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| Title: | Using every countries COVID-19 and government response data to create a composite index ranking their relative attractiveness for geographic supply chain diversification to combat the risk of a future pandemic outbreak. |

The COVID-19 Pandemic drastically affected global supply chains in a fundamentally different manner than other types of supply chain disruption events. It exposed the shortcomings in existing global supply chain management techniques and decision-making processes. Due to the severity of the COVID-19 Pandemic on global supply chains, the risk of a global pandemic outbreak must be considered a new black swan risk (like natural disasters, wars, terrorist attacks, etc.). Within the research field, two prevailing ideas have come about on how to combat this new black swan risk: supply chain regionalization and geographic supply chain diversification. However, geographic supply chain diversification appears to be the more viable of these two options. Given that the COVID-19 Pandemic has been the only global pandemic since the 1918 Spanish Flu, the COVID-19 data and government response data from every country can be used to determine which countries are the most attractive in terms of geographic supply chain diversification to combat the black swan risk of a global pandemic outbreak.

From every country’s COVID-19 data, we created an algorithm that fits a continuous and derivable interpolated function to every country’s COVID-19 case and death data. This allowed the calculation of advanced pandemic description metrics (e.g. the rate of growth of a pandemic) was performed to describe a country’s outbreak severity. By using government response data collected by the University of Oxford, metrics about every country’s response severity could calculated (with an attention to responses that would negatively affect global supply chains). Then, the interaction between the COVID-19 data and government response data was used to calculate further risk tolerance metrics which described how bad the pandemic was in a country before they enacted strict lockdown measures that would negatively impact global supply chains. The results of these metrics were used construct a composite index (composed of a outbreak severity, response severity, and risk tolerance index) to describe a country’s relative attractiveness for geographic supply chain diversification to combat the risk of a future global pandemic outbreak. Additionally, statistical correlation was performed between possible confounding variables (e.g. economic, healthcare quality, population, and press freedom data) to see if any significance trends existed. Additionally, we performed statistical correlation analyses between our calculated metrics and the 2019 Global Health Security Rankings (which were supposed to describe how well every country was equipped to handle a pandemic outbreak) to judge their efficacy.

We found that, although the 2019 GHS Rankings did not accurately predict the severity of a pandemic outbreak within a country (and sometimes the results there the opposite of expectation), they showed that the country’s that were most prepared to combat a pandemic outbreak had high risk tolerance (possibly because they had high trust in their healthcare systems) which lead to more severe pandemic outbreaks. We also found that Median Age, Press Freedom Ranking, and Categorical Income were all significant predictors of outbreak severity or government response. Furthermore, the results of our composite index appear to make intuitive sense and demonstrate enough parity for their practical application. The rankings of all G20 countries in our composite index are on the next page.

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| ISO | Composite | | Outbreak Severity | | Response Severity | | Risk Tolerance | |
| Index | Rank | Index | Rank | Index | Rank | Index | Rank |
| ARG | 0.3177 | 176 | 0.4122 | 175 | 0.2963 | 166 | 0.2445 | 97 |
| AUS | 0.4943 | 74 | 0.6808 | 78 | 0.4876 | 86 | 0.3145 | 77 |
| BRA | 0.4811 | 82 | 0.4329 | 172 | 0.3638 | 142 | 0.6464 | 15 |
| CAN | 0.5556 | 45 | 0.5796 | 133 | 0.5323 | 67 | 0.555 | 23 |
| CHN | 0.3951 | 144 | 0.6587 | 96 | 0.2705 | 172 | 0.2561 | 91 |
| DEU | 0.5989 | 27 | 0.5988 | 130 | 0.4591 | 97 | 0.7387 | 9 |
| FRA | 0.6021 | 25 | 0.5132 | 156 | 0.5537 | 59 | 0.7394 | 8 |
| GBR | 0.5813 | 34 | 0.4825 | 163 | 0.6518 | 23 | 0.6096 | 17 |
| IDN | 0.3942 | 146 | 0.6356 | 112 | 0.4067 | 115 | 0.1402 | 136 |
| IND | 0.3396 | 171 | 0.5568 | 146 | 0.3312 | 158 | 0.1309 | 152 |
| ITA | 0.4302 | 118 | 0.4564 | 169 | 0.4345 | 106 | 0.3998 | 58 |
| JPN | 0.6139 | 20 | 0.6828 | 75 | 0.8001 | 5 | 0.3588 | 63 |
| KOR | 0.5389 | 50 | 0.675 | 82 | 0.5342 | 66 | 0.4074 | 55 |
| MEX | 0.3443 | 170 | 0.4973 | 160 | 0.3846 | 131 | 0.151 | 129 |
| RUS | 0.3578 | 167 | 0.5325 | 151 | 0.4063 | 116 | 0.1348 | 145 |
| SAU | 0.4089 | 133 | 0.5408 | 150 | 0.4101 | 114 | 0.2758 | 86 |
| TUR | 0.4954 | 73 | 0.6061 | 126 | 0.5695 | 54 | 0.3106 | 78 |
| USA | 0.4652 | 95 | 0.4235 | 174 | 0.4808 | 89 | 0.4913 | 29 |
| ZAF | 0.3663 | 162 | 0.4793 | 164 | 0.4631 | 96 | 0.1564 | 127 |