National College of Ireland

Impact and Implications Analysis of Fintech and International Trade & Supply Chain Finance

MSc Research Project
MSC FINTECH

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MSc Project Submission Sheet

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Contents

Fintech and International Trade & Supply Chain Finance

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Abstract

This paper examines whether FinTech enables suppliers to achieve more profit and liquidity in the Trade and supply chain Finance (T & SCF) ecosystems compared to the traditional banking channels. Also, the specific objectives of the study are; (1) to determine whether FinTech exists in the business especially in multinational trade, (2) to evaluate the significant difference between FinTech and traditional banking channel and (3) to determine the relationship between FinTech and the performances of supply chain ecosystems. In earlier literature study, FinTech and T & SCF were addressed separately and rarely interconnected and this topic is hardly under research. The study was built on two theories namely; (1) Frictional Theory of profits - emphasizes more on the changing world through technology and believes that when technology changes, profits are likely to be realized .(2) Real Bills Doctrine of the Commercial Loan Theory - underlines the loan which are in short term nature where T & SCF facility offered by a bank is a short-term and self-liquidating loans. The study adopted the realism type of research and data was gathered from the Kaggle trade statistics and virtual data set. The gathered data was analysed using "R" and applied ARIMA model for quantitative data and compare the result of both data sets to assess impact, influences, and test the hypothesis stated. It further identified that Fintech aids in interest rate reduction and leads to an increase on supplier's profitability and marginally influencing the liquidity than traditional banking channel. Finally, the study recommends that Fintech companies to explore the business opportunities in invoice trading and InsurTech to examine invoice -by-invoice insurance protection model and suppliers to adopt alternative financing availability and banks to collaborate with Fintech and the governments to control the activities of trade transactions and digitalization

1 Introduction

1.1 Background

In this chapter, some of the key concepts regarding Fintech, Trade and supply chain finance, and motivation, context, purpose, objectives, research question and hypotheses of the study are discussed.

1.2 FinTech

It is an abbreviation of Financial Technology and includes both financial services and technological products. It is an innovative business model that transforming the financial sector with digital technology from Artificial Intelligence to Cryptography and created a plethora of possibilities and product and services. The FinTech aims is to fill the inefficiency gap in traditional banking and its legacy system with specialized software and algorithms. The statement of Bill Gates in the year 1994, "banking is necessary, banks are not" has become more realistic now. Fintech business model is designed to enhance the user experience, improve productivity, cost reduction, and resulted in innovation and services transformation in financial sectors. (Varga, 2017). Examples of FinTech is the use of phones in banking, use of cryptocurrency among others that focus on making sure people can access financial services everywhere and at any time.

Companies dealing in financial technology are either in the form of new businesses or already existing financial companies that tend to improve the technology of financial services that use traditional methods of banking. Modern industries currently use technology and software to avail financial services to their customers (Bofondi &Giorgio, 2017). Nowadays, companies dealing with FinTech have stiff competition with banks and aligned with new generations expectation such as fast and easy banking operations.

1.3 Trade and Supply Chain Finance (T&SCF)

It has been closely associated with the commerce and history of human trade evolution. It is a century-old financing model and influenced the Government policy, economic conditions, standard of living, and degree of financial inclusion. There are multiple parties involved in the transactions and core principle has been trusting among buyers and the sellers (Ref Appendix A). However, the main challenges in the trade transactions arise on enforcement of trust among stakeholders as well as mitigation of payment risk. This trust imbalance is overcome by the support of Banks and Financial institutions (B&FI) by creating a safety net between the buyers and the sellers. Banks provide financing facility from short to a medium-term loan in exchange of goods (domestic and international), generally through letters of credit, guarantees, factoring, invoice discounting and whereas 80% to 90% of trade transactions depend on this facility. (Xin Fin Orginization, 2018). According to Mckinsey report (*), SCF has potential global revenue of US $20 Billion and around the US $40trn outstanding invoices at any point of time globally.

Global supply chains are transforming and influenced by emerging technology. FinTech companies do intermediate between the institution and its suppliers (Ref Appendix B). They do provide working capital for the sellers and loans to buyers. This means both the suppliers and the buyers will benefit increasing liquidity and timely payments. Global Companies such

as Colgate, Dell, Apple, Adidas, Acer.Inc, among others, use FinTech to get capital that was never accessible in the past in supply chains to finance the growth of companies, develop new products on market, improve their financial standing and increase the capital available to the suppliers (Bofondi & Giorgio, 2017).

1.4 The Motivation of the study

Technology plays a vital role in the international trade and reflects the integration and dynamism in supply chain processes and its eco-systems. Companies in multinational trade have made several investments through operating in their own companies. However, the multinational companies do not only participate in investments of their home country but also countries abroad and sell off their products and services to the outside markets to help them to attain more profitability and stable liquidity (Gomber, et al., 2018)

Alavi, S. & Jabbarzadeh, A., (2018) revealed that the trade transactions are passes through the material, information, and financial flow between stakeholders. In earlier literature, the materials and information flow were discussed where financial flows are rarely discussed. Xu, et al., (2018) reinforced the statement that SCF is an emerging area and more research is required using experimental and case study by considering the multifaceted trade credit policies. Del Gaudio, B., et al., (2018) conferred that the development of financial markets and regulatory changes required banks to comply various norms and it has a repercussion on Small and medium enterprises to avail the financing facilities. This further required to assess that traditional banking facilities are an instrument to trade finance or different channels are required to fill the gap. Wang, C., et al., (2019) further states that the development of digital banking provides an enormous opportunity for alternative lending. Kavuri, A. & Milne, A., (2018) mentioned that earlier literature review fails to connect the emerging trend of Fintech such as Artificial Intelligence, Blockchain, Machine Language in banking channel.

The above literature and several reports indicate that the international trade in the supply chain finance is a versatile point which needs the special kind of data empirically to understand the difficult trade policies in credit (Werner. & A. R., 2016). This paper examines the impact and implications of Fintech towards T & SCF of goods and services in supplier perspectives. The operation of FinTech can be viewed at a wider range in five years back. The trade model around the globe was unable to bridge the gap of T&SCF and now served by Fintech firms. It is also clear that international trade and supply chain finances are serially correlated with the banking channels.

1.5 Context of the study

The economic growth in the world mostly leans on trade among many countries and a stable functioning supply chain management. Though technological advancements to improve and be used all over the economies, the main challenge to Fintech is in the expansion of trade and proves it to be more effective and safer (Bruton G, et al., 2015). The transactions under trade finance are manual process and paper intensify work. Therefore, the benefit of digitalization of trade procedures is a significant cost saving by eliminating the manual processes and administrations of trade documents. This can be roughly estimated to one out five of the total costs in physical transportation (Lukonga M I, 2018). Moreover, the digitalizing the process (Ref Appendix C) also helps governments getting stronger visible international trade and supply chain documents to eradicate black marketing, smuggling

among other related problems. This is true because the existing supply chain process has been not doing well especially in promoting international trade among the countries.

Considering the above and with all the relevant literature in this study ,evaluating the FinTech and T&SCF ecosystems along with the emerging trends helps to 1) Guide the Fintech to adopt the business model.2) Eye-opening to the B&FI to blend and adopt the new technologies.3)Supplier can explore the alternatives means of financing and change the way of doing business in ecosystems.4) Address the financial flow in and fill the earlier literature gap.

1.6 Purpose of the study

In the International trade, the relationship between buyers and sellers have a chain effect and any instability on the relationship often leads to business impacts. As Fintech has an evolving industry that has established over the past decade, it has brought innovations and disrupt the traditional banking and international trade. The study of the linkage between the Fintech and traditional banking with suppliers' perspectives on T & SCF ecosystems is worth to study. The purpose of the study is to examine whether Fintech allows suppliers to yield more profitability and liquidity in the supply chain ecosystem as compared to traditional banking channel. This process is carried out by analysing and comparing the data from traditional banking and Fintech towards T & SCF. This report assists stakeholders to understand the impact and implications of Fintech to improve their profitability and liquidity.

1.7 Specific objectives

- To determine the role of Fintech to enable the suppliers to achieve the competent way of financing and liquidity and as an alternative source of financing to Small and Medium Enterprises.
- To investigate the technology support to increase efficiency and reduce the cost to stakeholders.
- To examine the relationship between FinTech and its impact, implications, synergy, and influence in the T & SCF.

1.8 Research question

Banking and Fintech a level playing field –

"**What are the impact and implications of Fintech to suppliers in achieving more profitability and liquidity regarding trade & supply chain finance ecosystem compared to the traditional banking channels?"**

1.9 Research Hypotheses

From the supplier's perspective, the interest rate is an important aspect and any increase and decrease of rate have repercussion on the profitability. Moreover, the suppliers have challenges to get the finance (liquidity) at the right time through banking channels due to various reasons. Considering this and based on earlier literature, the following hypotheses are put forward.

Hypothesis 1: Is FinTech penetration into T&SCF ecosystems have direct impact/implications of the interest rate/profitability to the suppliers? (Kannan, 2019)

Javier Canto-Cuevas, et al., 2019 stated that there is a direct correlation exists between the interest rate and profit across the companies. The supplier's profitability affects not only by changes in firms' structures, environment, government policy, but also due to interest rate fluctuations on borrowings.

Hypothesis 2: Is the growth in FinTech directly relates to the suppliers to provide more liquidity than traditional banking? (Kannan, 2019)

The suppliers are part of manufacturing ecosystems, and companies depend on the supplier's goods and services for production. There exists the time lag between the production and sales which resulted in the working capital gap to buyers and sellers. This force both stakeholders to avail the traditional finance or alternative finance (through FinTech) with lower cost. (Javier Canto-Cuevas F, et al., 2019)

The remainder of the paper proceeds as follows: Section 2 discusses and critical analysis of the related work, In Section 3 describe the methodology and design specification, Section 4 deals with implementation, Section 5 relates to evaluation, Section 6 deals with result discussion and Section 7 concludes the paper with a summary and future works .

2 Related Work

This chapter discusses the previous literature review regarding this topic.

2.1 Theoretical review

The research built on two theories which are the Frictional Theory of profits and the Real Bills Doctrine of the Commercial Loan Theory

2.1.1 Frictional Theory of profits

According to Prof. G.J. Stigler (American economist), profits do exist which act as a reward to capital and should be repaid to the owner for reinvestment and savings after consumption and keeping it minus any returns (Gomm M, 2010). An economy which has constant growth without any fluctuations in demand and costs earns normal profits and as result capital could not increase in the long run. Frictional theory of profits describes shocks and changes (Technology) that usually occur in a country due to the unpredicted changes in demand and cost conditions and may lead to disequilibrium in the economy and causes the existence normal profits or losses to respective firms. Therefore, with frictional theory, economic profits are earned for a given period due to frequent changes caused by frictional factors that limit adjustments in the system to emerging conditions. However, if economic profits are enjoyed in the long run, many firms will be attracted to enter the industry and if firms operate under losses, some of them will tend to move out of the business (Haddad C & Hornuf L,2016). As the technologies alter the interest cost and influencing the profitability, this theory is relevant for this research.

2.1.2 The Real Bills Doctrine of the Commercial Loan Theory

The theory was based on the law that businesses should only be given short term self-liquidating and productive loans by commercial banks. Loans that are borrowed for short term which are repaid from cash generation of such goods and services is known as self-

liquidating loans (Balgova M & Plekhanov A., 2016). According to the commercial loan theory, the commercial bank should give short term loans only and only if it creates self-liquidating. (Gomm M, 2010). When this principle is applied, there is an equilibrium in the liquidity of all banks and equal distribution of money in the entire country. As this loan mostly have a short maturity period and self-liquidating, the bank losing money to such loans is 0 percent and these loans stimulate the productivity and income to the banks. However, there are some demerits associated with this theory where the borrower who fails to clear the first debt (risk of fund diversification) and claims for a new loan creates disequilibrium in the economy (Barba G N, et al., 2017). T & SCF facility provided by a bank is indeed a short-term nature and self-liquidating loans and as such this theory is pertinent for this study.

2.2 Related literature

Varga, (2017) carried out research which targeted to cover up the current academic literature about the existence of innovative financial technology companies. His study provided an overview of the most important factors for the rise of FinTech such as business models, open innovation and others. This research provides an alternative approach to make it clear for readers on how financial ecosystems have boosted the appearance of innovative technology companies and expanding at a faster rate.

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According to Deloitte Globe (2019 @), FinTech companies have objectives to solve problems related to the financial industry. Ajlouni & Hakim, (2018) further stated the issues like inefficient data, limited customer care services, difficulties in reaching their far customers can now be easily solved using FinTech. However, there are certain activities which can be solved only by banks due to experiences and familiarity of traditional banks where Fintech have challenges to solve. As such both FinTech and traditional banking channels can cooperate with each other for mutual benefits. Further, Deloitte emphasizes that the traditional financial sectors and FinTech companies can only solve the customer pains in financial services only if they work together.

Chunyan Chen & Ziyi Zhang, (2018), performed research on the differences between FinTech and the traditional financial sector in the United States and the aim is to determine the type of financial transactions that can affect the prices of commodities in industries. They found out that in 2008, there was a gradual decline in the economies all over the world due to the financial crisis and the general public lost hope and trust. As such the FinTech industry emerged during the same period where new technology such as machines for money transaction is applied and innovation keeps on raising and hit the traditional financial industry. While analysing the data, the Granger causality test under the VAR framework and the Toda Yamamoto version of Granger causality approach were applied to estimate the validity of the study. The results showed that there was a positive correlation between Fintech and traditional banking channels.

Farboodi M & Veldkamp L.,(2017) stated that financial technology empowers companies to manage their financial situations more effectively than traditional banking platforms. The suppliers in the ecosystems get the timely payment for supply of inventories to their business with the support of Fintech firms. Thus, it can be inferred from the discussion that FinTech plays important roles in the financial management of business organizations. Curtis E & Sweeney B, (2017) further mentioned that FinTech aids the companies to make tangible business strategies using the technologically advanced platforms based on the information acquired. Additionally, Carney, (2017) claimed the FinTech makes more fiscal resources to both existing companies and start-up. The fundamental of Fintech is a product innovation and

makes goods and services available to customers at low cost earn more revenue through economies of scale. As a result, these companies use this cashflow towards the return to the shareholders and the supplier payments. This leads the business continuity and enables the companies to obtain more raw materials and further capital from the investor (Gomber, et al., 2018). As FinTech delivers a solid base for the global flow of income and capital, it becomes instrumental for international trade.

Kwon I.W.G, et al., (2016) noted that the FinTech structures would attribute to liquidity and profitability to supplier companies using the online banking platforms. This leads to more working capital to the supplier's business and can be reinvested for raw material and inventories for more revenue. Hackius N & Petersen M, (2017) reinforced the view that regular cash and revenue flow to supplier's business enables more profitability and liquidity. Tunca T I & Zhu W, (2017) in their research mentioned that use of Artificial intelligence (AI) in business and its integration to inventory models enables better financial management. Also, as Fintech is a real-time and updates the transactions simultaneously into the system enables to overcome the traditional challenges and has brought the disruption in T& SCF. This research further stated that the application of AI by suppliers in their business help for better inventory management cost reduction and offer a competitive rate to the manufactures. Thus, Fintech boosts not only the liquidity but also inventory management and leads to higher profit.

Haddad C & Hornuf L., (2016) pointed out that the probability of default discourages the investor investing in new business. However, the trade finance is self-liquidating loan and thus encourage the Fintech firms to venture into trade finance facility for both established companies as well as to SME. Further, Schindler, (2017) stated that financial regulatory authorities are monitoring the Fintech functions especially on the transfer of the money to prevent the anti-monetary, fraud and ensuring to minimize the will-full default. The view of the author endorsed by the fact that Fintech platforms are regulated by the apex banking authorities in different countries with different policies and regulations. For example, the apex bank of the United Kingdom has made Fintech platforms are more secure and safe and created the ecosystem for the investor to venture into trade finance and it becomes more accessible to unbanked suppliers.

Above literature provide motivation and direction for exercising this report. Further, the above literature review and theory to the discussions, we infer that linking Fintech and T &SCF is necessitated to understand the shift which is taking place in supply chain ecosystems. Further, the study of the financial technology to supplier's perspective along with trade finance resulted that FinTech is pertinent to the suppliers and its profitability and liquidity.

3 Research Methodology and Design Specification

3.1 Method overview

This chapter discusses the research method, tools, techniques and data used to test Hypotheses.

3.1.1 Method Applied

The research procedure used under this report is a quantitative method using the Machine learning technique-Time series Auto ARIMA model Algorithm.

3.1.2 Machine learning

It is part of Artificial Intelligence (AI) generally involves in computational business requirements based on the algorithms with the ability to study and progress themselves by being exposed to new data. It is classified into three branches namely supervised, unsupervised & reinforcement learning. In Supervised learning, the algorithms make their estimates based on a set of historical data while Unsupervised learning is based on clustering of the data. Similarly, the reinforcement algorithm applies to data where it repeatedly trains itself. (Judith Hurwitz & Daniel Kirsch, 2018). The supervised learning can be further split into regression or classification models. The output of Classification models is discrete while the output of regression methods is a continuous value. This makes the regression model is the appropriate choice for the application of this thesis.

3.1.3 ARIMA

ARIMA stands for Autoregressive Integrated Moving Average. It is a Linear model that predicts the future value based on past trends and its own inertia. It is part of the regression analysis that ascertains the strength of moving variables with one dependent variable. In general, it applies when the data is reasonably large and there exist the correlations between the past trends and the observations is solid. (Adhikari & R. K. Agrawal, 2013)

3.1.4 Terminologies and Formula (Adhikari & R. K. Agrawal, 2013)

ARIMA: It uses the combination of autoregression (AR) and integrating (I) with a moving average (MA). Time series contains both AR and MA which represents the current value is dependent on both previous value and error terms

Autoregression (AR): It represents that expected value at any given time is a linear function of two previous values.

Moving average (MA): This denotes the expected value at a given time is a linear function of the two previous noise terms.

Integrating (I): Denotes integrating of AR and MA.

This model is also called as “ARIMA (p, d, q)” model and represents by

p -value: It denotes AR Component and integrating the effect of past values into the model. It is otherwise called a lag order value and represents the number of lag annotations in the model

d -value: It represents the degree of differencing that enables the number of times where the observations are differences needed for stationarity.

q -value: It refers to the order of MA component and the size of moving average which directs the number of lagged forecast errors in the estimated equation.

ACF: The autocorrelation function (ACF) is a mathematical algorithm to enable to identify the repeating patterns on the data and time series is determined by its variance, means, and ACF.

PACF: The partial autocorrelation function (PACF) is a contrast to ACF where it runs with its own lagged values, controlling for the values of the time series at all shorter lags.

To fit ARIMA (p, q): the following equation is applied

$$y_t = \beta_0 + \beta_1 y_{t-1} + \cdots + \beta_p Y_{t-p} + \varepsilon_t + \theta_1 \varepsilon_{t-1} + \cdots + \theta_q \varepsilon_{t-q}$$

AR MA

Lag -1 single differencing (Integration)

$y_t - y_{t-1}$
This is used for removing trends. Order d= {0,1,2}
Order d = how many times to perform lag-1 differencing?
d=0: no trends (no differencing)
d=1: linear trend (perform differencing once)
d=2: double differencing

Seasonal lag – Multiple differencing:
$y_t - y_{t-M}$

This is used for removing seasonality. Order D= {0=none, 1=once}

The below describes the ARIMA forecasting equation for better understanding.

Let Y denote the original series and y denote the differenced (stationary) series.
No difference (d=0): $y_t = Y_t$
First difference (d=1): $y_t = Y_t - Y_{t-1}$
Second difference (d=2): $y_t = (Y_t - Y_{t-1}) - (Y_{t-1} - Y_{t-2})$
$y_t = Y_t - 2Y_{t-1} + Y_{t-2}$
Note that the second difference is not just the change relative to two periods ago. i.e., it is not $Y_t - Y_{t-2}$. Rather, it is the change-in-the-change, which is a measure of local "acceleration" rather than a trend.

The key driver for using time series -ARIMA method is based on the fact that both the global market and financial technology are undergoing a radical change. The study of data with the timeseries analysis would enable to understand the chronological advancements of FinTech to furnish to various industries and how it has already surpassed traditional banking channels in turns of utilities. Moreover, T&SCF is growing due to the continuous advancement of technology and analysing the FinTech and its impact and implications in the ecosystem using Machine learning enables to address the hypotheses.

3.2 **Tool used**

Though the above formula can be used with manual calculation, considering the large volume of data and to get accuracy result, this report used "R Studio". The process involved the application of CRISP-DM approach and includes fetching data from Kaggle and other reliable sources, developing timeseries model, training and testing the data and measure the performance metrics using the Root Mean Square Error (RMSE) as per below formula.

$$RMSE = \sqrt{\frac{1}{n}\sum_{k=1}^{n}\left(\hat{f}_k - f_k\right)^2}$$

3.3 Variables and data under the study

The study considered the two kinds of data sets. One of the data set is from Kaggle "global community of trade statistics" and includes the three decades trade flows globally. The variables in this study involve years, regions, amount in US$ with their respective countries, items to be exported or imported and many others (10 Columns and >1 million rows). The main idea for choosing such data set is to provide a benchmark of trade flow as these funds given were sited through banking channel and as well as used trading finance facility to extent of 80% to 90%. (Xin Fin Organization, 2018).

Secondly, FinTech and supply chain finance is a broader area and due to this, the data is fragmented in various ways in the financial industry. As such, this research formed with virtual data sets (2nd data set) and gathered from several sources and these include; World Bank, IMF, WTO, Statista.com and among others. The key attributes are 1) Credit disbursements via FinTech platforms (Invoice Trading) 2) interest Cost as per % of total remittance value 3) Global FinTech adoption 4) Expected ROI on the FinTech Investments

4 Implementation

This chapter discusses the implementation of the proposed solution

4.1 ARIMA

The auto ARIMA model involves the time series of {trade_usd} value and it will calculate the p, d and q values within to train it. Hence the trade_usd value has to be transformed as timeseries and the data has been divided into train and test sets. The approach has been trained with the train data set and built the predictions. The RMSE metric has been designed by using actual test values and predicted values.

4.2 Implementation Steps

Following steps are followed to implement the model in "R"

1) The data have been loaded for both data sets and since the data set1 is large, it split into two files and merged.
2) As data set1 contains >200 countries and for import and export amount separately, the data are aggregated for import and export trade_usd value to arrive top 10 countries and selected top 5 countries to focus for the research.
3) This data has been converted into time series for the top 5 countries trade_usd value column and
4) The data has been chronologically split into the train (first 80%) and test sets (remaining 20%). Hence, the predicted values can be compared against actual test values from each frequency to measure the accuracy of the model.
5) Auto ARIMA model has been fit using trainset for the top 5 countries and the future values have been predicted based on the data frequency for the next 10 years.

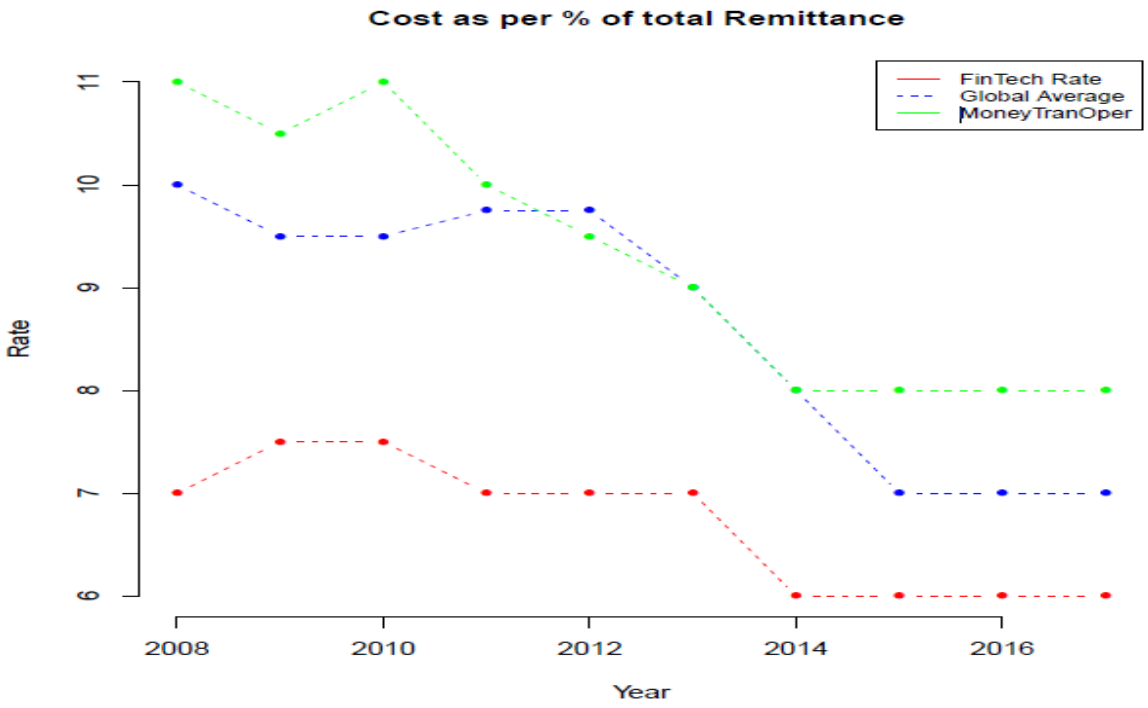
6) For Data set1 -RMSEs have been considered to find the estimate performance by using the actual (test set) and projected values for each of the top 5 countries.
7) For data set2 -applied plot function and exhibit the data in the graph.

5 Evaluation

The purpose of these sections is to provide the overview analysis of the result including the graphs, chart, and plots.

5.1 Experiment 1- To test the hypothesis 1

Figure 5.1: Cost as per % of total Remittance.



The above data are gathered from the World bank regarding the interest rate trend from 2008 to 2017. Also, money transfer operators and Global average are being displayed in the figure above as in comparison with the costs of total remittances with Fintech. It was observed that the rate has been gradually declining due to the FinTech service providers and proof that it is competition to the traditional financial services (Ref Annex F)

5.2 Experiment 2 - To test the hypothesis 2

The test is conducted for both traditional banking (A) and Fintech (B) data sets to compare and address the hypotheses stated.

5.2.1 Traditional Banking using data set 1 (A)

5.2.1.1 Descriptive statistics

This helps to understand the Min, Max values of data to proceed further.

Table: 5.1: For data set 1, following is the descriptive statistics for the column {trade_usd}

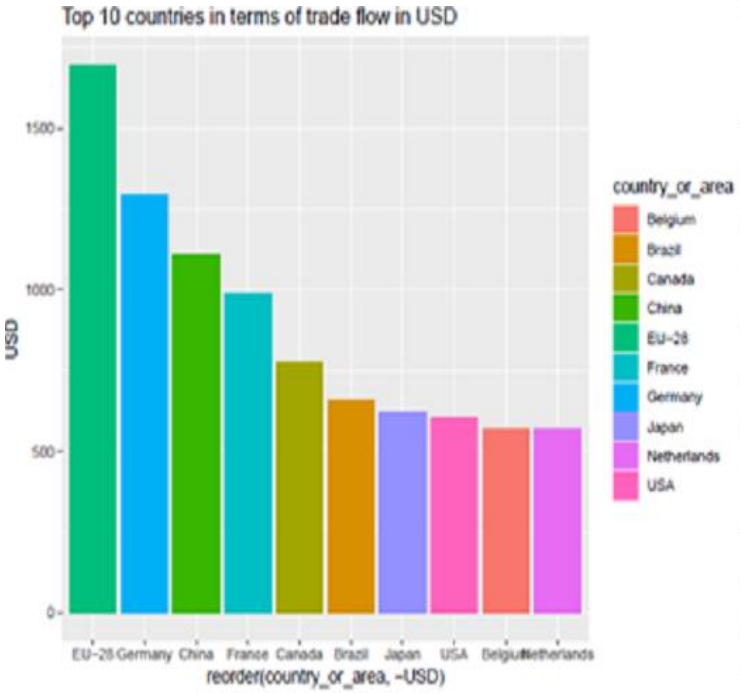
Min.	1st Quartile	Median	Mean	3rd quartile	Max
1	8028	116237	14580205	1558695	40261719672

.

5.2.1.2 Exports and Imports for the top 10 countries (Descending order)

Using the data obtained from the trusted sources listed in chapter 3.3 above, the traditional banking data was obtained and presented below.

Figure 5.2



S.no	country_or_area	US$ Bn
1	Netherlands	568
2	Belgium	569
3	USA	602
4	Japan	621
5	Brazil	660
6	Canada	775
7	France	990
8	China	1110
9	Germany	1292
10	EU-28	1696

* EU28 -Excludes Germany & France

The above figure 5.2 shows imports and exports of goods for top 10 countries in US$ (out of 200 countries in the data set selected). The results are represented in descending order. The findings show that EU-28 has got high imports and exports of goods and the least being the Netherlands. However, For the purpose of the study, this report selected only top 5 countries namely EU28, Germany, China, France, Canada

5.2.1.3 Performance Report- RMSE

The RMSE value calculated for each of country on the test dataset (Actual Vs. Predicted)

Table: 5.2 RMSE

S.no	Country	Train_rows	Test_rows	RMSE
1	EU-28*	12	4	11.136364
2	Germany	20	6	21.656876
3	China	20	5	23.315414
4	France	18	5	7.234338
5	Canada	22	6	5.719369

*Excluding Germany & France

The above table infers that the model can be applied to predict the {trade_usd} value for next 10 years. Even though China and Germany RMSE are slightly higher, the difference is minimal, and results can be reliable.

5.2.1.4 Prediction for the next 10 years

Based on the model built, predicted th**e** {trade_usd} value for next 10 years for the top 5 countries and result below:

Table 5.3: 10 Years projection of Trade flows in US$ in Billion for Top 5 Countries

Year	Canada	France	Germany	China	EU 28*
2017	55	67	87	125	171
2018	57	69	90	130	177
2019	59	70	92	135	184
2020	61	72	94	140	191
2021	63	74	97	145	198
2022	65	76	99	150	205
2023	67	77	101	155	211
2024	69	79	104	160	218
2025	70	81	106	165	225
2026	72	83	108	170	232

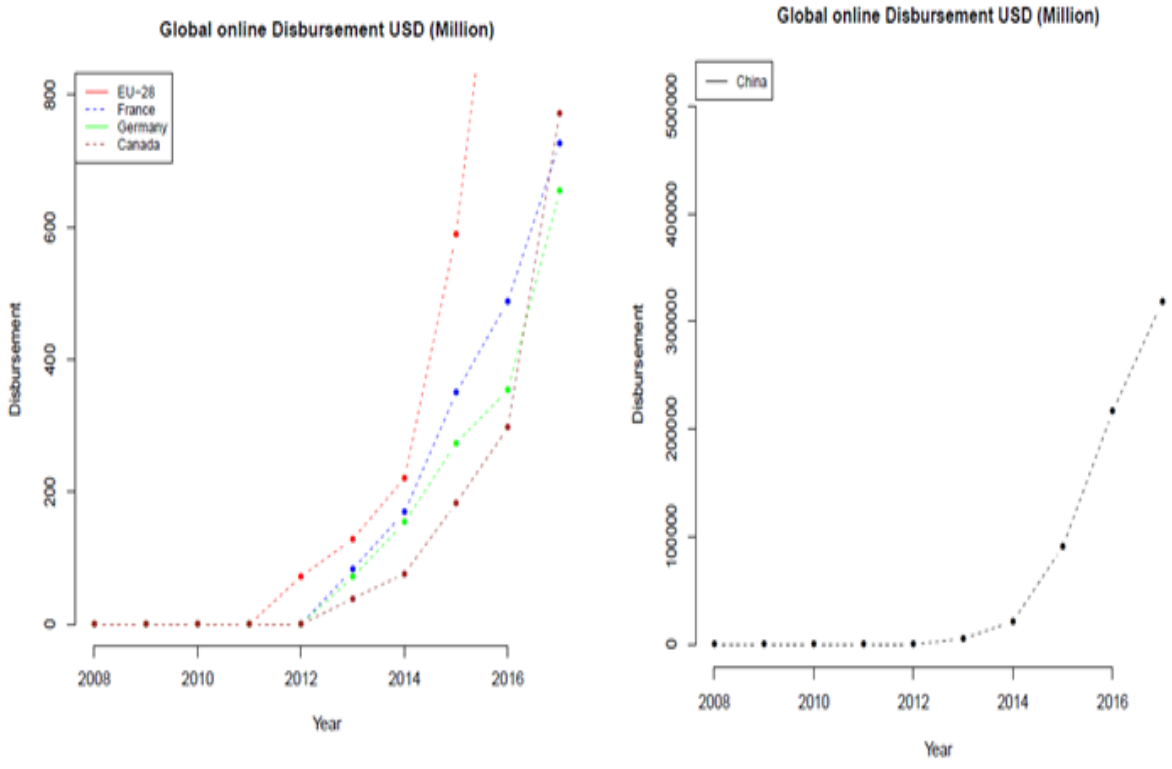
*Excluding Germany & France

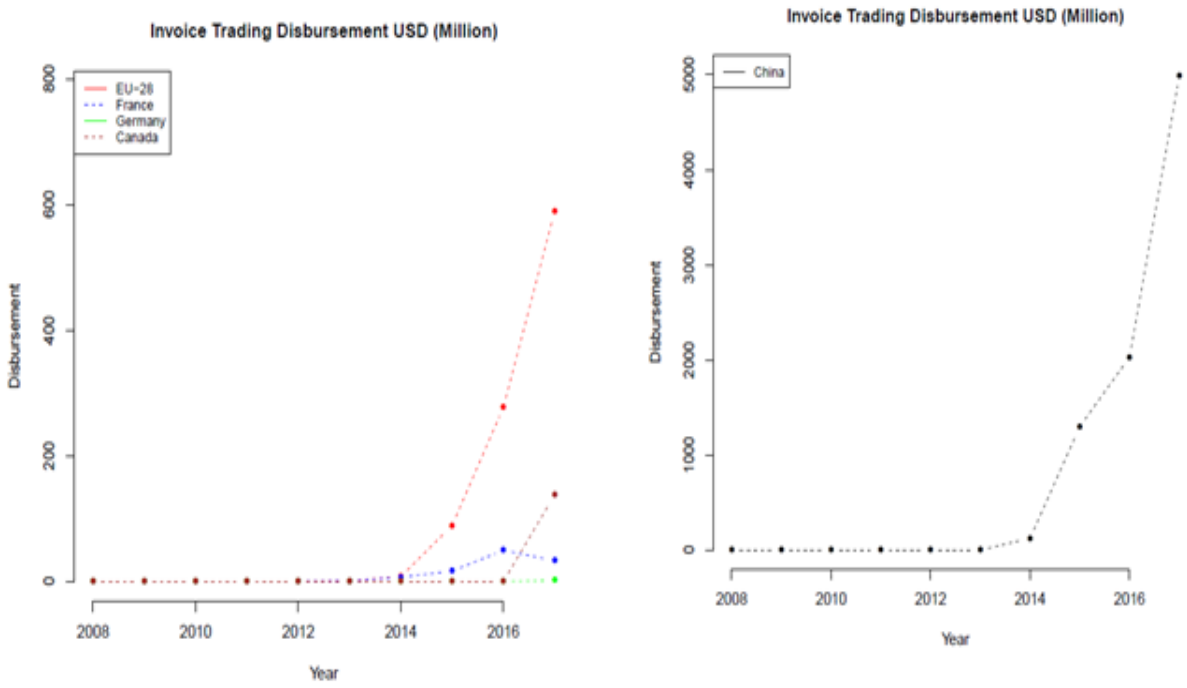
The above infer that all 5 countries showing upward trend based on past trend. (Refer - Appendix D)

5.2.2 Fintech data set 2(B)

5.2.2.1 Global online and Invoice Trading Disbursement in USD (Million)

Figure 5.3 (Euro to USD @ 1.1 conversion rate)





The above graph represents the data gathered from Cambridge University alternative finance for the top 5 countries selected for this report. Though alternative finance consists of P2P, consumer, Balance sheet lending, etc, this report selected only the invoice trading disbursement as it relates to T&SCF business model. Besides, this graph includes the overall Fintech online disbursement. The raw data gathered was in Euro million and converted into USD @ 1.1. Further, China disbursement was in US$ billion and presented separately due to the wider gap in comparison to other 4 countries disbursement (in million).

6 Results Discussion

In this section, the result methodology of the performed study is discussed in line with the hypotheses stated in 1.9 above. Finally, the research question mentioned in 1.8 is answered in the conclusion along with stakeholders' impact and implications.

6.1 Hypothesis 1 - Interest rate/profitability to the suppliers

Figure 5.1 presents the Cost as per % of total remittance by comparing the rate charged by money operator, Global average, and Fintech companies. It is observed that in the year 2008 the Global average rate was at 11% and has been reduced to 8% and similarly the money operator rate was at 10% and reduced to 7% in the span of 10 years. However, the rate charged by the Fintech companies was started at 7% in 2008 and gradually decreased by less than 6% till 2008. It is evident from this analysis that technology is the key driver for the cost reduction and as stated in 2.1.1- Frictional Theory of profits, the technology influenced the market, demand and supply conditions and creating friction in the economy.

Conclusion:
It is apparent from the above discussion that the Fintech plays a critical role in the interest rate reduction and in turn increase the supplier's profitability. Besides more and more Fintech companies are focusing on the T&SCF business leads to further rate reduction as well as increase in supplier's profitability. However, this could be a challenge to the traditional banks to sustain in the long run.

6.2 Hypothesis 2 – Liquidity the suppliers

The linear model ARIMA for data set 1 has produced reliable predictions on any frequency as the RMSE values are lower and the model is a better fit for the benchmark. Table 5.3 represents that Canada, France, and Germany expect to grow 20% to 25% and China and EU-28 expect to grow 30% to 35% over the next ten years.

Similarly, for data set 2, Figure 5.3 reflects the online and invoice trading disbursement through Fintech for top 5 selected countries and by looking out the result, data infer that Canada, France, Germany and EU 28 the overall transactions and invoice trading disbursement is less than USD 1800 million and where China was at US$ 35B Billion(online) and US$ 5.6 Billion (invoice trading) in the year 2017.Besides, Germany and Canada the invoice trading model was started only in the year 2017.

Conclusion:

On comparing the above result, it infers that the disbursement of trade flows by traditional banking is more than US$ 50 billion (Refer: Figure 5.2) whereby the overall invoice trading disbursement by Fintech company is less than US$ 7 Billion (selected countries). This reflects that the demand and supply of working capital requirements are not fully tapped by Fintech companies and inadequate to support the supplier's liquidity. Therefore, in response to the hypothesis stated, the growth of Fintech is slightly influencing the supplier's liquidity and yet to capture the market potential as well as the growth of trade flows. However, the investigation of whether Fintech firms provide more liquidity than traditional banking to suppliers remains and is worth considering empirically. Though market sizes of invoice trading by Fintech segments are still small, it reflects the wider gap and huge business opportunities and might soon become systemically relevant and should be carefully examined by Fintech firms.

6.3 Implications for Fintech Companies

The insights of this article might guide the Fintech companies in their strategic decision on how to venture into a new business model/ country. Further, the ARIMA Model developed in this report is readily available and can be replicated to other data sets to have an informed decision by Fintech firm. Moreover, the research **(#)** stated that 60% of this business model is repeated in nature and expected average ROI is 10 % to 15%, it is worth focusing the invoice trading segment by FinTech firms.

Furthermore, the impact of BASEL III and its capital requirements influencing the banks to restrain the funding to SME's. However, the availability of finance using the FinTech by SME's could be more efficient than the traditional banking and can be sustained for the long run and it is also evident from the regulatory support from different countries. For example, in France the Law of Modernization of the Economy (^), limits the payment terms to 60 days, meaning the buyer can not extend the cash flow beyond 60 days to their suppliers. It indicates that T&SCF is one of the best solutions for early payment to supplier's liquidity and countries like Spain, Turkey, Hungary, Latin America, and India are planning to set up similar laws where Fintech companies can consider this opportunity to explore.

Besides, this also gives opportunities to the InsurTech to explore invoice protection insurance on invoice-by-invoice using machine learning and artificial intelligence rather than total turnover followed by the traditional services provider. This give choices to the supplier to select financing or Insurance.

6.4 Implications for Suppliers

Our empirical analysis shows that the rate charged by Fintech firms are relatively lower than traditional banks and have a positive impact on suppliers' profitability. Therefore, Suppliers should have the conscious choice and consider exploring the financing from Fintech firms. This could drive more and more Fintech companies to venture into business and enables more liquidity to the ecosystems.

6.5 Implications for Banks

This report analysed that the bank interest rate is more than the Fintech offerings, and this implied that the market dynamics could influence the customer bases and bank's profitability. Though the digital transformation is critical for banks to survive, due to the product complexities and historical issues with legacy systems, banks are facing a challenge to overcome the market competition. Therefore, banks could explore a partnership with Fintech firms and create new ecosystems and could offer additional services to sustain in the long run.

6.6 Limitation

This study reflects 2 limitations. Firstly, under this report, the interest cost is measured as key attributes to examine the supplier's profitability. However, the supplier's interest rate is also based on credit risk, loan tenure, repayment capacity, and LIBOR, etc. Secondly, there are many co-occurrences exists between the traditional banking and Fintech fields, we have only selected the T&SCF that are emerging field. Further, due to data is fragmented, we have selected the global community of trade statistics and created virtual data sets for FinTech, and any changes in the data sets leads to different empirical results. Besides, Foreign exchange remittance is subject to various countries law and compliance could be challenge to Fintech. This should be considered in further study.

7 Conclusion and Future Work

This study examines the conceptual understanding of FinTech and International trade and supply chain finance towards the supplier's perspectives. The aim is to find out the impact and influence of Fintech in T&SCF ecosystems to get more liquidity and profitability to supplier's viewpoints. The supplier's profit is directly related to interest cost and liquidity is associated with bank financing. However, due to market dynamics, the traditional banks are facing challenges to support suppliers' requirements and forces them to explore alternative funding mechanism including Fintech funding. This concept is rarely under-research subject and financial flows in the supply chain ecosystems were rarely focused in earlier literature.

According to the data provided in this study and its application of ARIMA Model, shows that the Fintech have an impact and influence on the supplier's profitability. However, it has slightly influencing the supplier's liquidity and exists a wider gap to address in the ecosystem.

The study recommends that Fintech companies explore the business opportunities under invoice trading model considering technology play a critical role for a rate reduction and provide better ROI. Also, this report recommends that InsurTech to examine invoice protection insurance based on invoice wise rather than turnover to enable the supplier to have the choice of choosing invoices. Similarly, the interest rate is key drivers for the suppliers to shift the funding requirements and have a chain reaction for more and more Fintech firms to

explore. Though scenario throws competition to traditional banking, a strategy should be in place to partnering with Fintech firms to integrate and sustain.

In areas of further researches, studies should put eyes on the edge-cutting of technologies through the usage of artificial intelligence. This, in turn, will help in reducing the costs of operation in digitalizing the markets to obtain higher profits. Also, more emphasis should be put forward to the studies on the blockchain to connect the chain of supplying goods and services around the globe to indicate both short- and long-term measures that the FinTech suppliers face in operation. Furthermore, the studies should also focus on providing the ways how the governments of the countries should monopolize the processes of FinTech, and transactions made in the international trade.

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8 ANNEXURE – Key Terms and Abbreviations

- **FinTech**: Financial Technology
- **T & SCF**: Trade and Supply Chain Finance
- **SME:** Small and Medium Enterprises
- **ROI:** Return on Investments
- **InsurTech:** It refers to the combination of Insurance and Technology
- **BASEL III**: Third Basel Accord, the regulatory framework on bank capital requirements
- **Profit:** It is a difference between the revenue and cost including purchase cost, overheads, interest, etc.
- **Liquidity:** It refers to the cash flow generation from current assets and covers the current liabilities.
- **Traditional banking:** It can take either the form of National banks or state banks in accordance with the government of a given nation and that existed many decades back before the emergence of online banking.
- **Suppliers**: They are otherwise called vendors who supply goods and services to distributors or manufacturers.

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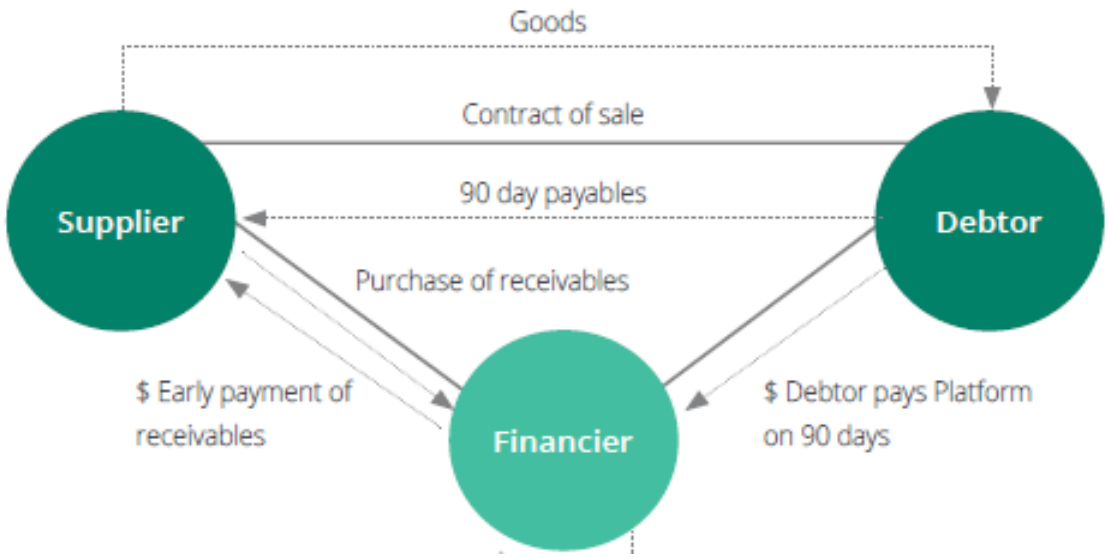
Foot note:

1. @ https://www2.deloitte.com/global/en/pages/financial-services/articles/gx-the-next-phase-of-fintech-evolution.html
2. *****https://www.mckinsey.com/~/media/McKinsey/Industries/Financial%20Services/Our%20Insights/Supply%20chain%20finance%20The%20emergence%20of%20a%20new%20competitive%20landscape/MoP22_Supply_chain_finance_Emergence_of_a_new_competitive_landscape_2015.ashx
3. **(#)**https://www.jbs.cam.ac.uk/fileadmin/user_upload/research/centres/alternative-finance/downloads/2018-ccaf-exp-horizons.pdf
4. (^)http://www.elexica.com/-/media/files/articles/2019/commodity%20trading%20finance/world%20supply%20chain%20finance%20report%202019_jolyon.pdf
5. **(**)**https://hr.ambafrance.org/Zakon-o-modernizaciji-gospodarstva

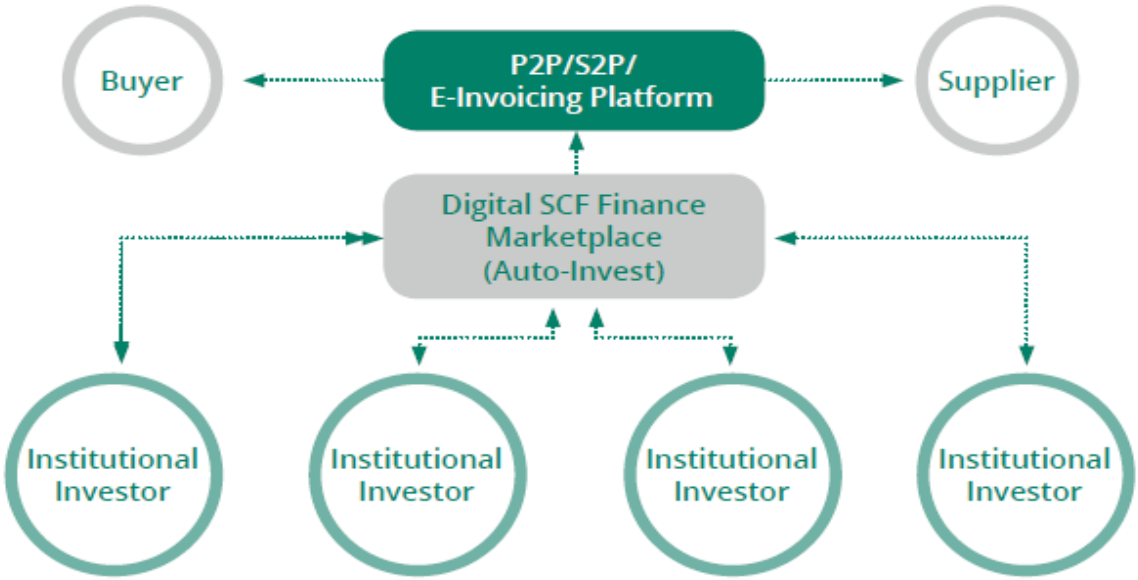
10 Appendices

Appendix A: Traditional Model for SCF (**)

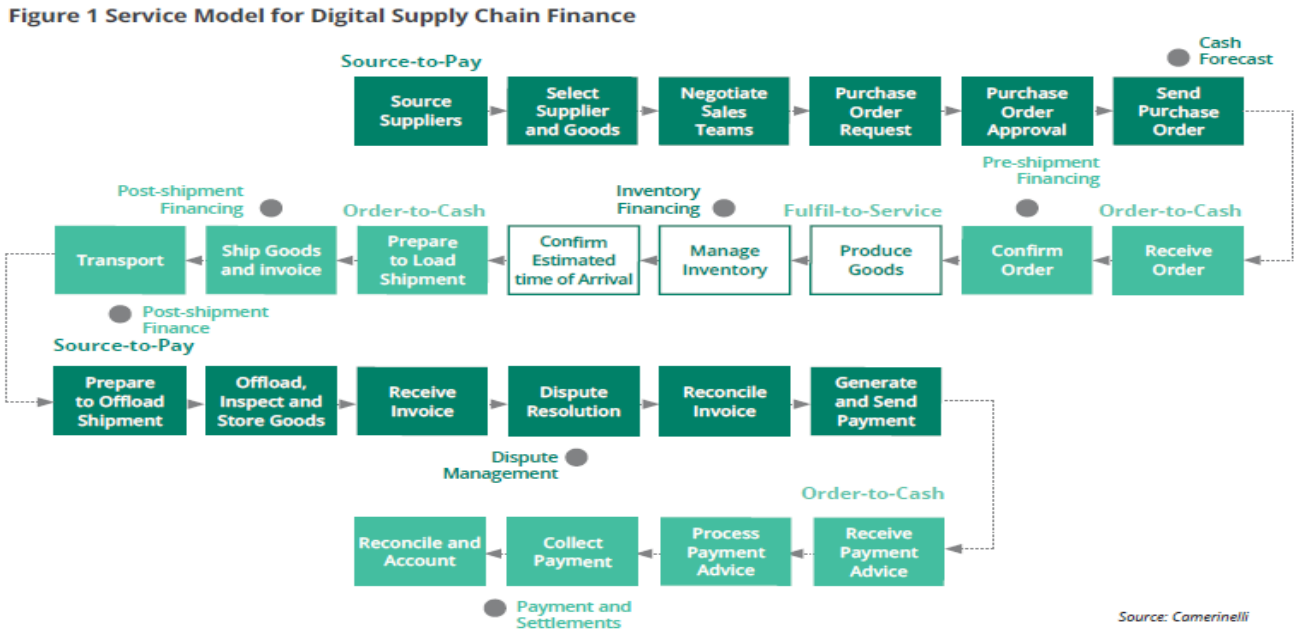


Appendix B: Digital supply chain model (**)

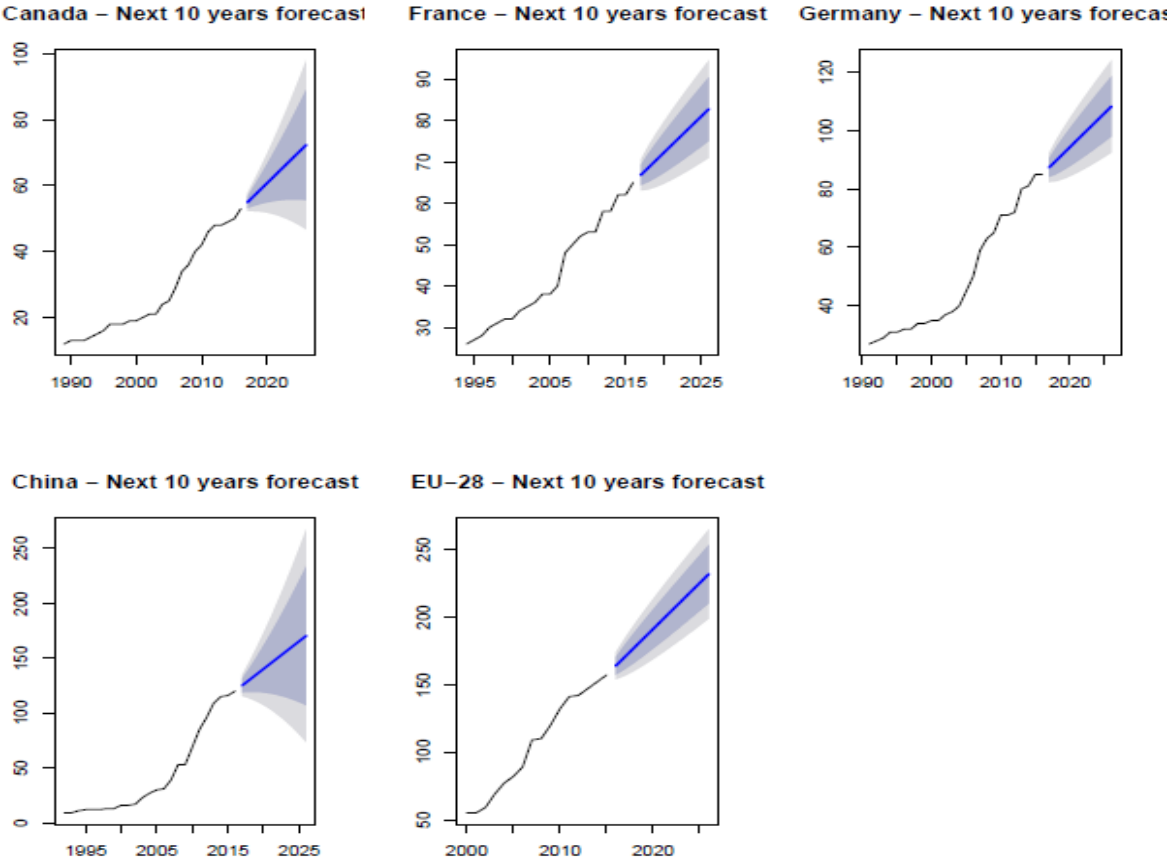
Figure 1: Service Model for Digital Supply Chain Finance



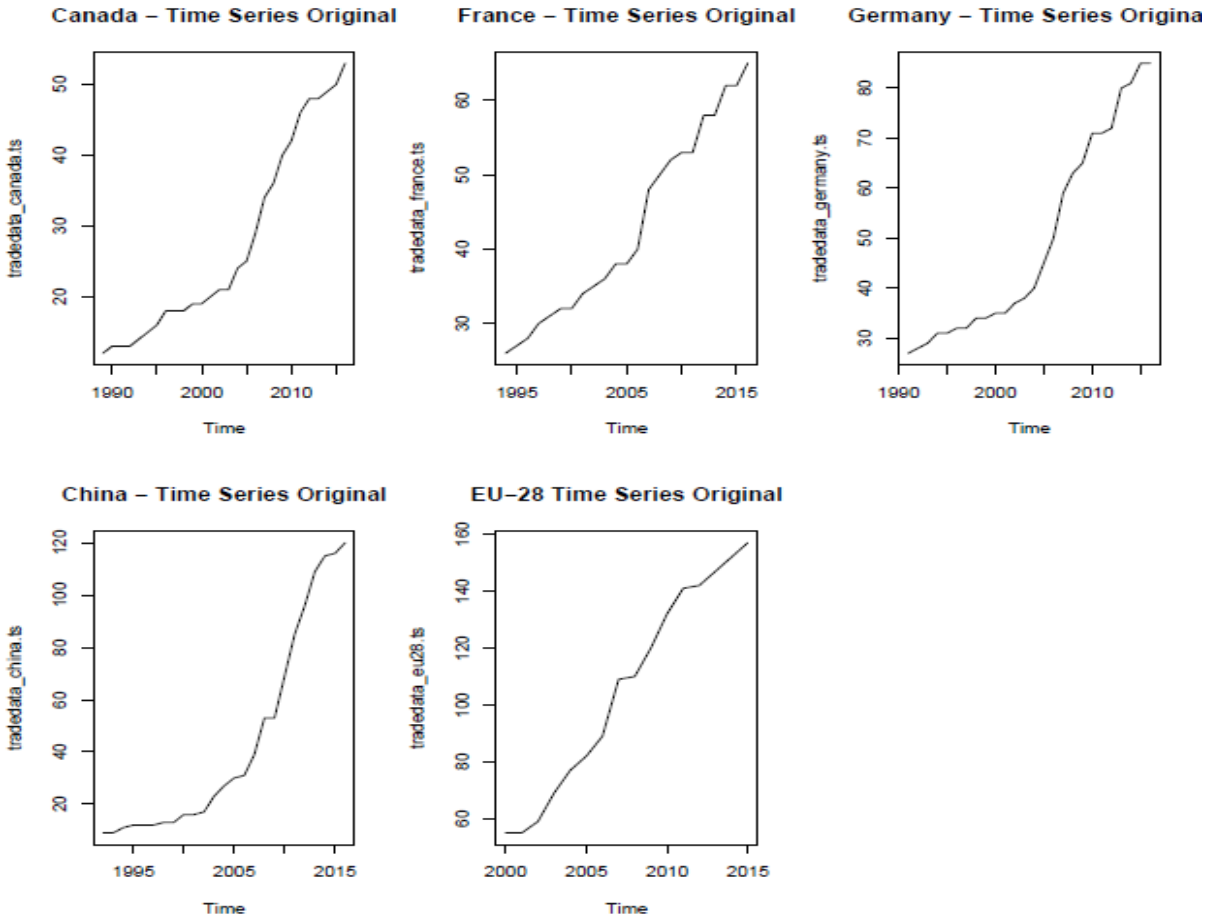
Appendix C: Digital supply chain service model (**)



Appendix D: Time series forecast for next 10 years (Ref "R")



Appendix E: Original Time series to interpret the trend (Ref "R")



Appendix F: Cost as per % of total remittance value (Ref: World Bank data)

Global Average	Money transfer operators	In united states
10	11	7
9.5	10.5	7.5
9.5	11	7.5
9.75	10	7
9.75	9.5	7
9	9	7
8	8	6
7	8	6
7	8	6
7	8	6
