

Smoothing Egyptian Households' Consumption: The Role of Credit Channel

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This study examines whether Egyptian consumers can smooth their consumption and the role of credit markets in this regard. This is in addition to examining the effect of the credit constraints in transmitting the monetary policy decisions to the households' consumption through its credit channel. To this end, the study utilizes a Vector Autoregressive model (VAR) to examine whether the monetary policy affects consumption through its credit channel. Then, an Autoregressive Distributed Lag (ARDL) Bound test to Cointegration is used to determine the effect of the credit constraints, represented by the external finance premium, in the long run. Consumption smoothing is separately tested using an Error Correction Model (ECM) besides a VAR one. The study uses quarterly data covering the period from the first quarter of 2002 till the fourth quarter of 2017. Results reveal that the EFP negatively affects consumption in the short and long run. Egyptian consumers are not able to smooth their consumption and the existence of credit constraints is most likely to be the reason for that. Finally, the analysis shows that the credit channel transmits the monetary policy decisions to the consumption of the households sector in Egypt.

Key Words: consumption smoothing, external finance premium, credit channel, saving for a rainy day

 <https://emuni.si/ISSN/2232-6022/15.105-135.pdf>

INTRODUCTION

[106] Consumption smoothing and the role of the financial sector in this smoothing process have been of great importance for households, policy makers, and banks. Low- and middle-income households spend almost all their income on basic needs. Therefore, it is essential to be able to mitigate the negative effects of any income shock on their consumption level. This cannot be done without having diversified consumption smoothing mechanisms, in which the financial sector has a great role in providing unconstrained borrowing and saving. Having a role in consumption smoothing encourages banks to heighten their interest in the households' sector in terms of the type of financial products offered, which will consequently increase their profitability.

If households can smooth their consumption, then depending on current income for measuring inequality or establishing welfare programs for policy makers cannot hold anymore. Moreover, fiscal and monetary policies need to be unpredictable and permanent in order to affect aggregate consumption. Consumption smoothing also has many other implications in designing insurance and pension policies. Accordingly, the aim of this study is to examine whether Egyptian consumers can smooth their consumption and the role of credit markets in this regard. This is in addition to examining the effect of credit constraints in transmitting monetary policy decisions to the households' consumption through its credit channel.

As a matter of fact, Egypt's financial and banking sectors remained underdeveloped with only 32% of all Egyptians above 15 having formal bank accounts, according to Findex database in 2017. Moreover, according to the Central Bank of Egypt (CBE, <https://www.cbe.org.eg>), only 10% of the total deposits at the banking sector goes as credit to the households sector. Crowding out of the private sector by government borrowing, risk-averse banks and the underdeveloped risk assessment tools of financial institutions are the main structural constraints facing credit to the households sector.

Moreover, the lack of collateral for a large part of the poor society raises the EFP they face. Also, the lack of customized products for



underprivileged households' needs acts as an additional constraint. All of this led to the financial exclusion of a large part of the society. Some efforts have been exerted by the CBE and the micro-finance institutions to include this financially marginalized part, but with limited coverage in terms of the number of services provided and number of beneficiaries included. This is particularly relevant to Egypt given the recent successive interest rate increases that aimed at lowering inflation by reducing consumption, following the floatation of the Egyptian pound in 2016.

[107]

This study contributes to the consumption and saving empirical literature on Egypt, which is relatively small. Also, few studies tested the impact of different monetary policy transmission mechanisms on the Egyptian economy (El-Shazly 2005; Al-Mashat and Billmeier 2007; Moursi, El Mossallamy and Zakareya 2007; Moriyama and Arbatli 2011). However, almost none of them was explicitly interested in the households sector.

The study utilizes a Vector Autoregressive model (VAR) to examine whether monetary policy affects consumption through its credit channel. Then, an Autoregressive Distributed Lag (ARDL) Bound test to Cointegration is used to determine the effect of the credit constraints, represented by the external finance premium, in the long run. Consumption smoothing is separately tested using an Error Correction Model (ECM) besides a VAR one. The study uses quarterly data covering the period from the first quarter of 2002 until the fourth quarter of 2017. Results reveal that the EFP negatively affects consumption in the short and long run. Egyptian consumers are not able to smooth their consumption and the existence of credit constraints is most likely to be the reason for that. Finally, the analysis shows that the credit channel transmits monetary policy decisions to the consumption of the households sector in Egypt.

The remainder of the study is organized as follows: the second section briefly reviews some of the relevant empirical studies. The third section examines consumption patterns of the households sector in Egypt over time and in comparison with Egypt's peers. The effectiveness of the credit channel transmission mechanism is tested in the fourth section. The fifth section tests the validity of

the REPIH for Egyptian households. Finally, the study provides a conclusion and highlights some policy implications.

LITERATURE REVIEW

[108] The Life Cycle-Permanent Income Hypothesis (LC-PIH) of Modigliani and Brumberg in 1954 and Friedman in 1957 was the first to introduce the concept of consumption smoothing. It assumes that consumers estimate their lifetime resources and determine their current consumption as a fraction of this estimate in order to maximize their consumption utility. In 1978, Hall introduced the Rational Expectations Permanent Income Hypothesis (REPIH). He suggested that consumption should follow a random walk process. Therefore, the one period lagged consumption has all needed information to predict current period consumption. This implies that predicted income changes should have no effect on consumption as consumers should be already considering them when taking their current period consumption decision. Accordingly, consumption is exogenous with respect to current income changes. This is unlike unpredicted permanent income changes that should be totally reflected in consumption. However, transitory income shocks should not affect consumption at all as consumers perceive their expected value to be zero over lifetime. These transitory income shocks should be saved or dissaved. This will occur only under the assumption of perfect capital markets in which consumers are free to borrow when they expect their income to increase and save when they expect their income to decrease in the future. This implies that savings are a good predictor of current income changes, a fact known as 'Saving for a rainy-day hypothesis.'

Monetary policy tools are believed to be short-term ones. Therefore, according to the REPIH implications, monetary policy has a minor effect on aggregate consumption. On the other hand, the transmission of monetary policies to households' consumption is taken for granted by many central banks (Bacchetta and Gerlach 1997). Accordingly, monetary policies that affect credit conditions are likely to increase or decrease the amount of credit available to households and thus affect their consumption, which contradicts



the REPIH implications. This implies the existence of imperfect capital markets, which impose borrowing and saving constraints restricting the consumption smoothing behavior of households. If consumers are not able to borrow or save freely, then they will depend totally on their current income or relatively costly external finance. Capital market imperfections are also reflected in high External Finance Premium (EFP). These imperfections can result from crowding out of the private sector by government borrowing, asymmetric information problems or bureaucracy (Holtemöller 2002). The EFP also reflects the credit worthiness of borrowers. A borrower with a weak financial position cannot negotiate lower interest rates, self-finance or provide more collateral. Therefore, he faces further increases in the EFP and, as a result, becomes more credit constrained (Bernanke and Gertler 1995, 34–6). This is known as the credit channel monetary transmission mechanism. The effect of the credit channel on consumption occurs as follows; when a tight monetary policy that raises interest rates occurs, interest expenses on the borrowers' liabilities side of the balance sheet increase and collateral prices decrease, dampening their financial position. This also raises the EFP that borrowers face (Aoki, Proudman and Vlieghe 2004), and causes sharp fluctuations in aggregate consumption trends. The literature has further proved that borrowing constraints do not only constrain borrowing but also saving rates as consumers are less willing to postpone consumption to the following period (Özcan and Özcan 2015; Smith 2011).

[109]

Several empirical studies tried to test the validity of the REPIH by examining the excess sensitivity of changes in consumption to changes in current income using both micro and macro data. The earlier studies using this approach focused on estimating the effect of lagged variables on the change in consumption or consumption growth, like Hall (1978). This approach was derived from Euler's equation. Flavin (1981) was the first to find consumption excessively sensitive to current income changes. This meant that current income was more important in determining consumption decisions than permanent income in contrast with the implications of the permanent income hypothesis. Alternatively, Altonji and Siow

[110]

(1986) found the coefficients of lagged income were insignificant and thus accepted the REPIH implications. Other REPIH implications derived from the random walk property of consumption were also tested, including the 'Saving for a rainy day hypothesis' and the exogeneity of consumption with respect to current income using Vector Autoregressive and Cointegration models (Campbell 1987; Anundsen and Nymoer 2015). Campbell (1987) could not accept the validity of the REPIH unlike Anundsen and Nymoer (2015). Later studies assumed that there are two types of individuals: consumption smoothing individuals ($1 - \lambda$) and individuals that depend on their current income, λ . They estimated λ using instrumental variables and examined if it was significant, implying the invalidity of the REPIH (Campbell and Mankiw 1990).

Some other studies further investigated the extent to which deviation from the REPIH can be traced back to the presence of household liquidity constraints. In other words, they tried to test the role of the financial sector in smoothing households' consumption. One group used the λ model of Campbell and Mankiw (1990) to examine the effect of either price constraints (as EFP) or quantity constraints (amount of credit), as a tool of monetary policy, on consumption expenditures (Campbell and Mankiw 1991; Bacchetta and Gerlach 1997; De Bondt 1999). Another group estimated the time varying excess sensitivity parameter and examined how it behaved over time with financial deregulations (Jappelli and Pagano 1989; Sarno and Taylor 1998; Peersman and Pozzi 2008). Other studies added extra information to the consumption equation in order to objectively differentiate between the liquidity of constrained and unconstrained individuals, including for example the amount of liquid assets they hold or the debt-service ratio (Zeldes 1989a; 1989b; Garcia, Lusardi and Ng 1997; Johnson and Li 2010). Some also used unique datasets that included direct indicators of liquidity constrained people (Jappelli, Pischke and Souleles 1998).

With continuous attempts to examine whether liquidity constraints are behind this deviation from the REPIH implications, other studies differentiated between periods of anticipated income increases and decreases (Shea 1995; Jappelli and Pistaferri 2000;



Gomes and Paz 2010; Khan and Nishat 2011). The Response of consumption to anticipated income increases was attributed to the existence of liquidity constraints. A very recent study done by Kristen and Merola (2019) used a small scale DSGE model to examine the reason for the recent drop in consumption for Irish households along with survey data to confirm the model results. The study found that the highly leveraged households were less able to smooth their consumption in time of crisis due to being credit constrained, unlike low leveraged households. Most of the above-mentioned studies concluded the invalidity of the REPIH due to the insufficient role of capital markets in smoothing household consumption.

[111]

Many other studies examined the effect of the financial sector on consumption smoothing, through directly testing the impact of the credit channel. They focused on the changing housing prices and their collateral role in affecting consumption expenditures of the households sector (Aoki, Proudman and Vlieghe 2004; Iacoviello 2004; 2005; Lustig and Nieuwerburgh 2004; Benito and Mumtaz 2009; Chen, Chen and Chou 2010; Aron et al. 2012). Most of these studies emphasized the importance of consumption in transmitting monetary policy through the credit channel.

Part of the literature was also concerned with the effect of different mitigating mechanisms for credit constrained households on consumption smoothing. Some of these mechanisms were microinsurance (Jansen and Carter 2018), remittances (Combes and Ebeke 2011; Helmy, Zaki and Abdallah 2017) and cash transfers (Bazzi, Sumarto and Suryahadi 2015).

It is worth mentioning that there is limited literature testing the validity of the REPIH for developing countries. Moreover, there are fewer studies for testing the impact of the credit channel on smoothing consumption for households in developing countries.

CONSUMPTION DEVELOPMENTS AND PATTERNS

Consumption expenditure is the largest component of Egypt's GDP. In 2017, it accounted for about 85% of GDP, according to the Ministry of Planning (MOP, <http://mpmar.gov.eg>) economic indicators. The share of households' consumption has been ranging between

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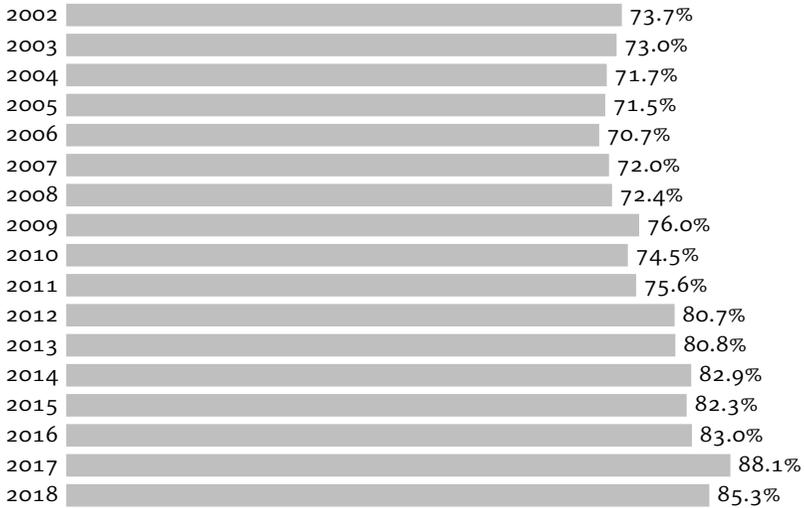


FIGURE 1 Percentage of Households' Consumption to GDP, 2002–2018
(based on Egyptian Ministry of Planning Economic Indicators,
<http://mpmar.gov.eg>)

71–88% of Egypt's GDP throughout the last two decades (see figure 1). This is considered quite a high percentage compared to its peers (International Monetary Fund 2017).

The distorted pricing of consumption goods and the inefficient food subsidies system are seen as partly responsible for Egypt's large share of consumption for decades. This is in addition to energy subsidies that resulted in over-investment in inefficient and capital-intensive industries. The state played a dominant role in these investments, resulting in relatively low employment growth and a very high fiscal deficit along with crowding out of the private sector by government borrowing (see table 1) (International Monetary Fund 2018). As a result, Egypt began its reform program in 2016 by gradually alleviating energy subsidies as part of the International Monetary Fund (IMF) recommendations to remove all food and energy subsidies. The act is expected to affect mostly the poor resulting in a decrease in their consumption (Al Azzawi 2017; El Hamidi 2016). According to the IMF, the 2017 increase in energy prices decreased consumption expenditures by 5.5% on average. The government tried to mitigate this consumption decrease by doubling the



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TABLE 1 Total Credit by Sector, 2011–2020

Year	Credit to government	Credit to public business sector	Credit to private business sector	Credit to households sector
2011	49.0%	3.7%	36.2%	11.1%
2012	54.0%	3.8%	31.8%	10.5%
2013	59.8%	3.2%	27.5%	9.5%
2014	64.3%	2.8%	24.0%	8.9%
2015	65.3%	3.2%	22.7%	8.9%
2016	67.3%	3.8%	20.5%	8.4%
2017	63.6%	4.8%	23.9%	7.7%
2018	64.1%	4.6%	23.2%	8.1%
2019	63.8%	4.3%	22.8%	9.1%
2020	65.9%	3.6%	20.9%	9.6%

[113]

NOTES Based on data from the Central Bank of Egypt (<https://www.cbe.org.eg>).

monthly food subsidy from 21 EGP per beneficiary to 50 EGP. This was to partially compensate the poorest 40 percent of Egyptians and half of the third and fourth quintiles along with ‘Takafol and Karama’¹ cash transfers (International Monetary Fund 2018).

These recent fiscal measures are expected to have significant effects on the daily consumption of people. Most of these fiscal measures are expected and permanent. Therefore, if not accompanied by a well-functioning banking sector to facilitate borrowing and saving, they are likely to increase volatility in households’ income and consumption, which will seriously hurt the low- and middle-income classes constituting the majority of the Egyptian population.

According to the Economic Census of 2017, Egypt’s population reached 94.7 million (that is 23.5 million households) with 57% living in rural areas. About 66% of total urban households live in privately owned houses versus 83% of total rural households. This might indi-

¹ ‘Takafol and Karama’ is a monetary aid program developed by the Ministry of Solidarity in March 2015. The program aims at alleviating poverty by providing conditional and unconditional monthly payments to the poor and disabled population in the Egyptian society. According to the World Bank (<https://www.worldbank.org>), the program reached 2.6 million families with average of 10 members each in 2018.

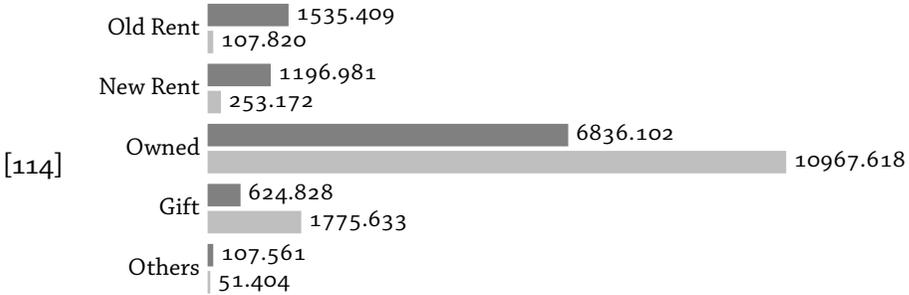


FIGURE 2 Classification of Households According to the Type of House and Place of Residence (dark – urban, light – rural; in millions; based on data from Central Agency for Public Mobilization and Statistics, <https://www.capmas.gov.eg>)

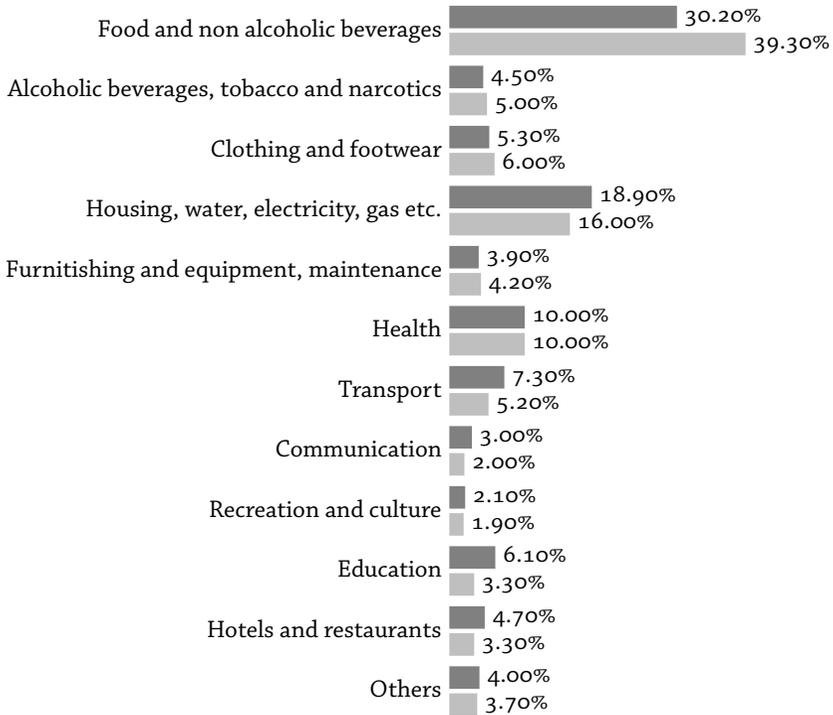
cate that most households have a kind of collateral by which they are eligible to enter the credit market and borrow if needed and made accessible by the financial sector (see figure 2).

According to the Household, Income, Expenditure and Consumption Survey of 2015, both urban and rural households spend approximately 35% of their actual consumption expenditures on food and non-alcoholic beverages (figure 3). When adding the amount spent on housing, clothing, education, health and transportation, it is found that approximately 80% of their spending goes to necessities. This means that if any unexpected income shock occurs, it will likely directly and intensively hurt their well-being. It is worth noting that most households tend to spend an amount equal to or less than their income. However, for higher income groups, there is more tendency to spend more than their income level.

The main sources of income for individuals and households, as per the Household, Income, Expenditure and Consumption Survey of 2015, are work (about 70% of total income in both urban and rural areas), followed by current transfers, both cash and in-kind (see figure 4). The least important source is real estate and financial possessions where financial possessions represent less than 2% of total income in urban areas and less than 1% in rural ones. Furthermore, according to the International Labor Organization (ILO) in 2018, over half of the employed are informal, working without a contract, pen-



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[115]

FIGURE 3 Classification of Households According to Main Expenditure Group and Place of Residence (dark – urban, light – rural; based on data from Central Agency for Public Mobilization and Statistics, <https://www.capmas.gov.eg>)

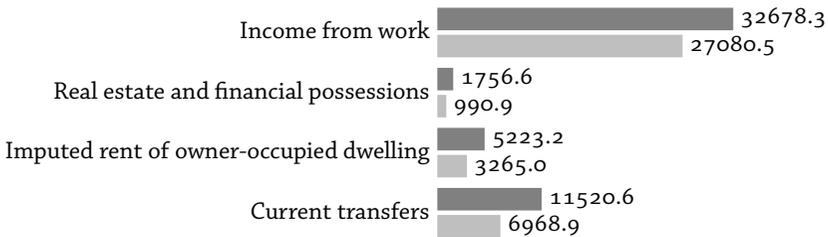


FIGURE 4 Average of Annual Households' Income According to the Source of Income and Place of Residence (dark – urban, light – rural; based on data from Central Agency for Public Mobilization and Statistics, <https://www.capmas.gov.eg>)

sion or health insurance, which could further hinder households' access to financial markets.

[116] It can thus be concluded that urban and rural households have almost the same patterns of consumption and income. However, the urban ones seem to have higher income and consumption levels. Work is the main source of income for households in Egypt while income from financial possessions is negligible. Also, 80% of households' spending goes to necessities.

THE EFFECTIVENESS OF THE CREDIT CHANNEL
TRANSMISSION MECHANISM IN HOUSEHOLDS'
CONSUMPTION

The aim of this study is to test the significance of monetary policy transmission on Egyptian households' consumption through the credit channel. This will also include investigating whether consumption is affected by credit constraints. Even if credit constraints were found significant, the study will proceed by testing whether Egyptians can still smooth their consumption as they can be informally borrowing and saving from family and friends.

The empirical analysis in this section is based on the work of Holtemöller (2002), Bacchetta and Gerlach (1997) and De Bondt (1999). In order to test this mechanism, a VAR model is applied where impulse response functions and variance decomposition are used to analyze the short-run dynamic relationship between the variables. Then, the long-run relationship between them is investigated as well.

Data sources

Quarterly data for the period from 2002: Q1 till 2017: Q4 is employed given the availability of data on credit to the households sector. The *households sector consumption expenditures* (C_t) data is obtained from the Ministry of Planning economic indicators. Some studies suggested using consumption expenditures of nondurable goods and services instead of total consumption as a more appropriate measure for consumption. This is to avoid any possible bias due to the failure to smooth the flow of benefits coming from the use of durable goods over time (Campbell and Mankiw 1990; Bacchetta and Gerlach 1997). However, De Bondt (1999) argued that to-



tal household consumption will give a better idea about the macroeconomic effect of the credit channel, as it is more important to the GDP of a country. Furthermore, Campbell (1987) found that his results were insensitive to using total consumption or consumption of nondurable goods and services only.

[117]

Disposable income (Y_t) is calculated as quarterly gross domestic product (GDP) at market price minus direct taxes on income and profits, as household disposable income reported by the Ministry of Planning is only available in annual figures. Therefore, disposable income was proxied by the only available quarterly components, GDP minus direct income taxes. To make sure that the proposed proxy is appropriate, we calculated a correlation coefficient between the annual disposable income reported by the Ministry of National Planning and annual figures for our proxy. The correlation coefficient was found to be 0.999 (see figure A1 in Appendix A).² The quarterly GDP data is obtained from the Ministry of Planning economic indicators. The direct tax data is obtained from the Ministry of Finance monthly bulletins (<http://www.mof.gov.eg>). Quarterly figures are available from 2005: Q3 till 2017: Q4 and annual figures are available for the whole period. A linear equation was estimated for the series to extrapolate the quarterly observations from 2002: Q1 till 2005: Q2 (Abdul Wahab 2017).

*Ex ante real interest rate*³ (R_t) is equal to nominal interest rate minus expected inflation. Expected inflation is taken as next period inflation rate. For *the nominal short-term interest rate*, the interest rates on loans less than or equal to one year is used as done by Holtemöller (2002). De Bondt (1999) used a weighted average of short and long-term interest rates, where the weights depend on the maturity structure of households' debt. However, in Egypt, reported long and short-term lending rates are not available. Only lending rates for loans less than or equal to one year are available. Further-

² Appendices are available at <https://emuni.si/ISSN/2232-6022/15.105-135a.pdf>.

³ Expected inflation was used rather than actual inflation as the REPIH is concerned about expectations therefore, households should adjust their consumption behavior according to their expectations about future inflation.

more, dividing loans according to their maturity is reported only until March 2006 and are aggregated for the whole private sector, including both business and households sectors.

[118] The EFP and the amount of real credit to the households sector are used to represent the price and quantity of liquidity constraints facing Egyptian households, respectively. Measuring the EFP at the macro level will likely be subject to some measurement errors because there is no accurate data on the external and internal cost of finance facing normal households (Bacchetta and Gerlach 1997; De Bondt 1999). However, several studies suggested alternative measures for the EFP facing the household sector. De Bondt (1999) suggested using mortgage lending rate reflecting households' wealth and the most important asset in consumers' balance sheet. But due to the unavailability of such data, mortgage lending rate was not used in the analysis. Moreover, consumers usually arbitrage between different types of credits to be used for consumption purposes. Therefore, sharp distinctions between the lending rates on different types of credit would not be of great importance. Bacchetta and Gerlach (1997) suggested two other measures for the EFP, one of which is the difference between the lending rate on loans less than or equal to 1 year and the rate on 3-month T-bills (EFP), and the other is the difference between the lending rate on loans less than or equal to 1 year and the annual saving rate on 3-month deposits (EFPD). The lending rate on loans less than 1 year is the only available lending rate reported by the CBE. In our study the EFP (EFP_t) is proxied by the difference between the lending rate on loans less than or equal to 1 year and the rate on 3-month T-bills as we found it more dynamic and more responsive to monetary policy changes and consumption (see table B1 and B2 in Appendix B).

Real credit to the households sector (Cr_t) is measured by total credit to the households sector instead of the mortgage and consumer credit used in Bacchetta and Gerlach (1997).

All the data for interest rates and the households sector credit is obtained from the CBE monthly reports except for the interest rate on 3-month T-bills, which is obtained from the International Financial Statistics database. The study uses the *Consumer price in-*



dex (CPI) to calculate expected inflation and as a price deflator of consumption expenditures and credit. CPI quarterly figures are obtained from the International Financial Statistics database. Finally, *GDP deflator* is used as a price deflator for disposable income. GDP deflator quarterly figures are calculated using GDP nominal and real data available at the Ministry of Planning economic indicators. Table B3 in the appendix shows the descriptive statistics for the model variables along with scatter plots for the relationships between them (figure B1 in the appendix). [119]

Estimation Results

UNIT ROOT TEST. The Augmented Dickey Fuller (ADF) test is firstly used to check the stationarity of the following variables of interest:

- C_t , log real consumption
- Y_t , log real disposable income
- Cr_t , log real credit to the households' sector
- R_t , real expected short-term interest rate
- EFP_t , external finance premium.

Before testing for unit roots, a evidence of seasonality was noticed in log real disposable income and log real consumption. Therefore, the STL Decomposition of Eviews was used to de-seasonalize them. Table 2 shows the results of the Augmented Dickey Fuller test of non-stationarity for the model variables. De-seasonalized log real income and log real household credit were found integrated of order 1 at the 5% significance level. However, de-seasonalized log real consumption, the EFP and real interest rate were found stationary at level.

VECTOR AUTOREGRESSIVE MODEL (VAR). In order to test whether the credit channel transmits monetary policy decisions to the consumption of the households sector, a VAR model is estimated similar to Al-Mashat and Billmeier (2007), Cambazoğlu and Karaalp (2013), Holtemöller (2002) and Moursi, El Mosallamy and Zakaria (2007). The order adopted in the analysis is C_t, Y_t, Cr_t, R_t and

TABLE 2 ADF Test Results

(1)	Level			First difference			(5)
	(2)	(3)	(4)	(2)	(3)	(4)	
C_t	Trend & intercept	-3.926159** (0)	-3.482763	None			I(0)
Y_t	None	6.070348 (3)	-1.946348	Intercept	-9.67902*** (2)	-2.910860	I(1)
Cr_t	Intercept	-2.240518 (0)	-2.908420	None	-5.77727*** (3)	-1.946447	I(1)
R_t	Trend & intercept	-4.089066*** (1)	-3.485218	None			I(0)
EFP_t	Trend & intercept	-4.105229*** (1)	-3.483970	None			I(0)

NOTES Column headings are as follows: (1) variable, (2) deterministic term, (3) ADF test statistic, (4) Mackinnon (1996) critical values at 5% significance level, (5) order of integration for variables in levels. The number between brackets refers to the number of lags; *** and ** indicate rejection of the null hypothesis of non-stationarity at the 1 percent and 5 percent level of significance respectively using Mackinnon (1996) critical values.

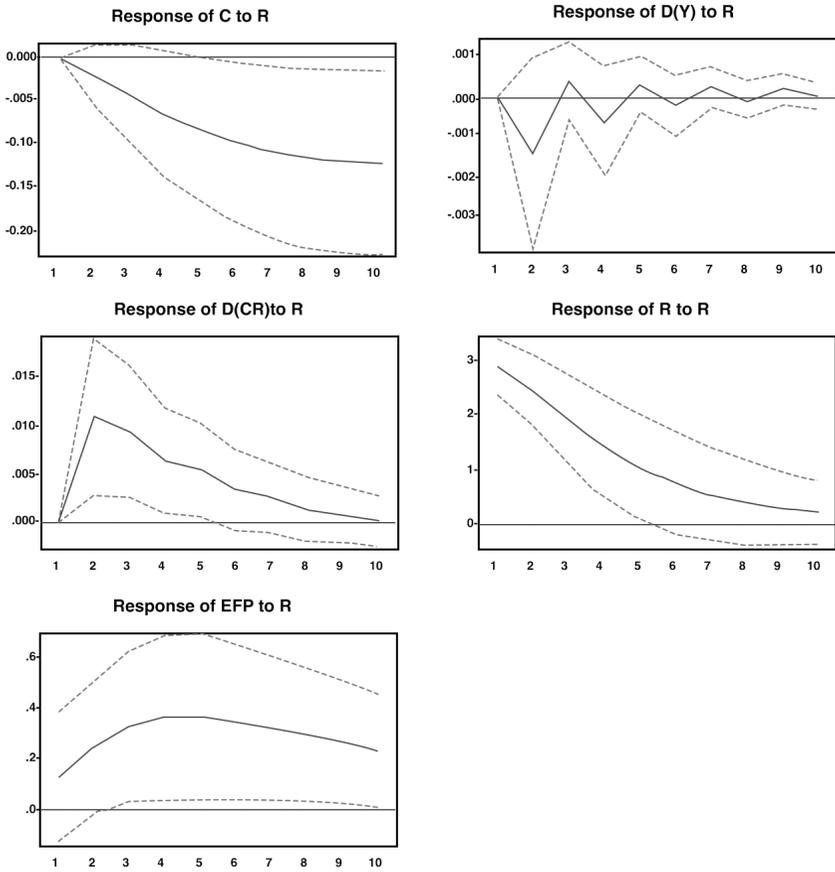
EFP_t , drawing on Hotlemöller (2002), Moursi, El Mosallamy and Zakaria, (2007) and Al-Mashat and Billmeier (2007). The central bank is assumed to first observe the status of the economy, regarding real consumption, income and credit in this case, then sets the short-term interest rate as a policy instrument that affects the real economy in the coming periods. Finally, the financial variables, EFP , responds.

Impulse Response Functions. Firstly, the reaction of the credit constraining variable, EFP , to monetary policy contraction or expansion needs to be examined. Secondly, the analysis looks at how this affects real households' credit and, consequently, how both affect real consumption. This enables judging the effectiveness of the credit channel for Egyptian households. Figure 5 shows the response of all the model variables to 1 standard deviation shock to the real interest rate.

The impulse response functions show a significant effect of one standard deviation shock of real interest rate on all the variables except disposable income. A positive shock to the real interest rate has a positive significant effect on the EFP that peaks at the fourth

[120]





[121]

FIGURE 5 The Response of All Variables to 1 SD Shock to Real Interest Rate

quarter and then decreases again. Also, a positive shock to the real interest rate has a negative effect on consumption that started to be statistically significant after the 5th period. This goes along with the credit channel of the monetary policy mechanism. However, a positive shock to the real interest rate increases credit till the second period then it starts decreasing again.

Figures 6 and 7 show the response of all the variables to 1 standard deviation shock in the EFP and real households' credit, respectively. The impulse response functions show a statistically insignificant effect of households' credit on all model variables. However, a positive shock to EFP significantly decreases consumption immedi-

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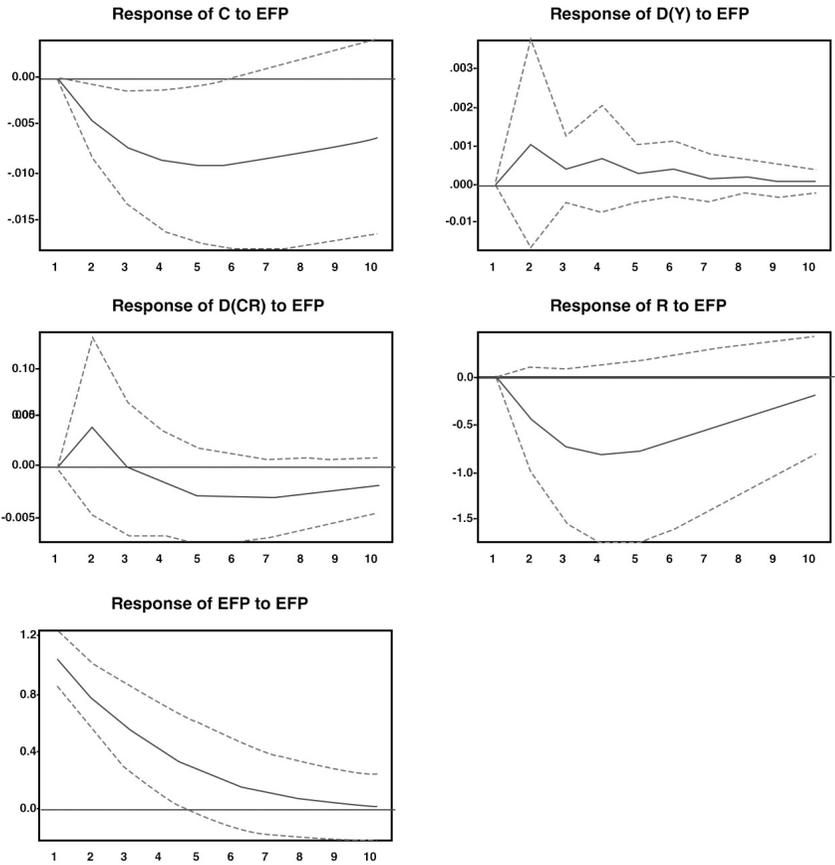


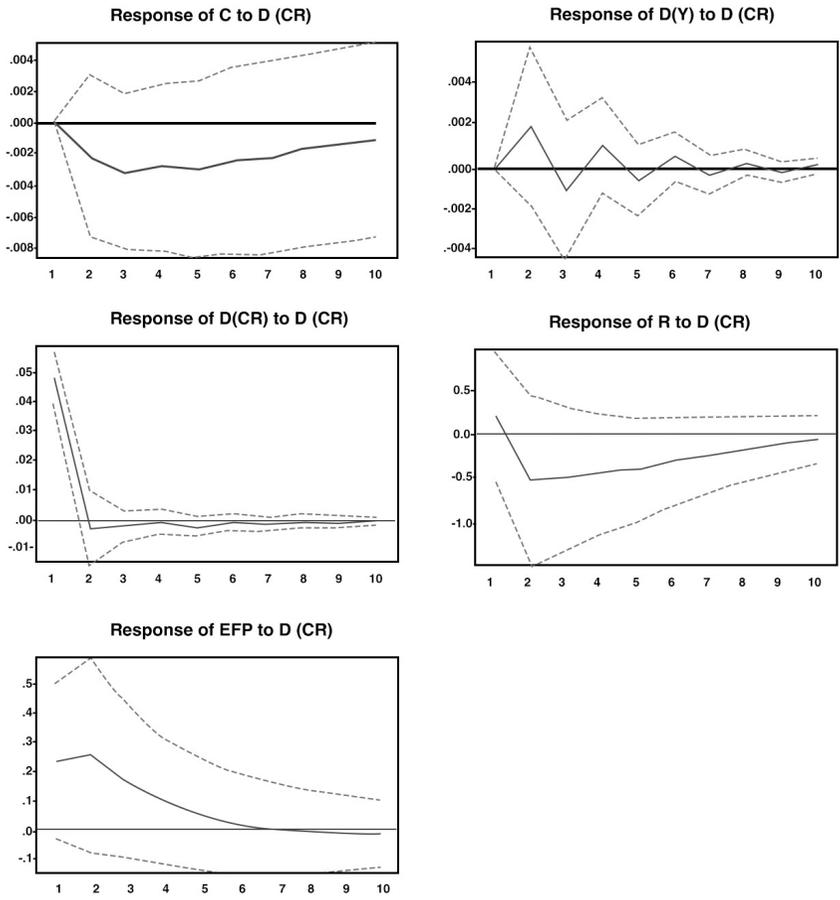
FIGURE 6 The Response of All Variables to 1 SD Shock to EFP

ately from the first period after the shock. From the effect of interest rate and EFP in figures 5 and 6 on consumption, we can observe that an increase in the interest rate increases the EFP first, which causes a sudden decrease in consumption expenditures that lasts till the fifth period when the direct effect of the interest rate increase appears. This is the timing problem that Bernanke and Gertler (1995) introduced in the credit channel.

Variance Decomposition. To further validate the results, variance decompositions of the consumption, EFP and households' credit are reported with the same order mentioned before. Table 3 shows that



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[123]

FIGURE 7 The Response of All Variables to 1 SD Shock to Log Real Households' Credit

after two and a half years, approximately 60% of the variation in consumption is explained by the variable itself. Then, 23% and 15% of the variation are explained by real interest rate and EFP, respectively. However, one can easily notice that the EFP was responsible for the largest part of the variation in consumption after consumption itself in the earlier periods, which coincides with the observed conclusion from the impulse response graphs.

Table 4 shows that after two and a half years, approximately 66% of the variation in the EFP is explained by the variable itself. The

TABLE 3 Variance Decomposition of De-Seasonalized Log Real Consumption

Period	SE	C	D(Y)	D(CR)	R	EFP
1	0.020521	100.0000	0.000000	0.000000	0.000000	0.000000
3	0.033293	89.19848	0.982987	1.319263	2.178858	6.320408
5	0.042235	76.94929	0.759919	1.798451	7.964369	12.527980
10	0.058412	59.71265	0.504237	1.482600	23.38616	14.914280

[124]

TABLE 4 Variance Decomposition of the EFP

Period	SE	C	D(Y)	D(CR)	R	EFP
1	1.073076	0.114600	0.671275	4.791219	1.385800	93.037130
3	1.530911	0.074325	0.953562	6.209646	4.052600	88.502510
5	1.692074	0.269000	0.820530	5.493900	16.111140	77.305080
10	1.850384	2.375300	0.741784	4.624400	26.361270	65.897160

TABLE 5 Variance Decomposition of Log Real Households' Credit

Period	SE	C	D(Y)	D(CR)	R	EFP
1	0.050164	2.158710	4.347620	93.493960	0.000000	0.000000
5	0.055315	2.505343	9.850095	77.520670	9.188463	0.935432
10	0.055979	2.454093	10.071730	75.900400	9.576030	1.997700

next most important variable is the real interest rate that is responsible for approximately 26% of the variation in EFP_t .

Finally, table 5 shows that after two and a half years, 76% of the variation in households' credit is due to the variable itself. Also, 10% of variation of households' credit is due to income and the same percent due to interest rate. Only 2% of the variation in credit is due to the EFP.

VAR Granger Causality. Granger causalities between model variables are estimated (see table C 1 in the appendix for the reported results). Results show that disposable income and EFP Granger cause consumption and all the variables collectively Granger cause consumption. Interest rate is the only variable that Granger causes the EFP. Disposable income, interest rate and all the variables collectively Granger cause households' sector credit.



The results suggest that the credit channel might be quite effective in transmitting monetary policy decisions to the households sector. The EFP is Granger caused by the interest rate and is significantly affected by its shocks in the short run. Furthermore, the EFP Granger causes consumption and the effect of any increase in the EFP is transmitted first to consumption before the effect of the initial increase in interest rate is realized. However, the EFP does not appear to have any effect on households' credit. This could be explained by the fact that most of households' lending in Egypt might be under fixed interest rate agreements so the increase in interest rate might encourage existing borrowers to increase their borrowing, but it will totally shut off new borrowers. Therefore, total credit might not decrease. The Granger causality test showed that consumption is an endogenous variable unlike income which is totally exogenous, which contradicts the REPIH assumption. This means that the REPIH could be invalid too.

[125]

COINTEGRATION/ERROR CORRECTION MODEL. The long-run relationship between model variables is also checked using the Autoregressive Distributed Lag (ARDL) bound test to cointegration. An ARDL (4, 0, 0, 1, and 0) minimizes SBC, where 4 lags of C_t , 1 lag of EFP_t and no lags for the other variables are required. The statistical results of the ARDL bounds test to cointegration are summarized in table 6.

The F -statistic falls above the upper bound of both Pesaran, Shin and Smith (2001) and Narayan (2004) critical values at 5 % significance level. Therefore, the null hypothesis of no cointegration is re-

TABLE 6 ARDL Bounds Test to Cointegration Results

F -test	Pesaran, Shin and Smith (2001)			Narayan (2004)		
	k	I(0)	I(1)	K	I(0)	I(1)
9.183908	4	2.56	3.49	1	2.823	3.872

NOTES Pesaran, Shin and Smith (2001) tabulated critical value bounds for F -statistic at 5% significance level at restricted intercept and no trend. Narayan (2004) tabulated critical value bounds for F -statistic at 5% significance level at restricted intercept and no trend at $n = 50$. k refers to the number of regressors which in this case is equal to one, n refers to the number of observations.

jected indicating the existence of some equilibrium relationship between the model variables in the long run. The estimated long-run equation is given as follows:

$$[126] \quad C_t = -0.827 + 1.117Y_t + 0.2674Cr_t + 0.0077R_t - 0.013EFP_t \quad (1)$$

$$\quad \quad \quad (-1.92) \quad (5.151) \quad (2.3058) \quad (3.231) \quad (-2.054)$$

The numbers in parenthesis are the *t*-statistics. At the 5 % significance level, all model variables are significant. Disposable income and credit are positively related to consumption. However, EFP has a negative relationship with consumption in the long run. This is compatible with the theory. Results further show that credit constraints negatively affect consumption in the long run. The positive significant sign of the interest rate coefficient can be explained by the possibility of the income effect of the interest rate increase is exceeding the substitution effect for Egyptians. This is similar to the results of Hussein, Moheildin, and Rostom (2017) such that when interest rate increases, consumers decrease their savings as they can obtain the same amount of income with lower savings. Therefore, consumption increases. However, households can still be smoothing their consumption through informal channels.

Once the long-run relationship is established, the short-run dynamics can be discussed in an ECM. The results of the ECM are presented as follows

$$\Delta C_t = -0.32E C_{t-1} + 0.0018\Delta EFP_t - 0.317\Delta C_{t-1} \quad (2)$$

$$\quad \quad \quad (-7.8657) \quad (0.972) \quad (-3.197)$$

$$\quad \quad \quad -0.5459\Delta C_{t-2} - 0.39\Delta C_{t-3}$$

$$\quad \quad \quad (-5.347) \quad (-3.74)$$

The ECM shows that the error correction term is significant and less than one which confirms the existence of a long-run relationship between the model variables. Moreover, it shows that 32% of the disequilibrium in the previous period is corrected in the current one. Lags of real consumption have a significant effect on current consumption. However, disposable income, interest rate, credit and EFP do not affect consumption in the short run according to



equation 2. Both the short and long-run analyses show that credit constraints have a negative effect on consumption. Monetary policy seems to be affecting household consumption through its credit channel, which indicates that the REPIH is more likely to be invalid unless households are informally smoothing their consumption by borrowing and saving from family or friends. [127]

Testing the Validity of the REPIH for the Egyptian Households

The significant effect of credit constraints on consumption does not necessarily mean that Egyptian households are not smoothing their consumption. They could be relying on self-financing through saving or borrowing from their relatives. Therefore, the study proceeds by testing the REPIH separately. The empirical analysis of this section is based on the work of Campbell (1987) and Anundsen and Ny-moen (2015). Their work focused on testing some implications of the REPIH in order to judge its relevance. One of the implications of the REPIH is that people save because they expect their income to decline, thus people 'save for a rainy day.' Accordingly, savings is a good predictor for future income declines. To test this implication, Campbell (1987) showed that consumption and income should be cointegrated as an implication of the REPIH too, such that any linear combination of them should be stationary. Therefore, savings, that is a linear combination of consumption and income, should be stationary. In a VAR model, if REPIH is valid, savings should be the optimal forecast for the present value of future declines in income.

The 'Saving for a rainy day' hypothesis also implies the exogeneity of consumption with respect to current income (Anundsen and Ny-moen 2015). Under the REPIH, consumption should be exogenous, thus consumption growth should not be Granger caused by lagged income. It is worth noting that the consumption function of Keynes implies the opposite, that is income affects consumption or, in other words, current income is exogenous with respect to consumption. This hypothesis will be tested while examining the long-run Granger causalities between disposable income and consumption.

In order to test these two hypotheses, firstly, cointegration between the variables of interest is tested using an ARDL model. Sec-

[128] only, if a long-run relationship is found between consumption and disposable income, then long-run Granger causalities is tested in order to decide upon the direction of the relationship between consumption and disposable income. Finally, a VAR model incorporating the stationary savings and the changes in disposable income is run in order to test if savings is a good predictor of income declines.

COINTEGRATION/ERROR CORRECTION MODEL. According to the results of the ADF test, consumption is stationary. This already contradicts the implications of REPIH in which consumption is expected to be a random walk process. However, as previously mentioned, the power of the ADF test is sometimes questioned, in terms of rejecting the null hypothesis of nonstationary when in fact the variable is stationary. Accordingly, cointegration is checked using the ARDL approach. Table 7 shows the ARDL test results. ARDL (1, 0) minimizes SBC. The *F*-statistic falls above the upper bound of both Pesaran, Shin and Smith (2001) and Narayan (2004) critical values at the 5 % significance level, which indicates that the null hypothesis of no cointegration between consumption and disposable income cannot be accepted.

The long-run equation appears as following:

$$C_t = -0.89 + 1.35Y_t \tag{3}$$

(12.67) (-3.47)

The numbers in parenthesis are the *t*-statistics. At the 5 % significance level, income is significantly positively related to consump-

TABLE 7 ARDL Bounds Test to Cointegration Results

<i>F</i> -test	Pesaran, Shin and Smith (2001)			Narayan (2004)		
	<i>k</i>	I(0)	I(1)	<i>K</i>	I(0)	I(1)
6.6427	1	3.62	4.16	1	3.86	4.44

NOTES Pesaran, Shin and Smith (2001) tabulated critical value bounds for *F*-statistic at 5% significance level at restricted intercept and no trend. Narayan (2004) tabulated critical value bounds for *F*-statistic at 5% significance level at restricted intercept and no trend at *n* = 50. *k* refers to the number of regressors which in this case is equal to one, *n* refers to the number of observations.



TABLE 8 ADF Test Results

Variable	Level		
	Deterministic term	ADF test statistic	Adj. critical values
S_{1t}	Intercept	-4.771** (0)	-3.37
S_{2t}	Intercept	-4.876** (0)	-3.37

[129]

NOTES ** Indicates rejection of the null hypothesis of non-stationarity at the 5 percent level of significance using adjusted critical values of Engle and Yoo (1987). S_{1t} is calculated as $S_{1t} = Y_t - 0.68C_t$ from equation D1. S_{2t} is calculated as $S_{2t} = Y_t - (1/1.35)C_t$ from equation 3. The number between brackets is the number of lags.

tion. Once the long-run relationship is established, an ECM can be estimated. The results of the ECM are as follows:

$$\Delta C_t = -0.27EC_{t-1} \tag{4}$$

(-4.54)

One can notice that as the optimum number of lags for income was 0 according to SBC, therefore, lags of disposable income did not appear in equation 4. The equation shows that 27% of the disequilibrium in the previous period is corrected this period. The cointegration relationship is estimated when disposable income is the dependent variable too (see Appendix D). Therefore, S_t is stationary. Savings as the residual of both cointegration equations were calculated and tested for their stationarity separately (table 8). We found that saving is stationary at level at the 5% significance level, thus we can test for the 'Saving for a rainy-day hypothesis.'

EXOGENEITY OF CONSUMPTION. The results show that there is a significant long-run relationship between C_t and Y_t . Accordingly, consumption exogeneity can be tested by ECM. From equation 4 and D2 in the appendix, there is a two way long-run relation between consumption and income, which makes the REPIH more likely to be rejected. Short-run Granger causality is also estimated using VAR Granger causality block exogeneity test. Results in table D2 in the appendix show that income Granger causes consumption but not vice versa, which contradicts the REPIH.

[130] VAR. As a final check to assure the rejection of the REPIH, testing if lags of savings are good predictors of income growth is performed using a VAR model with ΔY_t and S_t , where S_t is the estimated savings S_{1t} and S_{2t} (Campbell 1987). The ADF test above showed that S_t is stationary, so the analysis can be continued. A VAR model is estimated with 2 lags according to SBC. The two estimated equations are as follows:

$$S_t = 0.294 + 0.925S_{t-1} - 0.28S_{t-2} \quad (5)$$

(3.008) (5.22) (-1.65)

$$-0.87\Delta Y_{t-1} - 0.32\Delta Y_{t-2}$$

(-3.9) (-1.96)

$$\Delta Y_t = 0.108 + 0.113S_{t-1} - 0.233S_{t-2} \quad (6)$$

(1.36) (0.78) (-1.59)

$$-0.979\Delta Y_{t-1} - 0.139\Delta Y_{t-2}$$

(-5.43) (-1.06)

Lags of savings insignificantly affect log income. On the other hand, lags of income significantly affect savings. Therefore, the REPIH is rejected. According to the macroeconomic analysis, Egyptian consumers are not smoothing their consumption and credit constraints can be one reason for that. Consumption follows current income, which means that households are sensitive to sudden changes in income, a recurring phenomenon that is greatly affecting their well-being. Moreover, any macroeconomic policy that is likely to affect households' current income will be directly affecting their consumption.

CONCLUSION AND POLICY IMPLICATIONS

The study conducted an empirical analysis on the effect of liquidity constraints on consumption smoothing of Egyptian households through testing the effectiveness of the credit channel of monetary policy during the period of 2002–2017. The results showed that Egyptian households are not able to smooth their consumption. Credit constraints were found to have a negative effect on the con-



sumption of households. Moreover, the credit channel was found an effective transmission mechanism for monetary policy in affecting households' consumption.

The results of the study should be interpreted with caution due to some limitations the researchers faced and tried to deal with in the most efficient manner. The relatively small sample size might affect the results. Although there is higher frequency accurate data on interest rates and credit variables, there is no distinction between the lending rates facing the business sector from those facing households. Moreover, there is no separation between different types of credit that might give better insight into the balance sheet channel of monetary policy. Also, the amount of credit provided to the households sector is very small, which might affect the results.

[131]

For testing the REPIH, the problem of aggregation could not be avoided in quarterly data of consumption and disposable income, as consumers usually take their consumption decisions monthly or even weekly not quarterly (Jappelli and Pistaferri 2010). Moreover, differentiating between capital income and labor income can give better insight for tackling the research question. According to the REPIH, savings should be a good predictor of changes in labor income. Future capital income increases as a result of increasing savings. Therefore, this increase in future capital income can offset any decrease in the labor income (Campbell 1987). However, there is no data distinguishing between capital and labor income on the aggregate level.

This topic can be studied on either the micro or macro level. However, individual based data needed to answer this research question is missing. There is no available data on the amount of credit taken by each individual, the different lending rates they face or any data that combines consumption of the households sector along with income and financial inclusion. Moreover, since a big part of the society is financially excluded, it would have been better to differentiate between financially included and excluded individuals in the analysis. These limitations could be viewed as areas for future extensions in this topic that would allow better insights into consumption smoothing patterns and their relation to credit access.

[132]

In light of the empirical findings, it is particularly relevant for policymakers to consider the fact that households are not able to smooth their consumption. Consequently, any policy that is likely to affect their current income will cause sharp fluctuations in their consumption. Given the large and increasing poverty rate in Egypt, policies that lead to increasing income taxes or reducing in-kind subsidies will hurt households' wellbeing if not accompanied by other mitigating policies such as increasing cash subsidies or allowing for borrowing. However, this means that consumption responds to predicted income changes by monetary and fiscal policies. Therefore, stabilization policies will be able to affect consumption (Parker 1999). Finally, for households to smooth their consumption, they should first be included in the banking sector. Financial inclusion is thus considered an important step towards inclusive growth, reducing poverty, increasing saving, as well as formalizing the informal sector.

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