Spillover effects of financial development on the informal economic activity
Empirical evidence from Turkey

Salih Katircioglu
*Department of Banking and Finance, Eastern Mediterranean University,
Via Mersin 10, North Cyprus, and*

Hatice Imamoglu
Faculty of Business and Economics, Girne American University, Girne, Turkey

Abstract

Purpose – This study aims to investigate the role and spillover effects of the financial sector on the size of the informal economic activity in Turkey.

Design/methodology/approach – Time series analysis has been adopted for annual data of the 1970-2017 period. New approaches in unit root and cointegration tests have been used in this study. Estimations have been done via dynamic ordinary least squares and fully modified ordinary least square approaches.

Findings – Results confirm the existence of a long-run equilibrium relationship between the financial system and informal economic activities in Turkey. At the earlier stages of financial development (FD), informality tends to rise while in further stages, informality tends to decline over time. This study confirms the U-shaped relationship between FD and the informal economy in Turkey.

Research limitations/implications – This study has used logarithmic values of series in the econometric analysis except for real interest rates because of negative values in some periods. Thus, by using level forms of real interest, missing values would be avoided.

Practical implications – Increasing efficiency, control and institutional quality, as well as the quality of governance environment, would be useful tools in reducing the size of informality, as this study finds that spillover effects of financial services on the informal economic activity are adverse.

Originality/value – This study is the first of its kind to the best of the knowledge in the case of Turkey, which estimates the spillover effects of FD on informal economic activity.

Keywords Informal economy, Turkey, Time series analysis, Financial sector, Structural breaks

Paper type Research paper

1. Introduction

The informal economic activity is one of the crucial problems in the countries. According to Schneider (2010), the size of the informal economic activity is up to 17 per cent of gross domestic product (GDP) in developed countries while it is up to 43 per cent of GDP in the case of developing countries and up to 40 per cent of GDP in transition countries. Deterioration in the financial position of the government budget and social security institutions, resulting in the lack of development and distortion in investments are some of the essential results of informal activities (Imamoglu, 2016; Williams, 2011, 2010, 2008; Williams and Round, 2009; Schneider, 2009; Dabla-Norris *et al.*, 2008; Maurin *et al.*, 2006; Schneider, 2006; Öğünç and Yilmaz, 2000).

The financial sector has been linked to the size of informal economic activities in the relevant literature (Imamoglu *et al.*, 2018; Berdiev and Saunoris, 2016; Capasso and Jappelli, 2013; Blackburn *et al.*, 2012; Bose *et al.*, 2012; Dabla-Norris *et al.*, 2008; Straub, 2005). Capasso and Jappelli (2013) state that financial development (FD) may lessen credit costs and raise the opportunity cost of informal activity by enhancing the efficient intermediaries entering the markets. On the other hand, providing access to credits will increase the opportunity cost operating underground (Capasso and Jappelli, 2013; Blackburn *et al.*, 2012). The choice between formal and informal economic activity is a trade-off between its pros and cons. Operating formally will provide access to credit markets, access to vital public sources, the enforcement of property rights and contracts, and will lead to lower default and financial costs; it will also reduce the cost of credit by pledging more collateral, on return of exposure high entry cost, more burdensome tax obligation by disclosure of revenue and assets, exposure strict rules and regulations (Straub, 2005; Japelli *et al.*, 2005; Antunes and Cavalcanti, 2007; Katircioglu, 2010; Ellul *et al.*, 2012; Cham, 2018; Sodeyfi, 2016; Miah and Sharmeen, 2015; La Porta and Shleifer, 2008). With more development in the financial sector, firms will ease access to external funding with cheaper costs, benefits from its legal rights and benefits from other authorized advantages while increasing the profitability. Therefore, the negative correlation between FD and the size of underground economic activity is expected with this respect. Although there are several articles, which focused on the level effects of the financial sector in informal economic activities (Berdiev and Saunoris, 2016; Capasso and Jappelli, 2013; Blackburn *et al.*, 2012; Bose *et al.*, 2012; Dabla-Norris *et al.*, 2008; Straub, 2005), there is not any study investigating the spillover effects of the financial sector on informal economic activity to the best of our knowledge.

Thus, against this backdrop, this article investigates the spillover effects of financial sector development on the size of informal economic activities in the case of Turkey, which has a developing economy experiencing a high volume of informal activities. Studies in the case of Turkey showed that one-third of aggregate official income goes to informal economic activities. According to Schneider (2007), the size of the informal economy in Turkey was 32.1 per cent of GDP in 1999, 33.2 per cent of GDP in 2001 and 34.3 per cent of GDP in 2002. Moreover, according to Medina and Schneider (2018), this ratio is 27.4 per cent in 2018 for Turkey. On the other hand, the financial sector in Turkey has shown a tremendous development 1980s onwards where it has had to adopt several stabilization programs to stabilize price levels and achieve sustainable growth during the liberalization processes (Katircioglu *et al.*, 2019, 2018a, 2018b). Throughout the past three decades, Turkey has managed to promote its financial system, which has contributed to its economic sectors (Katircioğlu and Taspinar, 2017). Therefore, it would be interesting to examine the link of the financial sector with informal economic activities in Turkey. This study contributes to the existing literature from two perspectives: firstly, the spillover effects of the financial sector on informal economic activity will be examined for the case of Turkey, which was not done before. For such a nexus, Turkey is an exciting country case because of:

- a considerably high volume of informal activity (about 32 per cent); and
- significant development of the Turkish financial system apart from the 1980s.

Secondly, previous works (Imamoglu *et al.*, 2018) have shown that interaction between the financial system and informal economic behavior is likely to be inverted U-shaped revealing that at the initial stages of FD, there is a positive correlation between FD and informal economic activity where this correlation becomes negative at further levels of FD beyond its peak point. Such analysis again has not been done yet for the case of Turkey.

The following Section 2 presents the literature review in the field, Section 3 describes the data and methodology of the study, while Section 4 presents results, and Section 5 concludes the study.

2. Literature review
The role of financial markets in the economies has been extensively investigated, mainly using the finance-led growth hypothesis. It has been argued that the financial sector is of great importance for the development of economies (Katircioglu *et al.*, 2018c). Patrick (1966) proposed two hypotheses with this respect, which are:

(1) the supply leading hypothesis; and

(2) the demand following hypothesis.

The supply-leading hypothesis postulates that FD results in economic growth while the latter postulates the reverse (Soukhakian, 2007a, 2007b; Katircioglu, 2012; Saqib and Waheed, 2011; Jenkins and Katircioglu, 2010; Waheed and Younus, 2010). However, a long strand of studies focused on the effects of the financial sector on the overall or formal aggregate income levels and found positively significant effects most of the time (Kaushal and Pathak, 2015; Chandio, 2014; Katircioglu, 2012; Karacaer and Kapusuzoglu, 2010; Katircioglu *et al.*, 2007). For example, Soukhakian (2007a) finds that money supply leads to significant changes in macroeconomic activity supporting the supply-leading growth hypothesis for the case of the Japanese economy; this finding is not surprising because of a developed financial system in Japan. On the other hand, Soukhakian (2007b) studies the relationship between the financial sector and economic growth and confirms unidirectional causality that runs from real income per capita to FD in Iran; this finding, therefore, supports the demand-following hypothesis whilst rejecting the supply-leading hypothesis for the Iranian economy; this finding also should not be surprising because of the fact that Iran is not linked to the international financial system; thus, the other economic activities in Iran leads to significant changes in its domestic financial system. Katircioglu (2012) also finds the same result from Soukhakian (2007a) in the case of Sub-Saharan Africa.

Only a few studies have focused on the role of the financial sector in informal aggregate income. Imamoglu *et al.* (2018) searched the link between the financial sector and informal economies in the case of European Union (EU) members and conclude that the financial sector negatively affects the volume of informal economies in the economic long-term. This finding is reasonable in the case of EU countries, as they usually have developed financial systems, which are well-integrated with their economies and the volume of informal activities are generally low owing to developed control mechanisms. The same result is also obtained by Berdiev and Saunoris (2016), who find that FD leads to a decline in the size of the informal economies of the selected 161 countries; and on the other hand, a shock to the informal economy results in significant reverse changes in the financial sector. Capasso and Jappelli (2013) also find that FD is likely to reduce tax evasion, and therefore, informal economic activity as well. On the other hand, Blackburn *et al.* (2012) find a negative link between FD and the underground economy (UE); and that the lower is the stage of FD, the higher will be the incidence of tax evasion, which will result in increases in the size of the UE. Bose *et al.* (2012) support the findings of Imamoglu *et al.* (2018), Berdiev and Saunoris (2016) and Blackburn *et al.* (2012) by finding a negative link between financial sector development and UE; they find that both the depth and the efficiency of the banking sector matter in reducing the size of the UE.

As can be seen from the relevant literature, studies confirm the positive effects of FD on formal economic activity, which is proxied by GDP and rare studies outlined above to

confirm the adverse effects of FD on informal economic activity in the countries as expected. However, nexus between the financial sector and informal economic activity, as well as spillover effects of the financial sector on informal economic activity still deserves further attention from researchers. The next section will describe the data and methodology of the current study.

3. Data and methodology

3.1 Modeling

The origin of the theoretical framework in the present study is to examine the role of the financial sector on the underground economic activity, in the different stages of FD as also modeled in the study of Imamoglu *et al.* (2018). Besides, international trade openness and the interest rate might be control variables for this effect. Thus, equation (1) is proposed as follows:

$$UE_t = f\left(FD_t^{\beta_1}, \ FD_t^{2\beta_2}, \ TRD_t^{\beta_3}, \ INT_t^{\beta_4}\right) \tag{1}$$

Where *FD* is a proxy for FD, *TRD* is international trade openness and *INT* is the interest rate. In equation (1) *TRD* and *INT* are added as control variables to the model estimations because they are strictly related to the financial system and are expected to have roles in the finance-informality nexus (Jenkins and Katircioglu, 2010). Symbols, β_1, β_2, β_3 and β_4, are the coefficients of the regressors.

Equation (1) can be expressed in a logarithmic structure to capture the growth effects of regressors on regressand, as follows (Katircioglu, 2010):

$$\ln UE_t = \beta_0 + \beta_1 \ln FD_t + \beta_2 \ln FD_t^2 + \beta_3 \ln TRD_t + \beta_4 \ln INT_t + \varepsilon_t \tag{2}$$

where at period *t*, ln*UE* is the natural logarithmic form of the UE variable, ln*FD* is the natural logarithmic form of the FD variable, ln*FD*² is the square of natural logarithmic form of the FD variable, ln*TRD* is the natural logarithmic form of the international trade openness variable, ln*INT* is the natural logarithmic form of the interest rate variable and ε is the error-disturbance.

3.2 Data

Annual data covering 1970-2017 are used in this article. The variables of the study are the size of the UE, the composite financial index as a proxy for FD, TRD as international trade openness that has been proxied by the sum of exports plus the imports of goods and services as a percentage of the GDP, and the real interest rate (INT) that is annual interest rate on Central Bank of the Republic of Turkey (CBRT) discount minus inflation, consumer price (annual per cent). This study constructs its FD index and estimates the volume of underground economic activity in Turkey.

Data for UE has been gathered from the study of Imamoglu (2010), while FD data has been created by constructing a composite FD index and using principal component factor analysis similar to the previous works (Katircioğlu and Taspinar, 2017; Chen *et al.*, 2010). The variables to construct FD composite index in this study are as follows:

- the ratio of commercial bank assets to central bank assets plus commercial bank assets (A);
- domestic credits to the private sector by the banking sector (as a percentage of the GDP; DC);

- domestic credits provided to the private sector (as a percentage of the GDP; DCP);
- broad money supply (as a percentage of the GDP; M2); and
- liquid liabilities (as a percentage of the GDP; M3).

All these five variables have been gathered from World Bank (2017). Finally, TRD has also been obtained from World Bank (2017), while for INT, the annual interest rate on CBRT has been obtained from the Turkish Statistical Institute's booklet on statistical indicators and inflation, consumer price (annual per cent) has been obtained from World Bank (2017).

All the variables are used in logarithmic forms except real interest rates owing to negative values in some periods. Before empirical analyses, it would be a significant step to present descriptive statistics of all series under consideration as can be found in Table I.

In this study, Gauss codes have been customized as a second generation of econometric procedures that take into account multiple structural breaks. First, following Carrion-i-Silvestre *et al.* (2009), a unit root test has been used because of taking up to five breaks into consideration. Second, Maki's (2012) cointegration test, which takes into up to five breaks, has been used to investigate the existence of a cointegration vector. Third, dynamic ordinary least square (DOLS) and fully modified ordinary least squares (FMOLS) methods have been used to estimate the long-run coefficients.

3.3 Methodology
The generalized least squares (GLS)-based unit root tests of Carrion-i-Silvestre, *et al.* (2009), which allow up to five structural breakpoints in the series have been adopted to test stationary nature of them in this study. Following unit root tests, Maki (2012) cointegration tests, which again consider the existence of structural breakpoints in the series up to five have been adopted in the study to explore any cointegration relationship in equation (1). After obtaining the cointegration vector, DOLS and FMOLS approaches have been used to estimate long-run coefficients of equation (2) in this study.

4. Results and discussions
Unit root test results are presented in Table II, which suggests that $\ln UE$, $\ln FD$, $\ln FD^2$, $\ln TRD$ and INT are integrated of their first-order is I(1). As all variables are integrated in the same order, the existence of a cointegration relationship should be tested as the next step.

As all the series in the present study are I(1), the cointegration test approach by Maki (2012) was suitable to investigate the long-run relationship among the variables. Maki's (2012) cointegration test results under the existence of multiple breakpoints are presented in Table III.

Table III shows that the null hypothesis of no cointegration can be rejected in several of the model options with different break options; thus, a cointegration relationship has been confirmed for equation (1). As a result, equation (1) is a cointegration model and estimating

	UE	FD	TRD	INT
Mean	4.18	3.56	3.45	−5.17
Median	4.21	3.40	3.56	−2.67
Maximum	4.36	4.11	4.09	27.42
Minimum	3.78	3.13	2.21	−84.17
SD	0.13	0.28	0.53	21.28
Observations	45	45	45	45

Table I.
Descriptive statistics
of variables in the
logarithmic form

	P$_T$	MP$_T$	Levels MZ$_\alpha$	MSB	MZ$_t$	Break years
LnUE	7.83 [5.85]	8.02 [5.85]	−18.92 [−25.35]	0.16 [0.14]	−3.05 [−3.56]	2001, 2007 and 2009
LnFD	10.37 [6.33]	10.64 [6.33]	−18.45 [−30.03]	0.16 [0.12]	−2.99 [−3.85]	1993, 2001 and 2003
lnFD^2	10.19 [6.33]	10.40 [6.33]	−18.98 [−30.03]	0.15 [0.12]	−3.03 [−3.85]	1993, 2001 and 2003
lnTRD	8.02 [5.44]	8.22 [5.44]	−18.82 [−28.57]	0.16 [0.13]	−3.06 [−3.71]	1974, 1979 and 1982
INT	10.02 [4.79]	9.77 [4.79]	−16.03 [−29.28]	0.17 [0.13]	−2.76 [−3.78]	1980, 1982 and 1994
ΔlnUE	4.28*** [5.54]	4.47*** [5.54]	−21.13*** [−17.32]	0.15*** [0.16]	−3.22*** [−2.89]	–
ΔlnFD	4.19*** [5.54]	4.38*** [5.54]	−20.97*** [−17.32]	0.15*** [0.16]	−3.23*** [−2.89]	–
ΔlnFD^2	4.23*** [5.54]	4.41*** [5.54]	−20.81*** [−17.32]	0.15*** [0.16]	−3.21*** [−2.89]	–
ΔlnTRD	4.53*** [5.54]	4.43*** [5.54]	−20.67*** [−17.32]	0.15*** [0.16]	−3.21*** [−2.89]	–
$ΔINT$	4.27*** [5.54]	4.40*** [5.54]	−20.71*** [−17.32]	0.15*** [0.15]	−3.21*** [−2.89]	–

Notes: Break years are obtained through using the quasi GLS-based unit root tests of Carrion-i-Silvestre *et al.* (2009). ***denotes the rejection of the null hypothesis of a unit root at the customary 0.05 significance level. Numbers in brackets are critical values from the bootstrap approach by Carrion-i-Silvestre *et al.* (2009)

Table II.
The quasi-GLS based unit root tests under multiple structural breaks

No. of breakpoints	Test statistics [critical values]	Breakpoints
$T_B \leq 1$		
Model 0	−3.97 [−5.65]	2004
Model 1	−4.17 [−5.91]	1979
Model 2	−7.05*** [−6.52]	2003
Model 3	−6.86*** [−6.91]	2003
$T_B \leq 2$		
Model 0	−6.43*** [−5.83]	2004 and 2010
Model 1	−4.58 [−6.05]	1979 and 2004
Model 2	−7.07 [−7.24]	1993 and 2003
Model 3	−7.56 [−7.63]	1989 and 2003
$T_B \leq 3$		
Model 0	−7.15*** [−5.99]	1979, 2004 and 2010
Model 1	−6.56*** [−6.21]	1979, 2004 and 2011
Model 2	−7.34 [−7.80]	1980, 1993 and 2003
Model 3	−7.81 [−8.25]	1980, 1989 and 2003
$T_B \leq 4$		
Model 0	−7.22*** [−6.13]	1979, 1998, 2004 and 2010
Model 1	−8.04*** [−6.37]	1979, 1998, 2004 and 2011
Model 2	−7.91 [−8.29]	1980, 1993, 1998 and 2003
Model 3	−8.34 [−8.87]	1980, 1989, 1996 and 2003
$T_B \leq 5$		
Model 0	−7.56*** [−6.30]	1979, 1998, 2002, 2004 and 2010
Model 1	−8.22*** [−6.49]	1979, 1998, 2002, 2004 and 2011
Model 2	−8.99*** [−8.86]	1980, 1993, 1998, 2003 and 2009
Model 3	−8.34 [−9.48]	1975, 1980, 1989, 1996 and 2003

Notes: Numbers in corner brackets are critical values at 0.05 level from Table I of Maki (2012); *** denotes statistical significance at 0.05 level

Table III.
Maki (2012)'s
cointegration test for
the main effects
under multiple
structural breaks

parameters in equation (2) would be robust in the long-run period (Ariff *et al.*, 2018; Katircioglu, 2017; Katircioglu *et al.*, 2017; Sodeyfi and Katircioglu, 2016; Abduh and Omar, 2012). It is essential to mention that structural breakpoints, which have been obtained from Maki (2012) cointegration test, were added to equation (2) as dummy variables to estimate long-run coefficients (Katircioğlu, 2014). It might be worthy of noting that those structural breakpoints presented in Table III contain economic/financial/political crises' periods.

Three different estimations for long-run coefficients in equation (2) were carried out using the DOLS and FMOLS approaches that are:

(1) with intercept;
(2) with the trend and intercept; and
(3) without trend and intercept.

All six estimations are presented in Table IV, which confirm the inverted U-shaped link between financial sector development and the size of the informal economy in the case of Turkey. This conclusion is because the coefficient of ln*FD* is positively significant, while the coefficient of lnFD^2 is negatively significant (Imamoglu *et al.*, 2018; Katircioglu and Katircioglu, 2018). Also, it is worth to mention that, models with intercept and models with trend and intercept confirm that the size of the informal economy declines in the long run

Table IV.
Estimation of long-run coefficients

Dependent variable Independent variables	LnUE DOLS None	DOLS With constant	DOLS With trend	FMOLS None	FMOLS With constant	FMOLS With trend
Intercept	–	–54.489*** (0.000)	–63.215*** (0.000)	–	–7.741** (0.037)	–7.723** (0.039)
Trend	–	–	–0.011*** (0.007)	–	–	0.0001 (0.828)
lnFD	2.601*** (0.000)	32.511*** (0.000)	36.816*** (0.000)	2.570*** (0.000)	6.803*** (0.001)	6.831*** (0.001)
lnFD^2	–0.391*** (0.000)	–4.515*** (0.000)	–5.067*** (0.000)	–0.421*** (0.000)	–0.983*** (0.000)	–0.990*** (0.000)
lnTRD	–0.012 (0.821)	0.090** (0.028)	0.283*** (0.002)	0.114** (0.021)	0.066 (0.182)	0.051 (0.502)
INT	0.002 (0.198)	–0.009*** (0.005)	–0.011*** (0.007)	–0.0001*** (0.427)	–0.001* (0.073)	–0.001 (0.102)
R^2	0.949	0.992	0.996	0.653	0.671	0.672
Adj. R^2	0.689	0.945	0.972	0.627	0.637	0.629
S.E. of reg	0.055	0.023	0.016	0.083	0.081	0.082
Long run var	0.0014	0.0003	0.0001	0.0010	0.0083	0.0085

Notes: ***, ** and * indicate rejection of null hypothesis at 1, 5 and 10% significance level. In all six estimations, Hannan–Quinn information criteria is used

without a change in its regressors in the case of both DOLS and FMOLS approaches. This conclusion is due to negatively significant intercepts in these model estimations. This result confirms the reality that the overall informal economy in Turkey is a downward trend over the years compared to previous years.

Results in Table IV reveal that FD at its current state exerts positive effects on the size of informal economic activity, while these effects become negative at its further stages in Turkey. This finding shows that better control and policies toward informal activities are possible at further stages of financial sector development through a more efficient financial system and mechanism as institutional quality, government effectiveness and governance environment will also increase. It is also worth to mention that interest rates negatively impact on the size of informality while trade openness positively impacts on the size of the informal economy in Turkey. Results show that higher interest rates discourage informal economic activity, while trade openness encourages informality in Turkey.

5. Conclusion
This paper empirically investigated the long-term equilibrium relationship between financial sector development and the size of informal economic activity through the channels of international trade openness and interest rates in Turkey. To the best of the author's knowledge, this study is the first of its kind in the relevant literature to investigate the interaction between financial sector development and underground economic activity using the time series data set. It is also targeted to observe the volume of informal economic activity with further stages of development in the financial sector.

The results of this study reveal that a long-run equilibrium relationship exists between financial sector development and informal economic activities in Turkey. Most importantly, it is confirmed that the financial sector at its current state exerts positively significant effects on the size of informal economic activities, while this effect becomes negatively significant at the further stages of development in the financial system. This study also finds that higher interest rates discourage informality in Turkey, while trade openness is positively linked to the size of informality.

The findings of this study reveal policy implications for policymakers, especially in Turkey. As the financial system develops further and the efficiency of financial services is increased, then, policymakers will be able to reduce the size of informality in the economy, as this study found that the spillover effects of the financial sector on the informal economic activity is detrimental. Thus, this finding supports the findings of Imamoglu *et al.* (2018), Capasso and Jappelli (2013) and Bose *et al.* (2012). Without control mechanism and efficiency in financial services there arises a tendency of firms and individuals to operate informally; therefore, the Turkish authorities need to pay attention to increase efficiency, control and institutional quality, as well as the quality of governance environment. As also mentioned by Torgler and Schneider (2009) high regulatory quality, efficient rules and law, higher government effectiveness, higher voice and accountability and higher control of corruption are likely to result in reducing informal economic activity. As two research limitations:

(1) Firstly, this study has used logarithmic values of series in the econometric analysis except for real interest rates because of negative values in some periods. Thus, by using level forms of real interest missing values would be avoided; and

(2) Secondly, the data period covering 1970-2016 has been selected based on the availability of the related data for the Turkish case.

Therefore, further studies with more massive data sets are recommended for the other countries/regions for comparison purposes, mainly, as this debate is entirely new in the relevant literature.

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482

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Corresponding author
Salih Katircioglu can be contacted at: salihk@emu.edu.tr