



The Origins of Robust Supply Chain Management and Logistics in the Caribbean: Spanish Silver and Gold in the New World (1492–1700)

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Abstract

The Spanish Empire had a head start on their European counterparts in establishing themselves in the Caribbean and South America. They discovered a surfeit of resources in newly explored regions of the Caribbean, including most notably, gold and silver. Collecting, processing, protecting, and transporting these riches from the Caribbean to Spain was a tremendous undertaking and required the Spaniards to adopt new practices in supply chain management and employ innovative logistical techniques. This chapter explores the history of the Spaniards in the Caribbean and northern South America and analyzes their practices in terms of our modern understanding of supply chain and logistics. This chapter begins with a historical context of Spanish exploration. We then describe the supply chain practices that begin by extracting gold from Peru, Colombia, and Ecuador, transporting to Panama, crossing the isthmus via mule train, and aggregating the gold in Cartagena and Havana prior to transportation to Spain.

Supply chain management has been conceptualized as “the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers” (CSCMP (2016) Council of supply chain management professionals. Available at: <http://cscmp.org/about-us/supply-chain-management-definitions>. Accessed 17 Nov 2016). Using this framework, we provide a case study of this time period that contextualizes the origins of supply chain management as employed by the Spaniards.

Keywords

Spanish gold and silver · Logistics and supply chain management · New World riches · Capitalism

Introduction

The Spanish exploration of the New World, the discovery of gold and silver, and the repatriation of these riches to Europe hastened the development of long-distance trade and dramatically altered the shape of capitalism in the known world. According to Peterson (1975), during the Spanish rule of the New World, an estimated \$4 billion to \$6 billion worth of precious metals and gems were transported to Spain, which represents five or more times the value a similar sum would have today. To support the extraction, refining, and safe transportation of this wealth to Spain, an ingenious system of planning, logistics, and supply chain management evolved. This chapter traces the roots of the European desire for metallic riches, which in turn prompted voyages to the unknown, and ultimately, the evolution of a new world economy. Long-term, the abundance mined from the New World did not prove

beneficial to the economic development of the Iberian Peninsula (Pach 1968). Instead, profits from the Spanish treasure fleets were squandered on wars and the support of an economy dependent on goods imported from other countries. The correlation from events that took place over four centuries ago and today's global political and economic scenario is profound.

Evolution of the European Economy

Europe, at the dawn of the fifteenth century, was emerging from the ravages of the Black Death, a bubonic plague that killed 60% of its entire population (Benedictow 2005). The political, social, and economic system of feudalism, the strict hierarchy of rank where every person knew their place began to change as the century unfolded (Olsen-Raymer 2014). In addition to the clergy (cardinals, archbishops, bishops, abbots) and the aristocracy (descendants of the warlords who were owners of vast parcels of land), a new class of citizen evolved. Known as the bourgeoisie, these were the merchants, the shopkeepers, and the master-craftsmen.

Towns and large villages arose throughout Europe. Behind the strong walls and moats of these fortresses, medieval craft production developed. Textiles, furniture, furs, fruits, even the production of weapons furthered the advancement of commerce and trade (Engels 1957). The economy according to Braudel (1992) consisted of two gigantic spheres: production and consumption. However, a third world existed, the market, the place where the exchange of goods took place. Markets were typically held on fixed days. Commodities such as bread, cheese, meat, vegetables, fruit, fresh game, wool, hemp, flax and on and on – the production side – could be sold directly to the consumption side, the consumer via the market. Goods were bartered or sold, money exchanged hands, and credit was little used – capitalism in its rudimentary form.

From a macrostandpoint, the European economy was isolated from the rest of the world with the exception of the neighboring Muslim lands (Walton (1994). Political connections with far-off civilizations in the West, the Far East, and Africa south of the Sahara were nonexistent with only a minuscule amount of international trade conducted. The one striking exception to the absence of foreign commerce was the trade in spices. The Muslims, through their conquests, had control or influence over a wide array of territories where spices richly coveted for food preservation and flavoring were grown and harvested. Powerful Italian city-states including Venice, Florence, and Genoa, following the path of the Crusades, dominated the market for spices, trading with the Muslims through Levant, the ancient ports of the eastern Mediterranean (Ashtor 1975).

Trade in the European markets as well as what little international commerce took place had long utilized coins as a means of payment. Europeans coveted precious metals which could be fashioned into coins, the only stable and dependable form of currency at the time. Coins could be subdivided. Coins could be stored and did not deteriorate in value, provided there was faith in the quality of the metals used to form the currency. Gold and silver were comparatively rare, malleable which allowed

them to be worked into handy shapes, and held an alluring appearance. Coins fashioned out of gold or silver could be exchanged for any commodity, at any place, at any time, and played a fundamental role in the development of European commerce (Walton 1994).

A phenomenon occurred in the second half of the fifteenth century that altered the course of history. As European merchants began to expand their reach into areas such as Africa and the Western Hemisphere, they discovered that with the exception of the Muslims who despite political and religious differences shared similar ideas about trade and money, the concept of using gold and silver which had intrinsic value and could be used for coinage was not unilateral. The imbalance between areas of the world with more advanced notions of commerce and a need for precious metals and areas which held large amounts of gold and silver but expressed scant interest in utilizing these resources for monetary purposes began to emerge (Walton 1994). Those who could take advantage of this contradictory situation stood to reap significant profits. The hunt for gold and silver began in earnest.

The European Quest for Gold

European thirst for gold and silver was heightened by the fall of the Christian city of Constantinople to the Ottoman Turks in 1453. The Turks subsequently held control of an important center of economic, political, and cultural influence. They also held sway over the Balkan silver mines of Serbia, Bosnia, and Kosovo. According to Erlichman (2010), the annual production of the Central European silver mines in the mid-fifteenth century had collapsed to fewer than 2.5 tons. The loss of the Balkan silver mines deprived the Italians of nine tons of silver. England's annual production of 65,000 lbs sterling in 1474 was half of its production in 1350. The Netherlands output of silver was down two-thirds. All of which meant a tightening of currencies and a slowdown in business activity. A sense of urgency for new sources of gold and silver prevailed.

Ironically, the smaller, less powerful, less affluent country of Portugal became the catalyst for a giant leap in the search for metallic riches, and ultimately, the evolution of capitalism. Vilar (1969) contended that Portugal, a small country, achieved more than countries much larger in population and resources due to its location at the crossroads of the Mediterranean, the Atlantic, and Africa. Prince Henry the Navigator, considered the father of Portuguese maritime expansion, jump-started his country's exploration of Africa. The Portuguese roamed far and wide around the west of Africa colonizing the Madeiras and the Azores, exploring as far south as the Ivory Coast, Niger, and Cameroon, searching for African gold, slaves, and a shorter route to the spice and silk markets of India and Malaysia. These activities captured the attention of competing countries. Portugal's exploration and commercial successes in West Africa had rendered the Spanish Kingdom of Castile to a lesser status on the Iberian Peninsula. The marriage of Fernando of Aragon and Isabel of Castile altered the dynamics of the region. The royal duo of Fernando and Isabel proved formidable, conquering the Muslim kingdom of Granada in 1491, unifying most of

Spain. The duo then turned their attention to beating the Portuguese to spice markets of South Asia (Erlichman 2010).

Christopher Columbus, a Genoese with a commercial and sailing background, in search of a more direct route to the spice markets of Asia, proposed a western route in sharp contrast to the Portuguese intent to head east. Columbus, having been turned down by the English and twice by the Portuguese, found a willing partner in the Spanish monarchs. To finance Columbus's first expedition, 1,600,000 maravedis, the equivalent of 14–16 kg of gold had to be found, with the hope that a sum exceeding that amount would come back. The Spanish monarchy provided 1,140,000 maravedis, Columbus paid an eighth of the costs, but it was the banker de Santangel who raised the capital (Vilar 1969). After a 10 week sail across the uncharted Atlantic, Columbus landed on an island in the Bahamas on October 12, 1492, thinking that he had located a chain of islands off the eastern coast of Japan (Erlichman 2010). According to Thomas (2003), some of the natives Columbus first encountered upon his landing had gold hanging around their necks and from holes pierced in their noses, instantly capturing the explorer's interest. Whether Columbus desired to recover the costs of the voyage or a quest for wealth, his hunger for gold was apparent, mentioning the subject in his diary more than 65 times (Vilar 1969).

The discovery of gold in the Caribbean islands spawned an unprecedented rush to search for New World riches. The next 50 years witnessed a gold cycle in the islands. The Spanish confiscated Indian gold used for ornamentation and forcibly subjugated natives in their search for gold in local vicinities. Death and infirmity of the indigenous population took place as the Spaniards moved from Santo Domingo to Puerto Rico, Cuba, and Hispaniola. Ultimately, the Spaniards began to spread elsewhere as the discovery of gold and silver in other Latin America countries ensued. While gold was the initial draw, as the decades of the sixteenth century unfolded, silver became so critical that gold comprised only 15% of the value of the riches being returned to Spain (Vilar 1969).

Three Sources of Gold and Silver

The viceroys of New Spain failed to discover the fabled *El Dorado* city of gold, even after sending search envoys as far north as Kansas and as far west as the Grand Canyon. However, the Spanish Empire's efforts in New Peru proved much more fruitful. Pizarro conquered the Incan empire in 1532 and the Spanish Empire acquired the Cerro Rico de Potosi silver mine. Some historians estimate that 85% of all silver extracted from the Andes came from this mine alone (Weatherford 2010).

Mining operations were run predominantly with the labor efforts of conquered Incans. Despite the widespread use of imported slaves from Africa as a labor source in other regions of the empire, Incan slaves were already acclimated to high altitudes. Spanish governors adapted the practice of *mit'a*, a labor law implemented by Incan predecessors requiring Incan youth to provide a given period of public service.

However, instead of the Incan practice of using this labor to build roads and public edifices, the Spanish employment of *mit'a* was used to mine silver (Thomas 2003). This practice quickly segued into full-scale forced labor referred to as *encomiendas*. In addition to the gold and silver mines that were discovered throughout Peru, Bolivia, Ecuador, and Colombia, the Vice Royalty of Peru also discovered several mercury mines, an integral component in the processing of silver. The proximity of mercury, most notably from the Huancavelica mine, afforded both cheaper processing because mercury did not have to be imported from foreign sources, and expedited exportation of the processed silver. The silver was transported to the coastal cities of Arica, Lima, and Callao in Peru where it was loaded on ships and sailed to Panama City. The silver was loaded onto mule trains and crossed the Isthmus of Panama to coastal cities of Nombre de Dios and Porto Bello to await transportation to Spain.

The Cerro Rico silver mountain was the first major mining acquisition for the Spanish Empire. A second major source of wealth was discovered in northern South America. In 1514, the coastal cities of Cartagena and Santa Marta were established as a base for exploration of the rivers and tributaries of the Andes Mountains. The rich gold deposits found there were extracted by the now-common *encomienda* enslavement practices, but also by the importation of African slave labor. These riches were taken to Cartagena to await transportation to Spain.

Finally, despite initial discoveries of small silver and gold deposits in Mexico in the early 1500s, the Vice Royalty of New Spain continued to search for larger collections of these metals. They discovered abundant deposits of silver most notably in Zacatecas and Guanajuato in Mexico in 1546. The silver extracted from these mines was carried by mule train to the coastal city of Veracruz to await transportation to Spain. Once the gold and silver were staged in Cartagena, Porto Bello, and Vera Cruz, they were transported via Spanish galleon to the port of Havana which served as a final staging area prior to shipment to Spain as illustrated in Fig. 1.

Transportation via Treasure Fleet

By 1520, the Spanish established a system of convoys whereby two fleets would depart from Seville, Spain, to retrieve the newly discovered gold and silver. The flotilla consisted of war galleons heavily laden with cannon, supply frigates, and merchant carracks, which purveyed the Caribbean colonies with manufactured and trade goods. Under this system, the fleet would sail to Caribbean whereby half the fleet would head south to Cartagena and Porto Bello, while the other half of the fleet would recover the silver and gold supply from Caribbean outposts, notably Vera Cruz. The fleet would then rendezvous in Havana in preparation for the return trip to Spain. To further protect their supply chain, the Spaniards augmented the fortifications and increased standard garrison sizes in these port cities which staged the gold and silver.



Fig. 1 Seventeenth Century Spanish Gold and Silver Supply Chain Routes. (Source: Florida Department of State. Retrieved from <http://info.flheritage.com/galleon-trail/platefleets.cfm>)

The main production centers of Spanish gold and silver were too far inland to be susceptible to sacking. However, once the Spanish treasure galleons departed the staging docks of Cartagena, Porto Bello, and Vera Cruz, they were the target of attack at sea by a myriad of characters. Piracy, as the Spanish called it, consisted of all foreigners, mostly Protestant, who assaulted their assets (Thomas 2003). Despite the all-encompassing characterization of piracy by the Spanish, the constitution of these actors varied in both legitimacy and tactics. Piracy consisted initially of the French and English attempting to disrupt Spain's progress towards wealth. They achieved this by sacking cities, seizing ships, and funding settlements from which to base their operations. This exercise of legitimate force by established foreign navies

eventually digressed into independent actors partaking in the attacks. Piracy by the mid-seventeenth century had become an independent endeavor. Privateers were nonmilitary contractors of Spain’s enemies, buccaneers were ostensibly free-lance sea robbers and bandits, and freebooters were French pirates in the Antilles that attacked merchant and treasure ships alike prior to arriving in Spain. The attacks on Spanish ships were so pervasive throughout the Caribbean during this time period that scholars refer to the seventeenth century as the Golden Age of pirates.

Spanish Logistics and Supply Chain Management

To comprehend the scope of the Spaniards’ extraction, processing, and movement of the immense amount of physical riches mined from the New World, we must put this into the context of modern day logistics and supply chain management. The concept of logistics, the movement of equipment and supplies, emerged from the military’s support of troop activities in the field. Today, the Council of Supply Chain Management Professionals define logistics as “that part of the supply chain process that plans, implements, and controls the efficient, effective flow and storage of goods, services, and related information from the point-of-origin to the point of consumption in order to meet customers’ requirements” (Enarsson 2009, p. 1). According to Rodrique (2012), the principle of continuous flow is at the heart of efficient use of logistics to support supply chain management as shown in Fig. 2.

By examining Rodrique’s (2012) modern day logistic chain, we can visualize the Spaniards process of logistics management. First they extracted gold and silver from various New World sources. Then they processed the raw material and fabricated the silver into loaf-shaped bars that weighed about 70 lbs, wedges that weighed anywhere from 2 to 10 lbs, or smaller cakes that weighed a pound or so. Gold followed much the

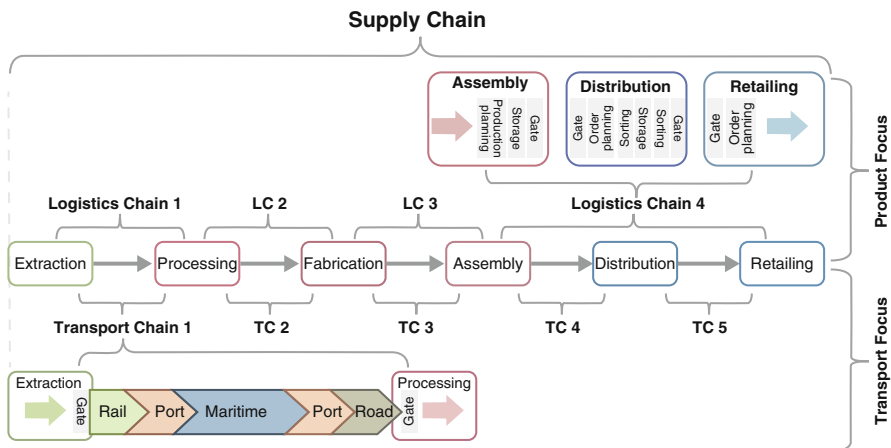


Fig. 2 The Scope of a Supply Chain, Logistics Chains and Transport Chains. (Source: Rodrique (2012), chapter 4, p. 5)

same process and was cast into similar shapes as silver but weighing only ounces rather than pounds (Peterson 1975). Following the processing and fabrication which took place at the various mining sites, the gold and silver was transported, typically by mule train, to assembly points in Vera Cruz, Mexico, Panama City, Panama, and Cartagena, Colombia. From these locations, Spanish ships made their way to Havana for final assembly and transport to Spain. To appreciate the scale of the Spanish logistics movement of riches to Spain, we need to consider the mode of maritime transportation. By the 1550s, the galleon had become the workhouse of the Spanish treasure fleet. Galleons were, on average, about 100 ft long, 30 ft wide and carried artillery plus supplies necessary to support a crew that could number as many as 200–300 men which included military personnel. Spanish galleons had a carrying capacity anywhere from 500 to 600 tons (Walton 1994), minute compared to today's modern cargo vessels where a medium size container ship is 700 ft in length and carries a load of 25,000 tons. To move the billions worth of riches to Spain, it is evident the Spaniards, against enormous challenges, focused efforts on achieving their version of a state of continuous logistics flow from the New World to Spain despite the fact that each voyage could take anywhere from 2 to 3 months, were comprised of 60 or more ships, and typically sailed in the spring to avoid the hurricane season.

The Spaniards modeled the logistics chain flow of extraction, processing, fabrication, assembly, distribution, and retailing centuries before the concept had been formulated. Lest there be confusion about the word retailing, the last step in the logistics flow process (Rodrique 2012), it is important to understand how the Spanish Crown's stake in New World riches evolved. Initially, the Spanish King demanded the bulk of the wealth confiscated from the Americas. However, it became evident that without proper incentive to navigate uncharted waters, bear harsh conditions, risk everything including life and limb, the proper development of the New World riches would languish and the full potential of exploiting this opportunity never achieved. The royal share was lowered and by 1500, the king's share was half, then reduced to a third, and in 1504 became a fifth. Where difficult mining conditions prevailed, the King's share could have been as low as a tenth (Peterson 1975). The larger share of New World abundance went to the merchants who financed the search for gold, silver, and other riches – the use of *variable or rolling capital*, money used in the production as defined by Braudel (1992). The regulation of trade between Spain and the New World was under the control of the Spanish House of Trade which was under the administration of the Council of the Indies and was responsible for formulating trade policies and procedures. So linked was the Merchant Guild of Seville to the House of Trade, members could be compelled to advance money to the crown to meet the financial needs of the state or finance fleets of treasure ships (Hamilton 1929). Figure 3 reveals in pesos the average annual imports of registered public and private treasure from the New World.

The value of this treasure to the Spanish Crown and the Merchants of Seville is best illustrated by the fact that “at the rate prevailing for un-skilled labor in Andalusia, Spain, the average annual receipts for 1591–95 would have paid for 21 ½ days' work of all the persons in the country employed for salaries and wages” (Hamilton 1929, p. 464).

Fig. 3 Average Annual Imports of Treasure in Pesos by Ten-Year Periods, (Source: Hamilton (1929), p. 464)

Period	Public	Private	Total
1503-1510	75,176.3	211,756.2	286,932.5
1511-1520	114,690.5	323,059.4	437,749.0
1521-1530	61,444.6	173,076.6	234,521.2
1531-1540	356,649.1	760,975.7	1,117,624.9
1541-1550	470,092.0	1,622,451.2	2,092,543.2
1551-1560	1,039,400.4	2,533,505.5	3,572,905.9
1561-1570	1,120,855.2	3,948,895.0	5,069,750.2
1571-1580	1,989,667.8	3,842,042.2	5,831,710.0
1581-1590	3,118,763.3	7,522,685.2	10,641,448.5
1591-1600	4,199,533.3	9,723,139.3	13,922,672.6
1601-1610	3,013,912.9	8,147,794.1	11,161,707.0
1611-1620	2,312,141.9	8,615,974.2	10,928,116.1
1621-1630	1,901,991.4	8,491,049.6	10,393,041.0
1631-1640	1,885,025.5	4,800,065.7	6,685,091.2
1641-1650	1,261,754.9	3,845,115.0	5,106,869.9
1651-1660	569,080.4	1,561,896.1	2,130,976.5

Robust Supply Chain Practices

The supply route the Spanish empire established during this time was unlike any others seen in history. The Romans had a network of roads to connect the farthest regions of their empire, but these were already well-established trade routes into a relatively known world (Grant 1991). Marco Polo's route to Asia was exploratory in nature and yielded relatively low trade volumes, and military conquests such as those undertaken by the Mongols and Alexander had a clear origin to front lines supply chain, but were subject to short term fluctuations in quantity and limited duration (Cole and Symes 2014). The Spanish transportation of precious metals from their newly established vice-royalties in Central and South America was truly the world's first supply chain that was maintained in consistent quantities over a sustained period of time (centuries) in an environment where the risks were unknown and extreme. Their success is remarkable by historical standards. Moreover, they changed the economy of Western Europe and established supply chain practices their European neighbors would emulate in their New World conquests.

Current knowledge of supply chain management is rooted in a mature stream of empirical and theoretical scholarship. The Spanish supply chain practices need to be contextualized in this contemporary understanding so that the fullness of their innovation can be brought to light. More specifically, in what ways does their supply chain conform to modern best practice? Many scholars argue that robustness is the defining characteristic of supply chain best practice (Kouvelis et al. 2006; Asbjornslett and Rausand 1999; Durach et al. 2015; Nair and Vidal 2011). Meepetchdee and Shah (2007) offer that robustness consists of "the extent to which the supply chain is able to carry out its functions despite some damages done to it" (p. 203). This characterization identifies resiliency in spite of setbacks as a key element in supply chain robustness. The Spanish Empire certainly persevered in

spite of myriad detriments to their operation. The treasure fleet was successfully captured in 1628 and destroyed in 1656 and 1657. Maritime weather sunk the treasure fleet in 1622, 1715, 1733, and 1750. Pirates successfully sacked port cities of Nombre de Dios (1595), Campeche (1663), Panama (1671), Vera Cruz (1683), Cartagena (1683), Porto Bello (1739), and Havana (1748). These efforts emboldened pirates and foreign navies to continue their sally on the Spanish treasure fleet and compelled Spanish governors to further fortify their port redoubts. Despite these setbacks, the Spanish supply chain continued to function. Klibi et al. (2010) opine that a supply chain is robust if it can sustain value creation under all plausible future scenarios. The Spanish successfully imported more than 89 million pesos from American origin between 1503 and 1660, which equates to more than 500,000 pesos per annum (Hamilton 1929). Their sustainable value creation vis-à-vis the silver and gold routes demonstrates the robustness of their supply chain. Wieland and Wallenburg (2012) characterize robustness as the ability of a supply chain to resist change to its initial configuration. Hence, a consistency of purpose characterizes robustness. The Spanish supply chain advanced as nautical, shipbuilding, and navigational technology improved, and they used these advances to expand their armada of fleets and continue global navigation and exploration, notably in South America and Philippines. They fought wars with their English, French, and Dutch counterparts. They established their new colonies, expanded their population centers, and established new commercial trade routes. They never abandoned their efforts to continue gold and silver extraction during the era of these concomitant opportunities. The incentive to maintain their lucrative supply chain was clear. Their reliance (and dependency) on gold and silver to fund these expansive endeavors fueled their commitment to maintaining the supply chain. This consistency of purpose further characterizes their supply chain as a robust one.

The Spanish supply chain can be regarded ostensibly as the world's first robust supply chain because the results of their efforts reflect the resiliency, sustained value creation, and consistency of purpose that characterizes robustness. A comprehensive understanding of their supply chain requires a deeper exploration of the factors that contributed to this robustness. Durach et al. (2013) conducted a meta-analysis of robustness as a supply chain construct and identified eight antecedents. They found that the factors contributing to a robust supply chain include leadership commitment, reliable human capital, intra-organizational relationship magnitude, an aggressive orientation on risk management, node criticality, bargaining power, visibility, and network complexity. The Spanish supply chain is contextualized in light of these factors.

Leadership Commitment

A robust supply chain begins with unwavering commitment from organizational leadership. In the years prior to the discovery of these new resources, the Spanish monarchy ushered in what would become the most influential union the era would see – that of Ferdinand of Aragon and Isabella of Castile. Their impact on the

Spanish search for and production of silver and gold during this early period set the precedents that proceeding kings and queens would use to grow their presence in the new world. This royal couple was committed to the Spanish supply chain for myriad reasons. First, the Spanish empire was in the midst of vanquishing the last bastion of Muslim presence in Spain. Their victory at Granada (1492) was the last step in evicting Muslim presence after eight centuries of occupation. In the postbellum years of Granada, Isabel and Ferdinand took measures to establish and sustain a unified and independent Spanish identity (Thomas 2003). They funded more wars and conquests for expansion using the funds from the resources they extracted from their new vice-royalties. The Spanish fought in campaigns against Morocco (1497), Muslims (1499), Ottomans (1499), Italy (1499), Papal States (1508), Tainos in the Caribbean (1508, 1511), Algiers (1518), Aztecs (1519), Mayans (1523), Switzerland (1526), Incas (1531), France (1551), Protestants (1562), Philippines (1567), and the Eighty Years War that began in 1567. The constant need to supply front lines, billet soldiers, hire mercenaries, incentivize exploration, and compensate the ever-growing list of nobles, officers, and governors to rule the expanded territories left Spain unwavering in their search for more gold and silver. The leadership commitment to maintain the supply chain was stark, even after the Isabela and Ferdinand era had ended. Spanish powers continued to pour resources into maintenance and development of the supply chain because had they not, they would have lacked the financial means to engage their empirical conquests of foreign lands and defense of their own. Thomas (2003) suggests that the Spanish monarchs ostensibly bankrupted their country by using their treasure from the New World to fund an incessant series of wars. The gold and silver they extracted continued to depreciate in value by nature of the increase in supply. The commitment to war and the inflation collectively contributed to the bankruptcy of the monarch.

The depreciation of precious metals during this time meant they needed even more to maintain their level of warlike relationships with neighboring European powers and American exploration and conquest. Leadership commitment to the supply chain became absolute as a result of this dynamic.

Human Capital

Human capital is an essential element in establishing and maintaining a robust supply chain. The origins of the metals in mines required the Spanish to employ slave labor of conquered peoples. The *encomiendas* were forced labor practices whereby the Spanish used local native populations who were well acclimatized to the weather of the Mexican heat and the altitude of the Andes. In more accessible regions, the Spanish would also import African slaves to areas such as Northern Colombia. Human capital for gold and silver processing was accessible to the Spanish in the form localized slave labor.

Once the Spanish transported the gold and silver to coastal cities such as Cartagena, Puerto Bello, and Vera Cruz, the empire relied on the military chain of command to transport and protect the gold as they made it Havana and then to Spain.

The Spanish navies were financed by the treasures extracted from the Americas and represented a source of human capital integral to the supply chain.

In addition to production and transportation of the treasure from origin to destination, the Spanish treasury funded the production of supplementary inputs to the entire process. They paid for Spanish shipbuilders in port cities of Seville and Cadiz to produce the galleons, barques, sloops, and merchantman carracks needed to execute this maritime supply system. They had access to the goods produced by domestic Spanish labor which supplied their Caribbean and American outposts. They funded transportation of Spanish families across the Atlantic which were fundamental in the operation and localized expansion of their burgeoning colonies.

Finally, the Spanish nobility had a robust system of governorship under which the colonies would be administrated. They placed governors in each of their major hubs to oversee the welfare of not only their cities but their part in the Spanish supply chain. Part of this governorship required the human capital to populate the garrisons of the forts which guarded the harbors of towns like Cartagena, Cumana, Maricao, Havana, San Juan, and Santa Marta.

In short, the Spanish empire had the necessary human capital to execute their supply chain via forced local labor to produce the metal, Spanish navy to transport and protect the treasure, supporting industries to supply the inputs, and a series of Spanish administrators to govern the entire process.

Intra-organizational Relationship Magnitude

Intra-organizational relationship magnitude within a robust supply chain represents the degree to which the unique entities within the organization work cooperatively and communicate. The monarchical nature of power and reporting hierarchies allowed the Spanish empire to strengthen the intra-organizational relationship of their supply chain. Their intra-organization relationship was enhanced by both the accountability measures practiced at the time and the punishments for non-compliance. For example, Spain sent royal accountants to their royal outposts to ensure the proper distribution of goods and collection of tariffs. They ensured that treasuries were accounted for and that the king and queen received their agreed upon share of private expeditions, and the entirety of what they were owed from origin production. Ship captains were required to keep logs and bills of lading that were reviewed by the appropriate authorities at various stages in the process. These accountability measures contributed to intra-organizational relationship. A king or queen in Spain could reasonably account for their production and treasure from origin in the Americas, to coffers in Spain. What made these accountability measures so effective was the punishment for noncompliance. A royal accountant who identified mistreatment or misplacement of royal funds could identify and report a governor or official and subjugate them to deportation back to Spain. This was precisely the case with Columbus in 1500. He was sent home to Spain in chains where he defended his case with the Isabel and Ferdinand. The Spanish navy had severe punishments for mutiny and insubordination. These included death, flogging,

and even relegation to Spanish penal colonies (Ortiz-Minaya 2014). The empire had demonstrated in the fifteenth and sixteenth century's vis-à-vis the Spanish Inquisition the ruthlessness and monarchical power that could use to enforce the rules. The combination of accountability and punishment for noncompliance contributed to the overall adhesiveness of the intra-organizational relationships.

Risk Management

A global supply chain faces a diverse set of risks due to disruptions, breakdowns, political factors, and disasters both natural and man-made, all of which complicate the process of assuring the safe passage of goods and making risk management challenging. Nowhere was this truer than what the Spanish faced while transporting riches from the New World to Spain. When looking at the Spanish risk management process through the lens of modern day risk management practices, we used the four categories of risk proposed by researchers (Manuj and Mentzer 2008; Christopher and Peck 2004) which were supply, demand, operational, and security. Figure 4 displays the interrelationship between the different types of risks.

For the Spanish, the risks were enormous to both the crown and the Merchants of Seville. By necessity, they became ingenious at developing risk mitigation strategies aimed at the primary challenges of the operational risk of inventory ownership; demand risk of competitor moves; and supply risks such as natural disasters, piracy, transit time variability, and confiscation by foreign adversaries.

The Spanish first line of risk management was to properly secure inventory ownership which was compounded by illegal smuggling, the stowage of gold and

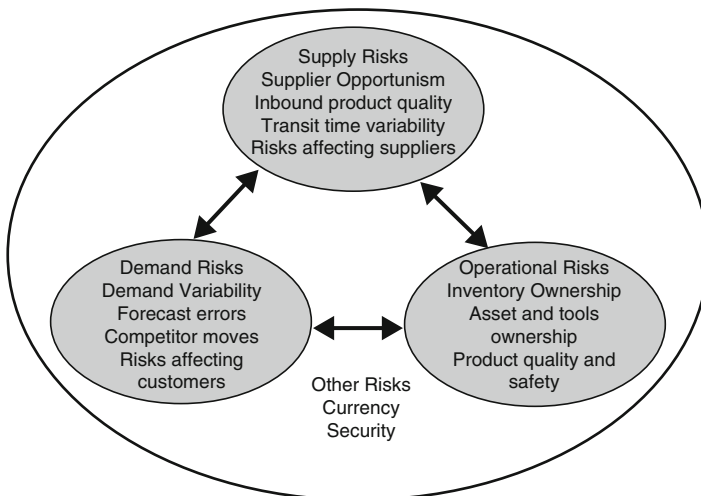


Fig. 4 Risks in Global Supply Chains. (Source: Manuj and Mentze (2008), p. 201)

silver aboard the Spanish ships. Responsibility for the safety of the gold and silver bullion lay with the *master de plata* (silver master) who was appointed by the Spanish Crown. This individual was chosen with great care and was obligated to post a bond of 25,000 ducats in silver with the Spanish officials. Multiple copies of the cargo manifest were developed as precautions against smuggling and to certify property ownership. Two were sent in ships other than the one carrying the treasure, one stayed behind, and one went with the actual ship carrying the gold and silver. These precautions were developed to expedite accounting should a disaster befall the ship or the entire fleet of ships (Peterson 1975). In theory, the cargo manifest should have listed each and every ounce of gold and silver going to Spain and had to be accredited as tax-paid. However, viewed by the Spanish officials, tax evasion and smuggling had grown so pervasive that The Law of 1580 was enacted stating any ship captain or officer caught in the act would have their bullion confiscated and be held liable in full to the ship owner. By 1593, the offense of smuggling was punishable by the loss of position for 4 years and should the offender prove to be an everyday seaman, they were consigned to the galleys for that amount of time. Those on the receiving end of unregistered bullion, often the Seville Merchants, would have their property seized by the Crown and banished from Spain and all Spanish territories. The Spanish Crown and the Seville Merchants in effect ran a monopoly and was determined to hang onto that monopoly at all costs.

The Spanish treasure fleets were subject to demand risks created by competitor's moves of piracy and confiscation by foreign adversaries. Barbour (1911) contended that the majority of those acting against Spain were privateers, in essence entrepreneurs seeking Spanish treasure through violent means while sailing under letters of marque or retribution, which gave them legal authorization to appropriate Spanish ships and the goods they carried. Spain's foreign competitors, the French, Dutch, and English, freely issued letters of marque in concerted efforts to capture a portion of the Spanish treasure being repatriated to Spain. While there were occasions of pirate buccaneers of fictional lore, they made up a small portion of the assaults committed in the Indies and Caribbean.

To combat these strategic adversarial moves, according to Walton (1994), the Council of the Indies in 1560s issued operational directives that governed the shipping of New World treasures to the mother country. These proclamations included extensive Spanish naval patrols in areas vulnerable to attack; primarily the Caribbean and the Atlantic waters off the coast of Spain; and initiating a system of regularly scheduled Spanish convoys that were heavily guarded. Large fleets including merchant ships and protective warships traveled in these convoys. Smaller craft accompanied the convoy to carry messages and scout surrounding waters (Walton 1994).

The Spanish had to contend with the supply risk of primitive navigation techniques and weather that impacted their continuous logistics flow. Maritime navigation in the fifteenth, sixteenth, and seventeenth century was archaic by today's standards. Seafarers had long possessed the ability to measure latitude, how far north or south they were from their home. However, determining their longitude –

their position east or west from a given point – was a challenge. The sailor could determine the local time by the position of the sun, but without a clock that had the ability to function despite corrosive elements and the rocking of a ship, it came down to a guess as to how long they had been traveling east or west (Schuler 2014). Despite, or perhaps because of these primitive navigation techniques, the treasure fleets developed the practice of departing for Spain from Havana, following the Gulf Stream north before turning east toward Spain. While the Spanish utilized enormous risk mitigation strategies to combat piracy and hostile action by foreign competitors, the most serious threat to the successful passage of the treasure ships was the weather. While weather conditions were generally better during the summer months, the warm waters of the Atlantic could spawn hurricanes. The Spanish lost ships to Caribbean storms in 1590, 1591, 1601, 1605, and 1614 (Walton 1994). Without the aid of modern day satellites, radar, GPS systems, and electronic depth finders to detect shoals and reefs, the best the Spanish could do was recognize through hard lessons, the time of the year that gave them the best chance of good weather and safe passage to the deep waters of the Atlantic. Should a weather related disaster or similar catastrophe occur, the Spanish Crown and the Seville Merchants utilized various contingency plans to mitigate the supply side risk of defaulting on the loans that financed the treasure fleets. Clauses were written into the loan contracts that allowed for the suspension of payments should a sizeable, unanticipated event occur and debt restructuring including the extension of the debt, alteration to the interest rate were common (Drelichman and Voth 2014).

Despite these risks and challenges, the Spanish Empire had a major impact on shaping the world economy. The European-style monetary system became the model in the western hemisphere. The treasure fleets first linked the continents together. The Spanish system was a success primarily because it met the needs of two forceful and influential factions: the Spanish Crown and the Merchants of Seville.

Node Criticality

There were three nodes, critical points where the Spanish logistics aspect of their supply chain system intersected. The first, node 1, were the main collection points of Vera Cruz, Panama, and Cartagena where the extracted and processed gold and silver was delivered from mines scattered throughout the Spanish America. The second, node 2, was the primary gathering point in Havana where shipments from node 1's were collected, stored, inventoried, and ultimately loaded onto ships bound for Spain. As characterized by Adenso-Diaz et al. (2012), critical nodes as shown in Fig. 5 are those that would cut the primary flow of the commodity if they were shut down. An argument could be made that a 3rd node could exist anywhere along the route of the Spanish treasure fleet once departed from Havana due to risks posed by weather, attack by privateers or pirates. The Spanish, however, took great care to control what they could control in the logistics flow of wealth from the New World to Spain.

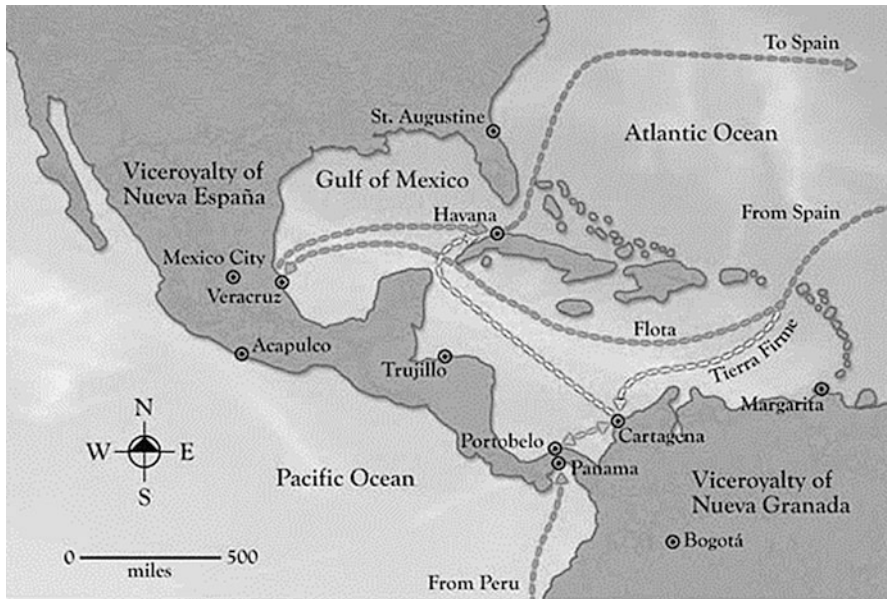


Fig. 5 Node Points: Spanish Supply Chain. (Source: Florida Department of State. Retrieved from <http://info.flheritage.com/galleon-trail/platefleets.cfm>)

Bargaining Power

According to Campbell (1998), a significant goal of supply chain management is to reduce uncertainty and create optimum conditions for long-term continuity, factors important to those responsible for the movement of gold and silver from the New World to Spain. Due to the monopoly held by the Crown and the Seville Merchants, one might ask “What bargaining power?” But when viewed as the need for task interdependence by Spanish miners, processors, transporters, and sailors operating in a challenging environment, thousands of miles from home, the subject takes on a different perspective.

Thompson (1967) argued that three types of task interdependencies exist – pooled, sequential, and reciprocal. Pooled interdependencies occur when various parties do not need to coordinate their activities. An example would be a merchant and its suppliers. Once orders are placed, it matters only to the owner of the shop when supplies are delivered and little coordination between vendors is required. This is not the case when moving large quantities of metals across long distances fraught with uncertainty. Sequentially interdependent tasks arise when one participant’s job must be finished in order for the next participant’s job to begin, which necessitates arrangements and schedules. Thus was the movement of New World riches to Spain which required the coordination of sequentially interdependent tasks. Once the gold and silver was mined and processed, it required coordinated movement to the major gathering points of Mexico City, Vera Cruz, and Cartagena. Sequentially, the processed New World riches

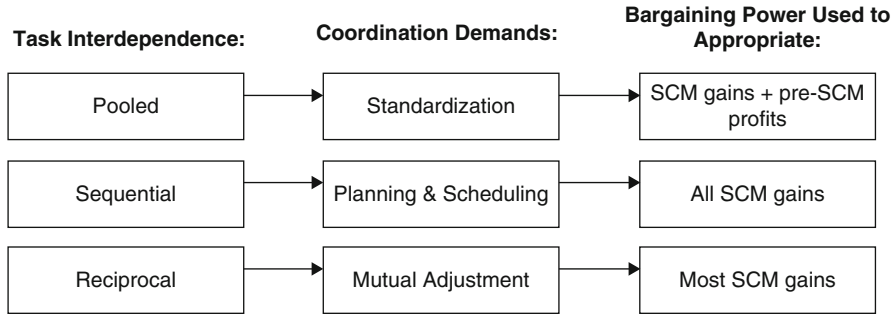


Fig. 6 Connection between task interdependence, needs for coordination, and bargaining power. (Adapted from Crook and Combs 2007, p. 549)

moved to Havana and then onto Spain. Each step of the process needed the prior step to be completed and required coordination of totally different tasks and ran on prearranged schedules. Reciprocal interdependence happens when organizations require the involvement of other people or units of operation (Thompson 1967). Reciprocal tasks most likely occurred where New World riches were mined and processed. The connection between task interdependence, needs for coordination, and bargaining power is shown in Fig. 6.

Crook and Combs (2007) pointed out that sequentially interdependent tasks require a heightened need for planning and the sequencing of events as one group's outputs becomes the next in line's inputs. It was in the best interests of all parties involved in the process of moving gold and silver to Spain to function together and deliver optimal performance under trying conditions. Bargaining power, defined by Bush (2016) as the ability or power to impact another, was likely minimal as long as the process flowed smoothly and supply chain management profits maximized. Every member of the logistics system, large or small, reaped profits and were controlled by the dual monopolies of the Spanish Crown and the Merchants of Seville.

Visibility

The scope of the Spanish global exploration, colonization, and exploitation of New World riches was breathtaking. Despite the limitations of navigation systems of the day and communication between the New World and Spain that relied totally on maritime travel, the factor of visibility played a role in the function of the Spanish supply chain management system. According to McCrea (2011), visibility in the logistics and supply chain process is when all parties, the shippers, the various business associates, and end users know where products are within the supply chain – from raw materials to the final destination. Modern day enterprise resource systems (ERP) integrates the shipper with the supplier and enables both parties with a click of a few computer keys to check on the status, location, and anticipated deliver of a particular order. This was not the case when it came to managing the process of moving gold and silver from the New World to Spain.

To understand the Spanish approach to managing the timing of the activities of mining, processing, overland transportation, and final shipment of gold and silver to Spain, it is useful to view this process through Vernon's (2008) definition of visibility in supply chain management as the "*identity, location and status of entities transiting the supply chain, captured in timely messages about events, along with the planned and actual dates/times for these events*" (p. 182). The entity in the Spanish movement of riches was the specific product (gold, silver). Identity was the system with which the Spanish coded the shipment components (Crowns portion, Saville Merchants portion). Location was where the product was in the process of movement from the mines to Spain. A visibility event was when a specific function within the process was completed and the next function began, i.e., movement from the mine and process site to the gathering site, overland movement to the primary shipment sites, and finally, onboard a ship headed to Spain. Planned and actual dates refer to when an event was to take place (Vernon 2008). In the 1560s the Council of the Indies decreed rules and regulations that stipulated procedures for the operation of the fleets between Spain and the New World. This edict required accelerated naval patrols in the critical areas of the Caribbean and the Atlantic waters off the shore of Spain, exposed areas where the treasure fleets initiated and completed their voyages and stipulated the timing of the sailing of two enormous convoys that departed from Spain each year filled with supplies and laden with New World riches on their return. Three factors were calculated into the timing of their sailing: (1) take advantage of the winds and currents, (2) bypass the steamy heat of the summer, and (3) attempt to sidestep the powerful storms, including hurricanes in the fall and winter which ultimately proved to be the most significant threat to the Spanish treasure fleet system (Walton 1994).

Network Complexity

Harland et al. (2003) concluded that as the complexity of the supply chain network increased, risk increased. As noted by Durach et al. (2015), two key factors add to an increase in network complexity: (1) the greater the number of nodes within the supply chain, (2) the supply chain tends to become ever more protracted and complex. In the case of moving New World riches to Spain, the Spanish were able to limit the number of nodes, but due to the sheer length of their supply chain and the challenges posed by primitive navigation devices, nonexistent communication systems, the constant threat of privateers, and unpredictable weather, the Spanish supply chain was complex. The overall success of the Spanish treasure fleets was a testament to Spanish ingenuity, courage, and planning.

Long-Distance Trade and the Development of Capitalism

Spanish activity in the New World, spawned by the discovery of gold and silver, marked a significant leap forward in the development of a global economy. For the general masses of the European population, commerce

continued in its most basic form, the local market where merchants bartered their goods in exchange for other goods or exchanged their wares for money. Some international trade, the merchants of the Italian states, for example, might have purchased goods in their locale, re-sold them in Egypt, used the proceeds to acquire spices, peppers, and other highly desirable commodities, to be re-sold in Italy at a profit. This mechanism represents what Braudel (1992) called a trade zone or market. According to Cetina (2006), the evolution of international trade required the development of long supply chains and intermediaries, a business model quite different from central markets. This trading process passed through an expanding maze of import-export merchants, financiers, and commercial adventurers who were not producers but brokers who locate, purchase, and stock goods to resell at a later date to consumers and other traders at the end of a supply chain. As the global economy developed, trading networks dominated by powerful groups were established inside and outside Europe. Charter trading companies emerged including the East India Company and the Hudson's Bay Company who subsequently built far-reaching international trading domains that focused on trade rather than the production of goods (Gereffi 2005).

Boxer (1969) argued that true world trade came about when a maritime connection was established with the four great continents with silver as the catalyst. China became the predominant buyer of silver when they converted from a paper-money system to silver in the 1570s. Silver flowed to China via three trade routes: (1) across the Atlantic to Europe and on to Asia, (2) from Europe around the African Cape, and (3) Mexico to Manila, to China. On the production side, Spanish America produced over 150,000 tons of silver between 1500 and 1800, likely more than 80% of the world output. Conventional thinking was that the driving factor behind the flow of silver to China was the European's desire for Asian luxury goods such as silk and porcelain which created a trade deficit that had to be settled. Contrarily, Flynn and Giraldez (1995) contended that the switch of more than a quarter of the world's population to the use of silver as currency contributed to a situation where silver's value in China was double its value in other parts of the world and gave birth to world trade. Irrespective of the ultimate cause, world trade blossomed and can be measured as seen by the rapid growth of European cities located along the Atlantic seaboard. Between 1600 and 1750, 40% of urban growth in Europe took place in just 15 Atlantic port cities (de Vries 2007). Intercontinental trade grew from approximately 2500 tons in 1501, approaching 800,000 tons in 1795 as illustrated in Fig. 7.

Braudel (1992) wrote that long-distance trade was a significant factor in the evolution of merchant capitalism and that the import-export merchants were a category apart. The risks of long-distance trade were extraordinary, but outlandish profits based on the price differences between markets far apart were the rewards of success. Supply and demand were not factors and controlled solely by the merchant wholesaler. A striking example of extravagant profits was "a kilo of pepper, worth one or two grams of silver at the point of production in the Indies, would fetch 10–14 grams in Alexandria, 14–18 in Venice, and 20 to 30 in the consumer countries

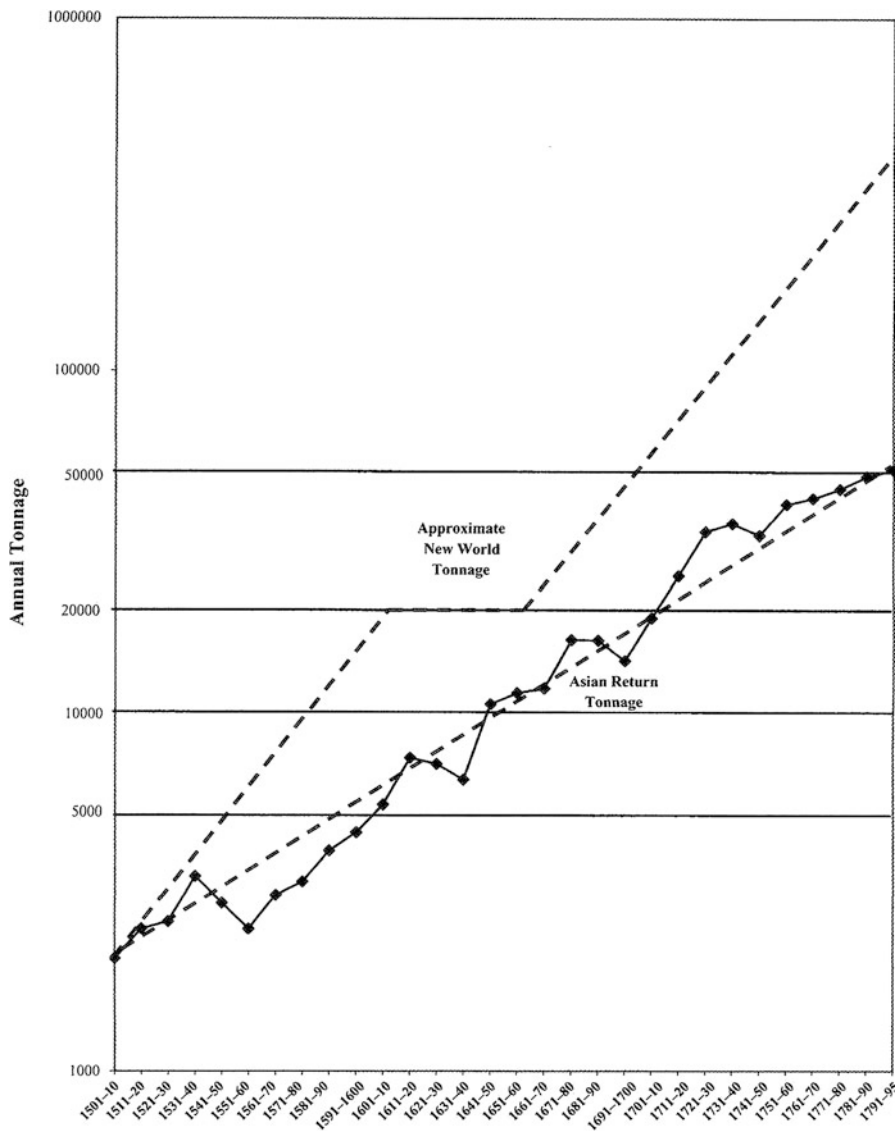


Fig. 7 Intercontinental trade. (Adapted from De Vries 2010, pg. 26)

of Europe” (Braudel 1992, p. 405). Sizeable profits were not the sole domain of luxury goods. Commodities including grain, wool, and manufactured cloth made their way through various trade routes and the contrast between the purchasing and selling prices was so great, that even factoring the cost of transport, the profits were sizeable. As noted by Braudel (1992), the preeminence of the import-export

merchants and long-distance trading were crucial factors in the development of merchant capitalism and the establishment of the merchant bourgeoisie.

New World Riches and the Impact on the Iberian Peninsula

Vilches (2010) wrote that the flood of gold and silver from the New World created a serious problem, price inflation on the Iberian Peninsula. Money was no longer simply a medium of exchange with a fixed and intrinsic value. Gold and silver became a commodity that could change in value based on supply and demand. Several scenarios unfolded that proved consequential. First, as the New World Spanish colonies matured, they required textiles, paper, and other manufactured products. Spain could produce just a fraction of the goods required by their overseas conquests which meant Spanish merchants had to seek products produced outside of Spain for re-export to Spanish colonies. The result was reduced profits, Spanish silver now going to foreign markets, and tax revenues experiencing a sharp decline. Second, Spain's aggressive foreign policy required huge amounts of money sent abroad to support its fleets and expansionist plans. Third, less than productive uses of Spanish riches ensued including a series of seemingly unending foreign wars, state debt, and excessive bureaucracy, all of which began crippling the Spanish economy (Walton 1994).

By the end of the seventeenth century, Spain was in decline. The French, Dutch, and English had aggressively colonized the Americas and Spain was being outmaneuvered by her fierce rivals politically and economically. War, exodus to the colonies, and famine contributed to a Spanish population decline of two million in 1700 from the start of the quest for New World riches in the early 1500s. Poor political decisions by an administration run by lawyers, aristocrats more inclined to showcase their wealth, and former military officers proved inadequate in developing programs and economic policies capable of revitalizing the country. As the century wore on, the Spanish Crown continued in a series of wars that required borrowing massive money from foreign bankers. Finally, an ongoing series of suspension of loans and suspension of payments led to Spain's creditors to cease loaning money to the Spanish Crown.

Conclusion

The Atlantic trade spurred by the Spanish quest for gold and silver played a significant role in the development of a new global economy. According to Acemoglu et al. (2002), Atlantic trade delivered significant profits to a segment of European merchants, the bourgeoisie. With these profits, the bourgeoisie were able to increase their investments, expand their trading, and grow the economy. On a grander scale global trade began when the major continents of the world began the routine transfer of goods on more or less a continual basis (Flynn and Giraldez 1995). While these achievements were inevitable, they were hastened by the

courageous and ingenious Spanish system of logistics and supply chain management. One can argue that the Spanish were also responsible for the demise of a significant portion of the indigenous native population as they institutionalized their processes of moving New World riches to Spain. Acknowledging this fact and leaving further exploration into this subject for another essay, one can visualize the dramatic changes that ensued post the rush for New World riches. The amount of foreign trade had become so immense that it became more and more challenging to clear international accounts. The discovery of gold in North America, the invention of ships made from metal and driven by coal-powered steam engines dramatically altered seaborne transportation. The emergence of alternate means of a money that included paper, letters of credit, the electronic transfer of funds and the United States bowing out of the promise to redeem its currency for gold were economic factors resulting from the long-ago Spanish quest for New World riches. This quest for riches compelled the Spanish Empire to adopt innovative supply chain practices, which reflect the basic framework of what modern scholars consider a robust supply chain.

References

- Acemoglu D, Johnson S, Robinson J (2002) The rise of Europe: Atlantic trade, institutional change and economic growth. National Bureau of Economic Research, Cambridge, MA. Retrieved from <https://www.nber.org/papers/w9378.pdf>
- Adenso-Diaz B, Mena C, Garcia-Carbajal S, Liechty M (2012) The impact of supply network characteristics on reliability *Supply Chain Management: An Int J* 17(3):263–276. Retrieved from https://www.researchgate.net/profile/Santiago_Carbajal/publication/233919540_The_Impact_of_Supply_Network_Characteristics_on_Reliability/links/0deec52a836aae9431000000/The-Impact-of-Supply-Network-Characteristics-on-Reliability.pdf
- Asbjørnslett BE, Rausand M (1999) Assess the vulnerability of your production system. *Prod Plan Control* 10(3):219–229
- Ashtor E (1975) Profits from trade with the Levant in the fifteenth century. *Bull Sch Orient Afr Stud Univ Lond* 38(2):250–275. Retrieved from https://www.jstor.org/stable/pdf/613212.pdf?casa_token=tM8HKJpOd5EAAAAA:CcbfKaDVaoRuin9dCsnTztjWGCXxZekdfB39YGXwDV_uOLDGGJI0KKiH8E0sJ-91hjbWffd8IHMwkM6jDVNCwTbZsTFDa5-Q1V_2xnSzfCY90fRqw
- Barbour V (1911) Privateers and pirates of the West Indies. *Am Hist Rev* 16(3):529–566. Retrieved from <https://www.jstor.org/stable/pdf/1834836.pdf>
- Benedictow O (2005) The black death: the greatest catastrophe ever. *Hist Today* 55(3):42–49. Retrieved from <https://www.historytoday.com/ole-j-benedictow/black-death-greatest-catastrophe-ever>
- Boxer CR (1969) *The Portuguese Seaborne Empire – 1414 – 1825*. Hutchinson, London
- Braudel F (1992) *The wheels of commerce*. University of California Press, Berkeley
- Bush T (2016) What is bargaining power in business? PESTEL Analysis. Retrieved from <https://pestleanalysis.com/bargaining-power-in-business/>
- Campbell A (1998) Cooperation in international value chains: comparing an exporter's supplier versus customer relationships. *J Bus Ind Mark* 13(1):22–39. Retrieved from <https://www.emeraldinsight.com/doi/abs/10.1108/08858629810206197>
- Cetina KK (2006) The market. *Theory Cult Soc* 2(3):151–156. Retrieved from http://kops.uni-konstanz.de/bitstream/handle/123456789/11724/The_Market_2005.pdf?sequence=1&isAllowed=y¢ralmarkets

- Christopher M, Peck H (2004) Building the resilient supply chain. *Int J Logist Manag* 15(2):1–13. Retrieved from https://dspace.lib.cranfield.ac.uk/bitstream/handle/1826/2666/Building_the_resilient_supply_chain-2003.pdf?sequence=3&isAllowed=y
- Cole J, Symes C (2014) *Western civilizations: their history & their culture*, 18th edn. Norton and Co, London
- Crook TR, Combs JG (2007) Sources and consequences of bargaining power in supply chains. *J Oper Manag* 25:546–555. Retrieved from <https://pdfs.semanticscholar.org/20ad/6dc4772028553dad032be4153d3f6eed1b3f.pdf>
- CSCMP (2016) Council of supply chain management professionals. Available at: <http://cscmp.org/about-us/supply-chain-management-definitions>. Accessed 17 Nov 2016
- de Vries J (2007) The limits of globalization in the early modern world. *The Economic History Review* 63(3):710–733. Retrieved from https://www.jstor.org/stable/40929823?seq=1#meta_data_info_tab_contents
- Drelichman M, Voth H (2014) Risk sharing with the monarch: contingent debt and excusable defaults in the age of Philip II. University of Zurich, Department of Economics, pp 1556–1598. Retrieved from <https://www.econstor.eu/bitstream/10419/111205/1/econwp145.pdf>
- Durach CF, Wieland A, Machuca JAD (2015) Antecedents and dimensions of supply chain robustness: A systematic literature review. *Int J Phys Distrib Logist Manag* 45(1/2):118–137. Retrieved from https://openarchive.cbs.dk/bitstream/handle/10398/9123/Durach_et_al_2015_Antecedents_and_Dimensions_of_Supply_Chain_Robustness_postprint.pdf?sequence=3
- Enarsson L (2009) What do we really mean by supply chain management? *Supply Chain Logist Q*. Retrieved from <https://www.supplychainquarterly.com/topics/Logistics/scq200901book/>
- Engels F (1957) The decline of feudalism and the rise of the bourgeoisie. *Mon Rev* 445–454. Retrieved from <https://www.marxistsfr.org/archive/marx/works/1884/decline/index.htm>
- Erlichman HJ (2010) *Conquest, tribute, and trade*. Prometheus Books, Amherst
- Flynn DO, Giraldez A (1995) Born with a “silver spoon”: the origin of world trade in 1571. *J World Hist* 6(2):201–221. Retrieved from <https://www.jstor.org/stable/pdf/20078638.pdf?refreqid=excelsior%3A454abd482e435629dedd8f1c998f4ca0>
- Gereffi G (2005) The global economy: organization, governance, and development. In: Smelser NJ, Swedberg R (eds) *The handbook of economic sociology*. Princeton University Press, Princeton, p 161
- Grant M (1991) *The founders of the Western world: a history of Greece and Rome*. Charles Scribner’s Sons, New York
- Hamilton EJ (1929) Imports of American gold and silver into Spain, 1503–1660. *Q J Econ* 43(3):436–472. Retrieved from <https://www-jstor-org.proxy195.nclive.org/stable/pdf/1885920.pdf?refreqid=excelsior%3A9ea2de89d58c40afcedaf6fb9f217d76>
- Harland C, Brenchley R, Walker H (2003) Risk in supply networks. *J Purch Supply Manag* 9:51–62. Retrieved from <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.471.2910&rep=rep1&type=pdf>
- Klibi W, Martel A, Guitouni A (2010) The design of robust value-creating supply chain networks: a critical review. *Eur J Oper Res* 203(2):283–293
- Kouvelis P, Chambers C, Wang H (2006) Supply chain management research and production and operations management: review, trends, and opportunities. *Prod Oper Manag* 15(3):449–469
- Manuj I, Mentzer JT (2008) Global supply chain risk management strategies. *Int J Phys Distrib Logist Manag* 38(3):192–223. Retrieved from <https://search-proquest-com.proxy195.nclive.org/docview/232593322/fulltextPDF/4D08ADF1258A4169PQ/1?accountid=14968>
- McCrea B (2011) Supply chain logistics technology: defining visibility. *Logist Manag*. Retrieved from https://www.logisticsmgmt.com/article/supply_chain_and_logistics_technology_defining_visibility
- Meepetchdee Y, Shah N (2007) Logistical network design with robustness and complexity consideration. *Int J Phys Distrib Logist Manag* 37(3):201–222
- Nair A, Vidal JM (2011) Supply network topology and robustness against disruptions –an investigation using multi-agent model. *Int J Prod Res* 49(5):1391–1404

- Olsen-Raymer G (2014) The Europeans – why they left and why it matters. Humboldt State University Department of History. Retrieved from <http://users.humboldt.edu/ogayle/hist110/expl.html>
- Ortiz-Minaya R (2014) From plantation to prison: visual economies of slave resistance, criminal justice, and penal exile in the Spanish Caribbean 1820–1886. ProQuest Dissertations Publishing. Retrieved from <https://search.proquest.com/openview/d731b34443decce2dd019e575ca0d170/1?pq-origsite=gscholar&cbl=18750&diss=y>
- Pach ZP (1968) The shifting of international trade routes in the 15th–17th centuries. *Inst Hist Res Cent Humanit Hung Acad Sci* 14(3/4):287–321. Retrieved from https://www.jstor.org/stable/pdf/42554829.pdf?casa_token=BzYZMRcj8hYAAAAA:_Fokt8pcPVcT05nO5IO9RKEsgUL9HYcW_cN_hRJSjR96wNCWUT_fvLAmefMB71hVacH0vb-aVi3W76XhJGcoK8fJbKwKFspDzYpYa8YB5T7zTti3w
- Peterson M (1975) *The funnel of gold*. Little, Brown, & Company, Boston
- Rodrique JP (2012) Supply chain management, logistics changes and the concept of friction. In: Hall PV, Hesse M (eds) *Cities, regions and flow*. Routledge, London, p 5
- Schuler CJ (2014) Ships, clocks and starts: the birth of navigation. Here 360. Retrieved from <https://360.here.com/2014/08/06/ships-clocks-stars-birth-navigation/>
- Thomas H (2003) *Rivers of gold*. Random House Publishing, New York
- Thompson JD (1967) *Organizations in action*. McGraw-Hill, New York
- Vernon F (2008) Supply chain visibility: lost in translation? *Supply Chain Manag An Int J* 13(3):180–184. Retrieved from file:///C:/Users/Wayne/Downloads/Supply_chain_visibility_lost_%20(1).pdf
- Vilar P (1969) *A history of gold and money*. Verso Books, London
- Vilches E (2010) *New world gold: cultural anxiety and monetary disorder in early modern Spain*. University of Chicago Press, Chicago
- Walton T (1994) *The Spanish treasure fleets*. Pineapple Press, Sarasota
- Weatherford J (2010) *Indian givers: how native Americans transformed the world*, 2nd edn. Three Rivers, New York
- Wieland A, Wallenburg CM (2012) Dealing with supply chain risks – linking risk management practices and strategies to performance. *Int J Phys Distrib Logist Manag* 42(10):887–905