dynamical model of negative feedback among these variables, shown below, has arrows flowing in one direction, and a complete cycle would constitute an oscillation. Correlations with urban population growth/decline are consistent with effects on urbanization measured by urban population. Causal arrows cycling in the opposite direction would make no sense.

OUTSIDE EFFECTS



**Figure 1. Cyclical Model**

The correlational evidence along directions diagrammed makes sense in each case. The unusual feature of this dynamic is the role or response of cities and polities to the situations diagrammed. Bob Adams, in discussion of this point, stressed the importance of politics – rules and cities – in affecting urban population. Rulers could round up people

and bring them to the city. In times of prosperity and urban growth, cities might form alliances to break up a central polity or might try to break away to capture revenues for themselves rather than for a central polity. A monarch in Ur first example, might appoint governors of other cities who in times of prosperity might foster revolt.

Thus, the process of fragmentation would not be regulated by a natural process of reaching carrying capacity, or even warfare.

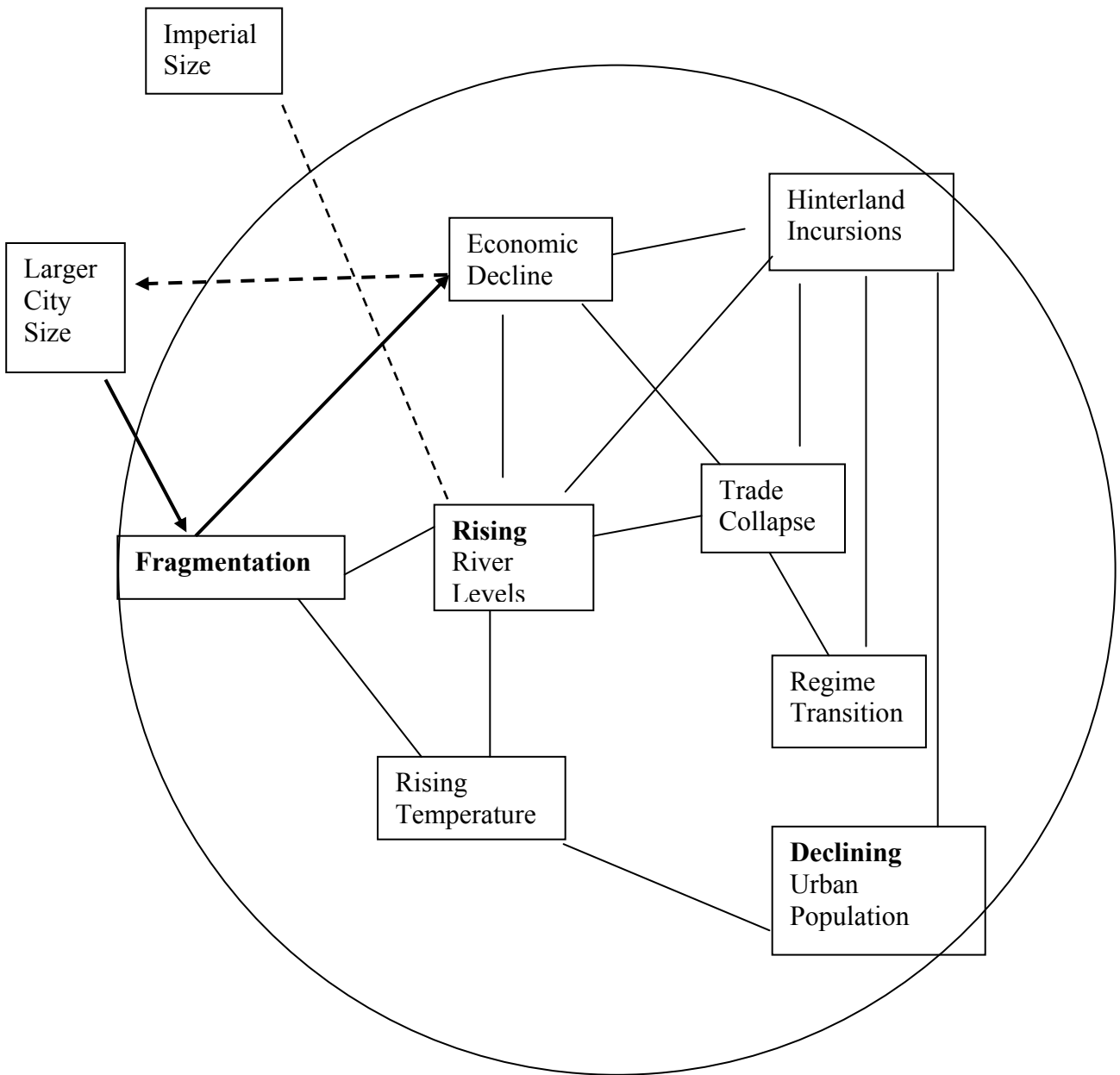
Fragmentation might be followed by contraction of the economy not only as an endogenous process but because of exogenous factors (outside effects as diagramed) or because fragmentation might lead to collapse of trade or greater vulnerability to incursion, depending on relation to neighboring cities or states.

Once the economy contracts, urban population decline might follow from foreign incursion or from people migrating to rural areas or marshes.

Drop in city size, might be a stimulus for a ruler to conquer other cities or territory and bring populations forcibly to the city, bring in new resources from conquered territory, or bring more cities into a trading network.

Overall, the pattern of correlations does not seem to support a Malthusian natural history model of resources governing population, or the determinacy of infrastructure. Rather it seems to have a place for ruler strategies and city responses to ruler strategies. Figure 2 reverses the labels and correlations of Thompson's Figure 5 and redraws the figure to highlight the feedback loop versus the large cluster of consistently correlated variables.

With the time series on the eleven variables, this would be an excellent opportunity to have Turchin and others try out alternative models of time lags among these variables.



**Figure 2. Cyclical Model in Relation to Large Cluster of Consistent Correlations**

Positive correlations shown as solid lines; negative as dotted lines. Possibility of a circular negative feedback cycle is shown as a cycle of thicker lines, two positive and one negative. The reversal of three of the variables is indicated in bold.