EFFECTS OF CROSS-LISTING ON VALUATION AND FIRM PERFORMANCE

Irene Mumbi Makanga¹, Mary Wanjiku Gateri ²

¹ Chandaria School of Business, USIU, Nairobi, Kenya
²Kenya Agricultural Research Institute – Thika, Kenya.

Correspondence: Mumbi Makanga, Chandaria School of Business, USIU, Nairobi, Kenya. P.O Box 14634 – 0800 Nairobi. Tel: +254 708 296241, E-mail: imakanga@students.usiu.ac.ke
ABSTRACT

The main objective of this study was to determine the effects of regional cross-listing on firm value and financial performance. The study was conducted using an event study methodology where a time series analysis to examine the evolution of variables over time and univariate analysis using the paired t-test for the periods before and after comparison was used. Additionally, a correlation analysis to measure the degree of relationship between Tobin’s Q, liquidity and leverage, profitability and growth, and operational performance was utilized.

The study’s results indicated that cross-listing yielded a valuation premia but was not sustained two years after cross-listing. There was no significant difference in financial performance before and after cross-listing, a sharp contrast from the expected results. Cross-traded firms have high market liquidity, profitability and growth, and operational performance.

Thus, the market dynamics for regional cross-listing in East Africa were consistent with other studies abnormal returns around cross-listing hypothesis for firm value and financial performance but the study concluded that these changes were not sustained for the Kenyan firms’ regional cross-listing case. Therefore, the study recommends enhanced market regulation and corporate governance consistent with the bonding hypothesis.

**Keywords:** Tobin’s Q, Liquidity, Leverage, Profitability, Growth, Operational Performance
1 INTRODUCTION

Born in the last half of the 20th century, the securities markets in the East Africa are fairly young in comparison to the well established and prestigious securities markets such as the NYSE, NASDAQ, TSX, LSE, FSX and Euro-next which have more stringent regulations and handle larger volumes of trade daily (Cetorelli & Peristiani, 2010). International cross-listings into these large exchanges are mainly motivated by legal bonding, market access, access to lower cost of equity, increase firm value and enhanced cooperate governance (Berg, 2012; Dodd, 2013; Cetorelli & Peristiani, 2010). Most of these motivations are met when firm’s cross-list from countries with poor legal protection to countries with more stringent legal protection systems such as the prestigious securities markets previously stated (Hilgert, 2005).

There have been various studies such as Charitou and Louca (2009), Smirnova (2004) and Cetorelli and Peristiani (2010) that focus on stock price reactions to international cross listing especially in the American Depository Receipts (ADR) and the numerous advantages of cross-listing to more prestigious markets as covered by Chan, Lee, Rudolph and Seow (2012), Dodd, 2011) in their studies, but little has been written on the issue of firm valuation resulting from the impact of regional cross-listing (Onyuma et al., 2012).

This current study therefore gathers a comprehensive list of arguments on cross-listing, seeking to provide a regional perspective to cross-listing. The study notes that a lot of evidence concerning this subject is from the US focusing on non-US companies cross-listing to the US securities market. Therefore, the need and importance to overcome the US-centered perspective of cross-listing arises and hence the need for a study focused on cross-listing behavior from different a point of view arose (Dodd, 2013), a problem noted by many researchers as it provides a key challenge to research on international cross-listing (Berg, 2012). For that reason, different perspectives are needed to solidify the already existing literature since the research results cannot be generalized outside the US.

However, cross-listing in the East African market for Kenyan companies does not create value for shareholders of cross-listed companies (Onyuma et al., 2012) as cross-listing into smaller markets does not have the same effect as cross-listing in more prestigious and more stringent markets in which the effects are already known. These firms are coming from a more developed securities market to less developed securities markets in relative comparison. Such has been the case for EABL, KCB and many other firms in Kenya. Furthermore, Onyuma et al. (2012) also stated that cross-listing does not have any significant impact on the financial performance or reducing
systematic borrowing for asset investments. Thus, this study tested this statement by examining the effects of cross-listing before and after cross-listing for firm value and financial performance.

Hence, the study offers an interesting examination for studying cross-listing reasons noting that the EAC securities market is smaller, handling lower trade volumes and lower market capitalization compared to the more established securities markets.

2 LITERATURE REVIEW

2.1 Effects of Cross-listing on Valuation

The major implication of Cross-Listing on firms is enhanced firm value. The value of cross-listed firms is said to increase as a result of the positive effects of stock price reactions in the home market (O'Connor, 2009). The positive effect is as a result of the increased market visibility, information disclosure by firms, increased investor protection and investor confidence (Cetorelli & Peristiani, 2010).

There are various theories by Dodd (2013) that provide the reasons for the valuation differences in cross-listing and they are: market segmentation; signaling theory; information disclosure; legal bonding, and investor recognition, market timing theory, proximity and business strategy theory and are subsequently expounded.

The capital market segmentation theory is a major and often cited rational for cross-listing is to overcome the investment barriers that segment capital markets (Doige, Karolyi, Lins, Miller, & Stulz, 2009). The market segmentation theory suggests that cross-listing makes a firms stock more accessible to investors who would find it less advantageous to hold stock because of the prevailing investment barriers (Dodd, 2013).

Information disclosure theory holds that firms cross-list in foreign markets with the strictest disclosure requirements (Dodd, 2013) because the increased information disclosure encourages trading, therefore leads to higher market valuation of the cross-listed firm. According to Abdallah (2008), the more the level of information dissemination as well as visibility of the firm in the foreign market, the more benefits a firm gains from cross-listing. Increased investor recognition results in increased firm value because of the increased awareness and recognition of the firm in the foreign markets (Eng & Ling, 2012).
The bonding theory implies that firms seek to ‘bond’ themselves to stricter rules and regulations in foreign markets, which gives raise to better corporate governance practices which limits the ability of managers and shareholder control that is, it improves the ability to terminate poorly performing managers, has independent boards and there is more dispersed ownership (Dodd, 2013; Doige et al., 2009).

According to Peng and Su (2012), The legal bonding mechanism is in three forms: (i) the firm subject themselves to enforcement powers in the foreign market (cases where cross-listing has taken place in host countries with even more stringent regulations than the home market); (ii) increased investor protection enables investors to exercise their rights i.e. taking class-action lawsuits and, (iii) cross-listing to more stringent markets forces firms to disclose more information to the public by providing more transparent financial information. Investors are more willing to invest in transparent firms as they are more capable to analyze the firms’ performance (Burns, Francis, & Hasan, 2007).

The signaling theory is where managers convey information about the firms’ future prospects and quality (Dodd, 2011). For example, cross-listing in US stock market signals firms commitment to protect minority investors in the home market, thus allows firms to raise capital at lower cost and hence exploit growth opportunities in the home market (Charitou & Louca, 2009). On the other hand, market timing theory suggests that corporate managers conduct listing during the hot periods in the stock markets in order to get even greater abnormal returns upon the announcement of cross-listing and on-cross listing.

The proximity theory however, holds that the greater the proximity with the home country, the greater the probability to cross-list (Guseva, 2013). According to Dodd (2013), this familiarity gives rise to many advantages such as, the information advantage which in most cases the investors in the home country already have and therefore, they have more willingness to invest. Hence, location and familiarity to the firm affects the investors’ interest in the firm (Peng and Su, 2012).

The Tobin’s Q is the most widely used measure for the market value of a firm in empirical analysis (Hirsch & Seaks, 1993). It is defined as the market value of the firm divided by the replacement value of assets (Wernerfelt & Montgomery, 1988). Studies such as Frésard and Salva (2011) used the Tobin’s Q as a proxy for valuation of cross-listed firms. Its wide use makes it the best measure for valuation and comparison of cross-listed firms’ value for this study.
The Tobin’s Q is computed using the following data: book value of total assets, book value of equity and market value of equity. Therefore, the Tobin’s Q is computed as the book value of total assets less book value of equity, plus market value of equity and then divided by the book value of total assets (Berg, 2012). The study utilized this equation to compute the firm value of the firms under study.

2.2 Effects of Cross-Listing on Liquidity and Leverage

2.2.1 Liquidity and the Liquidity Theory

Previous studies have found that firms and managers’ perception of the benefits of listing in the US have a basis in reality, where these studies have found that cross-listing in the US leads to numerous benefits as it is the most stringent and most expensive markets to cross-list due to the Sarbanes-Oxley Act (Hung, 2011). Therefore, firms that cross-list to the US experience increased liquidity, decreased exposure to market risks and increased visibility for foreign firms (Cetorelli & Peristiani, 2010).

The liquidity theory of cross-listing implies that cross-listing improves stock liquidity (Dodd, 2013). According to Dodd (2013), there are several studies that reported that cross-listing does improve the stock liquidity in terms of: (i) reduced trading costs i.e. the bid-ask spread is reduced significantly, (ii) reduced frequency of zero returns since the stocks beta volatility is substantial, (iii) increased trade volumes ensure that the stock can easily be sold when the investor wants and at any given time as there are more than enough buyers and sellers with the same economic interest in the stock.

Thus, the financial reasons behind managerial decisions to cross-list firms are better prices, liquidity, size of transaction, status or prestige that comes from foreign listing but the major reasons for managers’ consideration is to decreases firms’ cost of capital (due to the lower liquidity risk premium) and also helps to reduce cash flow expropriation by managers (Charitou & Louca, 2009). According to Hung (2001), Latin American firms (Mexican) cross-list in order to obtain liquidity and subject themselves to stronger corporate governance, enforcement and oversight. They seek to list in securities markets that will provide greater transparency to create and sustain a robust capital market. Additionally, small Japanese firms cross-list in the US to take advantage of the increased liquidity and relative mispricing of stocks (Dodd, 2013).

Prior studies provide evidence that cross-listing in the US leads to greater analyst’s coverage, more accurate earnings predictions and better corporate governance (Dodd, 2013). This suggests that cross-listed firms experience an improvement in their information environment (Charitou &
Louca, 2009), thus attracting more a greater investor base both in the home country and the
foreign country. As far as managerial expropriation is concerned, an increased shareholding base
reduces the measure of private control benefits which therefore increases the protection of
minority shareholders; hence there is lower fraction of cash flows expropriation by manager’s
post listing (Charitou & Louca, 2009; Hyang, Wonsik, & Sang, 2012).

According to Chouinard and D’Souza (2003-2004), most markets are not perfect markets where
information cohesion can result in concurrent price discovery to occur in multiple markets.
Furthermore, information asymmetries and transaction costs cause a certain degree of market
segmentation thus allowing one market from time to time become the market price leader for a
given stock (Chouinard & D’Souza, 2003-2004). Therefore, managers’ decision to cross-list is in
order to get better prices even with loaming exchange rate differentials. The effects of price
leadership in another market will also drive the prices of another market to adjust hence the firm’s
domestic equity market gains since the firm-specific news relevant to prices is likely to spread
hence the arbitrage is not possible (Achieng’-Tocho, 2005).

All in all the major goal is to increase the liquidity of their shares by increasing the trading
platforms, removing trading barriers created through market segmentation and thus firms expect
their securities to be more liquid as they will trade more frequently. However, according to
Kryzanowski & Lazrak (2008), intensified trading caused by increased informed trading will
reduce liquidity. While this point of view does not motivate our inquiry, the present study should
therefore not be viewed as to test stock market behavior or market fragmentation of the stock
markets.

The liquidity ratio is expressed as current assets divided by current liabilities. Under normal
circumstances a firm’s ratio should ideally be 2:1 ratio computed simply as current assets: current
liabilities. This ratio is mainly used to determine a firm’s ability to pay off its short term debts
such as bank overdrafts and other payables (Higgins, 2009). When a firm cross-list, due to the
choice of equity over debt financing, the firms borrowing should ideally decrease and the current
assets increase as a result of the increased liquidity of the firm. Therefore, the ratio value is
expected to be higher providing a larger margin of safety for covering short-term debt.

Emerging capital markets are plagued with problems of low liquidity, insufficient set of laws,
weak institutions and pathetic shareholder protection. For firms coming from such an
environment, various studies have indicated that cross-listing results in better liquidity and
increase in trade volumes with the trading being dominated in the foreign market (Smirnova,
2004). Smirnova (2004) further states the liquidity effect depends on previous ownership,
restrictions across share classes and ownership across markets, and listing classifications. Thus liquidity is attributed to the improvement to the listing destination and the scope of the foreign ownership restrictions in the destination market.

2.2.2 Leverage

Cross-listed firms are more likely to use equity financing due to the increased transparency of the host countries accounting system (Burns, Francis, & Hasan, 2007). Equity finance is better source of finance as opposed to debt finance as the company’s capital structure is not compromised. However, firms from poor investor protection are less likely to use equity as acquisition currency according to Burns, Francis and Hasan (2007), as there is a negative relationship between the target premium and the investor protection. The debt to equity ratio computes the firm’s financial leverage or the debt capacity. It is expressed as total debt divided by shareholders equity of a firm as a percentage. Therefore, it states that the ratio for certain value of shillings is supplied by the creditors; a certain value of shillings is matched by the shareholders (Higgins, 2009). Thus, the higher the shareholders fund the lower the risk to investors. For a cross-listed firm, the shareholders fund should be higher since most of the financing should ideally be done by the shareholders.

Cross-listing therefore is an investment opportunity for both capital and noncapital raising firms (Charitou & Louca, 2009). The study therefore sought to determine effects of cross-listing on firms’ liquidity and leverage. Cross-listing within the East Africa provides a great opportunity to test the various theories presented on cross listing as majority of the firms that have cross-listed originate from Kenya and the development of the legal systems in the East African Countries is not very different from each other. However, the only perceptible variation points to a comparatively more developed legal system in Kenya (Waweru et al., 2012), which serves as a great backdrop to test if cross-listing regionally has the same effect as cross-listing to more prestigious markets.

2.2 Effects of Cross-Listing on Profitability and Growth

2.2.3 Growth

The business reasons behind cross-listing encompass acquisition, expansion plans and publicity. Firm’s cross-list to gain foreign currency to acquire acquisitions, perform expansions plans or simply publicize their firm to their domestic counterparts signaling various intended messages to them. All these reasons are geared towards using cross-listing as a means to improve the magnitude of the firms’ growth opportunities (Charitou & Louca, 2009).
According to Hung (2011), firms from different regions list in the US for many different reasons for example, European Firms mainly cross-list in the US to gain better valuation, prestige that comes from US listing or obtain acquisition currency. Additionally, consistent with this argument, other studies have shown that firms cross-list as it may serve as advertisement for the firm’s products thereby increasing sales by raising demand and improving relationships with suppliers and employees (Abdallah, 2008). Since cross-listing is associated with significantly increased in the number of media hits, firms therefore seek to capitalize on market reputation (Charitou & Louca, 2009).

In the East Africa, according to Waweru et al. (2012) cross-listed firms seek to exploit various growth opportunities which are: business expansion; sales increase; and the desire to lower the cost of capital, however they hardly seek or desire to increase investor protection. For example, KCB and Equity Bank have expanded their operations through East Africa. These banks are cross-listed in more than one stock exchange within the East Africa securities market. These firms have used cross-listing as a means to improve their firms access to lower cost of external financing which enables these firms to embark on potentially profitability projects.

Cross-listing seems to positively influence firm growth, especially through external financing. Thus using capex, the study sought to find out the extant research conducted on US firms regarding the relationship between cross-listing and firm growth also applies to East African Firms. According to Khurana, Ximuin, & Periera, (2008) there are studies that have documented the positive relationship between firm growth and cross-listing.

Expressed as capital expenditures divided by total assets, the capex ratio therefore measures the ratio of funds used to acquire or improve physical assets that are used to increase the scope of operations of a firm against its existing total assets (Higgins, 2009). Growth firms cannot pass the possibility to tap into more capital markets which can ensure their growth potential is realized and that their growth opportunities are valued at their potential (Berg, 2012).

Additionally, segmentation predicts that as a result of market integration the stock prices will rise, hence market capitalization will increase before cross-listing and firm assets will increase after cross-listing (Waweru et al., 2012). Therefore, market segmentation seeks to improve stock invest-ability by increasing the shareholders’ base, risk sharing and this leads to lower costs of equity capital and higher stock valuation. Thus, the study on the effects of cross-listing on growth is crucial because of the presumptions that the studies in prior research made with regards to the raised externally financing from cross-listed firms is channeled towards profitable projects.
2.2.4 Profitability

Corporations generally view cross-listing as a value-enhancing decision particularly when the host market is the US (Shmuel, Karolyi, & Lemmon, 2007). However, there is disagreement about the sources of benefits and inconsistency of prior studies. The main goal of any firm is to maximize profits and therefore, all decisions made are geared towards that very goal. Hence, cross-listing is also a goal geared towards increasing firm value and shareholders wealth. According to Onyuma et al. (2012), theoretical asset pricing models have predicted an increase in the stock prices upon cross-listing. Thus, business expansions, sales increase, lower cost of capital and investor recognition are all reasons that may improve the business environment to propel it to greater heights.

Multinational companies’ cross-list in order to enhance their marketability in the target market (Guseva, 2013). Better cross-border marketability of not only shares but also their products and services, which from the managers’ perspective outweighs the direct costs of compliance with registration and reporting in the foreign market. Furthermore, various scholars have argued that cross-listing, especially in the US exchanges, signals to world that they are willing to subject themselves to stringent laws and regulations of the US market, thus bonding them to the US hence rewarded with a certain valuation premium due to the enhanced business reputation (Berg, 2012)

The return on asset ratio is expressed by net profit before taxes divided by the total assets. A measure the ratio for every shilling in earnings to everything shilling tied up in assets in the business (Higgins, 2009). A higher return on assets is ideal. This ratio can also be expressed as profit margin multiplied by asset turnover, in this case when both are high the more attractive the firm is.

For a cross-listed firm, the profitability ratio is expected to be high. This is because; studies have always assumed that the new found capital is used to finance profitable projects. Therefore, the implication of this argument is that cross-listing increases a firm’s ability to finance profitable projects, thus increasing firm growth through external financing and profitability (Khurana, Ximuin, and Periera, 2008).

Many of the cross-listing theories have similar economic predictions however; the majority of the studies on which this conclusion is based on are all conducted from a US perspective. Examining the effects of cross-listing outside the USA is important and crucial as the previous studies have made generalized conclusions on the effects of cross-listing on profitability and growth by mainly focusing on data from the US and emerging markets such as China and Hong Kong. Non-US
markets are also important destinations for cross-listing and empirical evidence of cross-listing outside the US is limited (Dodd, 2013).

2.3 Effects of Cross-Listing on Operational Performance
Enhanced operational performance of cross-listed firms may be seen as a side effect of cross-listing. This is because, cross-listing results in legal bonding, increased information disclosure, increased media coverage and thus firms are forced to do things right, hence enhanced corporate governance, enhanced business reputation, increased firm value and financial performance.

From the aforementioned theories of cross-listing and the supporting literature to back the claims, they explain how cross-listing results in the enhanced firm valuation and performance which is an effect of cross-listing. However, the literature only supports the cross-listing of firms from less stringent markets to more stringent markets i.e. Firms seeking to cross-list from Japan to the USA. There is little literature and evidence of cross-listing from other parts of the world and exploring the phenomenon of cross-listing (Dodd, 2013), with some studies calling for research in emerging markets such as: China, Hong Kong and Singapore (Berg, 2012).

On the premise that investors are normally very reluctant to invest in firms from countries with poor investor protection, where disclosure is inadequate hence making evaluation of the firms’ performance much more difficult for them. Thus Burns, Francis and Hassan (2007) affirmed that, cross-listing solves this problem as transparency is created as a result of the adherence to the stringent laws in the host country i.e. the US market the US GAAP, hence it is more difficult for firms to hide their covert actions thereby facilitating investor understanding for the firm’s financial statements.

Corporate governance is the set of arrangements through which firms account to their stakeholders (Fiador, 2013). Thus, enhanced corporate governance effects is evident after cross-listing as firms increased financial reporting standards to meet the stringent host markets’ high accounting system requirements and also transparency on information on the existing firm conditions, decisions and actions more accessible, visible and understandable to all the market participants.

Enhanced corporate governance as a result of cross-listing as hypothesized by Lel and Miller (2008), who examined the relative propensity for listed firms to terminate non-performing CEO’s. In their study, they constructed a database of 70,000 firm-year observations from 47 countries and found that cross-listed firms were more likely to terminate the non/poorly performing CEO’s than
their non-cross-listed counterparts. They further found that this effect is mainly concentrated in listing in the US, where there is the strongest investor protection laws.

Another study by Basu and Dimitrov (2010) focused on the group of firms that past studies suggest gained the most from the Sarbanes-Oxley Act and exchange regulations in the US, which mainly enhanced corporate governance. The study focused on large established firms and the results of the study on the overall showed that only small changes in the nature of governance or the operating performance of the sample firms was as a result of the Sarbanes-Oxley Act and exchange regulations enacted at that time. Their results also failed to show any significant cross-sectional relationship between the mandated changes and the operating performance of these firms, therefore board independence reinforces the positive impact of increased share holding on firm value (Hyang, Wonsik, and Sang, 2012).

Thus, the enhanced governance, according to the aforementioned study, is not as a result of cross-listing and enhanced firm value but is due to the already existing reward system for firms with good corporate governance and not because they cross-listed. They explained the lack of relationship was due to the fact that these firms already were compliant with the regulations in the US even before the laws were passed and therefore, indicated the extent these firms quickly adapt to the market mechanisms, which has served as an effective force in enforcing good corporate governance (Basu & Dimitrov, 2010). So, for the large organizations in the study the enhanced regulations in the US market were unnecessary to enhance corporate governance.

For this study, while measuring the firms’ operational performance, the elements in the population for this study come from various industries and vary in size. Thus, keeping in mind there many contextual differences in cross-listing decision, the decision to cross-list in more developed markets may not be the same informing the decisions to cross-list in similar or less developed markets as is the context of the East Africa Market according to a study conducted by Waweru et al. (2012).

Consistent with this argument, previous studies found that cross-listing determinants differ among industries as well as between home and host countries exchanges (Koh, Lee, Basu, & Roehl, 2013). For example, firms with motives for raising capital, increasing sales and high-tech firms tend to cross-list in the US, while as firms that plan to increase capacity for debt options cross-list on the European exchanges (Dodd, 2013). Therefore, operational performance as an experience experienced post-listing may differ depending on the industry and the reasons for cross-listing.
The asset turnover ratio varies with the nature of a firm’s products and competitive strategy. Thus, management diligence and creativity in controlling assets are all important determinants of a firm’s asset turnover (Higgins, 2009). The total assets turnover ratio is expressed as sales divided by total assets of a firm.

The total assets constitute current assets and fixed assets. Management diligence in managing these assets is tested by this ratio. So why do we compare assets to sales? This ratio enables us to concentrate on management control over the firm as it demonstrates the operational performance of the firm. For instance (Higgins, 2009), suppose a firm’s investment in account receivables has risen over time, this may be due to: (i) Sales have risen over time and so have the account receivables or; (ii) Management is slaking in their collection efforts. Therefore, this ratio can effectively distinguish between sales induced changes in investment and other causes such as management inefficiencies causing poor operational performance.

One can deduce that operational performance of cross-listed firms after cross-listing improves as a result of theoretical effects of cross-listing on firms such as increased value, liquidity and leverage, growth and also profitability. There is a consensus amongst researchers such as Dodd (2013) or Peng and Su (2012) that even with an increase in cross-listing and finance research on cross-listing, there is only preliminary understanding of the real economic consequences of the cross-listed firms’ growth. Moreover, Peng and Su (2012), argue that cross-listing is merely a financial or corporate governance decision that is concerning the growth of the firm.

3 METHODOLOGY
The sample for this study consists of firms that have cross-listed between the years 1997 to 2013. The study adopts an event study methodology to examine valuation, profitability, liquidity, leverage and operational performance effects of cross-listed firms before and after cross-listing by utilizing secondary data available from the firms published consolidated financial statements to examine the changes of the cross-listing event. Using the Tobin’s Q, current assets, capex, return on assets and total assets turnover ratios the study projects the trend of the analyzed data spanning 36 months before cross-listing and 36 months after cross-listing, noting the year of cross-listing as the event year and changes on the year of cross-listing and after that year are noted.

It is also important to note that the event study methodology has number limitations despite its many benefits in this research. Apart from the traditional limitation such as the assumption of an efficient market, short-term impact time estimation of an event and sensitivity to research design i.e. the model used (Sitthipongpanich, 2011), the major limitation that affects this study directly is
the dependence of accuracy and trustworthiness data complied. The estimations made will heavily
depend on it in all cases and the output of data may be inaccurate if the data used was
untrustworthy or inaccurate.

For the purpose of this study, it was essential to identify the companies from the Kenyan stock
market, who have cross-listed with enough data spanning three years prior and three years
subsequent to cross-listing. Thus, first a list of listed companies in the NSE was retrieved from the
NSE web page and a total of 62 companies were identified. As at 2013 December a total of 8
firms had cross-listed from Kenya to other stock markets within the EAC, but for this study, those
companies by definition have: (i) primary listing in the NSE and also have; (ii) data spanning 7
years, with 36 prior and 36 months subsequent, excluding the year of cross-listing were then
selected from the list. Only 5 firms met the set criteria.

Due to the nature of the population i.e. it is small and extremely diverse (companies range from
different industries and vary in size); the census method was the most appropriate and thus, the
most logical technique. The selected firms hail from the manufacturing, banking, commercial and
services industries.

The study used the financial statements to retrieve crucial financial information for computing the
Tobin’s Q, liquidity and leverage, growth and profitability and operational performance. The data
collected was entered into Ms Excel to compute the necessary financial ratios. The key variables
collected from the financial statements as shown in table 3.1, were book value of equity and book
value of total assets, market value of equity, current assets, current liabilities, total debt, profit
after tax, capital expenditures and sales.

The study then used the results to compute the yearly averages and the average means from each;
firm value, liquidity and leverage, profitability and growth, and operational performance using
excel and then entered into SPSS software for further statistical analysis.

The study retrieved the firm’s financial statements from the various companies’ websites and also
the capital markets authority. Prior permission was not required when collecting and using the
information for research as the information is available in the public domain for public
consumption. The criteria of interest when collecting data was accuracy, reliability and
completeness of information, thus it was crucial for the study to use the published annual financial
statements of the firm.

The data analysis for this study was carried out using descriptive statistics and trend analysis. The
study used time series analysis on the results from each of the results in the study for individual
firms. Additionally, the study subjected the data to further testing and thus conducted a univariate analysis using the paired t-test to establish the significance of the differences between the measure of firm value and financial performance before and after cross-listing. Finally, the study also utilized correlation analysis to analyse the data. The study intentions were to measure the degree and the direction of the relationship between the variables in the study thus revealing the relationship between the variables under study.

4 RESULTS

4.1 Time Series Analysis

4.1.1 Effects of Cross-listing on Firm Value

Considering that the independence of the Tobin’s Q variable is concerned with a time series dataset, thus the study conducted a time series analysis of the results for the Tobin’s Q, liquidity and Leverage, profitability and growth and operational performance of the five firms under study. Time series analysis is important as it illustrates the evolution of the ratios over time.

The figure 4.7 represents the yearly average means for all the firms in the study examining the effects of cross-listing on liquidity and leverage of the firm.

![Tobin's Q Yearly Averages](image)

**Figure 1: Tobin's Q Yearly Averages**

4.1.1 Effects of Cross-listing on Liquidity and Leverage

When studying the effects of cross-listing on liquidity and leverage, the study analyzed the current assets ratio by placing the firms’ current assets against the current liabilities, and the debt to equity ratio for leverage for the years under study. The figure below represents the yearly average means for all the firms in the study examining the effects of cross-listing on liquidity and leverage of the firm.
Figure 2: Liquidity and Leverage Yearly Averages

4.1.1 Cross-Listing Effects on Profitability and Growth
The study analyzed the data for each individual firm for profit after tax against the total assets ratio and also the capital expenditure against the total assets ratio, which computes the firm growth. The figure below represents the yearly average means for all the firms in the study examining the effects of cross-listing on profitability and growth of the firm.

Figure 3: Profitability and Growth Yearly Averages

4.1.2 Cross-listing Effects on Operational Performance
The operational performance of the firms understudy was computed by placing the individual sales for the firm against the total assets to get the total asset turnover of the firms i.e. the operational performance of the firm. The figure 4.25 below represents the yearly average means for all the firms in the study examining the effects of cross-listing on operational performance of the firm.
4.2 Univariate Analysis
In order to examine the significance of the change in the findings for the firm value and performance of the cross-listed firms before and after cross-listing, the study conducted a univariate analysis using the paired t-test for the firm’s Tobin’s Q, liquidity and leverage, profitability and growth and operational performance three years prior to cross-listing and three years after the cross-listing. The results for this study are presented in Table 4.1 for all firms in the study. The year of cross-listing was not included in computing the means for this study only the three years prior and three years subsequent to cross-listing were considered.

Table 1: Descriptive Statistics for Before and After Cross-Listing

<table>
<thead>
<tr>
<th>Descriptive Statistics 3 Years Before and 3 Years After Cross-listing</th>
<th>Mean</th>
<th>Std Deviation</th>
<th>Std Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair Tobin’s Q</td>
<td>Tobin’s Q Before</td>
<td>1.289</td>
<td>0.395</td>
</tr>
<tr>
<td></td>
<td>Tobin’s Q After</td>
<td>1.875</td>
<td>1.807</td>
</tr>
<tr>
<td>Pair Liquidity</td>
<td>Liquidity Before</td>
<td>1.249</td>
<td>0.811</td>
</tr>
<tr>
<td></td>
<td>Liquidity After</td>
<td>2.205</td>
<td>2.697</td>
</tr>
<tr>
<td>Pair Leverage</td>
<td>Leverage Before</td>
<td>3.493</td>
<td>2.597</td>
</tr>
<tr>
<td></td>
<td>Leverage After</td>
<td>2.551</td>
<td>2.272</td>
</tr>
<tr>
<td>Pair Profitability</td>
<td>Profitability Before</td>
<td>0.057</td>
<td>0.056</td>
</tr>
<tr>
<td></td>
<td>Profitability After</td>
<td>0.103</td>
<td>0.126</td>
</tr>
<tr>
<td>Pair Growth</td>
<td>Growth Before</td>
<td>0.015</td>
<td>0.060</td>
</tr>
<tr>
<td></td>
<td>Growth After</td>
<td>0.013</td>
<td>0.103</td>
</tr>
<tr>
<td>Pair O.P.</td>
<td>Operational Performance Before</td>
<td>0.634</td>
<td>0.649</td>
</tr>
<tr>
<td></td>
<td>Operational Performance After</td>
<td>0.495</td>
<td>0.452</td>
</tr>
</tbody>
</table>

The univariate analysis conducted on firms’ value and financial performance is illustrated in Table 1 above.
These findings show that though on average the firm value increased after cross-listing, there was no statistically significant difference in the results before cross-listing with a mean of 1.289 and a standard deviation of 0.395, and after cross-listing 1.875 and standard deviation 1.807, conditions; t(4) = 0.816 and p-value = 0.460 as shown in table 2.

Additionally, the results of the study yielded the results that showed on average the liquidity of the firms increased to the ideal 2:1 ratio, there was no significant difference in the results before cross-listing liquidity with a mean of 1.249 and a standard deviation of 0.811, and after cross-listing 2.205 and a standard deviation 2.697, conditions; t(4) = -1.022 and p-value = 0.365. Leverage decreased after cross-listing but the results had no statistical significance as the mean was at 3.493 and standard deviation 2.597, and after cross-listing 2.551 and standard deviation 2.272, conditions; t(4) = 0.592 and p-value = 0.586 as shown in table 2.

Table 2: Paired Differenced Before and After Cross-Listing

<table>
<thead>
<tr>
<th>Paired Test Statistics for the Tobin’s Q 3 Years Before and 3 Years After Cross-listing</th>
<th>Paired Differences</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
<th>95% confidence interval of the difference</th>
<th>t</th>
<th>Df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower</td>
<td>Mean</td>
<td>Upper</td>
<td></td>
</tr>
<tr>
<td><strong>Pair1</strong> Before; After</td>
<td>-0.586</td>
<td>1.605</td>
<td>0.718</td>
<td>-2.578</td>
<td>1.407</td>
<td>0.816</td>
<td>4</td>
<td>0.460</td>
</tr>
<tr>
<td><strong>Pair2</strong> Before; After</td>
<td>-0.956</td>
<td>2.091</td>
<td>0.935</td>
<td>-3.552</td>
<td>1.641</td>
<td>-1.022</td>
<td>4</td>
<td>0.365</td>
</tr>
<tr>
<td><strong>Pair3</strong> Before; After</td>
<td>0.942</td>
<td>3.558</td>
<td>1.591</td>
<td>-3.476</td>
<td>5.359</td>
<td>0.592</td>
<td>4</td>
<td>0.586</td>
</tr>
<tr>
<td><strong>Pair4</strong> Before; After</td>
<td>-0.045</td>
<td>0.070</td>
<td>0.031</td>
<td>-0.132</td>
<td>0.042</td>
<td>-1.442</td>
<td>4</td>
<td>0.223</td>
</tr>
<tr>
<td><strong>Pair5</strong> Before; After</td>
<td>0.002</td>
<td>0.071</td>
<td>0.031</td>
<td>-0.086</td>
<td>0.090</td>
<td>0.054</td>
<td>4</td>
<td>0.959</td>
</tr>
<tr>
<td><strong>Pair6</strong> Before; After</td>
<td>0.140</td>
<td>0.200</td>
<td>0.090</td>
<td>-0.109</td>
<td>0.388</td>
<td>1.559</td>
<td>4</td>
<td>0.194</td>
</tr>
</tbody>
</table>

Note: Pair 1 represents the Tobin’s Q i.e. firm value; Pair 2 represents the Liquidity and Pair 3 Leverage; Pair 4 and 5 represents the Profitability and growth respectively and; Pair 3 represents the operational performance i.e. total assets turnover.

These findings show that despite the increase in profitability and growth, there was no significant difference in the results before cross-listing. Profitability with a mean of 0.057 and a standard deviation 0.056, and after cross-listing a mean of 0.103 and a standard deviation 0.126, conditions; t(4) = -1.442 and p-value = 0.223 for profitability. Additionally, for growth, there was also no significant difference in the results before cross-listing as the mean stood at 0.015 and the standard deviation at 0.060, and after cross-listing 0.013 and standard deviation 0.103, conditions; t(4) = 0.054 and p-value = 0.959 as shown in table 2.

Finally, the findings show that there was a decrease in operational performance but there was no significant difference in the results before cross-listing operational performance with a mean of
0.634 and standard deviation 0.649, and after cross-listing 0.495 and standard deviation 0.452 conditions; \( t(4) = 1.559 \) and \( p \)-value = 0.194 as shown in table 2.

4.3 Correlation Analysis

The study conducted a correlation analysis in order to measure the degree and the direction of the relationships between the variables in this study. The study intended to find out if there was a significant relationship between the Tobin’s, liquidity, leverage, profitability and growth, and operational performance. The study yielded findings in Table 3.

Table 3: Correlation Matrix

The table below represents correlation between the key variables in the study. The correlation matrix has been compiled used the yearly averages from before and after cross-listing. The year of cross-listing is also included in the study. i.e. -3,-2,-1,0,1,+1,+2and +3.

<table>
<thead>
<tr>
<th>Correlations</th>
<th>Tobin’s Q</th>
<th>Liquidity</th>
<th>Leverage</th>
<th>Profitability</th>
<th>Capex</th>
<th>T.A. Turnover</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tobin’s Q</td>
<td>1</td>
<td>.310</td>
<td>-.417</td>
<td>.909**</td>
<td>-.084</td>
<td>-.210</td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.499</td>
<td>.352</td>
<td>.005</td>
<td>.858</td>
<td>.651</td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.909**</td>
<td>.623</td>
<td>-.549</td>
<td>1</td>
<td>-.278</td>
<td>-.232</td>
</tr>
<tr>
<td>Liquidity</td>
<td>.310</td>
<td>1</td>
<td>-.611</td>
<td>.623</td>
<td>-.393</td>
<td>.153</td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.499</td>
<td>.145</td>
<td>.135</td>
<td>.383</td>
<td>.744</td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.352</td>
<td>.145</td>
<td>1</td>
<td>-.549</td>
<td>-.255</td>
<td>.446</td>
</tr>
<tr>
<td>Leverage</td>
<td>-.417</td>
<td>-.611</td>
<td>1</td>
<td>-.549</td>
<td>-.255</td>
<td>.446</td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.352</td>
<td>.145</td>
<td>1</td>
<td>-.549</td>
<td>-.255</td>
<td>.446</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.352</td>
<td>.145</td>
<td>1</td>
<td>-.549</td>
<td>-.255</td>
<td>.446</td>
</tr>
<tr>
<td>Profitability</td>
<td>.909**</td>
<td>.623</td>
<td>-.549</td>
<td>1</td>
<td>-.278</td>
<td>-.232</td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.005</td>
<td>.135</td>
<td>.201</td>
<td>.546</td>
<td>.617</td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.909**</td>
<td>.623</td>
<td>-.549</td>
<td>1</td>
<td>-.278</td>
<td>-.232</td>
</tr>
<tr>
<td>Capex</td>
<td>-.084</td>
<td>-.393</td>
<td>-.255</td>
<td>-.278</td>
<td>1</td>
<td>-.139</td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.858</td>
<td>.383</td>
<td>.581</td>
<td>.546</td>
<td>.766</td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>-.210</td>
<td>.153</td>
<td>.446</td>
<td>-.232</td>
<td>-.139</td>
<td>1</td>
</tr>
<tr>
<td>T.A. Turnover</td>
<td>-.210</td>
<td>.153</td>
<td>.446</td>
<td>-.232</td>
<td>-.139</td>
<td>1</td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.651</td>
<td>.744</td>
<td>.316</td>
<td>.617</td>
<td>.766</td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>-.210</td>
<td>.153</td>
<td>.446</td>
<td>-.232</td>
<td>-.139</td>
<td>1</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed).

According to the results shown in table 4.3 above, there was no significant relationship between firm value, liquidity, profitability, growth (capex) and leverage. The results with significant strong positive correlations were profitability and Tobin’s Q, indicate that there is a strong relationship and the changes in Tobin’s Q correlate with the changes in the profitability of the firm. There was a strong significant relationship between Tobin’s Q and profitability of the firms in this study.
Additionally, the results with a weak relationship were Liquidity and the Total Assets Turnover. This indicates that the change in liquidity does not relate to the changes in the Total Assets of the firm. These results have a p-value of 0.744, showing that there had no statistical significance. Furthermore, the results with a significant negative correlation were Leverage and Liquidity, a negative correlation between these variables indicates that an increase in Leverage results in a decrease in liquidity and vice versa. The p-value is 0.005 at 99% confidence level, therefore there is a no statistically significant correlation between leverage and liquidity as the p-value is 0.145.

Finally, the results with weak negative correlation were Tobin’s Q and Growth; p-value was at 0.858. This indicates that the change in firm value does not correlate with changes in growth. The Pearson’s correlation was -0.084, close to zero and therefore, these variables strongly do not correlate. Additionally, the notions of significance of the results of this study were not statistically significant.

5 DISCUSSION

5.1 Firm Value as an Effect of Cross-Listing
The results revealed that cross-listing had a relatively minimal positive impact on the firm value and financial performance indicators and particularly firm value. The study yielded a cross-listing premium in terms of the firm value prior to and subsequent to cross-listing. The increased firm value was not sustained as a result of cross-listing. Regardless, the study findings also yielded a significant valuation effect which was consistent with other studies by Doidge et al (2004), Olatundun (2009), Congsheng (2012) and Waweru et al (2012). Therefore, the valuation implications of cross-listing were experienced in the following ways: (i) Firms experienced abnormal returns a year prior to and on actual cross-listing; (ii) Valuation declined two years after cross-listing – evident in all cases. Thus valuation was not sustainable.

Sustained valuation according to various literatures is mainly due to the already existing reward system existing in developed markets where firms are rewarded for bonding themselves to progressive policies that enhance business reputation and thus resulting consistent higher valuation of the firm, years after cross-listing as evident in the American market. Additionally, in these developed markets the strict disclosure policies encourages trading and therefore leads to higher valuation of the cross-listed firm (Dodd, 2013).

Additionally, on cross-listing the investor base of a firm increases which is a direct measure of the increased recognition; thus the increased media attention and awareness to the investors increases a firm’s value (Eng & Ling, 2012). This is evident when computing the Tobin’s Q as the market
price for the firm significantly increased, thus increasing the firm value. For the firms in the study, the market price did rise on cross-listing and thus having causing an increase in firm value for the firm.

However, in the East African market cross-listing does not necessarily guarantee increased recognition. For instance, Umeme Ltd cross-listed in the NSE from the USE in 2013, the firm stock price has not been traded locally but anyone even on cross-listing. Thus, cross-listing in this case may not necessarily guarantee valuation premia for firms in East Africa as the study supports this premise.

Overall the study found out that there was no significant difference in the valuation before and after cross-listing, which was a sharp contrast from the other studies conducted on developed and emerging markets which are associated with valuation premia post-listing. The market dynamics for regional cross-listing in East Africa are not favorable for sustained increase in the firm value as firms are not bound to protect their investors, there is poor information disclosure, unharmonized accounting standards, the market is poorly developed and only few investors are in the market actively participating in its development.

5.2 Liquidity and Leverage as an Effect of Cross-Listing

Dodd (2013) theorized that cross-listing improves stock liquidity as for cross-listed firms stock trade is traded at lower costs, high volatility, and increased trade volumes. Thus as an effect of cross-listing firms that cross-list are expected to have higher liquidity and lower leverage.

The study yielded that there was no significant difference in leverage and liquidity before and after cross-listing, a sharp contrast from the expected results. The expectation is that cross-traded stocks due to the high market trading volume and total turnover ratio have higher stock liquidity, which then intern should affect the firm’s capital structure by increasing equity and reducing the debt capacity of the firm.

For the majority of the firms in this study, firm leverage significantly decreased or remained relatively the same at post-listing. This effect could only mean that the capital rose (which was not sufficient as liquidity did not significantly change) during cross-listing, meaning that this did not make an impact of the firms overall structure as leverage remains unchanged. Thus, capital raised may have been used for expansion purposes but not enough to affect the firm’s borrowing habits.

Debt to equity ratio was the measure used to examine the effects of cross-listing on leverage and was used as an indicator of leverage for it shows to which extent debt was used in capital structure. The ratio of debt to equity declined after cross-listing as the liquidity increased.
However, by the same token the firm leverage was also found to decrease in the years subsequent to cross-listing compared to the period after cross-listing.

However, the effects of cross-listing on liquidity slight increased were evident. Leverage and liquidity were seen to go hand in hand, where an increase in liquidity resulted in a decrease in leverage as just as the cross-listing theories had predicted. However, most firms’ liquidity increase was not great enough to necessitate a change in the firms’ leverage. Numerous reasons may have caused this as firms are not only listing to smaller securities markets but also policy measures in East Africa may not be geared towards investor protection and information disclosures which may have affected the overall liquidity.

5.3 Profitability and Growth as an Effect of Cross-Listing

Profit after tax is the indicator used to measure profitability in this study. The profit after tax increased after cross-listing for majority of the firms under study. This confirms the theories presented by Dodd (2011), where cross-listed firms are expected to be more profitable then their local counterparts. Additionally, Khurana, Ximuín, & Periera (2008) also made the same conclusion.

The study yielded that there was no significant difference in profitability and growth of the firm before and after cross-listing. Overall, firms’ profitability varied from firm to firm. For reasons of expansion of operations into a new market, it was expected that the firms’ profits would increase and so would the firm growth (Waweru, Pokhariyal, & Mwaura, 2012). However, the study yielded mixed results, which was expected as the firms hailed from various industries and different factors do affect them.

Profitability post cross-listing increased but this increase was not sustained. It is expected that firms that cross-list are expected to be more profitable as they have increased investor recognition, they have expanded operations, their sales have been boost and the cost of capital is lower for them (Waweru, Pokhariyal, & Mwaura, 2012). Additionally, the firms gain cross-border marketability of not only shares but also their products and services which is expected to last a long time. It is also assumed that the new found capital by the firms is used to finance profitable projects and thus the profitability of the firm is expected increase. However, in the case for the East African firms profitability is un-sustained and somewhere along the way the benefits of cross-listing are lost.

On the other hand, the growth of the firm seemed unaffected by the event of cross-listing which was not expected as firms that cross-listed were bent on carrying out their expansion plans in their destined markets, thus raising capital for expansion and growth in the region. This despite this fact, the growth of the firm seemed unaffected by cross-listing.
This confirms what was previously mentioned on other studies conducted in the US and other developed markets yielded that cross-listing and growth have a positive relationship (Khurana, Ximuin, & Periera, 2008), while in this case, cross-listing and growth for the firms in this study had a weak relationship and insignificant relationship.

5.4 Operational Performance as an Effect of Cross-Listing

The study yielded that there was no significant difference in operational performance of the firm before and after cross-listing. For majority of the firms, operational performance was on the decrease as the firms sales and also total assets increased simultaneously, with total assets surpassing the increase in sales, significantly after cross-listing due to their entry into new markets. Market entry driven motives for cross-listing thus caused an effect on the overall firm operational performance, computed using the total assets turnover ratio.

The total assets turnover ratio as previously mentioned measures a firm’s productivity and competitive strategy. This for firms choosing to cross-list, their productivity and competitiveness seems to remain unchanged after cross-listing or declines. The why cross-list, if cross-listing does not enhance productivity of the firm or competitiveness? In the developed markets, firms that chose to cross-list are more competitive in the domestic market as they are viewed to be much better than the local counterparts.

Additionally, this comparison of assets to sales also illustrates the management control over the firm. This control is mainly seen in the management of current assets and current liabilities, which in this case have risen from the increased investments into the firm. Thus, the results have clearly distinguished effectively between the sales induced changes in investment and other causes such as poor operational performance.

Therefore, on cross-listing firms experienced increased total assets and since the total assets turnover ratio is a measure for the management diligence in managing these assets is being put to the tested, then we can therefore conclude the firms in this study did not effectively manage increased assets which resulted in a decline in the results for operational performance of the firm.

Furthermore, continued on a downward trend and thus management should be held accountable for the poor performance of the firm as making costly strategic moves such as cross-listing should ultimately increase the value for shareholders at the end of the day. Therefore it is important to note that cross-listed firm in more developed markets would react with a higher management turnover to correct the poor performance in the post-cross-listing period as cross-listed firm should be more sensitive and protect investor interests.
According to Charitou & Louca (2009), the abnormal returns resulting from cross-listing such as increased sales and total assets by the firm are positively related with the post-listing abnormal changes in operational performance. Moreover, in their study on cross-listing and operational performance, they found improvements in operational performance only for capital-raising firms after listing. For this study, the firms all cross-listed for capital-raising motives but their operational performance did not perform as expected, thus not consistent with other studies conducted in the US stock exchanges.

6 CONCLUSION AND RECOMMENDATIONS
The current study addressed the effects of cross-listing on firm value and financial performance and concluded that the overall firm value of the firms increased, so did liquidity of the firm. These results are consistent with the bonding hypothesis and the liquidity theory. However, leverage, growth and operational performance decreased. On the other hand, the results on profitability varied from firm to firm but overall, firm profitability increased.

The study recommends that firms continuously work towards shareholder wealth maximization and enhance the perception of the firm in the market in order to have sustained increase in firm value. Additionally, firms may attempt to implement policies geared towards transparency, more information disclosure and enhanced corporate governance through the institution of good practices. A transparent firm is more likely to have more willing investors and this increased the volumes of shares moves, which translates to higher firm liquidity and decreased leverage of the firm.

For further the research, a study focusing on regional cross-listing, share valuation differences of cross-listed and non-cross listed firms would be beneficial. Additionally, a study focusing on impact of regional cross-listing on stock market development and economic growth would provide useful information for policy formulation and increase government involvement. Furthermore, the managerial motives for cross-listing and also their expectations post cross-listing would provide great insight on the managerial decision making motive. Finally, future studies may consider delving into the valuation effects controlling the overvaluations and market timing effects which have considerably affected this study.

7 REFERENCES


25


