The Role of Foreign Direct Investment In The Relationship Between Global Innovation Index and Gross Domestic Product

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Abstract

Purpose: In today's world; where technology, capital and workforce are in a rapid flow across borders; quantitative indicators, that provide insight into the economic and innovative performance of countries, are of key importance for decision makers. One of these indicators is Foreign Direct Investment (FDI); which is not only a mechanism that drives competition and economic development, but is also an international capital flow. This paper investigates whether FDI has a mediator role in the relationship between Global Innovation Index (GII) and Gross Domestic Product (GDP).

Design/Methodology/Approach: The mediator variable analysis was conducted based on the secondary data of FDI, GII and GDP of 43 countries which has been obtained from the World Bank between 2014 and 2018.

Findings: As a result of the analysis, all hypotheses were accepted. Consequently, a positive and significant relationship was found between the Global Innovation Index (GII) and Gross Domestic Product (GDP), and it was found statistically significant that Foreign Direct Investment (FDI) has a mediator role in this relationship.

Originality: In the literature, there is not any research that explains the role of FDI in the relation between Global Innovation Index (GII) and Gross Domestic Product (GDP). In order to address the gap, this study investigates whether FDI has a mediator role in the relationship between GII and GDP.

Keywords: Foreign Direct Investment, Global Innovation Index, Gross Domestic Product.

1. Introduction

With the increase in international economic activity during recent years, Foreign Direct Investment (FDI) has also surged. FDI is a form of cross-border investment in which a company or an individual in a country possesses the control or significant authority over a company in another country by establishing a wholly owned subsidiary, acquisition of a local organization or establishing a joint venture (Civelek et al., 2016). The primary difference between foreign direct investment and foreign indirect investment is that foreign indirect investment includes portfolio investments made through the purchase of stocks and bonds and it does not have any control over the place of investment (Wang and Li, 2018)

The contribution of FDI to competition, economic development, transfer of practice and economic growth has been shown in previous studies (Pelinescu and Radulescu, 2009; Pece et al., 2015; Klein et al., 2001; Balasubramanyam et al., 1999). Annual FDI values on country basis are available from the World Bank database.

Gross Domestic Product (GDP), which is another important indicator for decision makers in a country, is a numerical metric that provides information about the general state of the countries' economies. GDP, which is defined as the monetary value of all final goods and

services produced within the borders of a particular country in a certain period, is calculated by an official national institution in each country (Uca et al., 2019). The GDP values of the countries are also accessible through World Bank's website and new GDP statistics are released each month (U.S. Bureau of Economic Analysis, 2021).

Innovation, which is suggested as the driving force of economic development by Schumpeter, is another important variable for national economies. As a matter of fact, it is discussed that the economic crises in the past paved the way for innovative companies which led countries to new growth paths. Innovation has also been found to have a positive impact on GDP (Despotovic et al., 2016). Adak's (2015) study emphasized the impact of technological innovation on economic growth. Indeed, in the globalizing world, the differences between countries in technology and innovation explain the differences in economic growth between countries (Mohamed et al., 2021). Likewise, Maradan et al. (2017) found that technological innovation is one of the most essential determinants of economic growth. For this reason, many countries place innovation at the center of their growth strategies (Dutta, 2012). The innovation activities of countries are measured in different ways. One of these methods of measurement is the Global Innovation Index, which ranks countries' innovation potential on a global scale and provides a benchmark among them. The Global Innovation Index (GII), which ranks countries in terms of their innovation performance each year, was developed in 2007 by INSEAD Business School, Cornell University and the World Intellectual Property Organization (WIPO) (Rajput et al., 2012; Crespo and Crespo, 2016).

In literature, there are various studies expressing the direct relationship between the innovative activities of countries and their GDP, which is a quite expected situation (Vukoszavlyev, 2019; Hasan and Tucci, 2010). However, besides the direct impact of being innovative on GDP, the role of foreign direct investment in GDP should be also discussed. In a previous study, it was seen that a unit increase in FDI would cause an increase of 1.23 units in GDP (Sargsyan, 2019). Similarly, Suliswanto and Kaluge, (2010) found that FDI has a positive and significant effect on GDP. Likewise, Andrade and Qing, (2015) have also demonstrated the positive association between foreign direct investment and economic growth (Andrade and Qing, 2015). Moreover, for Southeast Asian countries Richardson (1997), emphasized the considerable role of FDI in prompting economic growth. Furthermore, according to Giu-Diby's (2014) study on 50 African countries, FDI has been found to have a significant effect on economic growth. Similarly, Habibi's (2017) study showed that FDI affects economic growth. Due to the conspicuous benefits of foreign direct investment to the national economy, developing countries adopt various policies that facilitate FDI flow, such as investment incentives and facilitating foreign trade procedures (Mohamed et al., 2021).

As well as its impact on GDP, foreign direct investment certainly brings innovations in business functions such as production, marketing, R&D, innovation, finance, supply chain through technology transfer (Makki and Somwaru, 2004; Jiang et al., 2021). The crucial role of FDI in technology transfer and economic growth suggests that it should be considered as a critical variable to be included in this research. Therefore, when examining the relationship between innovation and GDP, it is essential to scrutinize the role of FDI in this relationship. However, when the literature is reviewed, it is seen that there is a lack of study explaining the role of FDI in the relationship between GII and GDP. Furthermore, regardless of the expected role of FDI, there is no study investigating the relationships between FDI, GII and GDP together. Although there are studies in the literature suggesting a direct relationship between innovative activities of countries and GDP figures, the mediator role of FDI in this relationship has not been demonstrated (Vukoszavlyev, 2019; Hasan and Tucci, 2010; Despotovic et al., 2016). Therefore, when examining the relationship between the global innovation activities of countries and GDP figures, it is indispensable to analyze the role of FDI in this relationship. Considering this gap in the literature, it is anticipated that this study will contribute to the existing research by investigating the role of FDI in the relationship between the Global Innovation Index and GDP, thus inspiring future research in this area.

The endogenous growth theory and neoclassical growth theory forms the theoretical basis for this paper. The endogenous growth theory postulates that innovation and technological

progress are considered as major determinants of economic growth. Moreover, the neoclassical growth theory proposes that foreign investment through multinational companies increases wealth in host nations and this situation enables the realization of growth much faster than domestic savings (Mohamed et al., 2021).

The remainder of this paper is structured into six sections. Firstly; the conceptual framework, which is related to each of the variables discussed in the research, is provided. Then, the research design and method is described. In the conclusion part, findings are interpreted according to other results in the literature. In the final section limitations and future research possibilities are discussed.

2. Conceptual Background

2.1. Global Innovation Index

Prior research has developed various indices to compare countries' positions on innovation policies and performance, and to evaluate the effectiveness of government interventions. Analysis of these indices' rankings helps countries to create future development and innovation policy (Crespo and Crespo, 2016). The first generation of innovation measures falls in the 1950s and mid-1960s period and is based on input indicators. On the other hand, the second generation of measurements (1970s and 1980s) focused on innovation outcomes. The third generation of measurements consists of very large indices, and such measurements combine measurements of different input and output columns of innovation (Donoso, 2017). Since the late 1990s, the most comprehensive approach in comparing the performance of different innovation systems has been indices and rankings (Menna et al., 2019).

The Global Innovation Index (GII) ranks countries in terms of their enabling atmospheres and innovation outputs (Rajput et al., 2012). The GII was developed in 2007 by the INSEAD School of Business, Cornell University, and the World Intellectual Property Organization (WIPO) to assess innovation potential in national and socio-economic systems and to support policies and practices that promote innovation (Crespo and Crespo, 2016). This index, which provides a valuable benchmarking opportunity, allows continuous evaluation of innovation factors (Rajput et al., 2012). Published annually since 2007, the GII presents the annual scores and rankings of countries (Cui et al., 2020). The GII not only emphasizes measuring innovation inputs and outputs, but also measuring the connection between innovation and growth and development (Dutta, 2012). Therefore, GII reports are valuable data sets to compare innovation efficiency at both national and international levels and to identify innovation trends (Jankowska et al., 2017). Moreover, GII plays a notable role on the development policies of countries by enabling the measurement of the difference in innovation ability of the countries (Cui et al., 2020). The global innovation index is based on two sub-indices; namely the innovation input sub-index and the innovation output sub-index (Dutta, 2012). These sub-indices are also built on a number of columns which are based on five key concepts: institutions, human capital and research, infrastructure, market complexity, and business complexity (Dogan, 2016; Crespo and Crespo, 2016).

2.2. Gross Domestic Product

Gross domestic product (GDP) is one of the quantitative indicators of the general condition and size of a country's economy. GDP was invented in the 1930s to help America recover from the Great Depression and was first defined in 1934 (Fioramonti, 2013). It is characterized as the monetary value of all final goods and services produced within a specific country's borders during a given period (Uca et al., 2019). Decision makers, economists and investors use this indicator to predict and interpret the state of the economy (Brezina, 2011). Gross domestic product, which is a complex indicator calculated at the macroeconomic level, can be used to make international comparisons and also provide valuable insight on the quality of life in a country (Anghelache et al., 2020).

2.3. Foreign Direct Investment

Foreign direct investment; which has an impact on production, economic growth, balance of payments, income, imports and exports; is one of the important premises of globalization

(Erdal and Tatoglu, 2002). Foreign direct investment is depicted as a form of cross-border capital flow (Lipsey, 2004). In other words, foreign investments can be explained as the transition of investments made by real persons or legal entities from one country to another country or countries (Yücel et al., 2019). Owning 10% or more of ordinary shares with a voting right is a criterion for proving the existence of a foreign direct investment relationship (Civelek et al., 2016). Furthermore, it is a mechanism that activates both domestic and international competition (Çelebi et al., 2015). In addition, foreign direct investment is a crucial tool for the transfer and adoption of best practices that are considered as keys for economic development (Klein et al., 2001). It has been observed that the increase in foreign direct investment inflow reduces the unemployment rate and boosts the desire to participate in employment (Basem-Hassan Lomabridi et al., 2012). A number of factors in the existing literature, which are found to have an impact on FDI, might be defined as market-related factors such as the size of the market, cost factors such as inflation and labour cost, and the investment climate which is considered to be dependent on political stability (Schneider and Frey, 1985). Despite the important contributions of past studies, the main determinants of FDI are still obscure (Schneider and Frey, 1985). Among the factors behind foreign direct investments; the search for resources, market, efficiency and strategic assets are prominent. A reliable and consistent economy along with the power of financial markets can be listed as some of the fundamental components that make countries attractive for foreign investments (Yücel et al., 2019). While in 1970s, most host governments and some economists thought that multinational investments would harm host economies and local competition, this idea was replaced by a more optimistic point of view in 1990s (Markusen and Venables, 1999). One of the most prevailing topics about foreign direct investment in the literature is its contribution to economic growth through technology transfer and skill diffusion (Balasubramanyam et al., 1999). Attraction of studying FDI is increasing as FDI is seen as a tool for technological progress and for the diffusion of improved production techniques (Bénassy Quere et al., 2007). With the World Bank's announcement of this data, studies conducted on this topic began to accelerate. Foreign direct investment data is announced in the World Bank database annually.

3. Research Model And Development Of Hypotheses

The initial research model suggests that Foreign Direct Investment plays mediator role in the relationship between Global Innovation Index and Gross Domestic Product as shown in Figure 1.
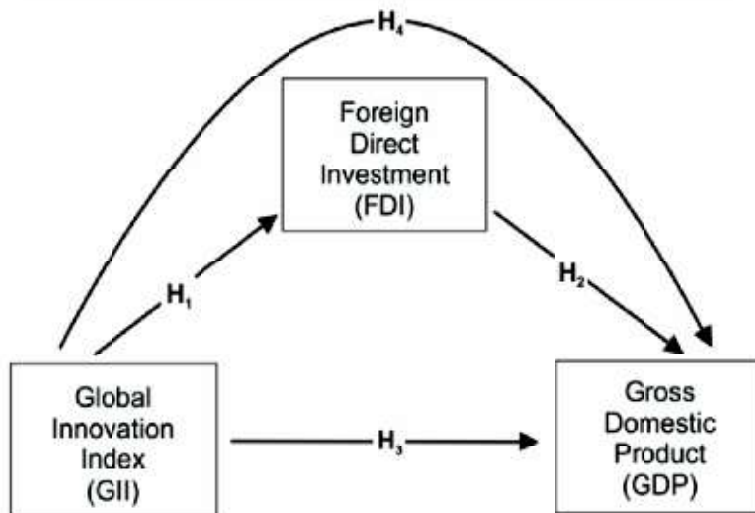

Figure 1:
Initial Research Model

3.1.The Relationship between Global Innovation Index and Foreign Direct Investment
Innovation is important for the development of a country. Indeed, FDI is the main channel for the transfer of advanced technology (Makki and Somwaru, 2004). The contribution of FDI to the country's competitiveness, economic growth and development, and transfer of practice has frequently been emphasized in past studies (Makki and Somwaru, 2004; Hlavacek and Bal-Domanska, 2016; Pece, Simona, and Salisteanu, 2015; Jiang et al., 2021). According to a previous analysis, it has been found that technology absorption and innovation capacity increases FDI (Kayalvizhi and Thenmozhi, 2018). Yet; in the current literature, there is no study highlighting the relationship between GII and FDI. To fill this gap, the hypothesis created under the guidance of previous studies is as follows:
H1: Global innovation has a positive effect on foreign direct investment.

3.2.The Relationship between Foreign Direct Investment and Gross Domestic Product
FDI has momentous impact on economic growth and export potential of countries (Pelinescu and Radulescu, 2009). Various studies have previously demonstrated the positive effect of FDI on economic growth (Sothan, 2017; Kalai and Zghidi, 2019; Zeng and Zhou, 2021; Sinha et al., 2020; Sangwan, 2015). Studies conducted in Pakistan and India, illustrated a positive relationship between FDI and GDP. (Nosheen, 2013; Ray, 2012; Mehra, 2013). Economic growth has been observed to increase in countries where FDI and trade have flourished (Makki and Somwaru, 2004). In addition, FDI has been identified as one of the principal factors driving economic growth in Africa (Zekarias, 2016). Likewise, a study in Central and Eastern Europe found that between 2000 and 2012, the growth in FDI also led to an increase in GDP (Hlavacek and Bal-Domanska, 2016). In this region, FDI has been discovered to be the main determinant of external economic confidence in the development and coherence of the economy (Hlavacek and Bal-Domanska, 2016). In this regard, inspired by the current research, the hypothesis we developed is as follows:
H2: Foreign direct investment has a positive effect on gross domestic product.

3.3. The Relationship between Global Innovation Index and Gross Domestic Product
The national innovation system has an eminent role in facilitating innovation activities and economic growth (Crespo and Crespo, 2016). Also, previous literature has emphasized the impact of innovation on economic growth (Menna et al., 2019). Another previous research demonstrated a correlation between the innovation performance of a national economy and GDP (Vukoszavlyev, 2019). Moreover, in a study conducted by using global patent data, it was concluded that countries with higher quality patents had higher economic growth (Hasan and Tucci, 2010). Various prior studies have also revealed that economic growth and innovation are positively related (Pece et al., 2015). Research by Rajput et al., (2012) underlined the reciprocal relationship between GDP and GII. Accordingly, the hypothesis we developed with support from previous studies is as follows:
H3: Global innovativeness has a positive effect on gross domestic product.

3.4. The Role of Foreign Direct Investment in the Relationship between Global Innovation Index and Gross Domestic Product
Foreign direct investment plays a pivotal role in economic growth through knowledge transfer and the development of technological processes (Pece, et al., 2015). Past studies indicate that GDP and FDI are among the main factors driving innovation (Svagzdiene and Kuklyte, 2016). Based on the noteworthy relationship between innovation and economic growth which is highlighted in the existing literature, we argue that the relationship between the Global Innovation Index and the Gross Domestic Product is mediated through foreign direct investment. Therefore, the hypothesis we developed in the light of previous studies is as follows:

H4: Foreign direct investment plays mediator role in the relation between global innovation and gross domestic product.

4. Research Methodology

This is a cross-sectional quantitative study. The analysis was conducted in SPSS statistics program. The mediator variable analysis was conducted by using the Baron and Kenny methodology (Baron and Kenny, 1986). According to Baron and Kenny; if the following requirements are fulfilled, the variable performs a mediator position (Baron and Kenny, 1986): Change in the independent variable results with a change in the mediator variable, change in the mediator variable results with a change in the dependent variable and If the mediator and the independent variables are incorporated in the assessment, the impact of independent variable on the dependent variable reduces or disappears completely.

4.1. Measures and Sampling

The sample of the study consists of 5-year (2014, 2015, 2016, 2017, 2018) data of 43 countries. The data is secondary and includes Foreign Direct Investment, Global Innovation Index, and Gross Domestic Product. The scope of the study is 43 countries; whose data is not missing in the years mentioned above. The data was taken from the World Bank.

4.2. Test of Hypotheses

The mediator analyses were performed according to the method suggested by Baron and Kenny (Baron and Kenny, 1986). As a prerequisite of this method, correlation values among the variables should be significant (Baron and Kenny, 1986). Correlations among the variables were found as significant. In the Table 2, correlation values are indicated. Hypotheses were tested in 3 models below:

Model 1: GDP $= \beta 0 + \beta 1.\text{GII} + \epsilon$ (used for testing H3)

Model 2: FDI $= \beta 0 + \beta 2.\text{GII} + \epsilon$ (used for testing H1)

Model 3: GDP $= \beta 0 + \beta 1.\text{GII} + \beta 2.\text{FDI} + \epsilon$ (used for testing H2 and H4)

Baron and Kenny's method initially require significant relationship among all the variables included in the conceptual model (Civelek, 2018). Therefore, Pearson correlation coefficients were calculated. As shown in the Table 1, the relationships among variables are statistically significant.

Table 1.
Correlation Coefficients

	GII	FDI	GDP
GII	1		
FDI	,204*	1	
GDP	,199*	,843*	1

* Correlation is significant at the 0.01 level

Three models were developed to test the mediator effect. R and R2 values of these models are shown in Table 2.

Table 2.
KMO and Bartlett spherical test results

Models	R	R2	Adjusted R2	Standard Error of the Estimate
Model 1	0,199	0,040	0,035	3,24354
Model 2	0,204	0,042	0,037	6,59075
Model 3	0,843	0,711	0,709	1,78206

Models		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	92,429	1	92,429	8,786	,003
	Residual	2240,878	213	10,521		
	Total	2333,307	214			
2	Regression	402,809	1	402,809	9,273	,003
	Residual	9252,297	213	43,438		
	Total	9655,105	214			
3	Regression	1660,054	2	830,027	261,366	,000
	Residual	673,253	212	3,176		
	Total	2333,307	214			

Table 3.
ANOVA Tables

In Table 3, ANOVA test results of each model are shown. ANOVA results show that the models are statistically significant.

Relationship	Model 1	Model 2	Model 3
GII → GDP	0.199*		0.028
GII → FDI		0.204*	
FDI → GDP			0.837*

Table 4.
Hypotheses Results

Note: Regression coeffcients are standardized.

*p<0.01

Sobel test was conducted (Sobel, 1982) in order to verify the results reached by Baron and Kenny method. As shown in Table 5, Sobel test result is significant.

	Sobel Test Statistic	P
GII → FDI → GDP	4.3195097	0,00

Table 5.
Sobel Test Results

As listed in Table 4; H1, H2, H3 and H4 were supported. These results of the tests supported a positive and significant relationship between global innovation index and foreign direct investment, between foreign direct investment and gross domestic product and between global innovation index and gross domestic product. These results also supported mediator role of foreign direct investment in the relationship between global innovation index and gross domestic product.

5. Conclusion

The current research contributes to the literature by discovering the mediating role of foreign direct investment in the relationship between the global innovation index and gross domestic product. Previous studies have highlighted the role that innovation plays in the development of the country. Certainly, innovation capacity has been identified as a prominent factor attracting foreign direct investment to countries (Kayalvizhi and Thenmozhi, 2018). This has prompted us to explore the relationship between the Global Innovation Index and Foreign Direct Investment. Many previous studies reveal that FDI plays a critical role in economic growth, development, exports and GDP. (Pelinescu and Radulescu, 2009; Zekarias, 2015; Hlavacek and Bal-Domanska, 2016). Moreover, the effect of innovation on economic growth and the correlation of innovation performance with GDP led us to develop hypotheses regarding the relationship between GII and GDP. After an extensive literature review, it has been ascertained that a study explaining how FDI plays a role in the relationship between GII and GDP does not exist. Furthermore; FDI, GII and GDP have not been investigated together in a study. Therefore, it is anticipated that this research will contribute to both future studies and companies by filling this gap in the literature.

A cross-sectional and quantitative research was conducted using data of 43 countries from

the World Bank between 2014 and 2018. As a result of the analysis, the mediating effect of foreign direct investment on the relationship between the global innovation index and gross domestic product was found to be statistically significant. According to the results, the importance of FDI emerged as having a great impact on the GDP figures of countries' innovation activities and making them more competitive and less imitative in global competition. It can be concluded that FDI has a substantial value in innovation and economic development. Correspondingly, it is underlined that decision makers should consider these three influential indicators together in their evaluation and analysis. Also, we have observed that our research findings are in line with the studies in the current literature. The fact that foreign direct investment greatly contributes to the economic development of countries by enabling technology transfer, organizational learning and international cooperation reinforces the importance of this research. It is anticipated that the result obtained in this article will contribute to the global innovation efforts, the development of products, services and processes enhancing the social life. Likewise, we argue that this study has the potential to change the perspectives of countries on foreign direct investment, gross domestic product and innovation at the national and international level. This research will indirectly support the production of high value-added products, the innovation performance of countries, which make them more attractive for foreign direct investment in the long term. It is also envisaged that these research results will be a valuable guide for companies and researchers based on the fact that foreign direct investment develops countries by enabling technology transfer, technology learning, organizational learning, international cooperation and partnership.

6. Limitations And Future Implications

The limitation of this study is that the research sample is restricted to 43 countries. Accordingly, it is suggested for future researchers to conduct this research with a larger sample of countries. Besides, we encourage future studies to conduct research by considering multiple quantitative indicators related to innovation and the state of the economy, as well as by conducting field research in this area.

Also, in the future, this research model can be enriched by adding other variables. For instance, digitalization emerges as one of the variables that should be examined together with economic growth and foreign direct investment. Indeed, some indices that provide information on digitalization, which is closely related to the economy, were used in a previous study (Digital Evolution Index, World Digital Competitiveness Ranking, Bloomberg Innovation Index) (Trusova, 2019). Thereby, forthcoming studies are encouraged to analyze the relationship between digitalization and economic growth globally by considering the relationship between these indices and GDP. Moreover, in future studies other variables related to technology might be included in the research model. An influential variable whose effect on economic growth has been illustrated in previous studies is information and communication technologies (ICT) (Morawczynski and Ngwenyama, 2007; Jalava and Pohjola, 2008; Sinha et al., 2021). The study of Nayak and Sahoo (2021), one of the valuable prior studies highlighting the impact of ICT on economic growth, has demonstrated that India's economic performance is positively affected by the development of FDI and ICT. Therefore, future research that analyze ICT, innovation, FDI and GDP together and make a comparison between countries using a larger country sample can make a significant contribution to literature. Likewise, the importance given to innovation and digitalization in countries after the Covid-19 epidemic, whether investments have increased and how this affects economic growth is another issue that needs to be examined.

Furthermore, the proven impact of innovation on GDP and the importance of the human role in creating innovation necessitate future research to include global indices related to human capital and education in this research model. Prior examinations have also shown the importance of human capital in economic growth (Adrian Risso and Sanchez Carrera, 2019). Specifically, human capital, coupled with technological innovation, has been shown to have a significant impact on growth (Adrian Risso and Sanchez Carrera, 2019). Additionally, it has been emphasized that the primary role of education is to adapt to innovation and technology

(Schultz, 1975). In this context, the relationship between education, GDP and innovation needs to be scrutinized in depth.

This research has both theoretical and practical implications. Firstly, findings support the theory of endogenous growth which indicates that innovation stimulates economic growth. In addition, findings approve the neoclassical growth theory which suggests that foreign investment through multinational companies increases wealth in host nations and this situation enables the realization of growth much faster than domestic savings (Mohamed et al., 2021). The study present practical implications for governments and stakeholders. Findings indicate that countries should benefit the enriching potential of both GII and FDI. Accordingly, discoveries of this study have the potential to indirectly affect the economic performance of countries and enhance the perspective of decision makers related to innovation. Acknowledging these relationships between GII, FDI and GDP can guide country managers while taking strategic actions. Therefore, this research indirectly encourages decisions that make countries more competitive and productive. This research also underlines the significance of promoting innovation and developing investor-friendly policies to attract investors to the country.

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