Consumer Confidence and Consumption: Empirical Evidence from Chile

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Abstract

This paper examines whether consumer confidence forecasts future consumption in Chile. The results show that consumer confidence indicators are positively related to consumption growth over the next quarter, indicating that consumption increases following periods of high consumer confidence. Furthermore, the results show that consumer confidence measures can be good predictors of consumption, even after controlling for information contained in economic fundamentals. This evidence suggests that consumer confidence indices reflect a component of consumer sentiment that is unrelated to macroeconomic conditions. Finally, additional results show that models that include consumer confidence produce more accurate predictions for positive, rather than negative changes in consumption.

Keywords: consumer confidence, consumption, forecasting, consumer behavior

JEL Classification:

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1. Introduction

Consumption is a large fraction of aggregate demand, and consumer confidence indices are leading indicators of its trend. Measures of consumer confidence reflect consumer's perceptions of current business and employment conditions, as well as their expectations about future business conditions, employment, income, and household finances. Consequently, a consumer confidence index is be the result of two effects: a rational reaction of consumers to past and current economic conditions; and a behavioral component unrelated to economic fundamentals, reflecting consumers' sentiments.

If consumer confidence indices are fully rooted in economic fundamentals, then the predictive power that confidence measures have upon, for example, aggregate consumption, could be equally achieved using only economic variables related to fundamentals. However, if consumer confidence also gauges consumer sentiment (see, for example, Lemmon and Portniaguina, 2006), then consumer confidence indices could improve the predictive power on future aggregate consumption, beyond the forecasting based on past economic fundamentals. Furthermore, consumer confidence measures are usually available on a higher frequency, typically on a monthly basis, than macroeconomic variables (for instance, aggregate consumption data is usually available on a quarterly basis). Thus, changes in consumer confidence can be considered a good proxy for periods of unobserved aggregate consumption.

Despite its intuitive attractiveness, the use of confidence measures to predict consumption growth is at odds with some of the early theoretical research on intertemporal consumption. On the one hand, the Permanent Income Hypothesis (hereafter, the PIH), originally developed by Modigliani, Brumberg and Friedman in the 1950s, proposes that consumers maximize utility over a long-term horizon. Consequently, rather than responding to every change in income, PIH

predicts that consumers smooth consumption over time. One implication from this theory is that consumer's rational expectations induce changes in consumption by smaller amounts when income changes are perceived as transitory rather than permanent. On the other hand, models of precautionary savings suggest that households will hold more assets when faced with greater income uncertainty. Therefore, if higher consumer confidence is associated with lower uncertainty about the future, then we will observe higher level of current consumption relative to future consumption when consumer confidence is high.

The main objective of this study is to empirically address the role of consumer confidence on future aggregate consumption in Chile. More specifically, we analyze how future consumption can be predicted using current consumer confidence. We begin our analysis by studying whether consumer confidence is a leading index for consumption, that is, if consumer confidence can help to explain future movements in consumption, controlling by macroeconomic conditions. To study the predictive power of consumer confidence measures, we compare a benchmark model, based on a regression of consumption on macroeconomic determinants, with a model that includes consumer confidence measures, and evaluate whether forecasting accuracy improves. We also evaluate predictive accuracy improvements by using "out-of-sample" data. The former test allows us to detect if the forecasting power we find using the "in-sample" models is a real improvement, or the result of data overfitting.

We also study the hypothesis that consumer confidence reflects investor sentiment that is unrelated to economic fundamentals. To explore this possibility, we separate confidence into two components; one rooted in economic fundamentals, and one reflecting sentiment. The methodology we adopt is as follows. First, we regress consumer confidence on a set of macroeconomic variables. By examine goodness of fit measures, we check whether a substantial

portion of confidence remains unexplained. Next, we treat the residual from this regression as our measure of excessive sentiment (optimism or pessimism) unwarranted by fundamentals. Then, we examine the predictive power of this excessive consumer sentiment on future consumption.

This study is based on the two surveys of consumer confidence that have been conducted in Chile. One is collected by Adimark (a private company) and commissioned by the Central Bank of Chile [the Index of Consumer Economic Perception (IPEC)] and the other is independently conducted by Universidad del Desarrollo Business and Economic Research Center [the Index of Consumer Perception (IPECO)]. These surveys poll a large number of households on their perceived personal financial situation, their expectations regarding the Chilean economy, and their willingness to purchase household durables.

The main finding of the article may be summarized as follows. First, our results show that both IPEC and IPECO are positively related to consumption growth over the next quarter, indicating that consumption increases following periods of high consumer confidence. This result is at odds with the prediction from precautionary savings models, where higher confidence is associated with lower uncertainty about the future and therefore a reduction in precautionary saving. Thus, high confidence should be associated with a higher level of current consumption relative to future consumption and lower consumption growth going forward. We find contrasting results.

Second, our results show that consumer confidence measures can be good predictors of consumption, even after removing the information contained in economic fundamentals. This evidence suggests that consumer confidence indices reflect consumer sentiment that is unrelated

to macroeconomic conditions. Finally, our results show that consumer confidence models have better predictive power for positive, rather than negative changes in consumption.

The reminder of the paper is structured as follows. Section 2 presents a literature review. Section 3 describes the consumer confidence data and control variables. Section 4 presents the methodology and empirical results. The last section presents a summary and the final remarks.

2. Related Literature

Several studies have analyzed how consumer confidence affects macroeconomic performance. For instance, Matsusaka and Sbordone (1995) find a significant contribution of consumer confidence measures to predict GDP changes, about one fourth of GDP changes. Merkle, Langer and Sussman (2004) analyze the predictive power of the components of confidence indexes, showing that current economic situation variables are better predictors of the beginning of recessions, whereas future economic situation variables are better predictors of the end of recessions. More recently, Casey and Owen (2013) find asymmetric reactions in consumer confidence to changes in economic fundamentals in the US. Consumer, however, they did not find evidence of a systematic negativity bias, as they expected. Howrey (2001) conclude that consumer confidence predicts recessions or expansions of economic activity, and personal expenditures. Dees and Soares Brinca (2011) arrive to similar conclusions for Europe.

Another strand in the literature focuses on the predictive power of consumer confidence measures on aggregate consumption, or over household consumption using microeconomic data from surveys. Carroll, Fuhrer and Wilcox (1994) showed evidence that lagged consumer confidence has some explanatory power for current changes in aggregate US household spending. Acemoglu and Scott (1994) also provided evidence of the predictive content of

consumer confidence. Souleles (2004) found that consumer confidence is a good predictor of consumption growth using microeconomic data from a household survey. Ludvigson (2004), testing the predictive power of consumer confidence on services, durables and non-durables consumption, found significant predictive content even in consumption functions that include other macroeconomic explanatory variables as control variables. Lahiri et al. (2012) find an incremental effect of consumer confidence in the estimation of consumption functions that include lags in consumer confidence, among other financial variables that could proxy for consumer confidence.

Regarding the question of why consumer confidence should predict consumption growth, there are three main theoretical explanations.

First, there is the Precautionary Savings Theory, in which consumer confidence represents consumers' expectations of future uncertainty, so a higher value of confidence, that is, a lower level of uncertainty, should be associated with less precautionary savings. Therefore, consumer confidence should be negatively correlated with future consumption growth. There is evidence for (Souleles, 2003) and against this hypothesis (Carroll, Fuhrer and Wilcox, 1994; Ludvigson, 2004). It is noteworthy that the only study that found evidence in favor of precautionary savings is the only one which used micro data at the household level, while all other studies used aggregate data.

Second, the Permanent Income Hypothesis (PIH), in which consumer confidence surveys capture household expectations of future income or wealth. Under the general version of the PIH, consumption should change only because of unexpected changes in permanent income. However, confidence could be related to future consumption growth if households are liquidity constrained or if some households follow a Keynesian consumption function. There is many

evidence in favor of this hypothesis (Acemoglu and Scott, 1994; Carroll, Fuhrer and Wilcox, 1994; Ludvigson, 2004), the most accepted among the feasible explanations.

Finally, the Animal Spirits could help to explain the ability of consumer confidence to predict consumption growth. The concept was proposed by John Maynard Keynes in 1936, who wrote: Animal Spirits are the instincts, proclivities and emotions that ostensibly influence and guide human behavior and influence the real economy.

3. Data

Our data sets come from several sources. Measures of consumer confidence are taken from two surveys. The first measure is the Consumer Economic Perception Index (IPEC), available on a monthly basis from 2001, collected by Adimark (a private company) and commissioned by the Central Bank of Chile. The second measure is the Consumer Perception Index (IPECO), available on a monthly basis from 2005, measured by the Universidad del Desarrollo Business and Economic Research Center. Data on macroeconomic control variables are taken from the Central Bank of Chile and the National Institute of Statistics (INE). Next, we describe the main variables used in this paper.

3.1 Consumer Confidence Proxies

The Economic Perception Index (IPEC) measures consumers' perceptions about current personal and nationwide economic condition, future economic condition and economic stability, and current willingness to purchase durable goods. The methodology is based on the University of Michigan Consumer Sentiment Index. The IPEC index is available on a yearly basis from 1981 to 1985, quarterly from 1986 to 2001, and monthly thereafter. The sample size is about 1,100 individuals surveyed by phone in 18 of the largest cities in Chile. The questionnaire

includes questions about current personal economic situation, current national economic situation, future national economic situation, future expected national economic stability, and current willingness to purchase durable goods. The index is constructed as the weighted average of the sub-indexes, calculating the net optimism fraction of answers. The index is distributed in the range between 0 and 100.

Figures 1 and 2 graph aggregate consumption and each of the consumer confidence indexes. They suggest a high correlations among the variables.

The Consumer Perception Index (IPECO) measures the consumers' assessment on current and expected personal economic conditions, labor market conditions, and expectations for future income. The survey is based on the methodology used by the University of Michigan Consumer Sentiment Index and the Conference Board Consumer Confidence Index. The index is available quarterly from December 2001 to March 2005, and monthly thereafter. Each month, the sample size is about 380 shoppers randomly selected from different shopping centers located in two of the largest cities in Chile (Santiago and Concepcion). The survey measures consumer perceptions on five topics: current economic situation, current unemployment, future economic situation, future unemployment, and future income. The index is constructed as the weighted average five sub-indexes for each variable, dividing the number of optimists by the sum of optimists and pessimists. The index is expressed on a basis equal to 100 for December of 2001.

[Figure 1 about here]

[Figure 2 about here]

3.2 Control Variables

Since we can only conclude that confidence measures help to predict consumption if they provide additional information to other economic fundamentals, we control for the following macroeconomic variables: Gross national disposable income, GNDI, as a proxy of consumers' income; Housing price index, IPC, as a proxy of households' real state wealth; Stock market price index, IGPA, as a proxy of households' financial wealth; Unemployment rate, as a proxy for income uncertainty; One-to-three-month consumer loans interest rate, as a proxy for the availability of credit.

In all the tests we use logarithms and first differences of variables, and all variables are expressed in real terms. We performed cubic interpolation on the available quarterly macroeconomic and survey data, to match the monthly frequency of the estimations and increase the sample size.

4. Empirical Results

4.1 Forecasting Future Consumption Growth

The first analysis examines the effects of consumer confidence on consumption growth in a multivariate setting. In particular, we test if consumer confidence changes can help to predict or anticipate consumption growth. For this purpose, we estimated a consumption model regressing total consumption growth on its own lags, lagged value of confidence measures, and contemporaneous values of macroeconomics fundamentals. The following equation shows the baseline regression for this test:

$$\Delta Consumption_t = c + \sum_{i=1}^{p} \phi_i \Delta Consumption_{t-p} + \sum_{j=1}^{l} \theta_i Confidence_{t-l} + \beta_1 \Delta Income_t + \beta_2 \Delta IPV_t + \beta_3 \Delta IGPA_t + \beta_4 \Delta Unemployment_t + \beta_5 \Delta IC_t + \varepsilon_t \quad (1)$$

where *confidence* is the one-period-lagged IPECO or IPEC index, *income* is measure by GNDI, *IPV* is the housing price index, *IGPA* is the stock market price index, *unemployment* is the unemployment rate, and *IC* is the interest rate on short-term consumption loans (one-to-three-months). We use 6 lags for consumption (p=6). The number of lags is defined based on the information criterion (AIC, BIC). All variables are expressed in logarithms so coefficients can be interpreted as elasticities. All control variables are measured in real terms and first differences. Finally, standard errors are estimated using the Newey-West estimator of the covariance matrix for inference.

We start by performing an "in-sample" evaluation of the model. Table 1 shows the results of the estimation. Columns (2) to (4) of Table 1 present the results of the OLS estimation. Column (2) presents the results of regressing consumption on macroeconomic determinants (benchmark model). Column (3) and (4) show the results when we add consumer confidence measures to the model. Results shows that both lagged confidence measures, IPECO and IPEC, are statistically significant at the 1 percent level. The adjusted R^2 increases after the inclusion of consumer confidence measures, and the root mean square error (RMSE) decreases.

One problem with the previous results is that the lags of consumptions on the right-hand side of Equation (1) are endogenous to the error term, causing an endogeneity bias. To alleviate this endogeneity concern, we apply the dynamic GMM estimator (Arellano and Bond, 1991; Blundell and Bond, 1998) to estimate the relationship between consumer confidence and

consumption.[1] Columns (5) to (7) of Table 1 show the estimates of the GMM estimator. Results in Table 1 indicate that the statistical significance of all variables improves when using the GMM as estimator.

Regarding the sign of the consumer confidence coefficients, they are all positive, that is, and increase in confidence is associated with a future increase in consumption growth. These findings are inconsistent with precautionary savings models, where higher confidence is associated with lower uncertainty about the future, and a reduction in precautionary saving. Then high confidence should be associated with a higher level of current consumption relative to future consumption and lower consumption growth going forward.

[Table 1 about here]

Next, we perform "out-of-sample" tests of the forecasting model. To perform an out-of-sample evaluation of the forecasting accuracy of the model, we use OLS rolling regressions with different samples of 36 observations each. More specifically, the first iteration of the procedure used the first 36 observations for estimation, and then we made h-steps ahead forecasts, where h = 1, 2, 3, 4, 5, 6 (one to six months ahead dynamic forecasts), and we obtained the corresponding forecasting errors. The second iteration repeated the process using the observations 2-37, and so on. Finally, we evaluated the forecasting accuracy of the models for every forecasting horizon. This way, we account for the fact that forecasting accuracy should be better for short run forecasts, and that confidence should predict consumption only in the short run, through modifying consumers' appraisal of their future path of income.[2]

Table 2 shows the results based on OLS models. We evaluate the forecasting performance of the models in the following way: if we find improvements in forecasting

[1] We estimate the dynamic GMM regressions using the "xtabond2" Stata command developed by Rodman (2009). We consider all variables as endogenous, and we instrument them using up to 12 lags.
[2] In previous calculations, we could not find any predictive power of confidence in long run forecasts.

accuracy when evaluating in both, in-sample and out-of-sample, we assume that the improvement is reliable. If we find improvements only for the in-sample models, but not for the out-of-sample models, then we assume that the improvement is pure overfitting and not real forecasting improvement. Results show that the inclusion of both measures of consumer confidence, IPECO and IPEC, improves forecasting accuracy for forecasting horizons 1 to 2, while the inclusion of IPECO improves forecasting accuracy for all the forecasting horizons. Considering that we obtain forecasting accuracy improvements in both, in-sample and out-of-sample evaluations, we can conclude that consumer confidence measures help to predict future consumption growth.

[Table 2 about here]

4.2 Fundamental and Sentiment Components of Confidence

The fact that consumer confidence has forecasting power for consumption growth provides some suggestive evidence consistent with our hypothesis. However, we still cannot completely separate the effects of the behavioral and rational hypothesis. To further explore the hypothesis that consumer confidence reflects consumer sentiment that is unrelated to economic fundamentals, we separate confidence into two components; one rooted in fundamentals and one reflecting sentiment. The methodology we adopt is as follows. First, we regress consumer confidence on a set of contemporaneous and lagged macroeconomic variables:

$$Confidence_t = c + \beta X_t + \phi\, X_{t-1} + \varepsilon_t \tag{2}$$

where X_t is a matrix of contemporaneous macroeconomic variables and X_{t-1} are the same set of variables lagged one period. The confidence measure is the IPECO or IPEC index, while the X matrix includes the following variables: income (GNDI), IPV (housing price index), IGPA (stock market price index), unemployment (unemployment rate), and IC (interest rate on short-term

consumption loans), that are the same determinants of consumption, plus some additional macroeconomic variables available in monthly frequency that could affect how consumers elaborate their perceptions about the economy. These variables are: IMACEC, a monthly index of economic activity; inflation; inflation of fuel prices; and the nominal exchange rate. These variables are in logs and in first differences when it was required to have stationary variables. We use current and lagged values of all variables as confidence's predictors.

Results for Equation (2) are presented in Table 3. Results show that the current and lagged interest rate, and the current and lagged fuel prices inflation were significant predictors of both confidence measures, while the lagged unemployment and lagged inflation were significant predictors of IPEC. The regression has an adjusted $R^2$of about 27 percent, indicating that only a third of the variation in consumer confidence can be explained by economic fundamentals.

[Table 3 about here]

Next, we treat the residual from Equation (2) as our measure of excessive sentiment (optimism or pessimism) unwarranted by fundamentals. Then, we examine the predictive power of this excessive consumer sentiment on future consumption. Table 4 shows regression results. Estimated coefficients for consumer sentiment are statistically significant only in equations estimated using GMM. The magnitude of the estimated coefficients for consumer sentiment are half of the coefficient associated to consumer confidence. We also find predictive power of consumer sentiment, as measure by the improvements in the goodness of fit and error measures, especially when we used IPEC as confidence index. All in all, we conclude that we have reliable results supporting the predictive power of confidence measures.

[Table 4 about here]

4.3 Asymmetric Predictive Power of Consumer Confidence

As an additional analysis, we examine whether consumer confidence has an asymmetric predictive power. In other worlds, it may be possible that consumer confidence models make more accurate predictions for positive changes in consumption rather than negative changes (or vice versa). To test this hypothesis, we estimated two separate equations; one regression for positive changes in consumption growth, and another regression for negative changes in consumption growth.

Table 10 shows the results. Consumer confidence has a significant relationship, at the 1 percent level, with both measures of consumption growth, and the relationship is stronger in the case of positive consumption growth, as it is shown by coefficients magnitude. However, we also show that the forecasting accuracy is better for predicting negative consumption growth, given the results for the R^2, RMSE and MSE decomposition, but this fact can be explained by the significant differences in the coefficients of the other macroeconomic variables. It should be noted that the coefficient of Ipeco is negative in the negative consumption equation, a result that might be explained by the differences in the set of instruments of each regression. It also should be noted that the samples for positive consumption growth equations are larger than the samples of the negative consumption growth equations, so the comparison might not be completely appropriate.

[Table 5 about here]

Finally, we performed two additional regressions including an interaction term for consumer confidence. We add two dummies, one for positive consumption growth and one for negative consumption growth, multiplying the confidence measures. The results shown in table 6 reveal that confidence measures actually have a significant effect over consumption growth, and

that the coefficients for the interaction with positive growth are larger than those for the interaction with negative growth. A one tailed Wald test showed that the difference is significant at the 1% level, suggesting that consumer confidence is best suited to predict positive consumption growth.

[Table 6 about here]

When searching for an explanation, we found that there is no statistical significant difference between the absolute value of positive changes in confidence and absolute value of negative changes, that is, the distribution of the changes is symmetric. Nevertheless, there is a difference in the changes of consumption: the absolute values of negative changes in consumption are larger than the absolute values of positive changes, suggesting that consumers overreact to negative fundamentals of the economy, decreasing their consumption, but that overreaction is not properly captured by the confidence measures or other macroeconomic variables.

As we showed in table 5, when consumption growth is negative its dynamics is explained mainly by its own lagged values, since the magnitude of the lagged consumption coefficients is two times the magnitude of the coefficients in the positive growth consumption equation, while the magnitude of the remaining variables is nearly the same. This result is supported by the PIH, which points out that all relevant information to predict consumption should be only contained in its own lagged values.

5. Summary and Concluding Remarks

The empirical results showed in this paper suggest that consumer confidence measures are leading indicators, and are positively related to future aggregate consumption growth. The

results are supported by many different specifications, revealing that consumer confidence measures indeed contain relevant information for consumption forecasting even after controlling for information contained in other macroeconomic variables.

We also found that consumer confidence produces better improvements in forecasting accuracy when consumption growth is positive, while when consumption growth is negative its dynamics is driven mainly by its own lagged values.

List of References

Acemoglu, D. & A., Scott. (1994). Consumer Confidence and Rational Expectations: Are Agents' Beliefs Consistent with the Theory?. Economic Journal, Royal Economic Society, vol. 104(422), pages 1-19, January.

Carroll, C. D., Fuhrer, J. C., & Wilcox, D. W. (1994). Does Consumer Sentiment Forecast Household Spending? If So, Why? The American Economic Review, 84(5), 1397-1408.

Dées, Stéphane & Soares Brinca, Pedro, (2011). Consumer confidence as a predictor of consumption spending: evidence for the United States and the euro area. Working Paper Series 1349, European Central Bank.

Flavin, M (1981). The Adjustment of Consumption to Changing Expectations about Future Income. Journal of Political Economy, University of Chicago Press, vol. 89(5), pages 974-1009, October.

Hall, R. (1978). Stochastic Implications of the Life Cycle-Permanent Income Hypothesis: Theory and Evidence. Journal of Political Economy, University of Chicago Press, vol. 86(6), pages 971-87, December.

Howrey, P. E. (2001). The Predictive Power of the Index of Consumer Sentiment. Brookings Papers of Economic Activity, 175-216.

Lahiri, K., Monokroussos, G., & Zhao, Y. (2012). Forecasting Consumption in Real Time: The Role of Consumer Confidence Surveys. Department of Economics, University at Albany, SUNY.

Ludvigson, S. C. (2004). Consumer Confidence and Consumer Spending. Journal of Economic Perspectives, 18(2), 29-50.

Matsusaka, J. G., & Sbordonde, A. M. (1995). Consumer Confidence and Economic Fluctuations. Economic Inquiry, 296-231.

Merkle, D. M., Langer, G. E., & Sussman, D. (2004). Consumer Confidence: Measurement and Meaning. ABC News.

Pindyck, R.S. & Rubinfeld, D.L. (1991). Econometric Models and Economic Forecasts. 3rd edition, McGraw-Hill.

Souleles, N.S. (2003): Expectations, Heterogeneous Forecast Errors, and Consumption: Micro Evidence from the Michigan Consumer Sentiment Surveys, Journal of Money, Credit, and Banking 36(1), 39-72.

*Figure 1**. Total consumption growth and IPECO. Normalized data***

Consumption Growth (seasonally adjusted) and IPECO index. Both variables are normalized. The sample period is 2001-2015.

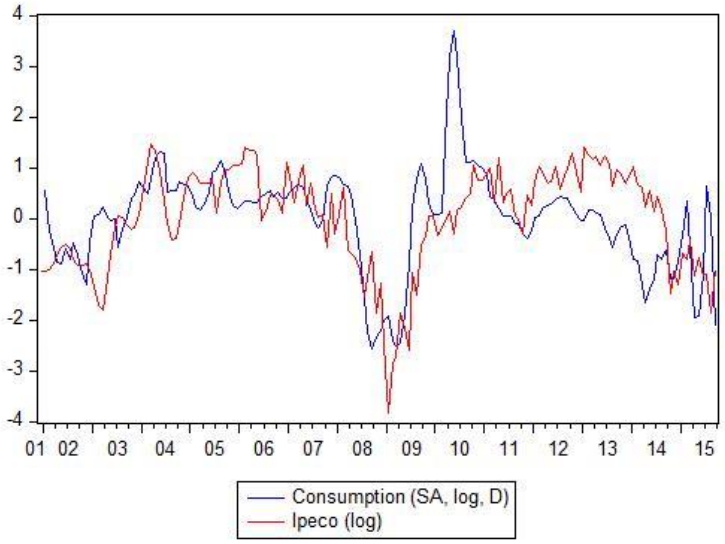

*Figure 2**. Total consumption growth and IPEC. Normalized data***

Consumption Growth (seasonally adjusted) and IPECO index. Both variables are normalized. The sample period is 2001-2015.

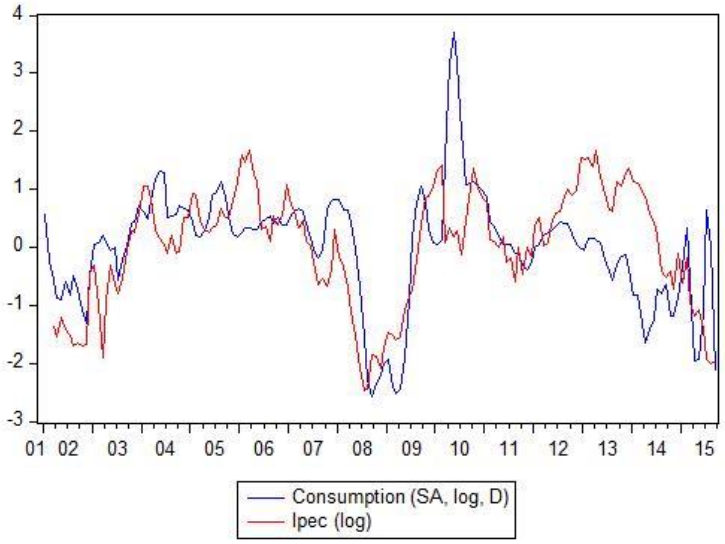

Table 1. ***Summary statistics***

Consumption, GNDI, IGPA, IPV, Unemployment and Interest Rate are in dlogs, while Ipeco and Ipec are in logs and lagged one period.

Variable	**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**
Consumption (dlog)	154	0.0045	0.0210	-0.0449	0.0347
GNDI (income) (dlog)	154	0.0045	0.0145	-0.0280	0.0410
IGPA (financial wealth) (dlog)	154	0.0055	0.0396	-0.1043	0.1420
IPV (housing wealth) (dlog)	154	0.0008	0.0100	-0.0244	0.0255
Unemployment (dlog)	154	-0.0017	0.0425	-0.1143	0.0838
Interest rate (dlog)	154	-0.0021	0.0772	-0.2929	0.2749
Ipeco (log, lagged 1)	153	4.7701	0.1444	4.1967	4.9699
Ipec (log, lagged 1)	153	3.8369	0.1505	3.4532	4.0826

Table 2. **Correlation matrix**

Consumption, GNDI, IGPA, IPV, Unemployment and Interest Rate are in dlogs, while Ipeco and Ipec are in logs and lagged one period.

	Consump.	**GNDI**	**IGPA**	**IPV**	**Unemp.**	**Int. Rate**	**Ipeco**	**Ipec**
Consump.	1.0000							
GNDI	0.6158	1.0000						
IGPA	-0.0399	0.0777	1.0000					
IPV	0.5192	0.3847	0.1468	1.0000				
Unemp.	-0.4076	-0.4448	-0.0332	-0.2027	1.0000			
Int. Rate	0.1517	0.0094	-0.1488	-0.1315	-0.1790	1.0000		
Ipeco	0.0723	0.0505	-0.1260	-0.0449	-0.1131	0.2772	1.0000	
Ipec	-0.0826	0.1421	0.0248	0.0000	-0.0877	0.1032	0.7939	1.0000

Table 3. **In-sample consumption regression**

This table presents the parameter estimates for the following model:

$$\Delta Consumption_t = c + \sum_{i=1}^{p} \phi_i \Delta Consumption_{t-p} + \sum_{j=1}^{l} \theta_i Confidence_{t-l} + \beta_1 \Delta Income_t + \beta_2 \Delta IPV_t + \beta_3 \Delta IGPA_t + \beta_4 \Delta Unemployment_t + \beta_5 \Delta IC_t + \varepsilon_t,$$

where *confidence* is the one-period-lagged IPECO or IPEC index, *income* is measure by GNDI, *IPV* is the housing price index, *IGPA* is the stock market price index, *unemployment* is the unemployment rate, and *IC* is the interest rate on short-term consumption loans (one-to-three-months). . Newey-West robust standard errors are in parentheses. *, **, and *** indicate the coefficient is significantly different from zero at the 10%, 5%, and 1% significant level, respectively.

	(1) Benchmark	**(2) Ipeco**	**(3) Ipec**	**(4) Benchmark**	**(5) Ipeco**	**(6) Ipec**
Ipeco		0.0052***			0.0051***	
		(0.0013)			(0.0004)	
Ipec			0.0042***			0.0050***
			(0.0015)			(0.0005)
Consumption(-1)	1.9192***	1.8113***	1.8798***	1.9564***	1.8434***	1.9025***
	(0.0912)	(0.0713)	(0.0723)	(0.0391)	(0.0320)	(0.0296)
Consumption(-2)	-1.4723***	-1.2908***	-1.3682***	-1.5807***	-1.3831***	-1.4513***
	(0.1557)	(0.1303)	(0.1272)	(0.0671)	(0.0525)	(0.0515)
Consumption(-3)	-0.5367***	-0.6470***	-0.6235***	-0.4591***	-0.5700***	-0.5486***
	(0.1081)	(0.0998)	(0.0962)	(0.0576)	(0.0396)	(0.0399)
Consumption(-4)	1.6736***	1.5736***	1.6385***	1.7056***	1.5811***	1.6309***
	(0.1390)	(0.1208)	(0.1272)	(0.0681)	(0.0523)	(0.0461)
Consumption(-5)	-1.2416***	-1.0673***	-1.1410***	-1.3393***	-1.1340***	-1.1918***
	(0.1725)	(0.1472)	(0.1503)	(0.0722)	(0.0594)	(0.0548)
Consumption(-6)	0.1960**	0.0864	0.1251	0.2492***	0.1261***	0.1539***
	(0.0905)	(0.0790)	(0.0786)	(0.0370)	(0.0309)	(0.0293)
GNDI (income)	0.0418**	0.0489**	0.0269	0.0635***	0.0653***	0.0489***
	(0.0212)	(0.0214)	(0.0219)	(0.0094)	(0.0085)	(0.0080)
IGPA (financial wealth)	0.0031	0.0053	0.0041	0.0068***	0.0108***	0.0093***
	(0.0044)	(0.0041)	(0.0040)	(0.0023)	(0.0017)	(0.0019)
IPV (housing wealth)	0.0035	-0.0009	-0.0069	-0.0061	-0.0110	-0.0193**
	(0.0153)	(0.0159)	(0.0172)	(0.0107)	(0.0081)	(0.0076)
Unemployment	-0.0102*	-0.0103**	-0.0094**	-0.0127***	-0.0122***	-0.0103***
	(0.0052)	(0.0045)	(0.0046)	(0.0028)	(0.0019)	(0.0020)
Interest rate	0.0063***	0.0050**	0.0055***	0.0102***	0.0088***	0.0103***
	(0.0023)	(0.0020)	(0.0021)	(0.0013)	(0.0010)	(0.0009)
Constant	0.0021***	-0.0222***	-0.0137**	0.0019***	-0.0219***	-0.0169***
	(0.0003)	(0.0059)	(0.0059)	(0.0001)	(0.0018)	(0.0019)
N	148	148	148	142	141	141
Adj. R2	0.9812	0.9831	0.9824	0.9904	0.9912	0.9909
RMSE	0.0020	0.0019	0.0019	0.0020	0.0019	0.0019
Bias Proportion	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Variance Proportion	0.2%	0.2%	0.2%	0.2%	0.2%	0.1%
Covariance Proportion	99.8%	99.8%	99.8%	99.8%	99.8%	99.9%
Estimator	OLS	OLS	OLS	GMM	GMM	GMM

Table 4. **Out-of-sample performance of OLS consumption models**

This table presents the results of the OLS rolling regressions, where $h = 1,2, \ldots ,6$ is the forecast horizon. The RMSE statistics are estimated for each forecast horizon, and it is compared with the RMSE of the benchmark model. The percentage under the RMSE is the increase or reduction in the RMSE when the confidence index is used as predictor of consumption growth, relative to the RMSE of the benchmark model.

	h=1	**h=2**	**h=3**	**h=4**	**h=5**	**h=6**
(4) Benchmark	0.00208	0.00380	0.00509	0.00581	0.00626	0.00671
(9) Ipeco	0.00202	0.00349	0.00464	0.00539	0.00597	0.00647
	-2.6%	-8.4%	-8.8%	-7.2%	-4.6%	-3.6%
(10) Ipec	0.00204	0.00370	0.00520	0.00617	0.00680	0.00731
	-1.7%	-2.7%	2.2%	6.2%	8.6%	8.8%

Table 5. **OLS Consumer confidence regression**

This table presents the parameter estimates for the following model:

$$Confidence_t = c + \beta X_t + \phi X_{t-1} + \varepsilon_t$$

where X_t is a matrix of contemporaneous macroeconomic variables and X_{t-1} are the same set of variables lagged one period. The confidence measure is the IPECO or IPEC index, while the X matrix includes the following variables: income (GNDI), IPV (housing price index), IGPA (stock market price index), unemployment (unemployment rate), IC (interest rate on short-term consumption loans), IMACEC (monthly index of economic activity), inflation, inflation of fuel prices; and the nominal exchange rate. These variables are in logs and in first differences when it was required to have stationary variables. We use current and lagged values of all variables as confidence's predictors. Newey-West robust standard errors are in parentheses. *, **, and *** indicate the coefficient is significantly different from zero at the 10%, 5%, and 1% significant level, respectively.

	Ipeco	**Ipec**
GNDI (income)	-0.0697	1.5049
	(1.6368)	(1.6863)
GNDI (-1)	0.2859	0.3452
	(1.3345)	(1.3542)
IGPA (financial wealth)	-0.1975	0.0994
	(0.2795)	(0.2905)
IGPA (-1)	-0.2211	0.1901
	(0.2637)	(0.2627)
IPV (housing wealth)	1.4701	-0.3322
	(2.7263)	(2.6647)
IPV (-1)	0.2078	0.2659
	(1.8772)	(2.0364)
Unemployment	-0.0832	-0.0169
	(0.3865)	(0.3840)
Unemployment (-1)	-0.3951	-0.6209*
	(0.3496)	(0.3307)
Interest rate	0.5509***	0.3702**
	(0.2061)	(0.1732)
Interest rate (-1)	0.5788***	0.3065*
	(0.1721)	(0.1650)
IMACEC	-0.0257	-0.0951
	(0.2028)	(0.2024)
IMACEC (-1)	0.1313	0.0102
	(0.2191)	(0.2157)
Inflation	1.3733	-3.2847
	(4.2606)	(4.1303)
Inflation (-1)	-5.8833	-10.6865*
	(4.9579)	(5.5235)
Fuel inflation	0.8050*	0.6600*
	(0.4827)	(0.3926)
Fuel inflation (-1)	1.1158**	1.0316**
	(0.5427)	(0.4372)
Exchange rate	-0.7871	-0.5967
	(0.6614)	(0.5162)
Exchange rate (-1)	-0.5559	-0.5455
	(0.4154)	(0.4578)
Constant	4.7712***	3.8540***
	(0.0312)	(0.0333)
T	153	153
Adj. R2	0.2748	0.2689

Table 6. **In-sample consumption regression, consumer sentiment (residual)**

This table presents the parameter estimates for the following model:

$$\Delta Consumption_t = c + \sum_{i=1}^{p} \phi_i \Delta Consumption_{t-p} + \sum_{j=1}^{l} \theta_i Confidence_{t-l} + \beta_1 \Delta Income_t + \beta_2 \Delta IPV_t + \beta_3 \Delta IGPA_t + \beta_4 \Delta Unemployment_t + \beta_5 \Delta IC_t + \varepsilon_t,$$

where *confidence* is the one-period-lagged IPECO or IPEC index, *income* is measure by GNDI, *IPV* is the housing price index, *IGPA* is the stock market price index, *unemployment* is the unemployment rate, and *IC* is the interest rate on short-term consumption loans (one-to-three-months).Newey-West robust standard errors are in parentheses. *, **, and *** indicate the coefficient is significantly different from zero at the 10%, 5%, and 1% significant level, respectively.

	(1) Benchmark	**(7) R Ipeco**	**(8) R Ipec**	**(4) Benchmark**	**(9) R Ipeco**	**(10) R Ipec**
Residual Ipeco		0.0026			0.0024***	
		(0.0016)			(0.0005)	
Residual Ipec			0.0022			0.0022***
			(0.0017)			(0.0006)
Consumption(-1)	1.9192***	1.8835***	1.8968***	1.9564***	1.9174***	1.9138***
	(0.0912)	(0.0844)	(0.0846)	(0.0391)	(0.0296)	(0.0262)
Consumption(-2)	-1.4723***	-1.4031***	-1.4196***	-1.5807***	-1.5111***	-1.5100***
	(0.1557)	(0.1491)	(0.1458)	(0.0671)	(0.0518)	(0.0495)
Consumption(-3)	-0.5367***	-0.5810***	-0.5749***	-0.4591***	-0.4881***	-0.4798***
	(0.1081)	(0.1070)	(0.1031)	(0.0576)	(0.0462)	(0.0471)
Consumption(-4)	1.6736***	1.6436***	1.6577***	1.7056***	1.6493***	1.6342***
	(0.1390)	(0.1336)	(0.1358)	(0.0681)	(0.0546)	(0.0501)
Consumption(-5)	-1.2416***	-1.1792***	-1.1978***	-1.3393***	-1.2581***	-1.2471***
	(0.1725)	(0.1663)	(0.1664)	(0.0722)	(0.0571)	(0.0513)
Consumption(-6)	0.1960**	0.1571*	0.1677*	0.2492***	0.2052***	0.2018***
	(0.0905)	(0.0885)	(0.0872)	(0.0370)	(0.0295)	(0.0268)
GNDI (income)	0.0418**	0.0406*	0.0373*	0.0635***	0.0614***	0.0621***
	(0.0212)	(0.0207)	(0.0214)	(0.0094)	(0.0091)	(0.0080)
IGPA (financial wealth)	0.0031	0.0039	0.0039	0.0068***	0.0076***	0.0070***
	(0.0044)	(0.0042)	(0.0042)	(0.0023)	(0.0017)	(0.0018)
IPV (housing wealth)	0.0035	0.0017	-0.0002	-0.0061	-0.0105	-0.0053
	(0.0153)	(0.0149)	(0.0160)	(0.0107)	(0.0094)	(0.0077)
Unemployment	-0.0102*	-0.0103**	-0.0102**	-0.0127***	-0.0140***	-0.0131***
	(0.0052)	(0.0050)	(0.0051)	(0.0028)	(0.0018)	(0.0018)
Interest rate	0.0063***	0.0061***	0.0059***	0.0102***	0.0095***	0.0106***
	(0.0023)	(0.0022)	(0.0022)	(0.0013)	(0.0009)	(0.0010)
Constant	0.0021***	0.0021***	0.0021***	0.0019***	0.0021***	0.0020***
	(0.0003)	(0.0003)	(0.0003)	(0.0001)	(0.0001)	(0.0001)
N	148	148	148	142	140	140
Adj. R2	0.9812	0.9815	0.9814	0.9904	0.9906	0.9909
RMSE	0.0020	0.0020	0.0020	0.0020	0.0020	0.0019
Bias Proportion	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Variance Proportion	0.2%	0.2%	0.2%	0.2%	0.2%	0.1%
Covariance Proportion	99.8%	99.8%	99.8%	99.8%	99.8%	99.9%
Estimator	OLS	OLS	OLS	GMM	GMM	GMM

Table 7. **GMM model for the asymmetric effect of consumer confidence on consumption growth**

This table presents the parameter estimates for the following model:

$$\Delta Consumption_t = c + \sum_{i=1}^{p} \phi_i \Delta Consumption_{t-p} + \sum_{j=1}^{l} \theta_i Confidence_{t-l} + \beta_1 \Delta Income_t + \beta_2 \Delta IPV_t + \beta_3 \Delta IGPA_t + \beta_4 \Delta Unemployment_t + \beta_5 \Delta IC_t + \varepsilon_t,$$

where *confidence* is the one-period-lagged IPECO or IPEC index, *income* is measure by GNDI, *IPV* is the housing price index, *IGPA* is the stock market price index, *unemployment* is the unemployment rate, and *IC* is the interest rate on short-term consumption loans (one-to-three-months). Newey-West robust standard errors are in parentheses. *, **, and *** indicate the coefficient is significantly different from zero at the 10%, 5%, and 1% significant level, respectively.

	$\Delta^+Consumption$	$\Delta^-Consumption$	$\Delta^+Consumption$	$\Delta^-Consumption$
	(11) Ipeco	**(12) Ipeco**	**(13) Ipec**	**(14) Ipec**
Ipeco	0.0043***	-0.0014***		
	(0.0005)	(0.0004)		
Ipec			0.0042***	0.0015***
			(0.0004)	(0.0003)
Consumption(-1)	1.6749***	2.3303***	1.7045***	2.2437***
	(0.0255)	(0.0355)	(0.0257)	(0.0311)
Consumption(-2)	-1.1326***	-2.2563***	-1.1722***	-2.2212***
	(0.0382)	(0.0965)	(0.0404)	(0.0701)
Consumption(-3)	-0.6064***	-0.0874	-0.5885***	-0.0247
	(0.0381)	(0.0923)	(0.0340)	(0.0583)
Consumption(-4)	1.3754***	2.2652***	1.3990***	2.0637***
	(0.0508)	(0.0497)	(0.0486)	(0.0644)
Consumption(-5)	-0.8738***	-2.0613***	-0.9061***	-1.9605***
	(0.0481)	(0.0861)	(0.0496)	(0.0924)
Consumption(-6)	0.0364*	0.7061***	0.0550**	0.6484***
	(0.0217)	(0.0574)	(0.0223)	(0.0569)
GNDI (income)	0.0421***	0.0388***	0.0298***	0.0512***
	(0.0066)	(0.0034)	(0.0070)	(0.0035)
IGPA (financial wealth)	0.0124***	-0.0012	0.0113***	-0.0028**
	(0.0012)	(0.0010)	(0.0013)	(0.0012)
IPV (housing wealth)	-0.0066	0.0242***	-0.0279***	0.0240***
	(0.0068)	(0.0019)	(0.0051)	(0.0023)
Unemployment	-0.0068***	-0.0149***	-0.0077***	-0.0107***
	(0.0018)	(0.0019)	(0.0019)	(0.0012)
Interest rate	0.0064***	0.0052***	0.0062***	0.0081***
	(0.0007)	(0.0010)	(0.0006)	(0.0007)
Constant	-0.0173***	0.0040**	-0.0130***	-0.0079***
	(0.0024)	(0.0017)	(0.0016)	(0.0010)
N	102	39	102	39
Adj. R2	0.9572	0.9940	0.9569	0.9942
RMSE	0.0019	0.0006	0.0019	0.0006
Bias Proportion	0.0%	0.1%	0.0%	0.0%
Variance Proportion	0.9%	0.0%	0.9%	0.0%
Covariance Proportion	99.1%	99.9%	99.1%	100.0%
Estimator	GMM	GMM	GMM	GMM
Consumption	+	-	+	-

Table 8. **The asymmetric effect of consumer confidence on consumption growth**

This table presents the parameter estimates for the following model:

$$\Delta Consumption_t = c + \sum_{i=1}^{p} \phi_i \Delta Consumption_{t-p} + d_p * \sum_{j=1}^{l} \theta_i Confidence_{t-l} + d_m * \sum_{j=1}^{l} \theta_i Confidence_{t-l} + + \beta_1 \Delta Income_t + \beta_2 \Delta IPV_t + \beta_3 \Delta IGPA_t + \beta_4 \Delta Unemployment_t + \beta_5 \Delta IC_t + \varepsilon_t,$$

where *confidence* is the one-period-lagged IPECO or IPEC index, *dp* is a dummy for periods when consumption growth is positive (*dummy plus*), *dm* is a dummy for periods when consumption growth is negative (*dummy minus*), *income* is measure by GNDI, *IPV* is the housing price index, *IGPA* is the stock market price index, *unemployment* is the unemployment rate, and *IC* is the interest rate on short-term consumption loans (one-to-three-months). Newey-West robust standard errors are in parentheses. *, **, and *** indicate the coefficient is significantly different from zero at the 10%, 5%, and 1% significant level, respectively.

	(4) Benchmark	**(15) Ipeco**	**(16) Ipec**
Ipeco*dp		0.0049***	
		(0.0005)	
Ipeco*dm		0.0042***	
		(0.0005)	
Ipec*dp			0.0028***
			(0.0006)
Ipec*dm			0.0020***
			(0.0006)
Consumption(-1)	1.9192***	1.7200***	1.7666***
	(0.0912)	(0.0382)	(0.0394)
Consumption(-2)	-1.4723***	-1.2810***	-1.3780***
	(0.1557)	(0.0634)	(0.0653)
Consumption(-3)	-0.5367***	-0.4926***	-0.4160***
	(0.1081)	(0.0491)	(0.0510)
Consumption(-4)	1.6736***	1.3681***	1.3937***
	(0.1390)	(0.0501)	(0.0574)
Consumption(-5)	-1.2416***	-0.9403***	-1.0147***
	(0.1725)	(0.0614)	(0.0664)
Consumption(-6)	0.1960**	0.0713**	0.1242***
	(0.0905)	(0.0329)	(0.0346)
GNDI (income)	0.0418**	0.0592***	0.0538***
	(0.0212)	(0.0097)	(0.0094)
IGPA (financial wealth)	0.0031	0.0093***	0.0065***
	(0.0044)	(0.0024)	(0.0025)
IPV (housing wealth)	0.0035	-0.0121	-0.0085
	(0.0153)	(0.0113)	(0.0101)
Unemployment	-0.0102*	-0.0079***	-0.0077***
	(0.0052)	(0.0023)	(0.0025)
Interest rate	0.0063***	0.0092***	0.0117***
	(0.0023)	(0.0012)	(0.0012)
Constant	0.0021***	-0.0200***	-0.0077***
	(0.0003)	(0.0022)	(0.0023)
N	142	142	142
Adj. R2	0.9904	0.9919	0.9912
RMSE	0.0020	0.0018	0.0019
Bias Proportion	0.0%	0.0%	0.0%
Variance Proportion	0.2%	0.2%	0.2%
Covariance Proportion	99.8%	99.8%	99.8%
Estimator	GMM	GMM	GMM