

Trade Perspectives in the Context of Safety, Security, Privacy and Loyalty

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Edited by

Sanda Renko and Blaženka Knežević

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PREFACE

Terrorism has become a daily challenge for modern business and distributive trade is not an exception. The effects of terrorist attacks have a dramatic impact on supply chains. Nowadays, there are estimates that a terrorist attack disrupts an important global supply chain at least once a week. Since 2012 there has been a notable rise in the number of deaths resulting from terrorist attacks at the global level. Unfortunately, trade facilities such as, for instance, shopping centres are also a target of terrorist actions more and more often. In addition, piracy attacks have also intensified around the world and are becoming a threat to the global exchange of goods and services by causing global trading companies large losses.

Terrorism and piracy are not the only issues that modern companies in distributive trade are dealing with. There are also losses that occur on a daily basis resulting from various types of theft. Therefore, it is necessary to assess these problems from a scientific point of view and to develop and apply different methods to protect customer privacy, security and safety in those new and challenging environments.

In the publication there are three chapters dealing with the topic of terrorism and piracy from the various aspects of distribution trade. Two chapters are dealing with various aspects of theft and their prevention. A couple of papers raise the question of consumer protection and several discuss the challenges of security and privacy in electronic and mobile commerce.

The publication is the outcome of the scientific conference Trade Perspectives 2016 that took place at the Faculty of Economics & Business, University of Zagreb. The chapters in this monograph are selected and updated from papers presented at the conference and they are authored by scientists from more than 10 academic institutions and professional organizations from 5 countries.

We hope that the monograph will contribute to better understanding the phenomena of security, privacy and loyalty in distributive trade and that it will provoke the use of future scientific approaches to these challenging issues of modern economy.

Zagreb, November 2017.
Editors

CHAPTER ONE

SUPPLY CHAIN RESILIENCE AND INTERNATIONAL TERRORISM

TOMISLAV BAKOVIĆ, INES DUŽEVIĆ
AND MATE DAMIĆ

Abstract

Although terrorism has been present as a factor in the global economy for some time, the perception of terrorism has increased as a growing threat since the 9/11 terrorist attacks on the United States of America and created gloom that hangs over the global economy. The effects of those attacks had a dramatic impact on global supply chains at the time and have left a mark on supply chain management in the years to come. Ever since the founding of the Islamic state, terrorist threats have once again become a topic of interest for researchers, especially in the area of supply chain management. There are estimates that on average a terrorist attack disrupts an important global supply chain at least once a week. These attacks are hard to anticipate and are not location specific but tend to happen both in developed economies as well as in third world countries which were not the case in the past. This chapter is a contribution to research on the impacts of terrorism on the supply chain and it offers a literature review of the most important terms when discussing supply chain resilience. The chapter explains the concept of supply chain resilience, the risks within the supply chain and the effect of international terrorism on global supply chains. It also offers a number of recommendations for practice in the form of theoretical designs that a resilient supply chain should contain.

Keywords: *supply chain risk, supply chain resilience, international terrorism*

1. Introduction

There is no universal definition of terrorism, but from an economic perspective, it can be said that terrorism presupposes the use of a threat or violence in order to achieve a political, religious or ideological change.¹ It also has an effect on the whole of society that comes under a terrorist threat, and not only on the directly targeted individuals or companies. Although there have been a number of terrorist attacks in the western world over the course of the 20th century, such as those conducted by the Irish Republican Army or the Basque Fatherland and Liberty organizations, as well as a number of far left or far right organisations in western Europe, none have had such an effect on the global economy as the 9/11 attacks on the World Trade Centre. The attacks themselves resulted in a significant loss of life and material damage but were not a direct cause of the disturbances in global supply chains that followed them. Government actions, such as border closings and the shutting down of air traffic were the direct causes of supply chain disruptions.² Since 9/11 the United States of America has waged a war on terror, first in Afghanistan and Iraq. However, their goals have not been fully achieved since they have managed to depose the former regimes supporting terrorist groups but haven't managed to root out terrorism. In fact, with the founding of the Islamic state caliphate in 2014, the number of terrorist attacks has increased significantly in the western hemisphere. Terrorism has a large effect on the economy in general and this can be seen especially in tourism, with the recent examples of Egypt and Tunisia, dealing with great loses in the tourism sector. Also, in the west, the trade of goods tends to be slowed down and influenced by new and rigorous border controls that have been advocated by a number of European Union member states due to the growing threat of international terrorism.³

¹ William Cunningham, *Terrorism: Concepts, Causes, And Conflict Resolution* (Virginia: Institute for Conflict Analysis and Resolution George Mason University, 2003)

² Yossi Sheffi, "Supply Chain Management under the Threat of International Terrorism," *The International Journal of Logistics Management* 12, no. 2 (2001): 1-11.

³ Ante Vuletić, Dora Naletina, and Andrea Polić, "The impact of terrorism on the security and continuity of international business activities," *In Trade perspectives 2016: Safety security privacy and loyalty*, ed. Nikola Knego, Renko Sanda, Knežević Blaženka.

When talking about the direct influence of terrorism on the economy, Enders and Olson talk about the direct costs⁴ such as reconstruction efforts, emergency interventions and the usual losses on the capital market as well as the losses due to insurance claims. The indirect influences of terrorism on the economy are usually related to human psychology that tends to reflect on basic market mechanisms. Thus, under the conditions of increased terrorism threats, one can expect a fall in the demand of goods and services as well as a fall in the available input for the economy or sudden changes in government regulations such as the ones already described earlier in the text.⁵ The influence of terrorism on the global economy is a vast area of research that is expected to grow even further in the years to come due to new forms of terrorism and their influences on market mechanisms.

This chapter, on the other hand, will be limited to the scope of the potential impact of terrorism on the supply chain. According to the British Standards Institution, supply chains are targeted by terrorist organizations at least once every seven days.⁶ Also, there are more than thirty countries in the world in which terrorism motivated attacks on the supply chain happen regularly.⁷ Most of these are third world countries rich in natural resources and the targets are usually connected to the oil industry and its infrastructure.

This chapter discusses the implications of terrorism on global supply chains through the concept of supply chain resilience. Supply chain resilience can broadly be explained as the ability of the supply chain to recover its former function after a disturbance has occurred. The first part of the chapter will explain the concept of supply chain risk management and important factors for the implementation of a successful risk management system. It will also offer a classification of risks that can cause disruptions in supply chains and explain the manner in which these

⁴ Walter Enders and Eric Olson, "Measuring the economic costs of terrorism," *The Oxford Handbook of the Economics of Peace and Conflict* (New York: Oxford University Press, 2012).

⁵ Moruff Sanjo Oladimeji, and Adeniyi Marcus Oresanwo, "Effects of terrorism on the International Business in Nigeria," *International Journal of Humanities and Social Science* 4, no. 7(2014): 247-250.

⁶ British Standards Institution, "Supply chain terrorism," <https://www.bsigroup.com/en-GB/our-services/Supply-chain-solutions/supply-chain-risks/security-risk/supply-chain-terrorism/> (accessed October 1, 2017)

⁷ Ibid.

risks are connected with supply chain resilience. An emphasis will be placed on environmental risk factors, as acts of terrorism are an integral part of environmental risks. A brief overview of the most important aspects of terrorism and the classification of terrorism-related activities will also be provided.

The second part of the chapter will be dealing with supply chain resilience. The concept of resilience is multidimensional and multidisciplinary. Therefore, it is researched in a number of scientific disciplines such as ecology, sociology, psychology and the economy. These different views are summarized in order to clarify the concept of resilience which is a subject of great interest in the research of supply chain risk management. As the most important part of the chapter, an overview of the theoretical design of resilient supply chains and the important features. These supply chains will also be presented for managerial and practical implications. The conclusion of the chapter sums up the findings on supply chain risks, resilience and the influence of terrorism on supply chains as well as a means of minimizing the costs and threats of terrorism and delivers implications for practice and further research on the topic.

2. Building a Supply Chain Resilient to Terrorism Threats

2.1. Risks in the Supply Chain

The supply chain can be defined as a network of organizations that are involved through upstream and downstream relationships in the different processes and activities that produce value in the form of products and services in the hands of the ultimate customer.⁸ It can be seen from the definition that there are a number of stakeholders involved in each supply chain and a number of functions that are part of each supply chain. A well-organized supply chain delivers goods efficiently and effectively to the market at minimum cost. Supply chain management that focuses on the minimization of costs, maximization of efficiency and speed of the supply chain has been an academic research area for some time. Another important research area focuses on the risks in the supply chain. Because of the growing awareness of supply chain risks, supply chain risk management

⁸ Martin Christopher, *Logistics and supply chain management: strategies for reducing costs and improving services* (London: Pitman Publishing, 1992)

has become a growing research area over the past few years, both for academia as well as the business sector.⁹

There are a number of definitions of risk, but most of them have a shared view on the attributes of risk. Thus, it is seen as a probability of damage, loss, or any other negative occurrence that is caused by external or internal vulnerabilities, and that may be avoided if preemptive action and careful risk assessment tools are in place.¹⁰ As seen from the definition of the supply chain there are a number of potential sources of risk in the supply chain. The definition of supply chain vulnerability states that vulnerabilities in the supply chain rise from exposures to serious disturbances, arising from risks within the supply chain as well as risks external to the supply chain.¹¹ The International Organization for Standardization (ISO) has created a set of standards for supply chain management (ISO 28000) that greatly take into account the risks in the supply chain. Supply chain risk management can be defined as the implementation of a strategy to manage the risks in the supply chain based on a continuous risk assessment, with the goal of reducing vulnerability and ensuring continuity of the supply chain.¹² There are four important management aspects of supply chain risk management:¹³

- Assessment of the risk sources for the supply chain
- Definition of adverse consequences for the supply chain
- Identification of the risk drivers
- Mitigation of the risks for the supply chain

In order to build and successfully manage risk and create a resilient supply chain, it is important to correctly assess the risks and the risk drivers for potential threats to the supply chain. The usual risks in the supply chain

⁹ Ila Manuj and John T. Mentzer, "Global Supply Chain Risk Management," *Journal of Business Logistics* 29, no. 1 (2008): 133-55.

¹⁰ Shashank Rao and Thomas J. Goldsby, "Supply chain risks: a review and typology," *The International Journal of Logistics Management* 20, no. 1 (2009): 97-123.

¹¹ Uta Juttner, Helen Peck and Martin Christopher, "Supply chain risk management: outlining an agenda for future research," *International Journal of Logistics Research and Applications* 6, no. 4 (2003): 197-210.

¹² Shashank Rao and Thomas J. Goldsby, "Supply chain risks: a review and typology" *The International Journal of Logistics Management* 20, no. 1 (2009): 97-123.

¹³ Juttner, Peck, and Christopher, "Supply chain risk management: outlining an agenda for future research"

are shrinkage and theft, terrorism, the smuggling of goods and piracy.¹⁴ Some authors tend to take a more general approach when defining the risks in the supply chain. Ritchie and Marshall have identified five factors that can be seen as major sources of risk for a company:¹⁵ environmental factors, industry factors, organizational factors, problem-specific factors and decision-maker related factors. The framework factors that comprise the circumstances in which the organization is operating are environmental, industry and organizational factors. Mason-Jones and Towill suggest a similar framework¹⁶ that divides the risks to the supply chain into three categories with a number of sub-categories as shown in Table 1.

Table 1. Risks in the Supply Chain

Risks internal to the firm	<ul style="list-style-type: none"> • Process • Control
Risks internal to the firm, but external to the network	<ul style="list-style-type: none"> • Demand • Supply
Risks external to the network	<ul style="list-style-type: none"> • Environmental

Source: Rachel Mason-Jones, and Denis R. Towill, "Information enrichment: designing the supply chain for competitive advantage," *Supply Chain Management: An International Journal* 2, no. 4 (1997): 137-48.

Both internal and external risks pose a significant threat and source of disruption for the supply chain. The scope of this chapter will be limited to identifying environmental risks in the supply chain since terrorism is one of the sources of risk in this group of factors. Environmental risk factors have the largest influence on supply chains since they affect each industry to some extent. Miller has divided environmental risk variables into political instability, shifts in government policy, macroeconomic uncertainties, natural uncertainties and social uncertainties.¹⁷ When writing about

¹⁴ Daniel Ekwall, "Supply Chain Security – Threats and Solutions," In *Risk Management - Current Issues and Challenges*, ed. Nerija Banaitiene, <https://www.intechopen.com/books/risk-management-current-issues-and-challenges/supply-chain-security-threats-and-solutions> (accessed August 16, 2016)

¹⁵ Bob Ritchie and Marshall V. David, *Business risk management* (London: Chapman & Hall, 1993)

¹⁶ Rachel Mason-Jones and Towill Denis R, "Information enrichment: designing the supply chain for competitive advantage," *Supply Chain Management: An International Journal* 2, no. 4 (1997): 137-48.

¹⁷ Kent D. Miller, "A Framework for Integrated Risk Management in International Business," *Journal of International Business Studies* 23, no. 2 (1992): 311-31.

environmental risk, other authors usually take into account the political, social and technological factors that make up environmental risk.

Political instability signifies a government that is not stable and thus cannot be expected to function independently and in the best interest of all stakeholders. It can also mark political changes caused by disruptions in the political system, such as a war or a revolution that brings about great uncertainty for the future political course of a country.¹⁸ Shifts in government policy refer to a change that affects the business community. An example of this would be government initiated changes in the monetary or fiscal system or other laws that have a direct effect on business such as tax and wage regulations.¹⁹ Macroeconomic uncertainty is connected with the level of economic activity and prices as well as the exchange rate that has a great impact on global supply chains.²⁰ Natural uncertainties are a great potential disturbance for the supply chain especially in the case of catastrophic events such as floods, earthquakes and fires. Social uncertainty signals the difference between the beliefs and values of the population and the current government policy or business practice.²¹

Companies usually do not give due consideration to social uncertainty since they are more adapted to managing technical and financial risks. The assessment of social insecurity is very important since it can be a trigger for future political instability.²² The greatest form of social uncertainty is the threat of terrorism that has been researched by a number of authors.²³

¹⁸ Martin Shubik, "Political risk: Analysis, process, and purpose," in *Managing International Risk*, ed. Richard J. Herring, 109-38 (New York: Cambridge University Press, 1983)

¹⁹ Wenlee Ting, "Multinational risk assessment and management: strategies for investment and marketing decisions," *The International Executive* 30, no. 2-3 (1988): 31-33.

²⁰ Lars Oxelheim and Clas Wihlborg, *Macroeconomic uncertainty-international risks and opportunities for the corporation* (New York: John Wiley & Sons, 1987)

²¹ John Dunn and Richard J. Herring, "Country risk: Social and cultural aspects," in *Managing international risk*, ed. Richard J. Herring, 139 – 68 (New York: Cambridge University Press, 1983)

²² Kent D. Miller, "A Framework for Integrated Risk Management in International Business" *Journal of International Business Studies* 23, no. 2 (1992), 311-31.

²³ Yossi Sheffi and James B. Rice Jr, "A supply chain view of the resilient enterprise," *MIT Sloan management review* 47, no.1 (2005): 41.; Ian I. Mitroff, and Murat C. Alpaslan, "Preparing for evil," *Harvard business review* 81, no. 4 (2003): 5 - 11.

Since terrorism has a goal of initiating political, religious or ideological changes through violent acts that fuel political instability, it should be taken into high regard when assessing environmental risks in the supply chain. The Arabian spring is the most recent example of social uncertainties that turned into political instability through violent anti-government revolutions all across the Middle East. This eventually spiraled out of control and created a hot spot in Syria that resulted in a war that has been going on for the past five years. Terrorism also has a significant impact on other risk factors. An example of this connection is the case of Cisco which wrote off more than \$2.5 billion worth of inventory because of a slowdown in the networking market following 9/11.²⁴

Terrorism implies the use of violence with the aim of achieving political goals and it is dependent on a number of factors such as: historical, political, social, cultural, ideological, religious, economic and even psychological.²⁵ Schmid, on the other hand, puts more emphasis on explaining that terrorism uses a threat specifically towards civilians and not the regular armed forces or the police. Therefore, a terrorist attack is always an asymmetrical conflict. Vuletić²⁶ uses Matusitz's²⁷ criteria in order to define terrorist activities as seen in Table 2.

Acts of terrorism are unexpected events that can occur at almost any time and any place in a world that has never been more connected and interdependent. Therefore, the question of building supply chains that can sustain the direct and indirect damage caused by the acts of international terrorism becomes vitally important for the companies that operate globally. The concept of resilient supply chains explains the features a

²⁴ Yossi Sheffi, "Supply Chain Management under the Threat of International Terrorism" *The International Journal of Logistics Management* 12, no. 2 (2001): 1-11.

²⁵ Mirko Bilandžić, Terorizam kao (ne)efikasna strategija: iskustva za Hrvatsku kao članicu Antiterorističke koalicije i Odbora za protuterorizam VS UN-a, *Zbornik radova Annales Pilar*, Zagreb : Institut društvenih znanosti Ivo Pilar (2009).

²⁶ Ante Vuletić, Dora Naletina, and Andrea Polić, "The impact of terrorism on the security and continuity of international business activities," *In Trade perspectives 2016: Safety security privacy and loyalty*, ed. Nikola Knego, Sanda Renko, Blaženka Knežević.

²⁷ Jonathan Matusitz, *Terrorism and communication* (Washington DC: Sage, 2013), 1.

supply chain should have in order to successfully cope with the threats of international terrorism.

Table 2. Criteria for an Activity to be deemed as Terrorism-Related

-	the use of violence or threat in order to achieve political, religious or ideological change
-	done only by nongovernmental subjects or secret services in the name of their governments
-	it reaches further beyond the imminent victim and is also directed towards the goals which encompass a broader spectre of society
-	a terrorist act is also mala prohibita (a crime against the law) and mala in se (a crime amoral in its core)

Source: Author, based on Ante Vuletić, Dora Naletina, and Andrea Polić, "The impact of terrorism on the security and continuity of international business activities," *In Trade perspectives 2016: Safety security privacy and loyalty*, ed. Nikola Knego, Sanda Renko, Blaženka Knežević, http://bib.irb.hr/datoteka/846065.Trade_Perspectives_2016_proceedings.pdf#page=19 (accessed 1 October 2017)

2.2. Supply Chain Resilience

Resilience as a concept is directly related to several issues in a number of scientific disciplines.²⁸ Therefore, it is related to social and ecological vulnerability, disaster recovery and risk management under increasing threats. From an ecological point of view, resilience determines the ability of systems to absorb change, i.e. it is a pace of restoration of the initial structure and function in an ecosystem after a disturbance.²⁹ Folke et al. offered a different view on resilience and introduced the adaptive cycle theory.³⁰ According to this theory, dynamic systems evolve rather than tend towards the initial state.

²⁸ Serhiy Y. Ponomarov and Mary C. Holcomb, "Understanding the concept of supply chain resilience," *The International Journal of Logistics Management* 20, no. 1 (2009): 124-43.

²⁹ Walter E. Westman, "Measuring the Inertia and Resilience of Ecosystems," *BioScience* 28, no. 11 (1978): 705-10.

³⁰ Carl Folke, Steve Carpenter, Thomas Elmqvist, Lance Gunderson, Cs Holling and Brian Walker, "Resilience and Sustainable Development: Building Adaptive Capacity in a World of Transformations," *AMBIO: A Journal of the Human Environment* 31, no. 5 (2002): 437-440.

The social perspective of resilience takes into account the disturbances that can take place in a community. The social definition of resilience can be cited from the International Strategy for Disaster Reduction³¹ as the capacity of a system or a community exposed to hazards to adapt by either resisting or changing in order to reach and maintain a minimum level of functioning and structure.

Developmental psychopathology is an area of psychology that examines the differences in the ways people react to stress and adversity as sources of disturbance in everyday life. A number of findings of the main psychological aspects of resilience have been taken into account for defining the economic concept of resilience. The most important principles coming from psychology which can be implemented into the building of any resilient system are:³²

- Control, in order to direct and coordinate activities;
- Coherence, a principle that states that it is important to enhance the direction and understanding during the worst time of a disruption in order to develop the processes and procedures needed to reduce uncertainty;
- Connectedness, states that systematic coordination is necessary to avoid duplication and the wasting of resources in stressful times.

When discussing the economic perspective of resilient systems, many authors have similar definitions that take into regard the capability of the system of returning to a stable state after a disruption has occurred. According to Hamel and Valikangas, the goal of resilient organizations from an economic perspective is to continuously innovate without causing damage to the organization.³³ Taking in consideration the previously mentioned theory of the adaptive cycle, Ponomarov and Holcomb give the

³¹ United Nations International Strategy for Disaster Reduction Staff, *Living with risk: a global review of disaster reduction initiatives (Vol. 1)* (United Nations Publications, 2004)

³² John W. Reich, "Three psychological principles of resilience in natural disasters," *Disaster Prevention and Management: An International Journal* 15, no. 5 (2006): 793-98.

³³ Gary Hamel and Liisa Valikangas, "The quest for resilience," *Harvard business review* 81, no. 9(2003): 52-65. <https://hbr.org/2003/09/the-quest-for-resilience> (accessed August 21, 2016)

following definition of supply chain resilience:³⁴ “The adaptive capability of the supply chain to prepare for unexpected events, respond to disruptions, and recover from them by maintaining continuity of operations at the desired level of connectedness and control over structure and function.” Falasca, Zobel and Cook³⁵ define resilience as the ability of a supply chain to reduce the probabilities of disruptions, to reduce the consequences of those disruptions, and to reduce the time to recover normal performance. Christopher and Peck³⁶, on the other hand, define resilience as the ability of a system to return to its original state or move to a new more desirable state after being disturbed. It can be seen that all authors take into account the two states of a system: the original, stable state and the state after a disturbance in the supply chain has occurred which, in the case of a resilient supply chain can be the same as the original state or better.

As mentioned in the introduction, after the 9/11 terrorist attacks there has been a tectonic shift in the terms of global security and a whole new approach to the risk that terrorism poses to the global economy. The case of the automobile companies, Ford and Toyota, is widely cited as an example of a supply chain disturbance following attacks. The main supplier of Toyota steering sensors couldn't deliver a shipment as it was being delivered by plane, and all air traffic was stopped instantly after the attack. Since the Japanese company adhered to the rules of “just in time” production they nearly halted the US-based production of Toyota vehicles. The same thing happened to Ford due to trucks delivering car parts vital for production being held at US borders. The main attribute of terrorism as a source of risk is that the threat of another terrorist attack is continuous, always present and has a number of unwanted side effects that have a large influence on global supply chains.

³⁴ Carl Folke, Steve Carpenter, Thomas Elmqvist, Lance Gunderson, Cs Holling and Brian Walker, "Resilience and Sustainable Development: Building Adaptive Capacity in a World of Transformations," *AMBIO: A Journal of the Human Environment* 31, no. 5 (2002): 437-440.

³⁵ Mauro Falasca, Christopher W. Zobel, and Deborah Cook, “A decision support framework to assess supply chain resilience,” in *Proceedings of the 5th International ISCRAM Conference*, (2008): 596-605.

³⁶ Christopher Martin, and Helen Peck, "Building the Resilient Supply Chain," *The International Journal of Logistics Management* 15, no. 2 (2004): 1-14.

Sheffi³⁷ states four challenges a company faces when dealing with a terrorist threat. The first one is the preparation for another attack. In case of a successful terrorist attack in the future, a company must prepare plans to operate in the aftermath of the attack since it can damage the company's assets, but it can also have an undesired effect on the company's suppliers or customers as well as other stakeholders. The best answers for ensuring the continuity of the supply chain are the investment in the relationship with suppliers, creating a sustainable inventory surplus and backing up the knowledge and the processes of the company. Another challenge is the management of supply chains under increased uncertainty caused both by terrorist actions and government responses to the actions. In order to reduce those risks, companies should cooperate more with their shippers to increase shipment visibility and generally work on improved collaboration in the supply chain. A number of models such as the "just in time" manufacturing, "efficient consumer response" in the grocery industry, and "quick response" in the textile industry are examples of good cooperative schemes that strengthen the collaboration within the supply chain. More advanced risk pooling techniques are also needed in order to minimize the effects of increased uncertainty.

A new era in the relationship between the government and companies in which they will have to cooperate more closely in order to minimize the risk of terrorism is another challenge, as well as the management actions needed for the insurance of the security of employees, physical assets and intellectual property. The sharing of information between companies and the government, especially in an era of ever-growing digitalization and huge amounts of data being transferred over PCs and smartphones, is a hot topic all around the world since it raises the questions of user privacy and the government right to know everything.

As mentioned previously, the goals of efficient supply chain management are to lower costs and increase the speed in producing, delivering and selling products to the end consumer. Even the most efficient supply chains were sometimes not able to make deliveries and have significantly affected the company's workflow and caused market trouble.³⁸ One of the reasons is the inability of efficient supply chains to quickly adapt to

³⁷ Yossi Sheffi, "Supply Chain Management under the Threat of International Terrorism" *The International Journal of Logistics Management* 12, no. 2 (2001): 1-11.

³⁸ Hau L. Lee, "The triple-A supply chain", *Harvard business review* 82, no. 10 (2004): 102-13.

unexpected changes in supply or demand that can also be caused by acts of terrorism. If supply chains are organized efficiently it means that they are highly standardized which leaves little place for fast reactions to market disturbances. Terrorism disturbs supply chains in various ways, directly by causing damage to important supply nodes and the assets of a company, and indirectly through changes in market supply and demand and government actions that disrupt the supply chain. Therefore, in order to build a resilient supply chain, efficiency is not enough.

A number of authors have described the features that a resilient supply chain should have.³⁹ They emphasise agility as an important feature of a resilient supply chain since flexibility in terms of returning to a previous state of functioning of the supply chain, or continuing to operate on a different level of stress is very important for a resilient supply chain. Another important issue in a resilient supply chain is the collaboration between the enterprises in the chain in order to ensure that every part of the chain is working for the best performance and anticipating and dealing with risks continuously and effectively. Pooling risk also plays a vital role in being able to react to increased uncertainty. When speaking of supply chain design, the most commonly used risk pooling methods are “postponement” and “build to order”. Postponement is a method by which companies delay the moment in which their products become customizable, thus trying to use most of the economies of scale by creating generic products and differentiating them at the furthest possible point down the supply chain. Build to order is another type of postponement strategy and it is used by companies who build items only after they have been ordered. These methods tend to significantly decrease the risks in the supply chain and tend to make it more resilient to disturbances. The main issue is that only companies that make large quantities of products with a similar technological base, such as a printer or mobile manufacturers, can use these methods.

By examining the paradox of companies that have very efficient supply chains and are not able to gain a sustainable competitive advantage, Lee

³⁹ James B. Rice Jr, and Federico Caniato, “Building a secure and resilient supply network,” *Supply chain management review* 7, no. 5 (2003): 22-30; Christopher Martin, and Helen Peck, "Building the Resilient Supply Chain." *The International Journal of Logistics Management* 15, no. 2 (2004), 1-14.; Yossi Sheffi, and James B. Rice Jr, “A supply chain view of the resilient enterprise.” *MIT Sloan management review* 47, no.1 (2005): 41-48.

proposed “a triple-A supply chain design”⁴⁰ that incorporates the most important features of a resilient supply chain. The triple-A stands for agility, adaptability and alignment. When discussing agility in economic terms it is the ability of a business system, or in this case, a supply chain to rapidly respond to disruptions. Agile supply chains handle disruptions in a cost-efficient way and do not endanger the continuity of actions within the supply chain. Lee⁴¹ states the importance of communication within the supply chain and sharing information about possible changes in supply or demand. Another important issue for accomplishing the goal of agility is the importance of redundancy in terms of keeping a small inventory of product components to prevent production halts.

The goal of adaptability is the creation of a supply chain that can easily accommodate market changes. In order to have an adaptable supply chain, a company must assess economic changes in the countries that are important suppliers and try to diversify the input sources and create different supply chains for different products. This is similar to the concept of postponement when pooling risk in the supply chain. An adaptable supply chain evolves over time as external changes reshape markets, and this feature is shared by Folke et al.⁴² when discussing the adaptive cycle theory in ecosystems.

Alignment is the third bottom line of the triple-A supply chain. When a company manages to align the interest of all enterprises taking part in a supply chain in such a manner that all the parts of the chain maximize their own interest, thus optimizing the performance of the chain as well it can be said that a supply chain is aligned. In order to achieve alignment, a company should clarify the role of each enterprise taking part in the supply chain. It should also make sure that the incentives coming from the company towards the enterprises in the chain are aligned in such a manner that they help each enterprise maximize their returns from the partnership.

⁴⁰ Hau L. Lee, “The triple-A supply chain”, *Harvard business review* 82, no. 10 (2004): 102-13.

⁴¹ Hau L. Lee, “The triple-A supply chain”, *Harvard business review* 82, no. 10 (2004): 102-13.

⁴² Carl Folke, Steve Carpenter, Thomas Elmqvist, Lance Gunderson, Cs Holling and Brian Walker, "Resilience and Sustainable Development: Building Adaptive Capacity in a World of Transformations," *AMBIO: A Journal of the Human Environment* 31, no. 5 (2002): 437-440.

Table 3 below sums up all the important features that a triple-A supply chain should have.

Table 3. The Triple-A Supply Chain

Agility	Adaptability	Alignment
<p>Objectives:</p> <ul style="list-style-type: none"> • Respond to short-term changes in demand or supply quickly, handle external disruptions smoothly 	<p>Objectives:</p> <ul style="list-style-type: none"> • Adjust the supply chain design to meet structural shifts in markets; modify the supply network to strategies, products and technologies 	<p>Objective:</p> <ul style="list-style-type: none"> • Create incentives for better performance
<p>Methods:</p> <ul style="list-style-type: none"> • Promote the flow of information with suppliers and customers • Develop collaborative relationships with suppliers • Design for postponement • Build inventory buffers by maintaining a stockpile of inexpensive but key components • Have a dependable logistics system or partner • Draw up contingency plans and develop crisis management teams 	<p>Methods:</p> <ul style="list-style-type: none"> • Monitor economies all over the world to spot new supply bases and markets • Use intermediaries to develop fresh suppliers and logistics infrastructure • Evaluate the needs of ultimate consumers - not just immediate customers • Create flexible product designs • Determine where a company's products stand in terms of technology cycles and product life cycles 	<p>Methods:</p> <ul style="list-style-type: none"> • Exchange information and knowledge freely with vendors and customers • Lay down roles, tasks and responsibilities clearly for suppliers and customers • Equitably share the risks, costs and gains of improvement initiatives

Source: Hau, L. Lee, "The triple-A supply chain" "The triple-A supply chain" *Harvard business review* 82, no. 10 (2004): 102-13.

The triple-A supply chain design offers an overview of all the features and actions a resilient supply chain should have. It also offers a multidimensional approach taking into account the important findings regarding the concept of resilience from sociology, psychology and ecology. Christopher and Peck⁴³ state that one of the reasons for the lack of resilience in supply chains is that resilience rarely sets a target objective, as opposed to costs and the speed of the supply chain. They stress the importance of understanding the pinch points and critical paths within the supply chain in order to be able to build a resilient supply chain. Similar to Lee⁴⁴ they also offer a number of design principles that should be incorporated into a resilient supply chain. Choosing a strategy of keeping several options open helps in reducing the impact of a disruption although it is not cost effective in the short run. Another recommendation is the policy of reexamining the redundancy against efficiency tradeoff in order to maintain a sustainable inventory surplus that can help defend against disruptions at critical points in the supply chain. Other design principles have been mentioned by Lee⁴⁵ and other authors as well, such as collaboration within the supply chain, agility and visibility.

3. Conclusion

The threat of global terrorism has never been more up to date especially when discussing global supply chains and the disruptions that acts of terrorism could possibly cause. This chapter has offered an overview of the risks present in the supply chain, characterizing terrorism as social insecurity with a tendency to spread to all-out political instability if not kept in check by local political authorities. In an ever more connected global economy, a single terrorist act in another part of the world can cause significant losses due to disruptions in the supply chain of a company caused by the act itself, as well as the actions of a government and other stakeholders after the attack.

The two most important determinants of efficient supply chain management are the reduction of costs and an increase in the speed of the chain. Research has shown that these two are not enough for creating a sustainable competitive advantage. In order to stay competitive, companies

⁴³ Christopher Martin, and Helen Peck, "Building the Resilient Supply Chain," *The International Journal of Logistics Management* 15, no. 2 (2004), 1-14.

⁴⁴ Hau, L. Lee, "The triple-A supply chain" *Harvard business review* 82, no. 10 (2004): 102-13.

⁴⁵ Ibid.

need to take into account the risks and changes of factors that influence the supply chain. Supply chain risk management theories assume that the risks should be assessed continuously and dealt with strategically. The concept of supply chain resilience is closely connected to risk assessment and the creation of a sustainable competitive advantage.

Resilience is a multidisciplinary concept that is used in the areas of economy, psychology, sociology and ecology. It is an attribute that defines the possibility of a system to return to its previous state or to evolve to a new state of stability after a disturbance has occurred. In order to be able to completely fulfill its purpose, a supply chain must be able to withstand or to minimize the effects of all possible disruptions, such as terrorist attacks, on all the enterprises involved in the supply chain.

The challenges that await supply chain management in the face of terrorist threats in the future are the actions a company will take in order to be prepared for another attack, reduction of the risks in the supply chain under increased uncertainty, and a change in relations with the government in terms of information sharing in order to minimize the risks of potential terrorist attacks. In order to answer to these challenges, companies should try to develop supply chains that adhere to the principles of the triple-A supply chain. This implies that a supply chain should not only be cost-efficient and speed sufficient but also agile, adaptable and aligned. Terrorism as a source of disruption in the supply chain is a question that requires further research. The resilience of a supply chain is a key attribute in dealing with the threats of terrorism but further research into different methods of strengthening the supply chain should also be undertaken.

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