The Economic Club of New York

The 2022 ECNY Innovation and Social Impact Challenge

To honor the Club's 115th anniversary, The Economic Club of New York launched the **Innovation and Social Impact Challenge**, which has contributed to the creation of our research division and aligns with the Club's mission to be a catalyst for thought and innovation and leverages our platforms to introduce content into the mainstream business and economic communities. These ideas or concepts can benefit not just New York or the U.S., but the broader community and humankind.

The three themes of the 2022 Challenge were: **Artificial Intelligence, Climate Change and/or Corporate Governance**.

This Challenge was presented to our Class of 2022 Fellows. With five entries submitted by teams or individuals, the winners were:

- 1st Place: *"Supply Chain Stress Testing at Macro Level"*
- 2nd Place Tie: *"Unleashing the Power of Climate Markets Will Drive Privacy ESG Risks: Is Your Board Seeing the Iceberg?"*
- 2nd Place Tie *"RealOne, Building Trust with Technology"*

Each applicant/team submitted a white paper and presented the work to an impartial panel of judges, who selected the winners**.** These are the winning white papers. The authors own the idea and content, but by participating in the Challenge, the applicants consent to publication on the Club's website. The submission of this work and the presentation of the award does not represent an endorsement of any idea or innovation by the Club; instead, our goal is to facilitate innovative thinking across economic, social, and/or political issues facing society. As a reflection of the Club's mission, the goal is to bring forward work to "be a catalyst for thought and innovation" and leverages our platforms to share innovative and beneficial concepts and ideas.

Please contact Club President & CEO, Barbara Van Allen at officeofthepresident@econclubny.org for more information the white papers, their authors, or the annual Innovation and Social Imact Challenge.

The Economic Club of New York

First Place Winning Entry

The Economic Club of New York

Innovation and Social Impact Challenge 2022

Supply Chain Stress Testing at Macro Level

Norbert Horvath, Amer Malik, and John Rauh

September 15, 2022

Supply Chain Stress Testing at Macro Level

Norbert Horvath[1,*], Amer Malik[2,*] and John Rauh[3,*]

September 15, 2022

Summary

Since the start of the COVID pandemic, supply chain vulnerabilities have been a primary focus around the world. This unexpected global shock led to shortages of products considered essential for society, leading to elevated price inflation. As a result, policy makers turned their attention towards identifying critical supply chains.

Performing quantitative analysis at firm level is limited as proprietary information is involved. By applying an existing modeling methodology and dataset in a novel way, we offer a solution to identify sensitive products as components of global supply chains for which the societal negative impact is greatest. To illustrate the capabilities of our product, we wrote a code package in R language that can perform the estimations and would serve as the basis for a future online tool.

As a next step, we would like to create an online solution and make our tool available for researchers, analysts, and policy makers to better serve the broader international community by helping to identify products and industries of critical importance and mitigate the effects of future disruptions.

1 Norbert Horvath

2 Amer Malik

2 John Rauh

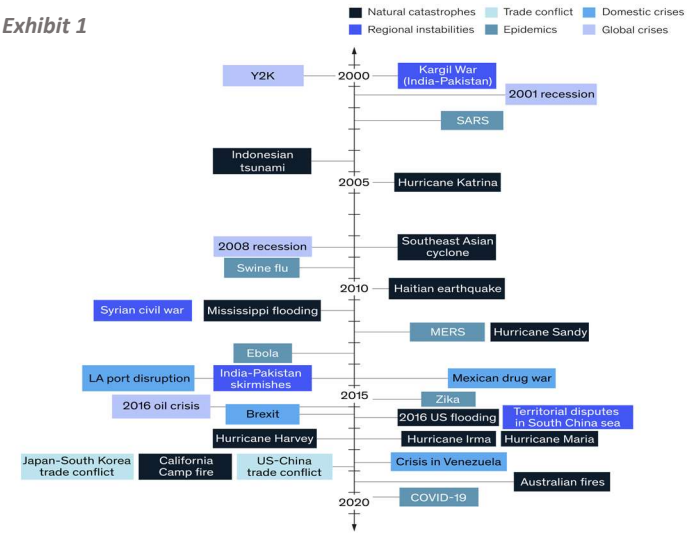
*Disclaimer: The views and opinions expressed in this paper are those of the authors and do not necessarily reflect the position of their employer

Introduction

The COVID pandemic has delivered the broadest supply chain shock in recent history, causing prolonged production delays, sharp adjustments in consumer behavior across different countries, and profound welfare implications. However, these are only the latest of a series of supply chain disruptions over the past two decades. As indicated by ***Exhibit 1*** (McKinsey & Co., 2020), the number of wars, trade conflicts, and natural disasters have become increasingly more frequent over the years, leading to significant loss for companies and for society at large.

By recognizing its importance, the White House recently initiated a comprehensive review of America's supply chains, including the identification of critical products and the creation of a data hub to monitor near term supply chain vulnerabilities (The White House, 2021). However, this review and its recommendations are only the first steps towards a more established solution for mitigating supply chain disruptions, and over time, a more systematic approach would be needed, similar to the one established in the U.S. banking system after the 2008/09 financial crisis (CCAR/DFAST).

Exhibit 1



By leveraging a quantitative framework originally designed for trade policy analysis, we propose a solution to support the identification of products that are critically important for a country with respect to their wealth impact under a severe supply chain shock. This would serve as a tool to help policymakers to reallocate resources where national interests are best served. While data about supply chains are typically part of firms' proprietary information and not available to the public, product level international trade data provides a reasonably accurate and transparent slice of information about complex international supply chains. By assuming sudden extreme values of export/production taxes in a given country, we are able to model a shock where a country suddenly stops supplying products to the rest of the world. This would mirror different types of shocks emerging in various geographical regions, including a pandemic lockdown, or factory shutdowns due to a natural disaster or war. To the best of our knowledge, the solution that we have leveraged for supply chain stress testing is a novel way to address this problem and has not been used in applied work before, despite its great potential to address these types of questions. We designed a code package with R statistical language that can analyze a large set of countries and products simultaneously.

The primary audience of our modeling tool includes policy makers, research institutions, and consulting firms. Our solution can be applied to any country and would serve the broader society to be better prepared for any type of supply chain shock and minimize the potential negative welfare impact of these shocks by preemptively channeling resources to relevant domestic industries.

Proposed Supply Chain Stress Testing Concept

Today's complex supply chains have thousands of layers and cover multiple geographical regions. Modeling a supply chain stress through the lens of international trade and applying the existing trade policy analysis architecture would be a straightforward approach to analyzing a supply chain stress:

- Granular product level (HS-4[4] or HS-6) publicly available trade statistics make it possible to capture a particular item in a complex chain at the point where it crosses borders and becomes part of the international trade network
- Partial equilibrium models designed for trade policy analysis can be customized to model a sudden stop of production of goods in a country and analyze its impact on wealth
- Demand and export elasticity estimates provide production adjustment estimates for unit price changes
- Customer and producer surplus estimates can be derived through the partial equilibrium model, which together makes up the net wealth impact of a sudden production shock

As an example, if China imposes a lockdown on its semiconductors production facilities, then this could be modeled by assuming a prohibitive export tax (100%) that reduces exports of this product produced in China to zero. In turn, prices and quantities in other countries will adjust along elasticities, increasing producer surplus and decreasing consumer surplus. The sum of the latter two will give us the net wealth effect by country. This provides a quantifiable measure of gain/loss at the country and product level due to a supply chain stress and can be used to assess the criticality of different products/industries.

Quantitative Framework – Intuition

To implement a supply chain stress test and produce quantifiable results, we leveraged the partial equilibrium model designed by Francois and Hall (2003) and offered by the WITS (World Integrated Trade Solutions) of World Bank. To ensure that we are able to provide results iteratively for thousands of products and for more than 200 countries, we implemented the model in a code package with R statistical language which later could serve as a basis for an online tool.
The model has three key building blocks: demand side, supply side, and market equilibrium. Using prices derived through the market clearing process, we can ultimately arrive at the net wealth effect. *Exhibit 2* illustrates how the different components follow each other.

Below we provide a brief intuitive overview of the main economic relationships used in the model. For a more formal derivation, see (Francois & Reinert, 1997), (World Trade Organization, 2012) or (Jammes & Olarreaga, 2005).

[4] The Harmonized System (HS) is a standardized numerical method of classifying traded products. It is used by customs authorities around the world to identify products when assessing duties and taxes and for gathering statistics. Different granularities exist, HS-4 includes around 1200 product categories.

Demand Side

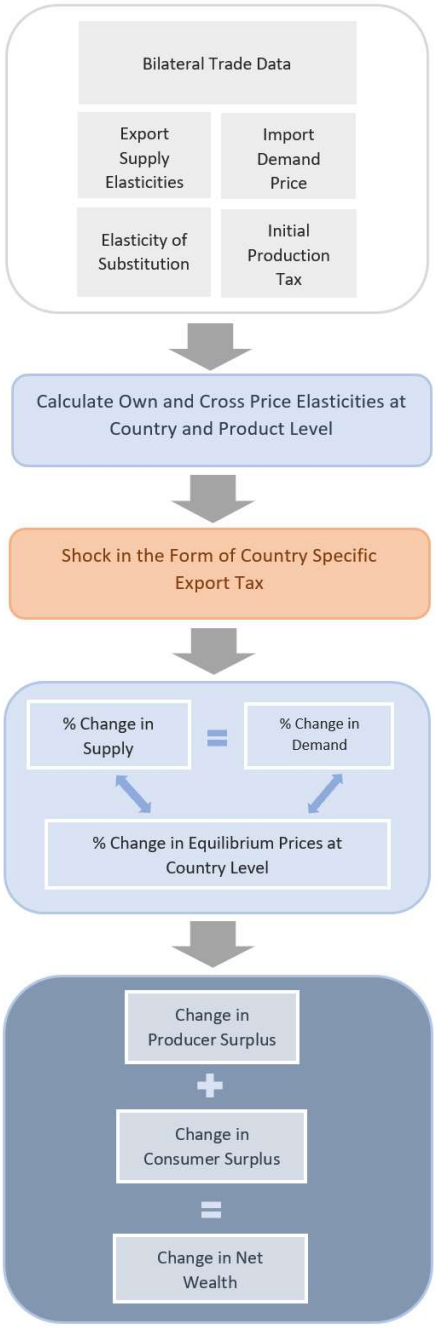
Import demand for a certain product from a given country depends on the import price from this country, the import price for the same or similar products from other countries, and the total expenditure a country devotes to this product. Using this relationship and relying on simplifying assumptions from microeconomic theory to make it a tractable problem, we can show that:

The *own price elasticity* (how much percent less product is imported from a given country by increasing the price there by one percent) is proportional to the sum of a composite import demand elasticity (a non-country specific aggregate price elasticity) and an importing country specific elasticity of substitution. The latter refers to changes in the imported quantity from a given country relative to others as a result of the higher relative prices. This relationship suggests that higher import prices from a given importer in general reduce the demand for its products, but this is mitigated by lower level of substitutability of its product from other countries.

The cross-price elasticity (how much percent more product is imported from a given country if import prices from other countries increase) can be expressed as a weighted average of composite import demand elasticity and elasticity of substitution. Intuitively, the higher overall elasticity reduces the import demand, but the higher the elasticity of substitution the more the given country is able to import from other places and that makes imports more elastic.

Putting all of these factors together, the demand side suggests that a 1% increase in prices changes the demanded quantity by making it less desirable (by the amount expressed in the own price elasticity) and making other countries' similar products more desirable (by the amount expressed in the cross-price elasticities).

Exhibit 2



Supply Side

Export supply depends on world prices; the higher the price of the product the more countries export. Tariffs and export taxes negatively affect export supply. An *export supply elasticity* is defined by how much change occurs in the export supply if prices increase (including export taxes) by one percent.

Market Equilibrium

In market equilibrium, supply is equal to demand. The supply side (through export taxes) is the component of the model where we infuse a shock to the system and cut off the supply of a specific product from the rest of the world. This triggers an adjustment of the trade/supply chain system by requiring consumers and producers to adjust. An equilibrium emerges when the change suggested by export elasticities equals the change suggested by demand elasticities. The percentage change in prices can be used to calculate the change in producer and consumer surplus. The sum of these two items results in the change in net wealth, which is our primary measure to determine the criticality of a given product.
As an example, when chip shortages in recent years constrained automakers from keeping up with demand for new cars, consumers reacted by switching to used cars as replacement products or simply postponing their purchase. These adjustments can be modeled by the above-described elasticities and trade data of the initial state.

Results – Sample Use Cases

Political changes, differences in labor costs and technological innovations have made it possible for the world to be more interconnected over the past few decades. This has helped the expansion of trade relations and therefore the rise of multi-layered international supply chains. Before turning to the ultimate output of our tool (net wealth effect by product), we leveraged our dataset and code package to visualize the largest trade relations by value across countries. This provides further evidence that using international trade data for supply chain analysis could provide a reasonably accurate way to approximate highly interconnected production relationships. ***Exhibit 3*** confirms a widely interconnected world where international supply chains expand over regions. We also analyzed exported product varieties by country at the HS-4 level over three decades. As ***Exhibit 4*** illustrates, the diversity of exported products increased markedly between 1995 and 2005. Data between 2005 and 2015 still suggests an expansion, though more muted than in the prior decade. This likely reflects the impact of two confounding effects: openness and specialization. In the 1990s, openness played a larger role due to political changes, while in the 2010s specialization was more of a primary focus.

Exhibit 3 *– Largest Trade Relationships between Countries (left) and*

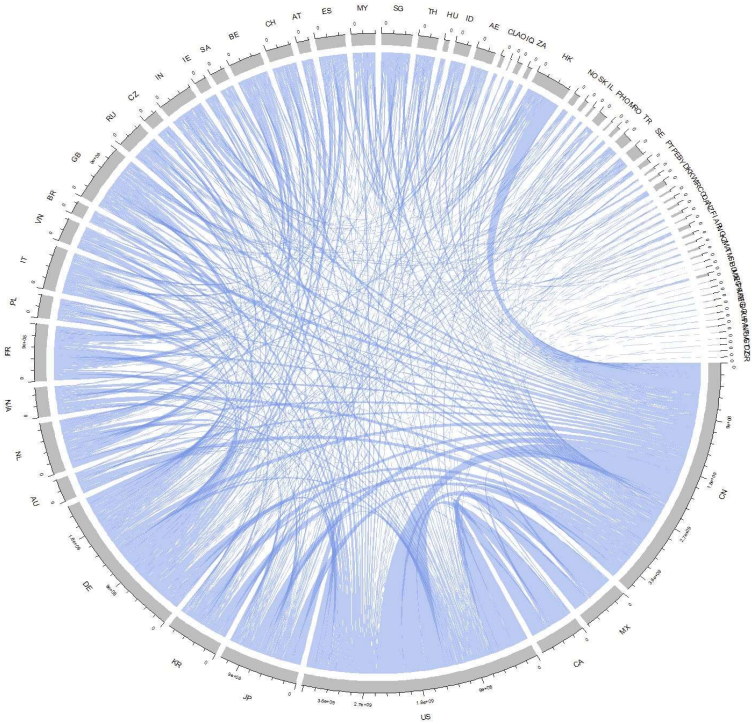
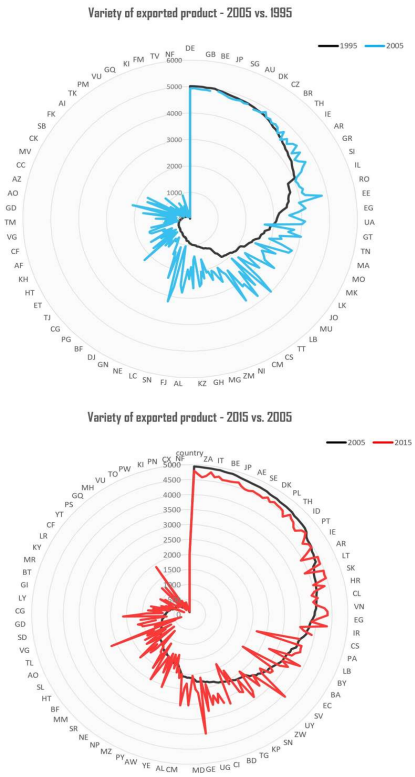


Exhibit 4 *– Product Variety Evolution over Time (Right)*



To illustrate the key output of our solution, we run our tool for two example use cases:

1. Shock on China supply chains in the form of complete stop of trade with other countries (e.g., COVID induced lockdown or geographical tension) and determining critical products and net wealth impact on the United States
2. Shock on Russian supply chains in the form of full isolation, impact on Germany and critical products

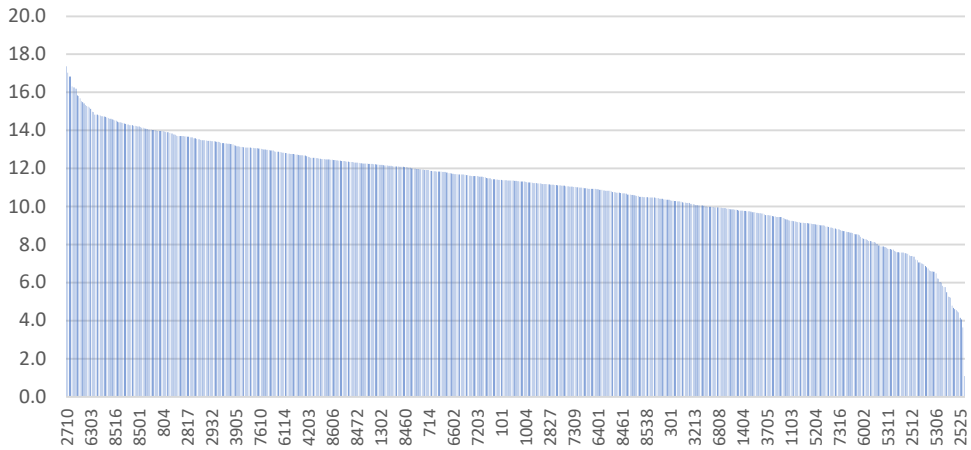
Exhibit 5 shows the ranking of products by wealth impact (select ISO product codes on the horizontal, a transformed quantitative wealth effect measure on the vertical axis). We find among the products with the highest negative wealth effect some of the more well-known U.S. technology imports, such as:

- *Telephone sets, including telephones for cellular networks or for other wireless networks*
- *Turbojets, turbo-propellers, and other gas turbines*
- *Diodes, transistors, and similar semiconductor devices*

On the other hand, relatively less straightforward items are also made the top of the list, such as:

- *Medicaments*
- *Aircraft*

Exhibit 5 – *Ranking of Products by Wealth Impact [Log(abs)] on the U.S. resulting from a China Supply Shock*



This gives information to policy makers on which industries have a heightened risk of a severe supply chain shock and where they should be focusing on to mitigate future disruptions.

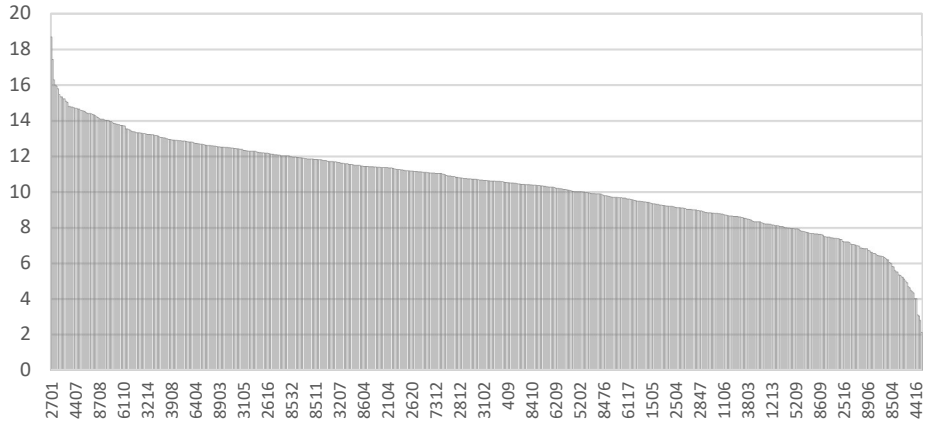
Similarly, *Exhibit 6* shows the ranking for German products under a Russian isolation. We find among the products with the highest negative wealth effect some of the more well-known German imported raw materials, such as:

- *Coal*
- *Petroleum oils and oils from bituminous minerals*
- *Diodes, transistors, and similar semiconductor devices*

On the other hand, relatively less straightforward items are also made the top of the list, such as:

- *Titanium*
- *Aluminum*

Exhibit 6 – *Ranking of Products by Wealth Impact [Log(abs)] on Germany resulting from a Russian Supply Shock*



It is worth noting that the "tail" at the beginning of the chart is higher than for the U.S., suggesting that critical products are more concentrated and have elevated impact compared to others.

Summary and Next Steps

Since the start of the COVID pandemic, supply chain vulnerabilities have been a primary focus around the world. This unexpected global shock led to shortages of products considered essential for society, leading to elevated price inflation. As a result, policy makers turned their attention towards identifying critical supply chains and what actions to take at national level to ensure future disruptions are less severe. Performing quantitative analysis on supply chains at the firm level is limited by the proprietary information involved. By applying an existing modeling methodology and dataset in a novel way, we offer a solution to identify sensitive products as components of global supply chains for which the society level negative impact is the greatest. We are leveraging a partial equilibrium model originally used for trade policy analysis and parametrizing it to be able to estimate the full lockdown of countries and supply chain disruptions. We wrote a code package in R language that can perform the calculations and could serve as the basis of a future online tool.

As a next step, we would like to create an online supply chain platform where researchers and analysts across the world would be able to use our analysis toolkit and perform model runs through a user-friendly interface. This would serve as a hub for supply chain stress related knowledge and would be a go-to place for governments and corporations in this topic.

To ensure that the international community has an awareness of the latest supply chain risks related knowledge, we would hold regular online educational sessions and would advise policy makers how to form relevant industry policies to best address critical supply chain risks.

The platform could be further enhanced by combining it with the latest AI and machine learning techniques to address specific business needs, provide more accurate model estimates and generate fresh insights.

We believe that our tool can significantly contribute to the broader society by helping policy makers identify critical supply chains, mitigate future disruptions, and protect and improve the well-being of the broader international community.

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Appendix

Data, Calibration, and Implementation

To perform sequential stresses on multiple products and countries and directly integrate them into an online tool we designed a script in R statistical language that generalizes the model compared to the version offered by the World Bank and makes it ready to use in stress testing.

The following key inputs are leveraged by our model to generate net wealth effect by country and product:

- Bilateral trade value data at product level
    - *Source:* Comtrade/BACI provides import/export data on a yearly basis at HS-6 granularity and for 200+ countries
    - *Description*: Comtrade is the most widely used, comprehensive, and accurate public trade statistics available. A French research institute (CEPII) performs further data cleaning and consistency adjustments. For demonstration purposes, we leveraged the 2019 (last pre - COVID) vintage in this white paper
- Import demand elasticities at product (HS-4) and country level:
    - *Source*: CEPII (Fontagne et al., 2022)
- Export supply elasticities at product (HS-4) and country level:
    - *Source*: Broda et al., 2006
- Elasticity of substitution estimates (same for all countries and products):
    - *Source:* Bajzik et al., 2020

The Economic Club of New York

Second Place Tied-Winning Entry

Unleashing the Power of Climate Markets Will Drive Privacy ESG Risks: Is Your Board Seeing the Iceberg?

By: Janet Lucylle Baker
Assistant General Counsel, S&P Global, Inc.
2022 Economic Club of New York Fellow –
September 15, 2022

With the clean energy transition being turbocharged by $369 billion of economic incentives in the Inflation Reduction Act of 2022 (INRA) and Federal Energy Regulatory Commission (FERC) Order 2222; dizzying pace of innovative green technologies, smart meters, Powerwalls, artificial intelligence (AI); disrupters; consumer privacy expectations; investor ESG disclosure and authentication demands; absence of a comprehensive U.S. federal privacy law; drumbeat of global privacy laws; and 2022 U.S. Supreme Court Case, Dobbs v. Jackson Women's Health Organization, holding that the U.S. Constitution does not confer a right to abortion ("Dobbs"), privacy is more important than ever. Yet, Boards are only seeing the tip of the privacy ESG iceberg.

Nascent trends documenting Boards' view and experience with privacy ESG are emerging and concerning. Ratings companies including S&P Global[1] and MSCI[2] classify privacy as ESG. Securities and Exchange Commission (SEC) filings show an emerging pattern of companies categorizing their compliance with data privacy regulations and voluntary standards as ESG matters.[3] "Q1 2021 had the largest quarterly number of relevant 10-K filings (13, up from just one in the year prior), while …relevant 8-Ks filed year-round has …roughly doubled over the last two years."[4] However, the results were not in … SEC disclosures, but in promotional exhibits, e.g. press releases and ESG reports.[5] The SEC's questioned, "…[Y]ou provided more expansive disclosures in your corporate social responsibility report … than …your SEC filings. …[W]hat consideration [did] you [give] to providing the same … climate-related disclosure in your SEC filings as …. your CSR reports."[6] 2022 SEC proposed rules[7], designed to provide consistent ESG disclosures[8], do not apply to all companies. However, they will likely to spillover to companies unregulated by the SEC if adopted. In short, SEC style climate disclosures may become the expectation or norm.

The 2021 PwC Corporate Directors Survey finds that only 54% of directors believe that ESG issues have a financial impact on company performance; higher than 38% in the 2020.[9] "While a growing percentage of directors' support ESG,… few companies are doing it."[10] "56% of directors complain that investors are giving too much focus to ESG--nearly twice those with that viewpoint in 2018."[11] "Using big data algorithms, CERES reviewed the Board credentials of the top 475 of the Fortune 2000 companies and found that most Board members do not have demonstrable sustainability credentials (only 17% qualified) and just 13% of Boards have robust oversight of ESG issues. [W]e find that many companies with material ESG issues have very little relevant expertise on their Boards."[12] Good performance on material ESG issues results in good corporate financial performance, with a 2016 study finding that a portfolio invested in companies that perform well on material ESG issues overperform by 6% on stock price.[13] The data indicates that many Boards do not recognize that privacy and ESG matters have a material financial impact

on their companies; and few have directors with ESG expertise. Robust oversight commensurate with growing privacy ESG risks and opportunities is not the norm.

While only 13% of Boards have robust oversight of ESG issues[14], investors, regulators, and consumers are increasingly focused on such issues; creating reputational risks to companies if they fall short of privacy ESG and general ESG commitments, standard disclosures, and evolving cultural norms. A World Economic Forum Whitepaper argues that fundamental shifts in technology, environmental, geological, and socioeconomics are causing ESG&D issues to become more material to companies in every sector.[15] In 2021, shareholders voted to replace at least two members of ExxonMobil's Board with people nominated by an activist investor group, Engine No. 1, because ExxonMobil was not addressing climate change quickly.[16] Facebook, Inc. was fined a record-breaking $5 billion penalty to settle FTC charges that the company violated a 2012 FTC order by deceiving users about their ability to control the privacy of their personal information.[17] It was ordered to restructure its approach to privacy from the corporate Board-level down, and establish strong new mechanisms to ensure that Facebook's executives are accountable for privacy decisions, and ensure that privacy decisions are subject to meaningful oversight.[18] Republican Congressman David Cicilline called the settlement "a slap on the wrist."[19]

Despite ESG commitments to protect user data; respect consumer privacy; decarbonize the economy; and invest in racial justice initiatives after the murder of George Floyd, companies have been accused of deceiving customers concerning privacy controls[20]; greenwashing[21]; "talking the talk without walking the walk" on racial/social/environmental justice commitments; "woke" investing by "woke" corporations[22] using measures immaterial to financial performance; and failing use a uniform ESG disclosure standard. Sheryl Sandberg, outgoing Chief Operating Officer of Meta, was exposed as a as "fake feminist" after Meta gave the Nebraska police access to private Facebook communications between a pregnant 17-year-old girl, who was planning an abortion, and her mother, who was subsequently charged with a felony, the first case post Dobbs.[23] "This from a company that stresses how much they value user privacy… and … vowed to cover travel expenses for any employee needing abortion access".[24] This case demonstrates that discrepancies between privacy ESG statements/disclosures and company actions will not ignored by the public and lawmakers, and Boards must educate themselves and oversee such matters.

A comprehensive federal privacy law could address accelerating privacy ESG risks by establishing clear standards for protecting consumer privacy, security, and human rights. It is unclear that Boards broadly recognize the absence of a federal privacy law in the United States as a material privacy ESG risk to companies, AI, and U.S. consumers. Without a federal standard like the European Union's General Data Protection Regulation (GDPR), Canada's Personal Information Protection and Electronic Documents Act (PIPEDA), and Japan's Act on the Protection of Personal Information (APPI), companies are required to comply with the patchwork of state privacy, biometric, and data breach laws found in California, Illinois, Virginia, Colorado, Connecticut, Utah, other states, territories, District of Columbia, and sector specific U.S. federal laws. Democratic Sen. Mark Warner complained, "With the FTC either unable or unwilling to put in place reasonable guardrails to ensure that user privacy and data are protected, it's time for Congress

to act."[25] Apple Inc. markets strong consumer privacy controls as a business advantage and advocates for federal privacy legislation[26],

H.R.8152, American Data Privacy and Protection Act (ADPA), introduced in the U.S. House of Representative on June 21, 2022, establishes requirements for how companies handle personal data and information that identifies or is reasonably linkable to an individual.[27] However, U.S. House Speaker, Nancy Pelosi, expressed concern about the ADPA preempting California data privacy laws, "…it is imperative that California continues offering and enforcing the nation's strongest privacy rights".[28] ADPA may not become law, but penalties, fines, and disgorgement of algorithms/artificial intelligences trained on ill-gotten data has been ordered under the current patchwork legal regime. Commenting on a $1.5 million fine with WW, "Our order against these companies requires them to delete their ill-gotten data, destroy any algorithms derived from it and pay a penalty for their lawbreaking," said FTC Chair Lina Khan.[29] If this approach becomes routine, the FTC's new enforcement weapon may spell D-E-A-T-H for algorithms.[30] Clearview AI was ordered to delete images and biometric data collected in violation of federal privacy laws in Canada[31]; banned from selling facial recognition software to most US companies[32]; fined a €20 million in Italy for violating privacy laws and ordered to delete any data on Italians[33]; and is being sued in Illinois.[34]

The FTC is stepping into the void created by the absence of a comprehensive federal privacy law in USA; exacerbating enforcement risk. Post Dobbs[35], the FTC sued Kochava for Selling Data that Tracks People at Reproductive Health Clinics, Places of Worship, and Other Sensitive Locations, alleging that its geolocation data from hundreds of millions of mobile devices can identify people and trace their movements.[36] While Dobbs was focused on reproductive rights, increasing government enforcement to protect geolocation, health, and other sensitive personal data will reverberate well beyond abortion. Government enforcement at the state and federal level due to the absence of a federal privacy law plus the patchwork of state level privacy laws in the USA is a risk that Boards must oversee and mitigate.

Unleashing the Power of Climate Markets. The transition to clean energy will be turbocharged by the Inflation Reduction Act (INRA) and FERC Order 2222, driving historic ESG opportunities and exacerbating privacy ESG risks.[37] Board oversight will be critical to effectively monetize the green energy transformation and minimize privacy and cybersecurity ESG risks. The INRA is a $369 billion investment in energy security and climate change programs, including clean energy, environmental justice, and workforce training, aka ESG over ten years. It creates an historic opportunity to drive the new ESG industry by linking INRA tax credits and economic incentives to ESG focused investments, commitments, and disclosures. INRA stimulates ESG investments because tax credits and clean energy efficiency incentives are available to individuals and companies,[38] including $9 billion in home energy rebate programs; 10 years of consumer tax credits for rooftop solar; and tax credits for electric vehicles ("EV") purchases (new EVs $7,500; used EVs $4,000).[39] Consumers will actively generate and store clean energy at home to maximize economic incentives. Privacy and cybersecurity ESG risks emerge because the home-based green technologies collect private customer usage data in real time and can connect to the power grid and share usage data with interested parties needing it for grid planning, monitoring, security.

For companies, the INRA opportunity will drive more capital into ESG investments by extending and modifying the production tax credit for electricity produced from certain renewables, including tax credits for wind, biomass, geothermal, solar (which previously expired at the end of 2005), qualified hydropower, and marine and hydrokinetic resources through 2024."[40] A bonus credit of 10 points exists for projects meeting wage and workforce requirements or 2 percentage points for brownfield sites, areas with significant employment related to oil, gas, or coal activities.[41] An increase in energy credits for solar and wind facilities placed in low-income communities would allow for the allocation of 1.8 gigawatts for "environmental justice solar and wind capacity" credits in each of calendar year 2023 and 2024.[42] ESG investments can now be quantified, which makes it easier determine whether companies are greenwashing or meeting the ESG commitments disclosed in their SEC and sustainability reports.

Approved in September 2020, FERC Order 2222, a landmark opportunity which opens wholesale power markets to distributed energy resources including EVs, EV chargers, solar panels, thermal storage, advanced water heaters (DERs),[43] will drive privacy ESG risks because customer private usage data could flow to DER aggregators, who are incentivized by the INRA to compete or be green alternatives to electric utilities. Order 2222 "enables DERs to participate alongside traditional resources in the regional organized wholesale markets through aggregations, opening U.S. organized wholesale markets to new sources of energy and grid services. …lower[ing] costs for consumers through enhanced competition."[44]

The historic economic incentives to companies and individuals created by INFA and Order 2222 will create privacy and cyber ESG risks to companies because electric utilities and consumers can interconnect by innovative technologies, e.g., smart meters[45] and Powerwalls[46]. The interconnected technologies collect more and more data about consumers that can lead to loss of user data confidentiality, including the breach of customer privacy. "The electric grid is changing from a relatively closed system to a complex, highly interconnected environment."[47] Smart grid data contains private information, name, address, account number, energy consumption, financial information, lifestyle (when home is occupied, unoccupied, when occupants are awake and asleep, behavior patterns, how often appliances are used), meter identifiers including IP addresses.[48] The Powerwall "collects information from or about you; …your Tesla vehicle; and …your Tesla energy products."[49] New cyber and privacy threat vectors to consumers, DERs, and utilities' power grid emerge from interconnected systems, such as unauthorized access from malicious attackers, malware, viruses and data leaks of private customer usage information, PII, and other sensitive data collected by the smart meter caused by cloud misconfiguration *inter alia*.

Next Steps?

The Whitepaper documents how Boards are not seeing the privacy ESG iceberg, which risks are aggravated by absence of a uniform U.S. federal privacy law; absence of consistent ESG disclosure standards tied to ESG commitments; increased regulatory scrutiny by the FTC post Dobbs and SEC; consumer privacy expectations; and opportunities presented by the clean energy stimulus from INRA and Order 2222. These risks can be addressed by the following:

- Board should be educated on the importance of an effective privacy ESG program[50], and directors with privacy ESG expertise should be added to the Board.
- Create a culture of privacy by structuring strong privacy from the corporate board-level down; establish strong mechanisms to ensure that executives, including a Chief Privacy Officer, are accountable for privacy decisions; and ensure that privacy decisions are subject to meaningful oversight.
- Operationalize a standard framework/process to ensure that the Board receives reports on material privacy matters and the results of the annual corporate privacy audits.
- Lobby for a federal privacy law.
- Lobby for adoption of the 2022 SEC proposed new rules for registrants regarding Cybersecurity Risk Management, Strategy, Governance, and Incident Disclosure.

Benefits, Application, Sustainability:

- Regulators, FTC and SEC, expect Boards to oversee and disclose material transformational climate opportunities, privacy ESG risks, and increased competition. Increasing Board capacity and competence in privacy will drive a culture of privacy across the enterprise, market, and to customers who expect their privacy to be protected. Boards can only drive and oversee a culture of privacy if they understand privacy.
- Enact a U.S. federal privacy law to provide the standard privacy/security protections enjoyed in Europe, Japan, and South Africa to all Americans. It will reduce administrative costs to business of complying with the current patchwork of privacy laws and regulations; provide all Americans without rigorous protection; and reduce fines, privacy lawsuits, and loss of goodwill after data incidents.
- Adopt the 2022 SEC's proposed new rules is sustainable because it will help investors, who are increasingly focused on ESG, understand, and compare ESG scores across firms. Regulators will expect Boards to oversee and disclose this material transformational climate opportunity, associated privacy ESG risks, and increased competition. ESG commitments to financial performance in SEC filings will be more meaningful than the puffery found in the ESG marketing and sustainability reports.

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The Economic Club of New York

Second Place Tied-Winning Entry

RealLine

BUILDING TRUST WITH TECHNOLOGY

September 15, 2022

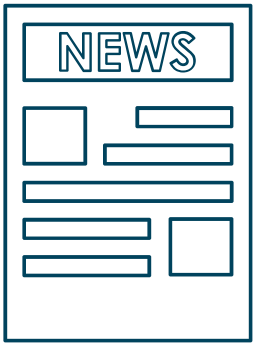
Published By:
Daniel Desatnik
Norbert Horvath
Marlaena LeMaitre
Dee Dee Thomas

Overview

The spread of misinformation and disinformation online is one of the most significant threats to modern society. On a macro level, it undermines faith in democratic systems, contributes to intra- and inter- national tension and conflict, and increases the difficulty to combat global health issues. On an individual level, it leads to cyber bullying, reputational damage, and "catfishing".

We propose using blockchain and artificial intelligence technologies to combat mis- and dis- information online. Our solution, called "**RealOne**" is a software integration for the native camera apps on iOS and Android. When a user takes a photo or video on their phone, a non-fungible token ("NFT") of the original file is minted, ensuring that it is an immutable, one-of-one digital creation. When the photo or video is shared online, an API request would be sent to determine whether the original NFT is being shared. If the image/video was altered, machine learning would determine the deviation from the original, and a grade would be assigned based on the degree of alteration.

Social media sites, news outlets, dating apps, and academic outlets could utilize RealOne to ensure that the media they are using is "authentic" and trustworthy.



Media is created on native phone app and minted as NFT

When reshared, RealOne uses blockchain and AI to ensure original file is unaltered

A grade is assigned to let the user know the content is trustworthy

Problem

"A lie can travel halfway around the world before the truth can get its boots on" - falsely attributed online to Winston Churchill

While the internet has put the world's information at our fingertips, the persistent and often pernicious proliferation of mis- and dis- information has eroded faith in online content, and, on a larger scale, contributed to inter- and intra- national tensions.

"Fake news" was named "word of the year" in 2017. The concept encapsulates the intentional dissemination of disinformation, as well as the unsuspecting sharing of misinformation. It can take the form of less harmful sensationalist headlines to attract online user volume, to pernicious disinformation generated and propagated by hostile foreign actors, particularly during elections. Fake news is also becoming increasingly more sophisticated, with AI technology employed to generate "deep fake" videos of public figures that appear authentic.

The rapid spread of fake news online can have profound societal consequences. For example, during the 2016 U.S. presidential elections, fake news stories received more engagement on Facebook than top stories from major media outlets.[1] By diluting the visibility of stories from mainstream news outlets, it reduces the reach of real news while simultaneously generating distrust in the media. As the 2016 experience proved, it can undermine well-established democratic processes and change the outcome of elections. Similarly, as the anti-vax movement demonstrated, it can serve as a platform for harmful conspiracy theories, spread false or discredited information, and risk the healthy functioning of society as a whole.[2]

Finding a solution to eliminate or at least materially reduce the amount of fake news would profoundly benefit society by making individuals better informed and solving collective actions problems such as responses to the COVID-19 pandemic.

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Attempts to combat fake news

Despite many efforts to address the spread of fake news, none of them have achieved widespread adoption

In the past few years several attempts have been made to prevent the proliferation of fake news. One of the early approaches was the application of independent human fact-checkers, who would put a warning label on the information considered dubious or false and ultimately result in the flagging or elimination of the story from the social media platform.

As artificial intelligence became more advanced and the scale of fake news expanded, AI complemented humans in the identification process. Journalism startups took a novel approach and involved blockchain technologies in proving the authenticity of the content.

Among the first of such startups were Civil Media, which intended to build a decentralized, blockchain-driven journalism marketplace. On this platform, users can reward media outlets with high-quality work and contest the reputation of outlets that they find questionable. A different approach was followed by Mavin, which aimed to build a browser plugin for online content trustworthiness rating. Its plugin would provide a trust score for news articles, based both on an AI assessment and the votes of human readers. Readers would be able to instantly recognize whether they could trust the content they read, share, or engage in.

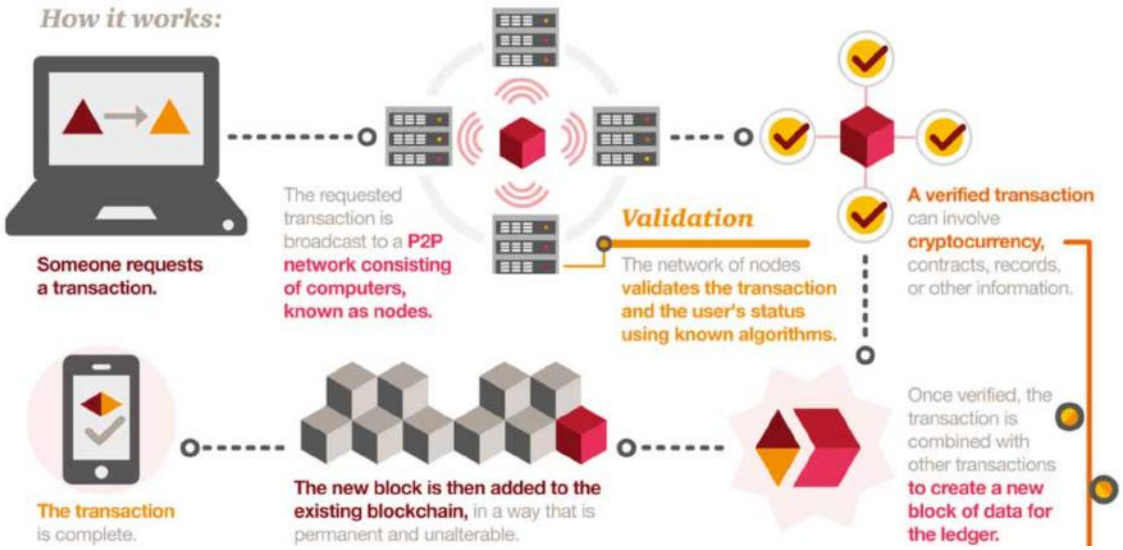
Of the mainstream media organizations, the New York Times has experimented with addressing fake news in photojournalism by launching the New Provenance Project. Its proof-of-concept social media site created in collaboration with IBM uses a blockchain to store information such as the image's photographer, time and date, location, caption, and other photos from the same event, helping users to get accurate contextual information about the photo in case it is used for misinformation.

Unlike RealOne, these solutions are imperfect, not widely accessible by users, and not optimized for social media.

Blockchain & AI

We propose using blockchain and artificial intelligence technologies to combat misinformation and disinformation online. RealOne verifies photos and videos shared online to determine whether they are authentic or have been manipulated by comparing it to the original, unaltered file stored on the blockchain, and assigning it a grade of authenticity.

The blockchain is a peer-to-peer technology that uses distributed ledgers to record information in a way that makes it virtually impossible to falsify or hack. In this way it enables "digital scarcity" and provides access to a decentralized, global network of computers to verify the authenticity of a digital asset to ensure it is not an unauthorized copy. We will utilize the immutability and traceability features of the blockchain to create original digital works at moment of creation, that, if altered, can be easily detected.

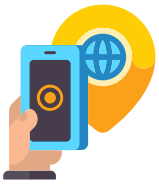


Source: https://www.garyfox.co/how-blockchain-works-infographic/

Artificial intelligence / machine learning has limitless applications. In this context, we will utilize AI to compare a media file displayed online against the original file's data stored on the blockchain to determine the magnitude and nature of deviation, if any, from the displayed file to the NFT.

Solution

RealOne

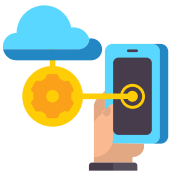


Mint NFT at Source

RealOne would integrate with the native photo application on iOS and Android devices, or as a standalone app. When a user takes a photo or video, a hash of the raw file is simultaneously and automatically uploaded to RealOne's database and minted as an NFT on Solana.

No Opportunity for Alteration

By minting the NFT simultaneously with the creation of the raw file, RealOne ensures there is no opportunity for the file to be altered. As a software integration layer, RealOne could be used in other content creation devices, such as security cameras and audio recorders.



API Request

RealOne would provide an application programming interface ("API") that would enable businesses to send information requests to RealOne's database. When an image is shared online - such as social media websites, news outlets, dating apps, or academic publications - an API request would be sent to RealOne containing key data regarding the media file.

Validation of Authenticity

RealOne would determine whether the original NFT has been shared. If it has not, RealOne would use AI to determine the degree and nature of any alteration and assign a grade of trustworthiness. If the content is trustworthy, a green check would display on the media. If the content is not trustworthy, a failing grade would display on the media.

Revenue Model

Charge per API Request: RealOne's API would integrate seamlessly with websites and applications. When an API call is made to RealOne from a website, it would charge the application a small fee (e.g. $0.01). This "pay per request" model is well established in the industry and is familiar to RealOne's potential adopters.

NFT Royalties: NFTs are unique in that the initial and subsequent sales of the NFT can be tracked through the blockchain. Each time an NFT is sold, RealOne would assess a small "royalty" for having facilitated the creation of the original NFT.

Implementation & Sustainability

Minimize Minting Fees: A significant barrier to RealOne's development will be the costs associated with minting an uncapped number of NFTs from users of iOS and Android devices worldwide. To minimize minting costs, RealOne will use the Solana blockchain. Solana is capable of processing up to 65,000 transactions per second, at a fee of $0.00025 each. In contrast, Ethereum supports only 15 to 20 transactions per second and the transaction fee is almost $30 in October 2021.[1]

Minimize Environmental Footprint: Transacting on blockchain requires energy. Bitcoin's "proof of work" method of processing transactions is exceedingly energy intensive, with Bitcoin accounting for more energy than Argentina. The Solana blockchain utilizes a "proof of stake" and "proof of history" method of processing transactions that is far faster, uses far less energy, and is thus considerably more environmentally friendly and sustainable.[2]

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Risks & Hurdles

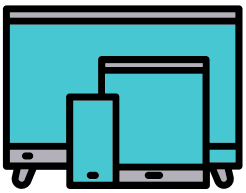
While we have illustrated the value of democratizing the creation of non-fungible tokens (NFTs) to combat misinformation, there are some risks and hurdles associated with enabling the creation of (minting) on smartphones.

Adoption: RealOne works only if the NFT is minted at the moment of creation of the media file. To ensure this, we need iOS and Android devices to enable the software integration with the camera, otherwise RealOne would need to be a standalone app. This creates a "chicken-and-the-egg" problem because bluechip companies are unlikely to integrate RealOne unless it has widespread use, and RealOne cannot gain widespread use unless it is easily accessible to the masses who are aware of its potential.

Privacy: Users will need to be aware that their media files are being uploaded and minted into NFTs which may contain data such as their name and location. Many users may not want to opt-in to this for privacy reasons. Lack of opt-in will further reduce adoption.

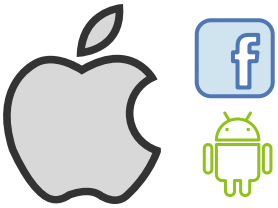
Costs: RealOne may have high costs of implementation. It would have to have enough cash reserves to cover minting fees while awaiting adoption and revenues from other websites. RealOne would also require substantial processing power to mint NFTs and utilize AI to process API calls.

Next Steps



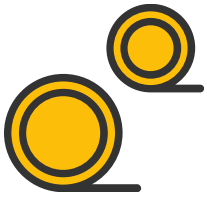
Create Proof of Concept / Minimum Viable Product

The first step is to develop a streamlined version of RealOne to demonstrate that it can create immutable and incorruptible NFTs and that third party websites can verify the authenticity of the NFT through API calls. The first iteration of RealOne would likely be limited to exact matches, and AI capability would later be added for more nuanced trustworthiness grades



Partner with Early Adopters

Once RealOne has shown proof of concept, we can provide incentives to influential partners to assist in its adoption. RealOne could provide no fees and/or profit sharing with leading companies. Apple's emphasis on privacy could make a partnership with RealOne enticing. Facebook could see RealOne as an important tool to combat misinformation. Its parent company, Meta, would find the proliferation of NFTs critical to building out the metaverse. Dating websites could require users to use RealOne NFTs to combat catfishing



Incentivize Community

RealOne could incentivize adoption at a grass roots level by building out an NFT marketplace to provide a cheap and effective way for users to create and sell NFTs. The seller can list their NFT on the marketplace for a price and ownership of these NFT's can be the key to a community. The community will benefit from network effects where you are able to converse and attend events with members who also own similar NFTs.