Consumer Confidence and Consumption: Empirical Evidence from Chile[*]

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 during the month following the indicators, demonstrating that consumption increases after periods of high consumer confidence. This result stands at odds with the theoretical predictions of consumption expenditures (for instance, the Precautionary Saving Hypothesis). Furthermore, the results show that consumer confidence measures can be good predictors of consumption, even after controlling for the information contained in other economic fundamentals. This evidence suggests that consumer confidence in Chile also reflect a component of consumer sentiment that is unrelated to macroeconomic conditions. Finally, additional results show that predictive models that include consumer confidence produce more accurate predictions for positive, rather than for negative changes in consumption over the next month.

Keywords: consumer confidence, consumption, forecasting, consumer behavior.
JEL Classification: E21, E27, C53

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1. Introduction

Consumers are the core component of the economy, and consumer confidence indices are the leading indicators of aggregate demand and the overall health of the economy. Measures of consumer confidence in Chile, as in most of the rest of the world, reflect consumer's perceptions of current employment conditions, as well as their expectations of future employment, income, and household finances. Consequently, consumer confidence indices could be the result of two effects: a rational reaction of consumers to past and current market conditions, or a behavioral component unrelated to economic fundamentals, reflecting consumers' sentiments.

If consumer confidence indices are fully rooted in economic fundamentals, then the predictive power they have upon aggregate consumption could be equally achieved using only economic variables related to fundamentals (i.e., unemployment, GDP growth, inflation, and the stock market performance). However, if consumer confidence also gauges consumer sentiment, which is unrelated to economic fundamentals, then consumer confidence indices could improve the predictive power on future aggregate consumption beyond the prevailing forecasting models based solely on past economic fundamentals. Furthermore, consumer confidence measures are usually released on a monthly basis, more frequently than most macroeconomic data (e.g., aggregate consumption data is usually available on a quarterly basis). Thus, changes in consumer confidence can also be considered a good proxy of consumption for periods of unobserved aggregate consumption.

Despite its intuitive appeal, the use of confidence measures to predict consumption growth and our empirical results are at odds with some of the early theoretical research on intertemporal consumption. For instance, 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 spread consumption over time. One implication of this theory is that the consumer's rational expectations induce fewer changes in consumption when income changes are perceived as transitory rather than permanent. Therefore, changes in expectations regarding future business conditions, employment, and income, as a proxy for changes in confidence measures, should have negligible effects on future consumption (Hall, 1978; Flavin, 1981).

Moreover, the Theory of Precautionary Savings suggests 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 a higher level of current consumption relative to future consumption when consumer confidence is high. Our results contradict the predictions of both the PIH and Precautionary Saving Hypotheses.

The main objective of this study is to empirically address the role of consumer confidence in determining future aggregate consumption in Chile. More specifically, we analyze how future consumption can be predicted using current measures of consumer confidence. We begin our analysis by studying whether consumer confidence is a leading indicator of consumption, even after controlling for the information contained in economic fundamentals. In other words, we examine whether consumer confidence can help to explain future movements in consumption, after controlling for macroeconomic conditions. To study the predictive power of consumer confidence measures, we compare a benchmark model, which is a regression of consumption on macroeconomic determinants, with a model that, in addition to the previous macroeconomic variables, includes consumer confidence measures. We then evaluate whether forecasting accuracy improves when consumer confidence measures are added. We also assess predictive

accuracy improvements by using "out-of-sample" data. This test allows us to detect if the forecasting power we find using the "in-sample" assessments is a real improvement or merely the result of data overfitting.

We also study the hypothesis that consumer confidence as a reflection of investor sentiment is unrelated to economic fundamentals. To explore this possibility, we separate confidence into two components; one rooted in economic fundamentals, and one reflecting sentiment. Here we adopt the following methodology. First, we regress consumer confidence on a set of macroeconomic variables. We check whether a substantial portion of confidence remains unexplained by examining goodness-of-fit measures. Next, we treat the residuals from this regression as our measure of excessive sentiment (optimism or pessimism) unwarranted by economic fundamentals. Finally, we examine the predictive power of this excessive consumer sentiment on future consumption.

Consumer confidence measures for this study are based on two surveys of consumer confidence that have been conducted in Chile. The first measure is collected by GfK Adimark (a private company) and commissioned by the Central Bank of Chile. This measure is called the Index of Consumer Economic Perception (IPEC). The second measure is based on a survey conducted independently by the Universidad del Desarrollo Business and Economic Research Center. This measure is called the Index of Consumer Perception (IPECO). Both surveys poll a large number of households about their perceived personal financial situation, their expectations regarding the Chilean economy, and their willingness to purchase household durables in the future.

The main findings of this article may be summarized as follows. First, our results show that both IPEC and IPECO are positively related to consumption growth over the next month,

indicating that consumption increases following periods of high consumer confidence. This finding contradicts the predictions of precautionary savings models, where higher confidence is associated with lower uncertainty about the future, and therefore a reduction in precautionary saving in the present period. Conversely, our results indicate that high confidence predicts higher levels of future consumption relative to current consumption (i.e., higher future consumption growth).

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. These results also suggest behavioral biases in the decision processes of consumers.

The remainder of the paper is structured as follows. Section 2 presents a literature review. Section 3 introduces the hypothesis to be tested in this paper. Section 4 describes the consumer confidence data and control variables. Section 5 presents the methodology and empirical results. The last section gives a summary and the final remarks.

2. Related Literature

Several studies have investigated whether measures of consumer confidence can be used to improve forecasts of real economic activity. Early contributions by Fuhrer (1988), Carroll, Fuhrer and Wilcox (1994), Acemoglu and Scott (1994), and Matsusaka and Sbordone (1995) present evidence that, after controlling for economic fundamentals, the Index of Consumer Sentiment (ICS), measured by the University of Michigan, predicts GDP changes and aggregate US household spending.

More recent studies have found similar results. For instance, Howrey (2001) shows that the ICS predicts recessions and expansions of both economic activity and personal expenditures. Merkle, Langer and Sussman (2004) analyze the predictive power of each of the components of the consumer confidence surveys in the US; they find that questions about the current economic situation are the best predictors of the beginning of recessions, whereas future economic situation variables are best suited to predict the end of recessions. Easaw, Garratt and Heravi (2005) show that consumer confidence is able to predict household's consumption in the UK, as well as the growth of labor income. Bovi (2013) shows that data from consumer surveys in the UK are useful to enhance the predictive accuracy of the best forecasting models without these data. Lahiri, Monokroussos and Zhao (2016) analyze empirical models of consumption, not only at the quarterly frequency, but using monthly data as well; they establish an important role of consumer confidence surveys in improving the accuracy of consumption forecasts in the US.

Desroches and Gosseling (2004) suggest that confidence could increase its influence over real activity during periods of major economic and political shocks, which are periods associated with high volatility of consumer confidence, suggesting that only large swings in confidence can affect spending. Dees and Soares Brinca (2013) reveal that consumer confidence indicators are good predictors of household consumption even after controlling for economic fundamentals in the US and Europe; they also argue that the contribution of confidence in explaining consumption increases when the confidence indicators experience large changes.

In addition, Souleles (2004) evaluates the role of consumer confidence at the household-level, which allows him to isolate the effect of confidence on consumption from the effect of macro variables; he concludes that consumer confidence helps to predict household expenditure,

counter to the PIH. Nevertheless, he finds that higher confidence is correlated with less saving, which is consistent with precautionary motives of consumption.

Despite the vast amount of literature suggesting that survey measures contain reliable information about future economic activity, there is also evidence rejecting the influence that consumer confidence have on the real economy. For instance, Batchelor and Dua (1998) show that consumer confidence would have been helpful in predicting the 1991 US recession; however, this result does not generalize to other recessions and, indeed, paying attention to consumer confidence at other times would have been very misleading. Ludvigson (2004) shows that much of the information contained in survey measures is found in other economic indicators, and the independent information provided by consumer confidence explains a relatively modest amount of additional variation in future consumer spending. Croushore (2005) analyzes whether consumer confidence in the US could improve forecasts of consumer spending by using only data available to forecasters in real time; he finds that consumer confidence is not of significant value in forecasting consumer spending and, in some cases, they make forecasts significantly worse. Claveria, Pons and Ramos (2007) find that models that include information from business and consumer surveys have lower RMSEs than the best similar models without survey information; however, this reduction is significant only in a limited number of cases.

Some research has shown that consumer confidence can have asymmetric effects on the real economy. For example, Easaw and Heravi (2004) show that consumer confidence in the UK is better able to make forecasts during periods of higher consumption growth rates and higher (or growing) consumer confidence. Bovi (2009) argues that assessments of the economic situation collected by consumer surveys are psychologically and permanently biased. In particular, during hard times people's forecast errors on the economic situation are structurally larger than in good

times. Also, personal/future conditions are systematically perceived to be better than the aggregate/past ones. Bruno (2014) analyzes the relationship between consumer expenditure and the confidence in Italy by using a non-parametric approach; he finds an asymmetric threshold effect of confidence on durables consumption, when confidence is below a certain threshold, while the converse is not true.

Other studies have focused on the components of consumer confidence to analyze whether the predictive power of confidence is based solely on fundamentals or whether it also comprises consumer' sentiments. According to Katona (1968), economic decisions of consumers are not completely determined by objective factors such as their income (ability to buy) but also depends on subjective factors such as attitudes and moods (willingness to buy). If attitudes change, consumption will change, even if consumers' ability to buy is unchanged. Roos (2008) estimates a willingness-to-consume model (Katona, 1968) using data from seven European countries. The empirical evidence rejects the PIH and supports the willingness-to-consume model. In this context, the predictive power of consumer sentiment indices should not be interpreted as a particular ability of consumers to predict their life-time income measured by consumer confidence indicators, but as the willingness to buy. Chauvet and Guo (2003) analyze the effects of nonfundamental movements in consumer confidence; their results suggest that nonfundamental changes in sentiment have been quite important around business-cycle turning points. Barsky and Sims (2012) show that consumer confidence has three main components: the animal spirits component (autonomous fluctuations in beliefs), the news component (information already contained in fundamentals), and noise. Although all components contribute to confidence innovations, the relationship between confidence and economic activity would be almost entirely reflective of the news component. By contrast, Starr (2012) finds that consumer confidence is

affected by news shocks and that after filtering out effects of news shocks, shocks to sentiment still have positive effects on consumer spending. Casey and Owen (2013) analyze in consumer confidence and media coverage of economic news. They find evidence of asymmetric reactions by consumers to changes in economic fundamentals; however, they find no evidence of a systematic negativity bias. They also find no evidence of bias in the media.

The behavioral biases documented in previous studies should be intensified in Latin American economies, where financial and mathematical illiteracy are widespread in the population (e.g., Garcia, Grifoni, Lopez, and Mejía, 2013). Additionally, during the last years Latin American economies have adjusted to sharply decreasing prices for their commodity exports, weakening their economies; many countries in the region are suffering a crisis of confidence in institutions after governments and private institutions of the major economies in the region are involved in corrupt deals and crony capitalism. As the prior literature review shows, the relationship between consumer confidence and economic activity in developed markets has been well documented. However, to the best of our knowledge, there are hardly any academic study that assess the empirical validity of this theoretical framework for consumers in Latin America. These relationships are precisely the focus of our study in this paper. More specifically, we investigate how measures of consumer confidence influence the outcomes of the real economy in Chile.

3. Hypothesis Development

Regarding the question of why consumer confidence should predict consumption growth, standard theories of consumer behavior attribute fluctuations in consumption expenditures to current and expected fluctuations in income, wealth, and interest rates, with no independent role for fluctuations in consumer confidence. However, using consumer confidence as a proxy for

consumers' expectations of future uncertainty and future income or wealth, where a higher value of consumer confidence indicates a lower level of uncertainty about future income, the Precautionary Saving Theory predicts that a higher value of consumer confidence (optimism) should be associated with less precautionary savings and higher consumption today compared with levels of consumption in the future. Hence, consumer confidence should be negatively correlated with future consumption growth. However, as shown in the previous section, the empirical evidence in the U.S. in support of this hypothesis has been inconclusive, and the precise role of confidence in influencing consumers' decisions has been difficult to identify. This article will provide evidence that the influence of consumer sentiment stands at odds with the theoretically predicted determinants of consumption expenditures in Chile. The following are the first two hypotheses in this study:

> ***Hypothesis 1****: High consumer confidence is positively related to future consumer spending.*
>
> ***Hypothesis 2****: High consumer sentiment (measured by the residuals of a regression of consumer confidence measures on macroeconomic variables) is positively related to future consumer spending.*

Additionally, financial and mathematical illiteracy are pervasive among Chilean consumers. Consequently, we should expect behavioral biases in the form of asymmetric reactions in consumer expenditures to changes (of similar magnitude) in consumer optimism and pessimism. In particular, we expect to find a systematic negativity bias, with consumers overreacting to pessimistic outlooks about the economy compared to optimistic outlooks. The following is the last hypothesis in this study:

Hypothesis 3*: Consumer confidence measures have a higher predictive power for positive changes in consumption expenditures than for negative changes in consumption.*

To empirically test these hypotheses, we use the following datasets, econometric methodology, and measures for consumer confidence and control variables.

4. Data

Our data set comes 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 GfK 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.

4.1 Consumer Confidence Proxies

The Economic Perception Index (IPEC) measures consumers' perceptions about current personal and nationwide economic conditions, future economic conditions and economic stability, and current willingness to purchase durable goods. Its methodology is based on the University of Michigan ICS. The IPEC was available on a yearly basis from 1981 to 1985, on a quarterly basis from 1986 to 2001, and on a monthly basis thereafter. The survey sample size is about 1,100 individuals surveyed by phone in 18 of the largest cities in Chile. The questionnaire includes questions about one's current personal economic situation, the current national economic situation, the 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-indices, calculating the net optimism fraction of answers.

The Consumer Perception Index (IPECO) measures the consumers' assessment of current and expected personal economic conditions, labor market conditions, and expectations of future income. The survey is based on the methodology used by both the University of Michigan ICS and the Conference Board Consumer Confidence Index. The index was available quarterly from December 2001 to March 2005, and monthly thereafter. Each month, the survey sample size is about 380 individuals randomly selected from different shopping centers located in two of the largest cities in Chile. 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 average of the five sub-indices for each variable, dividing the number of optimists by the sum of optimists and pessimists.

Figure 1 and Figure 2 illustrate the relationship between consumer expenditures and consumer sentiment. The figures depict high correlations between consumer expenditure and both measures of consumer confidence.

[Figure 1 near here]

[Figure 2 near here]

4.2 Control Variables: Economic Fundamentals

To answer the question of whether confidence measures serve mainly as proxies for some other fundamental variable that contributes to business cycle fluctuations, we rely on including as control variables determinants of household spending that are both suggested by economic theory and empirically observable. First, we control for consumer income using the Gross National Disposable Income (GNDI). We also control for household real and financial wealth

using the Housing Price Index (IPV) and the General Stock Market Price Index (IGPA), respectively. To control for income uncertainty, we use the National Unemployment Rate. Finally, we control for the cost of credit using the One-to-three-month Consumer Loans Interest Rate. In all the tests we use logarithms and first differences of variables. All variables are expressed in real terms. To match the monthly frequency of the consumer confidence measures we performed cubic interpolation on control variables available only on a quarterly basis.

The summary statistics of consumption and control variables are presented in Table 1, whereas Table 2 show the correlation matrix among these variables. It can be seen that consumption is strongly correlated with income (GNDI), and that the correlations with the confidence measures are low.

5. Empirical Results

5.1 Does Consumer Sentiment Accurately Forecast Household Spending?

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 values of confidence measures, and contemporaneous values of macroeconomics fundamentals. The following equation shows the baseline regression for this test:

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

where *Confidence* is the one-period-lagged IPECO or IPEC index ($l = 1$), *Income* is measured by GNDI, *IPV* is the housing price index, *IGPA* is the stock market price index, *Unemployment* is the national unemployment rate, and *IC* is the interest rate on short-term consumption loans. In all regressions we include up to six lags of consumption expenditures ($p = 6$). The number of lags was defined based on the information criteria AIC and BIC. All variables are expressed in logarithms so that coefficients can be interpreted as elasticities. Control variables are measured in real terms and first differences. Standard errors are estimated using the Newey-West robust estimator of the covariance matrix for inference.[1]

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

One problem with the previous results is that the lags of consumption 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 GMM estimator with lagged values of the predictors as instrumental variables to estimate the relationship between consumer confidence and consumption. Columns (5) to (7) of Table 3 show the estimates of the GMM estimator. Results in Table 3 indicate that the statistical significance of all variables improves when using the GMM as estimator.

[1] Our Newey-West estimator uses four lags on the basis of the formula: $4 * (T/100)\hat{}(2/9)$, recommended by Newey and West (1987).

Regarding the sign of the consumer confidence coefficients, they are all positive; that is, an increase in confidence is associated with a future increase in consumption growth. These findings are consistent with our Hypothesis 1, and inconsistent with Precautionary Savings models, where higher consumer confidence should be associated with lower uncertainty about the future, and a reduction in precautionary saving. Instead, we find that high consumer confidence is associated with a higher level of future consumption relative to current consumption, and therefore, higher consumption growth next month.

[Table 3 near here]

We also perform "out-of-sample" evaluations of the forecasting accuracy of the model. If we find improvements in forecasting accuracy when evaluating both in-sample and out-of-sample prediction errors, we assume that the improvement is reliable. However, if we find improvements only in the in-sample predictions, but not for the out-of-sample predictions, then we assume that the improvement is pure overfitting and not real forecasting improvement. To perform out-of-sample tests, we used OLS rolling regressions with different samples of 36 observations each. More specifically, we regressed iteratively, starting with the first 36 observations for estimation, and then we generated h-steps ahead forecasts, where $h = 1, 2, 3, 4, 5, 6$ (one to six months), 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 procedure allowed us to take into account 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' expectations of their future income.[2]

[2] In unreported results we confirmed this view of consumer confidence. In particular, we could not find any predictive power of confidence measures in long-run consumption expenditures.

Table 4 shows out-of-sample results, which 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 obtained 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 4 near here]

5.2 Fundamental and Sentiment Components of the Consumer Confidence Measures

The fact that consumer confidence has forecasting power for consumption growth provides evidence consistent with our Hypothesis 1. 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, which is similar to the one implemented by Lemmon and Portniaguina (2006), is as follows. First, we regress consumer confidence on a set of contemporaneous and lagged control 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 X matrix includes the control variables in Equation 1 plus some additional macroeconomic variables available, which we believe could also affect how consumers elaborate their perceptions about the economy. These additional variables are IMACEC, a monthly index of economic activity; two measures of inflation: the inflation of general prices, and the inflation of fuel prices; and the nominal exchange rate (CLP/USD). In all

these variables, we use natural logarithms and first differences when required to have stationary variables.

Estimated results for Equation (2) are presented in Table 5. Results show that the current and lagged interest rate, and the current and lagged fuel price inflation are statistically significant predictors for both confidence measures. Meanwhile, lagged unemployment and lagged inflation are significant predictors of IPEC. The regression has an adjusted-$R^2$of about 27 percent, indicating that only one-third of the variation in consumer confidence can be explained by economic fundamentals.

[Table 5 near here]

Next, we treat the residual from Equation (2) as our measure of excessive consumer sentiment (optimism or pessimism) unwarranted by fundamentals. Then, we examine the predictive power of this excessive consumer sentiment on future consumption. Table 6 shows regression results. Estimated coefficients for consumer sentiment are statistically significant only in equations estimated using the GMM estimator. The magnitude of the coefficients for consumer sentiment are half of the coefficient associated with consumer confidence. We also find predictive power of consumer sentiment as measured by the improvements in the goodness-of-fit and error measures, especially when we used IPEC as confidence index. All in all, we find evidence consistent with our Hypothesis 2 and we conclude that confidence measures are not only a proxy for other fundamental variables that contribute to business cycle fluctuations, but rather, that they have predictive power on their own.

[Table 6 near here]

5.3 The Asymmetric Predictive Power of Consumer Confidence

As an additional analysis, and to confirm the behavioral biases that give predictive power to consumer confidence measures, we examine whether consumer confidence has an asymmetric predictive power of household expenditures. We hypothesize a negativity bias in consumer sentiment resulting in consumer confidence models that make more accurate predictions for future positive, rather than negative, changes in consumption. 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 7 shows the results. Consumer confidence has a statistically significant relationship with both positive and negative consumption growth, however, the magnitude of the coefficients indicates that the relationship is most economically significant for positive consumption growth. Although we show that the forecasting accuracy is better for predicting negative consumption growth (as shown by the results for the R^2, RMSE and MSE decomposition), this outcome is the result of more statistically significant coefficients for the control macroeconomic variables. It is also worth noting that the coefficient for IPECO is negative for the negative consumption growth equation. This result might be explained by the differences in the set of instruments for each regression. It should also be noted that the samples for positive consumption growth equations are larger than the samples of the negative consumption growth equations, so comparisons might not be appropriate.

[Table 7 near here]

Finally, we performed two additional regressions including an interaction term for consumer confidence. Here we add two dummy variables, one for positive consumption growth and another for negative consumption growth. Then we interact them with our confidence measures. The results presented in Table 8 show that confidence measures actually have a

significant effect on consumption growth, and that the coefficients for the interaction terms with positive growth are larger than those for the interaction with negative growth. A one-tailed Wald test shows that the difference is significant at the one percent level, suggesting that consumer confidence is best suited to predict positive changes in consumption growth. These results are consistent with our Hypothesis 3 and suggest that consumers overreact to negative perceptions about economic prospects, decreasing their current consumption to a larger degree than the increase in consumption when they are optimistic about the economy.

[Table 8 near here]

6. Summary and Concluding Remarks

In this paper, we have shown how consumer confidence can be used to forecast consumer expenditures. As a proxy for consumer confidence, we use two survey-based measures of consumer confidence in Chile that measure consumers' assessment of current and expected personal economic conditions, labor market conditions, and expectations for future income.

The Theory of Precautionary Savings suggests 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. In the context of the Chilean economy, our results contradict the prior theoretical predictions regarding the effects of consumer sentiment on consumer expenditure. In particular, we find that consumer confidence measures are positively and significantly related to future household expenditures. Previous authors have used data from the U.S. as a proxy for consumer confidence; they find the evidence inconclusive for the role of consumer confidence in the real economy. However, we believe that Chile may represent a better context to test the role of consumer sentiment and other behavioral

biases because financial and mathematical illiteracy of the population is high compared to consumers in developed countries.

We conduct a set of robustness tests for our primary findings. For instance, to address the issue that consumer confidence reflects information already contained in economic fundamentals, such as unemployment rates and price inflation, we separate consumer confidence into two components: one rooted in fundamentals, and one reflecting consumer sentiment unrelated to fundamentals. After this robustness test, our results suggesting that confidence measures indeed contain relevant information for consumption forecasting still hold. Finally, and to confirm the behavioral biases among Chilean consumers that allow consumer confidence measures to have predictive power, we show that consumers in Chile have a negativity bias, meaning that consumer confidence measures forecast more accurately positive changes in consumer expenditure growth, rather than negative changes in expenditures.

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Table 1. **Summary statistics**

Consumption, GNDI, IGPA, IPV, Unemployment and Interest Rate are in dlogs (first difference of a variable in logs), 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 (first difference of a variable in logs), 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 $h = 1,2, \dots ,6$ 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 residual 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

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.

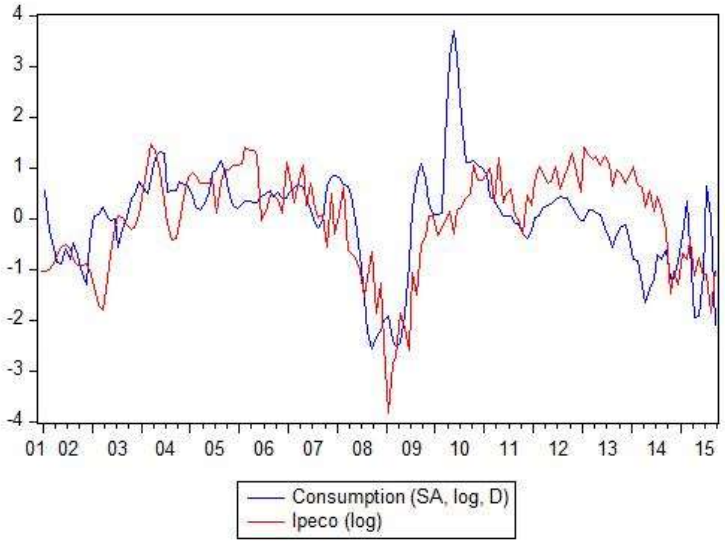

Figure 2. ***Total consumption growth and IPEC. Normalized data***

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