**Appendix**

In order to model the cointegrated relationship between population health (measured by life expectancy at birth) and economic development (measured by real GDP per capita) with a deterministic trend, we define these two variables based on Hatemi-J (2014), Hatemi-J and El-Khatib (2016), and Hatemi-J (2014) as follows:

[A1] 

where  and  represent life expectancy at birth and GDP per capita, respectively. Subscript *i*=1,2,3,…,*N* denotes the individual country, and *N* represents the total number of countries included in our study.  and  are the drifts, and *t*=1,2,3,…,*T* is the deterministic trend component.  and  are coefficients corresponding to the deterministic trend components for  and .  (for *h*=1,2) is white noise residual, and (for *h*=1,2) is the cumulative sum of the residuals. In order to model the asymmetric cointegrated relationship between  and , the positive and negative shocks for these two panel variables are defined as follows:

[A2] 

It follows that the positive and negative components could be defined as follows:

[A3] 

where =+ and =+.  and  (for *h*=1,2) are positive and negative cumulative sum of shocks, respectively.