EJEM
Econ.J.Emerg.Mark.

Economic Journal of Emerging Markets
Available at https://journal.uii.ac.id/jep

The determinants of private savings in Turkey: The role of financial development

Selçuk Akçay

Faculty of Economics and Administrative Sciences, Department of Economics, Afyon Kocatepe University, Afyonkarahisar, Turkey.
*Corresponding author: akcay@aku.edu.tr

Article Info

Article history:
Received 29 April 2022
Accepted 22 February 2023
Published 6 April 2023

JEL Classification Code:
C32; E21; F34

Author's email:
akcay@aku.edu.tr
selcuk19@hotmail.com

DOI: 10.20885/ejem.vol15.iss1.art1

Abstract

Purpose — Over the past two decades since the 2000s, Turkey's private savings rates have decreased, which has become a concern for policymakers. In addition to considering the key determinants of private savings, this study primarily aims to quantify the linear and nonlinear impacts of financial development on private savings from 1980 to 2015.

Method — This study uses Autoregressive Distributed Lag (ARDL) procedure and the Fourier Toda-Yamamoto causality framework.

Findings — The main findings are as follows: 1) The ARDL bounds test supports the presence of a long-run equilibrium relationship between private savings and its determinants; 2) Financial development affects private savings nonlinearly in an inverted U-shaped pattern, and 3) No causality relationship is observed between private savings and financial development.

Implication — As financial development has an inverted U-shaped relationship with private savings, indicating that the complementary effect of financial development is replaced with a substitution effect after a certain threshold level, Turkish authorities should consider this evidence when tailoring policies regarding financial markets.

Originality — This study is the first to identify whether the relationship between private savings and financial development is linear or nonlinear in the context of an emerging economy in Turkey.

Keywords — Private savings, financial development, Bounds Test, Fourier Toda-Yamamoto causality, Turkey

Introduction

The low savings rates in Turkey are a key feature of the Turkish economy. Indeed, private savings as a percentage of GDP has declined since the 2000s (Tunc & Yavas, 2016). For example, the private savings rate declined from 25.5% in 2001 to 10 % in 2015, representing a 61% decrease from 2001 to 2015 (Figure 1). According to Tatlıyer (2018) and World Bank (2011), the dramatic decline in private savings rates during this period could be explained by several factors. First, increased public savings crowded out private savings. Second, low inflation and real interest rates reduce economic uncertainty, which reduces precautionary savings. Third, expanding credit volume promotes consumption expenditures, thereby hampering private savings. Finally, a significant increase in social expenditure mitigated uncertainty and insecurity, thus encouraging spending rather than savings among households. Besides the factors above, the macroeconomic stabilization

P ISSN 2086-3128 | E ISSN 2502-180X

program "Transition to a Strong Economy," launched in the aftermath of the 2001 crisis, also played a significant role in this decline (World Bank, 2011).

The decline in private savings raises concerns about Turkey's ability to generate sufficient domestic resources to finance investment, which is critical for capital formation and economic growth. Accordingly, the lack of domestic savings has forced Turkey to borrow heavily abroad to close the savings-investment gap (Ertuğrul, Gebeşoğlu, & Atasoy, 2018). Table 1 presents the evolution of Turkey's savings-investment gap between 2000 and 2015. Over the same period, on average, Turkey's investment gap was 4.2% of GDP. By relaxing the constraints on domestic investment, foreign savings may fill the saving-investment gap but come with risks. Indeed, a greater inflow of foreign capital appreciates the national currency, which lowers the profitability and competitiveness of tradable sectors, deteriorates a country's balance of payments, and increases its external debt (Özatay, 2016).

Table 1. Savings-Investment Gap in Turkey (% GDP)

Years	Domestic Savings*	Domestic Investment*	Savings-investment gap
2000	18.4	21.2	-2.9
2001	18.4	15.5	2.9
2002	18.6	18.0	0.6
2003	15.5	18.0	-2.5
2004	16.0	19.8	-3.8
2005	16.0	20.4	-4.3
2006	16.7	22.4	-5.7
2007	15.6	21.4	-5.8
2008	16.9	22.1	-5.2
2009	13.3	15.3	-2.0
2010	13.6	19.8	-6.2
2011	14.4	23.8	-9.4
2012	14.6	20.4	-5.8
2013	13.5	20.9	-7.5
2014	15.2	20.3	-5.1
2015	14.3	18.4	-4.0
Average	15.7	19.9	-4.2

Source: Presidency of the Republic of Turkey: Presidency of Strategy and Budget, retrieved from. http://www.sbb.gov.tr/ekonomik-ve-sosyalgostergeler/#1540021349032-1be70108-294c, Table 2.5: The Shares of Total Domestic Savings and Gross Fixed Investments in GDP (1975-2015). (Accessed on August 13, 2020).
Note: * Public + Private

In addition to considering the key determinants of private savings, this study primarily aims to quantify the linear and nonlinear impacts of financial development on private savings. Three motivations motivated us to study Turkey. First, over the 2002-2015 period, although Turkey registered an average of 5.94 percent of real GDP growth (World Bank, 2020), this performance did not translate into higher savings. As mentioned, Turkey's aggregate private savings have been declining. Turkey's private savings rate is relatively low compared to the seven largest emerging market economies (EM7s) (Table 2). That said, over the 2002-2012 period, on average, with its 16% private savings, Turkey lagged far behind China (43%), India (33%), Russia (20%), Mexico (19%), and Brazil (19%) (Aizenman, Cheung, & Ito, 2019). The low level of domestic private savings urges Turkey to use foreign savings to finance investments to boost economic growth. Second, according to Svirydzenka's (2016) financial development index, Turkey's financial development performance is noteworthy (Figure 2). Indeed, the index increased from 0.13 in 1980 to 0.51 in 2015, corresponding to a 0.38-point increase for the 1980-2015 period. Moreover, in 2013, in terms of financial development, Turkey ranked 37 with a score of 0.537 out of 183 countries globally. However, these developments in the financial sector do not translate into growth in private savings. Finally, previous studies in Turkey, which explored the drivers of private

savings, have paid little attention to the nonlinear impact of financial development on private savings.

Understanding the drivers of private savings is essential because of the broader macroeconomic implications for Turkey and emerging economies. Turkey's low and declining private savings are concerns for at least two reasons (World Bank, 2011). First, low and declining private savings endanger the sustainability of economic growth. Second, low and declining private savings rates have increased Turkey's dependency on foreign financing, fueling the current account deficit and leaving Turkey vulnerable to at least three types of risk: macroeconomic risk, financial instability, and capital reversal. Indeed, in a recent study, Cavallo, Eichengreen, and Panizza (2018) found that foreign savings are not a good substitute for domestic savings and concluded that financing growth and investment out of foreign savings, while not impossible, is risky and is best pursued cautiously if at all.

Table 2. Private Savings for Seven Largest Emerging Markets (EM7s)[1] (% GDP)

Years	Brazil	China	India	Mexico	Russia	Turkey
2000	17	34	28	-	-	22
2001	18	39	29	-	-	26
2002	19	40	31	-	22	23
2003	19	42	33	18	22	20
2004	20	44	34	19	20	17
2005	19	43	35	18	17	13
2006	20	44	35	20	17	12
2007	21	46	36	20	19	13
2008	20	47	34	18	17	15
2009	18	46	36	19	18	14
2010	-	47	34	19	22	12
2011	-	45	32	20	21	11
2012	-	-	-	19	20	12
Average	19	43	33	19	20	16

Source: Data on Brazil, China, India, Mexico, and Russia from Aizenman et al., (2019). Data on Turkey from the Presidency of the Republic of Turkey: Presidency of Strategy and Budget, Retrieved From. http://www.sbb.gov.tr/ekonomik-ve-sosyalgostergeler/#1540021349032-1be70108-294c, Table 2.5: The Shares of Total Domestic Savings and Gross Fixed Investments in GDP (1975-2015). (Accessed on August 13, 2020).

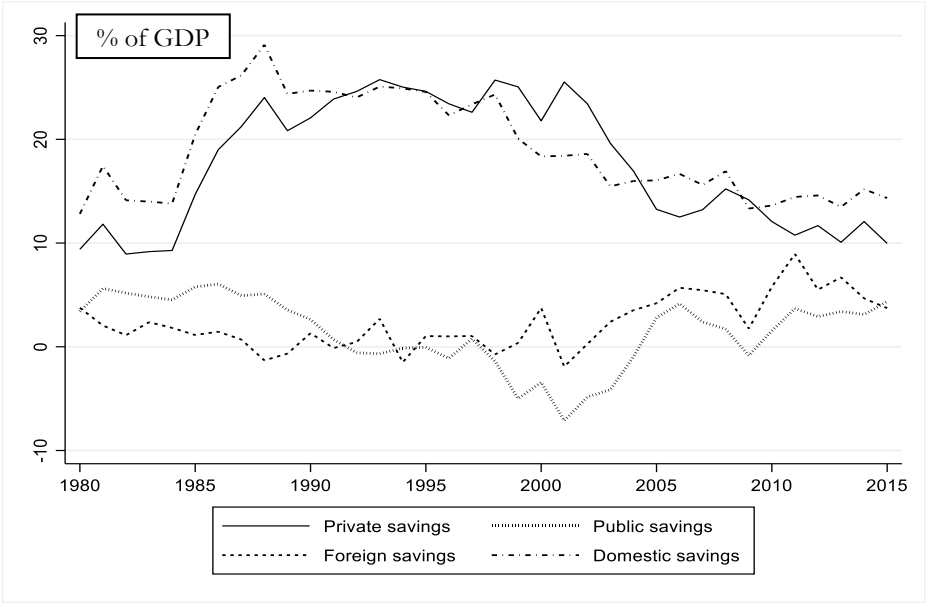
Note: Due to the unavailability of data, Indonesia, another member of EM7s, does not appear in the table.

This study contributes to the literature in at least four ways. First, few studies have explored private savings behavior in Turkey, and further studies are needed to shed new light on this topic. Second, previous studies (Gungor, Ciftcioglu, & Balcilar, 2014; Ozcan, Gunay, & Ertac, 2012; Van Rijckeghem, 2010) on Turkey examined only the impact of financial depth on private savings. Contrary to previous studies, we incorporate the financial development index developed by Svirydzenka (2016), which captures all dimensions of the financial sector (depth, access, and efficiency), into the private savings function within the context of Turkey. Third, it investigates both the linear and nonlinear effects of financial development on private savings. Prior studies on the determinants of private savings in Turkey have mainly focused on the linear impact of financial development and neglected nonlinear effects. Finally, to our knowledge, this is the first study to investigate the causal relationship between private savings and its determinants using a Fourier approximation.

Trends in Savings and Financial Development

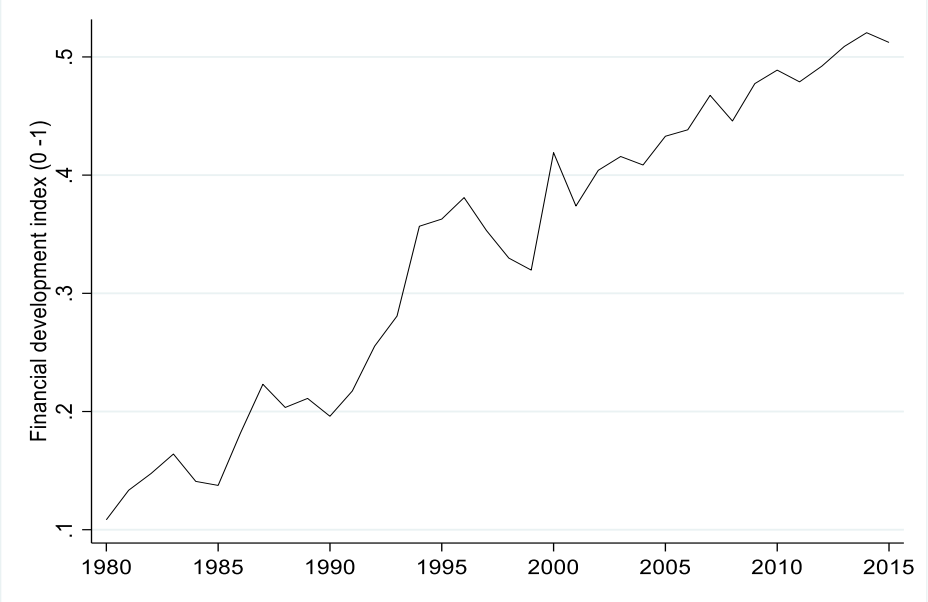
This section focuses on the patterns and stylized facts of Turkish savings and financial development. Figure 1 shows how Turkey's private, public, domestic, and foreign savings have evolved since 1980 and presents four important facts about savings behavior. First, the domestic savings rate has fallen steadily since 1989, reaching its second-lowest level (13.3%) in 2009. Second,

the public savings rate has declined continuously since 1986, and, in tandem with public saving, private saving has also fallen markedly since 1993. Third, in contrast to domestic savings, the foreign savings rate has risen significantly since 2001, and after 1997, foreign and public savings have exhibited similar movements. Finally, private and foreign savings are negatively associated. In other words, when foreign savings increase (decrease), private savings decrease (increase).



Source: Presidency of the Republic of Turkey: Presidency of Strategy and Budget. Table 2.5: The Shares of Total Domestic Savings and Gross Fixed Investments in GDP (1975-2015). Retrieved from. http://www.sbb.gov.tr/ekonomik-ve-sosyal-gostergeler/#1540021349032-1be70108-294c (Accessed on August 13, 2020).
Notes: Domestic savings = public + private, Private savings = household + corporate

Figure 1. Private, Public, Domestic, and Foreign Savings in Turkey (1975-2015)



Source: Svirydzenka (2016).

Figure 2. Financial Development Index in Turkey (1980-2015)

According to Gungor et al. (2014), Turkey registered noteworthy financial sector development after 1980, mainly due to the macroeconomic stabilization package - January 24, stability decisions - launched in 1980. Figure 2 presents an overview of the financial development

index[2] (fd) developed by Svirydzenka (2016) from 1980 to 2015. The financial development index increased from 0.13 in 1980 to 0.19 in 1983. The increase in the index in this period could be ascribed to the financial liberalization process, starting with a macroeconomic stabilization package in 1980. The index fluctuated between 1983 and 1989. From 1989 to 1994, it increased rapidly and reached 0.38 in 1996. The index decreased from 0.38 in 1996 to 0.31 in 1999, representing a decrease of 0.7. It reached 0.42 in 2000; though fluctuating, it exhibited a positive trend between 2001 and 2015. It seems that the macroeconomic stabilization program "Transition to a Strong Economy," initiated in the aftermath of the 2001 crisis, played a significant role in this positive trend (World Bank, 2011).

Private Savings and Financial Development

Two contending views on the linear impact of financial development on private savings prevail in the literature (Ito & Chinn, 2007). First, financial development may positively affect private savings by providing alternative savings instruments and more security to savers (firms and households). Second, financial development might negatively affect private savings by relaxing domestic liquidity constraints via greater access to consumer credit (borrowing) or housing finance and decreasing the need for precautionary savings. Emphasizing the role of industrialization, Aizenman et al. (2019) argue that financial development contributes positively to private savings in industrialized countries, while its impact is negative in developing countries. Improvements in credit conditions in developing countries have led to an increase in consumption, thereby reducing savings.

In addition to its linear impact, financial development may affect savings nonlinearly. According to Wang, Xu, and Xu (2011), if both firms and households face financial friction and financial development occurs first at the firm level and then expands to households, financial development can influence savings in an inverted U-shaped pattern. In other words, financial development initially promotes savings by enhancing firms' ability to borrow and invest but later hinders private savings by lowering households' precautionary saving motives. Thus, the overall impact of financial development on private savings a priori is undetermined.

Table 3. Summary of studies on Turkey

Author(s)	Period	Methodologies	Findings
Ozcan, Gunay, and Ertac (2003)	1968-1994	OLS	+ income; + financial depth + terms of trade shocks; + inflation
IMF (2007)	1980-2005	ECM	+ GDP per capita growth; + inflation - public saving
Van Rijckeghem (2010)	1988-2009	ECM	-public savings; + inflation
Matur et al. (2012)	1980-2008	OLS, Johansen co-integration	- public savings; - GDP growth rate; + inflation - banking credits to the private sector + real interest rate; - old dependency ratio
Ozcan et al. (2012)	1975-2008	OLS	+ income; + financial depth; + inflation + terms of trade shocks; - GDP growth rate
Gungor et al. (2014)	1960-2008	ARDL, PCA	-current account deficits; - old dependency ratio +financial development; + real interest rate, +per capita disposable income; + public savings
Tunc and Yavas (2016)	1999Q1-2014Q2	OLS, GMM	- consumer credit growth; - public savings, - real interest rate; + credits to the business sector; + GDP per capita growth + macroeconomic uncertainty

Notes: OLS - ordinary least squares; ECM - error correction model; ARDL -autoregressive distributed lag; PCA - principal component analysis; GMM - generalized method of moments.

Following the propositions mentioned above, empirical studies that tested the impact of financial development on savings yielded mixed results. For example, Grigoli, Herman, and Schmidt-Hebbel (2018) and Aizenman et al. (2019) find that financial development is negatively associated with savings. On the other hand, the evidence provided by Sahoo and Dash (2013),

Gungor et al. (2014), and Shawa (2016) shows that financial development promotes savings. Finally, Sahoo and Dash (2013) and Wang et al. (2011) documented an inverted U-shaped relationship between the two variables.

Understanding the determinants of private savings has been a fertile area for scholars. However, relatively few empirical studies have examined the potential determinants of private savings in Turkey, and these studies can be distinguished by whether they use macro-or micro-level data. Studies on Turkey that employed macro-level data are summarized in Table 3.

The literature review summarized above on Turkey shows that empirical research considers only the linear relationship between private savings and financial development and ignores the possibility of nonlinearity between the two.

Methods

Model and Data

This study's model is primarily based on those estimated by Aizenman et al. (2019), Grigoli et al. (2018), and Sahoo and Dash (2013).

$$pris_t = \lambda_0 + \lambda_1 y_t + \lambda_2 r_t + \lambda_3 pubs_t + \lambda_4 odr_t + \lambda_5 fs_t + \lambda_6 dem_t + \lambda_7 fd_t + \lambda_8 fd^2{}_t + \varepsilon_t \quad (1)$$

In the model, $pris_t$ stands for private savings (% GDP), y_t for real GDP per capita (in logarithm), r_t, for real interest rate[3], $pubs_t$, for public savings (% GDP), odr_t, for old-age dependency ratio (% of working-age population), fs_t, for foreign savings (% GDP) measured by the negative value of current account balance, dem_t for democracy[4], fd_t, for financial development, and ε_t for residual. The square of financial development (fd^2) is also incorporated into the model to account for a possible nonlinear relationship between private savings and financial development.

For instance, the existence of $\lambda_7 < 0$ and $\lambda_8 > 0$ suggests a U-shaped relationship between private savings and financial development. In this case, financial development negatively impacts private savings until a certain threshold level is reached, after which the impact is positive. However, $\lambda_7 > 0$ and $\lambda_8 < 0$ confirm an inverted U-shaped relationship between the two. In this case, financial development positively impacts private savings until a certain threshold level is reached, after which the impact is negative. The turning point that maximizes the effect of financial development on private savings for an inverted U-shaped relationship is

$$\frac{\partial(pris_t)}{\partial(fd_t)} = \lambda_7 - 2\lambda_8 fd_t = 0 \rightarrow fd_{\max} = \frac{\lambda_7}{2\lambda_8} \quad (2)$$

Note that the computed threshold from Equation (2) must be contained over the interval of $[fd_l, fd_h]$, where $[fd_l]$ and $[fd_h]$ represent the lowest and highest values of financial development, respectively.

It should be noted that the variables used in our model are not the only factors that influence savings behavior. Since our sample size (36 observations) is small, and due to the degrees of freedom available and to avoid multicollinearity problems, we excluded some other determinants of private savings from the model. For instance, inflation is omitted from the model to mitigate the collinearity problem between inflation and real interest rate.

Regarding data sources, private, public, and foreign savings data are obtained from the Presidency of the Republic of Turkey, the Presidency of the Strategy and Budget. The source of the democracy data is that of Marshall, Gurr, and Jagger (2018). GDP per capita, old-age dependency ratio, and real interest rate data are extracted from the World Bank World Development Indicators database (World Bank, 2020). Finally, financial development data are obtained from Svirydzenka (2016). In the literature, financial system deposits, liquid liabilities (M3 to GDP), stock market capitalization, and private credit to GDP are commonly used as indicators of financial development (Fromentin, 2017). However, it is worth mentioning that these indicators reflect only the depth (size) of the financial sector. Accordingly, we employed the financial

development index (*fd*) introduced by Svirydzenka (2016). This index is unique in that it captures financial institutions' and markets' depth, access, and efficiency dimensions.

Although the private saving-financial development nexus is the primary purpose of this study, macroeconomic, demographic, and institutional factors may also alter private saving behavior. The absolute income hypothesis (Keynes, 1936) and Permanent Income Hypothesis (PIH) (Friedman, 1957) assume a positive association between current income and savings. Therefore, we expect the coefficient of the GDP per capita to be positive.

The relationship between private savings and real interest rate remains a puzzle in the literature. The PIH and Life Cycle Hypothesis (LCH) hold that the positive and negative impacts of the real interest rate depend on the magnitude of income, substitution, and human wealth effects (Aizenman et al., 2019). If the substitution and human wealth effects dominate the income effect, the impact of the real interest rate on private savings is positive. On the other hand, if the income effect outweighs both the substitution and human wealth effects, the impact of the real interest rate on private savings is negative. Thus, the influence of real interest on private savings is ambiguous.

The Ricardian-Equivalence Hypothesis (REH) or debt neutrality hypothesis (Barro, 1974) ascertains that an increase in budget deficits is entirely offset by private savings, suggesting a negative association between public and private savings. Not only economic but also demographic factors can alter private saving behavior. According to the LCH, retired people accumulate assets during their working-age years and spend them during their retirement years (Ando & Modigliani, 1963). Since retired people finance their consumption expenditure with their accumulated savings, a higher old-age dependency ratio decreases private savings; thus, its coefficient is expected to be negative.

In theory, two major arguments debate the relationship between foreign savings (foreign capital) and private savings. First, foreign savings may contribute to a nation's total savings as an external source without substituting domestic savings. Therefore, foreign savings can supplement domestic savings. However, according to Cavallo et al. (2018) and Inter-American Development Bank (2016), foreign savings are not a good substitute for domestic savings, leading to costly macroeconomic crises and higher sovereign risk. Second, provided that foreign savings are used for consumption rather than productive investments, it may reduce private savings.

Sirowy and Inkeles (1990) argue that by securing property rights, strengthening the rule of law, and protecting basic freedoms and civil liberties, democracy can provide a friendly environment for economic agents to work, save, and invest. Moreover, according to Freytag and Voll (2013), institutional and political environments may alter saving behavior (individual and national levels). Therefore, we expect a positive association between democracy and private savings.

Over the 1980-2015 period, Turkish economy experienced a significant earthquake, financial and economic crisis, and global financial crisis, leading to a significant structural shift. Because conventional unit root tests do not account for structural breaks, we use unit root tests with structural breaks, as introduced by Zivot and Andrews (1992). Accordingly, a dummy variable (*dum*) that takes one after the structural break and zero before the structural shift is incorporated into the model.

Empirical Estimation

To study the cointegration between private savings and its determinants, this study implements the ARDL bounds testing approach (Pesaran, Shin, & Smith, 2001). Compared to conventional cointegration tests, ARDL has several advantages, such as (i) it can be applied for the variables integrated of order zero I(0) or one I(1) but not for variables integrated of order 2, I(2); (ii) it concurrently estimates short- and long-run parameters; and (iii) by selecting optimal lags, it eradicates residual correlation, alleviating the endogeneity problem. The last feature of the ARDL procedure is important because it enables researchers to estimate models even when endogenous regressors (Pesaran & Shin, 1999).

The ARDL model for Eq. (1) is as follows:

$$\Delta pris_t = \omega_0 + \sum_{i=1}^{q1} \omega_{1i} \Delta pris_{t-i} + \sum_{i=1}^{q2} \omega_{2i}\, \Delta y_{t-i} + \sum_{i=1}^{q3} \omega_{3i}\, \Delta r_{t-i} + \sum_{i=1}^{q4} \omega_{4i}\, pubs_{t-i} + \sum_{i=1}^{q5} \omega_{5i}\, \Delta odr_{t-i} + \sum_{i=1}^{q6} \omega_{6i}\, \Delta fs_{t-i} + \sum_{i=1}^{q7} \omega_{7i}\, \Delta dem_{t-i} + \sum_{i=1}^{q8} \omega_{8i}\, \Delta fd_{t-i} + \sum_{i=1}^{q9} \omega_{9i}\, \Delta fd^2{}_{t-i} + \psi_1 pris_{t-1} + \psi_2 y_{t-1} + \psi_3 r_{t-1} + \psi_4 pubs_{t-1} + \psi_5 odr_{t-1} + \psi_6 fs_{t-1} + \psi_7 dem_{t-1} + \psi_8 fd_{t-1} + \psi_9 fd^2{}_{t-1} + v_t \quad (3)$$

For example, to test the co-integration among the variables in Eq. (3), the null hypothesis of no cointegration $(H_0: \psi_1 = \ldots = \psi_9 = 0)$ should be tested against the alternative hypothesis$(H_1: \psi_1 \neq \ldots \neq \psi_9 \neq 0)$. The ARDL procedure proposes the Wald test (*F*-statistics) to establish the long-run equilibrium relationship between the I (0) or I (1) variables. Accordingly, two critical values (lower and upper) are generated by Pesaran et al. (2001) for I (0) and I (1) variables. The null hypothesis can be refuted if the computed *F*-statistic exceeds the upper critical value.

The ARDL procedure estimates $(q+1)^k$ the number of regressions, where *q* and *k* denote the maximum number of lags and number of variables, respectively. Information criteria, such as the Akaike (AIC), Schwarz Bayesian (SBC), and Hannan-Quin (HQ) information criteria, can be used to select the optimal lag lengths of each variable. Once cointegration is achieved, Eq. (4) can be estimated to obtain the short-run results.

$$\Delta pris_t = \psi_0 + \sum_{i=1}^{q1} \psi_{1i} \Delta pris_{t-i} + \sum_{i=1}^{q2} \psi_{2i}\, \Delta y_{t-i} + \sum_{i=1}^{q3} \psi_{3i}\, \Delta r_{t-i} + \sum_{i=1}^{q4} \psi_{4i}\, \Delta pubs_{t-i} + \sum_{i=1}^{q5} \psi_{5i}\, \Delta odr_{t-i} + \sum_{i=1}^{q6} \psi_{6i}\, \Delta fs_{t-i} + \sum_{i=1}^{q7} \psi_{7i}\, \Delta dem_{t-i} + \sum_{i=1}^{q8} \psi_{8i}\, \Delta fd_{t-i} + \sum_{i=1}^{q9} \psi_{9i}\, \Delta fd^2{}_{t-i} + + \psi_{10} ect_{t-1} + u_t \quad (4)$$

We use the Fourier Toda–Yamamoto causality (FTY) framework introduced by Nazlioglu, Gormus, and Soytas (2016) to investigate the causality relationship between private savings and its determinants. The main advantage of this framework is that it captures structural shifts in time-series data. Simply put, FTY is based on VAR ($p+d_{max}$), which can be specified as follows:

$$y_t = \varphi(t) + \beta_1 y_{t-1} + \ldots + \beta_{p+d} y_{t-(p+d)} + u_t \quad (5)$$

In Eq (5), $\phi(t)$ indicates the intercept as a function of time and shows any structural shifts in the dependent variable (y_t). To account for structural shifts, number, and form of breaks, the Fourier approximation is specified as follows:

$$\varphi(t) = \varphi_0 + \sum_{k=1}^{n} \gamma_{1k}\, sin\left(\frac{2\pi kt}{T}\right) + \sum_{k=1}^{n} \gamma_{2k}\, cos\left(\frac{2\pi kt}{T}\right) \quad (6)$$

In Eq (6), *n* represents the number of frequencies γ_{1k} and γ_{2k} gauges the size of the frequency and changes in frequency, respectively.
Eq (6) can be specified as a single Fourier frequency component as:

$$\varphi(t) = \varphi_0 + \gamma_1\, sin\left(\frac{2\pi kt}{T}\right) + \gamma_2\, cos\left(\frac{2\pi kt}{T}\right) \quad (7)$$

In Eq (7), *k* represents frequency for the approximation.
Finally, the FTY with single Fourier frequency causality can be obtained by substituting Eq (7) into Eq (5).

$$y(t) = \varphi_0 + \gamma_1\, sin\left(\frac{2\pi kt}{T}\right) + \gamma_2\, cos\left(\frac{2\pi kt}{T}\right) + \beta_1 y_{t-1} + \ldots + \beta_{p+d} y_{t-(p+d)} + u_t \quad (8)$$

To conduct the Granger non-causality test, Nazlioğlu et al. (2016) suggested using *F*-statistics instead of the Wald test.

Results and Discussion

The ARDL procedure cannot be applied to variables integrated of orders higher than I(1). Thus, it is crucial to perform stationary tests to ensure that no variable is I(2). If a variable is integrated of degree two, the *F*-statistics calculated by Pesaran et al. (2001) are invalid. The results of the Phillips and Perron (1988) and Zivot-Andrews (1992) unit root tests are reported in Table 4. The PP test results show that *pris, y, r, pubs*, and *fd* are I(1), whereas *odr*, *fs*, and *dem* are I (0). On the other hand,

the Zivot-Andrews test results indicate that while *pris*, *y*, *r*, *pubs*, *fs,* and *dem* are I(I), the rest of the variables are I(0). Hence, it is confirmed that the variables are not I(2). These findings pave the way for the application of the ARDL bound test approach in empirical analysis. Moreover, the breakpoint (2007) obtained from the Zivot-Andrews (1992) test for private savings, which can be attributed to the global financial crisis of 2007-2008, is included in the model as a dummy variable.

Table 4. Stationarity tests with and without structural break

Variable	PP			Zivot-Andrews				
	Level	1st dif.	Summary	Level	Break date	1st dif.	Break date	Summary
Pris	-1.497	-4.939***	I(1)	-4.051	1985	-5.710***	2007	I(1)
Y	-2.379	-6.368***	I(I)	-4.236	1999	-6.662***	2003	I(I)
R	-0.920	-6.501***	I(1)	-3.661	2002	-8.876***	1995	I(1)
Pubs	-1.334	-5.535***	I(1)	-3.691	2004	-6.753***	2002	I(1)
Odr	-3.827**	-	I(0)	-4.580*	1987	-	-	I(0)
Fs	-3.955**	-	I(0)	-4.136	2004	-7.296***	2008	I(1)
Dem	-4.090***	-	I(0)	-2.828	1989	-7.141***	1986	I(0)
Fd	-1.668	-6.479***	I(1)	-6.234**	1998	-	-	I(0)

Note: ***, **, * indicted significant at 1%, 5%, and 10% level.

After determining the integration characteristics, the ARDL bounds test is employed to detect the cointegration between private savings and its potential determinants. Subsequently, a bound F-test is applied to Eq. (3) to confirm the cointegration in the linear and nonlinear models, and the results are presented in Table 5.

Table 5. Results of bound tests

Models	*k*	*m*	*F*-Stat.	*F*-Critical Values			
				%5		%1	
				I(0)	I(1)	I(0)	I(1)
F(pris | y, r, pubs, odr, fs, dem, fd)	7	2	9.637***	2.32	3.5	2.96	4.26
F(pris | y, r, pubs, odr, fs, dem, fd, fd^2)	8	2	12.534***	2.22	3.39	2.79	4.1

Notes: The critical values from Pesaran et al., (2001). *** indicte significant at 1%. k and m represent the number of regressors and optimal lag length, respectively. The appropriate number of lags for both models is determined by the Schwarz Information Criterion.

Given that the *F*-statistics reported in Table 5 are greater than the upper critical bounds value, the cointegration relationship between private savings and their potential determinants is confirmed for the linear and nonlinear models. Table 6 reports the long- and short-run results for the linear and nonlinear models. Broadly speaking, the long-run results are consistent with the economic theory.

First, we investigate the linear relationship between private savings and financial development with other determinants of private savings, documenting that financial development does not significantly affect private savings. Regarding the control variables, public savings and the old-age dependency ratio are negatively related to private savings, whereas GDP per capita and democracy are positively associated with private savings. Finally, real interest rates and foreign savings do not significantly affect private savings.

As Wang et al. (2011) and Sahoo and Dash (2013) argue, the relationship between private savings and financial development could be nonlinear. Accordingly, we examine the possible nonlinearities between private savings and financial development by incorporating the square of the financial development index in the model. According to the inverted U-shaped hypothesis, one would anticipate a positive coefficient for the financial market development index level and a negative coefficient for the quadratic term.

To preview the long-run results of the nonlinear model, we document that financial development has a statistically significant and inverted U-shaped relationship with private savings.

The threshold beyond which financial development reduces private savings is 0.29. This result implies that private savings increase at the early stage of financial development, and after a threshold (0.29), financial development decreases private savings. As a robustness check, we use Lind and Mehlum's (2010) U test for non-monocity. The findings in Table 7 confirm an inverted U-shaped relationship between private savings and financial development, which is in line with Wang et al. (2011) and Sahoo and Dash (2013).

Table 6. Results and diagnostic tests

Linear model (Model 1)				Quadratic model (Model 2)			
A) Long-run	ARDL (1, 0, 0, 0, 0, 0, 2, 0)			ARDL (1, 0, 0, 0, 0, 0, 2, 0, 0)			
Regressors	Coefficient	t- stat.	p-value	Regressors	Coefficient	t-stat.	p-value
Y	13.183**	2.125	0.045	y	8.567**	2.124	0.045
R	0.011	0.721	0.478	r	0.008	0.765	0.452
Pubs	-0.889***	-6.852	0.000	pubs	-0.630***	-3.697	0.001
Odr	-4.231**	-2.481	0.021	odr	-2.808**	-2.580	0.017
Fs	-0.407	-1.371	0.184	fs	-0.378*	-1.832	0.081
Dem	0.543***	4.277	0.000	dem	0.456***	4.167	0.000
Fd	-5.359	-0.448	0.658	fd	90.235***	3.185	0.004
				fd^2	-154.635***	-3.396	0.002
B) Short-run							
Regressors	Coefficient	t-stat.	p-value	Regressors	Coefficient	t-stat.	p-value
Δdem	-0.039	-0.449	0.657	Δdem	-0.140*	-1.911	0.069
Δdem (-1)	-0.504***	-4.823	0.000	Δdem (-1)	-0.490***	-5.683	0.000
dum2007	-0.171	-1.693	0.345	dum2007	1.218**	2.787	0.011
constant	-45.571***	-10.050	0.000	constant	-39.568***	-12.433	0.000
ecm_{t-1}	-0.776***	-10.081	0.000	ecm_{t-1}	-0.907***	-12.481	0.000
C) Diagnostic Tests			p-value			Value	p-value
R^2		0.78	-	R^2		0.84	-
Adjusted R^2		0.75	-	Adjusted R^2		0.82	-
F -Statistics		26.220***	0.000	*F* -Statistics		40.099***	0.000
Serial correlation		0.126	0.938	Serial correlation		0.954	0.620
Functional form		1.019	0.319	Functional form		0.910	0.373
Normality		1.472	0.478	Normality		1.825	0.401
Heteroscedasticity		0.631	0.729	Heteroscedasticity		0.150	0.927
Cusum/Cusumq		Stable/Stable -		Cusum/Cusumq		Stable/Stable -	

Notes: ***, **, * indicte significant at 1%, 5%, and 10% level.

Table 7. Lind-Mehlum test results

Dep. variable: *pris*	
Data range for financial development	[0; 1]
Lower bound slope	26.6.29**
	(2.165)
Upper bound slope	-48.601 **
	(-1.855)
Lind-Mehlum U test	1.86**
	(0.0373)
Turning point	0.29
95% Confidence interval Fieller method	[0.211; 0.647]

Notes: H_0: Monotone or U-shaped vs. H_1: inverse U-shaped. ***, **, * indicte significant at 1%, 5%, and 10% level.

Turning to the control variables, an increase in GDP per capita in both models is positively correlated with private savings in the long run, implying that as economic agents' incomes rise, they tend to save more money. Therefore, it validates the Keynesian absolute income hypothesis and is consistent with Grigoli et al. (2018), IMF (2007), Matur et al. (2012), and Ozcan et al. (2012).

Although the coefficients of real interest rates are positive, they are not statistically significant in the long run in either model, indicating that neither income nor substitution effects hold in Turkey. This result is aligned with the results of Ozcan et al. (2003) but contradicts the findings of Gungor et al. (2014) and Tunc and Yavas (2016).

The results also reveal that public savings crowd out private savings in the long run in both models. For example, in the nonlinear model, a one percentage point increase in public savings leads to a 0.63 percent of GDP decrease in private savings in the long run. This result aligns with the findings of Van-Rijckeghem (2010), Matur et al. (2012), and Ozcan et al. (2012) that observe the Ricardian offsetting coefficients lie between -0.38 and -0.77 in the context of Turkey.

The old-age dependency ratio seems to affect private savings negatively and significantly in both models in the long run, meaning that the non-working old-age population tends to save less in Turkey, corroborating the LCH and in line with Ozcan et al. (2003), Matur et al. (2012), and Grigoli et al. (2018). This finding further suggests that Turkish policymakers should reconsider institutional arrangements such as legislation on social security provisions and retirement age.

Foreign savings crowd out private savings only in the nonlinear models. Quantitatively, a 1% increase in foreign savings creates a 0.37 % decline in private savings, reflecting the substitution of foreign savings for domestic private savings. One way of reading this finding is that greater access to foreign savings increases the liquidity that spurs consumption, particularly imported goods, thereby reducing private savings rates. Therefore, Turkish authorities should consider the gains and losses from overreliance on foreign savings. The studies by Bulíř and Swiston (2006) and Sahoo and Dash (2013) also find an inverse relationship between private and foreign savings.

Democracy is strongly associated with private savings in both models, suggesting that a democratic environment is conducive to private savings and lending support to the arguments of Freytag and Voll (2013) and Sirowy and Inkeles (1990), who state that saving behavior may be affected by institutions and the political environment.

The short-run results from the nonlinear model show that the coefficient of the dummy (*dum*) variable is positive and statistically significant, suggesting that structural breaks induce private savings. Moreover, the error correction terms with the expected sign (negative) are statistically significant in both models. For example, the error correction term equals 0.90, and is significant at the 1 percent level, implying that private saving adjusts almost entirely to its desired long-run level in the first year in the nonlinear model. Further, the diagnostic tests reported in Table 6 show that the estimated models are clear of serial autocorrelation, heteroscedasticity, and non-normal errors, and are correctly specified.

Table 8. Fourier Toda -Yamamoto test results

Direction of Causality	$p+d_{max}$	k	F-stat	*Bootstrap p-value*
$fd \neq> pris$	3	2	2.388	0.302
$pris \neq> fd$	3	2	2.856	0.239
$fs \neq> pris$	3	2	1.460	0.481
$pris \neq> fs$	3	2	7.309**	0.025
$y \neq> pris$	3	2	2.294	0.317
$pris \neq> y$	3	2	2.860	0.239
$r \neq> pris$	3	2	4.798*	0.090
$pris \neq> r$	3	2	1.436	0.487
$pubs \neq> pris$	3	2	2.044	0.359
$pris \neq> pubs$	3	2	0.860	0.650
$odr \neq> pris$	3	2	9.714***	0.007
$pris \neq> odr$	3	2	1.405	0.495
$dem \neq> pris$	3	2	3.633	0.162
$pris \neq> dem$	3	2	3.157	0.206

Notes: $\neq>$ indicates the null hypothesis of Granger non-causality. k denotes the frequency of the approximation. ***, **, * indicte significant at 1%, 5%, and 10% level.

Furthermore, given some structural breaks in the sample data, we checked for the Fourier causality relationship between private savings and its determinants. The results in Table 8 show one-way causality from old-age dependency and real interest to private savings and from private savings to foreign savings. Moreover, there is no causality between private savings and financial development, GDP per capita, public savings, or democracy.

Conclusion

Over the last two decades, the Turkish economy has witnessed a significant decline in private savings rates. This decline has become a concern for policymakers because it threatens to achieve the 2023 goals and jeopardizes the domestic private savings rates targeted (30% of GDP) in the 11th development plan period (2019-20023). Relying on the ARDL and Fourier causality approaches, we analyze the determinants of private savings in Turkey from 1980 to 2015. The quantification of the linear and nonlinear impacts of financial development on private savings is of particular interest.

Our key finding is that financial development has an inverted U-shaped effect on private savings. In other words, financial development has a declining marginal effect on private savings after a certain threshold, suggesting that financial development reduces private savings after this turning point. Regarding the other determinants, public savings, foreign savings, and the old dependency ratio are negatively related to private savings, while GDP per capita and democracy are positively associated with private savings. The real interest rate is not significantly associated with private savings.

The policy implications of this study are as follows: 1) financial development has an inverted U-shaped relationship with private savings, indicating that the complementary effect of financial development replaces a substitution effect after a certain threshold level. Turkish authorities should consider this evidence when tailoring policies regarding financial markets; 2) GDP per capita positively influences private savings, which indicates that overall economic growth is conducive to private savings. Therefore, Turkey should undertake growth-oriented policies; 3) lack of domestic savings forces Turkey to use foreign savings, but greater use of foreign savings displaces private savings. This increases the dependency on external financing and leads to a widening current account deficit, contributing to the risk of an external crisis. Therefore, Turkish authorities should place a particular emphasis on stimulating domestic private savings because, compared to foreign savings, domestic savings lower macroeconomic risks and influence external imbalance, notably with the least negative effect on economic growth; 4) since the old dependency is a drag on private savings, the Turkish government should provide tax incentives such as tax-exempt retirement accounts for retirees. The Turkish government initiated a voluntary private pension scheme in 2003 to encourage private savings for retirement. Although the number of participants in the voluntary private pension system is increasing, this is not at the desired level. Moreover, in Turkey, the pension funds stood at 5.5% of GDP in 2014, relatively lower than the weighted average of OECD countries (OECD, 2015). Accordingly, new policies such as decreasing fund management fees and introducing public awareness campaigns about the system should be implemented to increase the participation rate; 5) since public savings crowd out private savings, Turkish policymakers should implement policies aimed at reducing budget deficits to increase saving rates; and 6) given that democracy is positively associated with private savings, Turkish authorities should strive to maintain democratic institutions that protect property rights and strengthen the rule of law.

As with all academic studies, our study has some limitations. First, this study focuses on total private savings; future studies can investigate the sub-components of private savings separately, namely, households and corporations. Second, our study investigates the linear and nonlinear impacts of the general financial development index on private savings; future studies can follow the same analysis for the sub-indices of the general financial development index (financial market development index and financial institution development index). Finally, further research investigating the asymmetric impacts of general financial development and its sub-indices on private savings would be valuable.

Notes

1) EM7s included Brazil, China, India, Indonesia, Mexico, Russia, and Turkey.
2) The index ranges from 0 to 1, where 0 denotes the lowest level of financial development and one refers to the highest level of financial development.
3) Following Aizenman et al. (2019), the real interest rate is measured as r = ln[(1+i) / (1+ inf)], where ln refers to the natural logarithm; i to the nominal deposit rate, and inf to the inflation rate respectively.
4) Measured by polity2, based on the Polity IV project. The score gauges the level of democratic institutions and ranges from -10 to 10, with -10 to -6 indicating "autocracies" and +6 to +10 "democracies."

References

Aizenman, J., Cheung, Y.-W., & Ito, H. (2019). The interest rate effect on private saving: Alternative perspectives. *Journal of International Commerce, Economics and Policy*, *10*(01), 1950002. https://doi.org/10.1142/S1793993319500029

Ando, A., & Modigliani, F. (1963). The life-cycle hypothesis of saving: Aggregate implications and tests. *American Economic Review*, *53*, 55–84.

Barro, R. J. (1974). Are government bonds net wealth? *Journal of Political Economy*, *82*(6), 1095–1117. https://doi.org/10.1086/260266

Bulíř, A., & Swiston, A. (2006). *What explains private savings in Mexico?* (IMF Working Paper No. WP/06/191).

Cavallo, Eduardo, Eichengreen, B., & Panizza, U. (2018). Can countries rely on foreign saving for investment and economic development? *Review of World Economics / Weltwirtschaftliches Archiv*, *154*(2), 277–306.

Ertuğrul, H. M., Gebeşoğlu, P. F., & Atasoy, B. S. (2018). Mind the gap: Turkish case study of policy change in private pension schemes. *Borsa Istanbul Review*, *18*(2), 140–149. https://doi.org/10.1016/j.bir.2017.11.003

Freytag, A., & Voll, S. (2013). Institutions and savings in developing and emerging economies. *Public Choice*, *157*(3), 475–509. https://doi.org/10.1007/s11127-013-0121-7

Friedman, M. (1957). III. The permanent income hypothesis. In *Theory of the Consumption Function* (pp. 20–37). Princeton: Princeton University Press. https://doi.org/10.1515/9780691188485-005

Fromentin, V. (2017). The long-run and short-run impacts of remittances on financial development in developing countries. *The Quarterly Review of Economics and Finance*, *66*, 192–201. https://doi.org/10.1016/j.qref.2017.02.006

Grigoli, F., Herman, A., & Schmidt-Hebbel, K. (2018). Saving in the world. *World Development*, *104*, 257–270. https://doi.org/10.1016/j.worlddev.2017.11.022

Gungor, H., Ciftcioglu, S., & Balcilar, M. (2014). Does financial development increase private savings? The case of Turkey. *International Journal of Business and Social Science*, *5*(2), 36–47. https://doi.org/10.1142/S0217590816500028

IMF. (2007). *Safe to save less? Assessing the recent decline in Turkey's private saving rate* (IMF Country Report No. 07/364). https://doi.org/10.5089/9781451838237.002

Inter-American Development Bank. (2016). Saving for stability. In E. Cavallo & T. Serebrisky (Eds.), *Saving for development* (pp. 109–130). New York: Palgrave Macmillan US. https://doi.org/10.1057/978-1-349-94929-8_5

Ito, H., & Chinn, M. (2007). *East Asia and global imbalances: Saving, investment, and financial development* (NBER Working Paper Series No. w13364). https://doi.org/10.3386/w13364

Keynes, J. (1936). *General theory of employment, interest, and money*. New York: Harcourt Brace Company.

Lind, J. T., & Mehlum, H. (2010). With or without U? The appropriate test for a U-shaped relationship. *Oxford Bulletin of Economics and Statistics*, *72*(1), 109–118. https://doi.org/10.1111/j.1468-0084.2009.00569.x

Marshall, M. G., Gurr, T. R., & Jaggers, K. (2018). *Polity IV project: Political regime characteristics and transitions, 1800–2017*. Vienna.

Matur, E. P., Sabuncu, A., & Bahçeci, S. (2012). Determinants of Private Savings and Interaction Between Public & Private Savings in Turkey. *Middle Eastern and African Economies*, *14*(September), 102–125.

Nazlioglu, S., Gormus, N. A., & Soytas, U. (2016). Oil prices and real estate investment trusts (REITs): Gradual-shift causality and volatility transmission analysis. *Energy Economics*, *60*, 168–175. https://doi.org/10.1016/j.eneco.2016.09.009

OECD. (2015). *Pension markets in focus*. Retrieved from http://www.oecd.org/daf/fin/private-pensions/Pension-Markets-in-Focus-2015.pdf

Özatay, F. (2016). Turkey's distressing dance with capital flows. *Emerging Markets Finance and Trade*, *52*(2), 336–350. https://doi.org/10.1080/1540496X.2015.1011539

Ozcan, K. M., Gunay, A., & Ertac, S. (2003). Determinants of private savings behaviour in Turkey. *Applied Economics*, *35*(12), 1405–1416. https://doi.org/10.1080/0003684032000100373

Ozcan, K. M., Gunay, A., & Ertac, S. (2012). Macro and socioeconomic determinants of Turkish private savings. *Journal of Economic Cooperation and Development*, *33*(2), 93–130.

Pesaran, M. H., & Shin, Y. (1999). An autoregressive distributed lag modelling approach to cointegration analysis. In S. Storm (Ed.), *Econometrics and Economic Theory in the 20th Century: the Ragnar Frisch Centennial Symposium* (pp. 1–31). Cambridge: Cambridge University Press. https://doi.org/10.1017/CCOL521633230

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, *16*(3), 289–326. https://doi.org/10.1002/jae.616

Phillips, P. C. B., & Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika*, *75*(2), 335–346. https://doi.org/10.2307/2336182

Presidency of the Republic of Turkey. (2015). Presidency of strategy and budget, the shares of total domestic savings and gross fixed investments in GDP (1975-2015). Retrieved August 13, 2020, from http://www.sbb.gov.tr/ekonomik-ve-sosyal-gostergeler/#1540021349032-1be70108-294c

Sahoo, P., & Dash, R. K. (2013). Financial sector development and domestic savings in South Asia. *Economic Modelling*, *33*, 388–397. https://doi.org/10.1016/j.econmod.2013.04.018

Shawa, K. C. (2016). Drivers of private savings in Sub-Saharan African countries. *Journal of Economic Development*, *41*(2), 77–110. https://doi.org/10.35866/caujed.2016.41.2.004

Sirowy, L., & Inkeles, A. (1990). The effects of democracy on economic growth and inequality: A review. *Studies In Comparative International Development*, *25*(1), 126–157. https://doi.org/10.1007/BF02716908

Svirydzenka, K. (2016). *Introducing a new broad-based index of financial development* (IMF Working Papers No. 16(05)). https://doi.org/10.5089/9781513583709.001

Tatlıyer, M. (2018). Saving behaviour in Turkey: Where are we? And what can we do about it? In

A. F. Aysan, M. Babacan, N. Gur, & H. Karahan (Eds.), *Turkish Economy* (pp. 239–260). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-70380-0_11

Tunc, C., & Yavas, A. (2016). Not all credit is created equal: Mortgage vs non-mortgage debt and private saving rate in Turkey. *Central Bank Review*, *16*(1), 25–32. https://doi.org/10.1016/j.cbrev.2016.03.003

Van Rijckeghem, C. (2010). *Determinants of Private Saving in Turkey: An Update* (No. 2010/04). *Bogazici University Working Papers*. Bogazici University, Department of Economics.

Wang, P., Xu, L., & Xu, Z. (2011). *Financial development and aggregate saving rates: A hump-shaped relationship, mimeo* (SSRN Electronic Journal). Hong Kong. https://doi.org/10.2139/ssrn.2085277

World Bank. (2011). *Sustaining high growth: The role of domestic savings: Turkey Country Economic Memorandum Report No.66301-TR,*. Washington DC.

World Bank. (2020). World development indicators.

Zivot, E., & Andrews, D. W. K. (1992). Further evidence on the great crash, the oil-price shock, and the unit-root hypothesis. *Journal of Business & Economic Statistics*, *10*(3), 251–270. https://doi.org/10.2307/1391541