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# Causal inference of financial development and institutional quality across the globe☆

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ABSTRACT

The world has experienced increased integration of economic activities in the last decades, thus necessitating the unending examination of the responsible factors. In this case, the causal connection between institutional quality and financial development in 102 countries during the period 1990–2016 is examined. Beyond examining this relationship for the entire countries, the countries are further divided into four different income groups (low-income, lower-middle income, upper-middle income, and high-income countries). By employing empirical method that accounts for country-specific factors in the panel, the result of the study demonstrates bidirectional causality between institutional quality and financial development in the whole panel. In terms of country-income groups, the evidence of the study designates that there is two-way causality between institutional quality and financial development in upper-middle income and high-income countries. Moreover, no causality relationship is found in low-income and lower-middle income countries. These results provide policy guide on the effective way of promoting foreign direct investment across the globe.

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## 1. Introduction

Based on the World Bank report, the ratio of domestic credits to the Gross Domestic Product (GDP) provided by the financial sector in the world increased by twice as much in 2016 to 180%, from 91% in 1980. In high-income countries, the ratio of domestic credits, which was 106% in 1980, increased to 205% in 2016. On the other hand, just like the case of the developed countries, financial development (hereafter FD) especially in the low and middle-income countries have continued to increase. The domestic credit rate through the financial institution which was 43% in 1980 increased rapidly, for instance, to 136% in 2016 in the above-mentioned groups of developing groups. Thus, this development in the financial system is a clear indication of the relevance of institutional quality in promoting financial and related institutions. Meanwhile, North [1] describes institutions as "the rules of the game in a society, or more in form, humanly invented restrictions that shape human interference". These institutions can be grouped into official institutions such as

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constitutions, laws, policies, rights, regulations, and informal institutions such as norms, traditions, and religion [2]. There is wide literature on how strong and well-functioning institutions increase economic performance. Particularly, it is stated that institutional quality is a substantial determinant of economic growth [3–8]. In recent years, due to the characteristics of financial contracts, researchers have increased their interest in the relationship between institutions and finance. In credit contracts, individuals may not be able to fulfill their contractual responsibilities. Therefore, an institutional structure is needed in which an appropriate legal framework and the rights and responsibilities of the contracting parties can be audited [9]. If the institutions are poor, problems with asymmetric information e.g., moral hazard and adverse selection may increase. Such problems may cause inefficient operation of financial markets. In this context, it is difficult to achieve FD in legal and institutional systems where credit agreements are not applied and the cost of information cannot be reduced [1].

Recent studies have pointed out that especially financial market activities have tendency to influence inequalities [10,11]. Because of these, market economies and financial markets need institutions to legitimize themselves. Through market-legitimizing institutions, income is redistributed, social protection is ensured, and social conflicts are reduced [12]. Despite studies focusing on the main determinants of FD and institution quality [13,14], direct examination of the link between institutional quality and finance has been neglected. Therefore, to pursue the objective of investigating the empirical link between FD and institutional quality for a total 102 countries over the period 1990–2016, we employ the World Bank income classification of countries i.e., low income (hereafter LI), lower-middle income (hereafter LMI), upper-middle income (hereafter UMI) and high-income (hereafter HI) countries. The choice of the period is limited by the availability of the data and the developments in the world economy. Because the process of financial liberalization which started in developed countries in the 1980s expanded to include developing countries. Especially in the 1990s, international capital movements such as foreign direct investment and portfolio investments started to increase rapidly.

Several studies in the literature focused on the impact of institutional quality on FD and neglected whether there is causality from FD to institutional quality, considering that FD may have an impact on institutional quality, this study purposes to fill the empirical gap by providing empirical evidence on whether there is a feedback relationship between these variables. Second, contrary to most studies in the literature [13,15,16], the study is based on a large data set covering 102 countries. Additionally, countries are divided into four groups: LI, LMI, UMI and HI countries based on the World Bank classification. This handling has some advantages. The inclusion of many countries in the analysis will increase the number of observations and increase the reliability of econometric results. On the other hand, the division of countries into different income groups will provide more specific evidence based on country groups on the connection between finance and institutional quality. Third, the FD index obtained from the IMF [17] is used as an indicator of FD. Most of the studies in the literature have used variables such as domestic credits, stock market capitalization and total stock market value traded as indicators of FD [9,13,15,18]. These variables represent either banks or stock markets. Therefore, it completely cannot measure the complex and complicated structure of FD. On the contrary to traditional approaches, the FD index will represent a more inclusive and extensive indicator of FD [17]. Finally, the second-generation panel data methodology is applied in the study. Particularly, cross-sectional dependence (CSD) tests have been applied to determine whether the units have a cross-sectional dependence. If the cross-sectional dependency problem is not cared for, causality findings can be biased and inefficient. For this reason, the causality relationship is examined with Dumitrescu and Hurlin [19] causality test which considers this issue. In this way, this modern causality test ensures more robust estimates.

The study is planned as follows. In the second chapter, the related literature is reviewed. Section 3 depicts the data and methodology. The findings are submitted in Section 4. Last chapter contains the conclusion and policy implications.

## 2. Literature review

The related literature focuses on the influence of legal and regulatory institutions on FD. In this framework, it is emphasized that institutions including the conservation of property rights, contract implementation, strong accounting practices and other institutional factors such as political stability, democracy, and corruption are important actors in explaining FD [9,18,20].

Within this framework, there is a large theoretical and empirical literature examining the impact of institutional variables on FD. From the pioneering studies, La Porta et al. [21] stated that the legal system has a critical effect on the effectiveness of financial actors and transactions. The authors concluded that in countries where shareholder rights were weak, stock markets were small and undeveloped. On the contrary, it has been pointed out that the stock markets are larger and more developed in the British law system where shareholders are granted more comprehensive rights and protection. Rajan and Zingales [22] proposed the interest group theory to explain the determinants of FD. For this reason, the impact of political interest groups on financial markets was examined. The authors indicated that the policy directed by interest groups reduced the depth and efficiency of financial markets. It has been emphasized that the control of the opportunities provided by the financial markets by a particular group restricts the access of other actors to financial opportunities. Therefore, increasing the competition between distinct groups was especially important to ensure FD. Haber [23] examined the origins of FD in the United States of America (USA) and Mexico in the historical process. It was stated that differences in FD levels among countries could be explained by the legal origin and political institutions. The results of the study, which examined the period of 1790–1913, show that political institutions were an important catalyst for FD rather than the legal background. Similar to Rajan and Zingales [22], Haber [23] emphasized that the establishment of institutions to promote political competition would lead to a more efficient banking system.

Chinn and Ito [24] analyzed the influence of financial openness on FD in 108 countries from 1980–2000. The findings show that financial openness only supports stock markets after reaching a threshold level of legal development. In this sense, it is concluded that it was especially important to establish a certain institutional quality in FD. With an understanding similar to Rajan and Zingales [22], Girma and Shortland [15] examined the influence of democracy and political stability on FD both in developed and developing countries in the period 1975–2000. The authors pointed out that the political elites had easily reached financial capital in countries where democracy and FD could not be achieved. Therefore, the unproductive use of scarce financial resources prevented potential users from entering the financial market. The findings of the econometric model showed that the level of democracy positively affected not only the banking sector but also market capitalization. Baltagi et al. [25] investigated the connection among institutions, financial openness, and FD in rich and poor countries during 1980–2003. The findings of the study revealed that institutional quality and financial liberalization affected FD.

In his important study, Mishkin [20] pointed out that globalization was a key element in establishing institutions that will support the finance sector and economic performance in developing countries. In this study, six important institutional factors were listed to ensure FD. The author emphasized that the protection of property rights, the establishment of the legal system, the reduction of corruption, the improvement of the quality of financial information, the improvement of corporate governance, and the provision of regulations of the banking system were especially important for FD. In addition, according to Mishkin [20], per capita income and foreign capital inflows were accelerated with FD. With the increase in the income of individuals, the demand for quality institutions may increase. In addition, foreign investors can make pressure on the local government for institutional reform. All these developments indicate that institutional quality may enhance as FD increases. Huang [18] stated that democratic regimes may have a stronger institutional structure, especially property rights, compared to autocratic regimes. In this context, he argued that strong institutional structures have supported FD. In addition, the connection between institutions and FD in 90 developed and developing countries was investigated by the GMM (generalized moment of method) technique in 1960–1999. According to the findings of the study, improving institutional quality increased FD at least in the short run for LI countries.

Similar to Girma and Shortland [15], Roe and Siegel [26] highlighted political stability in providing FD. In the study that four different political instability indicators were used, it was concluded that political stability is especially important in the development of financial markets just as the stock market. Law and Azman-Saini [9] examined the impact of institutional quality on the banking sector and the stock market in sixty-three developed and developing countries. In the study, private-sector credit and stock market capitalization were used as financial indicators. The results of the analysis conducted through the dynamic GMM pointed out that the increase in institutional quality supported FD. Law et al. [27] researched the link between institution quality, finance, and economic growth in eighty-five countries in 1980–2008. The study findings indicated that FD, as Chinn and Ito [24] point out, supported economic growth provided that a certain level of institutional quality is reached.

Law et al. [28] researched the connection among globalization, institutions, and FD for 8 East Asian countries from 1984–2008. This study implement capitalization, private sector credit and stock market to represent FD. According to the results of panel DOLS (dynamic ordinary least squares), it was concluded that institutional quality affected both private sector credits and market capitalization statistically significantly and positively. Additionally, the result of VECM (vector error correction model) causality indicated that there was bidirectional causality between institutions and private sector credit. On the other hand, the study has found no causality between institutions and stock market capitalization.

Attention in the institutional characteristics of finance has continued through current studies. Law et al. [12] examined the impact of banking sector development and institutions defined by Rodrik [29] on economic growth for 87 countries. The findings of the study indicated that the institutions such as market-creating, market-regulating, market-stabilizing, and market-legitimizing reduced the financial curse. Kaidi et al. [30] researched the relationship among finance, institutions, and poverty in developed and developing countries in the 1980–2014. The results obtained from the study were quite complicated. The effect of institutional quality on finance has changed according to variable choice. Khan et al. [16] surveyed the connection among financial sector, natural resource rent, institutions, and economic growth in the United States of America from 1984–2016. In the study using Autoregressive Distributed Lag (ARDL) approach, it was concluded that institution quality is a substantial prerequisite for FD.

Recent studies have also extensively offered evidence of the effect of institutional quality on financial development. For instance, Aluko and Ibrahim [31] examined the relationship between finance and growth in sub-Saharan Africa within the framework of the intermediary role of institutions. The results obtained did not create a clear framework for the intermediary role of institutions. Khan et al. [32] investigated the relationship between natural resources, institutions, quality, and financial development in eighty-seven developing countries for the period 1984–2018. The results indicated that institutional quality had a positive impact on FD. Kim [33] researched the impact of remittances and institutional quality on FD in forty-six countries. Findings covering the period 1996–2016 showed that institutions supported FD. Ali et al. [34] investigated the interaction between financial inclusion, financial development, and institutional quality in 45 countries over the period 2000–2016. Like the study of Kim [33], it was found that institutional quality positively affects FD. Contrary to most studies in the literature, Olaniyi and Oladeji [35] concluded that institutional quality reduced the impact of financial development on growth in West Africa.

Although plethora of studies also justifies the roles of institutional quality and financial development on the economic (such as tourism) and environmental aspects [36,37], the specific impact of FD on institutional quality has remained

**Table 1**
Descriptive statistics.

| | Mean | Median | Max. | Min. | Std. deviation |
|---|---|---|---|---|---|
| FDI | 0.33 | 0.26 | 1.00 | 0.00 | 0.23 |
| C | 3.03 | 3.00 | 6.00 | 0.00 | 1.34 |
| LO | 3.78 | 4.00 | 6.00 | 0.00 | 1.43 |
| BQ | 2.25 | 2.00 | 4.00 | 0.00 | 1.15 |
| D | 3.98 | 4.00 | 6.00 | 0.00 | 1.60 |
| G | 7.86 | 7.91 | 12.00 | 1.00 | 1.92 |
| IQ | 20.92 | 20.16 | 33.00 | 2.83 | 5.14 |

sparsely explored. With simple logic, it is conceivable that there might be a bidirectional relationship between these variables. For this reason, the analysis of whether there is a feedback connection between finance and institutions is especially important to understand the relationship more comprehensively. In addition, this will be an important guide for policymakers in designing both institutional and financial policies.

## 3. Data definitions and methodology

In this attempt, 102 countries[1] are analyzed. The study focuses on four distinct groups of countries based on the World Bank classification. These country groups consist of 20 LI, 23 LMI, 25 UMI, and 34 HI countries. In the study, annual data for the period between 1990 and 2016 is considered. This study employs the financial development index (FDI) gained from IMF [17] as FD indicator. FDI is an indicator that reflects the depth, access and effectiveness of financial institutions and markets. In this context, FDI includes many different financial indicators such as private sector credit, pension fund assets, insurance premiums, stock market capitalization, stocks traded, stock market turnover ratio, and number of bank branches and ATMs [17]. Thus, this index is thought to reflect the complex structure of FD better. Values of FDI are between 0 and 1. Increasing values remark better FD and vice versa.

The data of the institutional indicators are acquired from International Country Risk Guide [38]. Following the Law et al. [28], 5 different indicators are preferred to create an institutional quality (IQ) index: corruption (C), law and order (LO), bureaucratic quality (BQ), democratic accountability (D) and government stability (G). C, LO, and D are ranged from 0–6. Also, BQ and G are scaled from 0–4 and 0–12, respectively. Increasing values point out that institutional quality has increased. The institutional quality variable is the sum of these five indicators. Therefore, our institution quality variable (IQ) is between 0 and 34. Increasing the value of IQ means that institutional quality has increased.

Table 1 exhibits the basic statistics of FDI and IQ for the entire panel. The minimum value of FDI is 0.003. Its maximum value is 1.00. Finally, its mean value is 0.33. The mean values of C, LO, BQ, D and G, which are chosen as institutional quality indicators, are respectively 3.03, 3.78, 2.25, 3.98 and 7.86. Finally, the minimum and maximum values of the IQ are 2.83 and 33, respectively, and the mean is 20.92.

Fig. 1 demonstrates the scatter plot of the relationship between FDI and IQ for each observation covering 102 countries and the period 1990–2016. The vertical axis indicates FDI, while the horizontal axis indicates institutional quality. As observed, the scatter plot shows a positive correlation between the FDI and IQ. The increase in IQ corresponds to a higher level of FDI and vice versa. Moreover, the country groups scatter plots, as shown in the Appendix also follows similar pattern of positive correlation (see Figs. A.1–A.4 of the Appendix).

To test whether there is a causal relationship between FD and institutional quality, Dumitrescu and Hurlin [19] panel causality test is applied. Just before investigating the causality in a panel model, the cross-sectional dependence (CSD) matter should be overseen. The CSD means that a shock in any cross-section unit might influence other units in the model. Because financial shocks are spreading rapidly, it is particularly important to consider CSD in financial studies. Simulations conducted by Banerjee et al. [39] and Pesaran [40] indicate the important bias and size distortions that might take place if CSD is overlooked. In addition, CSD is an important parameter in the selection of unit root tests in which the stationary of the series will be determined. If the series has a CSD, the second-generation unit root tests should be used, considering the correlation between the calculated error terms for each unit.

In the literature, it was observed that previous studies examining the relationship between finance and institutions did not consider CSD. In these studies, the results may not be dependable due to the failure to consider the CSD. In this context, first, it will be examined whether there is a CSD among units. To evaluate the CSD, Breusch and Pagan [41] LM, Pesaran [42] CD, Pesaran [42] scaled LM and Baltagi et al. [43] bias-corrected scaled LM tests are used in the study.

Panel data sets with a long-time dimension show the features of time series. Ignoring the unit root properties of the variables can lead to spurious regression problems and reduce confidence of the results. Therefore, it should be examined whether the series have unit roots. In addition, the CSD of the panel data needs the use of second-generation unit root tests. If the series has the CSD problem, the application of traditional unit root tests may induce the findings to be biased. In such a case, the causality relationship between FD and institutional quality cannot be analyzed correctly. Pesaran [44]

[1] The countries examined are presented in the Appendix of the study.

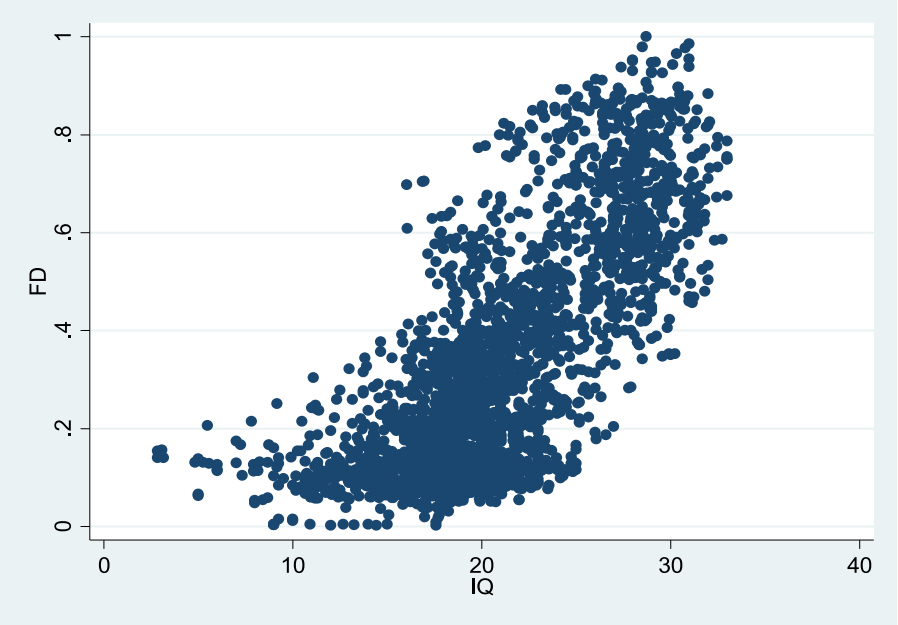



**Fig. 1.** Relationship between financial development and institution quality.
*Source:* Authors' computation.

**Table 2**
Cross-sectional dependence.

| | Financial development | | Institutional quality | |
|---|---|---|---|---|
| | Statistic | p-value | Statistic | p-value |
| Breusch–Pagan LM | 44716.83* | 0.00 | 31711.47* | 0.00 |
| Pesaran scaled CD | 388.81* | 0.00 | 260.67* | 0.00 |
| Bias-corrected scaled LM | 386.77* | 0.00 | 258.63* | 0.00 |
| Pesaran CD | 149.95* | 0.00 | 134.45* | 0.00 |

*Represents 1% statistical significance.

improved a test by considering the CSD. In this context, the use of the CADF test, which considers the CSD, will ensure reliable results. In addition, this test has some advantages. The Covariate Augmented Dickey–Fuller (CADF) test can be applied regardless of which time (T) and unit (N) dimensions are large [44].

Former attempts that investigated the connection between FD and institutional quality, nevertheless, did not conduct the cross-sectional dependence in the panel data analysis. Biased and inefficient estimates of causality might be procured if the CSD in a panel model is not considered [45]. Many of causality tests do not consider the CSD and heterogeneity. Dumitrescu and Hurlin (DH) [19] advanced a causality test that considers the CSD and heterogeneity. Through the test, potential causality relationships between variables can be identified. In addition to the impact of institutional quality, which is mostly examined in the literature, on FD, it can be determined whether FD is the cause of institutional quality. Thus, the interaction between variables can be analyzed more extensively. The null hypothesis in DH indicates that there is no causal relationship. On the other hand, the alternative hypothesis indicates that there is causality in at least one unit. Also, variables should be stationary to apply DH. If the variables are not stationary, the variables should be made stationary. Once these conditions are met, DH can be applied.

## 4. Empirical results

The first step of the empirical analysis is to investigate the CSD for the countries analyzed. The CSD is investigated through four different tests. Table 2 displays the findings obtained through CSD tests. In all the tests, the null hypothesis that there is not the CSD is rejected. In this context, it is concluded that there is cross-section dependence in the series. This finding shows that a shock in a country may affect other countries.

Table 3 indicates the results of the second generation CADF unit root test. CADF statistics refer that the null hypothesis expressing the existence of the unit root can be rejected at a %1 level of significance for FD and IQ. That is to say, the results suggest that both variables are stationary at the level.

**Table 3**
CADF test.

| | FD | Institutional quality |
|---|---|---|
| Statistic | −2.324* | −11.023* |
| p-value | 0.01 | 0.00 |

*Symbolizes 1% statistical significance.

**Table 4**
DH causality test (FD and IQ).

| | Null hypothesis | | | |
|---|---|---|---|---|
| | $H_O$: IQ does not cause FD | | $H_O$: FD does not cause IQ | |
| | Z-bar statistic | p-value | Z-bar statistic | p-value |
| Full Panel | 2.05 | 0.04** | 5.94 | 0.00* |
| LI | 1.21 | 0.22 | 1.58 | 0.11 |
| LMI | 0.77 | 0.43 | 1.41 | 0.15 |
| UMI | 1.73 | 0.08*** | 3.05 | 0.00* |
| HI | 3.21 | 0.00* | 5.29 | 0.00* |

*Indicate significance at 1%.
**Indicate significance at 5%.
***Indicate significance at 10%.

CADF unit root test results show that both variables are stable at the level. For this reason, Dumitrescu and Hurlin [19] causality analysis can be applied to these variables. Table 4 represents the results of the DH test for the whole panel, LI, LMI, UMI, and HI countries. In the analysis which includes all countries, the null hypothesis which refers that there is no causality running from IQ to FD is rejected at 5% significance level. That is to say, the IQ is the cause of FD for the whole panel. This implies that any changes in IQ will affect FD. At the same time, the null hypothesis, which indicates that there is no causality running from FD to IQ in the whole panel, is rejected at 1% significance level. Therefore, changes in FD will affect IQ. The findings show bidirectional causality between IQ and FD for the whole panel. These findings refer that there is a feedback connection between institutional quality and FD. Therefore, it can be said that FD and institutional quality are strongly linked to the whole panel.

After the whole panel, causality analysis is performed for country groups. The results indicate that the null hypotheses indicating the absence of causality cannot be rejected for low-income and LMI countries. The results reveal that there is a neutral connection between IQ and FD in both countries. This refers that IQ and FD are not related to each other.

In UMI countries, the null hypotheses indicating that there is no causality from IQ to FD and FD to IQ are rejected at significance levels of 10% and 1%, respectively. Therefore, the feedback relationship between these variables is valid in UMI countries. In high-income countries, the null hypotheses indicating that there is no causality running from IQ to FD, and FD to IQ are rejected at significance levels of 1% and 1%, respectively. The results imply that in these country groups, the feedback relationship between these variables is valid and that the two variables are strongly interacting.

The results demonstrate that the feedback hypothesis is valid for the whole panel. The findings of this study are consistent with those of Rajan and Zingales [22], Girma and Shortland [15], Law and Habibullah [13], Huang [18], Law and Azman-Saini [9] and Law et al. [28], which concluded that institutional quality is important for FD. On the other hand, Mishkin's [20] emphasis on FD to improve institutional quality is supported empirically by these findings. Although there are few studies examining the relationship between institution quality and FD with causality analysis, the bidirectional causality finding obtained from this study is consistent with those of Law et al. [27,28]. In this framework, reducing corruption, entrenching the law and order, increasing bureaucratic quality, actualizing regulatory institutions, establishing democracy, and ensuring government stability will increase FD. Increasing institutional quality will be particularly important in reducing economic and political uncertainty, increasing productivity, and directing scarce resources to productive areas. In addition, increasing institutional quality will increase the foreign capital inflows such as foreign direct investment and portfolio investments, and will positively affect the banking sector and capital markets. On the other hand, it is stated that FD mostly provides a higher per capita income level in economic literature [12]. In this context, increased FD can help increase per capita income and prosperity in the country. Increased income levels and living standards can increase demand for a better institutional structure. Also, increased foreign capital movements may accelerate the institutional reform process by pressure on local governments.

In terms of country groups, no causality relationship is found in LI and LMI countries. Indeed, it is known that institutional quality and FD are weak in these countries [4]. In these countries, it can be said that low-quality institutions prevent the efficient functioning of the banking sector and capital markets. On the other hand, the inefficient and ineffective financial framework has not been able to create an element of pressure on increasing institutional quality. As Rajan and Zingales [22] and Huang [18] point out, interest groups in these countries can be an obstacle to institutional reforms to protect their monetary and fiscal interests and reduce competition. The transfer of financial resources to this group and the inability of potential users to access financial opportunities prevent FD.

In particular, the weakness of basic institutions such as property rights, laws and democracy, and the failure to implement non-market institutions such as creating, regulating, stabilizing, and legitimizing lead to inadequate development of the financial sector. In these countries, reducing corruption, establishing strong laws, ensuring political stability, increasing the quality of bureaucrats who will design economic policies, and adopting democracy as a meta-institution, can improve domestic markets efficiently and increase foreign capital investments. Besides, it is important to support such institutional reforms with property rights, regulatory, macroeconomic stabilization, social insurance, and conflict management institutions stated by Rodrik [29]. Because central banks regulate credit and money supply, fiscal policies stabilize aggregate demand, regulatory authorities prevent anti-competitive behaviors, and the insurance system provides social protection and participatory democracy with accountability will reduce uncertainties on markets, increase efficiency and strengthen foreign capital investments. As Mishkin [46] and Rodrik [4] emphasize, designing institutions with local realities and accelerating foreign investment can increase FD and financial inclusion. As Law et al. [12] point out, these developments will pave the way for healthy FD and will be an important catalyst in increasing per capita income. The increase in income and the interaction created by foreign capital can increase the pressure of institutional reform.

In addition to this, a bidirectional causality relationship between institutional quality and FD has been identified in UMI and HI countries. It is known that institutional reforms have been made actual for a long time, especially in HI countries. Within this framework, improvements in institutional factors such as corruption, law, bureaucracy, and democratic demands reduce uncertainty and create a healthier financial structure in these countries. In addition, as Mishkin [20] points out, an increase in the level of income through the financial channel can create a demand for institutional quality. As these countries have relatively HI levels, the demand for institutional reform also brings institutional quality. According to the United Nations Conference on Trade and Development [47], foreign direct investment inflows to developed countries are higher than those of developing countries. Although labor costs are high, the fact that developed countries attract investment from developing countries implies that institutional quality is one of the crucial determinants of FD. The fact that foreign investors in these countries are extremely sensitive to institutional reforms is an important parameter in maintaining institutional quality in these countries. All these explanations indicate that the bidirectional causality between institutions and finance in UMI and HI countries is quite plausible.

### *4.1. Robustness check*

This section will investigate the sensitivity of initial results to alternative institutional quality indicators. In this section, a new institutional quality indicator is employed to check the robustness of the initial results. Four types of institutional indicators (market-creating, market-regulating, market stabilizing and market-legitimizing) defined by Rodrik [29] are used to perform robustness analysis of the relationship between FD and IQ.

To measure these institutions, Law et al. [12]'s methodology is followed. The law-and-order index from the International Country Risk Guide (ICRG) is a healthy indicator for measuring market-creating institutions. Market-regulating institutions make various regulations in the relevant markets and enable the markets to operate more efficiently. In this context, the regulatory index covering the credit market regulation, labor market regulation, and business regulation obtained from the Fraser Institute is used to measure market-regulating institutions [48]. Market-stabilizing institutions reduce the pressure on macroeconomic indicators and eliminate economic uncertainty. The sound money index obtained from the Fraser Institute is preferred to measure market-stabilizing institutions [48]. Finally, the democratic accountability indicator from the ICRG is operated to measure market-legitimizing institutions that provide social peace, social protection, and redistributive income. The law and order and democratic accountability range from 0–6. The other two are scaled from 0–10. The new institutional quality variable is the sum of these four variables. It has a value between 0 and 32 and is called IQ2. High scores mean high institution quality. Unlike our basic analysis, eighty-six countries are analyzed because the data from the Fraser Institute did not cover all countries. These country groups consist of 13 LI, 18 LMI, 23 UMI, and 32 HI countries. Due to the data constraint, the analysis period covers a total of 19 years, 1990, 1995, and 2000–2016. The countries analyzed in this section are shown in the Table A.1 of the Appendix.

Table 5 shows the causality connection between institutional quality and FD for the whole panel and sub-country groups. The findings of the robustness analysis confirm the main analysis findings of the study. The bidirectional causality relationship between Rodrik [29]'s non-market institutions and FD is identified in the whole panel. Based on this finding, improvements in market-creating, market-regulating, market-stabilizing, and market-legitimizing institutions will affect FD. On the other hand, the progress made in FD will further enhance these institutions. In terms of country groups, the results are the same as in the main analysis, except low middle-income countries. The unidirectional relationship from institutional quality to FD has been identified in LMI countries. These finding signals that the development of these institutions in low-middle-income countries may be important for FD.

## 5. Conclusion and policy implications

Although there are many determinants of FD in the literature, the impact of institutional factors on FD has started to attract attention in recent years. Despite the growing interest in the literature, the analysis of the direct relationship between FD and IQ is still extremely limited. Considering these developments, whether institutions have an impact on FD has become a substantial research question. At the same time, another important question is whether FD has an impact on institutional quality.

**Table 5**
DH causality test (FD and IQ).[2]

| | Null hypothesis | | | |
|---|---|---|---|---|
| | $H_O$: IQ2 does not cause FD | | $H_O$: FD does not cause IQ2 | |
| | Z-bar statistic | p-value | Z-bar statistic | p-value |
| Full Panel | 5.05 | 0.00[a] | 2.85 | 0.00[a] |
| LI | 0.24 | 0.80 | 0.31 | 0.75 |
| LMI | 3.14 | 0.00[a] | 0.40 | 0.68 |
| UMI | 3.12 | 0.00[a] | 2.66 | 0.00[a] |
| HI | 4.42 | 0.00[a] | 1.84 | 0.06[c] |

To answer these questions, the causality relationship between FD and IQ for four different country groups is investigated by Dumitrescu and Hurlin [19] causality analysis in 1990–2016. The findings point out that there is bidirectional causality between FD and IQ in the whole panel. On the other hand, a causality relationship is not found in LI and LMI countries, while bidirectional causality between FD and IQ is determined in UMI and HI countries. Additionally, a new institutional indicator has been described by Rodrik [29] to test the robustness of the basic analysis results. The robustness results supported the main results, except for lower-middle-income countries. In this country group, the unidirectional causality relationship from IQ to FD is identified.

### 5.1. Policy recommendation

The results of this study have theoretical and policy implications. First, these results show that the relationship between FD and IQ cannot be generalizable for different income-level countries. Although the positive and mutual relationship between FD and IQ is plausible, it can be said that the internal conditions of the countries such as colonial backgrounds, legal traditions, and cultural codes are decisive in the formation of FD and institutions. Especially in LI countries and lower-income countries within the framework of basic analysis, non-democratic systems, the inability of the legal system, political instability, and inadequate property rights have caused the causality relation not to be obtained. However, robustness results suggest that non-market institutions support FD in LMI countries, as a promising realization.

Additionally, the results obtained from the study will provide significant policy implications. Huang [18] emphasizes that democracy and strong institutional infrastructure should be established before FD is achieved. In this context, policymakers in the low-income and LMI countries should ensure that their democratic practices, reduction of corruption, the establishment of the rule of law, protection of property rights, improvement of investor protection legislation, and strengthening of the regulatory system. Such reforms increase institutional quality and reduce economic and political uncertainties. In terms of UMI and HI countries, maintaining institutional quality and developing regulatory institutions will be especially important. Because especially the regulatory institutions help reduce problems such as adverse selection and moral hazard. In this context, financial markets, which move away from speculative activities through powerful institutions, will work more effectively.

Although this study has made an important contribution to the literature in some respects, it has left some important questions to be answered in future studies. Future studies may focus more extensively on the relationship among globalization, IQ, and FD both theoretical and empirical. In other words, studies can analyze how globalization mediates the relationship between FD and IQ. Such a contribution could lead to a comprehensive discussion of Mishkin's [20] arguments. On the other hand, future studies also can investigate the connection between FD and IQ through different indicators for a single country or different country groups (the Organization for Economic Co-operation and Development-OECD, Middle East and North Africa-MENA, Emerging i.e., E-7, Sub-Saharan Africa, etc.). Analyzing countries with similar characteristics and socioeconomic development levels yields comparable empirical evidence and may help to formulate policy implications within the context of countries' internal conditions.

*Abbreviation*
ARDL: Autoregressive Distributed Lag
BQ: Bureaucratic Quality (BQ)
C: Corruption
CADF: Covariate Augmented Dickey–Fuller
CSD: Cross-sectional Dependence
D: Democratic accountability
DH: Dumitrescu and Hurlin
DOLS: Dynamic Ordinary Least Square
FD: Financial Development

[2] CSD and unit root tests were performed for the new institutional quality variable (IQ2). Test results show that IQ has cross-sectional dependence. According to Pesaran [44] CADF test applied in this framework, the variable is stationary at the level.

G: Government stability
GDP: Gross Domestic Product
GMM: Generalized Moment of Method
HI: High Income
IQ: Institutional quality
ICRG: International Country Risk Guide
LO: Law and Order
LI: Low Income
LMI: Lower-Middle Income
MENA: Middle East and North Africa
OECD: Organization for Economic Co-operation and Development-OECD
UMI: Upper-Middle Income
UNCTAD: United Nations Conference on Trade and Development
USA: United States of America
VECM: Vector Error Correction Model

## CRediT authorship contribution statement

**Umut Uzar:** Data curation, Methodology, Formal analysis, Writing – review & editing. **Kemal Eyuboglu:** Data curation, Methodology, Formal analysis, Writing – original draft. **Saffet Akdag:** Data curation, Methodology, Formal analysis, Writing – review & editing. **Andrew Adewale Alola:** Writing – review & editing.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Data availability

Data will be made available on request

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## Appendix

See Table A.1 and Figs. A.1–A.4.

**Table A.1**
List of the examined countries according to World Bank income classification.

| | | | | |
|---|---|---|---|---|
| Low income countries (995 USD or less) | | | | |
| Burkina Faso | Congo, Dem. Rep | Ethiopia | The Gambia | Guinea |
| Guinea-Bissau | Haiti | Liberia | Madagascar | Malawi |
| Mali | Mozambique | Niger | Senegal | Sierra Leone |
| Syria | Tanzania | Togo | Uganda | Yemen, Rep. |
| Lower-Middle income countries (996 USD to 3895) | | | | |
| Bangladesh | Bolivia | Cameroon | Egypt, Arab Rep | El Salvador |
| Ghana | Honduras | India | Indonesia | Kenya |
| Mongolia | Morocco | Myanmar | Nicaragua | Nigeria |
| Pakistan | Papua New Guinea | Philippines | Sri Lanka | Sudan |
| Tunisia | Vietnam | Zambia | | |

(*continued on next page*)

**Table A.1** (*continued*).

| | | | | |
|---|---|---|---|---|
| Low income countries (995 USD or less) | | | | |
| Upper-Middle income countries (3896 USD to 12,055 UDS) | | | | |
| Albania | Algeria | Botswana | Brazil | Bulgaria |
| China | Colombia | Costa Rica | Ecuador | Gabon |
| Guatemala | Iran | Jamaica | Jordan | Lebanon |
| Libya | Malaysia | Mexico | Namibia | Paraguay |
| Peru | South Africa | Thailand | Turkey | Venezuela, RB |
| High- income countries (12, 056 USD or more) | | | | |
| Argentina | Australia | Austria | Bahrain | Belgium |
| Canada | Chile | Cyprus | Denmark | Finland |
| France | Germany | Greece | Hungary | Iceland |
| Ireland | Israel | Italy | Japan | Korea, Rep. |
| Netherlands | New Zealand | Norway | Poland | Portugal |
| Qatar | Singapore | Saudi Arabia | Spain | Sweden |
| Switzerland | United Kingdom | United States | Uruguay | |

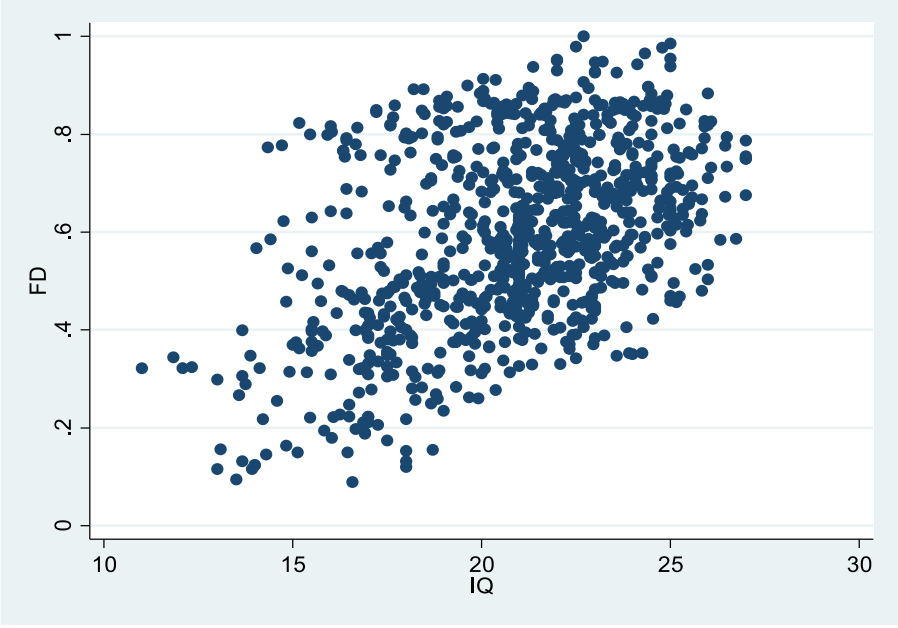



**Fig. A.1.** Relationship between FD and IQ for High Income countries.
*Source:* Authors' computation.

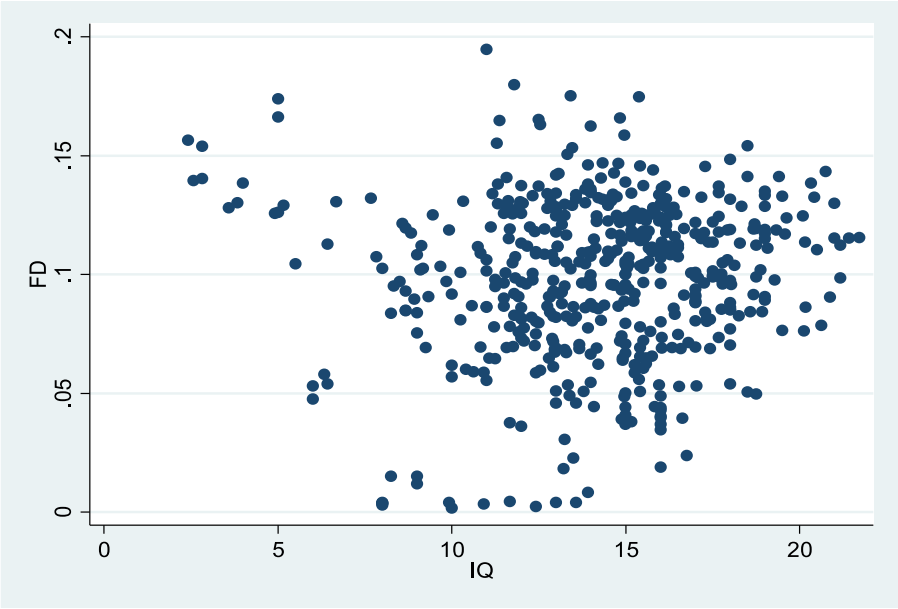



**Fig. A.2.** Relationship between FD and IQ for Low Income countries.
*Source:* Authors' computation.

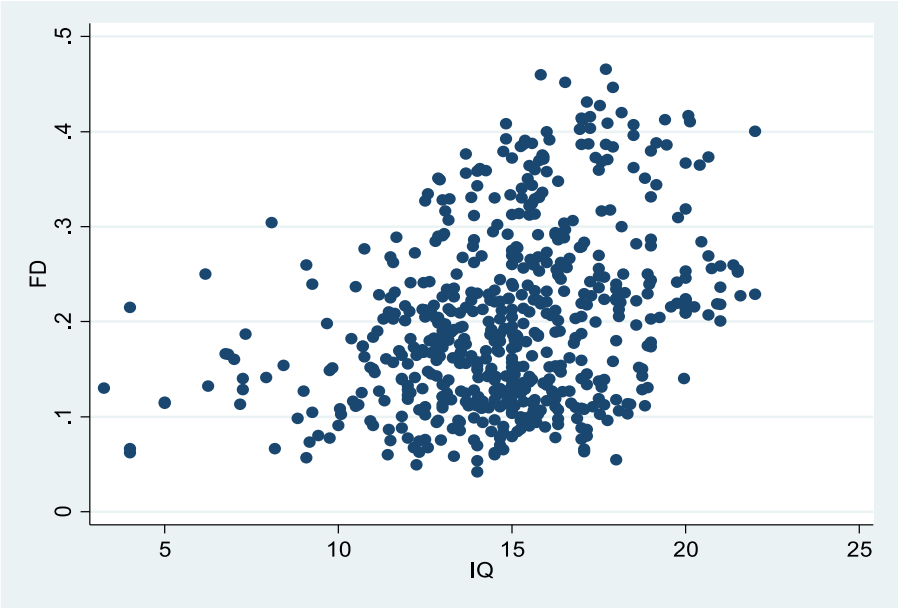



**Fig. A.3.** Relationship between FD and IQ for Lower-Middle Income countries.
*Source:* Authors' computation.

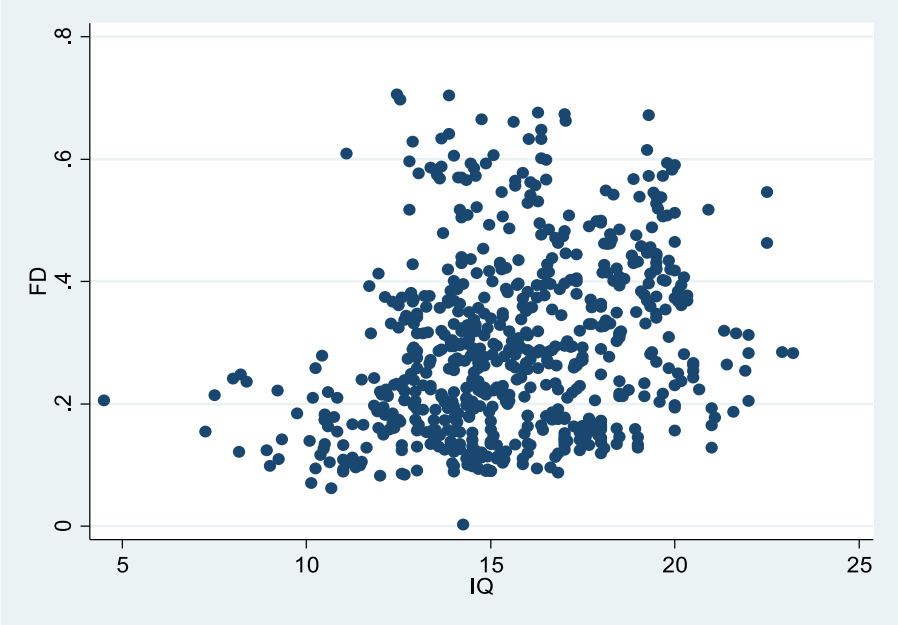



**Fig. A.4.** Relationship between FD and IQ for Upper-Middle Income countries.
*Source:* Authors' computation.

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