

CAUSALITY BETWEEN SOFTWARE EXPORT AND FDI: EVIDENCE FROM INDIA

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ABSTRACT

The software and related services industry has become one of the significant growth catalyst for India. This sector is a major contributor to the growth of the economy and has multiplier effect in terms of foreign exchange earnings, investment, employment and overall economic growth. India is attracting increasing attention from Multinational Enterprises (MNEs) as a base for their knowledge-based activities such as software development and global Research & Development activity. Software Technology Parks, regulatory reforms by the government, the growing Indian market and availability of skilled work force have been important factors in boosting foreign direct investment (FDI) inflows to computer software industry in India. In view of the above-mentioned facts, an attempt has been made to highlight the export performance of software industry in India; to present the trend of FDI inflows in the software industry and to examine the causality between the variables namely software export and FDI. Data has been collected from various secondary sources such as database of RBI, Ministry of Commerce & Industry, Department of Industrial Policy and Promotion and various issues of Economic Survey, during the span of 2000-01 to 2016-17. Granger Causality Test has been applied. The analysis reveals unidirectional relationship among the variables, stating that software export granger cause FDI. Therefore, the study suggests that one way to maximise the contribution of FDI in India, is to improve chances of FDI crowding-in domestic investments and minimise the possibilities of it crowd-out domestic investments. Secondly, government should increase software exports by effective policies to attract FDI inflows in the sector.

Keywords: Foreign Direct Investment (FDI), Software Export, Multinational Enterprises (MNEs), Stationarity, Granger Causality.

INTRODUCTION

Foreign Direct Investment (FDI) is now widely perceived as an important resource for accelerating the industrial development of developing countries. It flows as a bundle of capital,

technology, skills and sometimes even market access. Most of the developing countries, therefore offer a welcoming attitude to multinational enterprises (MNEs) that are usually associated with FDI. In the liberalization era, India is known to have attracted a huge quantum of FDI. According to the United Nations Conference on Trade and Development (UNCTAD, 2007) India has emerged as the second most attractive destination for FDI after China and ahead of the US, Russia and Brazil. India has experienced a marked rise in FDI inflows in the last few years. FDI inflows in India have increased from \$ 11.4 billion in 1990-99 to \$ 484.351 billion in 2000-2017. According to the Department of Industrial Policy and Promotion (DIPP), the computer software and hardware sector¹ in India attracted cumulative FDI inflows worth US\$ 22.83 billion between April 2000 and December 2016. This sector attracted the second highest FDI inflows during the year 2016-17.

The rise of the IT software and services industry over the 1990s represents one of the most spectacular achievements for the Indian economy. This sector is the single largest contributor to services exports of India and constitutes almost 45 per cent share of total services exports in 2016-17 (GoI,2016-17). Software export has registered a very strong compound annual growth rate of 39.45per cent during 1985-86 to 1990-91 and 52.75 per cent during 1991-92 to 2000-01. However, compound annual growth has slipped down to around 22 per cent since 2001-02. This has been mainly attributed to the slowdown in US economy since 2000 and also due to global uncertainty. This sector continues to be one of the largest employers in the country, directly employing nearly 3.86 million people in 2016-17 (GoI,2017). The reasons for the remarkable success of Indian software exports include low cost of labour, locational time difference with the western world enabling round the clock development, knowledge of the English language by Indian software professionals, favourable government policies etc. The increasing recognition of these factors among MNEs has led to increase investments by them in software development and in global R&D centres set up in India to exploit these advantages.

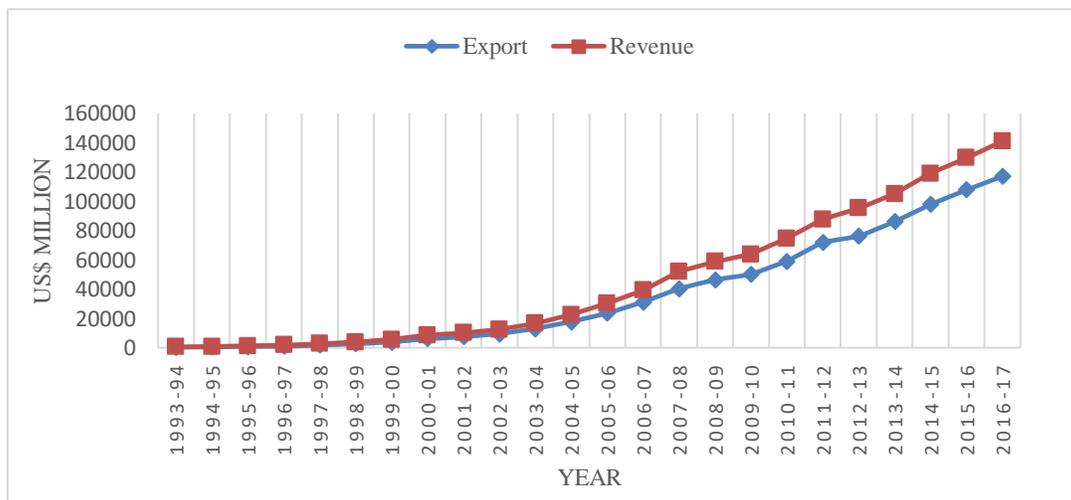
The paper is broadly structured into four sections. First section briefly introduces the topic and highlights the export performance of software industry in India and also presents the trend of FDI inflows in it. The second section deals with the review of literature followed by the data sources and methodology. The third section examines the causality between the variables namely software export and FDI. The fourth section concludes the results and suggests some policy measures.

¹Here, the data of FDI in Computer software and hardware sector has been used as a substitute variable for FDI in computer software industry (as 97.5 per cent of the data represents software industry and only 1.4 per cent is related to hardware industry).

Exports performance of Software Industry in India

India’s software exports began in 1974 but made limited impact until the 1980s. By mid-1980s, the forecasters, analysts and Indian policy planners began to understand the potential of Indian talent in computer software. This realization led to the formulation of first computer policy (related to software) in 1986. Since then IT has been given much thrust and software export has been growing at a phenomenal rate.

Figure 1: Growth of Exports and Revenue of Indian Software Industry



Source: NASSCOM & Deptt. of IT, GoI.

The above figure shows that there has been tremendous growth and spurt in the software export from India and revenue of the industry during the period from 1993-94 to 2016-17. Export has grown by leaps and bound in value terms from US\$ 330 million in the year 1993-94 to US\$ 3900 million in 1999-00 and further to an all-time high of US\$ 117,000 million in 2016-17. This shows that software export has increased more than 100 times during the period 1993-94 to 2016-17. The predominance of exports marks the Indian software industry as an export-led industry, and as such is different from its counterparts in countries like China and Brazil. The contribution of the software export to India’s GDP stood at 9.84 per cent in 2011-12 and its share in total exports is 34.39 per cent.

As far as the contribution of Indian software industry in employment is concerned, it is estimated to touch 3.86 million in 2016-17, as compared to 0.09 million in 1993-94. This represents a net addition of 3.77 million to the industry employee base since 1993-94. The indirect employment attributed by the sector is estimated to about 10 million. This translates to the creation of about 13.77 million job opportunities attributed to the growth by this sector. Surplus on net software

export has been a major source of financing merchandise trade deficit. The table below provides a glimpse about the share of net software exports in financing trade deficit since 2000-01.

Table 1: Net Software Exports and Merchandise Trade Deficit of India

Year	Net software Exports (Surplus) US\$ million	Merchandise Trade Deficit US\$ million	% share of net software exports in financing merchandise trade deficit
2000-01	5750	-12460	46.15
2001-02	6884	-11574	59.48
2002-03	8863	-10690	82.91
2003-04	12324	-13718	89.84
2004-05	16900	-33702	50.145
2005-06	22262	-51904	42.89
2006-07	29033	-61782	47
2007-08	36942	-91468	40.38
2008-09	43736	-119519	36.60
2009-10	48237	-118203	40.80
2010-11	50905	-127322	40
2011-12	60957	-189759	32.12
2012-13	63504	-195656	32.45
2013-14	66958	-147609	45.36
2016-17	70064	-112442	62.31

Source: Author's Calculation on the basis of RBI data.

Net software exports have been a major source of surplus on services account, financing almost 46 per cent of merchandise deficit in 2000-01. Its share has increased to almost 90 per cent in 2003-04. This is due to the spectacular performance of software exports during this period. Since 2004-05 its share started decreasing due to uncertainties in the international market. Merchandise deficit becomes broader than software exports. However, in 2013-14 its share has again increased to 45.36 percent, which shows a revival of the software exports and in 2016-17 the net software exports has reached to an all-time high US\$70064 million and financing 62.31 per cent of merchandise deficit.

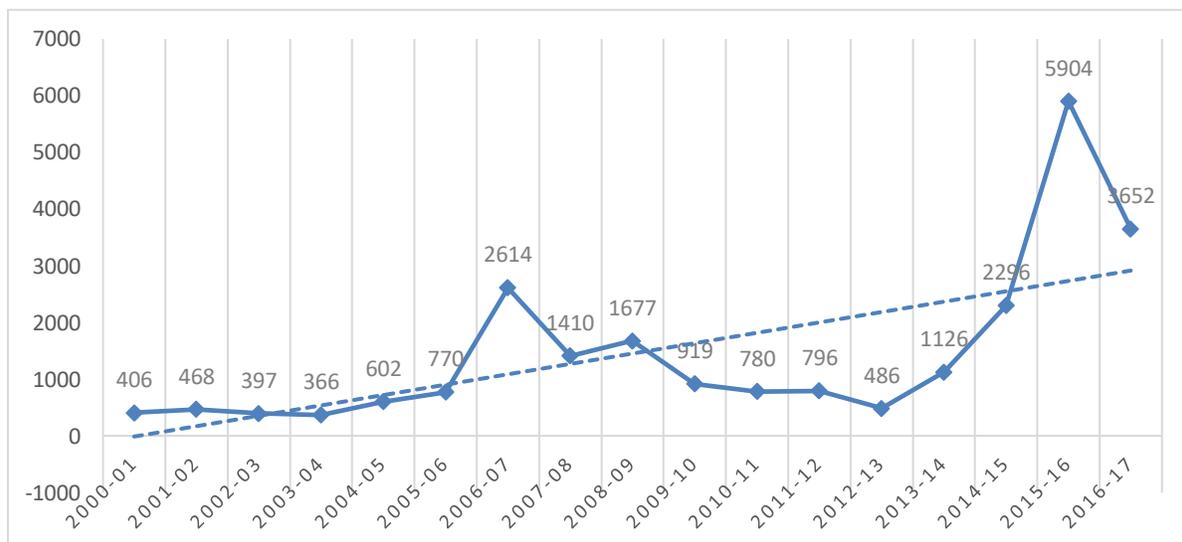
FDI in Software Industry of India

A 100 per cent FDI is permitted under automatic route to the Computer software industry in India. However, a pertinent condition is that, 26 per cent of their equity will be spent on welfare

activities for the Indian population in five years. The major fiscal incentives provided by the Government of India in this sector have been for Export-Oriented Units (EOU), Software Technology Parks (STP) and Special Economic Zones (SEZ). STP have been a major initiative in India to drive in Foreign Direct Investment in the computer software industry. These Software Technology Parks provide highly developed infrastructure and facilities that attract foreign investors. Regulatory measures by the Indian Government have also played a positive role in this regard. Measures like increased freedom of recruiting and laying-off employees, tax benefits and easing of export producers have contributed to the growth of FDI in this sector.

India is a preferred destination for companies that are seeking to offshore IT and back-office functions. It also retains its low-cost advantage and is a financially attractive location when viewed in combination with the business environment it offers and the availability of skilled people. The country is also known across the world for its successful export-led software industry. The following figure presents the trend of FDI inflows in computer software and hardware sector for the period of 2000-01 to 2016-17.

Figure 2: FDI in Computer Hardware and Software Sector of India (In US \$ million)



Source: Department of Industrial policy & promotion, GoI.

The figure shows that there have been fluctuations in the FDI inflows to the sector. But overall it shows an increasing trend over the years. In the year 2012-13 the FDI inflows decreased to the level of US \$486 million because of the financial recession in the developed and developing destinations. However, after 2012-13, the investments have increased sharply. Software giants have shown a keen interest in investing in India, mostly in research centres in technology hubs like Bengaluru and Hyderabad. This can be attributed to the Make in India initiative. Lower

wages and special investment privileges such as tax exemptions have strengthened India's position in the FDI space across the globe. India has also nurtured favourable policy regime and a business environment that is conducive for free flowing of foreign capital into the country. In 2016-17 the FDI has decreased to US \$ 3652 million because of the uncertainties in the Indian economy which arises due to the introduction of economic reforms in the form of GST and Demonetisation. GDP growth rate came down to 5.6 per cent in the fourth quarter of 2016-17. However, in the long run it would be helpful in attracting FDI in the sector. Since 2000-01 except for 2008-09 to 2013-14, computer software and hardware has always remained in the top five.

This can be exemplified by software companies like Google showing interest in investing in India. In 2015, Google said it would invest \$234.3 million for a new campus in Hyderabad, focusing on Google Education, Google Fibre broadband services and Street view. Also, Apple has announced the opening of its first technology development centre outside the US in Hyderabad with an investment of \$25 million. This could lead to jobs for approximately 4,000 people. Thus, all the major software companies have established or are going to establish their development bases in India.

Mauritius with an investment of US\$ 7883 million remained at the top among the investing countries in India in this sector. Other major investing countries in this sector are Singapore (29.61%), USA (9.16%), Netherlands (4.76%) and United Kingdom (1.85%). The following table presents the FDI inflows in sub sectors of Computer software and hardware.

Table 2: FDI Inflows in Subsectors of Computer Software and Hardware Sector

(From January, 2000 to December 2015)

Sub Sectors	Amount of FDI Inflows (in US \$ million)	Share to the total computer sector FDI Inflows (%)	% with total FDI Inflows
Computer software industry	19,932.25	97.5	7.15
Computer hardware	304.74	1.49	0.11
Others (software)	206.71	1.01	0.07
Total of above	20,443.70	100	7.34

Source: Department of Industrial policy & promotion, GoI.

It is clear from the table that the computer software industry has the major share in the total FDI to the computer software and hardware sector. The top Indian companies which received FDI inflows in this sector are: I FLIEX Solutions Ltd, I Flex Solutions Ltd, Tata Consultancy Services Ltd, Infracore Technologies Ltd, Mphasis BFL Ltd, I-Flex Solutions Ltd, Digital Global Soft Ltd, India Bulls Financials Services P. Ltd, IFLEX Solutions Ltd, Unitech Reality Projects Ltd.

REVIEW OF LITERATURE

FDI is a tool for accelerating economic growth through its strengthening of domestic capital, productivity and employment. FDI also plays a vital role in the up gradation of technology, skills and managerial capabilities in various sectors of the economy. This section reviews the empirical studies on the relation between FDI and software exports, which could facilitate in identifying the determinants of FDI as well as software exports and also helpful in understanding the impact of FDI on various sectors of the economy.

Sahoo, et al. (2015) have examined the determinants of software exports from India. The study suggests that in long run openness, human capital measured by higher education enrolment and policy measures executed by the Government of India have played decisive role in endorsing software exports from India. But in the short run, foreign direct investment has helped to improve software exports from India.

Kunwang Li and Bingzhan Shi (2013) have focused on the quantity and quality of China's ICT exports and its determinants to find out the key characteristics associated with China's ICT exports. They arrived at the conclusion that China's export is mainly driven by high quantity and low-quality production; and FDI, processing trade and government policies are the main determinants for China's ICT export growth. However, FDI and government policies have a different impact on quantity and quality. It increases the quality of exports but decreases the quantity.

Saleena (2013) tried to investigate the impact of FDI on services exports of India. She found that FDI has positively influenced the growth of services export in the Indian economy, after the liberalization period. Since services export is largely driven by Information and Communication Technology (ICT) in India, therefore, FDI must have positively influenced ICT exports.

Gola, et al. (2013) have evaluated the impact of FDI on economic growth in India from the period of 1990 to 2011. They found that FDI plays a crucial role in enhancing the economic growth and development of the country. Due to continued economic liberalization since 1991, India has seen a decade of 7 plus per cent of economic growth. In fact, economy has been

growing more than 9 per cent for three consecutive years since 2007 which make the country a proficient performer among global economies.

Lokesh and Leelavathy (2012) analysed the determinants of Foreign Direct Investment in their study. The study reaches at the same conclusion as Nagesh Kumar (2005) that FDI inflows into India is determined by the policy framework. Besides, market size, economic factors such as foreign exchange reserves, availability of low cost of infrastructure, availability of capital at cheap lending rate, low cost of labour etc. and political factors are also playing an important role in attracting FDI into India.

Vani, et al. (2007) tried to explore various aspects of FDI inflow in India across industries including inter-industry variations over important factors. The study reveals R&D as a significant determining factor for FDI inflows for most of the industries in India. The authors suggested that the software industry is showing intensive R&D activity, which has to be channelized in the form of export promotion for penetration in the new markets.

Kumar (2005) found in his study that India's success in attracting FDI in software industry owes largely to the cumulative investments made by the government over the past five decades in building what is now termed as national innovation systems including resources in development of a system of higher education in engineering and technical disciplines, creation of an institutional infrastructure for S&T policy- making and implementation, building centres of excellence and numerous other institutions for technology development, among other initiatives. He also found that the role played by the MNEs in software development in India is quite limited. Although all major software companies have established development bases in India but their overall share in India's software export is rather small at 19 per cent.

Sharma (2000) examined whether or not FDI has made any significant contribution to India's export growth. According to the author several factors have contributed to India's export growth including FDI. However, in his study he could not find any statistically significant impact on India's export performance although the coefficient of FDI variable has a positive sign.

DATA SOURCES AND METHODOLOGY

The study is based on secondary data congregated from RBI, Ministry of Commerce & Industry, Department of Industrial Policy and Promotion and Economic Survey, during the span of 2000-01 to 2016-17. Granger Causality Test is used to examine the causality among the variables.

Stationarity Test of Variables

In general, a time series model is said to be stationary if the two conditions are satisfied. First, the whole potential distribution is independent of time and second, the covariance at any two-

time points is dependent only on the distance between those points and are independent of time. The approach to unit root testing implicitly assumes that the time series that is to be tested can be written as

$$Y_t = D_t + z_t + \varepsilon_t$$

Where,

D_t = deterministic component (trend, seasonal components etc.)

z_t = stochastic component

ε_t = stationary error process

The aim is to determine whether the stochastic component contains a unit root or is stationary. Given a time series data, Augmented Dickey-Fuller (ADF) considers three differential-form autoregressive equations to detect the presence of a unit root:

Y_t is a random walk:

$$\Delta Y_t = \gamma Y_{t-1} + \sum_{j=1}^p (\partial_j \Delta Y_{t-j}) + \varepsilon_t$$

Y_t is random walk with drift:

$$\Delta Y_t = \alpha + \gamma Y_{t-1} + \sum_{j=1}^p (\partial_j \Delta Y_{t-j}) + \varepsilon_t$$

Y_t is a random walk with drift around a stochastic trend:

$$\Delta Y_t = \alpha + \beta t + \gamma Y_{t-1} + \sum_{j=1}^p (\partial_j \Delta Y_{t-j}) + \varepsilon_t$$

Where,

t is the time or trend variable

α is the intercept constant called a drift

β is the coefficient on the time trend

γ is the coefficient presenting process root, i.e. the focus of testing

p is the lag order of the first difference autoregressive process

ε_t is an independent identically distributed residual term

The difference between the three equations concerns the presence of the deterministic elements α (a drift term) and β_t (a linear time trend). The focus of testing is whether the coefficient γ equal zero that infers the original series has a unit root.

Granger Causality

This test helps in identifying the direction of the relationship between the two selected variables that is, it is a limited notion of causality where past values of one series (X_t) are useful for predicting future values of another series (Y_t), after past values of Y_t have been controlled for (Wooldridge, 2012). In this test, it is assumed that disturbance terms are uncorrelated and all the information relevant to the prediction of the selected variables is only present in the available time series data of the variables. The VAR model is a natural framework for examining Granger causality. Thus, the model of Y_t is a linear function of its own past values, plus the past values of X .

That is, if we consider two time series, $\{Y_t\}$ and $\{X_t\}$ and the lagged equation thus formed:

$$Y_t = \sum_{i=1}^k \alpha_i Y_{t-i} + \sum_{i=1}^k \beta_i X_{t-i} + u_t$$

Then if $\beta_i = 0$ ($i = 1, 2 \dots, k$), X_t fails to Granger Cause Y_t . The lag length k is, to some extent arbitrary. If X Granger causes Y , then some or all of the lagged X values have non-zero effects on the Y_t , $\beta_i \neq 0$ ($i = 1, 2 \dots k$).

RESULTS

Unit root results are shown in Table 3(a&b). It can be vividly stated that both the variables are non-stationary at the level and the first difference and turned out stationary at second difference when Akaike Information Criterion is applied.

Table 3 (a): Unit Root Results

Null Hypothesis: D (LNSEXP, 2) has a unit root

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.416539	0.0286
Test critical values:	1% level	-4.004425	
	5% level	-3.098896	
	10% level	-2.690439	

Source: Computed.

Table 3 (b): Unit Root Results

Null Hypothesis: D(LNFDI,2) has a unit root

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.735440	0.0001
Test critical values:	1% level	-4.004425	
	5% level	-3.098896	
	10% level	-2.690439	

Source: Computed.

Once the stationarity test is deployed on the variables, causal relationship between software export and foreign direct investment is investigated through the granger causality test.

Table 4: Granger Causality

Lags: 3			
Null Hypothesis:	Obs	F-Statistic	Prob.
LNSEXP does not Granger Cause LNFDI	14	4.48086	0.0468
LNFDI does not Granger Cause LNSEXP		0.60559	0.6321

Source: Computed.

The **table 4** depicts that the software export of India granger causes the FDI but FDI does not granger cause software export of the country. In other words, there exists a unidirectional relationship between software export and FDI.

CONCLUSION

India is a country with having the advantages of locational time difference with the western world, availability of skilled labours at cheaper rate, the second largest pool of scientific and skilled manpower which is also English speaking. Therefore, almost all the leading software companies have established their development centres in India to exploit these advantages. However, there found a unidirectional relationship between the variables which means that FDI inflows in computer software sector is sensitive towards software exports but software exports is not affected by FDI inflows in this sector. Meaning thereby, the Indian export success in the software industry is primarily driven by local enterprise, resources and talent. The overall share of MNEs in India’s exports of software is quite small at 19 per cent (Kumar, 2005). MNEs are increasingly looking to India because of her relatively well developed scientific and technological infrastructure and resources for setting up development bases. This is mainly due to the investment made by the Indian government in building local capabilities for higher education and training in technical disciplines, centres of excellence and in other aspects of national innovation systems.

Apparently, some of the MNE subsidiaries in software development are doing pioneering work for their parents like Oracle, SAP etc. However, the Indian subsidiaries of these MNEs do not share the revenue streams generated by their developments worldwide. MNEs tend to invoice the exports of their subsidiaries to them at cost plus 10-15 per cent. Therefore, the distribution of gains is grossly in favour of the home country of MNEs and against the host country, i.e. India in this case. One way to maximise the contribution of FDI, is to improve chances of FDI crowding-in domestic investments and minimise the possibilities of it crowd-out domestic investments. On

the other hand, government should increase software exports by effective policies to attract FDI inflows in the sector.

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