

# The interconnected wealth of nations: Shock propagation on global trade-investment multiplex networks

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Database [32] (analyzed for the first time as a complex network in [7]), as detailed in the Methods section. A directed link from country  $i$  to country  $j$  in layer  $T$  represents the exports of goods from  $i$  to  $j$  in a given year,  $X_{ij}$ .

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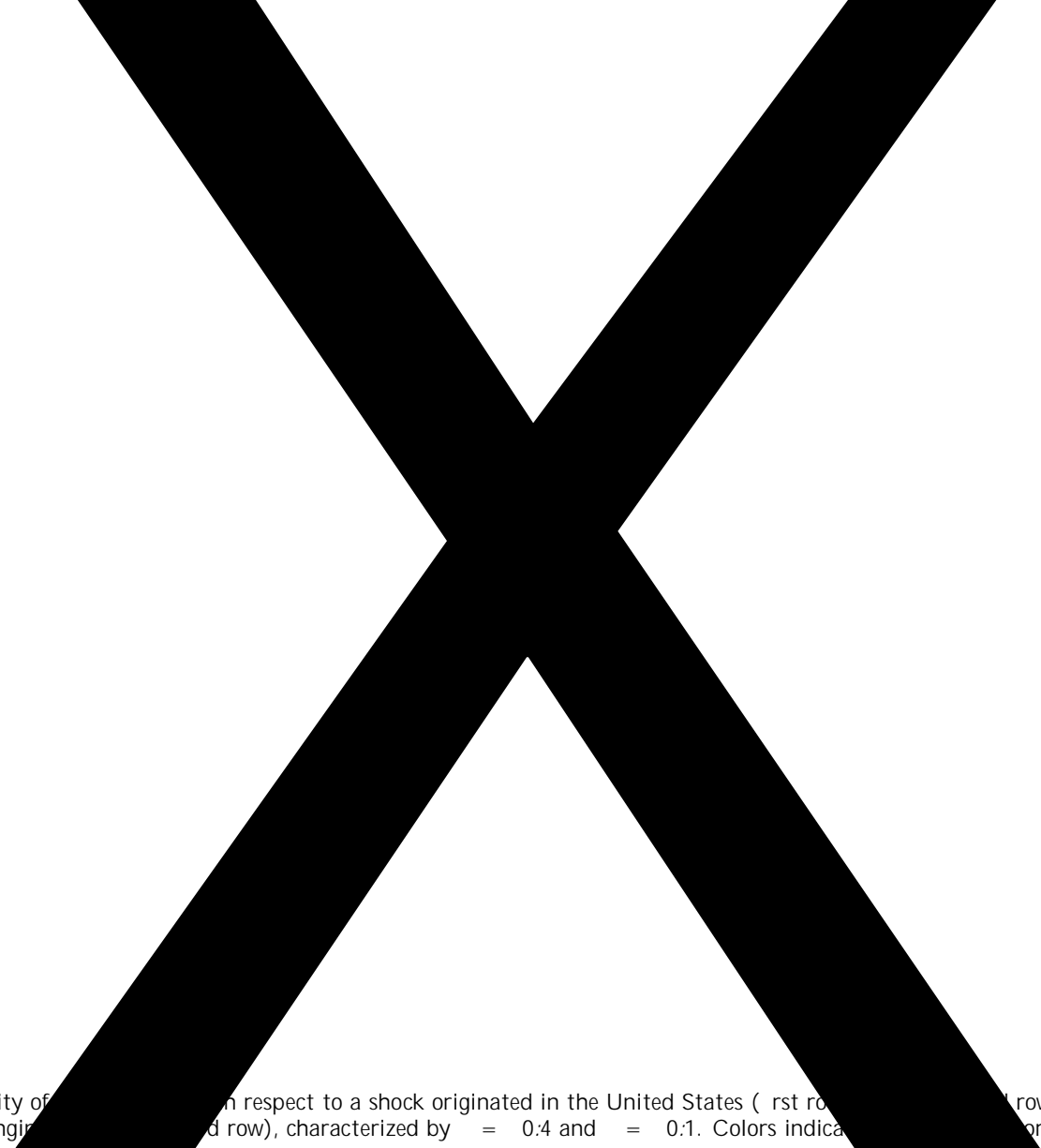


FIG. 1. Vulnerability of  $X_i$  in respect to a shock originated in the United States (first row), or in countries belonging to  $\mathcal{C}_i$  (second row), characterized by  $\alpha = 0.4$  and  $\beta = 0.1$ . Colors indicate the VaR,  $VaR[X_i]$ .

lution (once the shock has been totally absorbed by the

and investment  $S_i^I$ , as a function of the value of the initial shock  $I_i$ , characterized by  $\dot{I}_i = 0$ :



ingly, this systemic impact can be predicted on the basis

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- [1] F. Allen and D. Gale, *Understanding Financial Crises*  
(Oxford University Press, 2009).
- [2] P. Lane and G. M. Milesi-Ferretti, *THE EXTERNAL*



## SUPPLEMENTARY INFORMATION

### I. EMPIRICAL DATA SETS DESCRIPTION

In this section, we describe the empirical data sets used in the paper. Our work relies on the following data sources.

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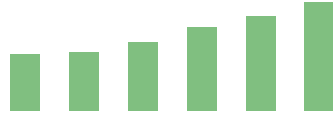


FIG. 6. Global value of trade and invest

TABLE I. Some topological properties of GTI multiplex: number of nodes  $N$ , number of directed  $E$

The SIR dynamics can be summarized as follows. The following two steps are repeated in loop until no more infected node are present:

**Step 1**, each node  $i$  in an infected state at time  $t$ ,  $s_i(t) = I$  (with  $M_i(t) \neq 0$  or  $A_i(t) \neq 0$ ) propagates the distress to all its neighbors (regardless of their status) and it becomes inactive immediately after,  $s_i(t+1) = R$ .

**Step 2**, each node  $i$  in a susceptible state at time  $t$ ,  $s_i(t) = S$ , with  $X_i(t) \neq 0$  or  $L_i(t) \neq 0$  (thus each node



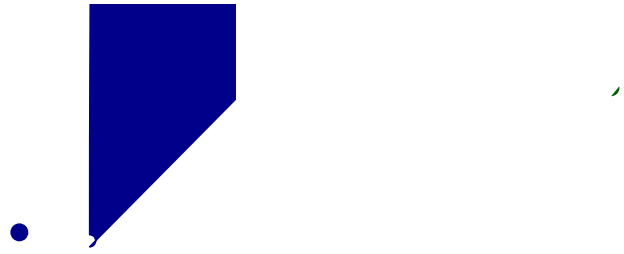


FIG. 9. Scatter plots of intra-layer (x-axis) versus inter-layer (y-axis) coefficients. Pass-through coefficients to trade ( $c_{MX}$  on the x-axis and  $c_{ML}$  on the y-axis), and to investment ( $c_{AL}$  on the x-axis and  $c_{AX}$  on the y-axis), for the  $G_{20}$  group. The size of the countries is proportional to their GDP.

#### IV. ESTIMATION OF THE PASS-THROUGH COEFFICIENTS OF SHOCK PROPAGATION MODEL

In this section, we describe how we estimate pass-through coefficients of the shock propagation model, and we briefly discuss them. For each country, the trend terms, pass-through coefficients, and noise terms in Eq. (2) of the main text are estimated by calculating variances and co-variances of the four time series  $\{dX_t, dM_t, dA_t, dL_t\}$ . We consider yearly data from 1980 to 2015, by excluding recession periods (i.e. years 1982, 1991, 2008), as reported by the IMF, see Section I. The variance of the noise terms, <sup>29</sup>











FIG. 14. Systemic impact on global trade

FIG. 14. ~~Systemic~~

