



**SUPPLY CHAIN FINANCIAL ANALYSIS IN SUPPORT OF INTERNATIONAL
DEVELOPMENT OBJECTIVES**

THESIS

Michael J. Hester, Captain, USAF

AFIT-ENS-MS-18-M-127

**DEPARTMENT OF THE AIR FORCE
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DEVELOPMENTAL OBJECTIVES

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Captain, USAF

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Abstract

Throughout the 21st century, the Department of Defense has carried the burden in combatting extremist ideologies around the globe, spending an estimated \$4.79 trillion fighting wars in Afghanistan, Syria, Iraq, and Pakistan. A recognition of the unsustainable nature of fighting such long-term, costly wars has led U.S. national security policy to shift in recent years towards combatting extremism through economic development and building capacity in less stable communities around the globe. The U.S. Agency for International Development (USAID) is the government agency responsible for achieving this objective, yet USAID acknowledges that many of the supply chains the agency finances are suboptimal and ineffective.

This research explores the impact that capital allocation, operational decisions, and geopolitical/economic events have on supply chain performance in the developing world to better inform businesses and developmental organizations of the practices that support sustainable economic development. Through a case study analysis of a Kenyan distribution firm using historical financial and sales data, the study revealed that working capital investment in the distribution echelon of developmental supply chains drives efficient capital flow that is driven by retail market demand. Additionally, human capital investment to develop supply chain expertise presents opportunities for foreign investment to address the deficient and suboptimal supply chain practices seen in many small and medium-sized enterprises. The research concludes by developing a model for measuring scalability based on revenue and cost structures, providing a methodology for supply chain firms to identify break-even points under varying growth projections.

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Michael J. Hester

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SUPPLY CHAIN FINANCIAL ANALYSIS IN SUPPORT OF INTERNATIONAL DEVELOPMENT OBJECTIVES

I. Introduction

1.1 Background

Since the devastating and landscape-changing events of September 11, 2001, the United States has been a nation at war. According to a study by the Watson Institute for International and Public Affairs at Brown University, \$4.79 trillion has been spent and/or allocated to wars in Iraq, Syria, Afghanistan, and Pakistan from 2001 through fiscal year 2017 (Crawford, 2016). The long-term viability of fighting such large-scale, costly wars to combat terrorism is impractical and represents an unsustainable approach, as the fight against extremism is increasingly one against a decentralized ideology rather than against conventional military forces (Gates, 2009). While the unilateral use of military force to address threats to American interests will always be a key pillar of America's national security, the U.S. has recognized the need to transition the fight against violent extremism to more diplomatic means through global partnerships and economic development rather than through militaristic approaches. In the 2015 National Security Strategy (NSS), then President Barack Obama highlighted the premise of the U.S. strategy to *Combat the Persistent Threat of Terrorism* stating, "We will work to address the underlying conditions that can help foster violent extremism such as poverty, inequality, and repression. This means supporting alternatives to extremist messaging and greater economic opportunities for women and disaffected youth. We will help build the capacity of the most vulnerable states and communities to defeat terrorists locally" (US Government, 2015; pg. 9).

Though the application of a dichotomous strategy to employ military force while simultaneously seeking to promote the development of stable, democratic foreign governments has long been acknowledged, the strategy outlined in the 2015 NSS was a marked shift in national security policy from previous NSS documents. U.S. policy consistently emphasizes a strong military as the foundation for national security, but this guidance from the executive branch shifted strategic policy from a Department of Defense (DOD) focus to a greater Department of State (DOS) approach to combatting the threat of terrorism. Under the 2015 NSS, DOD would continue to take action against imminent threats while working to train and equip local partners to combat terrorist groups. DOS programs would seek to develop international capacity to prevent conflict and strengthen governance to combat extremism. The premise of this delineation is characterized by the statement, “American diplomacy and leadership, backed by a strong military” (U.S. Government, 2015).

In December 2017, President Donald Trump released his National Security Strategy, laying out the policies and priorities to be pursued during his presidency. The 2017 NSS again shifted strategic security policy, adopting a DOD approach to address transnational threats by promoting “peace through strength” via increased military funding and pursuing threats to their source (U.S. Government, 2017). The strategy document promotes directly engaging the threat of terrorism through military action, intelligence operations, and technological solutions to combat recruitment and radicalization. Differing from past versions of the NSS, the policy outlines priority actions for each geographical region across three domains: political, economic, and military/security. While policy actions in the developed world revolve around ensuring

open markets, reciprocal trade agreements, and strong partnerships, the strategy commits to promoting strong, effective governance by providing economic aid and humanitarian response in developing parts of the world, such as Africa and South Asia.

The United States Agency for International Development (USAID), operating under policy guidance from the Secretary of State and the National Security Council, is the government agency responsible for administering non-military foreign aid. USAID highlights its role in the organization's mission statement: "The U.S. Agency for International Development leads the U.S. Government's international development and disaster assistance through partnerships and investments that save lives, reduce poverty, strengthen democratic governance, and help people emerge from humanitarian crises and progress beyond assistance" (USAID, 2018). There is consensus among USAID and other foreign aid organizations, such as the World Bank, that this mission must be achieved through sustainable economic growth, with a social focus on the poorest and most vulnerable individuals to develop human capital.

Critics of USAID contend that too many of its programs fail, and they argue that money allocated to the agency could be better spent on other domestic programs. USAID's own website highlights the difficulties the organization faces in "expanding, replicating, adapting and sustaining successful policies, programs or projects in geographic space and over time to reach a greater number of people" (Cooley & Linn, 2014). Additionally, President Trump has been an outspoken detractor of foreign spending, both on the campaign trail and since taking office (Marshall, 2017). Due to the policy shift brought about by this prevailing belief, and compounding the difficulty in meeting its stated goal, the State Department budget request, which includes the budget

of USAID, substantially cut funding to the agency in fiscal year 2018 (FY18), to \$37.61B from \$54.89B in FY17. (Comparatively, the DOD budget increased from \$582.7B in FY17 to \$639.1B in FY18, an increase of 10%). Operating under a budget reduction of nearly 30% while simultaneously answering the mandate to strengthen governance and the rule of law through poverty reduction and economic growth requires DOS and USAID to achieve greater levels of efficiency and success in their foreign aid programs.

USAID has recognized the importance of effective supply chains to the success of its programs and acknowledges that supply chains in developing countries are often “sub-optimal and ineffective” (Ensuring Effective Supply Chains, 2017). Supply chain finance and working capital management present opportunities for supply chain performance optimization distinct from the traditionally sought optimization of information and product flow. The focus on supply chain finance and working capital management in developing countries to achieve sustainable economic growth and poverty reduction was the product of a USAID sponsored research project which identified a number of factors that are linked to successful supply chains, including access to financing, growth in sales, working capital management and capital allocation from a systems perspective.

Yet the literature on supply chain finance and working capital management is sparse, specifically in the context of small and medium enterprises (SMEs) in developing countries, and revolves mostly around single firm optimization. Hofmann and Kotzab (2010) produced one of the seminal studies on working capital management from a systems perspective across a supply chain, but their analysis focused on maximizing the summation of shareholder value added (SVA) across every firm in the supply chain through optimization based on each firm’s weighted average cost of capital (WACC).

Additionally, Hofmann and Kotzab's model looks only at the length of the cash-to-cash cycle and does not look at the overall impact of a supply chain's working capital posture (i.e. where capital is allocated).

There is a gap in the supply chain finance literature regarding the impact of capital allocation and working capital management decisions on supply chain effectiveness in different contexts, especially in the domain of economic aid supply chains in developing countries. Previous research has focused on single firm optimization and has not addressed the impact of financing decisions in terms of a supply chain's working capital posture. This research seeks to address this gap in the supply chain finance literature by analyzing the impact of various capital allocation and financing decisions for an SME supply chain with operations in Kenya that relies on grants and financing from outside organizations. As capital allocation decisions can be driven by the donating organization, the operations of the firm, or the geopolitical climate, this analysis takes a holistic approach to measure the effect of capital allocation and operational decisions, as well as geopolitical conditions, on supply chain performance over a three-year time period. This research seeks to provide a clearer understanding of the barriers faced by SME supply chains in developing countries and inform developmental organizations of the supply chain finance practices that drive profitability and sustainable economic growth.

1.2 Problem Statement

As international foreign aid institutions seek to eliminate poverty and stabilize governments through economic growth, while simultaneously facing diminishing

operating budgets, foreign aid supply chains must learn to operate more efficiently to maximize the return on each dollar deployed. This requires an understanding of the impact that capital allocation, operational decisions, and geopolitical conditions have on long term supply chain performance from a systems perspective. This research explores the impact that these variables have on system performance by analyzing the case of a distributor of clean energy products operating in sub-Saharan Africa. Previous research has identified that access to financing, working capital management, and sales growth were primary drivers of success for small and medium-sized companies in developing countries. Identifying the effect of capital allocation, operational decisions, and geopolitical/economic conditions on supply chain performance can inform developmental organizations and businesses of actionable elements of supply chain management that can lead to sustainable economic growth in the developing world.

1.3 Research Question

The question this research seeks to answer is what impact do working capital management, operational decisions, and geopolitical conditions have on supply chain performance for a clean energy distribution supply chain in Kenya, and can these factors be leveraged to drive profitability and sales growth across the supply chain?

1.4 Research Overview

The remainder of this thesis outlines the related literature, methodology employed, analysis and results, and the conclusions of the research across four chapters. Chapter II provides a review of the relevant literature and identifies the gap in the supply

chain finance literature this research seeks to address. The literature review examines research on supply chain finance and working capital management, financial performance measurement, international development, foreign aid organizations, and economic development in Kenya. Chapter III outlines the methodology used in the study, the sources and methods of data collection, and the financial analysis applied to the target firm in the case study.

The analysis and results are discussed in Chapter IV. Chapter IV outlines significant events occurring within the supply chain, categorized into the three segments of capital allocation, operational decisions, and geopolitical/economic events. Each of these events are analyzed in terms of the financial and operational impact to the target firm. The research concludes in Chapter V with a discussion of the research contributions and implications for developmental organizations and the Department of Defense. This section also identifies the limitations of the study and opportunities for future research. The recommendations for future research revolve around extending the study and enhancing generalizability of the findings by extending the methodology used to disparate supply chains and geographical regions.

II. Literature Review

2.1 Introduction

Chapter II provides an overview of the recent literature related to the research question and problem statement. This review of the literature consists of a review of research in the areas of supply chain finance and working capital management, a summary of the performance measurement and financial analysis applied in this research, and an overview of international development and economic growth, specifically within Kenya.

2.2 Supply Chain Finance

Supply chain innovation has increased corporate performance in recent years due in large part to improvements in product and information flow. The supply chain literature has shown that firms' supply chain management practices and financial performance are linked. D'Avanzo et al. (2003) found that superior supply chain performance and financial success are strongly connected. Swink et al. (2010), looking at seventy-six publicly traded companies from 2004 – 2007, found that top supply chain companies consistently outperform their peers financially. Research has traditionally measured the link between supply chain operational performance measurements and financial outcomes. Distinct from the optimization of product and information flow, supply chain finance (SCF) targets financial flows and capital allocation within supply chains to allow firms and suppliers to improve working capital and reduce costs (Wuttke, Blome, Foerstl, & Henke, 2013).

As supply chains have become increasingly global and more complex, SCF and working capital management have grown in popularity as they present new opportunities to enhance system-wide performance. Gelsomino et al. (2016) highlight that the focus on supply chain finance by academia has begun to increase in the last decade, with the literature specifically revolving around two perspectives. The finance-oriented perspective considers SCF as a set of financial solutions and focuses on financial aspects largely involving intervention by financial institutions to affect payables and receivables periods. In this context, SCF seeks to optimize financial flows at the inter-organizational level through solutions implemented by financial institutions and technology providers. The supply chain-oriented perspective is concerned with working capital optimization in terms of inventories, financing, accounts payable, and accounts receivable at the system level.

Stemmler (2003), who was among the first authors to use the term supply chain finance, explained that “Logistically induced financial processes comprise inventory management, the handling of the logistically induced financial flows as well as the supporting processes with an immediate reference to logistics as, for example, the insurance management for stocks.” The financial flow tied to product and information flow for the use of resources and services provided among firms within the supply chain is a pillar of supply chain finance in many contexts. This analysis is more concerned with the financing of operations and working capital, specifically in the context of SME supply chain operations seeking to engender economic growth in the developing world.

There are two important aspects of supply chain-oriented SCF, with one more externally focused and one internally focused within the supply chain. The first involves

how firms/supply chains acquire resources, access capital, and their costs of capital. This is driven significantly by market forces and location, economic factors, and overall supply chain performance, as well as a number of other considerations. The second aspect, which includes much of the literature on working capital management, comprises how capital and resources are allocated and deployed throughout the supply chain. The allocation and usage of capital resources significantly impacts demand, profitability, margins, taxes, service levels, and ultimately, the success of the supply chain.

Capital structure and the costs of financing are influenced by profitability, age of the organization, asset structure, total assets, and access to public equity markets (Chittenden et al., 1996). Due to the inherent availability of data associated with publicly traded companies, much of the supply chain finance literature has focused on publicly traded companies, specifically in the developed world. Relative to publicly traded companies, private firms rely less on public equity and capital markets, resulting in higher debt ratios and reliance on internal cash holdings (Brav, 2009). This drives private firms, which includes a majority of developmental and SME organizations, to stockpile cash to maintain liquidity, causing a deficiency in investment even as they experience increases in performance. Limited access to capital and reliance on debt financing is an inhibitor to growth, and this effect is amplified for small and medium-sized companies in developing countries and reinforces the importance of effective working capital management. (USAID, 2014).

2.3 Working Capital Management

Management of working capital and its effect on financial performance has come under increased scrutiny in recent years. According to a note published by J.P. Morgan, “Prioritizing working capital allows companies to make strategic investments, which in turn drive operational efficiencies and reduce overhead. Conversely, not having enough operating liquidity because assets are tied up in things like inventory or unpaid invoices can have a huge effect on cash flow. Having negative cash can spook investors and shareholders and result in undervaluation of your company” (J.P. Morgan, 2015). A 2014 survey revealed that the top 1,000 U.S. companies have more than \$1 trillion in excess cash tied up in working capital, which is equal to 6 percent of the nation’s gross domestic product (GDP). In Europe, the top 1,000 EU companies hold a net of €850 billion in working capital, equivalent to 7.6 percent of European GDP (J.P. Morgan, 2015).

Working capital management involves the decisions made regarding accounts payables, accounts receivables, inventory, and cash (Lazaridis & Tryfonidis, 2006). These components determine a firm or supply chain’s cash conversion cycle, defined as “the average days required to turn a dollar invested in raw material into a dollar collected from the customer” (Stewart, 1995). The cash conversion cycle measures a firm’s liquidity, or how quickly assets can be converted to cash to fund business operations. This is especially important for small and medium-sized enterprises (SMEs), which experience fewer sources of short and long term financing than larger firms (Moss & Stine, 1993). Working capital management attempts to balance the dynamic between two conflicting premises: shortening the C2C cycle increases a firm’s profitability by

enabling them to generate cash more quickly, but it can also harm the firm's operations and service levels, which in turn can reduce profitability (Nobanee, 2009). There is consensus among the literature that effective working capital management is a significant driver of firm profitability and success.

Research on the topic of working capital management has previously examined measures to improve performance of a single company while ignoring performance optimization across multiple firms in a supply chain. Filbeck & Krueger (2005) analyzed the differences in working capital measures across industries and changes in working capital measures for firms within the same industry by administering a survey of working capital efficiency measures to Chief Financial Officers (CFOs) in 1,000 publicly traded firms. Their study found significant differences both across industries and within industries over time, speculating that changes in macroeconomic factors such as interest rates, the rate of innovation, and competition are likely to impact working capital management. Lazaridis and Tryfonidis (2006) studied 131 companies listed on the Athens Stock Exchange to measure the relationship between corporate profitability and working capital management. They found a statistical relationship between profitability and the cash conversion cycle, and that optimization of the components of the cash conversion cycle (accounts receivable, accounts payable, and inventory) can generate increased profits. Gill and Biger (2010) sought to expand on the work of Lazaridis and Tryfonidis by applying a similar analysis to 88 firms listed on the New York Stock Exchange. Their study yielded similar results with regards to the relationship between payables windows and profitability, but whereas Lazaridis and Tryfonidis found a

negative relationship between the number of days inventory is held and profitability, Gill and Biger found no significant relationship between these factors in their sample.

García-Teruel and Martínez-Solano (2005) analyzed 8,872 SMEs located in Spain based on the criteria of having fewer than 250 employees, turnover of less than 40 million euros, and possessing less than 27 million in total assets. Their study, which sought to measure the importance of working capital management in SME firms, found a negative relationship between firms' profitability and their accounts receivable windows and inventories. Conversely, Mathuva (2010), studying a sample of 30 Kenyan firms listed on the Nairobi Stock Exchange, found that there is a significant positive relationship between the time it takes to convert inventory into sales and profitability. This implies that the costs of carrying higher inventories are less than the costs of stockouts and interruptions to the production process. Mathuva (2010) also found a highly positive relationship between the firms' accounts receivable periods and profitability and between the firms' accounts payable periods and profitability.

Nazir and Afza (2015) analyzed working capital management by measuring the degree of aggressive investment policies (AIP), as determined by the ratio of current assets to total assets where a lower ratio indicates a more aggressive policy, and aggressive financing policies (AFP), which is measured by the ratio of total current liabilities to total assets. The measures of AIP and AFP were compared to two performance measures: return on assets (ROA) and the ratio of the market value of the firm to the book value of the firm's assets. Their sample included 204 non-financial Pakistani firms listed on the Karachi Stock Exchange. Regression analysis estimating the relationship between the working capital and performance measures found a negative

relationship between aggressive working capital policies and the selected measures of performance, contradicting the results of García-Teruel & Martínez-Solano (2005).

A common theme among the supply chain finance and working capital literature is the sample to which analyses are applied. Many papers focus on publicly traded companies listed on stock exchanges due to the availability of financial data. The relevant financial data associated with working capital management in private companies, specifically SMEs, is often difficult to attain or nonexistent. Additionally, research tends to be confined to a limited number of performance metrics and variables, narrowing the potential scope of analysis. In their review of the supply chain management and financial performance literature, Shi and Yu (2013) highlight the under-researched nature of many supply chain variables and propose that more supply chain variables should be empirically examined to determine their contribution to financial performance. Finally, while aspects of working capital management such as accounts receivables and accounts payables windows inherently affect multiple firms in the supply chain, the literature focuses on single firm performance rather than taking a systems approach.

Hofmann and Kotzab (2010) produced one of the seminal pieces of literature under the concepts of collaborative working capital management and inter-organizational approaches to the cash-to-cash (C2C) cycle. Research regarding managerial accounting has often discussed relationships between firms but is lacking in the realms of cash flow and working capital. Likewise, the supply chain management (SCM) literature has analyzed the impact of collaboration and open information exchange abundantly, but research on system-wide financial decision making and managerial accounting is sparse (Hofmann & Kotzab, 2010). Their work, *A Supply Chain-Oriented Approach of Working*

Capital Management, addresses this gap in the literature at the intersection of working capital management, managerial accounting, and supply chain management.

Hofmann and Kotzab argue that while it is well documented that superior SCM has a significant impact on the financial performance of a company, firms within a given supply chain often seek to enhance their individual financial position, in which case performance at the system level is not optimized. Larger, more powerful firms frequently seek to transfer risk and inventories to upstream or downstream partners by extending their accounts payable periods and shortening their accounts receivable periods, but these same firms are inherently going to have lower costs of capital due to creditworthiness, meaning these practices of risk transfer negatively impact the system as a whole. While this form of risk transfer may lead to short term improvements on the balance sheet, they run counter to the concepts of effective SCM and increase overall risk as suppliers and buyers are increasingly pressed for capital. Hofmann and Kotzab hypothesize that, based on the concepts of SCM, collaborative approaches to working capital management are more successful.

Hofmann and Kotzab employ a qualitative approach of case and empirical research to analyze financial data of the top 20 publicly traded, American companies in 2004 with regard to their C2C cycle performance (i.e. companies with the lowest C2C cycle), as well as the performance of the top 20 industries in the same year. They also draw on data from the work of Losbitchler and Rothböck (2006) in which the authors reviewed the financial statements of approximately 7,000 companies reported from 1995-2004 to examine C2C cycle performance over time in order to develop a framework for creating shareholder value through supply chain excellence.

Hofmann and Kotzab's work advances the literature on working capital management, but it is also limited by a number of weaknesses. First, the authors present a myopic analysis of the impact collaborative working capital management can have by analyzing only in the context of publicly traded, large market capitalization companies. This ignores disparate markets and supply chains that face contrasting operational and economic conditions. Additionally, utilizing only the performance metric of shareholder value added, which represents the economic profits generated by the company above the cost of capital, is not necessarily the optimal metric to use across all global supply chains. In essence, maximizing SVA is the idea that shareholders' invested capital should earn a higher return than if it had been invested in another asset or investment opportunity carrying an equivalent amount of risk. While there is significant support for using SVA as a performance metric (Biddle, Bowen, & Wallace, 1999; Hillman & Keim, 2001; Lovata & Costigan, 2002), many global supply chains are not concerned with this metric, specifically SMEs seeking to grow sales and operating similarly to startups. Specifically, humanitarian and developmental organizations do not seek to return value to many of their financiers in the form of economic profits. In many cases, this metric may not be the best indicator of supply chain success. Finally, Hofmann and Kotzab analyze the impact to a simple linear supply chain, and their model ignores intricate networks with competing interests (i.e. multiple suppliers linked to the same manufacturer). Conflicts of interest will inherently arise and it is not practical for a firm to collaborate to enhance SVA in a competing firm.

While there is a significant amount of literature on working capital management and performance measurement techniques, the research leaves a gap in the supply chain

finance literature: rigorous application of financial analysis using a broad set of financial metrics to small and medium enterprises (SMEs), especially those in developing countries. This research fills the literature gap by examining the impact of capital investment and working capital management on SME performance through the application of financial analysis and case research methodology.

2.4 Supply Chain Performance Measurement and Financial Ratios

Traditional supply chain management (SCM) performance measurement generally centers around operations focused metrics such as fill rate, lead time, capacity utilization, customer wait time, work-in-process, etc. (Gunasekaran, Patel, & Tirtiroglu, 2001; Hausman, 2002; Kleijnen & Smits, 2003). The literature indicates that nonfinancial performance measures in supply chain systems have received increased attention (65%) when compared to financial performance measures (35%) (Gunasekaran et al., 2001). Gunasekaran et al. (2001) highlight that many supply chain analyses fail to incorporate a balanced framework representing both financial and non-financial measures. In analyzing the impact of capital allocation, operational decisions, and geopolitical/economic, this case analysis seeks to balance the measurement of performance by analyzing both the financial and operational impact of events within the supply chain.

Business performance measurement is largely based on financial analysis, but most analyses include simplistic measures such as purchasing price and cost, or focus on a limited number of financial metrics. Higgins (2012) notes that one or several ratios may be misleading, but when combined with additional information about the

management and economics of a company, ratio analysis can be a revealing indicator of performance. This analysis presents a broad application of financial ratio analysis across the categorizations of profitability, asset utilization, and leverage and liquidity. The financial metrics applied in this analysis, given in Table 1, are compiled from Higgins (2012) work, *Analysis for Financial Management*.

Table 1: Financial Performance Metrics

Profitability	Asset Utilization	Leverage/Liquidity
Profit Margin	Asset Turnover	Working Capital
Gross Margin	Days of Inventory	Working Capital Turnover
Operating Margin	Collection Period	Assets to Equity
Return on Equity	Payables Period	Current Ratio
Return on Assets	Days Sales in Cash	Acid Test

The calculation for each of these metrics, along with the application to the target firm, is included in Appendix A. These ratios do not have target values, but must be evaluated comparatively to past performance or competing firms. This research conducts a time series comparative analysis to determine the impact of targeted events within the supply chain. This provides insight into how these events effect the financial health and performance of the target firm.

2.5 International Development and Economic Growth in the Developing World

Small and medium sized enterprises (SMEs), particularly SMEs that operate in developing countries, face significant barriers to performance not experienced by large companies in the developed world, namely access to capital, raw materials, and significant uncertainty in demand (London, Anupindi, & Sheth, 2010). Additionally, institutional weakness and political instability present challenges to economic growth and

business development not seen in many large, industrialized nations. Alesina et al. (1996) highlight that an unstable political environment impacts economic growth regardless of the form of government due to political unrest, reduced investment, and legislative barriers. New and smaller firms operating under unstable government institutions experience increased exposures to systemic risks such as macroeconomic volatility, financial crises, defaults by governments, and arbitrary taxation (Claessens, 2006).

Addressing these barriers to growth is where developmental institutions such as the U.S. Agency for International Development (USAID) and the World Bank interject. USAID's stated mission is to "promote and demonstrate democratic values abroad, and advance a free, peaceful, and prosperous world. In support of America's foreign policy, the U.S. Agency for International Development leads the U.S. Government's international development and disaster assistance through partnerships and investments that save lives, reduce poverty, strengthen democratic governance, and help people emerge from humanitarian crises and progress beyond assistance" (USAID, 2018). Similarly, the World Bank's goals are to "End extreme poverty within a generation and boost shared prosperity " (The World Bank, 2018a).

Each of these organizations work closely with government institutions to open markets, fund developmental programs, and support stable, effective governance. The organizations provide funding through a variety of programs and application processes driven by partnerships with government, financial institutions, private equity, and philanthropic entities. USAID seeks to promote U.S. national security and economic prosperity through various developmental programs, with the ultimate objective being

self-reliance and ending the need for foreign aid. The World Bank provides financial assistance to developing countries around the world through low-interest loans/credits and grants, as well as technical assistance in the form of policy advice, research and analysis.

As part of its analytic work, the World Bank produces an annual *Doing Business* report that ranks the economies of 190 countries based on the ease of doing business as defined by eleven factors. These factors include starting a business, dealing with construction permits, getting electricity, registering property, getting credit, protecting minority investors, paying taxes, trading across borders, enforcing contracts, resolving insolvency, and labor market regulation (The World Bank, 2018b). The intent of the *Doing Business* project is to provide an objective measure of the impact of business regulations and their enforcement by measuring the impact of the eleven factors on domestic small and medium-sized companies.

Each country is ranked by a “Distance to Frontier” score which measures the relative performance observed across the indicators listed above, providing a measurement of each nation’s performance relative to the best performance observed as well as a time series comparison to measure individual changes in performance in each year since 2005. Many of the indicators used by the World Bank measure bureaucratic and procedural factors related to the stability of the central government and rule of law within the country, with “Getting Electricity” and “Trading Across Borders” remaining as the sole factors related to the level of infrastructure development.

The *Doing Business* project encourages the implementation of efficient regulation and provides a measurable benchmark for reform in economies around the globe. The

goal is to provide an objective basis to understand and improve the regulatory environment to assist business development around the globe. It also provides insight into the economic and regulatory framework under which many SMEs in the developing world operate. The final section of the literature review addresses development in Kenya, specifically looking at data from *Doing Business* reports and the aspects of development potentially affecting the target firm of this analysis, to provide economic context for this research.

2.5 Development in Kenya

Though Sub-Saharan Africa remains one of the most underdeveloped regions in the world, Kenya is one of Africa's top economies and most stable democracies. In the 2018 *Doing Business* report, Kenya ranked 80th with a "Distance to Frontier" score of 65.15 (The World Bank, 2018b). This compares to a regional average "Distance to Frontier" score of 50.43 for Sub-Saharan Africa as a whole. The improvements seen in Kenya's regulatory and business environment is reflected in the country's gross domestic product (GDP). Kenyan GDP growth has been significant in the last 20 years, growing from \$13.12B in 1997 to \$70.53B in 2016, an annualized rate of 8.77% (The World Bank, 2017c). Figure 1 gives the country's GDP growth during this span.

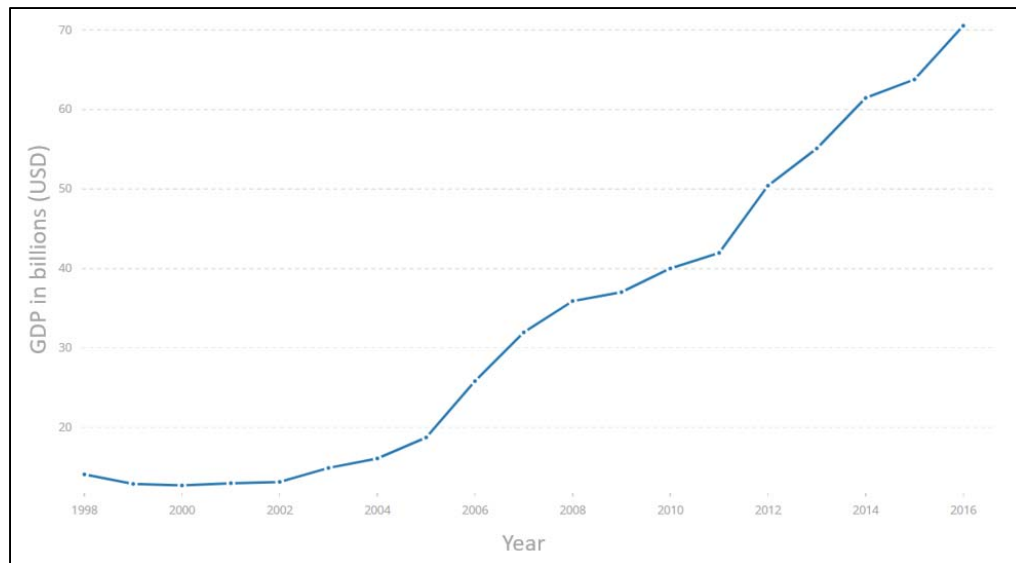


Figure 1: Kenyan GDP Growth (World Bank, 2016)

Kenya's increase in GDP growth in recent years is due to a number of factors. Foreign direct investment (FDI) in the country has grown significantly since 2005, though it has trended down in recent years (The World Bank, 2018c). Additionally, Kenya has seen year-over-year improvement in five of the measures tracked by the World Bank. Chief among these is an increase in the percentage of the population with access to electricity. In the World Bank's 2018 *Doing Business* report, Kenya ranked 71 out of 190 nations in the "Getting Electricity" performance indicator, up from a ranking of 106 in the 2017 report (The World Bank, 2017a, 2018b). Figure 2 shows the rise in the percentage of the population with access to electricity from 1990 to 2014. While still low relative to the developed world, Kenya has seen significant improvement in the percentage of its population that has access to electricity.

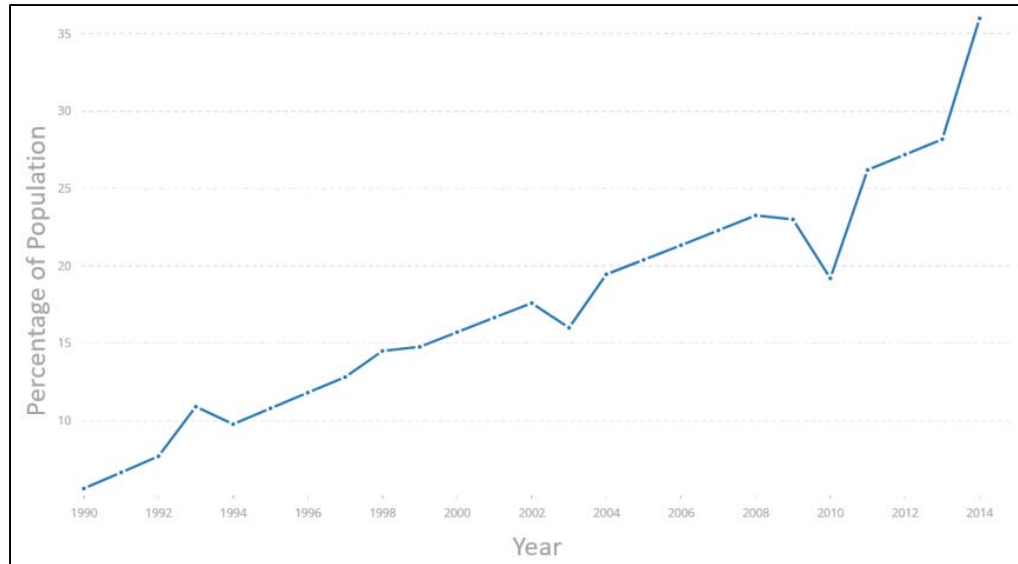


Figure 2: Kenyan Growth in Access to Electricity (World Bank, 2016)

Access to electricity is chiefly important to the target firm for this analysis, as the company is a distributor of clean-energy products for low-income households lacking access to the electrical grid. The target firm's business model presents unique challenges to the firm due to the niche the company fills in the energy market. There is a belief that the early adoption of clean energy technologies in developing countries can put these countries on a path to surpass western countries, which rely significantly on fossil fuels, in sustainable energy implementation (Augustine, 2008). While affluent societies are often willing to pay for the environmental and societal benefits brought about by clean technologies, many consumers in developing countries cannot afford to pay higher prices for these benefits when they are concerned with day-to-day survival. Yet there is substantial unmet demand for energy around the world. According to the United Nations Development Programme (UNDP), though the number of people with access to electricity increased by 1.7 billion from 1990 to 2010, one in seven people still lack access, which significantly constrains economic growth (UNDP, 2018).

To address this issue, energy generation and distribution through infrastructure development is a key pillar of Kenya's Vision 2030 development program. The country is seeking to increase energy generation capacity from approximately 2,300 megawatts (MW) in 2015 to 23,000 MW by 2030 (USAID, 2017). This focus on increased energy generation and distribution is evident in the World Bank's Doing Business reports. The nature and cost of the energy infrastructure being developed further compounds the challenges this rise in access to electricity presents to DISTRO. The most recent Vision 2030 progress report, from March 2016, estimates that 61 percent of the capacity to be generated and distributed in the ensuing 40 months would come from renewable sources (Kenya Vision 2030, 2016). Additionally, the energy plan is expected to bring the cost of power down from the current average cost of 17.92 U.S. cents per kilowatt hour to under 10 U.S. cents for domestic households.

Despite the rise in the capacity and reach of the electrical grid, funding has continued to flow to the off-grid energy sector in the region. In October 2017, USAID announced \$6.3 million would be awarded to companies engaged in off-grid energy solutions, such as household solar-systems and micro-grids, to support the expansion of operations, the testing of new business models, and to finance rural electrification projects extending access to millions of people (USAID, 2017c). In November 2017, USAID announced a separate round of \$4 million in new investment for eight companies operating in the household solar power space in Africa. The recipients of this funding include a number of DISTRO suppliers, such as Greenlight Planet, d.light, Fenix, and Orb Energy (USAID, 2017b).

The challenge of meeting the growing demand for energy in developing parts of the world while seeking to implement clean, sustainable solutions requires that companies entering these markets operate with a level of efficiency that allows them to remain economically competitive with conventional forms of energy production. But there is still a significant market potentially available for off-grid solutions. The main detractor in Kenya's "Getting Electricity" score is the cost as a percentage of income per capita. High costs potentially incentivize lower income households to seek out off-grid solutions. Additionally, while access to electricity in Kenya has risen significantly, according to the World Bank the percentage of the population with access remains at less than 40% as of 2014, significantly trailing the developed world. Though more recent estimates place the percentage as high as 63%, with a population of 48.5 million this leaves a potentially large market for off-grid providers (Kenya Power, 2017).

Kenya has experienced significant economic improvement in recent years, but the country continues to be a substantial recipient of foreign assistance. USAID works closely with the Kenyan government to advance access to education, improve healthcare, support agriculture and infrastructure development, and strengthen governance. The country continued to experience headwinds in both political and economic terms throughout this case analysis. This dynamic provides a suitable context to measure the impact of capital allocation, operational supply chain decisions, and geopolitical/economic events on SME performance.

2.6 Summary

The literature agrees that the execution of an organization's supply chain management practices and its financial performance are related (D'Avanzo et al., 2003; Ellinger et al., 2011; Ellram & Liu, 2002; Shi & Yu, 2013). Historically, research has revolved around product and information flow, but the concepts of supply chain finance and its impact on the long-term success supply chains has begun to gain traction. There are many facets of SCF and gaps in the literature remain, specifically in the context of SME performance and developmental aid seeking to cultivate sustainable economic growth in developing countries. Globally SMEs account for the largest share of total employment and job creation, yet little research in the realm of supply chain finance exists identifying the practices and methods of capital allocation that generate economic growth (Ayyagari et al., 2011). This research seeks to address the gap in the literature regarding supply chain finance and working capital management in developmental, SME supply chains to determine how funding can be most effectively allocated across the supply chain to drive profitability and sustain long term economic growth.

III. Methodology

3.1 Overview

The purpose of this research is to fill the literature gap regarding small and medium-sized enterprise (SME) supply chain finance and working capital allocation in the developing world. Supply chain literature incorporating rigorous financial analysis to the structural and operational decisions made within a supply chain over time represents a lightly researched area in the domain of supply chain analysis. This study presents a unique methodology applying a comparative time series financial analysis to an SME supply chain with operations in Sub-Saharan Africa. Chapter III provides an overview of the methodology and data collection techniques used to accomplish the analysis.

The research applied a case study framework incorporating both qualitative and quantitative data sources to identify the significant capital allocation and operational decisions made within the target supply chain and the impact of these factors. This chapter first outlines the methodology used and the company targeted for the case study analysis. Following is a synopsis of the sources of data collection and an overview of the method of analysis. The chapter next outlines the financial analysis applied to measure performance in terms of profitability, asset utilization, liquidity, and sales volume across varying time periods, product lines, and geographic regions. Chapter III concludes with a discussion of developing a methodology to measure the potential scalability and impact of growth within the target firm.

3.2 Case Study Research

Supply chain working capital allocation and financing decisions in SME supply chains are scarcely studied topics in the supply chain literature. To address this gap, this research seeks to inductively measure how the allocation of financing, the operational decisions made within the supply chain, and geopolitical/economic events within the country in which the supply chain operates affect supply chain performance. The study draws on empirical, interview, and quantitative data to analyze how these various factors have impacted an SME supply chain currently operating in Sub-Saharan Africa from both a financial and operational standpoint. A case study approach is ideal to accomplish this objective, as case research is better suited to analyzing little known or poorly understood, contemporary phenomena in their real-world setting (Barratt et al., 2011; Leedy & Ormrod, 2016).

This is particularly the case for SME operations in developing countries, where access and reliability of information is severely limited due to the structural and institutional weaknesses present within the country. The research focus on publicly traded companies in the developed world stems largely from the availability of data inherent to these types of organizations, producing the literature gap outlined in Chapter II. Case research is guided by the state of the existing literature, where a less extensive foundation in the literature potentially drives a more open ended research question (Dehoratius & Rabinovich, 2011). This research broadly endeavors to identify the events that affect SME supply chain performance and determine the impact of these events to generate theoretical contributions to the supply chain finance literature.

Edmondson and McManus (2007) highlight the need for fit between four elements in case research: the research question, prior work, research design, and contribution to the literature. While prior work and the literature guide the overall research question, the research design, including data collection and analysis, must be tailored to the research question posed (Edmondson & McManus, 2007). This in turn should lead to theoretical contributions that link to the existing literature. Eisenhardt (1989) outlines the strengths of case studies in building theory: theory building from cases holds a high likelihood of generating novel theory, the theory is likely to be testable with constructs that can be readily measured, and the theory is likely to be empirically valid.

There are a number of drawbacks associated with case research that are identified by the literature. A common criticism of case study research is the lack of scientific basis for generalization. Additionally, there is a high degree of interaction between subjects and the researcher, potentially biasing the results of the study (Boyer & Swink, 2008). A third criticism is the time and cost required to conduct case research and produce results. Each of these concerns must be considered throughout the research design.

Yin (2014) argues that the purpose of case study research is to generalize to theoretical propositions rather than to a broader population as with statistical research. To establish generalizations that hold over diverse situations, the case analysis was conducted over an extended period of time and insights were captured from multiple stakeholders both internal and external to the target firm (Stake, 1995). Capturing competing insights also aids in overcoming potential bias stemming from the extensive interaction with the target company.

McCutcheon and Meredith (1993) provide three methods for enhancing generalizability in case study research: 1) Include as many independent variables as possible so other situations including these variables will be included in the theory, 2) Include multiple populations to develop a more comprehensive theory, and 3) Testing the theory on alternate populations. The goal of this research effort is to generate theoretical propositions that can be extended to new populations in the developing world. The following section outlines the case study framework and methods of data collection constructed in pursuit of this objective.

3.3 Case Study Framework

The research design is a single case study analyzing a supply chain distributor to identify the financial and operational impact of events across three contexts. The three segments of analysis include 1) capital allocation, 2) operational decisions, and 3) geopolitical/economic events. Though the overarching research objective is to inform developmental organizations and businesses of the capital allocation methods and supply chain practices that generate sustainable economic growth in SME supply chains, due to the interrelated nature of supply chain performance and political/economic events, these factors can't be studied in isolation. Yin (2014) highlights that in case study research the "boundaries between phenomenon and its context may not be clearly evident." The inclusion of geopolitical and economic context in the analysis of supply chain performance ensures causality isn't attributed to events absent consideration of this context.

To increase credence in the interpretation of data and demonstrate commonality in the assertions submitted under this research effort, a mixed methods approach that triangulates multiple data sources is utilized (Stake, 1995). Data collected from both qualitative and quantitative sources, as well as contextual data informing the political and economic climate, provide the basis for supply chain event identification and measurement of the financial and operational impact to the supply chain. Figure 3 summarizes the triangulation of the different data types, and the main sources of data collection. These sources are discussed in more detail throughout Chapter III.

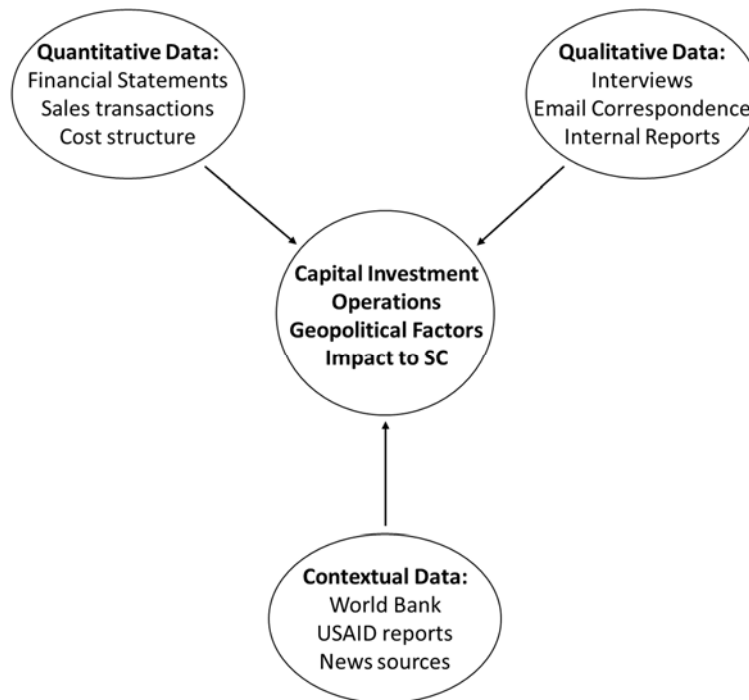


Figure 3: Data Sources and Triangulation

The case analysis identifies significant supply chain events impacting the target supply chain from the sources identified in Figure 3 and measures the financial and operational impact of the events to the firm. The research applies financial analysis to the quantitative data collected, and calculates the impact of various supply chain initiatives

on the profit generated per product sold for differing products, regions, and time periods. The analysis ultimately provides a measure of the scalability of the company within the cost structure incurred under the events impacting the supply chain. The following section provides an overview of the target organization identified for the case analysis.

3.4 Target Supply Chain Overview

For anonymity, the organization targeted for analysis is referred to as “DISTRO” throughout this analysis. DISTRO, founded in 2007, is a for-profit social enterprise firm that operates as a distributor of affordable, clean energy products to low income households. The company connects microfinance institutions (MFIs) to carbon markets by allowing them to lend to clean energy programs and support the company’s product line, which includes heating and cooking stoves and solar power and lighting products. DISTRO has operations in Kenya and India that include a network of retail locations, a distribution warehouse, product manufacturers, and retail banking firms. This research focused specifically on the Kenyan segment of operations. Though the Kenyan segment reports to a U.S. based corporate office, it operates as a stand-alone organization.

DISTRO’s Kenya operations are based out of Nairobi, Kenya. The company sales products across five geographical regions in the country, and has seven suppliers that hold inventory in Nairobi. DISTRO’s business model seeks to fill a unique niche in the sustainable energy markets by providing clean energy products that operate independently of the electrical grid. The company carries two general categories of products: charcoal cookstoves and solar lighting/power sources. For this analysis, the brands and product names are masked for privacy regarding DISTRO’s supplier base.

Table 2 summarizes the names representing the top seven products sold by the company throughout the case, as well as a description of the product type. Product lines have been phased out and new products have been introduced overtime. “V2” represents new versions of products replacing previous versions under the same brand.

Table 2: DISTRO Product Descriptions

Product Name	Description
Kamna	Charcoal cookstove
Kamna V2	Charcoal cookstove
Trouba	Charcoal cookstove
Faran	Charcoal cookstove
Faran V2	Charcoal cookstove
Lucerna System	Solar lighting and energy hub
Lucerna Single	Solar lighting and mobile charging

The recent growth in access to the electrical grid within Kenya, outlined in Chapter II, presents challenges to DISTRO’s growth and profitability. This research seeks to measure the efficiency of the supply chain and businesses practices implemented by DISTRO as the company competes both with local competitors offering similar product lines and with the increase in access to the electrical grid brought about by federally funded infrastructure development. The impact working capital management techniques such as making an inventory and warehouse investment, shifting working capital from supplier warehouses to the distributor, and investment to increase the employee base are measured based on their impact to sales volume, the profit generated per product sale, and overall firm profitability. To measure the impact at both the operational/tactical and strategic levels, this study presents a two-phased approach incorporating analysis of daily product sales data as well as analysis of the company’s financial statements. The data collection process is addressed next followed by a

discussion of the techniques used to analyze these data and measure the impact of the decisions made on supply chain performance.

3.5 Data Collection

In order to develop “a holistic understanding of the operations and supply chain phenomena,” multiple methods of data collection and analysis were employed (Boyer & Swink, 2008). The sources of data collection span three classifications: quantitative, qualitative and contextual data. One of the chief motivations in selecting DISTRO for this case study analysis was the company’s willingness to openly share extensive sales, cost, financial, and operational data. The following sections describe the data collected and the use of the data in the analysis.

3.5.1 Qualitative Data

Qualitative data identifying significant operational events affecting DISTRO and the impact of these events were collected through opportunistic, informal discussions with DISTRO and USAID personnel, email correspondence, and various reports provided by DISTRO. Due to the inability to conduct a field visit, regular discussions were conducted via Skype. The additional sources of qualitative data were provided by DISTRO management personnel. Table 3 gives the qualitative data sources, a brief description of the data, and the data’s role in the analysis.

Table 3: Qualitative Data Overview

Qualitative Data Sources	Description of Data	Analysis Use
Interviews with DISTRO	Phone call interviews with the regional manager, operations manager, and logistics manager.	Provided background and overview of operations, SC events, and clarification on quantitative data sources.
Interviews with USAID	Phone call interviews with personnel located in Kenya and East African countries.	Qualitative data collection, supply chain event identification, and operational impact of events.
Email Correspondence	Regular email correspondence from July 2017 – Feb 2018.	Provided information on operational initiatives, supply chain programs, and the impact of market events.
Internal DISTRO Reports	Historical initiatives, supply chain policies, and methods of data tracking.	Supplementary data for supply chain event identification and data interpretation.
Presentations	Company specific presentations outlining organizational structures.	Gives supply chain and operations framework/context.

3.5.2 Quantitative Data

Quantitative data were collected from financial statements, sales transactions, and cost data provided by DISTRO and its logistics service providers. DISTRO produces financial statements in accordance with generally accepted accounting principles (GAAP) biannually, providing a total of five reporting periods of financial statements. The financial statements include the company's income statements, cash flow statements, and balance sheets from mid-2015 through 2017. DISTRO uses QuickBooks, an accounting software tool for small business, to create these statements. In addition to financial data, operational data including the costs of warehousing and transportation, sales volume, product mix, and product costs were provided in various documents. The quantitative data is used to measure the impact of capital investments, operational initiatives, and geopolitical events through calculation of financial metrics identified by the financial

literature as significant indicators of financial health and firm performance, as well as through calculation of the profit generated per product sale under various initiatives and cost structures. Table 4 provides an overview of the quantitative data sources and their uses in the analysis.

Table 4: Quantitative Data Overview

Quantitative Data Sources	Description of Data	Analysis Use
Financial Statements	Accounting documents including income statements, balance sheets, and cash flow statements produced by DISTRO were provided for 2015-2017	Financial metrics calculated from the financial statements provided insight into the financial health of the firm under varying capital allocation structures and operations.
Sales Transactions	Transaction data including quantities, revenues, invoices, dates, locations, and sales staff.	Measure sales volumes, revenues, and margins for various products, regions, and time periods.
Product Prices & Margins	Wholesale, distributor, and retail product prices and the margins earned by DISTRO.	Calculation of profit generated per product sold; allows for identification and measure of product price changes.
Transportation Costs	Flat rate transportation costs and overage costs for shipment to retail sales locations.	Allocated to individual product sales to calculate profit margins for each sale.
Warehouse & Inventory Costs	Warehouse processing and overhead fees, inventory order levels and shipments.	Warehouse investment analysis and calculation of profit generated per product sold.

3.5.3 Contextual Data

Contextual data identifying geopolitical and economic factors impacting the domestic Kenyan economy and potentially impacting the supply chain's operations are included, as "many interesting phenomena cannot be understood if removed from their social context" (Bonoma, 1985). The contextual data were collected from sources provided by the World Bank, USAID, the Kenyan National Bureau of Statistics, and various news sources, providing the social, political, and economic context within which the DISTRO

supply chain operates. Geopolitical and economic events analyzed were identified through both the contextual data and discussions with DISTRO and USAID personnel.

Table 5 summarizes the contextual data sources and its use in the analysis.

Table 5: Contextual Data Overview

Contextual Data Sources	Description of Data	Analysis Use
World Bank Economic Data	Economic reports	Provides economic context for the case study, identifying events affecting GDP growth within Kenya.
USAID Development Reports	Foreign aid funding allocation	Provides grant data to identify which projects and companies funding is currently being allocated towards.
News Sources	Regional coverage from sources such as The Wall Street Journal, The New York Times, and other major news outlets.	Used to identify significant political and economic events occurring within Kenya and East Africa.
Ease of Doing Business Reports	Annual reports rank countries based on a number of factors related to operating a business.	Provides comparative rankings for Kenyan economy
Kenya National Bureau of Statistics (KNBS) Economic Indicators Report	Monthly reports produced by the KNBS that include a number of leading economic indicators, consumer prices, GDP growth, and imports/exports.	Coupled with geopolitical and domestic news reports, provides insight into the economic conditions within the country during the period of analysis.

3.6 Method of Analysis

The qualitative and contextual data collected from the sources outlined previously were used to develop a timeline of events potentially impacting the financial and operational performance of the DISTRO supply chain. Once this timeline was developed, the impact of the events identified was measured through analysis of the company's financial statements and the product sales data during the timeframe within the case study period aligning with each event. The financial statements were used to

calculate financial metrics measuring performance across three broad categories: profitability, asset utilization, and liquidity. The sales data were used to measure performance in terms of sales volume and the profit generated per product sale across varying time periods, product lines, and geographic regions. Additionally, the operational impact of events was identified through discussions with DISTRO personnel and operational performance metrics, where data is available. The following sections provide an overview of the financial statements analyzed and the financial performance ratios calculated from the financial statements.

3.7 Overview of Financial Statements

Higgins (2012) describes a company's financial statements as the scorecard of business, as they "translate a company's diverse activities into a set of objective numbers that provide information about the firm's performance, problems, and prospects." To measure the impact of working capital investments, operational decisions, and geopolitical/economic events on DISTRO's supply chain, the analysis focuses on the data reported in three types of financial statements: the income statement, the balance sheet, and the cash flow statement. The income statements, cash flow statements, and balance sheets produced by DISTRO were used to calculate financial metrics and ratios identified by the financial analysis literature as indicators of financial health and performance. A brief outline of the contents contained in each of these documents is given below. A discussion of the financial metrics used to analyze supply chain performance is given in the Appendix.

Income Statement:

The income statement summarizes a company's financial performance over a set accounting period by partitioning changes in owner's equity into revenues and expenses. The difference between revenues and expenses is the company's net income. The income statement is an important measure of financial health in several aspects. First, top line revenue growth conveys the changes in the amount of money received by the sale of goods and services to customers. Second, and most importantly, when combined with the expenses the company incurred to produce this revenue the income statement shows whether the company made or lost money during the reported period. Ultimately, companies must be profitable to survive and the income statement provides the most clear and basic measure of profitability. In the case of DISTRO, the income statement allows us to align revenues, costs, and financial ratios with significant operational decisions, capital infusions, and geopolitical events for analysis.

Balance Sheet:

The balance sheet provides a summary of the company's assets, liabilities, and equity at a given point in time. Whereas the income statement and cash flow statement report aggregate data over the duration of a set accounting period, the balance sheet is a snapshot in time summarizing the assets, liabilities, and owner's equity as of the date the statement is produced. The balance sheet reflects the relationship between the accounting equation:

$$\text{Assets} = \text{Liabilities} + \text{Shareholders' Equity}$$

Assets on the balance sheet are segmented into current assets, or those that are expected to be converted into cash within one year, and long-term assets, which includes

all other assets. Similarly, liabilities are listed as current liabilities if they are due within one year and long-term liabilities if they are due at any time after one year. Additionally, assets are listed on the balance sheet in order of decreasing liquidity. This format of reporting and the data contained in the balance sheet provides a means to capture changes in liquidity and leverage over time as DISTRO has shifted its operational strategy.

Cash Flow Statement:

The cash flow statement records the amount of cash and cash equivalents entering and leaving the company. This differs from net income recorded on the income statement and balance sheet in that the cash flow statement does not include the amount of future incoming/outgoing cash that has been recorded as credit. If raw materials, taxes, advertising, salaries, etc. are paid in cash, then it is subtracted from net sales but if it is bought on credit it is reflected in accounts receivable. Changes in cash are segregated into three categories: cash provided or consumed by operating activities, investing activities, and financing activities. The statement of cash flows is important for DISTRO due to the inventory investment made and the consumer credit program the company initiated.

3.8 Financial Metrics

The financial analysis applied to the data provided by DISTRO were segregated into three broad categories: profitability, asset utilization, and leverage/liquidity ratios. These three classifications of financial metrics provide a holistic measure of financial and operational health by providing insight into various aspects of overall performance and risk within the firm.

Profitability metrics represent a firm's ability to generate earnings when compared to the costs incurred by the company in generating product sales. Generally, higher ratios period-over-period indicate improved performance. Asset utilization, or turnover-control ratios, measure the efficiency with which a company is managing its asset base to produce sales and generate revenue. Asset utilization ratios are more specific than profitability metrics, as they measure the performance along more segmented aspects of performance such as the utilization of inventory or the management of credit periods. Liquidity ratios are an important aspect of working capital performance measurement and a company's ability to manage its debt obligations. Liquidity refers to the speed with which assets can be converted to cash or, at the firm level, whether a company has the required assets to meet its obligations readily available. Changes in liquidity metrics reflect changes in the risk exposure of the firm.

Table 6 provides a summary of the financial metrics within each categorization. No single metric is considered in isolation, but rather each metric provides a unique piece of the overall financial conditions of the firm. These measures will be used to conduct a comparative analysis internally, by comparing ratios from multiple accounting periods. The metrics used to analyze the financial data are given in the Appendix, along with an explanation of the metric's significance and the calculation for each metric.

Table 6: Financial Metrics

Profitability	Asset Utilization	Leverage/Liquidity
Profit Margin	Asset Turnover	Working Capital
Gross Margin	Days of Inventory	Working Capital Turnover
Operating Margin	Collection Period	Assets to Equity
Return on Equity	Payables Period	Current Ratio
Return on Assets	Days Sales in Cash	Acid Test

3.9 Profit per Product Analysis

In addition to an analysis of the financial statements produced by the company, the study sought to measure the impact of events within the supply chain by measuring sales volume and the marginal profit generated per product sold under various capital structures and operational decisions over time. Measuring sales volume by product, location, and over differing periods (monthly, annually, etc.) was accomplished by segmenting the data to align with the significant supply chain events identified through exploratory interviews and contextual data collection. To calculate the marginal profit per product sold, the variable costs associated with each transaction (i.e. each shipment) were identified and allocated to each product based on a combination of the type of product sold, the quantity sold and the location of the sale. The variable costs include the product's wholesale cost, a warehouse processing fee, commissions paid to employees, and transportation costs incurred for each shipment. The revenue generated by each product sale is contingent upon the type of sale and how the product was sold. DISTRO sales products through a number of channels which includes sales directly from the distributor (DISTRO) and sales made at the retail level by stockists. The marginal revenue varies for each type of sale depending on the product sold.

The transportation costs to DISTRO's retail sales points were provided by the transportation service provider, referred to as TRANSPO. The prices provided by TRANSPO were applicable for shipments up to five kilograms (kgs) and within five kilometers from the town of destination. Shipments in excess of 5 kgs are charged an additional 40 Kenyan shillings (KES) per kg. Shipments to locations for which a published price was not provided were assumed to carry the transportation cost associated

with the nearest location for which there was a posted price. The warehouse processing fee includes a 300 KES charge for each shipment that is independent of the number of products included in the shipment. This fee was incurred beginning in June 2017 when an initial warehouse investment was made.

Once the variable costs were appropriately allocated and the profit margin per product was calculated for each sale, the data were analyzed across the timelines associated with the significant events outlined previously. Additionally, the marginal profit was aggregated for time periods corresponding to when DISTRO produces its semiannual financial statements and compared to the overhead costs the company incurs. Since DISTRO operated at a net loss in each of the years studied, the analysis sought to determine the level of scale in product sales required to reach firm profitability. The results of these analyses are discussed in Chapter IV.

3.10 Scalability Model

Scalability represents the capacity of a firm to achieve sustainable growth, where an increase in sales volume leads to a corresponding increase in profitability. USAID's Development Innovation Ventures program, which provides funding to firms and projects that align with the agency's mission statement, specifically highlights "Pathways to Scale" as a core principle in its screening process for applicants seeking capital financing (USAID, 2017a). The program lays out the expectation that recipients of USAID funding scale sustainably to "reach millions of people in the developing world within a decade," whether commercially or through public support (i.e. incorporation into developing government programs).

This case study analysis concludes with a framework for measuring scalability in SME supply chains in the developing world. Though the model is developed and validated with financial data provided by DISTRO, the methodology can be employed across other companies operating in various societal and market contexts. The model incorporates the revenues and variable costs incurred for each product sold. A company's financial statements capture the cost of goods sold, operating expenses, and other costs incurred in generating sales, but only at an aggregated level. Analyzing sales data at the transactional level and allocating the appropriate expenses to each product sold provides a means to capture a true measure of scalability. The model is presented in the analysis at the end of Chapter IV.

3.11 Summary

A case study analysis of a foreign aid supply chain with operations in Kenya is suited to address the gap in the supply chain finance literature regarding SME supply chain finance in developing countries. Additionally, a mixed methods approach incorporating both qualitative and quantitative data analysis provides a stronger, more wholistic understanding of the impact of capital allocation, operational decisions, and geopolitical events. The subsequent chapter discusses the analysis conducted through the application of these methodologies and the results of that analysis.

IV. Analysis and Results

4.1 Overview

The purpose of this analysis is to determine the supply chain financing methods that drive supply chain performance by measuring the impact of capital allocation, operational decisions, and geopolitical/economic events on the performance of an SME foreign aid supply chain with operations in Kenya. Though the overarching goal is to inform foreign aid investment decisions, the impact of capital allocation on supply chain sales growth and profitability cannot be viewed in isolation due to the interconnected nature of decisions made within the supply chain and events external to the supply chain. Supply chain performance is impacted by a myriad of variables. The inclusion of operational decisions and political or economic events within the country of operation provides support in ascertaining the supply chain impact attributable to capital investment, though assigning direct causality to certain events is often not possible.

This chapter summarizes the analysis of the target supply chain to answer the research question outlined in Chapter I. The chapter begins with a brief overview of the structure of the target supply chain (referred to as DISTRO) and a summary of sales volume by product, time period, and region. Next, the significant capital allocation, operational, and geopolitical/economic events potentially affecting DISTRO operations are summarized, and the financial and operational impact of these events is addressed. The chapter then discusses the overall financial performance of the firm and ends with an analysis of the potential scalability of the company to grow towards profitability.

4.2 Supply Chain Overview

DISTRO operates as a distributor of off-grid, clean energy products to low income households, providing services to link customers, retailers, and financial institutions. DISTRO's Kenyan operations are based out of Nairobi, and the company sales and distributes products through a network of 84 locations throughout Kenya. The sales locations are divided into six geographical regions: Nairobi1, Nairobi2, Rift Valley, Embu/Mt. Kenya, Nyanza, and Coast. Since Nairobi is the largest sales region by population, the company splits the city into two separate regions. The company's product line consists of variations of solar lighting systems and clean cookstoves. Throughout the analysis, DISTRO sold products through three main sales channels: a micro finance institution (MFI), a national bank, and retailers. Figure 4 depicts the locations at which DISTRO sold products throughout the case analysis period. The green markers indicate sales locations within the MFI channel, and red represents the locations of sales made through the bank and retailers.

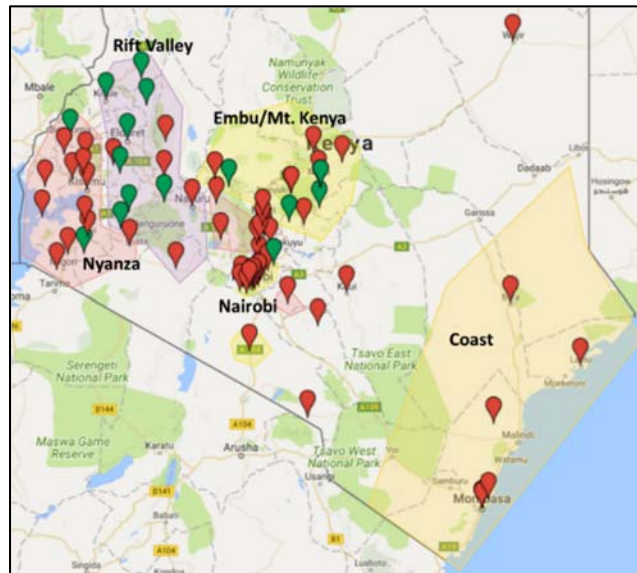


Figure 4: DISTRO Retail Sales Locations (Breitbach, 2017)

Regional sales managers are in charge of the sales force in each geographic region. All sales managers receive a monthly salary, but DISTRO transitioned its employee compensation structure for its sales managers throughout the case analysis timeframe. Previously, sales agents and their sales teams received a commission bonus if they sold more than 50 products in a given month. In 2017, the company eliminated commissions due to concerns over the incentives the program created and potential opportunities for fraudulent commissions claims. Throughout 2017 the company did not pay any commissions to its sales staff, though the company is looking to implement a new commission structure in 2018 that eliminates the issues generated under the previous program.

Prior to making an inventory investment in June 2017, DISTRO held little to no inventory and bought products from suppliers that store inventory in warehouses in Nairobi. Formerly when an order occurred, sales agents or retailers would order and pay for products using DISTRO's mobile payment platform and the company's transportation provider would pick up products from suppliers' warehouses for delivery to the point of sale. DISTRO would aggregate customer orders and submit a weekly purchase order to its suppliers. Depending on when the retail order was placed relative to the weekly order cycle, customers could potentially be forced to wait up to nine days to receive products once a payment had been made. Following the inventory investment, DISTRO began processing orders daily and scheduling pickup/transportation within 24 hours of an order being placed, significantly reducing average order fulfillment times.

DISTRO's transportation service provider, referred to as TRANSPRO, is a leading provider of transportation, logistics, and warehousing services in Kenya. TRANSPRO

offers rates based on the retail locations shown in Figure 4. With DISTRO's warehouse and suppliers' warehouses located in Nairobi, transportation costs in Nairobi1 and Nairobi2 are much lower than in the other sales regions. Table 7 displays the average transportation costs across all retail locations in each region. The rates provided by TRANSPO, which are contingent upon location, weight, and quantity shipped, are used to compute the product profit margins of each sale to measure the scalability of the DISTRO supply chain.

Table 7: Average Transportation Cost by Region (in KES)

Nairobi1	Nairobi2	Embu/Mt. Kenya	Rift Valley	Nyanza	Coast
248	305	333	377	423	487

4.3 DISTRO Sales Overview

The case analysis covers a thirty-month period, from July 2015 – December 2017, during which time there were a total of 10,899 products sold by DISTRO. Over the three years analyzed, the company experienced a downward trend in total sales annually. Sales in the second half of 2015 totaled 4,790, while full year 2016 experienced 3,341 sales and 2017 had 2,768 product sales. Figure 5 gives the monthly sales volume throughout the case analysis period.

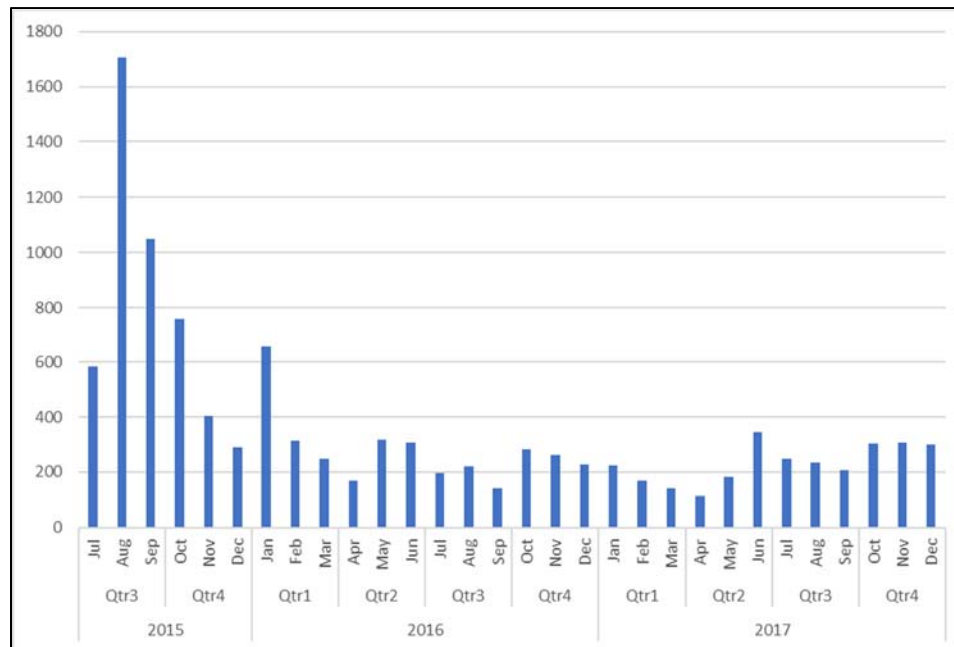


Figure 5: Monthly Sales Volume

A disproportionate number of sales occurred early in the dataset during the second half of 2015 and in January 2016. A large portion of sales during this time period were sold through the MFI sales channel by a microfinancier that provides credit and financing to rural and lower income households and with whom DISTRO partnered. 1,718 of the products sold were through the MFI channel, accounting for 32% of total sales during this time period, with all sales occurring prior to February 2016. DISTRO and the MFI held a fractious business relationship, in which disputes over payables periods led DISTRO to quit extending credit to the MFI in November 2015. DISTRO resumed selling through the MFI channel in January 2016 before permanently terminating the business relationship in February 2016.

Due to the termination of sales through this channel and the visual distortion to sales time plots caused by the large volume of sales through the MFI, the analysis of sales volume excludes the time period during which products were sold through the MFI

channel. The data excluded include the second half of 2015 and MFI sales in January 2016. The sales data during this timeframe are included in the financial and marginal profit analyses. Figure 6 displays the monthly product sales from January 2016 through December 2017, excluding MFI sales.

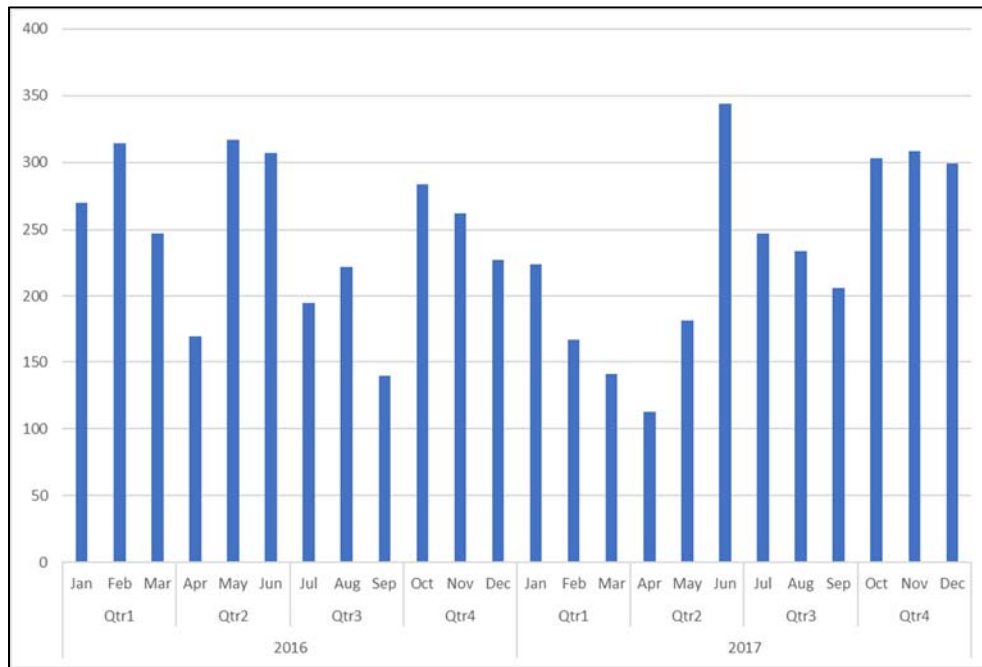


Figure 6: 2016 - 2017 Monthly Sales

There is seasonality present throughout the year, with a dip in product sales occurring in April and September each year. Table 8 gives the quarterly sales volume, and the quarter-over-quarter (QoQ) and year-over-year (YoY) sales growth. QoQ and YoY sales growth was largely negative during 2016 and 2017, but the company began to experience a rebound in sales growth during the second half of 2017. The potential drivers of this sales growth are discussed at the end of Chapter IV.

Table 8: Year-over-Year and Quarter-over-Quarter Sales Growth

	1Q 2016	2Q 2016	3Q 2016	4Q 2016	1Q 2017	2Q 2017	3Q 2017	4Q 2017
Sales	1,217	794	557	773	532	639	687	910
QoQ	-16.19%	-34.76%	-29.85%	38.78%	-31.77%	20.11%	7.51%	32.46%
YoY	N/A	N/A	-83.31%	-46.76%	-56.29%	-19.52%	23.34%	17.72%

4.4 DISTRO Product Sales and Profit per Product

The top seven products by number of sales accounted for over 98% of all sales during the case study period. The analysis of product margins will focus primarily on these products. Products accounting for the remaining ~2% of sales were largely the most unprofitable and are often sold in blocks within the same month, distorting product margins over certain time periods. Effects of this kind will be addressed independently. Additionally, several products have been phased out and replaced with newer variations. The scalability model for the company will be applied to products sold as of the end of the analysis period based on 2017 profit margins. Figure 6 gives the volume of sales by product line for the top seven products. (The type of product associated with each product name is given in Table 2 in Chapter II.)

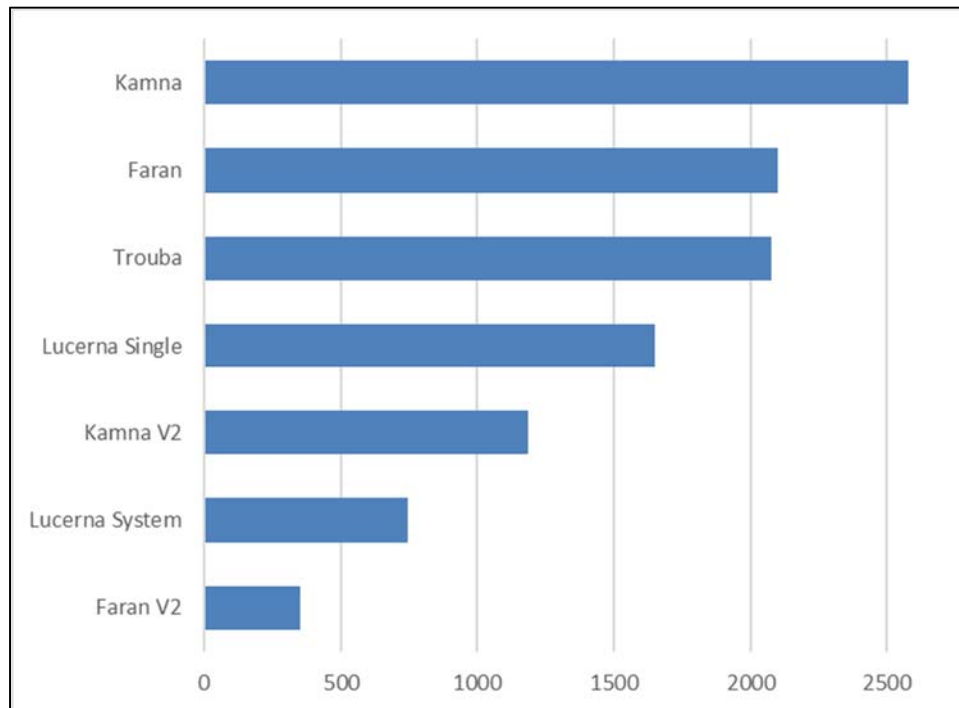


Figure 7: Top Seven Products by Sales

Product Profit Margins

The profit per product sold is calculated based on the sales price and the variable costs associated with each transaction. These costs include the location, weight and quantity of each shipment, and where applicable (post-June 2017), a warehouse processing fee. Figure 8 gives the average profit per product sold for the top seven product lines. This chart reflects the disparity in the profit margins carried by the solar lanterns compared to the product margins of the cookstoves. The three highest selling products by total sales are among the worst performing product lines in terms of profitability. The Kamna V2, which was phased in to replace the Kamna, reflects a slightly higher margin than the original Kamna due to a change in the price of the product during the case period.

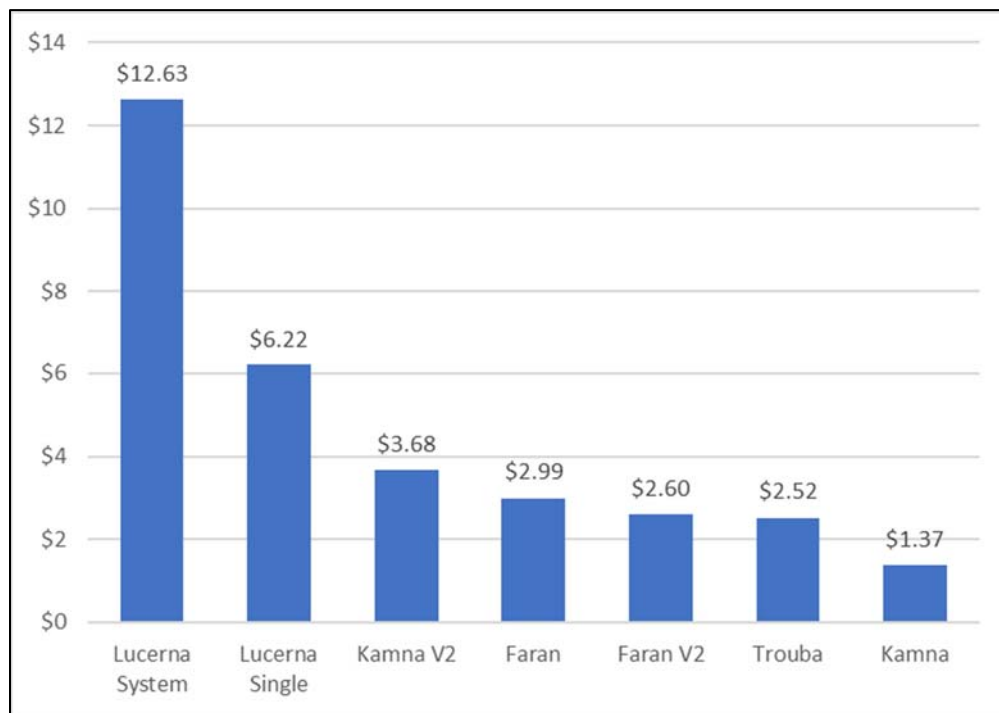


Figure 8: Average Profit per Product

Figure 9 shows the total profit generated by each product throughout the analysis period. This displays the effect of the disparity in the marginal profit per product sold. Though the cookstoves represent a higher volume of sales, the solar lanterns generate the majority of profit for the company. The cookstoves also carry lower retail prices for customers, making them easier to sell to low income customers. Though the Lucerna System carries a substantially higher profit margin than the other products sold, due to the volume of sales the total profit generated was only marginally higher than the profit generated by the Lucerna Single.

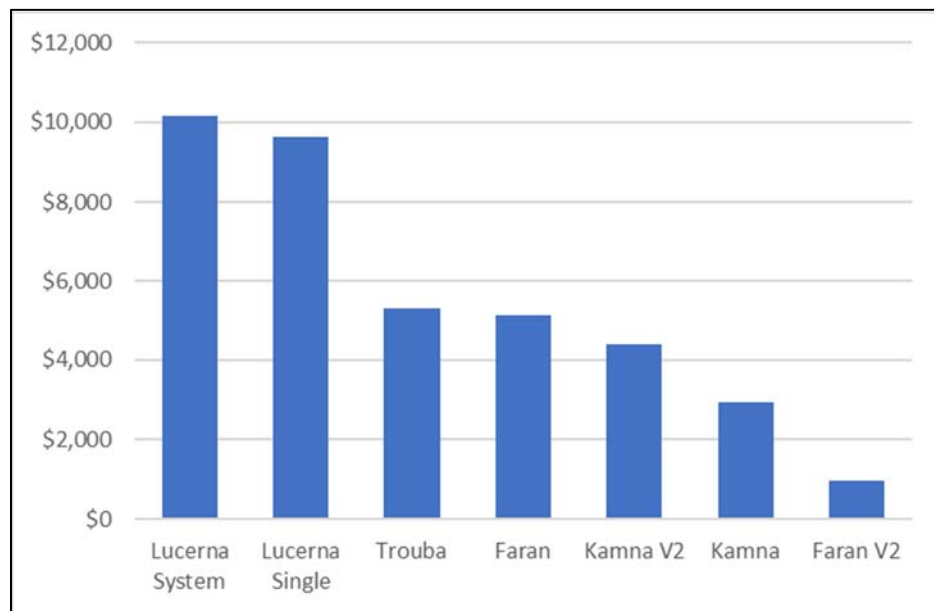


Figure 9: Total Profit per Product

The Trouba accounted for 60.3% of the revenue generated in 2017 but only 49.3% of the total profit generated due to the low profit margin. This is due both to the lower markup DISTRO receives compared to the wholesale price and the transportation costs associated with the product following the transition to a new transportation provider. Table 10 gives the percentage markup DISTRO receives above the wholesale

price. The Trouba earns the lowest margin for the company on a percentage basis, excluding transportation and warehousing fees.

Table 9: DISTRO Product Markup

Lucerna Single	Lucerna System	Faran	Kamna	Kamna V2	Trouba	Faran V2
36.36%	30.43%	27.64%	29.41%	29.41%	19.19%	27.64%

Additionally, shipments incur a weight overage cost of 40 KES for each kilogram (kg) above 5 kgs. The Trouba weighs 6 kgs, so each shipment incurs a weight overage fee in addition to the base rate shipping fee. The profitability of the Faran V2 suffers from the same dynamic, as the product weighs 7 kgs. The product accounted for 11.3% of the revenue generated by DISTRO in 2017, but for only 2% of profit generated. Though the Faran and Faran V2 are marked up at the same percentage above the wholesale price, the majority of Faran sales were in Nairobi while the majority of Faran V2 sales were in the Rift Valley Region, further from DISTRO's warehouse and shipping locations. DISTRO's transportation provider charges higher rates for shipments to regions located further away geographically, and DISTRO does not pass these costs on to retail customers. Further, the warehouse processing fee of 300 KES is applied regardless of the quantity shipped. DISTRO does not optimize the allocation of this fee by bundling shipments into larger order quantities. The average quantity per order on the Faran was 2.57, while the average order quantity for the Faran V2 was 1.84. Though this is a small disparity, over large volumes of sales and under thin profit margins, this impacts the profit earned per product. Table 11 summarizes the number of sales, the retail price and DISTRO markup (in USD), and the product profit margin on each transaction earned by DISTRO throughout the analysis period.

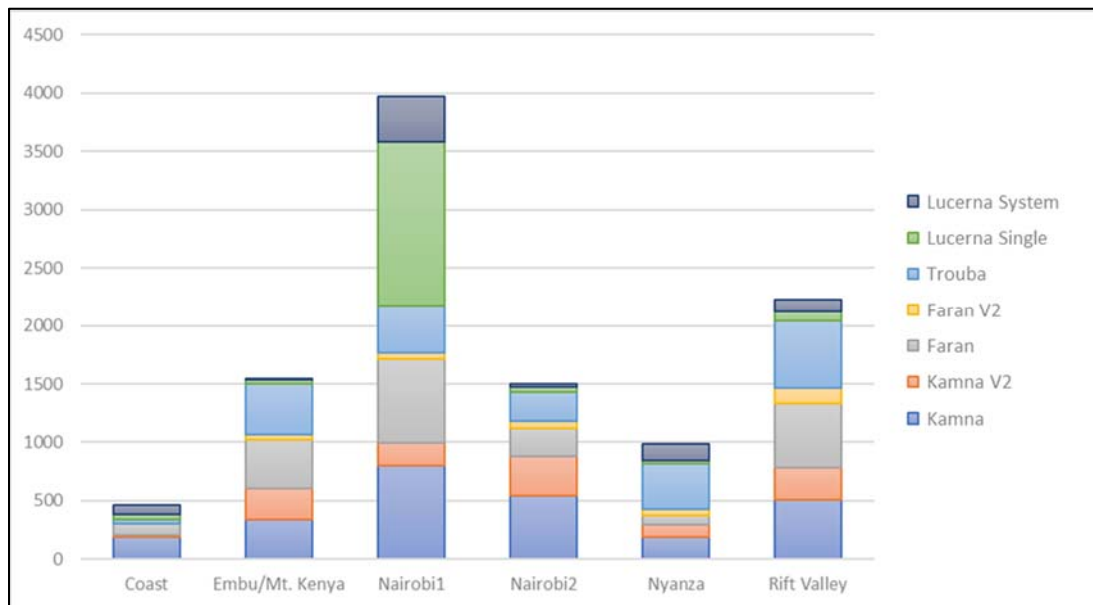
Table 10: Sales and Profit Margin Summary

Product	Sales	Retail Price	DISTRO Markup	Profit Margin
Kamna	2,580	\$39.50	\$8.08	\$1.37
Faran	2,098	\$38.61	\$7.52	\$2.60
Trouba	2,078	\$45.54	\$6.53	\$2.52
Lucerna Single	1,652	\$39.60	\$9.50	\$6.22
Kamna V2	1,185	\$39.50	\$8.08	\$3.68
Lucerna System	743	\$79.19	\$16.63	\$12.63
Faran V2	352	\$38.61	\$7.52	\$2.60

*KES to USD conversion: 1 KES = .0099 USD

4.5 Product Sales by Region

Figure 10 displays the volume of sales and products sold across DISTRO's six sales regions. Nairobi1, the largest region by population and the location of DISTRO's offices and warehouse, generated 37% of the sales volume. The Lucerna Single, which carries a higher margin than cookstove products, has sold well near DISTRO's warehouse and suppliers in Nairobi, but sales volume has been much lower in other regions. Sales of additional product lines were similar across regions.

**Figure 10: Product Sales by Region**

DISTRO’s strategy regarding sales locations has shifted year-to-year due to factors discussed later in Chapter 4. Figure 11 displays the sales by region broken out across 2015, 2016, and 2017. Sales in Nairobi have become a smaller percentage of total sales, as sales volume in Embu, Nyanza, and Rift Valley have grown.

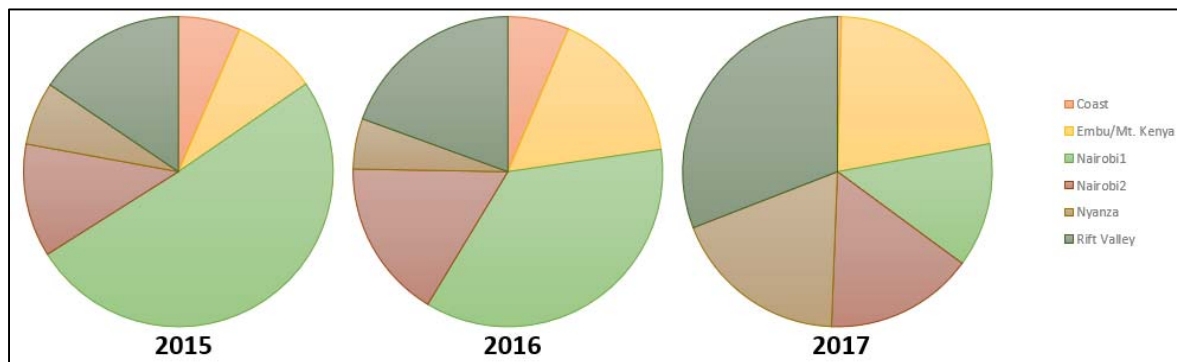


Figure 11: Annual Sales by Region

4.6 Supply Chain Events Overview

Through a combination of exploratory discussions with DISTRO and USAID personnel and the review of contextual data, a total of nine significant events categorized under the segments of capital allocation, operational decisions, and geopolitical events potentially affecting DISTRO’s cash flow, sales, costs, and profitability were identified. The decision to include events across these three categorizations was made due to their interrelated nature and the potential overlap in the impact of events of each type. Economic and political events within the country often drive supply chain strategy and financial performance, and many operational decisions are closely related to capital allocation requirements. Several of the significant events identified during the analysis experienced overlap across these categories, specifically regarding capital allocation and operational decisions. In such cases, events of each type were categorized based on the

capital outlay required to undertake the associated event. For example, a warehouse and inventory investment will inherently impact the operations of the supply chain, but due to the capital requirements incurred, it is classified as a capital allocation event rather than an operational decision. Conversely, organizational structure and employment strategies will impact the finances of the firm, but they typically do not require a significant capital outlay.

The supply chain events chosen for analysis targeted calendar year 2017 so as to allow for a comparative analysis of financial performance year-over-year. Additionally, the current regional management team in Kenya began working with DISTRO in January 2017 and is able to provide comprehensive insight into the operations of the supply chain during this period. Table 12 gives the events identified, along with the categorization of each event. The following section addresses these events independently, first providing an overview/background of each event, then addressing the operational and financial impact to the DISTRO supply chain.

Table 11: Supply Chain Event Summary

Capital Allocation	Operational	Geopolitical/Economic
Warehouse Investment	New Product Rollout	Kenyan Presidential Election
Lending Program	Product Price Changes	Drought/Energy Markets
Travelling Warehouse	Employee Turnover/Compensation	Interest Rate Cap

4.7 Supply Chain Events Analysis

Warehouse Investment

In June 2017, DISTRO made a working capital investment in the form of a central warehouse and a first-time inventory investment. Prior to the investment, DISTRO did not hold inventory and would ship products directly to customers from its suppliers. The

warehouse, which was funded through a grant paid by the Massachusetts Institute of Technology, is managed by a segment of TRANSPO, which also provides transportation services for DISTRO's product shipments.

DISTRO pays a standard \$300 warehouse management fee to TRANSPO each month. Additionally, each order to ship product incurs a 300 KES charge (equivalent to \$2.97) that is independent of the quantity ordered. When an order occurs, an operations manager for DISTRO submits a request for shipment to the warehouse personnel and the order is immediately processed. Each individual order placed by DISTRO is to a single retail location but may contain any combination of products and quantities. The warehouse was initially stocked on 3 June 2017.

An analysis of an initial inventory investment, specifically for an SME, represents a unique opportunity for supply chain finance study. Previous research on working capital management has focused on supply chains in which inventory is currently being held, analyzing the effect of reducing inventories as well as the impact of payables and receivables windows. A February 2017 report on the economic impact of solar lighting in rural Kenya analyzed the impact of the availability of solar lights on product sales. Survey data from the Google-funded research project found that only 1% of respondents had not purchased the product because it was not available for purchase (Rom, Günther, & Harrison, 2017). This study seeks to test this finding by determining whether increased availability and easier access in the form of inventory leads to increased sales.

Impact of Warehouse Investment

The warehouse and inventory investment made by DISTRO in June 2017 has had a significant impact on the firm from both a financial and operational standpoint. The

overarching benefits seen throughout the supply chain include increased integration and enhanced relationships between suppliers and DISTRO, improved cash flow, and faster order processing and delivery times. These benefits are driven by a combination of the credit terms and payables windows negotiated between DISTRO and its suppliers, changes in the order replenishment/purchase order cycle, and the frequency of deliveries brought about by having stock on-hand.

DISTRO manages its inventory under an order-point, order-up-to-level policy, where inventory levels are set based on product sales volume, and inventory is ordered once in-stock quantities are zeroed out. DISTRO currently receives no economies of scale benefit in its order policy, as the company accounts for a relatively small share of its suppliers' market base. Originally the company held inventory for nine separate product lines. Due to a lack of sales in several product lines, the company shifted to holding inventory for only six separate products by the end of 2017. Figure 12 shows the company's inventory levels for its top three product lines by sales during the first five months in which inventory was held. DISTRO put a hold on inventory orders beginning in October 2017 due to uncertainty surrounding the presidential election and in order to better understand the impact of the warehouse on the firm's cost structure. The order replenishment cycle has improved as DISTRO began to better understand how to manage its inventory levels following the initial supply of products.

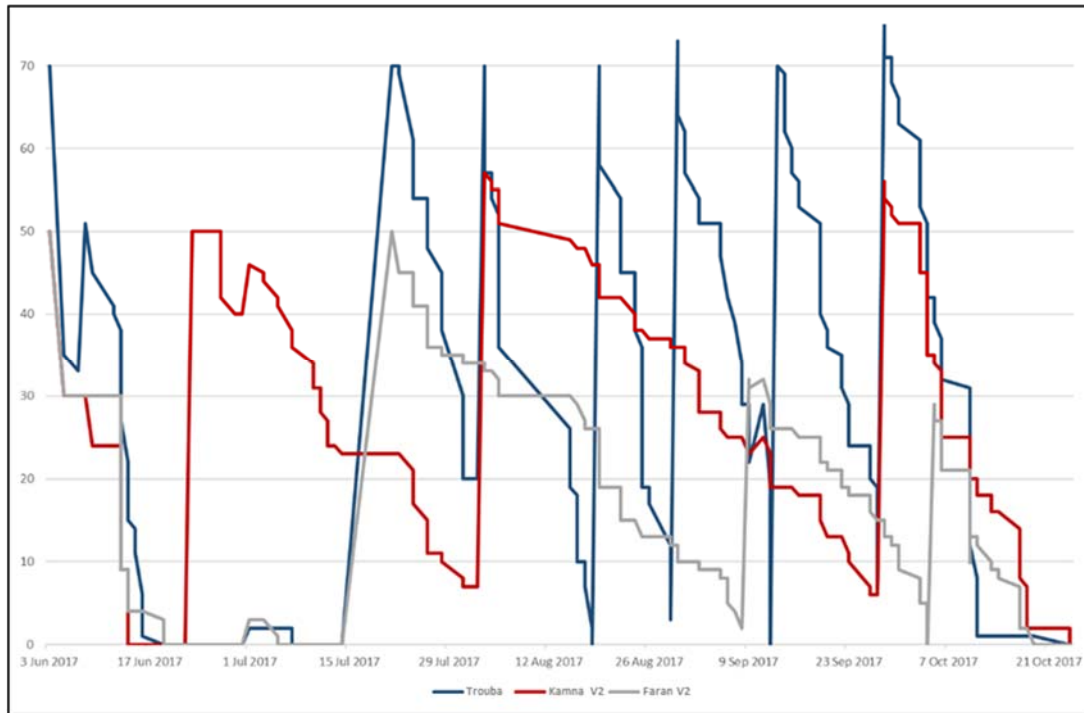


Figure 12: Inventory Levels for Top 3 Products Sold

Under generally accepted accounting principles (GAAP), inventory is carried as an asset on the balance sheet, allowing for the calculation of various performance measures that provide insight into the financial and operational impact to the company. Under DISTRO's current inventory policy and agreements with its suppliers, inventory is held under terms similar to consignment with a 30-day payables window. Therefore, when end of year financial statements were produced for 2017, the company did not include the value of inventory on its balance sheet. For this analysis, the valuation of the inventory held during the second half of 2017 was calculated based on the average number of units held during the accounting period multiplied by the wholesale price paid to suppliers, as standard accounting practice values inventory at cost rather than at the sales value (Harrison et al., 2010).

DISTRO's inventory on hand averaged \$6,368 throughout 2H 2017. Though this amount is technically held on 30-day credit terms with the company's suppliers, DISTRO has the option to return products to its suppliers once the cash payment becomes due rather than paying for unsold products. This 30-day option ensures DISTRO doesn't incur a capital outlay when the company submits a purchase order. At the end of each month, DISTRO makes payment for the products sold within that month, which has allowed the company to increase its cash on hand through 2H 2017. The company's working capital position has increased substantially on a percentage basis due to this impact on cash flow. In 1H 2017, the company reported negative working capital driven by a sizable increase in the company's total accounts payable. In 2H 2017, DISTRO's working capital increased to \$28.9 thousand as the firm was able to retain more cash as a product of the credit terms negotiated with suppliers. Table 13 summarizes the changes in DISTRO's working capital and liquidity.

Table 12: Working Capital and Cash Flow Metrics

Metric	2015	2016	2017
Working Capital	\$579.30	\$6,964.59	\$28,921.35
Working Capital Turnover	338.51	17.75	3.71
Working Capital as a Percentage of Sales	0.30%	5.63%	26.95%
Current Ratio	1.01	2.22	3.79
Quick Ratio	.98	2.17	3.18

The decrease in working capital turnover and increase in working capital as a percentage of sales reflect the considerable increase in DISTRO's working capital position. Though sales increased by 36% from 1H 2017 to 2H 2017, the increase in working capital was much higher. If the company is able to continue growing its sales

under the current working capital structure, these metrics will improve. The year-over-year improvement in the current ratio, which measures a company's ability to cover its liabilities, indicates that the additional cash on hand has made the company more liquid. The quick ratio provides a similar measure of liquidity that accounts for the potentially illiquid nature of inventory. As DISTRO's inventory position has increased, the health of the company's financial statements has improved.

In addition to the financial impact of the inventory investment, the operational impact within the supply chain has been significant. At the beginning of 2017, DISTRO would aggregate retail orders and place a large weekly purchase order to its suppliers. Due to the delays this caused in the fulfillment of customer orders, DISTRO transitioned to placing purchase orders three times each week. Once the inventory investment was made, the company was able to ship products to fill orders within 24 hours. The impact of this transformation was felt at multiple echelons within the supply chain. As opposed to the model of placing 3 orders each week, during the thirty weeks in which the warehouse was operational in 2017, DISTRO placed 14 orders with its suppliers. This adds value for both the operations manager placing orders at DISTRO, and the managers at the company's supplier warehouses. DISTRO doesn't collect data on customer wait time (CWT), but the warehousing data provided by the company does reflect the time between when an order is placed and when the shipment is processed. Following the inventory investment, 99% of the orders received were processed and shipped within one day. This means CWT is solely dependent upon the transportation time to the location of the sale. The expedited order processing time significantly reduced average customer wait time by filling orders daily rather than weekly or every other day.

The benefits realized in the inventory investment did come at a financial cost incurred by DISTRO. As discussed previously, the company pays a \$300 flat rate warehouse management fee each month and a 300 KES processing fee for each shipment. Since the \$300 overhead fee is a non-variable cost, it is not allocated to individual product sales and is instead applied to the scalability model at the end of Chapter IV. The 300 KES processing fee is allocated evenly across each product in each shipment. The fee is applied to each shipment regardless of the quantity shipped, meaning the cost per product decreases with higher volume in each shipment. The impact of the 300 KES fee to the overall profit margins are given in Figure 13.

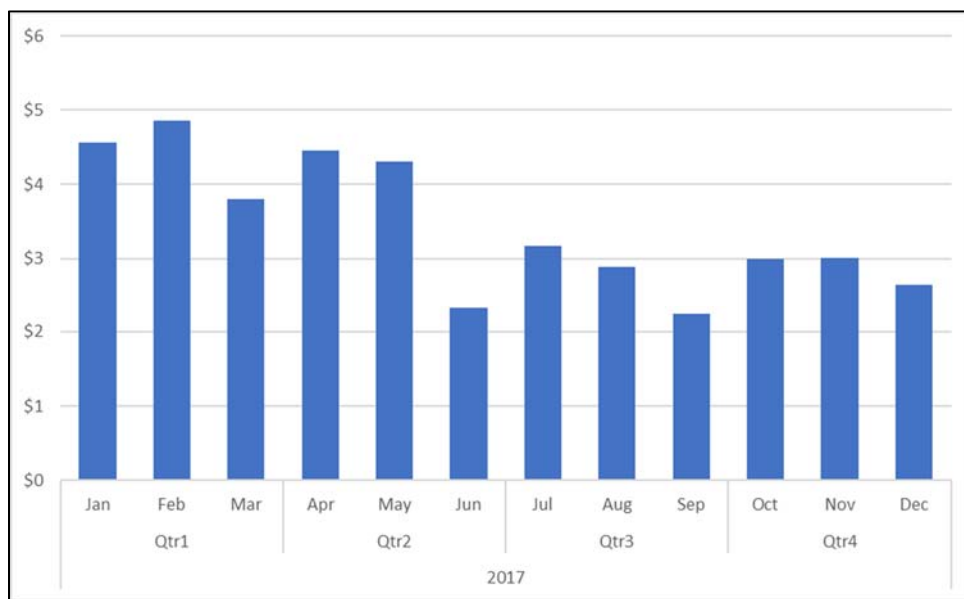


Figure 13: Average Profit per Product

Prior to the inventory investment, the average profit per product in 2017 was \$3.57. Following the investment, the average product per profit dropped to \$2.17. The dip in the average profit margin shown in June is due to a high volume of lower margin products sold during the month, specifically of an unprofitable product line that was

dropped by the company. This drop in profit margin is offset by the increase in sales volume seen during this period. The average monthly profit in 2017 increased from \$446 prior to the investment to \$492 after. DISTRO could better manage its profit margins by accounting for quantities within the shipments processed through its warehouse.

Inventory allows for greater flexibility in working capital management. During a market downturn when sales decrease, current assets can be used as a source of cash to finance operations and other obligations. According to Higgins (2012), well-run companies manage current assets in an accordion-like fashion with sales volume, which is appealing to creditors. In a business cycle upswing current assets will require loans, while during a downswing current assets can be decreased to provide cash to repay loans. With the credit supply in Kenya coming under pressure due to legislation capping interest rates, the improvements to DISTRO's balance sheet brought about by its inventory investment and credit terms can potentially be levered to attract capital for financing operations.

Lending Program

In 2013, DISTRO formed a partnership with a large national bank headquartered in Nairobi. The national bank is referred to as BANK throughout this analysis. The objective of the partnership was to develop a uniquely tailored loan to provide financing for DISTRO's product line to BANK customers through a USAID funded grant as part of USAID's Developing Sustainable Cookstove Sector (DSCS) program. In the initial design of the program, DISTRO personnel worked directly with BANK branches to promote and sale products. The bank created a new loan application, under which the

estimated savings on an average customer's charcoal expenditures could cover the repayment of the loan in a six-month period.

The program expanded to over 100 branches but using DISTRO staff to sale through Equity branches was not cost effective due to low foot traffic in the branches. The program was then expanded to a network of retail shops authorized to sale the products. Products are marketed and sold in retail shops, and financing is provided through BANK's financial technology platform. Prior to the launch of the loan on the technology platform, loan forms had to be processed by BANK branch personnel for approval, and loan recipients received a voucher for the product in the interim that could be redeemed at the retail shops.

DISTRO and BANK, in collaboration with the World Bank, planned to launch a marketing campaign in June 2017 to aggressively promote the program. Though some marketing has taken place, due to concerns regarding the 2017 Kenyan presidential election, the World Bank held off in participating, greatly diminishing the reach of the marketing campaign.

Impact of Lending Program

In interviews and discussions with stakeholders involved with the loan program, personnel were not willing to disclose financial data related the program due to confidentiality concerns inherent to the financial services industries. Specifically, the capital commitments involved with program initiation and the marketing campaigns managed by DISTRO were topic areas in which the firm was not willing to disclose information. Additionally, sales made through the program are not specifically identified by DISTRO, so an analysis of the sales volume generated by the program or the effects of

the program on firm profitability is not possible. The company has indicated that the program has gone well apart from issues in the initial marketing campaign planned with the World Bank addressed further under the impact of geopolitical events section of Chapter IV.

The program has also shortened the waiting period for customers purchasing products on credit by streamlining the loan application process. The loan application is a single-page document that allows customers to qualify for and receive a loan within 24 hours, down from a waiting period of approximately two weeks prior to launching the program. Customers receive financing and products significantly quicker, further improving CWT and potentially impacting the sales volume of the company.

Travelling Warehouse Program

As part of the marketing and road show initiative following the rollout of the online lending program, DISTRO initiated a travelling warehouse program in conjunction with the company's inventory investment in June 2017. The program involved renting a van in Nairobi and carrying stock from DISTRO's warehouse to sales regions outside of Nairobi to generate additional sales and product awareness. The program is relatively expensive for DISTRO operations, as the company pays on average \$250 to rent the vehicle per campaign (compared to a \$300 per month warehouse management fee). The initial travelling warehouse carried products across seven different product types to Nakuru. The remaining rollouts of the travelling warehouse, to Nyahururu, Gilgil, and again to Nakuru, were on a smaller scale than the initial program rollout. The program ran in June and July of 2017 on six different occasions.

The company is looking to continue the program in Nairobi using their own vehicles to offset the costs incurred in renting a van. The company is also looking at the cost of renting vehicles for use within Nairobi, as this carries much cheaper costs than renting for locations in other sales regions. Though the program is intended to serve as a form of marketing for DISTRO, the company is also seeking to generate positive cash flow through the travelling warehouse. The analysis of the travelling warehouse program will revolve around the level of sales required for the program to be profitable, and the sales volume generated in the region in the months following the program.

Impact of Travelling Warehouse Program

The travelling warehouse program holds the potential to deliver higher margins for DISTRO, as the company is not paying transportation costs on the products sold. Additionally, since DISTRO picks up inventory from its own warehouse, shipments under the program do not incur the warehouse processing fee applied by TRANSPO. The only cost incurred by the company is the cost to rent the van used to carry product and the cost of goods sold.

The original travelling warehouse program to Nakuru generated 29 total product sales and revenues of \$113.45. This is well below the \$250 cost to rent the vehicle used. The warehouse to Gilgil generated higher revenues at \$139.48. Nyahururu produced the highest sales volumes and revenue for the program, with 46 total product sales and revenue of \$189.64. None of the campaigns generated enough revenue to offset the cost of running the program.

Though DISTRO is seeking ways to make the program profitable by reducing costs, the travelling warehouse was designed as a marketing campaign to generate

product awareness and long-term product sales in the regions visited. Each branch experienced above average sales volume at the branch visited during the month in which the program was run, but this did not translate into a longer term increase in sales. Additionally, sales in the broader region did not experience a higher volume of sales in the months following the travelling warehouse, implying that the marketing campaign did not have a significant impact in driving sustained sales growth.

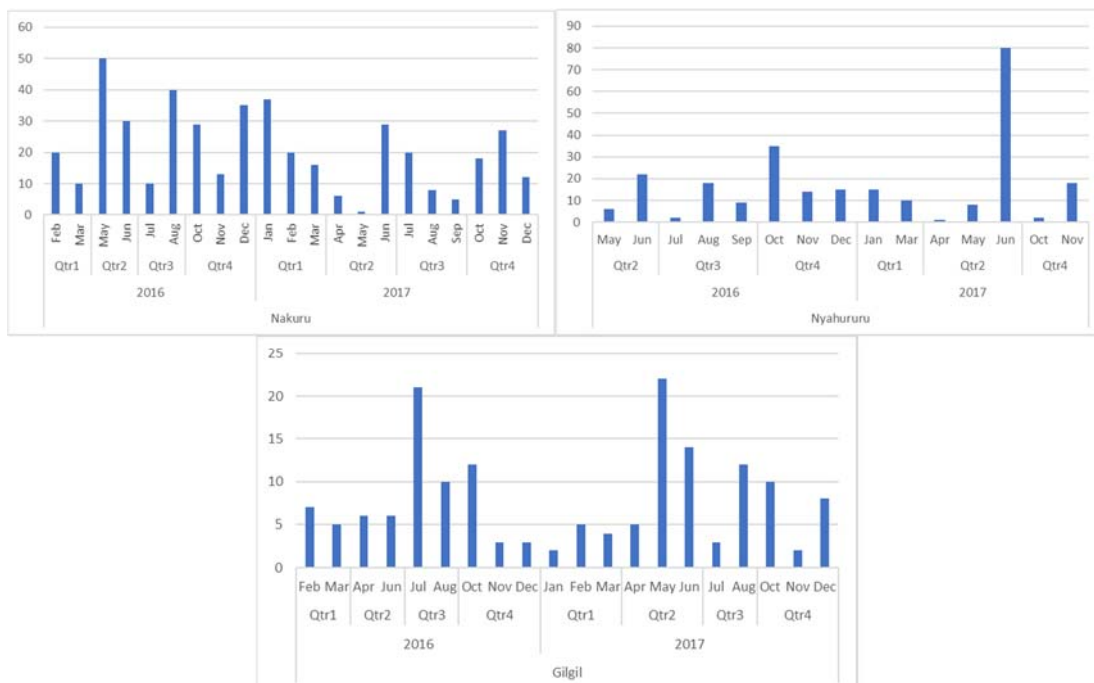


Figure 14: Nakuru, Nyahururu, and Gilgil Product Sales

The scalability of the program is contingent upon the mix of products sold. Based on 2H 2017 sales data for the six products held in the DISTRO warehouse at end of year, to generate positive cash flow the program would need to be scaled to approximately 56 product sales. Solar lantern sales accounted for only 4.3% of products sold during this period. If the company is successful in its strategy to increase solar sales as a percentage of total sales, the program could potentially be profitable at lower volumes, but the

volume of solar lantern sales would need to increase to more than 25% of total sales to significantly impact the breakeven volume.

New Product Rollout and Product Price Changes

DISTRO has shifted its product line over time, both to new variations of older products as its suppliers have improved upon solar and cookstove technology, and to new product brands from additional suppliers. In 2015, the company offered nine total products which included several brands of cookstoves and solar lighting systems.

Throughout 2017, the company generated revenues from eleven total products, though several of these products were phased out over the course of the year. In the second half of the year, five product lines accounted for over 99% of the company's sales volume.

Revenue was generated from a total of sixteen different product lines throughout the analysis period. The company also implemented two significant price changes to products during the two and a half years analyzed. The analysis of new product rollouts and product price changes will encompass a breakdown of the profit margins and sales volume generated from the various product lines.

Impact of New product rollout and Product Price Changes

DISTRO introduced seven new products throughout the case period. Among these seven were the Kamna V2 and Trouba, the two highest revenue generating products in the company's most recent reporting period. In 2017, the Trouba accounted for over 60% of the revenue generated from product sales while the Kamna V2 accounted for 16.62%. The five additional products introduced during this time period did not produce the same level of sales volume or revenue.

Of the five additional products, three were solar lighting products and two were cookstoves. Figure 15 displays the volume of each product sold and the average profit margin per product (names/brands are masked). The Estufa was the highest selling product, but the product carried a very low profit margin and was discontinued in July 2016 due to poor sales volume and low profit generation. The Linterna, a solar lighting system that includes four lights and a radio, generates a very high nominal product margin because the product is highly priced, but DISTRO sold only one Linterna during the case analysis. In interviews with DISTRO, management indicated that they cut ties with the supplier of the Linterna due to poor relationships and a lack of operational “fit” within the supply chain. The Ligero is the only product still sold by DISTRO, but it continues to have very low sales volume.

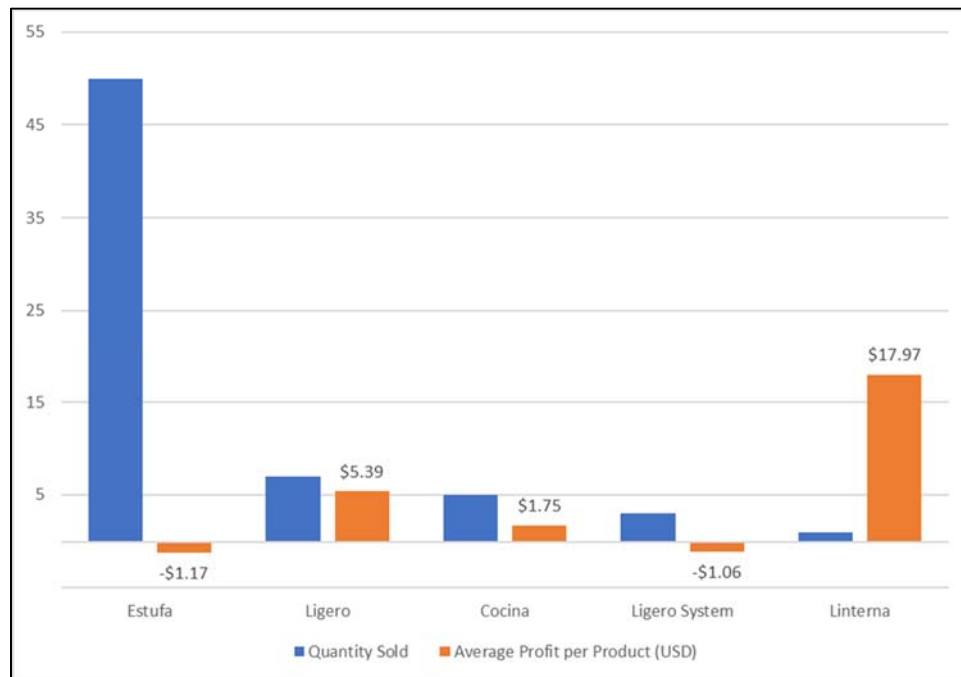


Figure 15: Low Volume Product Sales

In addition to new product rollouts, DISTRO's product price shifted twice during the case analysis period driven by price changes in the supply chain's supplier base. The two products that were repriced were the Kamna V2 and the Trouba. The Trouba was first added to the company's product line in the second half of 2016. In March 2017, the wholesale, distributor and retail prices of the product were increased from the price at which the product was originally offered by 11%, 17%, and 7%, respectively. This increased the margin paid to DISTRO by 600 KES, or approximately \$5.94. Figure 16 gives the sales volume and average profit margin for the Trouba since it was initially sold by DISTRO. The price change caused sales to dip in the first month under the new retail price, but sales quickly rebounded and grew in the subsequent months. The average profit margin per product sold peaked in January and February 2017, due to several products being sold at higher retail prices during this period, but dropped beginning in June 2017. The drop in the second half of the year was brought about by the warehouse processing fee. The Trouba is often bought and shipped in quantities of one, in which case the 300 KES warehouse processing fee is incurred for each shipment. With the low average profit margin for Troubas (\$2.52), this cost significantly impacts the marginal profit generated for each sale.

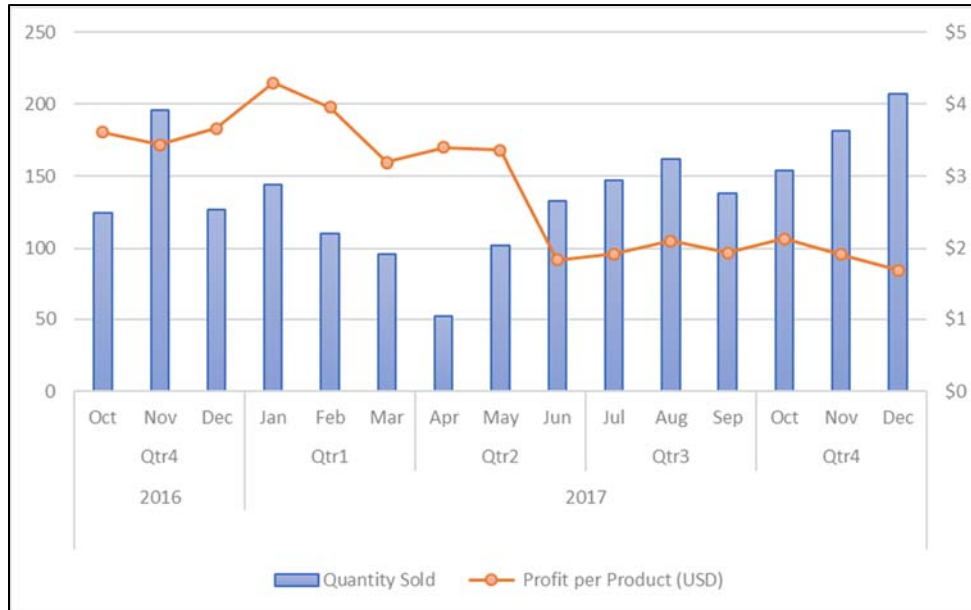


Figure 16: Trouba Sales and Profit per Product

The Kamna V2 was introduced as part of DISTRO's product line in April 2016 as a replacement for the Kamna. This is also the same month that the company shifted transportation service providers, incurring a new cost structure for product shipments. When first brought to market, the product was priced 500 KES lower than the original Kamna. The Kamna V2 was a significant driver of sales throughout 2016, but sales volume began to diminish late in the year and into 2017. At the end of June 2017, the wholesale, distributor, and retail price of the product were each increased by 14%. The effect on the profit generated by the product is given in Figure 17.

The spike in June was driven by sales made prior to the price increase through the travelling warehouse program, as well as a large one-time order. There were also a number of sales in Olkalau, which incurs one of the highest flat rate transportation costs, weighing on the average profit margin within the month. Overall, the average profit per

month from Kamna V2 sales following the price change increased from \$115.17 to \$150.58.

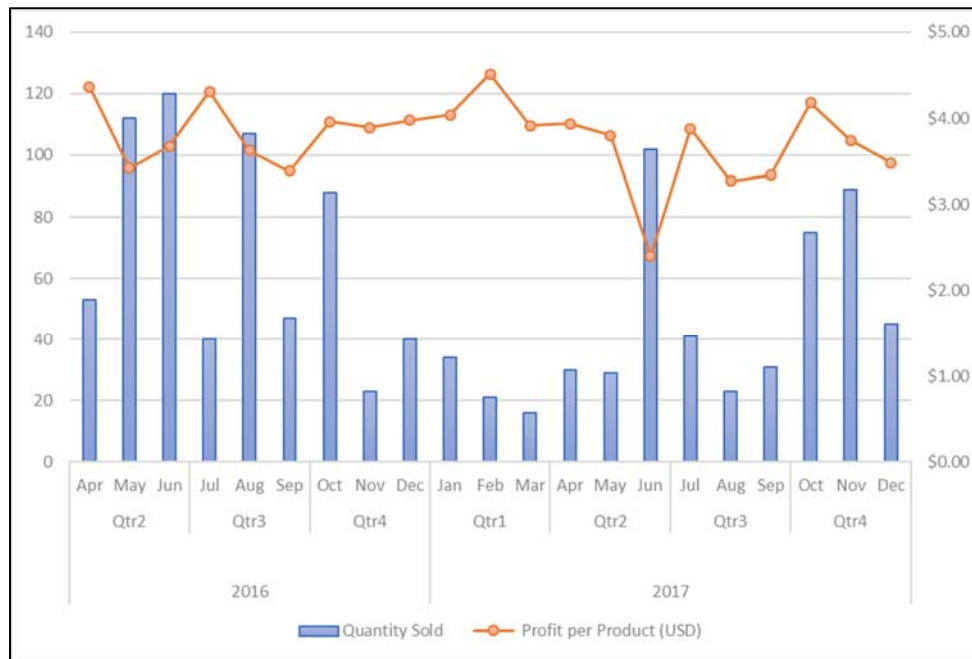


Figure 17: Kamna V2 Sales and Profit per Product

An interesting takeaway from each of these graphics is that the quantity shipped is inversely correlated with the profit margin per product. This is because months with higher quantities of products sold were generally sold to regions further away from DISTRO’s warehouse and supplier warehouse. Product sales in regions further from Nairobi are typically ordered in bulk, so a larger number of products are incurring the higher transportation costs associated with these shipments. Since DISTRO doesn’t pass transportation costs to its customers, this weighs on the marginal profit earned on each product.

Overall, the increases in product prices have benefited each echelon of the supply chain by raising margins while not negatively impacting long term monthly sales growth.

Price changes drove a slight improvement in the gross margins reported in Table 19 and discussed subsequently in Chapter IV, as the revenue generated from the sale of each product has increased relative to the cost of goods sold. This means that DISTRO retains more of each dollar of sales to service its other costs, impacting the level of scale at which the company becomes profitable.

Employee Turnover (Regional Manager and Sales Force) and Compensation Structure

DISTRO experiences relatively high staff turnover due to the company's employee hiring strategy. DISTRO employs a number of expatriates, particularly within its management team. The current regional manager began with the company in January 2017, while the previous regional manager was with the company for one year. In addition to turnover at the management level, the company has experienced significant turnover in its sales force. The impact of employee turnover on sales will focus on revenue generated per employee and the sales per sales staff employee.

The company also shifted its employee compensation structure throughout the analysis. Prior to 2017, sales staff and bank staff received commissions based on sales volume. Sales staff commissions were discontinued beginning in 2017 and bank staff commissions were terminated in August of 2017 due to difficulties in sales verification and the potential for fraudulent reporting. Currently, sales agents are not provided any type of financial compensation based on product sales. The company is looking to implement a commission structure in 2018 that focuses on the type of product sold (solar lantern vs. cookstove) due to variations in the profit margins across different product types. On average, solar lanterns earn a much higher margin than cookstoves, though cookstoves account for a greater volume of sales. The company is seeking to leverage

this disparity by implementing an incentive structure only for solar lanterns. The impact of employee and bank staff commissions are captured in the sales price of the transaction data supplied by DISTRO.

Impact of Employee Turnover and Compensation Structure

DISTRO's Kenyan operations were led by three separate regional managers throughout the case analysis. This research study was initiated under the current regional manager who began in January 2017, making it difficult to assess the qualitative impact previous regional managers had on the firm. Due to the high rate of employee turnover, many of the personnel working under previous regional managers are no longer with DISTRO. However, interviews with current personnel did reveal several distinctions in the operational strategies applied under the current and previous regional managers.

In 2017, under new regional management, DISTRO took a more aggressive approach in the management of its sales staff. Throughout the year, the company released seven sales agents and hired two new members to the sales staff. By the end of 2017, only two sales agents that were employed in 2015 remained with the company. During this period, DISTRO made a concerted effort to hire employees in Western Kenya to penetrate the market due to the dynamics of the electrical grid in Kenya, discussed subsequently in Chapter IV. The two new sales managers hired in 2017 are specifically devoted to branches in the Nyanza region

DISTRO credits a significant portion of the sales growth experienced throughout 2017 to employee motivation stemming from turnover within the employee sales force. Under a 23% reduction in the sales force, DISTRO grew both sales volume and revenue. Table 14 displays the change in sales agents during each reporting period and sales and

revenue generated per employee. Revenue and sales per employee trended downward until the second half of 2017, when sales volume grew significantly under a smaller sales force.

Table 13: Sales and Revenue per Employee

	2H 2015	1H 2016	2H 2016	1H 2017	2H 2017
Sales Agents	36	23	22	21	16
Sales per Employee	96.1	87.4	60.5	55.8	99.8
Revenue per Employee	\$4,513.51	\$3,344.46	\$2,123.06	\$2,109.64	\$3,937.26

DISTRO also shifted its employee compensation structure in 2017, eliminating commissions paid to its sales staff based on the number of sales made. The shift did not significantly impact the sales volume for each of DISTRO's sales agents. Four of the top five performing sales agents by total sales in 2016 were again the top performing sales agents in the first half of 2017. Interviews with DISTRO staff revealed that the sales volume required to earn additional compensation was rarely achieved, indicating the program was poorly structured to incentivize sales staff.

Geopolitical and Economic Events Overview

Macroeconomic factors have largely been conducive to growth in recent years, with low oil prices and a rebound in the global economy supporting Kenya's services-based economy. Though 2017 GDP figures have yet to be released, economic projections produced by the World Bank predict a dip in 2017 GDP growth due to a number of headwinds facing the country. Civil unrest brought about by the country's 2017 presidential election, an ongoing drought impacting energy markets, and a slowdown in credit growth within the private sector have weighed on the country's

economic growth. Despite the ongoing headwinds facing the country, the World Bank forecasts economic growth to rebound to 5.8% and 6.1% in 2018 and 2019, respectively (The World Bank, 2017b).

2017 Presidential Election

On 8 August 2017, general elections were held in Kenya to elect the president and other various legislative positions. Incumbent President Uhuru Kenyatta was reelected with 54% of the vote, but opposition candidate Raila Odinga refused to accept the results of the election, claiming the electoral commission's computers were hacked to favor President Kenyatta (Stavis & Parkinson, 2017a). Mr. Odinga's claims sparked wide spread protests among his supporters in Nairobi and Western Kenya. Kenyan politics are largely shaped by tribal divisions within the country. In the 2007 Kenyan elections, allegations of vote rigging and voter intimidation led to tribal violence that left 1,500 people dead and hundreds of thousands displaced from their homes (BBC, 2008). Raila Odinga was the also opposition leader in the 2007 election, seeking to unseat then-President Mwai Kibaki.

Following the election held in August 2017, the electoral commission rejected Mr. Odinga's claims that their systems had been hacked. International monitors of the election found no fraud, claiming the election was free and fair (Stavis & Parkinson, 2017b). On 1 September 2017, Kenya's supreme court surprised many by backing a petition filed by Mr. Odinga, annulling the presidential election results (Parkinson, 2017). The court did not assess blame, only citing irregularities and a lack of accordance with the constitution, and ordered that a new vote occur within the next 60 days. The decision by the court marked the first presidential election to be annulled in Kenya's history.

In early October, Mr. Odinga withdrew from the election, arguing the vote wouldn't be fair, and called for protests across the nation (Stavis-Gridneff, 2017a). Mr. Odinga raised concerns that the new election date didn't allow adequate time to implement safeguards preventing irregularities in the vote. On 30 October 2017, President Uhuru Kenyatta was declared the winner of the Kenyan presidential election. International officials and rights groups documented 70 deaths following the August vote and 14 deaths following the October vote, while government figures put the death toll at 10 (Moore, 2017).

Though end of year economic data is not yet available, the World Bank predicts gross domestic product (GDP) will expand by 4.9% in 2017, down from its original projection of 6% (Stavis-Gridneff, 2017b). The downgrade was issued as a number of Kenyan banks and businesses reported a decrease in performance this year and the country's largest retailer entered into bankruptcy. It is difficult to attribute deviations in economic performance specifically to the protests and civil unrest brought about by the election, as there are a number of factors potentially affecting economic growth. The impact of the Kenyan election on the DISTRO supply chain will be measured through the operational impact identified in interviews with DISTRO personnel.

Impact of 2017 Presidential Election

Economists and international financial institutions estimate varying impacts to economic growth and business development that are attributable to the civil unrest stemming from protests during the 2017 Kenyan presidential election cycle. Additionally, DISTRO is under resourced to track the market impact of such events to the company, making it difficult to identify any financial impact to the supply chain.

Regions in which most of the protests and violence occurred (Nairobi and Western Kenya) didn't have a noticeable drop off in sales throughout the second half of 2017. However, the election season did shape the firm's operations throughout the Fall of 2017.

In initial interviews with DISTRO personnel, members of the management team outlined several operational decisions framed by the political context. In October 2017, DISTRO planned to delay warehouse replenishment in anticipation of a slowdown in sales following the second round of elections potentially causing order processing delays, though the slowdown in sales never materialized. DISTRO's favorable credit terms negotiated with the suppliers for its warehouse protect the firm from a liquidity crisis if sales are degraded, but inventory investment made on credit could carry significant ramifications for supply chains operating under different financial structures.

The most significant impact on DISTRO involved the rollout of the online lending program. Violence stemming from election protests in August 2017 caused the World Bank to postpone plans for a marketing campaign expanding DISTRO's lending program to additional banks outside of the original agreement DISTRO reached with BANK. Though DISTRO was not willing to disclose financial data involved with the program, management did indicate the company incurred a large financial commitment under the program that didn't produce the marketing and product awareness expected. The company believes the lack of participation by the World Bank diminished the rollout of the program. In interviews, management stated that the eventual marketing campaign "wasn't really related much to what the original campaign was going to be. It was just a small part of what was originally planned."

Though the disruptions within Kenya stemming from the election didn't significantly impact DISTRO, the event demonstrates the barriers facing supply chains operating in the developing world, especially SMEs that cannot afford unanticipated reductions in sales volume. This also highlights the uncertainty facing investment institutions seeking to allocate capital to finance business growth in less stable countries. Market and political events that can't be calculated present potential detractors to investment made that are independent of the financial health and operational effectiveness of the investment target.

Kenyan Drought and Impact to Electrical Grid

Throughout 2016 and 2017, Kenya experienced a severe drought causing food shortages and shaving an estimated .6% off economic growth (Stavis, 2017b). In addition to the public health concerns and economic impact on the country, the drought has had a significant impact on energy markets. As electricity access and power generation have risen within Kenya over the past two decades, hydropower has been the cheapest and most abundant source of power, followed by geothermal. Poor rainfall within the country has led to a reduction in power generation from hydropower sources, causing the cost of hydropower to rise. Figure 18 displays energy generation by source from mid-2016 through 2017.

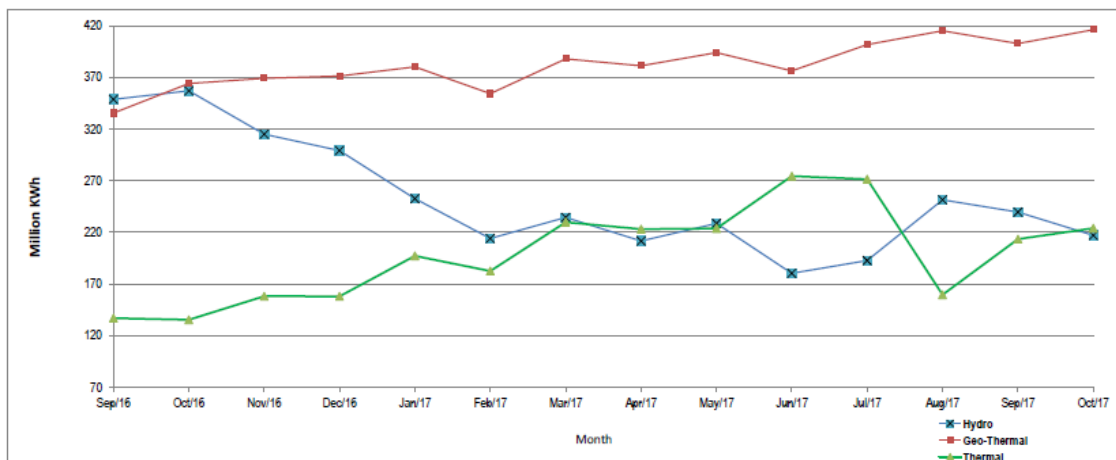


Figure 18: Kenyan Electricity Generation by Source (KNBS, 2017)

While the mix of power generation by source has shifted due to the lack of rainfall in the country, energy generation as a whole has continued to increase. Though capacity within the country has continued to grow, an increase in the scale of the electrical grid has not driven down electricity prices. Figure 19 gives the historical cost per kilowatt-hour based on officially posted rates and monthly electric bills, to include the impact of tariffs and charges applied by regulation. Rates have been relatively flat over the past three years, but higher than average costs over the past decade.

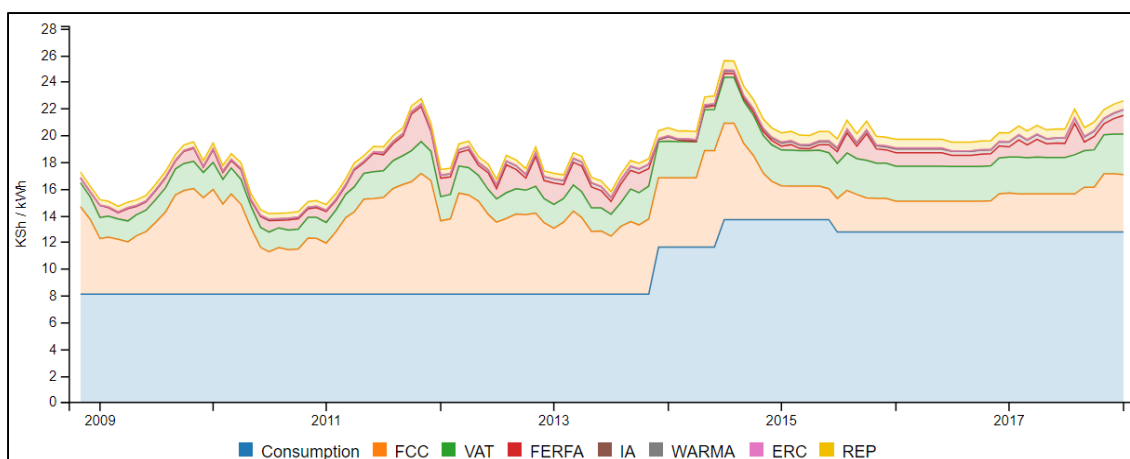


Figure 19: Electricity Cost per kWh (KES) (Regulus Limited, 2018)

Though high energy costs negatively impact growth in the broader economy, a rise in energy costs could be a boon for DISTRO product sales. As DISTRO operates in the off-grid energy market, rising electricity prices could potentially drive lower earning households to substitute away from grid electricity to off-grid solutions. Interviews with DISTRO and USAID personnel with experience in eastern Africa energy projects indicate that access and reliability of the electric grid is a much larger threat to off-grid sales than price fluctuations. As the measures of access and reliability discussed in Chapter II have continued to improve, while drought conditions have affected the mix and price of electricity generation, the impact to the DISTRO supply chain could be substantial. The effect is measured in this analysis through an analysis of product sales in regions that have experienced the greatest increases in access to electricity.

Impact of Kenyan Drought and Electrical Grid

Interviews with USAID and DISTRO personnel in Kenya, specifically information provided by large suppliers within the country, indicated that rises in access to electricity and reliability of the electrical grid are potential threats to off-grid energy product sales rather than increases in electricity prices. While rises in kWh rates potentially affect upper middle-class families using larger amounts of power, DISTRO's target market is lower income households without access to electricity or with lower energy footprints. Though data regarding access to the electrical grid is mostly aggregated to the national level, interviews and a review of the Kenya Vision 2030 progress reports identified that the Rift Valley region has seen the greatest rise in electrical access with the rise in geothermal power. Conversely, the grid remains sporadic and more spread out in Western Kenya.

Total sales volume in the Rift Valley region has not been significantly impacted.

Figure 20 displays monthly sales in the Rift Valley region in 2016 and 2017. Sales volume has remained relatively steady, though sales as a percentage of total sales did trend down through 2017 as shown in Figure 21. This is largely due to operational decisions made by DISTRO. In response to growth in access within the Rift Valley region, and to leverage the dynamic in Western Kenya, DISTRO has shifted its sales force to drive product sales in the Nyanza region.

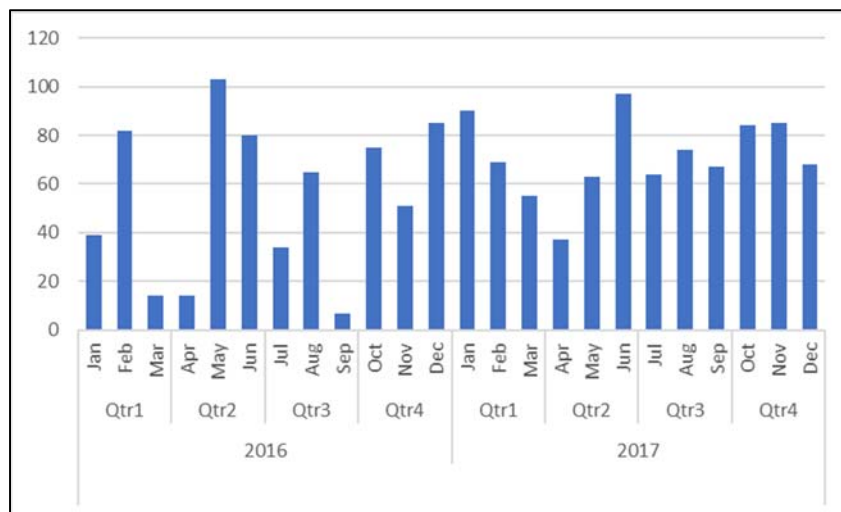


Figure 20: Rift Valley Monthly Sales

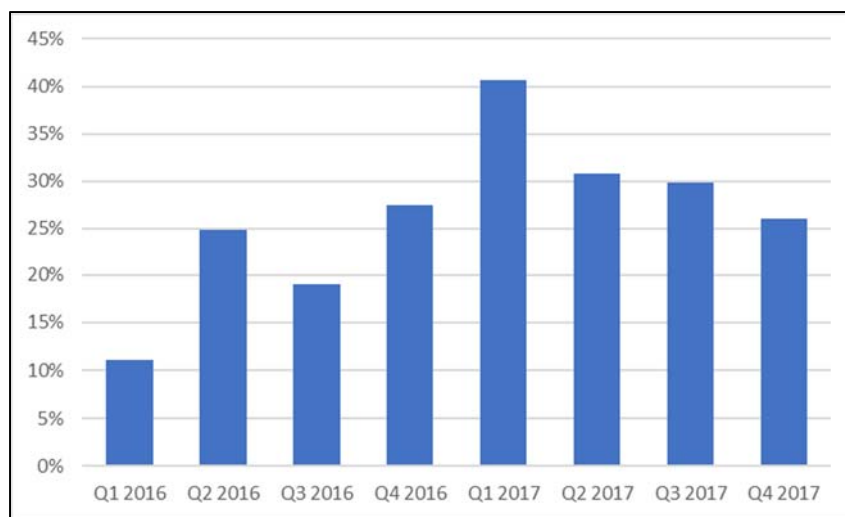


Figure 21: Rift Valley Sales as a Percentage of Total Sales

Figure 22 displays the impact of the change in DISTRO's sales strategy to total product sales within Nyanza. The total volume of sales in this region increased significantly throughout 2017. Additionally, Figure 23 gives the change in sales in the Nyanza region as a percentage of total sales. Nyanza sales have grown to account for nearly one-third of total sales compared to less than 5% of total sales in 1Q 2016.

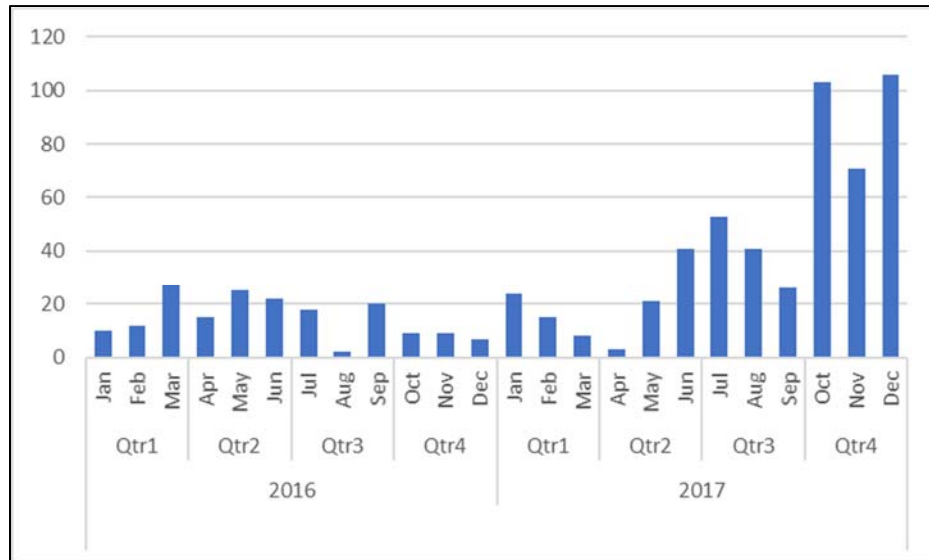


Figure 22: Nyanza Monthly Sales

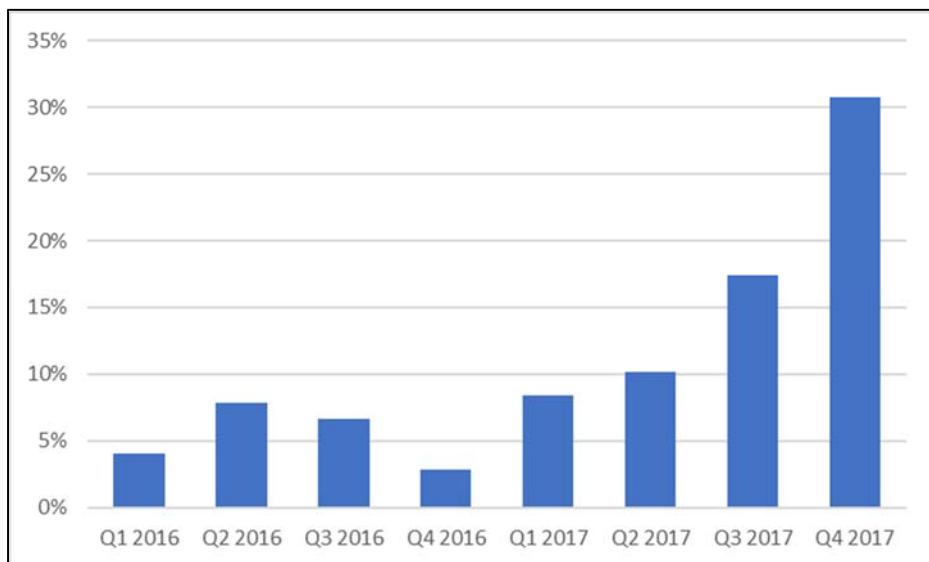


Figure 23: Nyanza Region Sales as a Percentage of Total Sales

Though total sales volume in the Rift Valley has remained relatively stable, the mix of products sold within the region has been impacted by the growth in electricity access. Consumers that do have access to electricity are more likely to purchase cookstoves rather than solar lantern products. This is because access to electricity in Kenya typically means access to lighting. Cooking is still done using kerosene or charcoal cookstoves rather than with electrically powered ovens. Figure 22 shows change in cookstove sales and solar lantern sales within the Rift Valley over the past three years. This suggests that electricity growth in the region has been detrimental to solar lantern sales.

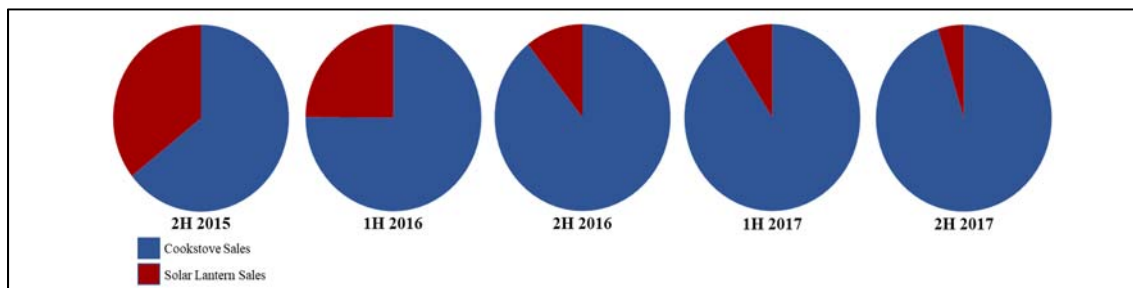


Figure 24: Cookstove Sales vs. Solar Lantern Sales (2015 - 2017)

As solar lantern products carry higher margins than cookstoves, the shift in sales has negatively impacted the average profit margin per product sold in the region. Figure 23 gives the average product margin for all sales in the Rift Valley through 2016 and 2017. The large spike in 2Q 2016 is due to higher than average volume of Lucerna System sales, which carry the highest profit margin.

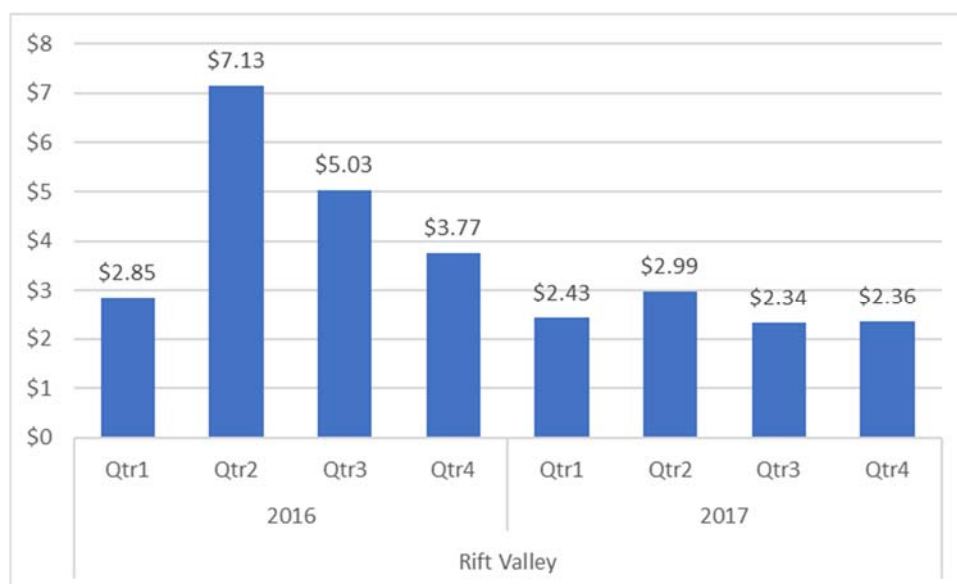


Figure 25: Rift Valley Product Margins

The shift in the type of products sold in the Rift Valley along with the decision to target sales in the Nyanza region places downward pressure on DISTRO's profitability. In addition to the lower margins earned on sales within the Rift Valley, DISTRO incurs greater costs in selling products in Nyanza. In 2017, the average product margins on all product sales in Nyanza was \$1.81 compared to \$2.51 in Rift Valley due to higher transportation costs associated with shipping to further locations. The decision not to offset transportation fees by pricing product sales based on location makes the prospects in this market segment less attractive, and negatively impacts the scalability of DISTRO.

Access to Credit

Credit growth in the Kenyan private sector dipped to a 13 year low in 2017, coming in at 4.3%, well below the country's 10 year average of 19% (The World Bank, 2017b). Economists believe a 2016 law capping interest rates at 400 basis points (4%) above the central bank's lending rate, which has remained at 10% for the past 16 months, is largely to blame (Stavis, 2017a). The law took effect in September 2016 and reversed

a 25 year government policy of not setting commercial rates (Ouma & Bella, 2016). The cap was introduced by President Uhuru Kenyatta, going against the advice of the Central Bank of Kenya and the Treasury department, as he sought to fulfil a 2013 election promise to lower the cost of credit ahead of the 2017 election. The International Monetary Fund has pressured the Kenyan government to lift the restriction on interest rates, and warns the cap could reduce GDP by as much as two percentage points annually (Njini, 2017). Table 15 depicts the Central Bank of Kenya rate and a weighted average of loans provided by commercial banks.

Table 14: Kenyan Central Bank and Commercial Bank Interest Rates (KNBS, 2018)

Month/Year	Average Yield Rates 91 – Days Treasury Bills	Central Bank Rate	Rates for Commercial Banks Loans and Advances (Weighted Average)	Overdraft Rates	Average Deposit Rate	Inter – Bank Rates	Savings (Commercial Banks Rates)
2016							
January	11.36	11.50	18.00	18.25	7.54	6.12	1.56
February	10.63	11.50	17.91	18.25	7.51	4.54	1.40
March	8.72	11.50	17.87	18.06	7.17	4.10	1.35
April	8.92	11.50	18.04	18.36	6.70	4.01	1.49
May	8.15	10.50	18.22	18.25	6.38	3.82	1.59
June	7.25	10.50	18.18	18.04	6.78	4.56	1.60
July	6.16	10.50	18.10	17.53	6.64	5.88	1.67
August	8.48	10.50	17.66	17.96	6.42	4.98	1.68
September	8.06	10.00	13.86	13.74	6.91	4.87	3.78
October	7.76	10.00	13.73	13.48	7.82	4.12	6.08
November	8.26	10.00	13.66	13.49	7.65	5.12	6.52
December	8.44	10.00	13.69	13.49	7.33	5.92	6.37
2017							
January	8.62	10.00	13.66	13.30	7.20	7.70	6.09
February	8.64	10.00	13.69	13.32	7.66	6.41	6.81
March	8.68	10.00	13.61	13.29	7.12	4.46	5.89
April	8.77	10.00	13.52	13.30	6.97	5.31	5.67
May	8.73	10.00	13.71	13.44	7.07	4.93	5.85
June	8.42	10.00	13.66	13.75	7.05	3.99	5.66
July	8.22	10.00	13.68	13.64	7.47	6.84	6.40
August	8.18	10.00	13.65	13.66	7.29	8.12	5.94
September	8.13	10.00	13.69	13.65	7.62	5.52	6.42
October	8.09	10.00	13.71	13.68	7.82	7.85	6.47
November	8.01	10.00	13.68	13.60	8.07	8.86	6.93
December	8.01	10.00	13.63	13.52	8.34	7.27	6.91

Artificially capping interest rates distorts the credit market by not allowing market forces to determine where rates should be set. Offering credit at lower rates increases the risk profile for financial institutions, incentivizing these institutions to limit lending. While lower rates potentially drive greater demand for borrowing, in Kenya it has reduced the supply of commercial credit. Access to financing has been shown to be a successful driver of SME growth, and a reduction in the credit supply carries potentially devastating effects for SME operations and companies such as DISTRO (Beck & Demirguc-Kunt, 2006).

Impact of Access to Credit

Companies raise capital through two primary forms of financing: equity and debt. Debt financing is reflected on the cash flow statement under the “Cash Flow from Financing” category, while equity is reflected on the balance sheet. DISTRO raises a significant portion of its funding through private equity and social investment through the company’s U.S.-based corporate headquarters. Due to financial disclosure and privacy regulations both internal to DISTRO and investment institutions, DISTRO did not fully disclose its financing operations. However, in discussions the company did indicate that the supply of credit within Kenya has impacted the DISTRO supply chain and the financial institutions the company works with in-country.

Analysis of the company’s financial statements provides some insight into the changes in equity financing under the interest rate cap. Throughout 2016 and 2017, the lack of growth in the credit markets has caused DISTRO to rely more heavily on equity financing from the company’s corporate headquarters in the U.S. Though the company’s net loss from 2016 to 2017 increased by less than 10%, the equity provided by DISTRO

corporate increased 62% and by more than 1.5 nominally. Table 16 gives the percentage growth in the assets and equity carried on the balance sheet. Though DISTRO grew its total assets significantly throughout 2017, the company's assets to equity ratio has remained relatively flat due to the increased reliance on equity financing. This indicates that DISTRO has been financed in a relatively conservative manner, but has transferred an increased level of risk to the company's corporate headquarters.

Table 15: Percentage Growth in Assets and Equity

	1H 2016	2H 2016	1H 2017	2H 2017
Asset Growth	9.80%	6.36%	65.53%	17.83%
Equity Growth	123.42%	35.92%	22.48%	32.61%
Assets to equity	10.32%	8.08%	10.92%	9.7%

In addition to the impact to the company, the financial institutions with which DISTRO partners have also been impacted. Specifically, DISTRO management highlighted that “we have contractual agreements with a number of different entities” within Kenya that have been negatively affected by the interest rate cap. Interest rates are driven by a combination of supply, demand, and creditworthiness within the economy. Artificially lowering interest rates increases the risk profile for banks, causing them to lend at rates that are not set by market forces and potentially lowering the return on investments made. As DISTRO seeks to further develop the lending program initiated through partnership with the national bank, interest rates below the naturally market-determined rate potentially constrain opportunities for growth.

4.8 Event Analysis Summary

Though 2017 marked a shift in DISTRO's operational and investment strategy potentially affecting firm performance, the business climate in Kenya has largely been shaped by factors external to the supply chain. Each of these events have had varying effects on DISTRO operations and financial health. As highlighted previously, the interrelated nature of capital allocation decisions, operational decisions, and political and economic events impedes the ability to determine causality for certain aspects of performance when solely analyzing the data, particularly when financial data are reported at an aggregated level as is the case with DISTRO. Discussions with DISTRO personnel about the impacts of these events and changes in the financial data provide insight into which events drove the changes seen in financial and operational performance.

The geopolitical and economic events occurring within Kenya have shaped the firm's strategy and impacted DISTRO financially, though the financial impact is difficult to attribute and quantify. Events categorized as capital investment, specifically the inventory investment and lending program, have improved the firm's financial health while also improving operations and customer wait time. Additionally, the management of human capital has driven increased volumes of sales per employee while reducing DISTRO's overhead expenses (i.e. wage bill). The rollout of new products had disparate effects depending on the product introduced, while product price changes did not significantly impact sales quantity and increased profit generation.

In combination, the events analyzed have improved the overall performance of the firm and driven an increase in sales volume throughout 2017. The next section analyzes the financial performance of DISTRO to determine the impact events occurring within

the supply chain, initially looking broadly at overall firm performance, then addressing performance in terms of profitability, asset utilization, and leverage and liquidity. The section ends with a discussion of the events that drove the changes in financial performance.

4.9 DISTRO Financial Performance Overview

The financial analysis of DISTRO comprises a breakdown of data reported in the company's financial reports, as well as computation and discussion of financial metrics identified by the finance literature as representative measures of certain aspects of performance. Performance metrics span three broad categories of analysis: profitability, asset utilization, and leverage/liquidity. Data are generated from semiannual financial reports produced by DISTRO management, though financial statements produced for 2015 include only full year data. To allow for the disaggregation of data to identify intra-year trends, the financial metrics analyzed include only 2016 and 2017. The subsequent section of the analysis addresses the effect of the supply chain events outlined previously as they relate to firm's financial performance.

DISTRO has operated at a net loss in each reporting period since the company was founded. Though this is typical in the "growth phase" for a successful startup company, this is unsustainable in the long term. As of the end of 2017, the net loss carried forward by the company exceeded \$1.2 million. Table 17 displays DISTRO's top and bottom line performance, cost of sales, and net loss carried forward throughout the period of analysis. Revenue and the cost of sales have trended down as sales volume has

decreased year-over-year. DISTRO's net loss has varied in each reporting period due to the use of tax credits.

Table 16: Full Year Financial Performance

-	2015	2016	2017
Revenue	\$196,101	\$123,630	\$107,299
Cost of Sales	\$146,693	\$94,948	\$87,441
Net Income/Loss	-\$364,135	-\$250,870	-\$275,629
Net Loss Carried Forward	-\$827,071	-\$955,380	-\$1,231,009

The drop in sales in full year 2017 is reflected in both revenue and cost of sales. Since DISTRO has consistently operated at a net loss, the company has accumulated deferred tax credits that can be used to offset certain expenses. The use of these tax credits in 2016 resulted in a lower net loss despite the drop in revenue. Aggregation of financial data into full year reporting masks the underlying changes in performance throughout the year. Semiannual revenue and cost data reflect a slightly different trend. Table 18 displays the semiannual revenue, cost of sales, EBIT, and net income for 2016 and 2017. Further disaggregation of the data is limited due to the accounting periods for which DISTRO produces financial reports.

Table 17: Semiannual Financial Performance

	1H 2016	2H 2016	1H 2017	2H 2017
Revenue	\$76,922	\$46,707	\$44,302	\$62,996
Cost of Sales	\$65,863	\$40,579	\$38,637	\$55,322
EBIT	-\$147,448	-\$113,725	-\$165,072	-\$137,689
Net Income	-\$137,145	-\$113,725	-\$137,940	-\$137,689

Revenue and cost of sales trended down through the first three reporting periods, but increased significantly in the second half of 2017. Though DISTRO grew its revenue by over 42% from the first half of 2017 (1H 2017) to the second half of 2017 (2H 2017), the increase in sales did not translate to the bottom line due to a tax credit realized in the first half of the year. Earnings before tax and interest (EBIT) provides a measure of profitability absent the impact of tax credits. Interest expenses are incurred at DISTRO's corporate office and DISTRO has historically used tax credits in the first half of the year, meaning EBIT and net loss values have been reported equivalently in the second reporting period each year. In 2017, EBIT increased by 16.6% from the first half of the year through the second half. Additionally, the transportation and packaging costs paid by DISTRO increased by 114% from the first half of 2017 to the second half of the year, impacting the net loss for the year.

4.9.1 Profitability Metrics

Due to changes in how DISTRO reported financial data (specifically expense data) beginning in 2016, data reported in 2015 is not comparable to the data reported in 2016 and 2017. Therefore, the profitability metrics include only semiannual data for 2016 and 2017. Table 19 gives the profitability metrics for DISTRO throughout 2016 and 2017.

Table 18: Profitability Metrics

Metric	1H 2016	2H 2016	1H 2017	2H 2017
Profit Margin	-178.29%	-243.48%	-311.36%	-218.57%
Gross Margin	22.52%	24.33%	17.47%	19.24%
Return on Equity	-26.79%	-16.34%	-16.18%	-12.18%
Return on Assets	-259.52%	-202.33%	-148.26%	-125.60%

The negative values in Table 19 are a reflection of the net losses DISTRO has reported in each period. Though each product line carried by the company is currently profitable, the overhead expenses incurred by the company and low sales volume have prevented the company from being profitable. Financial metrics calculated from companies operating at a loss take on a different dynamic than companies operating profitably. Typically, increases in ROE and ROA are indicators of successful companies and potentially ideal investment opportunities because they reflect increased profitability generated by the assets the company owns or equity provided by owners. With negative earnings, the increase in ROE and ROA for DISTRO is due to a different dynamic.

The changes in ROE and ROA are a product both of changes in the net loss from each reporting period as well as increases in the company's asset base and owners' equity. Since DISTRO's Kenyan operations are financed through the company's U.S.-based corporate headquarters, changes in equity reflect the capital required from the corporate office to finance operations. The equity provided by DISTRO corporate increased nearly four-fold during the period of analysis due to the diminished supply of credit within Kenya. The assets held by the company also increased significantly throughout the period due to changes stemming from improvements in cash flow brought about by the inventory investment. The improvement in the gross margin from 1H 2017 to 2H 2017 is a reflection of product price changes made by the company. If DISTRO is able to continue growing its sales volume, specifically in the solar lantern product lines, each of these ratios will improve.

4.9.2 Asset Utilization Metrics

The asset utilization metrics must also be interpreted differently in the case of DISTRO. DISTRO's asset base increased 128% from 2015 through 2017, stemming from growth in the company's cash position and a rise in deferred tax assets from carried-over losses. The main driver of the increased cash position stemmed from the inventory investment made in June 2017. Growth in the company's assets and an increase in inventory held have caused several asset utilization metrics to trend negatively. In 2017, DISTRO's growth in sales outpaced the growth in assets on a percentage basis, indicating the company is deploying assets more efficiently in generating revenue. The days of inventory ratio is a reflection of the increase in inventory made by capital investment in the company rather than indication of poor operational efficiency. Additionally, changes in the days sales in cash is another reflection of the increase in cash on hand rather than of diminished sales.

Table 19: Asset Utilization Metrics

Metric	1H 2016	2H 2016	1H 2017	2H 2017
Asset Turnover	1.46	0.83	0.48	0.57
Days of Inventory	4.18	1.47	14.46	22.84
Receivables Period	0.07	6.90	11.88	19.30
Payables Period	32.42	24.19	86.77	33.75
Days Sales in Cash	19.28	50.27	92.23	124.34

4.9.3 Leverage and Liquidity Metrics

The leverage and liquidity measures provide several additional indications that DISTRO's financial health is improving. The increase in cash on hand and current assets have significantly improved DISTRO's working capital position and risk profile. The lack of movement in the assets to equity ratio are a reflection of increases in equity

provided by DISTRO's corporate office, as equity growth has largely outpaced asset growth. The current ratio and acid test provide further evidence of the improvements in the company's financial health. The year-over-year increase in these two ratios show the firm was improved liquidity as the cash flow throughout the supply chain has improved due to investment in working capital.

Table 20: Leverage and Liquidity Metrics

Metric	1H 2016	2H 2016	1H 2017	2H 2017
Working Capital	-\$3,075.57	\$6,964.59	-\$1,326.69	\$28,921.35
Assets to Equity	10.32%	8.08%	10.92%	9.7%
Current Ratio	.75	2.22	.94	3.79
Acid Test	.64	2.17	.82	3.18

4.10 Financial Performance Summary

Throughout 2017, DISTRO's financial performance in terms of profitability, asset utilization, and liquidity improved as the company's asset base and sales volume grew. Though the company remains highly unprofitable, changes in financial metrics have been positive due to the investments and operational changes made within the supply chain that have grown sales volume and increased cash flow throughout the supply chain. The inventory investment and credit terms negotiated with suppliers have improved DISTRO's liquidity and smoothed operations by reducing customer wait time and streamlining the order replenishment cycle. Additionally, the management of human capital and a reduction in the employee base has reduced the overhead costs of the firm while simultaneously growing the number of sales generated per employee. Product price changes have improved the company's gross margins in recent reporting periods,

while investment in inventory and increases in cash have increased the assets carried on the balance sheet.

Brav (2009) argues that the tendency for many private, SME firms to stockpile cash can be harmful, as this potentially limits growth opportunities and profitability. DISTRO's growth in its cash position is due to a different dynamic than the conditions laid out by Brav. First, most private firms stockpile cash to maintain liquidity due to heavy debt burdens. In the case of DISTRO, the company relies more on equity investment rather than debt, meaning it isn't growing cash to offset increases in its liabilities. Additionally, DISTRO is growing its cash position from a very low level. This increase in cash has provided flexibility for the firm in terms of its operations, marketing, and the amount of inventory carried. Under the increased cash position, DISTRO has grown sales and expanded into new markets rather than seeing a slowdown in growth.

While the firm's financial performance throughout 2017 improved under various operational initiatives and investments, the improved performance during the year was largely driven by an increase in sales. The following section addresses the potential causes of this growth in sales as determined by discussions with DISTRO personnel and analysis of the quantitative data provided.

4.11 Cause of Sales Growth

DISTRO has experienced a significant turnaround in both quarter-over-quarter (QoQ) and year-over-year (YoY) sales growth, depicted in Figure 24. Though this turnaround in sales coincided with several capital investments and operational initiatives

undertaken by DISTRO, attributing causality is difficult due the number of economic and geopolitical factors at play within the country. In interviews with DISTRO personnel, management attributes the growth in sales specifically to several factors: turnover in its sales agent force, marketing campaigns and targeting new markets, and the initial investment in inventory.

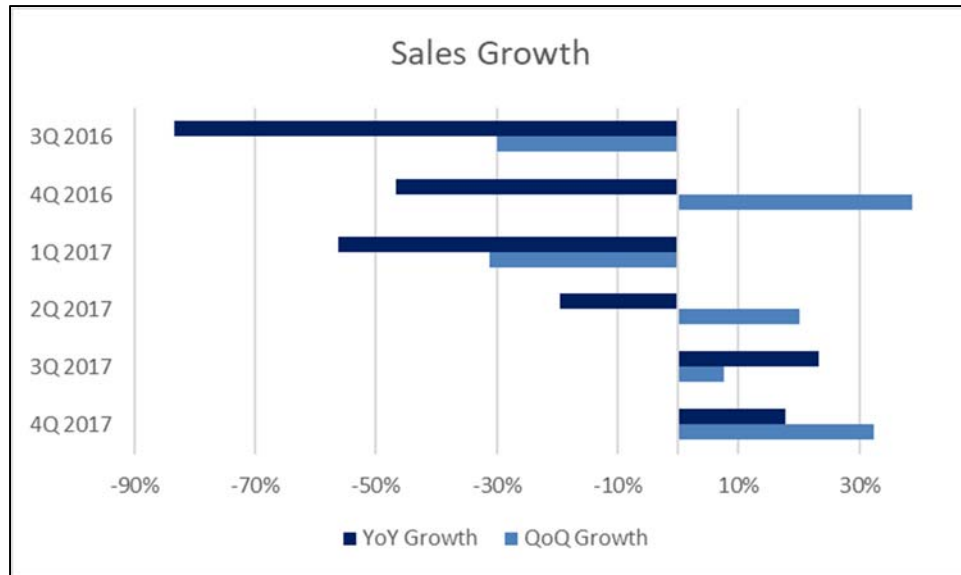


Figure 26: Year-over-Year and Quarter-over-Quarter Sales Growth

The turnover in the employee base and more active management of the sales agents employed by the company was a significant driver of sales volume, as it led to more sales and revenue per employee. Part of the decision to more effectively manage the human capital aspect of its supply chain involved targeting new markets due to the dynamics of the electrical grid within the country. Expanding into markets in Western Kenya drove higher volumes of sales in these regions than had been seen previously. The company also sought to increase sales in new regions through increased marketing. The marketing campaign introduced in the form of the travelling warehouse proved to be transient in terms of generating sales volume. In each region in which the travelling

warehouse program was initiated, there was a spike in sales volume during the particular month in which the program was run, but there was no long-term growth seen in any of the regions analyzed. This is potentially due to market saturation and small population dynamics within the regions visited, but the volume of sales is not nearly high enough for the travelling warehouse campaign alone to have reached market saturation.

The transient spike in sales implies that sales growth is driven by product availability rather than product awareness. This is also reflected in the improvement in sales attributed to the investment in inventory. The reductions in customer wait time (CWT) seen following the investment was also a significant driver of sales growth, as customers were more willing to buy products that they didn't have to wait up to nine days to receive. If DISTRO is able to continue growing sales, the financial performance of the company will continue to improve as it moves closer to profitability. The final section of this analysis explores the impact of scaling product sells on the company based on the growth and cost structure under the events occurring within the supply chain throughout 2017.

4.12 Measuring Scalability

The ability to scale operations to achieve sustainable profitability is a key measure in the application process to acquire funding from institutions such as USAID. Through the analysis of DISTRO's financial statements, sales data, and cost structure, this paper develops a model for measuring scalability that can be replicated for organizations that produce financial reporting statements. The model seeks to identify the level of sales required to offset the fixed costs incurred by the company once all variable costs have

been properly allocated to each product sale. The scalability model for DISTRO will focus on the top five products sold in 2H 2017, which accounted for over 99% of sales. Additionally, the mix of products sold during this time period will be used to test the breakeven point for DISTRO, though the model can be adjusted based on forecasted sales.

DISTRO's cost structure is largely contingent upon the location of sales, the type of product ordered, and the amount of product ordered. Under the terms negotiated with the company's transportation service provider, shipments to various locations incur a flat rate fee based on the number of containers shipped, as well as an overage fee for excess weight. Additionally, the warehouse processing fee for each shipment is allocated to each product within each shipment. Product margins were provided by DISTRO for each product sold by the company. Once these revenue and cost values were properly allocated, average product profit margins were calculated based upon the product sold and the region of the sale. The per-product profit margins calculated for data in 2H 2017 and applied to the model are given in Figure 25.

The model was developed in Microsoft Excel linking DISTRO's financial statements, sales data, and cost structure, providing an interface to test the breakeven point under different growth projections and changes in expenses. Figure 26 displays the various breakeven points for the model run under simple exponential growth trends of 10%, 15%, 20%, 25%, 30% and 35%. Additionally, the model assumes annual growth of 5% in the company's overhead expenses.

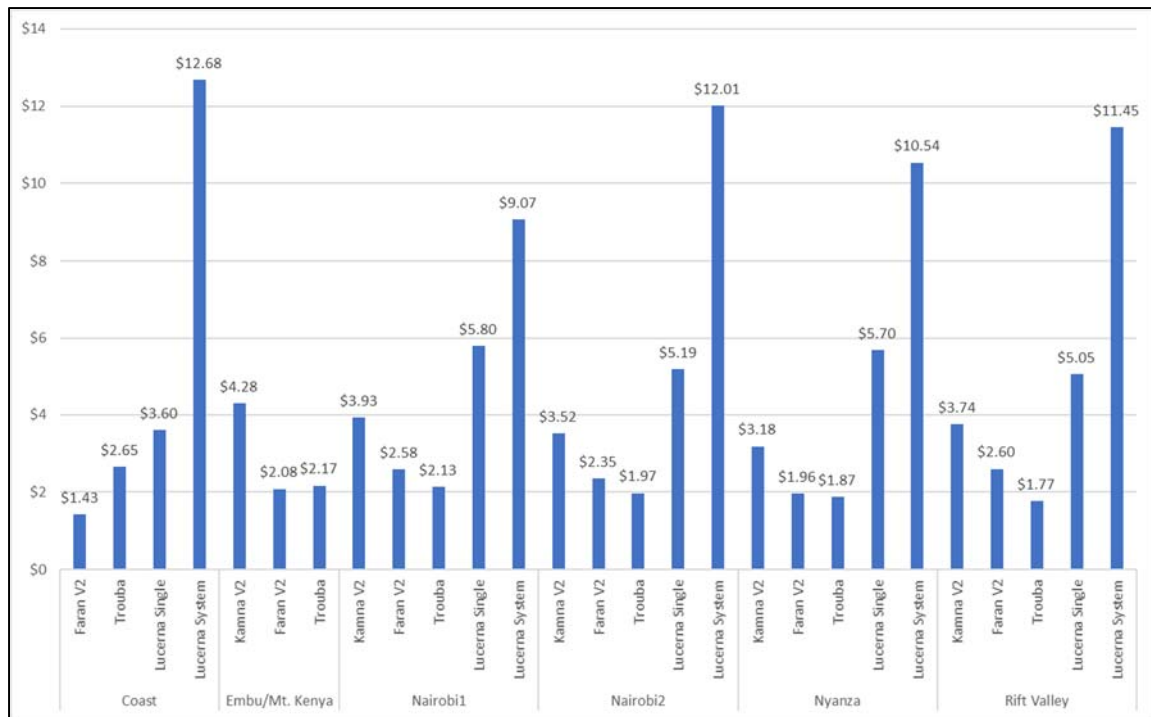


Figure 27: Profit per Product by Region

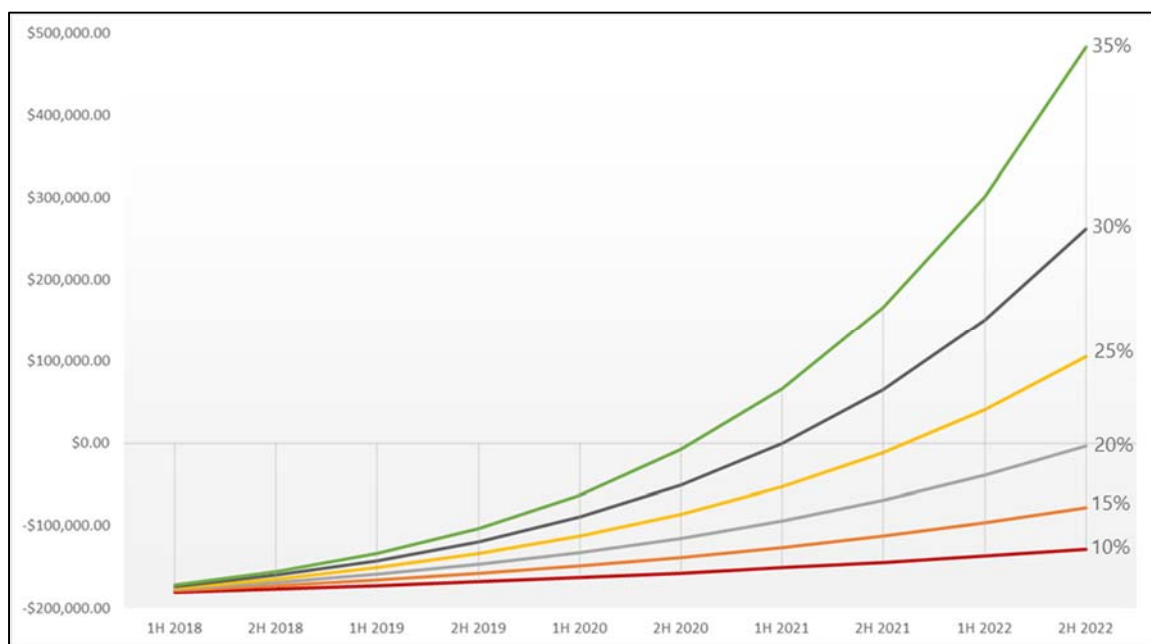


Figure 28: Scalability Under Exponential Growth Rates

To scale to profitability, DISTRO would need to grow to approximately 14,312 product sales at the product mix seen in 2H 2017. This is a 417% increase in sales from the volume seen throughout 2017. In addition to the overhead costs paid for the African segment of DISTRO operations, the company pays a portion of the overhead expenditures for the U.S. based offices to cover salaries and services such as accounting, training, and program management. These costs account for 31% of the costs incurred on DISTRO's income statement. If costs paid to the U.S. based offices are excluded from the model, DISTRO's breakeven point in sales to cover the African segment of operations is 9,930, equivalent to a 258% increase. Though each of these values seem immense, if DISTRO is able to maintain the sales growth rate the company achieved in 4Q 2017 (32.46%), the company would scale to profitability by Q1 2020. This timeline could be reduced if the company becomes better able to manage quantity shipments to leverage the warehouse processing and transportation fees, or by passing on transportation costs to retail customers.

Linking the income statement to the marginal profit earned on each product sale provides a means to quantify the impact of various cost reductions and growth projections to the bottom line. As many SME firms, specifically those operating within Kenya, utilize similar methods for collecting financial statement and cost data, the model can be replicated and applied across different contexts. Chapter V further addresses the contributions and implications of this model.

4.13 Conclusion

Chapter IV provided a summary of the analysis conducted in pursuit of identifying the capital allocation and operational practices that drive sustainable economic growth in SME supply chains. DISTRO made a number of investments and operational changes throughout the analysis that affected the profitability of the company and drove an increase in sales volume. Though the investment in inventory has affected the company's marginal profit per product, the reductions in customer wait time and the frequency of purchase orders submitted to suppliers has added significant value to the supply chain, driving sales volume. Additionally, holding inventory and the credit terms negotiated with DISTRO's suppliers has substantially improved the firm's balance sheet and financial position. Management of human capital also proved to be a significant driver of sales growth and revenue generation. While the impact of political and economic events is more difficult to forecast and to quantify, these events significantly impacted supply chain operations and overall strategy. The implications of this analysis, and the contributions to the academic literature, are addressed in Chapter V.

V. Conclusion and Recommendations

5.1 Overview

The goal of this study was to determine the financial and operational impact of significant events occurring within the target SME supply chain across the spectrum of capital investment decisions, operational decisions, and geopolitical and economic events to better inform investment institutions of the practices that support sustainable economic development. Chapter V examines the research conclusions and contributions generated from this case study analysis, specifically addressing the findings in pursuit of addressing this overarching goal. Additionally, the limitations to the study are outlined, and based on these limitations and the implications of the research effort, opportunities for future research are identified.

5.2 Case Conclusion

Small and medium enterprise (SME) supply chains in developing countries face barriers to growth not seen in large, industrialized nations. Political instability, poor infrastructure, and weaker financial institutions represent challenges not seen in the developed world. Yet research in the domain of supply chain performance within this context is lacking. This research effort helps to fill the literature gap through the application of financial analysis to an SME firm in Kenya, identifying the impact of events across the spectrum of capital allocation, operational decisions, and geopolitical and market events.

Global institutions seeking to influence foreign government policy are often unsuccessful in affecting the political or economic climate. For example, efforts by the

International Monetary Fund to impact legislation capping credit rates within Kenya have been ineffective, causing a shortage in the credit supply within the country. While these events are largely unpredictable and the impact is difficult to forecast, they can potentially be mitigated through effective capital allocation and supply chain strategy. Several of the events identified throughout this analysis provide support for this proposition.

Though 2017 marked a disruptive year within the Kenyan economy, DISTRO was able to strengthen its balance sheet and grow sales throughout the year due to a number of investments and initiatives taken by the company. Specifically, effective human capital management and the development of talent within the sales force drove higher volumes of sales despite the economic turmoil seen in the Fall of 2017, and the inventory investment made smoothed cash flow and operations across the entire supply chain. The following sections address the research contributions generated from the analysis of these events, highlighting aspects of SME supply chain operations that can be leveraged to drive more efficient capital allocation and investment in developmental supply chains.

5.3 Research Contributions

Development of human capital and supply chain expertise is a critical yet underfunded aspect of supply chain operations in the developing world.

After experiencing decreases in the number of sales and revenue generated per employee in 2016 and early 2017, DISTRO was able to significantly grow these metrics under a smaller, more talented workforce in the second half of 2017. The company attributes much of the rise in sales throughout 2017 to turnover within its workforce,

under which the company let go of underperforming sales agents and brought on new talent. Hiring new sales agents in Western Kenya specifically drove sales growth in this region considerably. This turnaround stemming from more aggressive employee management highlights the importance of investment in human capital within the supply chain context, an often overlooked aspect of supply chain management.

The analysis also revealed another significant finding within the realm of human capital management: there is a distinct lack of supply chain expertise in many SME supply chains in the developing world. Several of the processes and decisions discussed with DISTRO management displayed a lack of fundamental supply chain knowledge that created inefficiencies and unnecessary cost burdens. Several specific instances of poor supply chain practices include:

Ignoring the impact of order quantity and transportation costs on profit margins

Order quantities and weights significantly impact the costs DISTRO incurs on each shipment made by the company. In the second half of 2017, DISTRO lost money on 60 of the 791 orders placed due to transportation related costs, equivalent to 7.6% of orders. Yet DISTRO does little to actively manage the impact of order quantities and leverage this dynamic to minimize costs to the company. Additionally, transportation costs are not factored in to retail prices, meaning the firm's strategy to shift sales to regions further away from its warehouse are less profitable.

Failure to understand cost structure

Discussions with DISTRO management revealed that unknown costs being incurred by the company were often not identified for several weeks or months at a time. Specifically, the costs associated with transportation to and from the company's

warehouse were being double billed without DISTRO's knowledge. Furthermore, the initial costs and processing fees of warehouse shipments were not immediately known by management when the investment was made.

Internal data collection is convoluted, incomplete, and there is no system redundancy

The data provided by DISTRO displayed a lack of consistency over various reporting periods, and significant data cleaning and preprocessing was required to analyze the data provided by the company. In some instances, point of sale and sales agents responsible for sales were not collected or reported. Additionally, metrics that are known to be significant indicators of customer satisfaction, such as customer wait time, are not tracked by the company.

Unstructured warehouse replenishment cycle

When the initial inventory investment was made, DISTRO chose to operate under a simple order-point, order-up-to policy where replenishment cycles were initiated when product levels neared zero. Under this model, purchase orders to the company's suppliers are sporadic and inventory levels are often zeroed out, resulting in no stock on hand to fill customer orders. Though the investment smoothed the cash flow and ordering process significantly, adjusting the inventory policy of the company could further streamline operations.

The lack of sound supply chain practices is potentially compounded by the under resourced nature of the company, which prevents DISTRO from allocating time and additional resources to address the inefficiencies seen within the company. A greater understanding of basic supply chain practices could significantly alter the breakeven

point for the company, but development of supply chain expertise is an aspect of investment that has been neglected by developmental organizations.

While USAID's website highlights that supply chains in the developing world are often sub-optimal and ineffective, the organization has done little to address this deficiency in terms of the human aspect of supply chain management. In the case of DISTRO, many of the inefficiencies in the supply chain proved to be driven by a lack of supply chain expertise and experience. Yet a review of funding provided by USAID shows that investment has not targeted alleviating this deficiency. To be sure, USAID works closely with government institutions and provides robust funding to educational opportunities in developing parts of the world, but foreign aid investment typically targets program initiatives or structural investments within the supply chain. Targeting human capital and supply chain knowledge within developing world supply chains, rather than providing funding to organizations in hopes that they will be able to operate effectively with more capital, presents an opportunity to build efficiency and greater levels of sustainable growth into developing world supply chains.

Working capital investment at the distribution level drives supply chain integration, optionality for retail customers, and capital allocation throughout the supply chain that is driven by market demand.

The working capital investment made in the form of a warehouse and inventory investment generated operational and financial benefits throughout the supply chain. The order cycle and credit terms negotiated with DISTRO suppliers significantly improved the liquidity and risk profile of DISTRO while also improving the cash flow and relationships with the supplier base. Shifting from placing purchase orders multiple

times a week to once or twice each month added value for operations managers both at the distribution and supplier levels of the supply chain, while simultaneously reducing customer wait time on retail product purchases. Though this enhanced integration came at a financial cost to DISTRO (in the form of a 300 KES processing fee per shipment), it drove higher levels of profitability brought about by increases in sales volume.

When funding is directed towards the distribution level of the supply chain, it provides optionality for retail customers and drives cash flow across the supply chain that is market driven. In the long term, retail customers buy consistently high-quality products that are accurately priced. Distributors will in turn buy products from suppliers whose products sale through retail channels, directing capital to successful suppliers and allowing the market to determine efficient allocation of capital.

Despite the benefits seen in working capital investments, organizations such as USAID continue to finance product suppliers rather than supply chain distributors. In October and November 2017, USAID announced over \$10 million in financing to organizations in Sub-Saharan Africa's off-grid energy sector through the organization's Development Innovation Ventures (DIV) program. In addition to technology providers and financial institutions, a significant portion of the funding was directed to suppliers of individual off-grid product lines, four of which were direct suppliers to DISTRO. Three of these four suppliers were providers of the new products rolled out by DISTRO that represented the lowest selling and least profitable product lines. Though these product suppliers potentially experience greater volumes of sales and profitability in other distribution channels, the products sold through DISTRO were sold at the retail prices set

by suppliers and were not successful. This implies inefficient allocation of funding within the DISTRO supply chain.

The allocation of capital to various suppliers potentially distorts markets by propping up suppliers that should be driven out of the market by economic forces and the natural business cycle. By funding distributors that carry multiple product lines, outside investment is indirectly financing other aspects of the supply chain as determined by market demand. Distributors are not incentivized to push product lines that are not desired by the market, whereas suppliers are solely concerned with the success of their own product lines. Discussions with DISTRO highlighted this dynamic, when management stated “the big solar companies are receiving tens of millions of dollars to finance customers purchasing their own products.”

In addition to the financing provided to product suppliers, investment organizations have allocated money to multiple marketing campaigns, but these investments proved to be ineffective drivers of long term growth and profit generation. DISTRO’s travelling warehouse program demonstrates the transient nature of marketing campaigns. Regions in which the campaign was conducted experienced a short-term spike in sales that didn’t carry over into the ensuing months. This indicates that sales are driven by the availability of product rather than an increased awareness of the products being sold.

Investing in distributors provides greater levels of product availability while providing optionality to retail customers. In the case of DISTRO, working capital investment at the distribution level led to reductions in customer wait time leading to increased sales volume, improvements in the financial health of DISTRO, and smoothed

cash flow and order replenishment within the supplier base that enhanced integration and improved partnerships across each echelon of the supply chain. Targeting investment to grow the distribution level of developmental supply chains and allowing market demand to determine the allocation of capital within the supply chain represents a more efficient method of developmental investment that leads to long term sustainable economic growth.

Department of Defense Implications

Throughout the 21st Century, the Department of Defense has carried the burden in fighting terrorist ideologies and security threats around the globe. In 2009, then-Secretary of Defense Robert Gates highlighted the growing dependence upon military force to address violent extremism and security threats around the globe, stating that “The military and civilian elements of the United States' national security apparatus have responded unevenly and have grown increasingly out of balance” (Gates, 2009). This disparity has continued to grow in recent years. In 2017, the Department of State budget was equivalent to less than 9% of the Department of Defense budget (Department of Defense, 2016; U.S Department of State, 2016). The increasingly decentralized nature of extremist ideologies highlights the unsustainable and impractical approach of ensuring domestic security while maintaining this imbalanced approach.

Previous research has identified the negative correlation between terrorist activity and economic growth (Blomberg et al., 2004; Mesquita, 2007; Young & Findley, 2011). Reduction in poverty through sustainable economic growth and business development in less stable areas of the globe presents opportunities for combatting extremism through methods alternative to defense-focused measures, potentially lifting the burden placed on

DOD organizations. This requires efficient capital allocation that more effectively drives sustainable economic growth in the developing world. This research indicates that investment in working capital within the distribution echelon of the supply chain, along with investment in human capital to develop supply chain expertise, creates value throughout the supply chain that supports this objective.

The deployment tempo experienced by Airmen and military members throughout the 21st Century has led to a burnout effect within many units throughout DOD. Sustainable economic growth in the developing world to address extremist ideologies provides potential relief to the Department of Defense, allowing DOD to focus more heavily on the Chief of Staff's priorities of revitalization, development of the officer and enlisted corps, and further developing command and control capabilities.

Methodology for measuring scalability of operations in SME supply chains

The final contribution of this research effort is the development of a methodology for measuring scalability in small and medium enterprise supply chain operations. A common theme throughout this case analysis was the lack of understanding involving the target firm's cost structure and the financial impact of certain aspects of the supply chain's operations. Specifically, transportation costs and quantities within shipments considerably impact the profit that is generated from each product sale. The model developed through this analysis provides a measure of the impact these variables have on scaling to profitability.

USAID's Development Innovations Venture (DIV) annual program statement (APS) highlights the importance placed on scalability in the decision of whether to provide financing, but the program fails to provide direction as to how the metric of

scalability should be demonstrated by applicants. Along with scalability, the program identifies two additional overarching criteria required for applicants to receive funding: evidence of program effectiveness and cost-effectiveness. These criteria are assessed using the matrix identified in Table 22, providing only a subjective measure of compliance with the program’s core principles.

Table 21: Development Innovation Ventures Evaluation Matrix (USAID, 2017a)

Rating	Description
Excellent	Exceeds expectations in that it is comprehensive, thorough, and with exceptional merit, demonstrating that the proposed project will likely result in effective and efficient performance. Exhibits no deficiencies.
Very Good	Demonstrates overall competence, meets all minimum requirements, and exceeds requirements in some areas, but not all. Even if there are some identified weaknesses, the applicant demonstrates that it can successfully complete all deliverables in a timely, efficient, and economical manner.
Good	Meets requirements. While the applicant demonstrates an ability to complete the work in some areas, there are some significant weaknesses or deficiencies. However, these combined weaknesses or deficiencies still represent a manageable performance risk.
Fair	Minimally meets basic requirements or demonstrates a limited understanding of the requirements. Implementation of the proposed project would likely lead to unsatisfactory performance. Contains deficiencies and weaknesses that may negatively affect performance.
Poor	Many deficiencies, including failure to address key elements, failure to understand work necessary to perform the required tasks, or failure to provide a reasonable approach to fulfilling requirements. Performance risk is high.
Nonresponsive	Fails to address all elements of the criteria; fails to understand the work necessary to perform the required tasks; fails to meet the requirements of the solicitation.

In addition to the DIV APS, USAID has developed a “Pathways to Scale” guide for firms in the early stages of growth and product development. The guide provides a framework for planning to achieve scale, but it focuses on the business model and partnership aspects. A true quantitative measure of growth and cost requirements to economically scale is lacking.

The model developed through this research effort provides this quantitative measure, applying a methodology that can be replicated for firms producing financial reports and sales transaction data. The model links the income statement, sales and revenue data, and the variable costs associated with each product sale to provide a quantitative measure of scalability that can be tested under various growth projections and cost structures. Ultimately, firms must grow to profitability to succeed and survive in the long-term. This research provides a method for identifying the impact of various operational decisions and investments on the potential scalability of SME firms.

5.4 Limitations

A number of limitations arose throughout this research effort. Willingness to share certain financial data limited the analysis of several events occurring throughout the case period, as a result both of disclosure laws and privacy concerns. Events of this nature were analyzed through qualitative data and the operational impact to the supply chain rather than through measuring the financial impact. There are also concerns with qualitative data collection, in that responses generated in discussions with personnel may not be fully truthful and open due to a desire to communicate operational impacts in a positive light. Specifically, discussions held with DISTRO management potentially result in a biased conveyance of program success in the initiatives generated under the current leadership team. The collection of quantitative data provides credence to the findings generated from the sources of qualitative data by providing an additional measure of performance across the events and initiatives analyzed. Additionally,

discussions with multiple stakeholders and personnel internal and external to the supply chain to capture competing views provides reliability in the qualitative data collected.

Finally, there are limitations inherent to the single case study method, specifically with regards to generalizability of the findings. The research design sought to mitigate these limitations by triangulating data from multiple sources, holding discussions across various groups of stakeholders, and analyzing data over varying time periods, but the focus on DISTRO resulted in analysis that doesn't extend outside of Kenya or across multiples industries. The recommendations for future research seek to increase the generalizability of the findings by applying a similar methodology across various contexts and supply chains. The opportunities for future research identified in this research effort are discussed in the following section.

5.5 Future Research

Multiple opportunities for future research arose throughout the course of this study, specifically research targeted towards enhancing the generalizability of the research findings. The opportunities for future research include:

1. Extending the study to measure the impact of working capital investments in other SME supply chains, specifically supply chains operating in other developing countries. Though countries in Sub-Saharan Africa rank lowest in the 2018 World Bank's Doing Business report on average, Kenya is one of the strongest and most stable democracies in the region. Extending the study to include firms operating in less stable countries could provide greater generalizability to the research contributions generated from this study. Additionally, DISTRO operates in a specific market segment working as a distributor of

off-grid, clean energy products. Examining the operations of different product lines could potentially produce different findings regarding the operational impact of various supply chain events and decisions.

2. Examining the impact of inventory and warehousing investments for SMEs in developing countries under various credit terms and payables windows. The target firm in this research benefited from favorable credit terms with its supplier base, which was reflected in the financial performance of the company. The literature indicates that shareholder value added can be maximized based on the optimization of payables and receivables windows throughout the supply chain. Analyzing the impact of additional performance measures under various payment terms provides opportunities for identifying further impacts of inventory and working capital investment in developing world supply chains.

3. Measuring the impact of additional supply chain management practices such as forecasting and the application of regression analysis to identify predictive factors in supply chain performance, various transportation strategies and cost structures, strategic sourcing, or outsourcing competencies. This research effort highlighted the need for supply chain expertise within developing world supply chains, and the supply chain literature has identified the relationship between superior supply chain management and financial success, but most academic studies evaluate performance in the context of large, publicly traded companies. Analyzing the impact of enhanced fundamental supply chain practices in developing world SME operations potentially provides insight into the extent the effect of superior supply chain performance can have within this domain.

4. Further micro analysis of warehousing performance, analyzing the impact of order quantity, quantity discounts, various inventory policies, and additional cost structures. This analysis indicates that investment in inventory at the distribution echelon of the supply chain provides benefits throughout the supply chain. Analyzing the impact of various warehouse and inventory management strategies addresses generalizability in the findings of this study.

5.6 Conclusion

Reducing poverty through sustainable economic growth in the developing world requires an understanding of the methods of capital allocation and supply chain practices that drive successful operational and financial performance. This study informs developmental organizations and business of the methods that lead to this end. Working capital investment within SME distribution channels and investment in human capital and supply chain expertise represent underfunded areas within the developmental context which hold the potential for generating sustainable growth and increased profitability. SME supply chains in underdeveloped countries experience barriers not seen throughout much of the developed world, yet research on the impact of investment in these organizations remains sparse. This research aids in filling the gap in the supply chain finance literature related to capital allocation and SME supply chain performance in the developing world. Future research within this domain provides further opportunities to inform policy makers and developmental organizations of the methods of investment that can effectively achieve the desired outcome of eliminating poverty around the world.

Appendix A: Financial Metrics

Profitability Measures

Profit margin represents the fraction of each dollar of sales that a company retains as profit on the income statement. It reflects the ability of a company to control its operating costs as well as the effectiveness of its pricing strategy, making it a significant metric from an operating standpoint. Higgins (2012) notes that a high profit margin is not necessarily better than a lower profit margin as one must measure the combined effect of profit margin and asset turnover. Companies that add substantial value to a product are able to price in higher profit margins, but adding significant value typically requires a large asset base. As DISTRO's revenue fluctuates under various volumes of sales, the profit margin provides insight into how well the company manages its expenses to generate this revenue.

$$\text{Profit Margin (\%)} = \frac{\text{Net Income}}{\text{Sales}}$$

Gross Margin is a measure of profitability that distinguishes between fixed and variable costs by giving the ratio of sales less the cost of goods sold to sales, where the cost of goods sold includes the direct costs associated with the production of the products sold by the company (i.e. the cost of the materials). Since DISTRO acts as a distributor that purchases finished products and sales through various channels, the company operates at very thin product margins. The gross margin is an important indicator of DISTRO's breakeven sales volume, as the company makes various capital allocation and operational decisions within the supply chain.

$$\text{Gross Margin} = \frac{\text{Sales} - \text{COGS}}{\text{Sales}} = \frac{\text{Gross Profit}}{\text{Sales}}$$

Operating margin provides another measure of profitability similar to the gross margin, which provides an additional measure of operational efficiency. The differentiating factor between gross margin and operating margin is that the gross margin accounts for costs associated with the direct production of goods, while the operating margin accounts for additional expenses making up the company's overhead costs. In the case of DISTRO, direct production costs include only the wholesale cost of the products sold. Operating costs includes the costs of goods sold, as well as wages and depreciation. The impact of potential shifts in DISTRO's employee compensation structure over time, or depreciation arising from an increase in capital assets, will reflect in the company's operating margin.

$$\text{Operating Margin} = \frac{\text{Operating Income}}{\text{Sales}}$$

Return on Assets (ROA) provides a measure of the combined effect of the profit margin and asset turnover. ROA is a percentage showing how effective a company's assets are in generating revenue. It indicates the efficiency of a company in the allocation and management of its resources by measuring profit as a percentage of financing provided by both owners and creditors. The efficiency with which DISTRO manages any growth in its asset base will be reflected in the ROA metric.

$$\text{Return on Assets (ROA)} = \text{Profit Margin} \times \text{Asset Turnover} = \frac{\text{Net Income}}{\text{Assets}}$$

Return on Equity (ROE) is a measure of earnings per dollar of equity capital. It builds on ROA by measuring the combined effect of three important components of performance: the profit margin, asset turnover, and financial leverage. Financial leverage is the amount of owners' equity used to finance assets. DISTRO is largely funded

through equity raised by its U.S. corporate headquarters. ROE provides insight into how effectively DISTRO is deploying this equity capital to create value in the form on income.

$$\text{Return on Equity (ROE)} = \text{Profit Margin} \times \text{Asset Turnover} \times \text{Financial Leverage} = \frac{\text{Net Income}}{\text{Shareholder's Equity}}$$

Asset Utilization Measures

Asset Turnover measures the amount of resources (assets) required to generate sales without accounting for expenses, serving as an indicator of the efficiency with which a company uses its assets. The asset turnover ratio is closely tied to the industry within which a firm operates. For example, utilities carrier larger asset bases due to the infrastructure required to operate, whereas retailers typically have smaller asset bases and higher sales volume, resulting in higher asset turnover ratios. As DISTRO begins to increase the assets it carries on its balance sheet through investment in working capital, the asset turnover ratio provides insight into how efficiently new assets are generating revenue.

$$\text{Asset Turnover} = \frac{\text{Sales}}{\text{Total Average Assets}}$$

Days of inventory indicates how long it takes for a company to turn its inventory into sales. It provides a measure of the effectiveness of a company's inventory management. Though DISTRO's initial inventory investment provides only a baseline for comparison, going forward trends in the metric will be important to identify how well the company is managing its inventory investment.

$$\text{Days of Inventory} = \frac{\text{Inventory}}{\text{Cost of Sales}} \times 365$$

The collection period and payables period metrics measure a firm's management of its credit windows and cash flow. The collection period represents the average number of days between when a sale is made and when payment is received. Similarly, the payables period reflects how long a company takes to pay its creditors, suppliers, etc. Ideally, companies would like to shorten the collection period and lengthen the payables period, as this equates to more cash on hand. But companies must manage both aspects to maintain healthy relationships with both customers and creditors/suppliers. The trends identified in these metrics will reflect the health of DISTRO's cash flow as the company undertakes various initiatives such as holding inventory or selling products on credit.

$$\text{Collection Period} = \frac{\text{Accounts receivable}}{\text{Credit purchases per day}}$$

$$\text{Payables Period} = \frac{\text{Accounts payable}}{\text{Credit Purchases per day}}$$

Cash is an important asset for SME firms, as it is used to facilitate transactions and compensate balances on bank loans. Days' sales in cash provides a measure of the amount of cash on hand to fund operations and product sales. Since cash is an asset on the balance sheet, days' sales in cash provides a measure of both asset utilization and liquidity for the firm.

$$\text{Days' sales in cash} = \frac{\text{Cash and securities}}{\text{Sales per day}}$$

Leverage and Liquidity Measures

The most basic measure of liquidity is simply a company's working capital position, which is the difference between its current assets and current liabilities. Current assets include cash and other assets that are expected to be converted to cash within one

year. Current liabilities are obligations that are due to be paid within the next year.

Working capital is a representation of a firm's short-term financial health. If a company's current assets do not exceed its current liabilities, the company is illiquid and potentially facing bankruptcy. DISTRO has carried very little current assets due to its decision not to carry inventory, but the impact of an initial inventory investment will reflect in the company's working capital position.

$$\text{Working Capital} = \text{Current Assets} - \text{Current Liabilities}$$

Working capital turnover measures the efficiency with which sales are generated from the money that funds operations. A high ratio indicates that the company is efficiently using current assets and liabilities to generate sales. A low ratio potentially indicates poor inventory turnover or poor management of accounts receivable windows. As this ratio improves, it indicates that the company requires less outside funding to finance operations.

$$\text{Working capital turnover} = \frac{\text{Sales}}{\text{Working capital}}$$

The current ratio gives the proportion of current assets to current liabilities. A low ratio indicates a lack of liquidity, meaning the company must rely on operating income or outside financing to meet its maturing obligations. Though DISTRO continues to rely on financing to supplement its income and fund operations, the company must grow to profitability or it will cease to exist. The current ratio provides insight into the impact of capital allocation and operational decisions in achieving this end.

$$\text{Current Ratio} = \frac{\text{Current assets}}{\text{Current liabilities}}$$

The acid test ratio expands on the current ratio, providing a more conservative measure of liquidity by including only cash, marketable securities, and accounts receivable in the numerator to account for the potentially illiquid nature of inventory.

$$\text{Acid Test} = \frac{\text{Current assets} - \text{inventory}}{\text{Current liabilities}}$$

The operating cash flow ratio measures how well the cash flow generated from a company's operations cover the firm's current liabilities. This provides a good measure of a company's short-term liquidity by measuring the impact of only cash rather than non-cash items that are included in net income. As DISTRO attempts to grow operations, the operating cash flow ratio provides an indication of whether this growth generates sustainable levels of cash flow.

$$\text{Operating Cash Flow Ratio} = \frac{\text{Cash flow from operations}}{\text{Current liabilities}}$$

In addition to financial analysis, exploratory interviews were conducted with stakeholders across multiple organizations, and respondents were selected based on a combination of purposeful and opportunistic sampling. The stakeholders included employees of DISTRO, contacts at the United States Agency for International Development, and local and government contacts in Kenya, particularly within the retail banking firms that work with DISTRO. Stakeholders across this wide spectrum were included to gather information regarding how financing is acquired, the decisions involved in providing aid, and how this can drive working capital decisions by the supported organization (DISTRO), while information specific to supply chain capital allocation was gathered from DISTRO respondents. To produce findings that are more

generalizable, interviews with DISTRO employees were conducted across multiple echelons within the supply chain. Specific individuals within the organization were targeted based on their previous experience in supply chain operations, and considerations were made for how individuals' previous experience, both culturally and in business, would influence their responses.

Bibliography

- Alesina, A., Ozler, S., Roubini, N., & Swagel, P. (1996). Political instability and economic growth. *Journal of Economic Growth*, 1, 189–211. <https://doi.org/10.1007/BF00138862>
- Ayyagari, M., Demirguc-Kunt, A., & Maksimovic, V. (2011). Small vs. young firms across the world: contribution to employment, job creation, and growth. *World Bank Policy Research Working Paper Series*, (April), 1–57. <https://doi.org/0.1596/1813-9450-5631>
- Barratt, M., Choi, T., & Li, M. (2011). Qualitative case studies in operations management: Trends, research outcomes, and future research implications. *Journal of Operations Management*, 29(4), 329–342. <https://doi.org/doi:10.1016/j.jom.2010.06.002>
- BBC. (2008, April 12). Deal to end Kenyan crisis agreed. *BBC News*. Retrieved from <http://news.bbc.co.uk/2/hi/africa/7344816.stm>
- Beck, T., & Demirguc-Kunt, A. (2006). Small and medium-size enterprises: Access to finance as a growth constraint. *Journal of Banking and Finance*, 30(11), 2931–2943. <https://doi.org/10.1016/j.jbankfin.2006.05.009>
- Biddle, G. C., Bowen, R. M., & Wallace, J. S. (1999). Evidence on EVA. *Journal of Applied Corporate Finance*, 12(2), 69–79.
- Blomberg, S. B., Hess, G. D., & Weerapana, A. (2004). Economic conditions and terrorism. *European Journal of Political Economy*, 20(2).
- Bonoma, T. V. (1985). Case Research in Marketing: Opportunities, Problems, and a Process. *Journal of Marketing Research*, 22(2), 199. <https://doi.org/10.2307/3151365>
- Boyer, K. K., & Swink, M. L. (2008). Empirical Elephants—Why Multiple Methods are Essential to Quality Research in Operations and Supply Chain Management. *Journal of Operations Management*, 26(3), 338–344. <https://doi.org/10.1016/j.jom.2008.03.005>
- Brav, O. (2009). Access to Capital, Capital Structure, and the Funding of the Firm. *The Journal of Finance*, LXIV(1), 263–308.
- Breitbach, T. W. (2017). *Supply Chain Financing in Developing Countries*. Massachusetts Institute of Technology.
- Chittenden, F., Hutchinson, P., & Hall, G. (1996). Small Firm Growth , Access to Capital Markets and Financial Structure: Review of Issues and an Empirical Investigation. *Small Business Economics*, 8(1), 59–67. <https://doi.org/10.1007/BF00391976>

- Claessens, S. (2006). Access to financial services: A review of the issues and public policy objectives. *World Bank Research Observer*, 21(2), 207–240. <https://doi.org/10.1093/wbro/lkl004>
- Cooley, L., & Linn, J. (2014). *Taking Innovations to Scale: Methods, Applications and Lessons*, Results for Development Institute, (September), 1-24
- D'avanzo, R., Lewinski, H. Von, & Wassenhove, L. N. Van. (2003). THE LINK BETWEEN SUPPLY CHAIN AND FINANCIAL PERFORMANCE. *Supply Chain Management Review*, 7(6), 40–47. Retrieved from <https://trid.trb.org/view.aspx?id=606673>
- Dehoratius, N., & Rabinovich, E. (2011). Field research in operations and supply chain management. *Journal of Operations Management*, 29(5), 371–375. <https://doi.org/10.1016/j.jom.2010.12.007>
- Department of Defense. (2016). Department of Defense (DoD) Releases Fiscal Year 2017 President's Budget Proposal.
- Edmondson, A. C., & McManus, S. E. (2007). Methodological fit in management field research. *Academy of Management Review*, 32(4), 1155–1179. <https://doi.org/10.5465/AMR.2007.26586086>
- Eisenhardt, K. M. (1989). Building Theories from Case Study Research. *Academy of Management Review*, 14(4), 532–550. <https://doi.org/10.5465/AMR.1989.4308385>
- Ellinger, A. E., Natarajarathinam, M., Adams, F. G., Brian Gray, J., Hofman, D., & O'Marah, K. (2011). Supply chain management competency and firm financial success. *Journal of Business Logistics*, 32(3). <https://doi.org/10.1111/j.2158-1592.2011.01018.x>
- Ellram, L. M., & Liu, B. (2002). THE FINANCIAL IMPACT OF SUPPLY MANAGEMENT. *Supply Chain Management Review*, 6(6), 30–37. Retrieved from <https://trid.trb.org/view.aspx?id=623784>
- Ensuring Effective Supply Chains: A Grand Challenge for Development. (2017). Retrieved from <https://www.usaid.gov/grandchallenges/supplies>
- Filbeck, G., & Krueger, T. M. (2005). An Analysis of Working Capital Management Results Across Industries. *American Journal of Business*, 20(2), 11–20. <https://doi.org/10.1108/19355181200500007>
- García-Teruel, P. J., & Martínez-Solano, P. (2005). Effects of Working Capital Management on SME Profitability. *International Journal of Managerial Finance*, 3(2), 164–177. <https://doi.org/10.1108/17439130710738718>
- Gates, R. M. (2009). A Balanced Strategy: Reprogramming the Pentagon for a New Age. *Foreign Affairs*, 88(1), 28–40. <https://doi.org/Article>

- Gelsomino, L. M., Mangiaracina, R., Perego, A., & Tumino, A. (2016). Supply chain finance: a literature review. *International Journal of Physical Distribution & Logistics Management*, 46(4), 348–366. <https://doi.org/10.1108/IJPDLM-08-2014-0173>
- Gill, A., & Biger, N. (2010). The Relationship Between Working Capital Management And Profitability: Evidence From The United States. *Business and Economics Journal*, 2010(1), 1–9. <https://doi.org/10.18052/www.scipress.com/ILSHS.20.14>
- Gunasekaran, A., Patel, C., & Tirtiroglu, E. (2001). *Performance measures and metrics in a supply chain environment*. *International Journal of Operations & Production Management* (Vol. 21). <https://doi.org/10.1108/01443570110358468>
- Harrison, W. T., Horngren, C. T., & Thomas, C. W. (2010). *Financial Accounting* (8th ed.). Pearson Education.
- Hausman, W. H. (2002). Supply Chain Performance Metrics. *International Journal of Operations & Production Management*, 32(1), 28–48. <https://doi.org/10.1108/01443571211195727>
- Higgins, R. C. (2012). *Analysis for Financial Management* (10th ed.). New York: McGraw-Hill.
- Hillman, A. J., & Keim, G. D. (2001). Shareholder Value, Stakeholder Management, and Social Issues: What's the Bottom Line? *Strategic Management Journal*, 22(2), 125–139. [https://doi.org/10.1002/1097-0266\(200101\)22](https://doi.org/10.1002/1097-0266(200101)22)
- Hofmann, E., & Kotzab, H. (2010). A SUPPLY CHAIN-ORIENTED APPROACH OF WORKING CAPITAL MANAGEMENT. *Journal of Business Logistics*, 31(2), 305–330. <https://doi.org/10.1002/j.2158-1592.2010.tb00154.x>
- J.P. Morgan. (2015). Optimizing Cash Flow: How to Manage Working Capital. J.P. Morgan Commercial Banking. Retrieved from <https://www.jpmorgan.com/jpmpdf/1320675884489.pdf>
- KNBS. (2017). Leading Economic Indicators October 2017. Kenya National Bureau of Statistics. Retrieved from <https://www.knbs.or.ke/download/leading-economic-indicator-october-2017/>
- KNBS. (2018). Leading Economic Indicator December 2017. Kenya National Bureau of Statistics. Retrieved from <https://www.knbs.or.ke/download/leading-economic-indicator-december-2017/>
- Kenya Power. (2017). Kenya Power confirms 5.9 Million customers connected to the grid. Retrieved from <http://www.kplc.co.ke/content/item/1951/kenya-power-confirms-5.9-million-customers-connected-to-the-grid>
- Kenya Vision 2030. (2016). Progress: Energy Generation and Distribution. Retrieved from <http://www.vision2030.go.ke/493/progress-2016-march-energy-generation-distribution/>

- Kleijnen, J. P. C., & Smits, M. T. (2003). Performance metrics in supply chain management. *Journal of the Operational Research Society*, 54(5), 507–514. <https://doi.org/10.1057/palgrave.jors.2601539>
- Lazaridis, I., & Tryfonidis, D. (2006). The relationship between working capital management and profitability of listed companies in the Athens Stock Exchange. *Journal of Financial Management and Analysis*, 30(76), 1–12.
- Leedy, P. D., & Ormrod, J. E. (2016). *Practical Research: Planning and Design* (11th ed.). Pearson.
- London, T., Anupindi, R., & Sheth, S. (2010). Creating mutual value: Lessons learned from ventures serving base of the pyramid producers. *Journal of Business Research*, 63(6), 582–594. <https://doi.org/10.1016/j.jbusres.2009.04.025>
- Losbitchler, H., & Rothböck, M. (2006). Creating Shareholder Value through Value-driven Supply Chain Management. In W. K. and T. Blecker (Ed.), *Managing Risks in Supply Chains* (pp. 281–296). Berlin, Germany: Erich Schmidt Verlag.
- Lovata, L. M., & Costigan, M. L. (2002). Empirical Analysis of Adopters of Economic Value Added. *Management Accounting Research*, 13(2), 215–228. <https://doi.org/10.1006/mare.2002.0181>
- Mathuva, D. M. (2010). The Influence of Working Capital Management Components on Corporate Profitability: A Survey on Kenyan Listed Firms. *Research Journal of Business Management*, 4(1), 1–11.
- Mccutcheon, D., & Meredith, J. (1993). Conducting case study research in operations management. *Journal of Operations Management*, 11, 239–256.
- Mesquita, E. B. de. (2007). The Quality of Terror. *American Journal of Political Science*, 49(3), 515–530.
- Moore, J. (2017, October 30). Uhuru Kenyatta Is Declared Winner of Kenya’s Repeat Election. *The New York Times*. Retrieved from <https://www.nytimes.com/2017/10/30/world/africa/kenya-election-kenyatta-odinga.html>
- Moss, J. D., & Stine, B. (1993). CASH CONVERSION CYCLE AND FIRM SIZE: A STUDY OF RETAIL FIRMS. *Managerial Finance*, 19(8), 25–34. <https://doi.org/10.1108/eb013739>
- Nazir, M. S., & Afza, T. (2015). Impact of Aggressive Working Capital Management Policy on Firms’ Profitability. *IUP Journal of Applied Finance*, (August), 19–31.
- Njini, F. (2017, May 11). Kenya’s Largest Bank Expects Rate-Cap Removal in Second Half. *Bloomberg Markets*. Retrieved from <https://www.bloomberg.com/news/articles/2017-05-11/kenya-s-largest-bank-sees-rate-cap-being-removed-in-second-half>

- Nobanee, H. (2009). Working Capital Management and Firm's Profitability: An Optimal Cash Conversion Cycle. *Department of Banking and Finance*, (July), 1–14. <https://doi.org/10.2139/ssrn.1471230>
- Ouma, S. D., & Bella, G. (2016). Kenya Reintroduces Interest Rate Caps Abandoned in 1991. *Bloomberg Markets*. Retrieved from <https://www.bloomberg.com/news/articles/2016-09-02/kenya-s-reintroduces-first-interest-rate-caps-in-25-years>
- Parkinson, J. (2017, September 1). Kenyan Supreme Court Nullifies Election, Calls for New Vote. *The Wall Street Journal*. Retrieved from <https://www.wsj.com/articles/kenya-supreme-court-nullifies-election-calls-for-new-vote-1504260050>
- Regulus Limited. (2018). Electricity Cost in Kenya. Retrieved from <https://stima.regulusweb.com/>
- Rom, A., Günther, I., & Harrison, K. (2017). The Economic Impact of Solar Lighting: Results from a randomised field experiment in rural Kenya. *SolarAid*, (February), 1–10.
- Shi, M., & Yu, W. (2013). Supply chain management and financial performance: literature review and future directions. *International Journal of Operations & Production Management*, 33(10), 1283–1317. <https://doi.org/10.1108/IJOPM-03-2012-0112>
- Stake, R. E. (1995). *The Art of Case Study Research*. Thousand Oaks, CA: Sage Publications Inc.
- Stavis-Gridneff, M. (2017a, October 10). Kenyan Opposition Leader Withdraws From Election Rerun. *The Wall Street Journal*. Retrieved from <https://www.wsj.com/articles/kenyan-opposition-leader-withdraws-from-election-rerun-1507646147>
- Stavis-Gridneff, M. (2017b, December 7). Kenya's Growth Seen at Five-Year Low Amid Political Gyration. *The Wall Street Journal*. Retrieved from <https://www.wsj.com/articles/kenyas-growth-seen-at-five-year-low-amid-political-gyration-1512646127>
- Stavis, M. (2017a, February 2). IMF Cuts Kenya Growth Outlook on Bank Loan Charges Cap. *The Wall Street Journal*. Retrieved from <https://www.wsj.com/articles/imf-cuts-kenya-growth-outlook-on-bank-loan-charges-cap-1486044653>
- Stavis, M. (2017b, April 11). Outlook for Kenyan Economy Dimmed by Severe Drought. *The Wall Street Journal*. Retrieved from <https://www.wsj.com/articles/outlook-for-kenyan-economy-dimmed-by-severe-drought-1491948060>

- Stevis, M., & Parkinson, J. (2017a, August 9). Opposition Leader Claims Fraud in Kenya Election. *The Wall Street Journal*. Retrieved from <https://www.wsj.com/articles/opposition-leader-claims-fraud-in-kenya-election-1502271456>
- Stevis, M., & Parkinson, J. (2017b, August 11). Kenyan Vote Monitors Find No Fraud, but Candidate Insists Otherwise. *The Wall Street Journal*. Retrieved from <https://www.wsj.com/articles/kenyan-candidate-says-vote-monitors-are-wrong-and-that-he-really-won-1502390849>
- Stewart, G. (1995). Supply chain performance benchmarking study reveals keys to supply chain excellence. *Logistics Information Management*, 8(2), 38–44. <https://doi.org/10.1108/09576059510085000>
- Swink, M. L., Golecha, R., & Richardson, T. (2010). Does Supply Chain Excellence Really Pay Off? *Supply Chain Management Review*, 14(2), 14–21. <https://doi.org/http://dx.doi.org/10.1108/17506200710779521>
- The World Bank. (2017a). *Doing Business 2017: Equal Opportunity for All*. Washington D.C. <https://doi.org/10.1596/978-1-4648-0948-4>
- The World Bank. (2017b). *Kenya's Economic Outlook to Dip in 2017*. Washington D.C. Retrieved from <http://www.worldbank.org/en/news/press-release/2017/04/12/kenyas-economic-outlook-to-dip-in-2017>
- The World Bank. (2017c). *Kenya GDP (Current USD\$)*. Washington D.C. Retrieved from <https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?end=2016&locations=KE&start=1997>
- The World Bank. (2018a). *About the World Bank*. Washington D.C. Retrieved from <http://www.worldbank.org/en/about>
- The World Bank. (2018b). *Doing Business 2018: Reforming to Create Jobs*. Washington D.C.
- The World Bank. (2018c). Foreign direct investment, net inflows (BoP, current US\$). Retrieved from <https://data.worldbank.org/indicator/BX.KLT.DINV.CD.WD>
- U.S. Government. (2015). National Security Strategy. National Security Council, Office of the White House. Retrieved from <http://nssarchive.us/wp-content/uploads/2015/02/2015.pdf>
- U.S. Government. (2017). National Security Strategy. National Security Council, Office of the White House. Retrieved from <https://www.whitehouse.gov/wp-content/uploads/2017/12/NSS-Final-12-18-2017-0905.pdf>
- U.S Department of State. (2016). Congressional Budget Justification: Department of State, Foreign Operations, and Related Programs.

- USAID. (2017a). *Development Innovation Ventures Annual Program Statement*. Retrieved from https://www.usaid.gov/sites/default/files/documents/15396/DIV_APS_OAA-16-000006.pdf
- USAID. (2017b). USAID ANNOUNCES \$4 MILLION TO SOLAR START-UPS FOR AFRICAN OFF-GRID ENERGY. Retrieved from <https://www.usaid.gov/news-information/press-releases/oct-14-2016-usaid-announces-4-million-solar-start-ups-african-grid-energy>
- USAID. (2017c). USAID ANNOUNCES \$6.3 MILLION IN AWARDS TO BOLSTER SUB-SAHARAN AFRICA'S OFF-GRID ENERGY SECTOR. Retrieved from <https://www.usaid.gov/news-information/press-releases/oct-25-2017-usaid-announces-63-million-awards-bolster-sub-saharan-africas-grid>
- USAID. (2018). Mission, Vision and Values. Retrieved from <https://www.usaid.gov/who-we-are/mission-vision-values>
- Wuttke, D., Blome, C., Foerstl, K., & Henke, M. (2013). Managing the innovation adoption of supply chain finance - Empirical evidence from six European case studies. *Journal of Business Logistics*, 34(2), 148–166. <https://doi.org/10.1111/jbl.12016>
- Yin, R. K. (2014). *Case Study Research: Design and Methods* (5th ed.). Los Angeles: Sage Publications Inc.
- Young, J. K., & Findley, M. G. (2011). Can peace be purchased? A sectoral-level analysis of aid's influence on transnational terrorism. *Public Choice*, 149(3), 365–381. <https://doi.org/10.1007/s11127-011-9875-y>

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14. ABSTRACT Throughout the 21st century, the Department of Defense has carried the burden in combatting extremist ideologies around the globe, spending an estimated \$4.79 trillion fighting wars in Afghanistan, Syria, Iraq, and Pakistan. A recognition of the unsustainable nature of fighting such long-term, costly wars has led U.S. national security policy to shift in recent years towards combatting extremism through economic development and building capacity in less stable communities around the globe. The U.S. Agency for International Development (USAID) is the government agency responsible for achieving this objective, yet USAID acknowledges that many of the supply chains the agency finances are suboptimal and ineffective. This research explores the impact that capital allocation, operational decisions, and geopolitical/economic events have on supply chain performance in the developing world to better inform businesses and developmental organizations of the practices that support sustainable economic development. Through a case study analysis of a Kenyan distribution firm using historical financial and sales data, the study revealed that working capital investment in the distribution echelon of developmental supply chains drives efficient capital flow that is driven by retail market demand. Additionally, human capital investment to develop supply chain expertise presents opportunities for foreign investment to address the deficient and suboptimal supply chain practices seen in many small and medium-sized enterprises. The research concludes by developing a model for measuring scalability based on revenue and cost structures, providing a methodology for supply chain firms to identify break-even points under varying growth projections.					
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