THE CONTRIBUTION OF THIRD-PARTY INDICES IN ASSESSING GLOBAL OPERATIONAL RISKS*

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In the face of global uncertainties and a growing reliance on third-party indices to obtain a snapshot of a country's operational risks, we explore the related questions: How accurately do third-party indices capture a country's operational risk, and how does the operational risk of the country, in turn, affect the volume of its import and export supply chains? We examine these questions by empirically investigating 81 member countries of the World Trade Organization (WTO) using archival data collected from UN agencies, independent think tanks, the WTO, and the Economist Intelligence Unit. We use seven third-party indices to gauge a country's internal environment and map those indices to corresponding country-specific operational risks to further understand the consequent effects of those operational risks on trading volume. Results provide strong evidence for the use of certain third-party indices in assessing operational risk. In addition, operational risks are found to negatively affect the volume of import and export supply chains, albeit in varying degrees.

Keywords: supply chain management; risk/risk assessment; strategy development; archival research; regression analysis; partial least squares

INTRODUCTION

Risk assessment is an essential component in supply chain planning. While newfound promises from globalization have ushered in a vast network of countries actively pursuing global trade, uncertainties remain. As supply chains spread globally, risks of operational disruptions become costlier and less controllable. *Operational risks* abound: maritime attacks in the Gulf of Aden, H1N1 in Mexico, SARS in Hong Kong, currency crisis and supplier insolvency in Argentina, credit meltdown in Iceland — just to name a few. These are risks that supply chain managers consider in making offshoring and trade-partnering decisions across countries. Consider that even a reputed supplier in Pakistan will fail to secure a contract because of the operational risks from a fragile government and the Taliban insurgency in the Swat valley. In short, *the country* offers an institutional aegis for any firm intent on participating in the global economy. Unless country-level assurances are available, firms would shy away from trading with clients and suppliers based in a country with high operational risks. Such assurances include the rule of law, the element of due process, an established court system, intellectual property protection,

financial liquidity, and currency stability, among others. Perhaps that has been a reason why firms from certain countries establish corporate (not operational) headquarters in stable Western economies. As Bryan Squibb, managing director of Aon Trade Credit, rightly notes, "understanding the nature of supply chain risk exposures, and where they occur most frequently, is now a board-level priority" (*Supply Chain Digest* 2006).

Operational risks and third-party indices constitute the core of our discussion. Extending the Basel (Basel Committee on Banking Supervision [BCBS 2008] definition, we define operational risk in commercial supply chains as *the calculated loss resulting from adverse shifts across one or more activities in a global supply chain owing to inadequate or failed assessment of processes, people, systems, and external events that can disrupt the commercial flow of information and materials.* In global supply chains, operational risks encompass disruptive threats tied to a trading partner's country of origin. These operational risks stem from governance problems, geographic separation and cultural gaps between trading partners, and bipartite limitations of communications in information transparency (Aron, Clemons and Reddi 2005). In short, a lack of arms-length transactions, imperfect and asymmetric information, risk of the loss of intellectual property, costs of monitoring reliability, quality and threats, and operating in regulatory

FIGURE 1
An Overview of the Proposed Model
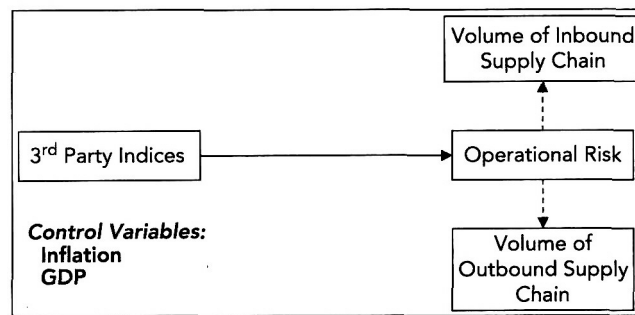
mazes are just a sample of the myriad economic, technological, sociocultural and political uncertainties that can affect the performance of global supply chains. Therefore, an improved understanding of country-level operational risks is essential as a prelude to global sourcing and trading.

Operational risks stymie import and export supply chains by the closing of or tight control and quarantine over incoming goods and services via air, land or water. Note that Canadian trade suffered a loss of US$515 million in 2003 from SARS; Avian flu led to a loss of US$10 billion to South-East Asian economies; and Mexico continues to lose US$57 million per day from operational threats related to the H1N1 virus (Shah 2009). In fact, 2 days after the H1N1 virus was defined as a pandemic, the United States closed all trucking routes to and from Mexico. Facing growing uncertainties across stretched commercial supply chains, third-party indices can aid managers in making important supply chain decisions, from contracting to selecting suppliers across the globe. These indices can complement internal supplier assessments by providing firms with more complete information as a prelude to supplier selection, thereby supplementing existing efforts in supply chain risk management.

As assessment yardsticks, measures for the internal environment of a country can provide crucial information as harbingers to operational risks. Third-party indices provide a multifaceted view of a country's internal environment (Aron et al. 2005). These third-party indices provide numerical rating measures for the purposes of comparative assessment and decision-making as precursors to global supply chain planning. Moreover, these indices are developed by independent third-party organizations and agencies espousing unbiased, universal affiliations.

Merits of these third-party indices have been emphasized in circles of practice and policy. For example, information and financial transparency indices have been linked to global trade to an extent that, during volatile economic conditions, companies rush out of highly opaque countries (Gelos and Wei 2006). Take, for example, the rampant maritime piracy in the Gulf of Aden and how that has disrupted commercial supply

chains. Ongoing disruptions and operational risk considerations are forcing companies to restructure contracts and re-envision supply routes by foregoing the Suez Canal to sail around the Cape of Good Hope. This increases costs and lead times by adding approximately 5,500 miles and 20 days. Yet, central to the supply chain disruption from piracy is the political instability in Somalia, best highlighted by third-party indices.

While policy groups (e.g., agencies such as UNDP and World Trade Organization [WTO]) and major firms rely on third-party indices to aid supply chain-related decision-making and policy formulation, these indices have received little attention in supply chain research. Nonetheless, in a flat and uncertain world, it is useful for practitioners and researchers to enquire: *to what extent do third-party indices explain operational risk in countries, and what consequences do operational risks have on the "volume" of a country's import and export supply chain?* In answer to our enquiry, we explore an empirical framework (refer to Figure 1 for a preliminary overview) and empirically test our contentions using archival data[1] collected on 81 member countries of the WTO, gathered from UN agencies, independent think tanks, the WTO and the Economist Intelligence Unit (EIU).

The remainder of this paper is organized as follows: "Theoretical Underpinnings" discusses the theoretical underpinnings leading to our proposed model. "Conceptual Framework and Hypotheses" develops hypotheses core to the proposed model. "Research Design, Analyses, and Results" discusses the research design, analyses and results. "Discussion and Contribution" concludes the study with a discussion of the results and contributions of this study.

THEORETICAL UNDERPINNINGS

We use Transaction Cost Economics (TCE) (Williamson 1985) as the theoretical underpinning for examining underlying governance mechanisms and assessing operational risks across global supply chains. TCE specifically

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[1]The authors will make their dataset publicly available, on request.

draws attention to the cost of contracting, monitoring and safeguarding under the threat of *opportunism* — a trait where parties leverage information asymmetry to the disadvantage of the other (buyer or supplier) (Williamson 1985; Rindfleisch and Heide 1997; Van Oosterhout, Heugens and Kapstein 2006; Datta and Chatterjee 2008). Because risks from opportunism increase transaction costs (tighter contracts, heightened monitoring), gauging the risks of doing business with a country is essential (March and Shapira 1987; Lee and Billington 1992; Landeghema Van and Vanmaele 2002; Cavinato 2004; Enyinda, Ogbuehi and Briggs 2008). Threats of opportunism and information asymmetry further contribute to uncertainty, noted as "neither ignorance nor complete and perfect information but partial knowledge" (Knight 1985, p. 199; Datta and Chatterjee 2008). In the scope of our discussion, assumptions underlying TCE surface the costs of transacting under threats of opportunism from countries participating in global supply chains. Thus, under assumptions of information asymmetry and opportunism, firms need to rely on credible sources of information that can alleviate transaction costs by offering crucial and (relatively) complete information on transacting with (parties operating in/ from) a country.

Williamson (2008) further establishes the relevance of TCE in the supply chain context. Williamson's research focuses on transactions in a supply chain as the fundamental unit of analysis. Transactions are grounded in contracts involving more than one party across the supply chain. Williamson (2008) points out that supply chain transactions are driven by opportunism and self-interest that capitalizes on information asymmetry. An opportune party in the supply chain transaction will try to create complex contracts that are incomplete or prohibitively difficult to monitor in global supply chains (Lamming, Caldwell, Harrison and Phillips 2006). As such, the prevalent market (buy) contracting in commercial supply chains has to assume that opportunism exists and that the other party will leverage its position on incomplete and asymmetric information. After all, "the market-mode features high-powered incentives, little administrative control and a legal-rules contract law regime, which combination is well suited to implement autonomous adaptations but poorly suited to effect co-operative adaptations" (Williamson 2008, p. 8). In the scope of our discussion, countries and market suppliers originating from a country will tend to portray *asymmetric and incomplete* highlights of their country's environment to secure contracts.

Apart from peremptory "muscular" buyers who can create stringent contracts to their own advantage, benign and credible buyers are likely to make suboptimal decisions in relation to their supply chain contracting (Williamson 2008). As implied by Williamson, in commercial supply chains, information asymmetry

about a country can lead to unintended operational risks from unforeseen contingencies, myopia in contracting and undue supply chain complexities. The calculus of credibility therefore requires firms to rely less on the supplier's promotion of their country and more on independent third-party assessments of a country for hazard mitigation, transparency, relatively credible commitments[2] and most of all, reducing information asymmetry in an attempt to mitigate opportunism.

Opportunism based on information asymmetry is a form of deception. In market transactions, opportune parties in "business-seeking" countries will try to capitalize on the bounded rationality of the other party by revealing incomplete information to mislead or deceive the party into contracting with them. For example, in 2008, Argentina was providing deceptive inflation statistics by removing products whose prices rose too sharply from its consumer price index (CPI). As a result, the Argentine government misinformed (deceived) international stakeholders by showing a 0.6 percent inflation when, in reality, inflation was in the double digits (The Economist 2008). While the Argentine Central Bank engaged in underreporting real inflation for over two years, third-party statistics (e.g., INDEC) signaled the misinformation. If firms were to transact on the basis of the inflation rates offered by the Argentine government, their supply chain transactions would be contracted on deceptive premises. Given the amorphous nature of self-reported measures by countries and suppliers to obtain contracts, reliable third-party information can mitigate deception in competitive environments (Spence 2002). Therefore, for a third-party index to be credible, it has to provide "reliable" information cues.

Reliable information from third-party indices offers tremendous decisional benefits in the face of information asymmetry across various operational facets — including supply chain transactions and coordination. Reliable information gained from the indices needs to be more than redundant and reinforcing — it must credibly fill the information gap created by asymmetric and incomplete information. Therefore, because third-party indices claim to offer reliable information to mitigate uncertainty from information asymmetry and opportunism, their reliability and credibility become core to assessing operational risks in countries.

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[2]It is worthwhile to mention here that the entire notion of TCE is built on asymmetric information between two transacting parties. It thereby comes as no surprise that one of the salient features of a governance structure, in order to mitigate asymmetry, would be to institute transparency in the transactional process (Lamming et al. 2006). In fact, transparency has gained a lot of momentum with research in all supply chains that aim for a global reach. As an example, Roth et al. (2008) sketch the vulnerability of global food supply chains with poor visibility.

CONCEPTUAL FRAMEWORK AND HYPOTHESES

We begin this section with an illustration of the relationship between a country's internal environment,[3] operational risk and trade. This paper defines internal environment of a country in light of (i) information environment (*transparency*), (ii) business environment (*relational continuity, economic freedom,* and *financial standards and compliance*) and (iii) socioeconomic environment (*political rights and liberties, governance performance* and *economic growth*).

Information Environment and Operational Risk

The information environment of a country refers to information transparency related to governance of its internal environment. Countries with a transparent information environment allow open access to information, have fewer restrictions on information dissemination, take significant steps to bridge the digital divide and publish accurate and reliable information.

As a dimension of transparency, corruption is closely tied to operational risk. Rose-Ackerman (2006) remarks on bid rigging, tender forgeries, political pressures and rampant bribery as serious operational risks and impediments to trade. Similarly, in examining operational practices among utility companies in South America, Bo and Rossi (2007) find that corruption adversely affects operations and limits economic progress, noting that "corruption may ultimately determine the viability and health of business in any given country." Timeliness, periodicity and coverage of disclosures relate to operational risks by continuously conveying useful and complete information on time. Gelos and Wei (2006) find that transparency from disclosures allows markets to react on time. Moreover, disclosures mitigate information asymmetry and reduce operational concerns and risk.

Finally, given that countries have unique deduction techniques, a transparent assessment of the way data has been collected and analyzed toward the disclosures is equally important. For example, the Argentine government decided to remove sharply rising item prices in its CPI to understate its inflation. Similarly, at the core of Dubai's current liquidity crisis is Dubai promoting itself as a haven for opening businesses while obfuscating the hassles of closing businesses where "any creditor foolhardy enough to test the regime can expect to recover just ten cents on the dollar" (The Economist 2009). Given that countries use unique deduction techniques to conveniently promote themselves, transparency of the deduction techniques (including data collection, analysis and information dissemination) and the information environment is important. This information allows interested parties to gauge

the accuracy, validity and reliability of the information. Unless reliability of disclosed information can be assessed, operational risks remain from a lack of assurance on a country's internal environment. Therefore, we argue:

H1: Countries with more transparent information environments will have less operational risks than countries with less transparent information environments.

Business Environment and Operational Risk

The business environment of a country aims at maximizing sustainability (economic freedom and relational continuity) and creditworthiness (financial standards and compliance) of a country's internal environment to reduce operational risks.

Economic Freedom. Economic freedom is the fundamental right of every human to control his or her capital, labor, property and enterprise. In economically free societies, governments allow labor, capital and goods to flow freely (Heritage Foundation 2009). A decade ago, Colombia was a nation in turmoil; ruled by drug kingpins, narcofunded leftist terrorists and guerrillas and far-right paramilitaries. Today, with the "Build Colombia" economic freedom program, Columbia trains employers in proactively ensuring compliance with all Colombian labor laws on occupational safety, child labor, working hours and other issues of concern to Colombian workers. The International Labor Organization's (ILO) report on the Colombian government's push toward economic freedom breathed new life into Columbian trade (Griswold and Hidalgo 2008; Roberts 2009) as investors perceived less operational risks. We thus posit the following:

H2: Countries with more economic freedom will have less operational risk than countries with less economic freedom.

Relational Continuity. A fundamental premise of maintaining a sustaining or going concern is a set of good business rules overseen by an efficient regulatory system that is accessible to users and simple to understand. Relational continuity establishes sustainable business development in a country by considering aspects related to the incorporation, operation and dissolution of business as one proxy for assessing a country's internal environment related to economic governance (Business Indicator Index 2009). For example, in Norway, it takes five procedures, 5 days and 2.6 percent of annual income per capita in fees to open a business. In contrast, Argentina is a paradox. "The failure of Argentina, so rich, so under-populated, twenty three million people in a million square miles, is one of the mysteries of our time," wrote the Nobel Laureate V.S. Naipaul. It takes 15 procedures and little more than a month to open a business in Argentina! Thus, when all economies under the WTO are ordered by their average percentile ranks, Norway is in 10th place, while Argentina is a distant 111th (Business Indicator Index 2009) — increasing perceptions

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[3]For the purposes of this paper, we use the term "internal environment" synonymously with concepts of "governance environment" and "institutional environment."

of operational risks from bad economic governance. Therefore, we argue:

H3: Countries with higher relational continuity will have less operational risk than those with lower relational continuity.

Financial Standards and Compliance. Stability of capital markets is a prerequisite for operations. Failing financial standards and compliance, including liquidity crises, mismanaged money supply and capital flow manipulation are serious operational risk concerns for any firm intending to establish business relationships in a country.

The index of financial standards and compliance gauges a country's internal financial environment constituting its (i) reporting standards, (ii) banking system and (iii) regulatory system. A country failing in one or more of the aforementioned aspects creates a risky operational proposition for business. Consider wanton financial deregulation in Iceland. Iceland, with little regard to its currency, the *Krona*, had committed itself to borrowing and investing heavily in other international currencies — making loans 9–10 times the size of their own Gross Domestic Product (GDP). Lax regulations, coupled with marginal reporting and compliance led to the mortgage meltdown, bringing Iceland to the brink of bankruptcy and overthrowing the government behind the financial deregulation (The Economist 2008). The financial meltdown further led to a scuttled pullout of businesses — fearing risks of operating businesses without credit availability, in financial turmoil and with uncertainties surrounding money flow.

A global economy hinges on standards related to financial transactions and reporting that offers a degree of accounting transparency and ensures accurate information related to a country's financial environment. Similarly, a stable banking system with well-defined regulations effectuates free flow of capital. Thus, financial standards and compliance symbolize a country's creditworthiness to its investors, and increased creditworthiness reduces country-specific operational risk. We thus posit:

H4: Countries with higher financial standards and compliance will have less operational risk than countries with lower financial standards and compliance.

Socioeconomic Environment and Operational Risk

The socioeconomic environment of a country aims at establishing *freedoms* of expression, association and beliefs among its citizens, thereby enhancing *governance performance* to stimulate *economic growth* and reduce operational risks.

Political Rights and Liberties. Freedom House (2009) defines political rights and liberties in the light of a democratic political system in which the government is accountable to its own people, the rule of law prevails and freedoms of expression, association and belief, as well as respect for the rights of minorities and women are guaranteed. For example, companies consider it risky sending their female executives to countries with laws requiring women to wear *burkhas* (e.g., Saudi Arabia) or *chadors* (e.g., Iran). The freedom of press in Pakistan is a case in point. In November 2007, Pakistan ex-President General Pervez Musharraf declared a state of emergency, suspending the constitution and dismissing the chief justice. The political unrest stemming from a state of emergency deterred businesses from setting up operations in Pakistan. In short, doing business in a region without the freedom of speech, respect for humanity and presence of constitutional (rather than religious) law is often deemed risky. Thus, we contend:

H5: Countries with more political rights and liberties will have less operational risk than countries with less political rights and liberties.

Economic-Political Governance Performance. Economic-political governance performance refers to sustainable economic development supported by a solid institutional framework necessary to fight poverty, establish equal opportunity and thus compensate for harsh social conditions (Bertelsmann 2008).

The Bertelsmann Transformation Index ties overcoming absolute poverty to a more secure market-based democracy. Democratic norms of accountability help protect the viability and legitimacy of the economic system from being undermined by distributional conflicts among social and economic actors that can increase disparity and poverty. A measure of *absolute poverty* quantifies the number of people below a poverty threshold that is independent of time and place. For the measure to be absolute, the line must be the same in different countries, cultures and technological levels. World Bank draws the International Poverty line at US$1.25/day; based on this measure, 42 percent of Indians live below the poverty line, the highest rate in South Asia. Because the ratio of per capita consumption to per capita population equates to poverty, it comes as no surprise that the population of India is a beast to reckon with in this regard. However, India's efforts toward social justice and equal opportunity have been regarded as a positive strand in its economic-political governance. Better economic-political governance creates a conductive operational environment that can, over time, raise the overall living standard and alleviate poverty. This allows us to hypothesize:

H6: Countries with higher levels of economic-political governance will have less operational risk than countries with lower levels of economic-political governance.

Economic Growth. Economic growth is closely tied to economic competitiveness (Porter 2000) and is more than a mere increase in GDP. Economic growth reflects the economic productivity of a country over time, typically measured using indicators such as real GDP forecast,

FIGURE 2
The Conceptual Model
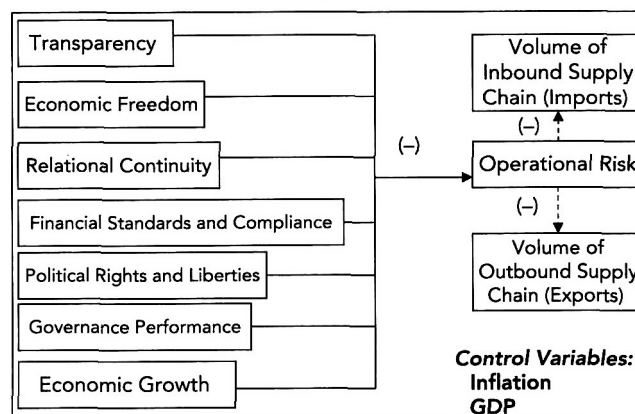
unemployment, education and health (World Economic Forum 2008). Economic growth has to be calculated in real, inflation-adjusted terms such that the effect of inflation on economic performance is accurately discounted.

A case in point is the economic growth in Bangladesh from the period of 1947–71. Initially founded as East Pakistan in 1947, political unrest, inflation, severe unemployment, lack of birth control and a largely illiterate workforce have plummeted economic growth and created an operational quagmire. Malaysia, on the other hand, with its established educational institutions, industrial development and healthcare initiatives, created an environment conducive to international business operations. As a result, Malaysia enjoys economic growth relatively higher than its neighbors. Thus, we contend that higher economic growth enhances stability and reduces operational risk.

H7: Countries with higher economic growth will have less operational risk than countries with lower economic growth.

Operational Risk and a Country's Import and Export Supply Chains

We use the terms *import supply chain* and *export supply chain* to point to the volume of merchandise imported by and exported from a country. We argue that the volumes of country's import and export supply chains are best manifested in its trade patterns to and from its shores (notwithstanding its internal supply chain), respectively. The perception of high operational risk of a country limits other countries from trading with it. There are risks of insolvency (e.g., Iceland, post-financial meltdown), embargoes (e.g., North Korea, Cuba) and unfair expropriation (e.g., Zimbabwe), among others. The sampled examples point to the fact that operational risks, at the very least, chafe the patterns of trade flows in countries. Arguing that volumes of merchandise imports and ex-

ports reflect the "volumes" of import and export supply chains, respectively, operational risks can truly impede a country's import and export supply chains Figure 2.

The growth of the Internet has increased information dissemination and the slightest hint of operational disruptions can risk immediate spread across the globe and sway business decisions. From disease outbreaks and credit constraints to electoral violence, terrorist threats and coercive posturing, operational risk information constantly shapes supply chain decisions.

While a country's operational risks have a negative bearing on the volume of its import and export supply chains, it is interesting to note that the effect is unequal. Consider Mugabe's 2000 coercive land distribution reform that triggered the country's operational risk (Clemens and Moss 2005). Robert Mugabe, the president of Zimbabwe, misused Zimbabwe's 1992 Land Reform Act to nationalize the farmland and coercively remove existing landowners without compensation or legal recourse. The land was badly parceled and redistributed to government members and their families who had no training or interest in agricultural operations. In a short period, the "bread basket" of southern Africa plummeted into starvation and famine. Zimbabwe, the sixth-largest producer and exporter of tobacco, a cash crop, fell to its lowest levels in 50 years. Investors perceived operational risk and withdrew their capital, original landowners migrated and the government forced banks to lend to the new, untrained landowners with high default risk. Risks of operations affected Zimbabwe's internal production acutely. Corn production, Zimbabwe's largest export produce that had helped build its agrarian supply chain, was approximately halved in a few years. Even more astounding is that Zimbabwe, once a major exporter of corn, became a net importer (Madslien 2008). Operational risks often choke internal business and production, some of which are intended for the country's internal market. If opera-

tional risks deter supply to the internal market, the country has to rely on importing merchandise to serve its population but fails to secure international buyers who abstain due to operational risks. A country's export supply chain therefore remains more sensitive and vulnerable to internal operational risk shocks than its import supply chain. Thus, we hypothesize:

H8: Higher operational risks negatively impact a country's import and export supply chain volume.

H9: Operational risks will affect a country's export supply chain volume more adversely than the country's import supply chain volume.

Control Variables

For this study, we have chosen inflation and GDP as our control variables. Core inflation is measured by the CPI. The measured inflation rates, coupled with uncertainties in future demand conditions and control measures, directly impact trading (Bauer, Haltom and Peterman 2004). High inflation typically leads the government to induce measures that prove to be detrimental to trade. A case in point is Argentina where, in late 2005, a 6-month ban on beef exports and higher agricultural

export taxes were designed to boost local supplies. On the other hand, since country-specific GDP is widely used as a source of information in all the third-party indices used in this paper, its inclusion as a control variable comes as no surprise.

RESEARCH DESIGN, ANALYSES, AND RESULTS

We empirically investigate 81 member countries of the WTO using archival data collected from UN agencies, independent think tanks, the WTO and the EIU. We use a host of seven third-party indices (Tables Ia and Ib) to gauge a country's internal environment, map those indices to corresponding country-specific operational risk (data obtained from EIU) and investigate the consequent effects of operational risk on trading volume. Our sample of 81 countries out of the 153 WTO member nations is approximately 52 percent of the WTO members. We have 10 countries from Africa, 18 from Asia, 9 from Eastern Europe, 7 from the Middle East, all 3 countries in North America, 12 from South America and 22 countries from Western Europe. It is thus

TABLE IA

Constructs and Indices

Internal Environment	Factor	Construct	Function of ...	Index [Variable Definition in Parentheses]
Information environment	X1	Transparency	Timeliness of disclosure Periodicity and coverage Corruption Quality of statistics to support standards	Transparency International's Corruption Perception Index [TICRIndx]
Business environment	X2	Economic freedom	Import-export restrictions Labor flexibility Capital infrastructure	Heritage Foundation Economic Freedom Index [HFEFIndex]
	X3	Relational continuity	Ease and turnover of Business cycle	Business Indicator Index [BIIndex]
	X4	Financial standards and compliance	Reporting standards Banking system Regulatory system	Moody's Credit Rating [Moody]
Socio-economic environment	X5	Political rights and liberties	Democracy Legal system Gender equality Freedom and respect	Freedom House Index [FHIndex]
	X6	Governance performance	Market Economy Poverty Population	Bertelsmann Transformation Status Index [BTSIndex]
	X7	Economic growth	Real GDP forecast Unemployment Education Health	World Economic Forum Global Competitive Index [WEFGCIndex]

TABLE IB

Explanation of Indices in the Study

Index name (Criterion)	Criterion Attributes	Type of Data	Data Source	Method of Collection	Frequency of Update	Common Usage
Transparency International's Corruption Perception Index (CPI)	Timeliness of disclosures; Periodicity and coverage; Corruption; Quality of statistics to support standards	Ranked, frequency data (from low to high transparency)	Country experts (7 sources, e.g., EIU) and business leaders (3 sources, e.g., IMD)	Meta survey of 13 surveys from 10 sources	Annual	Global corruption; Bribery watch; Promoting revenue; Transparent reporting
Heritage Foundation's Economic Freedom Index (EFI)	Import–export restrictions; Labor flexibility; Capital infrastructure	Continuous (Ratio type, rate; from low to high freedom)	World Bank, EIU, U.S. Department of Commerce, Government Publication from each country	10 components of economic freedom are equally weighed and averaged	Annual	Economic performance; Economic freedom
Financial Standards Foundation's Business Indicator Index (BII)	Ease of business cycle; Turnover of business cycle	Ranked data by degree of compliance (from low to high "ease of business")	12 business indicators (e.g., FOREX, US foreign investment Law, US trade regulations)	Sum scores from 12 business indicators to rank against a standard	Annual	Adherence to global standards; Country risk profile
Moody's Credit Rating (Moody)	Reporting standards; Banking system; Regulatory system	Ranked data (from low to high financial standards)	Sovereign Default and Recovery rates, Moody's financial metrics key ratios	The risk is assessed based on Moody's key ratios and comparison to rates; a rating is then applied to the assessed risk	Annual	Political Risk; Risk of investing in a foreign land
Freedom House Index (FHI)	Democracy; Legal system; Gender equality; Freedom and respect to minorities	Numerical rating, ranked by countries (from low to high rights and liberties)	Analytical reports from 193 countries in 16 territories	Survey; numerical ratings for both political rights and human liberties are assigned for ranking	Annual	Democratic values; Political rights; Civil liberties
Bertelsmann's Transformation Status Index (TSI)	Market Economy; Poverty; Population	Ranked data, by market economy and management performance (from low to high governance performance)	Analytical assessment on 17 criteria pertaining to market economy and performance, across 128 countries	The 17 criteria are subdivided into 52 questions; mean value of the answers are ranked	Annual	Best practices in constitutional democracy; Practices in socially responsible market economy; Efficient political management for boosting international trade

TABLE IB Continued

Index name (Criterion)	Criterion Attributes	Type of Data	Data Source	Method of Collection	Frequency of Update	Common Usage
World Economic Forum's Global Competitive Index (GCI)	Real GDP forecast Unemployment health	Ranked data, frequency (from low to high economic growth)	Publicly available data for 134 countries and the "Executive Opinion Survey" conducted by World Economic Forum annually in these countries	A polling of over 12,000 business executives worldwide (courtesy, Executive Opinion Survey)	Annual	Impediments to economic growth Strategies to achieve sustained economic progress

safe to assume that our dataset is neither regionally nor geographically biased. The sample is representative of the WTO member set and, hence, unlikely to taint any inferences in our study. The country list can be found in the Appendix.

We start off the discussion in this section with a detailed framework of the various indices used, and their respective mapping with the constructs conceptualized in the previous section (Tables Ia and Ib).[4]

Consider the measurement for a country's information environment in Table Ia. We define information environment of a country in terms of the transparency of information interchange. Since its inception in 1993, Transparency International, a global civil society organization, has been leading the fight against corruption. Transparency International's Corruption Perceptions Index measures the perceived level of public-sector corruption in 180 countries and territories around the world. The corruption perception index is a "survey of surveys," i.e. a meta survey based on 13 different expert and business surveys (Table Ib). Transparency International ranks these countries based on their timeliness of disclosure, periodicity and coverage of information, level of corruption, and the quality of statistics used to support these standards.

This study does not suffer from common method bias given the multiple sources of independent archival data collected via different, comparative methods (refer to Table Ib; Campbell and Fiske 1959). Given that the data originate from independent sources and observations, there is no propagated bias from the use of a common method to assess the antecedents and outcomes. The third-party indices used in the analysis are world bodies with global data, and are hence devoid of any country specific bias. The country-specific operational risk data were collected from fact sheets of the EIU, a premier global source of economic data. Finally, we used merchandise exports and imports as proxies for the volume of export and import trade volumes of a country; the data were obtained from fact sheets of the WTO.

Because the third-party indices have different scaling systems (as an example, the Heritage Foundation Economic Freedom Index uses a 100-point scaling system, while both the Freedom House Index and World Economic Forum Global Competitive Index use a seven-point scale), we normalize all variables in our analysis into a 10-point scale. To diminish the bias of export or import volume due to size of the country itself, we normalize the raw merchandise export/import data by taking a ratio of the per capita export/import to the per capita GDP of respective countries.

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[4]The Business Indicator Index (BIIndex) is courtesy of Financial Standards Foundation.

Choice of a Statistical Method

This research is a novel exploration of supply chain challenges in risky global settings. In exploratory research settings, partial least squares (PLS) regression has been well established as a suitable *component-based* modeling technique (Hulland 1999; Diamantopoulos and Winklhofer 2001; Hsu, Chen and Hsieh 2006). In particular, we find PLS to be appropriate because of the following:

First, PLS is fitting for novel exploratory studies where the research aims to surface relationships rather than confirm theory. *Covariance-based* structural equation models (SEMs) such as LISREL or AMOS are more suited for theory confirmation where the focus is on parameter estimations.

Second and more importantly, in exploratory studies where the multivariate model implies *logically common causes* and *correlated errors*, PLS is more appropriate than covariance-based SEMs. While there are methods such as full-information maximum likelihood (FIML) and three-stage least squares (3SLS) that consider cross-regression correlation in order to increase efficiency, they are partly inoperable because of their failure to provide a k-step estimation procedure when estimating multiple equations with logically common causes and correlated errors. While this study has sample size limitations ($n=81$), it is not the primary driving logic for using PLS. Although studies have often cited sample size limitations as the reason to choose PLS (e.g., Hoe 2008), the appropriateness of PLS in this study centers on the presence of logically common causes and correlated errors.

Third, the PLS technique is not limited by distributional restrictions on data while covariance-based SEMs require multivariate normal distribution and can suffer from factor indeterminacy problems and inadmissible solutions (Hsu et al. 2006).

We thus report results from a combined analysis using both PLS regression as well as ordinary least squares (OLS) regression on our dataset. While the OLS platform provides robustness and seeks linear functions of the predictors in our model to explain as much variation in each response as possible, the PLS platform adds to the accountability when the predictors are correlated. In regards to establishing the effect of mediation, we use the theories put forward by Judd and Kenny (1981) and Baron and Kenny (1986) to test the mediation effects[5] of operational risk on the relationship between a country's internal environment (based on third-party indices) and its volume of import and export supply chains.

Test of Assumptions

This study assumes linearity[6] between the antecedent and outcome variables. Following Neter, Wasserman and Kutner (1990), the two assumptions of linearity are that (i) our dependent variable (Y), Operational Risk, is a *continuous* variable and (ii) the independent (X) variables used in our model are *fixed* (the values of X are measured without error; this is a valid assumption based on the authenticity of data sources for our indices). Therefore, it is appropriate to use a linear specification to test our hypothesis.

As noted, a linear regression technique using ordinary least squares serves the purpose of our study. We use the following model specifications to test our hypotheses with corresponding variable definitions explained within parentheses in Table I.

$$\text{Operational Risk} = \beta_0 + \beta_1 \text{TICRIndx} \\ + \beta_2 \text{HFEFIndex} + \beta_3 \text{BIIndex} \\ + \beta_4 \text{Moody} + \beta_5 \text{FHIndex} \\ + \beta_6 \text{BTSIndex} \\ + \beta_7 \text{WEFGCIndex} + \varepsilon$$

$$(1)$$

where β_0 is the Intercept, β_1 is the Population estimate for Transparency (TICRIndx), β_2 is the Population estimate for Economic Freedom (HFEFIndex), β_3 is the Population estimate for Relational Continuity (BIIndex), β_4 is the Population estimate for Financial Standards and Compliance (Moody), β_5 is the Population estimate for Political Rights and Liberties (FHIndex), β_6 is the Population estimate for Governance Performance (BTSIndex), β_7 is the population estimate for Economic Growth (WEFGCIndex), ε is the Unexplained Error.

The relationship between operational risk and the volumes of a country's import and export supply chains were similarly specified by regressing the exports and imports on operational risks as shown here:

$$\text{Export} = \beta_8 \text{Operational Risk} + \beta 10 + \varepsilon \quad (2)$$

$$\text{Import} = \beta_9 \text{Operational Risk} + \beta_{11} + \varepsilon \quad (3)$$

where β_{10}, β_{11} are the Intercepts, β_8, β_9 are the Population estimates for operational risk.

The model diagnostics indicate that our specification is accurate. The validity of the regression model was confirmed by checking the three assumptions of residuals as defined by the Gauss-Markov theorems: (i) normally

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[5]The heuristics follow a four-step process (Baron and Kenny 1986): step 1 establishes an effect that may be mediated; step 2 treats the mediator as an outcome variable; step 3 establishes the coexistence of the mediator and the input variables in explaining the outcome; finally, step 4 explains the extent of mediation.

[6]The assumption of linearity is underpinned by the choice of a linear regression as a robust technique. While it is difficult to accurately establish linearity (somewhat mitigated with bivariate plots), multiple regression analysis is not largely affected by minor deviations in the linearity assumption (Neter et al. 1990).

TABLE II

Normality and Zero Mean

Regression error average	0.00
Standard deviation of errors	0.52
D statistic	0.0836
D critical at 1%	0.0894
D critical at 5%	0.0962
D critical at 10%	0.1146
Null hypothesis: The errors are normally distributed. Conclusion: The errors are normally distributed at the 1% α level.	

FIGURE 3
Heteroschedasticity

Residual by Predicted Plot

distributed residuals, (ii) errors have zero mean (refer to Table II) and (iii)[7] errors have constant variance. Figure 3 below validates that the residuals are evenly distributed between ± 1 (with one outlier).

RESULTS

Table III presents the descriptive statistics of the variables of interest. Table IV presents the estimation results of the three models from OLS regression, as presented in the equations (1), (2) and (3), respectively. As Table IV below suggests, all the three models (from equations 1, 2 and 3, respectively) hold true at a 5 percent level of significance.[8]

Table V below shows the OLS regression coefficients and their respective significances, along with the explained variation of the regression model.

Table VI shows the PLS regression coefficients and their respective significances, as depicted in Wold's Variable Importance Plot (VIP; Wold 1985). The statistics summarize the contribution a variable makes to the model. If a variable has a small coefficient and a small VIP, then it is a candidate for deletion from the model. Wold (1994) considers a value of 0.8 to be a small VIP.

We now describe the results for each of our hypotheses and focus only on the estimation of our hypothesized model in Figure 2. Hypothesis 1 argues that higher transparency reduces operational risk of a country. The coefficient of transparency is significant and negative in the model ($\beta=-0.408$, $p<0.05$; Table V). Hence, our results support this hypothesis. Similarly, Hypotheses 3–6 are also supported by our results.

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[7]The fourth assumption regarding autocorrelation was relaxed since the data was not time series.

[8]As an additional validation step, we tested the relationship between operational risk and the volumes of a country's export and import supply chains by looking at export and import data of the 81 countries in our dataset for two consecutive years. The results mimic our current findings. The results are omitted for purposes of brevity and are available from the authors upon request.
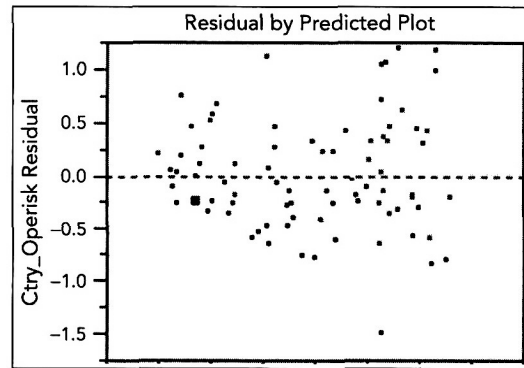
Hypothesis 2 argues that greater economic freedom reduces operational risk. However, our analysis shows that the coefficient of economic freedom is not statistically significant even though the direction of hypothesized causality is maintained ($\beta=-0.029$, $p>0.05$; Table V). The fact that our results do not follow the hypothesis can be attributed to the fact that the Heritage Foundation Index, widely used as a proxy for economic freedom, is probably not a sufficient indicator of true economic freedom. The next section discusses this anomaly in detail.

Hypothesis 7 argues that a higher economic growth reduces operational risk. However, our results show that while the coefficient of economic growth follows the same direction of causality, it is statistically insignificant ($\beta=-0.028$, $p>0.05$; Table V). Thus, the results do not support this hypothesis.

PLS, by the assumption of orthogonality of its latent factors, mitigates the threat of multicollinearity between our explanatory variables. However, with this added assumption, PLS also loses some robustness as compared with OLS. With PLS regression, all our explanatory variables except "Political Rights and Liberties" turned out

TABLE III

Descriptive Statistics

	Mean	Standard Deviation
Transparency	4.98	2.3
Economic freedom	6.42	1.02
Relational continuity	6.76	2.05
Financial standards and compliance	5.86	2.97
Political rights and liberties	3.81	2.57
Governance performance	7.3	1.73
Economic growth	6.35	0.97

TABLE IV

Test of Models

Model	Criterion	Predictor(s)	F Ratio	Probability
Model I	Operational risk	Third-party indices	105.59	< 0.0001*
Model II	Export	Operational risk	9.375	0.003*
Model III	Import	Operational risk	7.222	0.0088*

Number of observations: 81;
*Significance at the $\alpha=0.05$ level R^2 for Model I: 90.1%.

to be significant. A possible reason for these results is explained in the discussion section.

Hypothesis 8 argues that higher operational risk reduces the volumes of export and import supply chains of a country, respectively. The coefficients of operational risk for both the volume of export supply chain ($\beta=-0.057$, $p=0.003$) as well as for the volume of import supply chain ($\beta=-0.048$, $p=0.0088$) are significant and negative in the model, thereby supporting the hypothesis.

Finally, Hypothesis 9 argues that operational risk of a country affects its export supply chain more adversely than its import supply chain. It is important to note here that higher operational risks impact the volume of export supply chains more than they do to the volume of import supply chains (note the difference in the coefficients for the same range in export and import). As noted, we also used export and import data for the following year to further validate our model. The validation received confirmation in direction, significance and magnitude. Hence, our results support this hypothesis. The next section discusses this finding in greater detail.

Operational Risk as a Mediator Variable

The four steps of Baron and Kenny for testing mediation reveal the following results as shown in Table VII:[9]

1. For the outbound supply chain (exports) of a country, operational risk completely mediates the relationship between economic freedom and exports as well as that between political rights and liberties and exports; for all the other input variables, operational risk acts as a partial mediator in their respective relationships with a country's outbound supply chain.

2. For the inbound supply chain (imports) of a country, operational risk completely mediates the relationship between economic freedom and imports, that between political rights and liberties and imports, and that between financial standards and compliance and imports; for all the other input variables, operational

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[9]Table VII shows steps 1–4 as proposed by Baron and Kenny (1986); total observations=81; *significance at the $\alpha=0.05$ level.

risk acts as a partial mediator in their respective relationships with a country's inbound supply chain.

Implications of these results are discussed next.

DISCUSSION AND CONTRIBUTION

Take calculated risks. That is quite different from being rash. (~ George S. Patton, US General, WWII)

Supply chains span the globe. For entrepreneurs and mature businesses competing in a global economy, business survival hinges on a calculated, rather than a rash, insight on source and market strategies. Consequently, companies need to rely on third-party assessments of a country's internal environment, operational risks and trade dynamics as a prelude and aid to commercial supply chain decision making. Results support our central argument that third-party indices, which serve as proxies to various facets of a country's internal environment, are instrumental in understanding operational risk in a country. Offering major support for our hypotheses, five of the seven indices are statistically significant with indices of *transparency* (a 34 percent impact) and *economic-political governance performance* (a 27 percent impact) serving as the strongest predictors to operational risk. The path diagram in Figure 4 illustrates these findings. Moreover, operational risk in also found to be a key determinant and a mediator of the volume of a country's import and export supply chains.

This paper offers important contributions to both research and practice. First, every third-party index promotes itself as the best gauge of a country's internal environment. However, one of the foremost contributions of this study is that no single index can serve as the quintessential barometer of a country's internal environment. This study posits that each index is necessary, but not sufficient. Given that, even in unison, the indices together simply offer a "partial" view of a country's internal environment, research and practice should consider these indices as works in progress.

TABLE V

Estimation of Coefficients (OLS)

Model	Factors	Coefficient	p Value
Model I	Transparency	− 0.408	< 0.0001*
	Economic freedom	− 0.029	0.8378
	Relational continuity	− 0.146	0.0135*
	Financial standards and compliance	− 0.107	0.0235*
	Political rights and liberties	− 0.161	0.0194*
	Governance performance	− 0.326	0.0053*
	Economic growth	− 0.028	0.8421
Model II	Operational risk	− 0.057	0.003*
Model III	Operational risk	− 0.048	0.0088*
# of observations: 81. *Significance at α=0.05 level.			

Using a single index as a measure of a country's internal environment can be an incomplete gauge. The Heritage Foundation's Economic Freedom Index is a case in point. Considered a premier source in this genre of data, the Heritage Foundation's index is popular as an objective guide of economic success of 183 countries. However, our research has shown that the data from the Heritage Foundation, while authentic, is not adequate to understand operational risk in a country (Table V; $\beta=-0.029$, $p>0.05$). While this index highlights economic freedom in terms of efficient, strike-free labor forces, minimum antitrust regulations and no cap in minimum wages, some significant facts go unmentioned. For example, the index may examine entrepreneurship as a core indicator in rating a country. However, a country can have extremely convenient regulations about opening a business but extremely stringent regulations related to bankruptcy protection and credit defaults (e.g., Dubai, Iceland). Unless the index covers all facets of entrepreneurial economics, the index remains incomplete, per se.

TABLE VI

Estimation of Coefficients (PLS)

Variable Importance Plot	
Predictor	VIP
TICRIndx	1.143647
HFEFIndex	1.0527949
BIIndex	0.9964911
Moody	1.0370518
FHIndex	0.7890031
BTSIndex	0.9214549
WEFGCIndex	1.0589557

While Adam Smith's concept of "laissez faire" is a central feature in global supply chains, his remark that "when institutions protect the liberty of individuals; greater prosperity results for all" (Viner 1927) may not always hold true. Consider two countries that are classified "free" by the Heritage Foundation's Economic Freedom Index and the *Wall Street Journal*: Singapore and Bahrain. Singapore has had a long history of violation of civil rights. In Singapore, members of a religious sect spent weeks behind bars for "peacefully exercising their right to freedom of expression" (Solomon 2000). Again, while Bahrain wins accolades for its vibrant and competitive banking market with few government restrictions, the index overlooks the fact that Bahrain has had a traditional monarchy and that the government has suppressed dissent for the past three decades. Amnesty International has in the past noted that Bahrain's political detainees have included "children as young as 10." This example supplies fuel to our PLS findings that illustrate the insignificance of "political rights and liberties" in determining operational risks in a country.

Second, the article highlights the role of intermediaries in TCE as a mechanism to reduce uncertainties in commercial supply chain operations. As there is a natural tendency for global supply chains to be inefficient,[10] decision makers often seek intermediation. Commercial supply chains stretch across the globe with little control over the exact logistics, shipment routes, and local shifts in economy, operations and regulation. Little control and a lack of end-to-end coordination reduce supply chain efficiencies and make supply chains less transparent. Faced with such uncertainties from incomplete infor-

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[10]As noted earlier, inefficiencies arise from the distributed nature of commercial supply chains linking multiple entities that create severe coordination, communication, and contracting hurdles.

TABLE VII

Operational Risk as a Mediator Variable

Baron–Kenny steps	Model	Criterion	Predictor	F ratio	Probability
Step I	Model IV	Export	Third-party indices	4.57	0.0003*
	Model V	Import	Third-party indices	4.00	0.0009*
Step II	Model II	Export	Operational risk	9.375	0.003*
	Model III	Import	Operational risk	7.222	0.0088*
Step III	Model VI	Export	Third-party indices Operational risk	4.05	0.0005*
	Model VII	Import	Third-party indices Operational risk	3.91	0.0007*

		p Value	
	Third-Party Indices	**Model VI**	**Model VII**
Step IV	Transparency	0.6295	0.2343
	Economic freedom	0.0263*	0.0227*
	Relational continuity	0.8505	0.3982
	Financial standards and compliance	0.4140	0.0259*
	Political rights and liberties	0.0117*	0.0485*
	Governance performance	0.2220	0.3254
	Economic growth	0.6855	0.6097

*Significance at $\alpha=0.05$ level.

mation, parties in supply chains need to rely on independent, unbiased and reliable sources of information offered by third-party intermediaries. This paper puts forth the point that third-party index providers, as intermediaries, play a vital role in reducing transaction costs (and hence, information asymmetry) while trading with multiple countries. The upshot of using third-party indices is that, given the costs and difficulties of direct information acquisition to gauge the credibility of a country's internal environment, indices provide useful cues that proxy for direct information about a country's internal environment.

Third, an effort to find the impact of operational risk on a country's import and export supply chains leads to interesting findings. Our results indicate that operational risk has approximately a 20 percent greater adverse effect (coefficient of operational risk in model II, i.e. exports is − 0.057 as opposed to that in model III, i.e. imports, which is − 0.048) on exports than on imports. Higher operational risks reflect tough production and logistics environments within a country by dampening the growth of Export Oriented Units (EOUs).[11] For a country that suffers from production and distributional woes, it often has to rely more on imports to cater to internal demand while stagnating trade balance.

[11]EOUs are firms whose main focus is generating goods and services for explicit purposes of export. Such EOUs are granted certain tax havens and safeguards by the government to promote exports.

Fourth, prior research had focused on understanding risk in light of risk sources and the causality between them. In contrast, we try to understand a country's operational risk as a function of its internal environment, using some of the most widely used third-party global indices as proxies to the latter. Specifically, we observe the holistic nature of all (or the significant) indices in measuring operational risk. By investigating 81 member countries of the WTO, and controlling for country-specific and common method biases, we show that unlike the business environment (as envisioned in most previous research), the information environment (*transparency*) and the socioeconomic environment (*governance performance*) of a country impact its operational risk the most.

Fifth and finally, to the best of our knowledge, no effort has yet been undertaken to investigate a country's operational risk as a mediator between the country's internal environment and the volume of its import and export supply chains. This paper portrays operational risk in the role of a complete or partial mediator to the relationship between a country's internal environment and its import and export supply chain volumes.

So what defines a country's ability to build its import and export supply chain volume? Is it the freedom of the masses, the compliance of financial institutions, a market-driven economy, or a parliamentarian democracy? In contrast with the traditional views that socioeconomic freedom is the only prerequisite to trade, our study offers an interesting departure. Our findings suggest that it is

FIGURE 4
Path Diagram of the Model in This Study
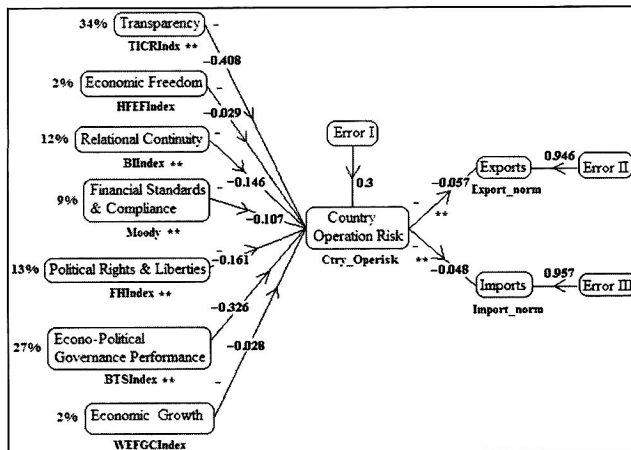
**Statistical significance at $\alpha=0.052$

not the internal environment of a country that necessarily drives trade. Rather, it is how well a country manages perceptions of operational risk. From our previous discussion and reference to Solomon (2000), Asian countries like Singapore and China have shown that a country can travel the path toward a free market while maintaining an authoritarian regime for a long period of time. China, for example, has a pegged currency for ensuring stability in long-term contracting with the United States. China's authoritarian regime ensures certain operational stability by maintaining uniform codes and capital flows. Note that, over the past decade, the Chinese government has taken serious steps to facilitate business operations more than facilitating civil liberties. And most companies and their host countries welcome China's posture toward managing operational risk as a salient precondition to building import and export supply chains.

Limitations and Future Work

Global third-party indices have long been (and still are) used as proxies to identify internal environments of any country. While the authenticity of data sources for these indices is beyond debate, some questions remain about the construct validity of these indices (i.e., do the indices truly measure what they expect to measure?). Moreover, because most of these third-party indices originate from world bodies (like the World Bank, IMF and the WTO) that rely on global data, precedent factors that make up these indices are sometimes highly correlated. For example, Moody's Credit Rating index examines regulatory and banking standards that closely map with the Heritage Foundation's (EFI) factors of capital infrastructure and export–import regulations. Similarly, the Global Competitive Index's (GCI) unemployment is closely related to Bertelsmann's Transformation Index's (TSI) fac-

tor on poverty — greater unemployment may signify increased poverty. Therefore, there remains an issue regarding redundancy in country risk measurements when a multitude of such indices are taken into consideration.

Given that multicollinearity with economic data is quite common, previous researchers have traditionally put a higher cap on the variance inflation factors to validate their findings. In their analysis of data pertaining to innovations and acquisitions, Prabhu, Chandy and Ellis (2005) have defined an acceptable cut-off of 10 while studying the variance inflation factor statistics for their variables. Nevertheless, high multicollinearity between economic variables remains an issue with this type of study.

However, this issue also creates a platform for future research. First, because each of the global indices used in this study uses a wide range of factors and concepts to define the respective indices, it is imperative to choose some of these indices and investigate the completeness[12] of their composition. Second, building on our argument that certain constituents for the indices do covary, it would be operationally prudent to establish a single index that removes covariance of the correlated constituents.

On a different note, a common problem encountered in choosing or relying on an index is its credibility to capture short-term shifts in the environment. We contend that while the nature of the indices may certainly follow a lagged consideration of internal environments (often a

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[12]As each global index used in this study comes from an independent research body, the indices, taken together, may provide complete information. However, certain indices may be more complete than others. If an index is more complete, it would require less complementary (and supplementary) information, and research and practice can focus on extending that particular index to make it more complete.

function of the periodicity of the measurements), we have been cautious to measure them at similar periodic intervals. Furthermore, it is useful to note that operational decision-making is often contractual and considers various windows-of-operation and thus requires a relatively "temporally stable" assessment of a country's environment. An "oversensitive" or "nervous" index may not serve to best inform decision-making over a longer time horizon.[13]

Finally, while this study examines short-term relationships between internal governance environments, operational risks and trade, important questions remain: Can higher economic growth rates be maintained in the long term? Will an inability to maintain long-term higher economic growth rates over time adversely affect operational risks? It is interesting to realize that economic growth rates are a part of a larger mosaic of factors and it is the promise that a country has in place the right governance ingredients for mitigating operational risks. Moreover, there may be some disagreement over the window that constitutes long term. While it is true that a precipitous economic drop over time will severely affect operational risk perceptions (e.g., Zimbabwe), it would be useful to examine the relationship in greater depth using panel data. Future researchers can conduct a similar study from a time-series lens on a single country by utilizing all of these indices from multiple time periods to account for changes in operational risks for that country. Such a study might also offer key insights into our assumptions of linearity between operational risk and economic growth over time.

Conclusion

In short, this research examines operational risk of a country in the light of its internal environment and assesses the mediating role of operational risk in relating a country's internal environment to the volume of its import and export supply chains. It turns out that a country's information environment and socioeconomic environment are better indicators of the country's operational risk than is the country's business environment.

Supply chain decisions are core to any business. Information asymmetry, arising from miscued information in decision-making, can lead to dire consequences. Firms are advised to have a better understanding of some of the antecedents of information transparency, like timeliness, periodicity and coverage of disclosures, corruption levels, and technical authenticity of reported standards from prospective countries before negotiating a business proposition. Firms are also advised to study a region's balance between democracy and market economy, which is core to understanding operational risks in that region.

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[13]We thank an anonymous reviewer for his/her direction and helpful comments here.

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APPENDIX

Country List Used in the Study

Country	Region	Country	Region
Algeria	Africa	Canada	N. America
Cameroon	Africa	Dominican Republic	N. America
Egypt	Africa	United States	N. America
Ghana	Africa	Australia	Oceania
Kenya	Africa	New Zealand	Oceania
Morocco	Africa	Argentina	S. America
Nigeria	Africa	Bolivia	S. America
South Africa	Africa	Brazil	S. America
Tanzania	Africa	Chile	S. America
Tunisia	Africa	Colombia	S. America
Bangladesh	Asia	Ecuador	S. America
China	Asia	Guatemala	S. America
Hong Kong	Asia	Honduras	S. America
India	Asia	Mexico	S. America
Indonesia	Asia	Peru	S. America
Japan	Asia	Uruguay	S. America
Kazakhstan	Asia	Venezuela	S. America
Malaysia	Asia	Austria	W. Europe
Pakistan	Asia	Belgium	W. Europe
Philippines	Asia	Bulgaria	W. Europe
Singapore	Asia	Croatia	W. Europe
South Korea	Asia	Czech Republic	W. Europe
Sri Lanka	Asia	Denmark	W. Europe
Taiwan	Asia	Finland	W. Europe
Thailand	Asia	France	W. Europe
Vietnam	Asia	Germany	W. Europe
Estonia	E. Europe	Greece	W. Europe
Latvia	E. Europe	Hungary	W. Europe
Lithuania	E. Europe	Ireland	W. Europe
Poland	E. Europe	Italy	W. Europe
Romania	E. Europe	Luxembourg	W. Europe
Slovakia	E. Europe	Netherlands	W. Europe
Slovenia	E. Europe	Norway	W. Europe
Turkey	E. Europe	Portugal	W. Europe
Ukraine	E. Europe	Russia	W. Europe
Iran	Middle East	Spain	W. Europe
Israel	Middle East	Sweden	W. Europe
Jordan	Middle East	Switzerland	W. Europe
Lebanon	Middle East	United Kingdom	W. Europe
Saudi Arabia	Middle East		
Syria	Middle East		
UAE	Middle East		