

Nexus between exports, imports and foreign direct investment: Evidence from Bangladesh

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Abstract

Foreign Direct Investment (FDI) plays a significant role in international trade (IT). Numerous recent studies focused on the FDI-IT nexus and found a strong interrelation between the two variables. The current research empirically examines the causal linkage among imports, exports, and FDI in Bangladesh, utilizing available time-series data from 1980-2015. The study finds that the long-run equilibrium association exists among Exports, Imports and FDI. The study also finds unidirectional causality running from imports and exports to FDI, meaning the rise and fall of exports and imports cause an increase or decrease in FDI of Bangladesh, respectively, and there is no other long-run causality found among other variables. In the short run, unilateral causality is running from imports to FDI, imports to export and exports to FDI. These empirical findings mean that expanding trade can be used to attract more FDI in Bangladesh. Therefore, the study findings strongly support the notion that international trade (exports and imports) stem from the attraction of FDI.

Keywords Bangladesh, Co-integration, FDI, Export, Import, Granger causality Test, VECM.

Paper type Research paper

1. Introduction

The degree of international trade and FDI are the most important variables that significantly affect the globalization process and let the capital and goods be moved freely across the borders (Pourshahabi, Salimi Soderjani, & Mahmoudinia, 2013). Thus, making an effective policy strategy is essential to have enough knowledge about the social and economic impacts of FDI and trade. A notion of



globalization has long been emphasizing the contribution of trade liberalization which includes exports and imports from developed to developing nations, that eventually increase the extent of foreign direct investment. FDI works as an engine for the rising productivity position of the country (Lipsey, 2004).

Trade (export and import) serves as an essential tool for fostering the ability and skills of the host country's people through importation and espousing the superiority of manufacturing technology and innovation. The exporters learn and acquire the knowledge to use advanced technology and innovation for production in two ways: global market competition and represent sub-contractors to foreign firms. Most producers of the countries, particularly import-substitute countries face a big challenge from foreign enterprises. Since the product of developed countries is generally capital-intensive, foreign enterprises try to satisfy to accept a large capital-intensive production to continue (Frankel & Romer, 1999).

FDI has now come to be one of the prime sources for enhancing innovations, technological spillover, job opportunities as well as export spillover by using capital investment in the recipient country (De Mello, 1999; Fosfuri, Motta, & Rønde, 2001; Haacker, 1999; Kaufmann, 1997; Lipsey, 2000). Technological spills from foreign to local firms can be grouped into four main groups: skills, imitation, linkage, and competition. Local firms can improve their products by imitating the technology used by foreign industries, that is called imitation.

Multinational firms also create competition with local counterparts. Therefore, local firms face great enforcement from multinational firms to utilize the current capitals more effectively and accept new technology to continue their production (Wang & Blomström, 1992).

Most developing countries such as Bangladesh are enduring to overcome the obstacle of the low-ranking position of economic growth due to the absence of inadequate job chances and inefficient technology as well as because of the absence of capital investment resources. Therefore, Bangladesh has become a country that heavily relies on more imports and less export due to the lack of FDI inflows compared to the neighborhood countries like India.

After independence, Bangladesh started to impose higher tariffs and quota on imports. It refers to the inward-oriented development strategy. This change created anti-export bias within the Bangladesh economy. However, starting from 1980, the policy regime shifted the direction of export promotion from import substitution, quotas were removed step by step, and tariff rates decreased. Trade policy authorities concentrated on enhancing

export performance. Bangladesh government took some steps to attract FDI and export promotion which included the establishment of exclusive Export Processing Zones (EPZs) (Ahmed & Uddin, 2009).

A substantial number of studies from varied backgrounds have been carried out to observe the association and causality among these variables. Some studies (Mahmoodi & Mahmoodi, 2016; Tekin, 2012) conducted using panel data modeling reveals a positive linkage between FDI and international trade. The results of these findings are different in each country and generally rely on foreign investment and trade. These studies indicate negativity, positivity, complementarity, and substitutability of the relationship among the variables. The details of these findings have been presented in the second section of the literature review.

The results of these studies are different from each other; some of them show positive while others show negative, which makes inconclusive for this topic. Moreover, empirical studies have become sensitive due to the selected variables in model specification. In Bangladesh, most studies were concentrated to work on the linkage among trade and economic growth, export and economic growth, or the effect of FDI on economic growth. Besides, the majority of empirical studies that were done in Bangladesh was emphasizing about the economic growth, FDI and trade openness (Adhikary, 2010; Dutta, Haider, & Das, 2017; Hussain & Haque, 2016). Thus, a new study is needed to find the linkage between FDI and international trade in the context of Bangladesh.

Based on the above discussion, it is essential to research this area. To do so, this study will emphasize the relationship and causality between FDI, export, and import. The primary objectives of this study are- i) examining the relationship among exports, imports, and FDI in Bangladesh, and ii) pointing out the direction of causality among exports, imports, and FDI in Bangladesh.

The findings of this study will contribute to the ongoing debate on FDI and international trade nexus in a developing country like, Bangladesh both inside and outside academic circles. Moreover, these will also assist relevant government staff, practitioners and policymakers in developing appropriate policies towards FDI and export performances. The rest of the article has been organized as follows section two presents an analysis of the existing literature; section three lays out the tools and techniques of the study; section four covers findings and discussion, while section five concludes the study and provides some recommendations. The result of this study will improve the existing literature in this area. It will be beneficial to academicians for the reference of further research on this related issue.

2. Review of literature

The causality association between FDI, export and import has been theoretically and empirically discussed carefully in many studies of the last three decades. The findings of these studies are, considering the nature and geographical area. Many scholars concluded that the association between FDI and trade is positive.

FDI has become a debated topic in the international trade context (Grubert & Mutti, 2000, Makki & Plummer, 2005). FDI is an essential component of economic development due to the linkage of imports and exports of the country (Ahmad, Alam, Butt, & Haroon, 2003; Uddin & Ahmed, 2021). FDI of the recipient country is connected to the massive imports of intermediate goods by passing through the demand-pull channel (Çetinkaya, Acet, & Erdoğan, 2011; Hailu, 2010). In this context, several works concluded a positive link between FDI and exports/imports (Dunning, 1988). On top of that, some studies found a negative relationship between these variables (Blind & Jungmittag, 2004).

De Mello Jr and Fukasaku (2000) pointed out the positive relationship between FDI to trade by using the bivariate VECM model. This view has not supported the notion of trade-oriented economics. Similarly, Driffield and Love (2007) suggested that FDI plays a significant part in the rise of export performance by these countries. Dunning, Kim, and Lin (2001) also found a positive association with FDI in Taiwan and Korea. Moreover, Lipsey (2004) also found a positive relationship between foreign affiliate sales and export by conducting firm-level data.

On the other hand, some of the current studies have found a negative association between trade (import and export) and FDI. To illustrate, Svensson (1996) carried out a study to explore the effect of FDI on exports in Sweden. This study was based on industrial level data, that concluded the relationship between export and FDI is negative particularly for finished goods.

Correspondingly, the result of Blomstrom, Lipsey, and Kulchicky (1988) indicates that the linkage between FDI and exports is more favorable in individual firms and recommends that export and FDI can be used as an alternative tool. Belderbos and Sleuwaegen (1998) also confirm a similar result. Some researchers believe that an adverse relationship exists between trade and foreign investment. Blonigen, Tomlin, and Wilson (2004) prove that Tariff-jumping of FDI could cause an adverse condition on the US local industrial exports than the other portions of FDI, with joint venture and acquisition.

Some studies have paid attention to the association between

complementarity and substitutability among FDI and trade (export and import). The survey done by Clausing (2000) investigates the linkage between transnational movement and trade by conducting two-panel data that presents that the relationship between these variables is mutually reinforcing or complementary to each other. Multinational companies may stimulate exports of related products, even if it leads to the displacement of some exports.

Another study was done by Anwar and Nguyen (2010) using the gravity model in Vietnam throughout 1996-2005. It indicate that FDI export and FDI import had a complementary relationship in Vietnam. It also suggested the effect of FDI will be larger if some resources are invested, such as financial development, education, training and diminishing the gap technology occurs between local and foreign industries. Rugman (1990) also found the complementary relationship between FDI and export. A similar conclusion was reached by (Brainard, 1993) and (Lipsey & Weiss, 1981).

On the contrary, Beugelsdijk, Smeets, and Zwinkels (2008) scrutinized the relationship between trade and FDI by using highly combined data on 44 countries from the time of 1983 to 2003. The finding of this study argues that trade and horizontal FDI are mostly substituting each other; good performance of trade may lead to the decline of foreign direct investment.

The study done by Chani, Azam, and Younas (2014) gives us an empirical indication about the causal relationship between FDI export and import in Pakistan with annual data from 1972 to 2009. The study applied a co-integration and Granger test to evaluate possible linkage about these variables. The outcome of this study displays that variables have a long-run equilibrium association. Using the time-series method, Liu, Burrridge, and Sinclair (2002) carried out a study to analyze the causal connection among economic growth, trade and inward foreign in China from the period of 1981 to 1997. They employed co-integration and Granger causality under VARECM to explore relationship and causality among variables. Their result presents the long-run equilibrium association between FDI, trade and economic growth. In addition, Granger demonstrated that EG and inward FDI, EG and export have a complementary with each other respectively. Another study was done by Sharma and Kaur (2013) that examined causality associations among foreign investment and trade. The study makes a comparison study between India and China over the period 1976 to 2011 by using Granger causality. The finding of the study depicted unilateral causality starting from FDI to imports and FDI to exports. There is also mutual reinforcing among imports and exports in China. The result of India found

two-way causality occurs among FDI and exports, exports and imports and FDI and imports. But this result is not similar to the result of China. Many studies also confirm the existence of bidirectional causality among these variables such as (Chani, Azam, & Younas, 2014; Dritsaki, Dritsaki, & Adamopoulos, 2004; Pacheco-López, 2005; Saaed & Hussain, 2015).

In contrast, some researchers found unidirectional causality between trade and FDI. For instance, Shawa and Shen (2013) investigate the causal association among FDI, GDP growth and exports in Tanzania from 1980 to 2012 and adopt Co-integration and Granger Causality to examine the long-run association and causality direction. The outcome of co-integration of FDI, GDP growth and export confirms long-run association among variables. The granger method found unilateral linkage from FDI to Export which means FDI contributed to enhancing the export performance and there is no causality test was determined other variables. Similarly, Samsu, Derus, Ooi, and Ghazali (2009) examined causal associations among FDI and export in Malaysia from 1970 to 2003 and the data performed in this study is time-series data. To evaluate the causal link between FDI and exports, they used Co-integration and vector error correction model. The findings of this study confirms long-run associations between FDI and export and while the outcome of Granger causality indicates one way causality occurs from FDI to export in the long term. The result of short run indicates the absence of causality among foreign direct investment and export in many studies (Bhatt, 2013; Samsu, Derus, Ooi, & Ghazali., 2009; Sultan, 2013).

While some studies gave priority to the positivity, negativity and complementarity, substitutability relationship, a clear investigation for causality association between trade and FDI appears to be uncommon.

Various studies on Bangladesh found different results. Rahman (2011) conducted a practical examination on the link between FDI and international commerce in Bangladesh, using 1972-2007 data and adopting Co-integration and Granger Causality to find the long-run correlation and the direction of causality among these variables. Rahman (2011) found the absence of co-integration among foreign investment, exports and imports, and unilateral causality from FDI to imports. Ahmed and Uddin (2009) examined the causal association among exports, remittances, imports, and GDP growth in Bangladesh, using time series data from 1976 to 2005 and employing Co-integration and Vector Error Correction Model (VECM). In Co-integration, the outcome of this study indicated the occurrence of long-run stable association between exports, imports, remittances and GDP growth. The result of Granger causality under VECM revealed unilateral

causality from exports growth to GDP growth and import to GDP and remittances to GDP growth in the short run.

The result of empirical analysis on the previous studies shows the positivity, negativity and complementarity and substitutability relationship between FDI, export and import, research about causality among these variables are rare. The relationship among these variables can be bi-directional or unidirectional causal relationships or positive or negative relationships. It's rarely seen that no causal relationships among these variables. Several researchers have been working on the causal link between export, import and FDI, particularly in Bangladesh (Rahman, 2011) by using co-integration for the long run and Granger causality to examine the causal link between FDI exports and imports. Most of the previous researchers used the co-integration method and the Granger causality approach to conclude their studies. But this study employed both co-integration and VECM to analyze the causal link of the short run and long run between FDI, import and export in Bangladesh with recent data during the period of 1980-2015.

3. Methodology of the study

This study adopted an econometric method to analyze the linkages among export, import and FDI in Bangladesh during the last quarter-century. This study has been chosen by longitudinal design that indicated analyzing data collected from 1980 to 2015. FDI is measured using net FDI inflows; export is estimated by goods and services exports where the import is proxied by the import of goods and services.

The econometric method adopted here to study the interconnection between the macroeconomic variables has the following function procedure:

$$fdit = f(xp_t, mp_t) \dots\dots\dots (1)$$

To express the empirical understanding of the responsiveness of exports, imports and FDI, the procedure we conducted by expressing the log transformation of both the independent and variables. Thus the final equation for estimation becomes-

$$LFDI_t = \beta_0 + \beta_1 LEX_t + \beta_2 LIMP_t + \beta_3 t + \varepsilon_t$$

Where the variables denote,

$LFDI_t$ = foreign direct investment inflow

LEX_t = export of goods and service (GDP %)

LIM_{pt} = import of goods and service (GDP %)

The empirical analysis employed in this study would cover a range of this year's 1980 - 2015 that could be sufficient enough to express the relationship between FDI, IMPORT and EXPORT. The data which is using this study is getting from the World Development Indicators (WDI) that the world bank issued in 2016. Here the dependent variable is foreign direct investment measured by using net FDI inflows as the percentage of GDP and independent variables are export that is estimated by the export of goods and services as the percentage of GDP and import that proxied by the import of goods and services as the shares of GDP.

Table 1
Definition of variables

Variables	Definition	Source
FDI	FDI inflows as % of GDP	World Development Indicators (WDI)
Import	Goods and services import as % of GDP	WDI
Export	Goods and services export as % of GDP	WDI

We used E-views software for analyzing this data. Initially, in time series analysis, the preliminary step should be checking the stationary of the variables. We have taken the augmented Dickey-Fuller (ADF), the test widely used for stationarity. We also perform a co-integration test to check whether these variables have a long-run association or not. To do so, we employed the Johansen Multivariate co-integration procedure by Johansen 1988. After variables are found co-integrated it's appropriate to examine the short run of the variable through vector error correction model without losing the value of long-run variables. Finally, we employed the Granger causality test to identify any presence of causality linkage among these three variables in questions namely, FDI, export and import.

4. Empirical results and discussion

This section presents different tests including checking unit root test by ADF test to examine the stationarity among variables, lag criteria, co-integration test. To check if these variables have a long-run association or not, and vector error correction model, Granger test. Moreover, forechecking the robustness of the estimated models, we used different diagnostic tests like serial correlation test, heteroskedasticity test, normality test.

4.1. Unit root test

There are various kinds of specifications used in ADF. This study used to trend and intercept. Here

Null hypothesis: variable is non- stationary.

Alternative hypothesis: variable is stationary.

As a rule of thumb, if the p-value is less than 5%, the null hypothesis gets rejected. It means that the variables are stationary.

Table 2

Unit root test for FDI export and import

Variable	ADF t-statistic	P-value	5% critical value	Decision
FDI	1.580551	0.9991	-2.967767	Non-stationary
Δ FDI	-3.912698	0.0244	-3.574244	Stationary
EXPORT	-0.605503	0.8567	-2.948404	Non-stationary
Δ EXPORT	-5.917779	0.0000	-2.951125	Stationary
IMPORT	0.537664	0.9856	-2.951125	Non-stationary
Δ IMPORT	-3.746258	0.0076	-2.951125	Stationary

Note: Δ denotes 1st difference of variables

Table 2 demonstrates the finding of the unit root test. All these variables have become nonstationary at the level, as we can see from the table. Because the critical value is greater than the test statistic, which leads futile to reject the null hypothesis, which indicates there's a unit root test; due to this reason we conclude that the series has a unit root test which means the series is not stationary at level. Finally, the variables become stationary at the first level which means the null hypothesis is rejected. After all the variables are stationary in first differences, before performing the co-integration test, the selection of optimal lag must be applied.

4.2. Lag order selection criteria

The result of table 3 reveals that the number of optimal lags is 2. After the order of integration and the number of lags is finalized, we apply the co-integration analysis by Johansen co-integration test.

Table 3

Criteria for Lag order determination

Lag	FPE	LR	LogL	SC	AIC	HQ
0	5.45e+22	NA	-970.8576	61.00351	60.86610	60.91165
1	5.08e+20	146.7857	-886.9801	56.73590	56.18625	56.36845
2	3.09e+20*	26.94228*	-869.7370	56.63295*	55.67106*	55.98990*
3	3.54e+20	10.32960	-862.2246	57.13816	55.76404	56.21952
4	3.81e+20	10.88767	-853.0560	57.53987	55.75350	56.34563

* denotes lag order chosen by the respective criterion

4.3. Co-integration test

This study employed by Co-integration test to check the long run association among foreign direct investment, exports and imports. This test pointed out if the variables have long run association or not. The value test has been presented below:

Null hypothesis: variables have long-run association.

Alternative hypothesis: variables have no long run association.

If the P-value is equal to or below 5%, the null hypothesis gets rejected.

Table 4

Johansen co-integration test

Trace Statistics				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Critical Value (0.05)	Probability**
None *	0.487498	30.97561	29.79	0.0364
At most 1	0.199884	8.916724	15.49	0.3731
At most 2	0.046108	1.557767	3.84	0.2120
Maximum Eigenvalue				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.487498	22.05889	21.13	0.0370
At most 1	0.199884	7.358957	14.26	0.4476
At most 2	0.046108	1.557767	3.841	0.2120

Here, Table 4 illustrates the P-value of none * is below 5% that means the null hypothesis is rejected. This outcome indicates the variables are co-integrated.

The p- value of at most none * is less than 5% so null is rejected. But second null hypothesis can't be rejected because p-value of at most 1 is more than 5%. To put another way, these tests show the presence of long run equilibrium linkage among foreign investment, export, and import. In the long run, they move together.

4.4. Long-run causality checking under VECM

Table 5

Long run estimates of vector error correction model

Dependent variables	ECT (coefficient)	P Value
D(LFDI)	-1.33011	0.0003
D(LEXPORT)	6.61159	0.0002
D(LIMPORT)	2.5824	0.0069

Long-term causality under VECM checking whether there is any causality exists or not. To do so, we follow the criteria is to make a significant result which means the causal long-run relation from independent to dependent variable is, the coefficient of the (Error Correction Term) ECT must be $[-1$ to $0]$ and the probability value must be less than 5%. In table 5 showed that the coefficient of ECT of the model where the dependent variable is LFDI is -1.3301 which is negative also significant at a 5% significant level. Which indicates the long-run unidirectional causality from EXPORT, IMPORT to FDI. When the dependent variable is EXPORT the ECT of this model is 6.61159 which is positive and the p-value is less than 5% so it is concluded that there is no long-run causality association between the independent variables to the dependent variable. In the third model, when IMPORT is the dependent variable the ECT is positive but it is significant at the 5% significant level, so it is also factual that there is no causality FDI, EXPORT to dependent IMPORT.

4.5. Checking the quality of the model

Table 6

Diagnostic tests

Breusch-Pagan-Godfrey Test of Heteroskedasticity			
F-statistic	0.537465	Probability. F(9,23)	0.8322
Obs*R-squared	5.734310	Probability. Chi-Square (9)	0.7662
Scaled explained SS	1.993396	Probability. Chi-Square (9)	0.9916

The result shows in Table 6 that the p-value of the observed R-squared is 0.7662 or 76.62% which is higher than 5%. Eventually, the null hypothesis cannot be rejected. It refers to the variance of the residuals as homoscedastic.

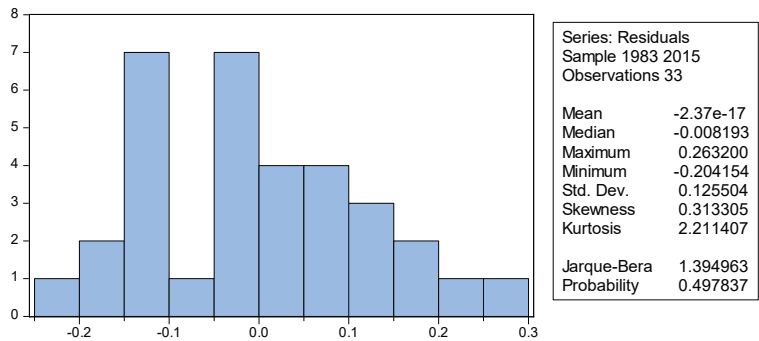
Table 7

Breusch-Godfrey Test (LM Test) for Serial Correlation

F-statistic	0.760491	Prob. F(2,23)	0.4788
Obs*R-squared	2.046915	Prob. Chi-Square(2)	0.3594

Table 7 shows the result of serial correlation, which is more than a 5% significant level. So, we conclude that there is no serial correlation in this model.

Table 8
Normality test



The result shows in the above figure that the probability value is more than 5% significant level, which is 0.497837 or 49.78%. So null hypothesis cannot be rejected. It refers that residual follow the normal distribution.

4.6. Short-run causality checking under VECM

To check the short-run causality, we run the VECM model to determine whether there is short-run causal link among the variables or not. The criteria to identify short-run causality is that f-statics must be significant at a 5% significant level. Here, Table 9 shows that FDI and export are mutually reinforcing, which means that export has a short run causal relation with FDI. In the meantime, we can see from table 9 that there is another run causality running from FDI to export at a 5% significant level. This is an interesting result which is maintained the support of theory and previous analysis. This finding suggests that the performance of export inspires the inflow of FDI to the nation. And also, FDI stimulates the performance of export. This result are same with the outcome by (Alguacil, Cuadros, & Orts, 2002; Chani, Azam, & Younas, 2014; Pacheco-López, 2005; Pourshahabi, Salimi Soderjani, & Mahmoudinia, 2013).

Table 9
Short-run causality under VECM

Causality	Chi-square(Wald test statistic)	P-value
Export FDI	20.69652	0.0000**
Import FDI	9.722757	0.0077**
FDI Export	7.900627	0.0192**
Import Export	11.90151	0.0026**
FDI Import	2.433043	0.2963
Export Import	2.746690	0.2533

Moreover, the null hypothesis for import cause FDI is also got rejected at a 5% level of significance, this indicates that FDI attains to manufacture imported product locally. The finding of this study is similar to the result of some previous studies (Chani, Azam, & Younas, 2014; Pourshahabi, Salimi Soderjani, & Mahmoudinia, 2013). There is also unidirectional from import to export, which means the more import is escalated, the more export is likely increase. This confirms the result (Asafu-Adjaye & Chakraborty, 1999), which explores the importance of import capital goods in the production performance of exports in developing nations and if some series of problems might happen, imports may lead to import reduction, which can influence the export contribution of economic growth.

5. Recommendations and conclusion

The study attempts to investigate empirically the associations among foreign direct investment, export, and import with time-series data from Bangladesh during the period 1980-2015. The study employed Johansen co-integration test to explore the long-run equilibrium relationships among variables, vector error correction model (VECM) to discover the causality linkage among variables in the short run as well as in the long-run and Granger causality test to identify the direction of causality between variables. The finding shows the long-run equilibrium relationship among FDI, export, and import for Bangladesh. The study also found unidirectional causality running from import and export to the foreign direct investment that means the rise and fall of export and import cause increase or decrease of FDI of Bangladesh respectively and there is no other causality found among other variables in the long run. This study also reveals unidirectional short-run causality from the point of import to FDI and import to export that indicates import of capital goods is essential to the production performance of exports in Bangladesh. There are also bidirectional causality reveals between FDI and export that means both of these variables are mutually reinforcing and it has supported the theory of complementarity and the earlier studies of descriptive analysis. Finally, we checked the model efficiency and showed the absence of serial correlation and the heteroskedasticity in this model. Moreover, the residuals are normally distributed, indicating that the model's quality is perfect. This study recommended that the policymakers of Bangladesh should pay attention to the stimulation of trade and his policies, too; this will lead to the inflow of FDI in Bangladesh. This study recommended the policymakers of Bangladesh should pay attention to the stimulation of trade and his policies, too; this will lead to the inflow of FDI

in Bangladesh. Due to some resource constraints and time, it was impossible to make extensive research like to include extra variables; large sample size on this topic is a potential area for future research.

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