Appendix for

“An Unexpected Link between Export Sanctions and Cyberespionage”

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**A. Data and Descriptive Statistics**

**Table A.1. Description of Variables and Data Sources**

|  |  |  |
| --- | --- | --- |
| **Variables** | **Description** | **Data Sources** |
| Cyber Espionage | Number of cyber espionage  (State B -> State A) | DCID |
| Cyber Espionage (Alternative DV) | Number of data theft  (State B -> State A) | Global Dataset of Cyber Incidents |
| Export Sanctions | State A -> State B | GSDB |
| Cyber Capacity | State B's  government cyber security capacity | V-Dem |
| Economic Complexity Difference | | ECI(A) – ECI(B) | | Atlas of Economic Complexity |
| Internet Usage | Individuals using the Internet  (% of population)  log(State A + State B + 1e-8) | ITU |
| Strategic Rivalries | Strategic Rivalries | Thompson et al.(2021) |
| Armed Conflict | At least 25 battle-related deaths in a calendar year | UCDP |
| Democracy | Electoral Democracy(A) \* Electoral Democracy(B) | V-Dem |
| UN Voting | UNGA voting similarity | UNGA Voting |
| Trade Dependence | log((Trade/GDP(B)) + 1e-8) - log((Trade/GDP(A)) + 1e-8)) | IMTS(Trade), UN(GDP) |
| Politically Relevant Dyads | Pairs of contiguous states or pairs of states including at least one major power | Lemke and Reed(2001) |

**Table A.2. Descriptive Statistics – Full Dyads**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Statistic** | **N** | **Mean** | **St. Dev.** | **Min** | **Max** |
| Cyer Espionage | 747,716 | 0.001 | 0.058 | 0 | 17 |
| Export Sanctions | 747,716 | 0.019 | 0.137 | 0 | 1 |
| Prior Espionage | 747,716 | 0.001 | 0.056 | 0 | 17 |
| Prior Sanctions | 747,716 | 0.020 | 0.139 | 0 | 1 |
| Cyber Capacity | 666,719 | -0.177 | 1.325 | -3.556 | 3.505 |
| ECI Difference | 719,354 | 1.115 | 0.823 | 0.000 | 5.685 |
| Internet Usage | 686,670 | 3.802 | 1.187 | -18.421 | 5.297 |
| Strategic Rivalry | 747,716 | 0.003 | 0.056 | 0 | 1 |
| Armed Conflict | 747,716 | 0.0001 | 0.007 | 0 | 1 |
| Democracy | 594,122 | 0.275 | 0.206 | 0.0003 | 0.846 |
| UN Voting | 728,566 | 0.818 | 0.151 | 0.000 | 1.000 |
| Trade Dependence | 682,164 | -0.000 | 3.081 | -13.574 | 13.574 |

**Table A.3. Descriptive Statistics – PRD Only**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Statistic** | **N** | **Mean** | **St. Dev.** | **Min** | **Max** |
| Cyer Espionage | 71,982 | 0.008 | 0.181 | 0 | 17 |
| Export Sanctions | 71,982 | 0.026 | 0.159 | 0 | 1 |
| Prior Espionage | 71,982 | 0.007 | 0.178 | 0 | 17 |
| Prior Sanctions | 71,982 | 0.025 | 0.157 | 0 | 1 |
| Cyber Capacity | 67,522 | 0.583 | 1.474 | -3.556 | 3.505 |
| ECI Difference | 70,372 | 1.500 | 1.024 | 0.000 | 5.685 |
| Internet Usage | 68,330 | 4.194 | 1.025 | -3.130 | 5.297 |
| Strategic Rivalry | 71,982 | 0.026 | 0.160 | 0 | 1 |
| Armed Conflict | 71,982 | 0.001 | 0.022 | 0 | 1 |
| Democracy | 63,782 | 0.333 | 0.251 | 0.0003 | 0.846 |
| UN Voting | 70,972 | 0.750 | 0.200 | 0.000 | 1.000 |
| Trade Dependence | 69,478 | -0.000 | 4.944 | -13.574 | 13.574 |

**Table A.4. Descriptive Statistics – Alternative DV**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Statistic** | **N** | **Mean** | **St. Dev.** | **Min** | **Max** |
| Cyer Espionage | 824,916 | 0.001 | 0.046 | 0 | 9 |
| Export Sanctions | 824,916 | 0.019 | 0.135 | 0 | 1 |
| Prior Espionage | 824,916 | 0.001 | 0.044 | 0 | 9 |
| Prior Sanctions | 824,916 | 0.019 | 0.136 | 0 | 1 |
| Cyber Capacity | 735,687 | -0.118 | 1.323 | -3.556 | 3.505 |
| ECI Difference | 793,068 | 1.115 | 0.824 | 0.000 | 5.685 |
| Internet Usage | 746,052 | 4.018 | 1.088 | -18.421 | 5.298 |
| Strategic Rivalry | 824,916 | 0.003 | 0.055 | 0 | 1 |
| Armed Conflict | 824,916 | 0.0001 | 0.008 | 0 | 1 |
| Democracy | 655,698 | 0.273 | 0.205 | 0.0003 | 0.846 |
| UN Voting | 806,722 | 0.814 | 0.153 | 0.000 | 1.000 |
| Trade Dependence | 752,288 | -0.000 | 3.088 | -13.449 | 13.449 |

**Table A.5. Descriptive Statistics – Complete Case**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Statistic** | **N** | **Mean** | **St. Dev.** | **Min** | **Max** |
| Cyer Espionage | 536,652 | 0.001 | 0.065 | 0 | 17 |
| Export Sanctions | 536,652 | 0.020 | 0.139 | 0 | 1 |
| Prior Espionage | 536,652 | 0.001 | 0.064 | 0 | 17 |
| Prior Sanctions | 536,652 | 0.020 | 0.141 | 0 | 1 |
| Cyber Capacity | 536,652 | -0.154 | 1.309 | -3.556 | 3.505 |
| ECI Difference | 536,652 | 1.127 | 0.837 | 0.000 | 5.325 |
| Internet Usage | 536,652 | 3.781 | 1.205 | -18.421 | 5.297 |
| Strategic Rivalry | 536,652 | 0.004 | 0.060 | 0 | 1 |
| Armed Conflict | 536,652 | 0.0001 | 0.009 | 0 | 1 |
| Democracy | 536,652 | 0.282 | 0.207 | 0.0003 | 0.846 |
| UN Voting | 536,652 | 0.825 | 0.144 | 0.000 | 1.000 |
| Trade Dependence | 536,652 | -0.000 | 2.889 | -11.812 | 11.812 |

**B. Additional Results**

**Table B.1. First Stage Logistic Regression**

|  |  |
| --- | --- |
|  | **Export Sanctions** |
| Prior Sanctions | 11.55430\*\*\*(0.13644) |
| Democracy | -4.45176\*\*\*(0.19474) |
| UN Voting | -3.58888\*\*\*(0.11654) |
| Trade Dependence | 0.04507\*\*\*(0.00696) |
| Year Fixed Effect | Yes |
| Pseudo R² | 0.871 (0.870, 0.871) |
| AUC | 0.99 (0.99. 0.99) |
| imputation | 20 |
| N | 747,716 |

\*\*\*p < 0.001; \*\*p < 0.01; \*p < 0.05; Robust standard errors clustered by dyad are reported in parentheses; Pseudo R² and AUC are reported as the mean and range across all imputed datasets.

Table B.1 presents the results of the first-stage logistic regression model predicting the likelihood of export sanctions. The results demonstrate a strong model fit, with an AUC of 0.99, and show that all instrumental variables are highly significant predictors of the endogenous variable.

**Table B.2. Exclusion Restriction Test – Zero-first-stage Test**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Prior Sanctions** | **UN Voting** | **Trade Dependence** | **Democracy** |
| Prior Sanctions | 1.81055 (1.08702) |  |  |  |
| UN Voting |  | -0.11712 (0.85998) |  |  |
| Trade Dependence |  |  | -0.08848 (0.05941) |  |
| Democracy |  |  |  | -2.57968\* (1.22853) |
| prior\_espionage | 0.28307\*\*\* (0.03592) | 0.27484\*\*\* (0.04793) | 0.28757\*\*\* (0.03571) | 0.26972\*\*\* (0.03486) |
| Cyber Capacity | 1.58664\*\*\* (0.16641) | 1.58448\*\*\* (0.19437) | 1.58015\*\*\* (0.16310) | 1.60557\*\*\* (0.19588) |
| ECI Difference | -0.70910\* (0.28844) | -0.69148\* (0.30257) | -0.69272\*\* (0.26031) | -0.66797\* (0.29686) |
| Internet Usage | -0.22159 (0.20291) | -0.23040 (0.18409) | -0.18895 (0.21166) | -0.07372 (0.24550) |
| Strategic Rivalry | 5.44592\*\*\* (0.44822) | 5.47428\*\*\* (0.41956) | 5.60209\*\*\* (0.40594) | 5.05406\*\*\* (0.51793) |
| Armed Conflict | 1.73820 (0.94454) | 1.68030 (0.94872) | 1.76101 (0.93299) | 1.86225 (1.02056) |
| imputaton | 20 | 20 | 20 | 20 |
| N | 697758 | 697758 | 697758 | 697758 |

\*\*\*p < 0.001; \*\*p < 0.01; \*p < 0.05; Robust standard errors clustered by dyad are reported in parentheses for all models.

Table B.2 reports the results of a test for the exogeneity of each instrument (the exclusion restriction). This test assesses whether the instruments have a direct effect on the main outcome variable (cyberespionage), which would violate a core assumption of the 2SRI model. The results indicate that Prior Sanctions, UN Voting, and Trade Dependence are statistically insignificant, supporting their validity as instruments. In contrast, Democracy is statistically significant (p < 0.05). Based on this finding, Democracy was included as a control variable in the second-stage model in our main analysis, rather than being used as an instrument.