

Understanding the Consumer Confidence Index in Colombia: A structural FAVAR analysis*

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Abstract

The consumer confidence index (CCI) is very relevant for economic analysis due to its timely publication and forecasting capacities. Although there is extensive literature on the link between CCI and macroeconomic aggregates, in particular with households' consumption, few papers have studied the fundamental factors that explain the CCI behaviour. Actually, no attempt has been made for the Colombian case. In this paper we aim to fill this gap. We estimate a Structural Factor-Augmented VAR (SFAVAR) model and perform a historical decomposition (HD) on the CCI series to obtain the underlying structural innovations that drove the CCI dynamics over the past few years. Our findings suggest that the CCI responded to changes in the underlying determinants and to non-fundamental shocks possibly related to uncertainty periods and non-economic, socio-political or electoral events. Moreover, a counterfactual analysis shows that households' consumption forecasts improve when using the CCI series that are not affected by these non-fundamental shocks.

Keywords: Consumers' Confidence Index; Colombia; Structural; FAVAR; Historical Decomposition.

JEL: C32, C38, D12, E71.

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Análisis del Índice de Confianza del Consumidor en Colombia: Un FAVAR estructural*

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Las opiniones contenidas en el presente documento son responsabilidad exclusiva de los autores y no comprometen al Banco de la República ni a su Junta Directiva.

Resumen

El Índice de Confianza del Consumidor (ICC) es un instrumento relevante para el análisis económico, dada su oportuna publicación y sus capacidades de pronóstico. A pesar de que existe una gran cantidad de trabajos que estudian la relación entre el ICC y los agregados macroeconómicos, y en particular con el consumo privado, son pocos los estudios que han analizado los factores fundamentales que definen el comportamiento del ICC. De hecho, no hay ningún estudio al respecto para el caso colombiano. Con este documento tratamos de resolver este problema. Estimamos un modelo VAR estructural de factores (SFAVAR) y realizamos una descomposición histórica de choques del ICC para obtener los errores estructurales que determinaron la dinámica del ICC en años recientes. Nuestros resultados sugieren que el comportamiento observado del ICC obedeció tanto a cambios en sus determinantes como a choques no fundamentales relacionados, posiblemente, con eventos coyunturales de naturaleza no-económica, socio-política y/o electoral. Adicionalmente, un ejercicio contrafactual permite ver que el pronóstico del consumo privado mejora cuando se utiliza una serie del ICC que no está afectada por los choques no explicados por sus fundamentales.

Palabras Clave: Índice de Confianza del Consumidor; Colombia; Estructural; FAVAR; Descomposición Histórica.

JEL: C32, C38, D12, E71.

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1. Introduction

The consumer confidence index (CCI) has been widely used for economic analysis and forecasting, due to its higher frequency and more timely publishing times when compared with most hard economic data. As policy making requires a continuous assessment of the current real activity conditions and both short and mid-terms economic outlooks, these opinion surveys become relevant for and are constantly monitored by market analysts and policy makers. There is extensive literature on the link between CCI and macroeconomic variables dynamics, specially on its statistical properties and its predictive power when forecasting real private consumption. Most of it has focused on analyzing advanced economies cases (see, e.g. Carroll et al. (1994); Bram and Ludvigson (1998); Ludvigson (2004) or Dees and Soares Brinca (2003) for the U.S and Euro area cases). For the Colombian case, only Julio and Grajales (2011) have presented evidence that the CCI improves short-term private consumption forecasting.

In spite of these efforts, the study of the actual determinants of consumers' confidence has been partially neglected, as most papers overlook the importance of understanding the underlying causes of CCI dynamics. Part of this issue is that consumers' sentiment depends upon both economic and non-economic (or psychological) factors (Katona, 1975), and implies the existence of unobserved variables determining the consumers' preferences. Some attempts are those of Vuchelen (1995, 2004); Ramalho et al. (2011); Paradiso et al. (2014); Lahiri and Zhao (2016), which study the role of economic variables and socio-political events on CCI. However, these do not provide a comprehensive explanation and analysis of the fundamental factors driving CCI. Moreover, no attempt has been made to study the determinants of the CCI for the Colombian case. We aim to fill this gap by presenting a novel approach that explores how CCI responds to structural innovations. By *structural* we mean those shocks occurring to a group of non-observable factors that have been identified in the literature as the fundamental variables determining consumers' sentiment. The idea of using latent factors to explain the dynamics of a substantial amount of economic time series is not new. Indeed, Kilic and Cankaya (2016) use a FAVAR to study the effects of CCI on economic activity, but not the other way around. For the Colombian case, latent factor time series have been used to explore the relationship between financial, real and monetary variables (see, e.g. Cabrera-Rodríguez et al., 2014), but not for assessing the links between CCI and its determinants.

We perform a principal components analysis to a large dataset of economic variables comprising different theoretical categories, and propose a set of six factors as potential determinants of the CCI in Colombia. Afterwards, we estimate a factor-augmented structural VAR (SFAVAR) that allows for a historical decomposition (HD) of this index into its structural innovations. Our results suggest that over the past few years, the CCI responded to both changes in the underlying economic structural determinants and to short-lived, non-fundamental shocks, possibly related to uncertainty periods and non-economic, socio-political or electoral events. Moreover, a counterfactual analysis shows that private consumption forecast improve when using the CCI series that are not affected by these non-fundamental shocks.

The remainder of this paper is structured as follows: Section 2 describes how consumers' confidence is measured in Colombia and why it is important for policy making. Section 3 focuses on literature related to determinants of CCI. Section 4 presents the empirical strategy. Section 5 discusses the results. Finally, concluding remarks are in Section 6.

2. Consumer Confidence Indexes in Colombia: How is measured and its relationship to private consumption

The Consumer Confidence Index (CCI) for Colombia is computed since November 2001 by the Foundation for Higher Education and Development (*Fedesarrollo*, for its name in Spanish), recently ranked as the second most important think tank in Latin America¹. On a monthly basis, Fedesarrollo publishes a detailed report called the Consumer Opinion Survey (COS), which aims to identify peoples' perceptions and outlook about their current and future economic conditions. Randomized, telephone-based surveys are applied to a rotating panel of households. Household heads, or men and women over 18 years old when required, are asked to answer the questionnaire. They are interviewed and asked seventeen questions about diverse topics, ranging from their own family's economic perspectives, their self-reported perception on the country's current situation, and their willingness to buy durable goods or to invest in real state. The questionnaire (in Spanish) can be found in the Appendix section.

According to the methodological aspects described in Fedesarrollo (2017), the sample consists of eight hundred and fifty (850) individuals from five Colombian cities: Bogotá (300), Medellín (160), Cali (150), Barranquilla (120) and Bucaramanga (120). A two-stage sampling design allows for assessing consumers' opinions based on their socioeconomic status and their demographic characteristics. The results of December 2017 show that 48,0% of the surveyed individuals consider themselves to belong to a low income category (socioeconomic strata 1 and 2), 29,5% to the medium income category (stratum 3) and 22,5% to the high income category (strata 4 to 6). With respect to their demographic characteristics, COS is mostly applied to people that are 45 years old or older (55,9%), about 33,7% of the interviewed individuals are between 25 and 44 years old, and only 10,4% of the surveyed are between 18 and 24 years old. On average, gender is evenly distributed within the sample (51,9% men, 48,1% women). The non-response rate is about 50%, which means that every month about half of the sample in the rotating-panel is renewed.

Results from the seventeen questions in the COS are condensed into three indexes that summarize consumers' perceptions about their current economic situation and their perspectives about the future. The most important one is the Consumer Confidence Index (CCI), which is a (weighted) average between the Economic Conditions Index (ECI) and the Consumer Expectations Index (CEI), as displayed in Figure 1. These indexes, in turn, are the average of the balance² of first and eleventh items for the former, and the second, third and fifth for the latter.

¹According to the 2017 Global Go To Think Tank Index (GGTTI) Report prepared by the Think Tanks and Civil Societies Program at Lauder Institute, University of Pennsylvania. See McGann (2018) for a detailed explanation on the subject.

²As explained in the methodological document by Fedesarrollo (2017), the balance, is the percentage of positive valued responses less the negative valued responses. Its range goes from -100% to $+100\%$.

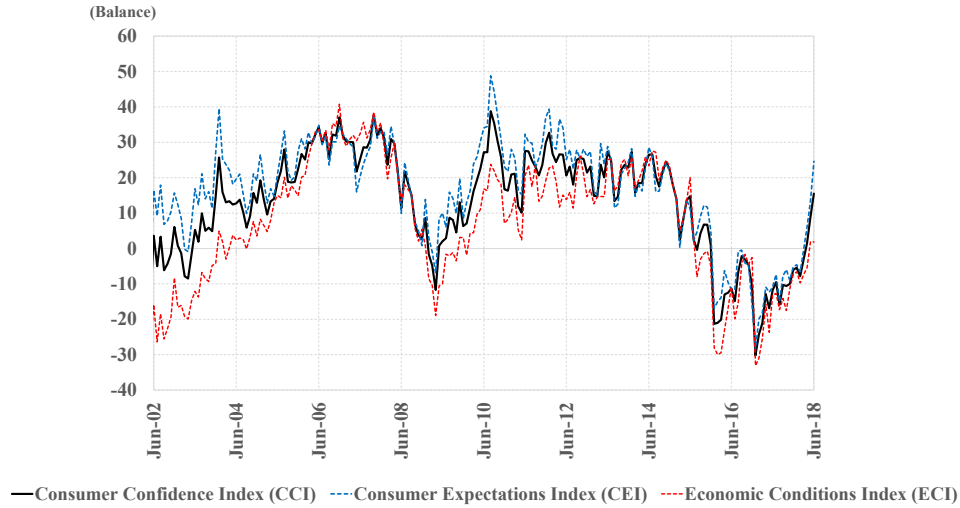


Figure 1: Consumer Confidence Index (CCI) and its components.
Source: Fedesarrollo.

Market analysts and policy markers monitor these indexes not only because they reveal the direction where the economy is heading, but also due to their high frequency and timely publication. In the first case, these indexes mirror the fluctuations of the business cycle. In fact, a statistical examination of structural breaks suggests that CCI behaves differently according to the stage of the Colombian business cycle. We performed a series of F-tests (Andrews, 1993; Andrews and Ploberger, 1994), OLS-based CUSUM tests (Ploberger and Krämer, 1992), and breakpoints tests (Bai and Perron, 1998, 2003), all of which rely on the cumulated sums of standard OLS residuals from the regression model specified by $CCI_t = \beta_0 + u_t$. In short, these tests check for changes in the estimated parameter $\hat{\beta}_0$ throughout the sample. We performed these tests using the `strucchange` package in R (R Core Team, 2017). See Zeileis et al. (2002) and Zeileis et al. (2003) for a detailed explanation and implementation of these tests. Our results are robust across tests and specifications. For the structural change tests results, see the Appendix B.

The breakpoints test results suggest that the CCI sample displays four breakpoints: June 2005, April 2008, July 2010 and June 2015, as depicted by the vertical lines in Figure 2. The horizontal lines correspond to the CCI average computed for each period. For informative purposes, shaded areas correspond to the contraction phases of the Colombian business cycle up to 2011 reported in Alfonso et al. (2013).

The first period, from November 2001 to June 2005, was characterized by being a slow but continuous recovery phase after the late 1990s profound crisis in the Colombian economy. During that period, commodity prices rose steadily, which, in turn, fostered the terms of trade growth and a recovering of the national income dynamics. The high levels of terms of trade also triggered a nominal exchange rate appreciation, all of which had second-round positive effects on the current account deficit and on both private and public incomes. Simultaneously, the CCI showed an upward trend from low initial levels until mid 2005. Starting at -17,7% and ending at 18,7%, the average for the CCI during this period was 10,0%. During the second period, from July 2005 to April 2008, the CCI remained stable around high levels, averaging at 28,6%.

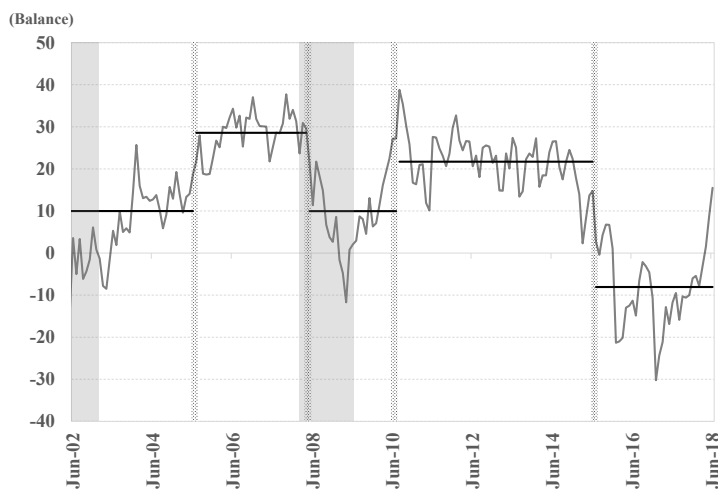


Figure 2: Estimated structural breaks for the CCI.

Source: Fedesarrollo, authors' own estimations.

The third period began with a sharp decline in the CCI from May 2008 to a local minimum on April 2009 (-11,7%), followed by a recovery phase up to July 2010, when the CCI reached levels similar to those registered before its drop. This episode can be framed within the financial crisis period. During that period, commodity prices plunged and a uncertainty ruled the financial markets, which, in turn, impacted the access to external credits and raised Colombian international risk indexes. Albeit its deep consequences on the economy, this downturn was rapidly overcome. A fourth period is identified between August 2010 and June 2015, when the CCI remained fairly stable at slightly lower levels that those recorded during the pre-crisis period. The average for the CCI was 21,7%. The fifth one, from July 2015 to June 2018, is framed within a period characterized by a sharp decrease of oil prices and a new increase in Colombian international risk measures, which, in turn, had consequences on national income, public revenues, and ultimately, drove a major change in the domestic taxation scheme which caused a temporary increase in the consumer price index (CPI) and restrained private consumption³. The CCI reached an all time minimum on January 2017 (-30,2%), but since then it has displayed an upward trend that suggests an improvement in consumers' perceptions about the economic conditions.

A second important feature of the CCI is its timely publishing. Fedesarrollo reports CCI results about two or three weeks after the end of the period (i.e. month) of interest, around the 15th or 20th day of the following month, while the Colombian national statistical office (DANE) takes about 45 days after the end of the quarter to publish GDP figures. Said that, an index that i) gives hints about the current state of the economy, and that ii) is published with a lag of only 15 to 20 days, is tremendously advantageous for economic authorities as it provides tools that help in their decision making process, given that the latter involves the assessment of current (and future) economic conditions.

In fact, several research papers have studied the relationship between CCI and macroeconomic

³Indeed, Granger et al. (2018) show that over the past five decades tax reforms in Colombia have been, on average, procyclical. In particular, the reform approved by Law number 1819 of 2016 allowed for an increase in both direct and indirect taxes that affected households' disposable income and its purchasing power.

aggregates, in particular GDP and consumption growth (see, e.g. Carroll et al., 1994; Matsusaka and Sbordone, 1995; Bram and Ludvigson, 1998; Ludvigson, 2004 for applications using U.S data). For the Colombian case, Julio and Grajales (2011) show a contemporaneous relationship between CCI (quarterly average) and households' consumption yearly growth rate, and also report how confidence indexes explain a large share of private consumption's conditional variance. Their findings on cross-correlation and spectral density exercises suggest that these contemporaneous relationships are caused by common, structural economic trends, and not by purely noisy shocks to the economy. Indeed, the contemporaneous correlation coefficient between these indexes and real private consumption growth was 83,9% for the CCI, 81,3% for the ECI and 79,8% for the CEI, as of the second quarter of 2018 (Figure 3).

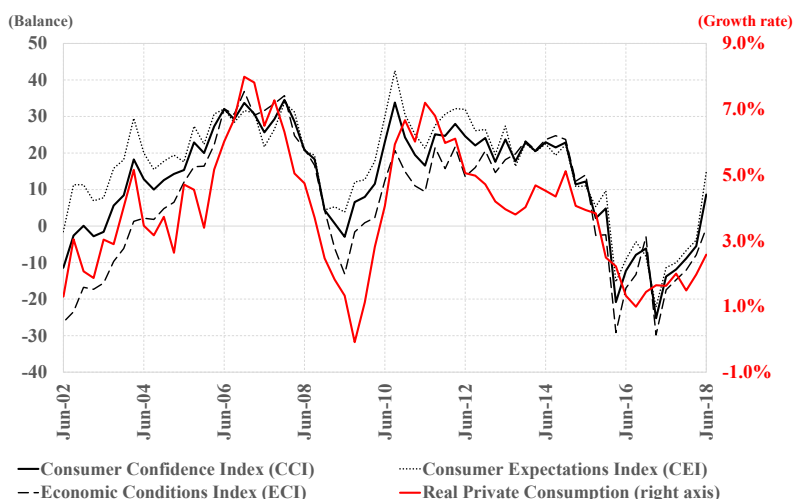


Figure 3: Confidence Indexes and Real Private Consumption growth rate.
 Source: Fedesarrollo, DANE, author's computations.

Recall, however, that most of the literature on confidence indexes is focused on how CCI dynamics are correlated with changes in national account variables, more specifically GDP and private consumption growth. To the best knowledge of the authors, only a handful of articles explain the main drivers behind CCI movements. Understanding the determinants of CCI is important because changes in this index might result from either actual perturbations to consumers' behaviors and preferences, or from short-term, non-fundamental, temporal shocks that do not affect demand trends and signal nothing but noise to policy makers. If economic authorities (particularly the Central Bank) were to react to these irrelevant, short-term CCI movements, the subsequent implementation of an inefficient, sub-optimal policy design would yield an increase (rather than a decrease) of macroeconomic instability and would yield an aggregate welfare loss (Aoki, 2003; Orphanides, 2003). Also, abrupt movements of CCI derived from noisy shocks can misguide authorities and give misleading signals about where the economy is heading. In fact, it has been shown that confidence indexes can be volatile and that sometimes are temporarily affected by political news or confidence shocks which are not necessarily related to the business cycle (Throop, 1992; De Boef and Kellstedt, 2004). To date, the determinants of CCI in Colombia have not been studied. This paper aims to fill this gap and provides an insight on the consumers' confidence behavior by presenting a structural decomposition of the CCI into its non-observable, theoretical determinants. Following the international literature on CCI determinants, as presented in Section 3, these shocks are identified using a Structural Factor Augmented VAR (SFAVAR) (Section 4).

3. Literature Review: The main drivers behind the CCI

Most of the literature explaining consumers' sentiment has been concerned about how CCI responds to short-term, exogenous, unexpected shocks (usually related to socio-political or electoral events) that influence both the individual perception of the household's current situation and economic outlook, with actual implications on consumption. For example, Throop (1992) showed that although consumer sentiment responds to changes in the current state of the economy, at times of a major economic or political event (such as the Persian Gulf War), this index can move independently and influence households' spending on durable goods. Blood and Phillips (1995) also reports evidence for a causal effect of headline economic news upon consumer sentiment in the U.S. De Boef and Kellstedt (2004) estimated error-correction models to study the dynamic relationship between both economic and political variables and CCI. They show that consumers' confidence maintains a long-run equilibrium relationship with economic forces that can be temporarily disturbed by political events (such as wars, elections, presidential approval and ruling political party). Their conclusion is clear: after controlling for economic conditions, news coverage of the economy affects how consumers view the Government's ability to manage the economy, which in turn has both short-run and lasting impacts on CCI dynamics. For the dutch case, Alsem et al. (2008) also show that the opinion of readers with respect to the state of the economy can be influenced not only by economic fundamentals but also by the way in which these are reported by the media. Using VAR models and impulse-response analyses, the authors report a significant but short-lived effect of a news-related variable on consumer confidence.

On the other hand, Garner (2002) studied the effect of geopolitical events (such as the 9/11 terrorist attacks and the Persian Gulf War) on both the Conference Board and Michigan indexes of consumer confidence in United States. Interestingly, his results show that these indexes were resilient and recovered shortly after the occurrence of most of those events. Thus, the declines of CCI were related mostly to weaker macroeconomic conditions.

However, despite the CCI movements caused by changes in the fundamental macroeconomic variables have also been studied, some papers have identified and disentangled the complex nature of its underlying determinants. Our hypothesis is that, in addition to those unexpected, non-fundamental shocks, the determinants of the consumer confidence indexes can be approached by clustering several economic variables into a series of groups that share some commonalities. In fact, some studies have identified a positive and significant short-term relationship between the business cycle and consumers' sentiment. Souleles (2004) tests whether consumers' behave according to the rational expectations hypothesis and finds that although consumers generally underestimate and misinterpret the stance of the business cycle, their sentiment scores still reflect to a great extent a direct influence of the economic conditions and help to further forecast nondurable goods and total consumption. More recently and for the Portuguese case, Ramalho et al. (2011) obtained statistical evidence to claim a short-run relationship between CCI and several real sector economic series, once they control for national political, electoral and specific events coming from the country becoming an EU member state. In summary, these studies find that macroeconomic variables related to the business cycle and the real sector explain to some extent the confidence index dynamics.

In addition to the latter, some studies have investigated the relationship between CCI and the labor market characteristics. Adams and Green (1965) showed how respondents' attitudes are highly correlated with some measures of employment conditions, such as hirings and firings, and the length of the average work week in the manufacturing industry. These factors carry an

immediate impact of changes in the business cycle to the consumers. Mueller (1966) also reported close relationship between the labor market conditions and consumers' confidence. Using survey U.S micro data, and after controlling for demographic characteristics and family's income level, the author shows a negative and significant effect of unemployment on consumer sentiment. Moreover, she found that other variables regarding the personal financial and employment situations, such as income change and the head's unemployment experience, greatly influence the formation of expectations about business conditions and current state of the economy.

Other authors have assessed the role of other possible determinants of the consumer sentiment. For instance, Ward Otoo (1999) used micro-data from the Michigan Survey to study the relationship between changes in consumer sentiment and stock prices. She found that an increase in equity values has a positive effect on sentiment, since people use movements in stock prices as a leading indicator of economic activity rather than a measure of future wealth growth. Özerkek and Çelik (2010) studied the mediating role of CCI in the relationship between Government spending and private consumption. The authors find a long-run equilibrium relationship between these three variables and argue that their empirical results provide evidence in favor of 'Ricardian'-type consumers that internalize increments in Government spending (GS) into their consumption decisions. Indeed, for a panel of emerging countries, they report a 1,0% increase in GS results in a 0,31% decline in CCI.

Similar to ours, a paper that studies the role of the main determinants of CCI is that of Lahiri and Zhao (2016). The authors used data from the University of Michigan's Surveys of Consumers and find that, at the aggregate level, macroeconomic conditions satisfactorily explain consumers' sentiment. However, at the household level, individual interpretations and perceptions about the country's, the economy as a whole, and their employment and financial conditions play a complementary, important role. Among the determinants, the authors identify that expected financial conditions of the country, expected changes in the household's real income, expected level of unemployment, expected inflation and perceptions about the performance of Government economic policies, have considerable marginal effect on the household-level sentiment. They also report asymmetric effects of economic news in sentiment scores, as consumers seem to be more sensitive to negative than to positive economic events.

4. Empirical Strategy

4.1 Data and Factors

Following the economic literature presented in the previous section, we arrange a total of 65 variables into six different groups, each one associated to a wide definition of a determinant of households' sentiment. The first group consists of variables related to the international context relevant for the Colombian economy. In this group we classify series of international prices of commodities exported by Colombia, terms of trade, economic performance of Colombian trading partners, exchange rates, risk indexes, and international sentiment indexes. Accordingly, we label this group as the 'External conditions' determinants. The second set of variables are those related to the local context, and is named by 'Domestic conditions'. This group contains data on economic activity, retail, manufacturing, Colombian exports, and government spending. A third group is defined by aggregating variables that reflect the conditions of the labor market. We group different unemployment and underemployment rates (including those computed for the household heads), employment quality

measures, participation rates, unemployment duration, and remittances, salaries and income measures. We label this group as the ‘Labor market and household’s income conditions’ determinants.

The fourth group, named ‘Financial conditions’ after the series in it, resumes the information carried by those variables associated to the financial market settings that impact both households’ credit supply and demand. These include several interest rates, mortgage and loan disbursals, default and portfolio risk indexes. Another group is made up of variables regarding direct and indirect taxes paid by the households. We consider rents and VAT collections. This group goes by the name of ‘Taxation conditions’. Lastly, the sixth group is related to the ‘Cost of living conditions’. It covers the consumers’ price index, inflation expectations and the producer’s price index for consumer goods.

Our sample consists of monthly data from March 2003 to June 2018. Table A3 in the Appendix section describes the data used in this paper. The series were seasonally and calendar adjusted following the X-13-ARIMA-SEATS procedure developed by the United States Census Bureau (U.S. Census Bureau, Time Series Research Staff, 2017) and the functions in the `seasonal` package in R (Sax, 2017). Moreover, we chose the series’ three-month moving average due to the persistent nature of consumers’ assessment of recent events.

To summarize the relevant information implicit in the selected series, we perform a principal component (PC) analysis for each group. We select a single factor for every group as the eigenvalue associated to the first component suggests that these factors summarize a high amount of the variance (in every case more than 40,0%) of the series in every group. Following Schmitt-Grohé and Uribe (2016), all variables (factors and CCI) were quadratically detrended, as displayed in Figure 4. We test for the presence of unit root. The null hypothesis of unit root is rejected for every series using an augmented Dickey-Fuller test (Dickey and Fuller, 1979, 1981). The unit-root test results are presented in Appendix B.

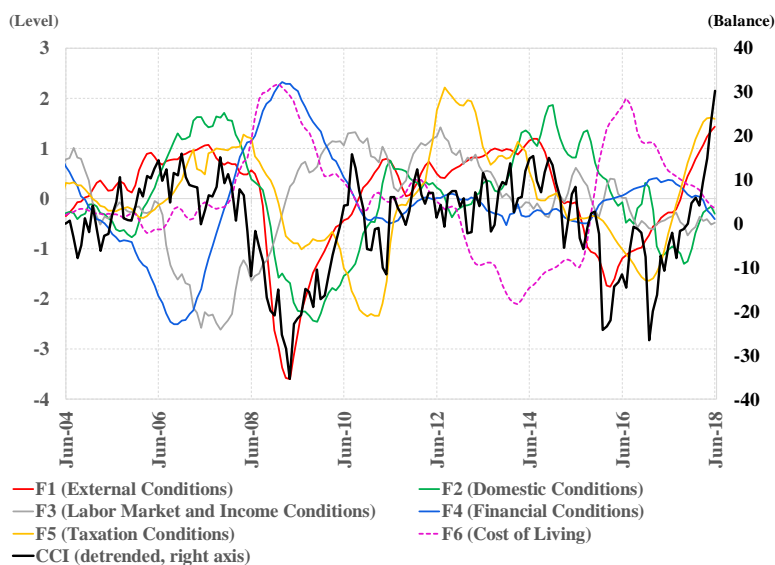


Figure 4: Consumer Confidence Index and its Determinants (Factors).
Source: Author’s computations. For exposition purposes, factors displayed are standardized.

In addition to the latter, we assume that CCI movements that are not explained by these factors

can be attributed to non-fundamental shocks, which, in turn, should be understood as the result of political and/or public order events, news, among other reasons. To study the relationship between these fundamental factors and CCI dynamics, we estimate a structural Factor Augmented vector autoregressive model (SFAVAR), whose technical details are explained in the next subsection.

4.2 Structural Factor-Augmented VAR

We aim to identify the main drivers of the dynamics of CCI for Colombia. To do so, our empirical strategy is to estimate a Structural Factor-Augmented VAR (SFAVAR), closely related to the work of Belviso and Milani (2006), that allows for an economic interpretation of the (linear) relationship between the underlying latent determinants and the CCI. We follow the two-stage estimation approach in Bernanke et al. (2005) by first obtaining a set of principal components from a large data-set of economic time series classified into different sub-groups (as explained in the previous subsection), and then by estimating the FAVAR model. Our approach is different from the Bayesian alternative proposed in Belviso and Milani (2006), as it is computationally simpler and does not impose a parametric structure to the factors. We acknowledge that a flaw of the PC analysis is that it ignores the dynamic nature of the factors. However, the literature has shown that in most cases the empirical results are robust to either approach.

Following the standard notation in the VAR literature (see, e.g. Lütkepohl, 2005), let \mathbf{Y}_t be a vector of K observable variables, $\mathbf{Y}_t = (Y_{1t}, \dots, Y_{Kt})'$. Individual components of \mathbf{Y}_t are required to be $I(0)$ beforehand. Also, for simplicity, assume no deterministic components. Moreover, let \mathbf{A}_p be a matrix of $K \times K$ coefficients, for $i = 1, \dots, P$. The reduced form representation of a linear VAR is

$$\mathbf{Y}_t = \Phi(L)\mathbf{Y}_{t-1} + \mathbf{e}_t \equiv \sum_{p=1}^P \mathbf{A}_p \mathbf{Y}_{t-p} + \mathbf{e}_t \quad (1)$$

where $\Phi(L)$ is a conformable lag polynomial of finite order P , \mathbf{e}_t is a $K \times 1$ vector of residuals, such that $\mathbf{e}_t \sim \mathcal{N}(\mathbf{0}, \Sigma_e)$. Now, as in Bernanke et al. (2005), we aim to enrich the analysis allowed by equation (1) with additional economic information, not fully captured by \mathbf{Y}_t , that may be relevant to correctly modeling the dynamics of the series. This additional information is assumed to be summarized by a $M \times 1$ vector of latent factors \mathcal{F}_t , $M \ll K$, related to concepts, such as ‘economic activity’ or ‘cost of living conditions’, that are understood to be the drivers behind a handful of observable series and that cannot be fully represented them. Therefore, the linear VAR in equation (1) becomes a Factor-Augmented VAR (FAVAR) as

$$\begin{bmatrix} \mathbf{Y}_t \\ \mathcal{F}_t \end{bmatrix} \equiv \mathbf{Z}_t = \Psi(L)\mathbf{Z}_{t-1} + \mathbf{u}_t \equiv \sum_{p=1}^P \mathbf{B}_p \mathbf{Z}_{t-p} + \mathbf{u}_t \quad (2)$$

where $\Psi(L)$ is again a conformable lag polynomial of finite order P , \mathbf{B}_p a matrix of $(K + M)^2$ coefficients, and \mathbf{u}_t an error term such that $\mathbf{u}_t \sim \mathcal{N}(\mathbf{0}, \Sigma_u)$. It is straightforward to see that the FAVAR in equation (2) is a linear VAR in \mathbf{Z}_t , and therefore, the usual estimation, forecasting and structural analysis procedures apply. However, equation (2) cannot be estimated directly through OLS because \mathcal{F}_t is not observed. As already stated, we proceed as in Bernanke et al. (2005), follow a two-step principal components approach, ‘plug-in’ the factors obtained in the previous subsection and estimate the FAVAR using standard methods.

Equation (2) is a *reduced form* FAVAR representation of the *structural* model, in which contemporaneous (instantaneous) relationships between endogenous (observed and latent) variables may be of interest. Following Amisano and Giannini (1997) and Lütkepohl (2005), let the underlying structural FAVAR (SFAVAR) in equation (2) be expressed as

$$\mathbb{A}\mathbf{Z}_t = \mathbb{A}\Psi(L)\mathbf{Z}_{t-1} + \boldsymbol{\epsilon}_t \equiv \sum_{p=1}^P \mathbf{B}_p^* \mathbf{Z}_{t-p} + \boldsymbol{\epsilon}_t \quad (3)$$

where $\boldsymbol{\epsilon}_t$ is a vector of $K + M$ structural errors, such that $\boldsymbol{\epsilon}_t = \mathbb{A}\mathbf{u}_t$, and $\mathbf{B}_p^* = \mathbb{A}\mathbf{B}_p$ for each $i = 1, \dots, P$. The Structural FAVAR (SFAVAR) in (3) is of interest because, given a set of identifying restrictions, the model allows for assessing the dynamic relationships between the variables in \mathbf{Z}_t (particularly in \mathbf{Y}_t) and the structural errors in $\boldsymbol{\epsilon}_t$. We impose a recursive ordering in \mathbf{Z}_t and proceed with a Cholesky decomposition of the empirical covariance matrix for the model's residuals \mathbf{u}_t . Said that, and by assuming $\boldsymbol{\epsilon}_t \sim \mathbb{N}(\mathbf{0}, \boldsymbol{\Sigma}_\epsilon)$ with $\boldsymbol{\Sigma}_\epsilon = \mathbb{I}_{K+M}$, the Cholesky decomposition renders \mathbb{A}^{-1} to be an inferior triangular matrix with $\text{diag}(\mathbb{A}^{-1}) = \mathbf{1}$, and $\boldsymbol{\Sigma}_u = \mathbb{A}^{-1}(\mathbb{A}^{-1})'$.

The recursive structure we impose in the SFAVAR implies two types of assumptions: First, that the structural shocks are assumed to be uncorrelated, i.e. the covariance matrix $\boldsymbol{\Sigma}_\epsilon = \mathbb{I}_{K+M}$ is diagonal, and therefore, the underlying economic interpretation is that the structural shocks do not have a common cause. Second, that restrictions on the contemporaneous relationships between variables are imposed by setting the elements above the diagonal of \mathbb{A}^{-1} to be equal to zero, i.e. $a_{ij} = 0$, $i < j$, $\forall a_{ij} \in \mathbb{A}^{-1}$.

Following economic theory, we order the variables in vector \mathbf{Z}_t from the most exogenous to the least exogenous. That is, $\mathbf{Z}_t' = [\mathcal{F}_{1t}, \mathcal{F}_{2t}, \mathcal{F}_{3t}, \mathcal{F}_{4t}, \mathcal{F}_{5t}, \mathcal{F}_{6t}, \text{CCI}_t]'$, where \mathcal{F}_{1t} is the external conditions factor, \mathcal{F}_{2t} is the domestic conditions factor, \mathcal{F}_{3t} the labor market and household's income conditions, \mathcal{F}_{4t} the financial conditions factor, \mathcal{F}_{5t} taxation conditions, and \mathcal{F}_{6t} the cost of living conditions. This ordering entails CCI responding to the structural shocks of all the above latent factors. The main results for this specification of the SFAVAR are presented in Appendix B.3.

4.3 Historical Decomposition

By the Wold decomposition theorem, the SFAVAR in equation (3) can be expressed in the structural (Factor-Augmented) Vector Moving Average representation (SFAVMA) as

$$\begin{aligned} \mathbb{A}\mathbf{Z}_t &= \mathbb{A}\Psi(L)\mathbf{Z}_{t-1} + \boldsymbol{\epsilon}_t \\ \Psi'(L)\mathbf{Z}_t &= \boldsymbol{\epsilon}_t \\ \mathbf{Z}_t &= \Psi'(L)^{-1}\boldsymbol{\epsilon}_t \\ &= (\mathbb{A} - \mathbf{B}_1^*L - \mathbf{B}_2^*L^2 - \dots - \mathbf{B}_P^*L^P)^{-1}\boldsymbol{\epsilon}_t \\ &= \sum_{j=1}^{\infty} \Psi_j' \boldsymbol{\epsilon}_{t-j} \end{aligned} \quad (4)$$

where $\Psi_j' = \theta_j \mathbb{A}$, with the coefficient matrices θ_j obtained recursively as $\theta_j = \sum_{i=1}^j \theta_{i-j} \mathbf{B}_i^*$ by setting $\theta_0 = \mathbb{I}_{K+M}$ and $\mathbf{B}_i^* = \mathbf{0}$ for $i > P$. See Amisano and Giannini (1997), Lütkepohl (2005),

Chapter 2) or Lütkepohl (2013) for further details on the derivation of a VMA representation of a linear (structural) VAR model.

Given the SFAVMA in equation (4), we are not only interested in the contributions of the structural shocks to the forecasts of the series (as in an Impulse Response analysis), but also in the contribution of these structural shocks to the observed (historical) series, as proposed by Burbidge and Harrison (1985). From equation (4), it is clear that for any $i = 1, 2, \dots$, we can write \mathbf{Z}_t as

$$\mathbf{Z}_t = \sum_{j=0}^{i-1} \Psi'_j \epsilon_{t-j} + \sum_{j=i}^{\infty} \Psi'_j \epsilon_{t-j} \quad (5)$$

The first sum in the right hand side of equation (5) is the historical contributions of the structural innovations ϵ_t since time t . The second sum is the base projection of the series based on the information available up to t , that is, the information about \mathbf{Z}_t provided by $\mathbf{Z}_0, \dots, \mathbf{Z}_{t-P+1}$. The historical decomposition can start at $t = 0$, but for a t close to t_0 , the initial values may have a substantial impact, even for stationary processes. As suggested by Lütkepohl (2013), one may only consider the historical decomposition for some periods away from t_0 .

5. Results

5.1 Historical Decomposition Results

Results on the historical decomposition (HD) are coherent with the dynamics displayed by the Colombian business cycle over the past decade. These results allow for the identification of economic and political episodes that had been of interest to the policy makers. The latter, in many cases, determined monetary and fiscal policies decisions that had a direct impact on the Colombian economy. We discard some observations after the starting date, and focus on the periods defined by the turning points identified in Section 2, i.e. those in between April 2008, July 2010 and June 2015.

With respect to the first period (April 2008 to June 2010), it is clear how CCI displayed a downward trend during the 2008 financial crisis. Authorities claimed that the contagion channel to the real sector was through an ‘international confidence shock’ that affected both (Colombian) consumers and firms spending and investing decisions. Indeed, the poor *international conditions* started to contribute negatively to the CCI decline at the beginning of 2009. The overall deterioration of the sentiment indexes in the U.S, the Euro zone, and most of latin american countries explained to a great extent the latter as the crisis deepened into 2009. Moreover, CDS indexes reached high levels during the first half of 2009. Déés (2017) provides empirical evidence on the existence of a confidence channel in the international transmission of shocks. In particular, the latter would allow for an international confidence shocks propagation to the domestic business cycle. Indeed, the *domestic* and *financial conditions* also contributed negatively throughout 2008 and 2010. The *non-fundamental* shocks also impacted the CCI in a negative way during the crisis period, but in a moderate fashion. Between 2008 and 2009 the *cost of living* contributed negatively, as the CPI inflation reached about 8% in the last quarter of 2008.

Shortly after the financial crisis, it were the *non-fundamental* shocks that contributed the most to the rise in CCI. This index peaked in August 2010, right after the start of the second episode

of analysis (July 2010 to May 2015). The five year period that followed the financial crisis was characterized by the consolidation of the CCI at greater and relatively more stable levels. The main driver behind these dynamics were the positive *labor market and household income conditions*. Indeed, following a series of reforms in 2012⁴, the Colombian labor market went through a process of laborforce formalization (Morales and Medina, 2017). At the same time the *internal conditions* factor contributed positively, specially between 2013 and mid 2014. On average, the contribution from the *cost of living* factor was positive throughout the 2010 and 2015. Actually, the CPI inflation remained stable around 3,0%, which happens to be long term inflation target set by the monetary authority. During the same time span, the contributions of *the taxation component* were negative at the begining, but positive afterwards (from late 2012 until the end of the period). This could have been related to the series of tax reforms between 2010 and 2013, the first focusing on the elimination of tax deductions (Laws number 1370 of 2009 and number 1430 of 2010, see Granger et al., 2018), and the second on the reduction of labor taxes and contributions (Law number 1607 of 2012, Granger et al., 2018).

**Historical Decomposition of the Consumer Confidence Index
(quadratically detrended)**

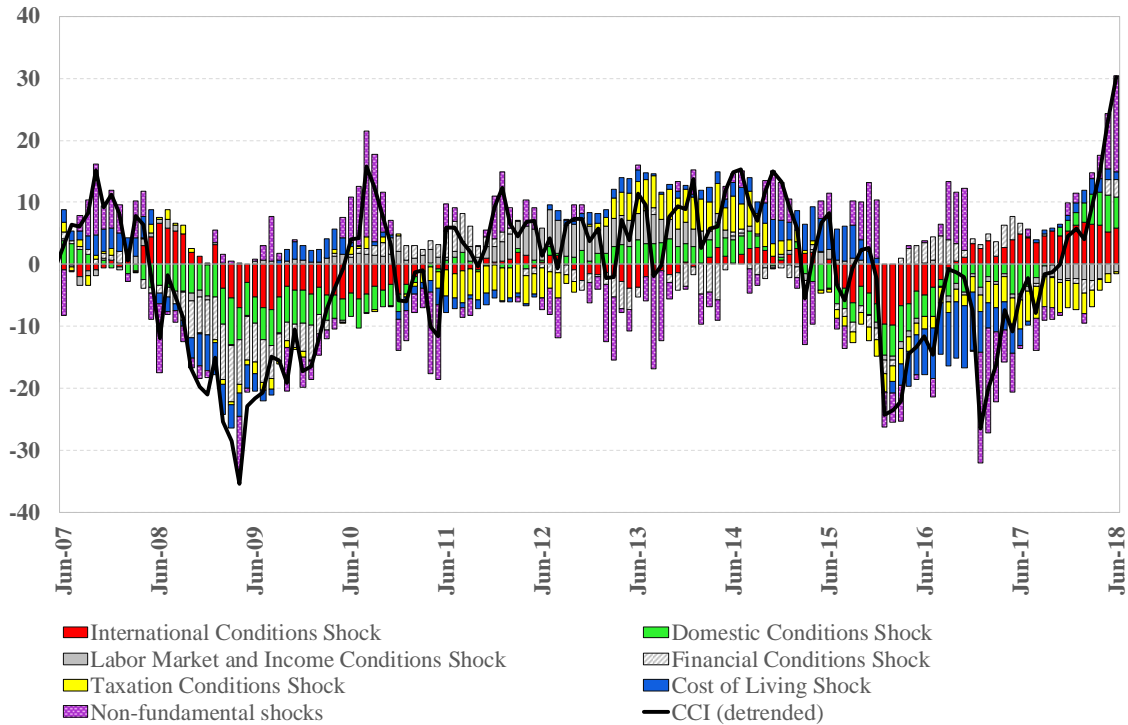


Figure 5: Historical Decomposition of CCI (quadratically detrended).
Source: Authors' computations.

The third period of analysis starts in June 2015. From the HD, it is clear how between mid 2015 and 2016 the CCI was negatively affected by the downturn of the *external conditions* factor caused by the 2014 drop of international oil prices and the subsequent worsening of the Colombian terms of trade and external income sources. Moreover, our trading partners slowed down their growth,

⁴Law number 1607 of 2012. See Morales and Medina (2017) for an assessment of this reform on the Colombian labor market and its effects on formal employment.

yielding a lower external demand for Colombian non traditional exports. At the same time, due to the imbalances transmitted by this shock to the Colombian economy, the *internal conditions* also worsened throughout that period. Indeed, the economy experienced not only lower observed and potential GDP growth rates, but also other several negative effects on the macroeconomic equilibrium conditions (Cárdenas-Hurtado et al., 2018). Likewise, the mediocre dynamics of other series, such as the retail sales and industrial production, also portrayed the economic slowdown. Furthermore, and in most part due to the permanent low international prices, oil production dropped from about one million barrels per day (bpd) and stagnated around 860 thousands bpd. The lagged and cumulative response of the *internal conditions* implied a negative contribution of this factor to the CCI dynamics that lasted until the third quarter of 2017, almost a year after the negative effect of the *external conditions* shock dissipated.

In addition to the latter, the HD reflects the second-round negative effects that ‘El Niño’ phenomenon, the accumulated exchange rate depreciation, and other supply shocks (such as strikes on the transportation sector) had on the *cost of living conditions* and, consequently, on the households’ confidence. Total CPI inflation reached a decade-high of almost 9,0% in July 2016, and stayed above 4,0% until mid 2017. Also, two sharp drops of CCI in January of both 2016 and 2017 were largely explained by short-term *non-fundamental* shocks that lasted at most half a year. These declines could have been associated to the announcement (late 2015) and later implementation (early 2017) of a tax reform that impacted the purchasing power of households’ real income through an increase of the VAT and the income tax rates (Law number 1819 of 2016). Indeed, in 2017 the HD shows an increased negative contribution by the *taxation conditions*. These effects lasted until the end of the first quarter of 2018, when the base effect of the VAT increase in February 2017 dissipated almost entirely.

During the first half of 2018, the CCI displayed an upward trend that was noticed by the economic authorities⁵. Notwithstanding, the HD results suggest that this improvement is highly influenced by a positive non-fundamental shock that complements a somewhat better, yet slightly moderate, performance of its underlying determinants. The latter means that the recent CCI figures should be further analyzed with care. For 2018, the *external and internal factors* have contributed positively to the CCI dynamics. Indeed, this is closely related to the increase of the international oil prices and the better GDP growth figures from our most important trading partners. Moreover, the Colombian economy is gradually overcoming the negative effects of the 2014 terms of trade and its aftermath. After a four-year period of imbalances, the most relevant macroeconomic variables are settling in back to their equilibrium levels. Indeed, the CPI inflation is converging to the long term 3,0% target determined by the monetary authority, whilst the 2017 tax reform is allowing the government to slowly adjust their fiscal balance back to a sustainable level. Also, the Balance of Payments (BoP) deficit has stabilized over the past few quarters, which reflects the fact that domestic demand had to adjust to a permanently lower (external) income level.

5.2 Counterfactual Analysis

A byproduct of the HD is the computation of ‘counterfactual’ scenarios in which we isolate the effect of selected structural shocks. In our case, we construct a counterfactual CCI series in which

⁵See, e.g. the Official Press Releases and the Monetary Policy Reports by Banco de la República’s Board of Directors issued in June and July 2018. Retrieved from <http://www.banrep.gov.co/en/minutes>.

the effects of non-fundamental confidence shocks are eliminated. The resulting series, which we call *fundamental CCI* (CCI_f), can be understood as one for which consumers' confidence dynamics were solely determined by changes in the underlying economic drivers, as displayed in Figure 6.

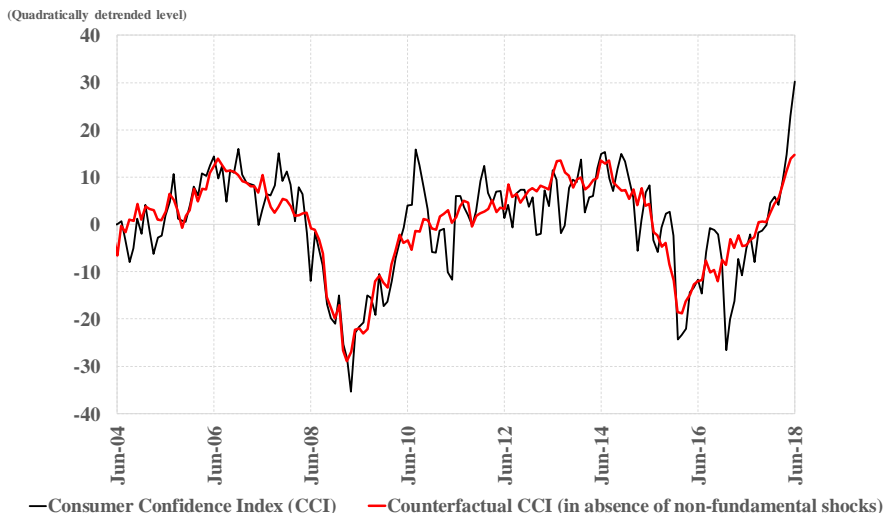


Figure 6: Consumer Confidence Index and its Counterfactual.
Source: Author's computations.

This counterfactual series is of our interest as we can determine if the fundamental CCI better predicts households' consumption growth than the original CCI series. If so, we could argue that CCI carries non-economic information that can misguide policy decisions. To do so, we study the contemporaneous relationship between the fundamental CCI and households' total consumption and its main components: non-durable, semi-durable, durable goods and services consumption. Through simple linear regression models, we regress the consumption breakdown on CCI and CCI_f , separately. Table 1 presents the regressions results.

The estimated coefficients of the regression models using CCI and CCI_f as explanatory variables are statistically significant in all cases (standard deviations in parenthesis). For the total consumption model, the R^2 index increases slightly when using the counterfactual CCI as the independent variable. However, for the non-durable goods and services models (the most important components of total consumption⁶), the explanatory power increases significantly for the counterfactual model. This is particularly true for the former case. Moreover, the model's predictive power, measured by the sum of squared residuals (SSR) is lower for the counterfactual models than those using the conventional CCI series.

These results suggest that the fundamental part of the CCI has a stronger predictive power on actual households' spending on non-durable goods and services than for the durable and semi-durable goods consumption cases. Although further research on this topic is welcomed, one could argue that economic agents base their primary needs spending decisions (i.e their services and non-durable goods consumption) on their perception of the current economic conditions, which are in

⁶The shares of services and non-durable goods in total households' consumption are about 55% and 30%, respectively.

Regression equation: $\Delta C_t = \beta_0 + \beta_1 CCI_t + \epsilon_t$										
	Total		Non-durables		Semi-durables		Services		Durables	
CCI	0,121		0,094		0,202		0,094		0,491	
	(0,020)		(0,019)		(0,068)		(0,018)		(0,112)	
CCI _f		0,139		0,116		0,204		0,110		0,517
		(0,022)		(0,019)		(0,078)		(0,019)		(0,129)
Cons.	4,122	4,102	3,359	3,340	4,650	4,625	4,266	4,248	7,346	7,277
	(0,222)	(0,218)	(0,202)	(0,190)	(0,743)	(0,756)	(0,194)	(0,188)	(1,223)	(1,252)
R ²	0,424	0,444	0,347	0,424	0,154	0,126	0,366	0,405	0,285	0,252
Adj. R ²	0,412	0,433	0,334	0,412	0,136	0,108	0,353	0,392	0,270	0,236
F-stat.	35,375	38,395	25,541	35,338	8,735	6,934	27,752	32,611	19,140	16,134
Prob.	0,000	0,000	0,000	0,000	0,005	0,011	0,000	0,000	0,000	0,000
SSR	118,56	114,42	97,58	86,11	1325,58	1369,05	90,40	84,95	3588,11	3756,30
LogLik.	-92,53	-91,64	-87,66	-84,54	-152,89	-153,69	-85,75	-84,20	-177,78	-178,93
AIC	3,781	3,746	3,587	3,461	6,195	6,228	3,510	3,448	7,191	7,237
BIC	3,858	3,822	3,663	3,538	6,272	6,304	3,587	3,524	7,268	7,314

Table 1: Linear regression results: Consumption on CCI and its counterfactual (CCI_c).
Source: Author's computations. Coefficients' standard errors in parenthesis.

turn informed by their observation and objective explanation of economic series.

On the other hand, households' durable and semi-durable goods consumption decisions could be partly influenced by non-fundamental reasons that conventional confidence indexes are prone to reflect. Among this non-fundamental reasons, we can classify the consequences of uncertainty, and the short-lived episodes of either optimism or pessimism derived from news, political and electoral events, among others. New research is needed to further disentangle the complex details present in the relationship between consumers' confidence and households' consumption in Colombia, and to find what kind of useful information the non-fundamental shocks contains. Indeed, the magnitude of the estimated coefficients for durable and semi-durable goods consumption is much greater than the estimates for the other households' consumption components, both when using CCI and CCI_f as explanatory variables. We can argue that durable and semi-durable goods consumption growth have greater elasticities with respect to CCI dynamics than non-durables and services consumption.

6. Conclusions

Due to its higher frequency and more timely publishing times when compared with most hard economic data, the consumer confidence index (CCI) has been deemed relevant for policy makers and market analysts and has been widely used for economic analysis and forecasting. Indeed, there is extensive literature on the link between CCI and both GDP and private consumption growth rates, but for the Colombian case research on this topic has been limited to that of Julio and Grajales (2011). Despite of its importance and utility, few papers have studied the fundamental factors that

drive the CCI and, specifically, no attempt has been made for the Colombian case. Therefore, we aim to fill this gap by presenting a novel approach that helps to identify the determinants of the consumer confidence index (CCI) dynamics in Colombia.

To do so, we first perform independent principal component analyses on six different groups of variables that the literature has identified as potential determinants of consumers' sentiment. After that, we extract the first factor for each group and end up with six different potential determinants labeled after the variables from which they were extracted. Secondly, we estimate a Structural Factor-Augmented VAR (SFAVAR) model and perform a historical decomposition (HD) on the CCI series to obtain the underlying structural innovations that drove the CCI dynamics over the past few years.

Both the SFAVAR and the HD results are coherent with the behaviour displayed by the Colombian business cycle over the past decade, and can be further analyzed given the specific context. We analyze the CCI dynamics and its corresponding HD results along three specific periods previously defined by a structural change test: from April 2008 to June 2010, from July 2010 to May 2015, and from June 2015 to the present day. Our results suggest, for example, that the decayed international and domestic conditions contributed the most to the drop in the CCI during the 2008 financial crisis, mostly as the consequence of an international confidence shock. Also, the HD identifies the role of external conditions on the CCI decline during the period that followed the international oil price crash in mid 2014. Moreover, our results also show how consumers' confidence was affected by the the negative effects of the rise of the cost of living conditions (due to El Niño and other supply shocks) and by the shocks that came after the announcement and implementation of the 2014 tax reform. For 2018, the HD results suggest that the recently reported upward trend for the CCI was caused mostly by a positive non-fundamental shock, complementary to the positive influence from external and internal conditions. As a final remark, we argue that the HD results allow for the identification of non-structural shocks that might have influenced macroeconomic policy decisions.

Finally, we capitalize on a byproduct of the HD to further analyze the role of the CCI on households' consumption decisions. The HD allows for the computation of a 'counterfactual' CCI, a series we name the fundamental CCI (CCI_f). This alternative confidence index ignores the effect of the non-fundamental structural shocks on the actual CCI. With the original and alternative series at hand, we perform a linear regression analysis to determine whether the CCI_f has better predictive properties than the CCI on on total households', non-durable, semidurable, durable and services consumption. We find that the CCI_f explains better the households' consumption decisions on services and non-durable goods. This result suggests that these spending decisions are mostly determined by agents after an objective assessment of both the household's and the economy current economic conditions, while the durable and semi-durable spending decisions might depend more on the uncertainty and the exogenous, short-lived episodes of optimism or pessimism derived from news, political or electoral events.

Although we have taken an important step towards enriching the academic literature and the understanding of consumer confidence indexes in Colombia, much further work is needed to establish whether there is or not a causal relationship between the consumer sentiment and the spending decisions of different types of goods and services, and whether these fundamental and non-fundamental shocks give some useful information to the policy makers and market analysts that help to improve their forecasts of the economic activity.

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Appendix

A. Consumer Opinion Survey Questionnaire

Consumers' Confidence Index (CCI) = $(Q1+Q2+Q3+Q5+Q11)/5$

Economic Conditions Index (ECI) = $(Q1+Q11)/2$

Consumers' Expectations Index (CEI) = $(Q2+Q3+Q5)/3$

Questions:

- Q1.** ¿Diría usted que a su hogar le está yendo económicamente mejor o peor de lo que le estaba yendo hace un año? (balance)
- Q2.** ¿Piensa usted que dentro de un año a su hogar le estará yendo económicamente mejor, peor o más o menos lo mismo que hoy? (balance)
- Q3.** ¿Cree usted que durante los próximos 12 meses vamos a tener buenos tiempos económicamente, malos tiempos, o qué cree usted? (balance)
- Q4.** ¿Diría usted que hoy en día las condiciones económicas del país en general son mejores o peores de lo que estaban hace un año? (balance)
- Q5.** Y dentro de 12 meses, ¿cree usted que las condiciones económicas del país en general estarán mejores, peores, o más o menos iguales a como están hoy en día? (balance)
- Q6.** Durante los siguientes 12 meses, ¿usted cree que va a haber más desempleo que hoy en día, más o menos lo mismo, o menos? (balance)
- Q7.** ¿Cree usted que durante los próximos 12 meses los intereses de los préstamos subirán, se mantendrán iguales o bajarán? (balance)
- Q8.** ¿Usted cree que durante los próximos 12 meses los precios de las cosas en general van a subir, van a bajar o se van a mantener como están hoy en día? (balance)
- Q9.** Porcentualmente, ¿cuánto cree usted que van a (subir/bajar) los precios de las cosas en general durante los próximos 12 meses? (percentage)
- Q10.** ¿Cree usted que este es un buen momento o un mal momento para comprar vivienda? (balance)
- Q11.** ¿Cree usted que este es un buen momento o un mal momento para comprar cosas grandes como muebles o electrodomésticos para el hogar? (balance)
- Q12.** ¿Cree usted que los próximos 12 meses serán un buen momento o mal momento para comprar auto? (balance)
- Q13.** ¿Diría usted que en la actualidad les está alcanzando para ahorrar algo o no? (balance)
- Q14.** ¿En los últimos 12 meses alguien en este hogar ha solicitado un préstamo en alguna entidad financiera? (balance)
- Q15.** ¿En los últimos 12 meses alguien en este hogar ha solicitado un préstamo de dinero a algún familiar, amigo o conocido? (balance)

B. Statistical Results Appendix

B.1 Structural Change Tests

F-test results (Andrews, 1993; Andrews and Ploberger, 1994)

H_0 : No single-shift of unknown timing. $\sup F$ -statistic = 203,8; p-value $< 2,2e^{-16}$.

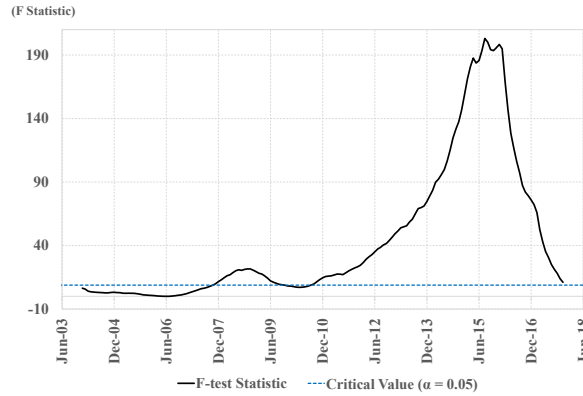


Figure A1: Rolling F-test Statistic. Trimmed sample = 5%.
Source: Author's computations.

Empirical Fluctuation Process (OLS-based CUSUM) test (Ploberger and Krämer, 1992)

H_0 : No single-shift of unknown timing. \sup efp-statistic = 3,9753; p-value = $3,753e^{-14}$.

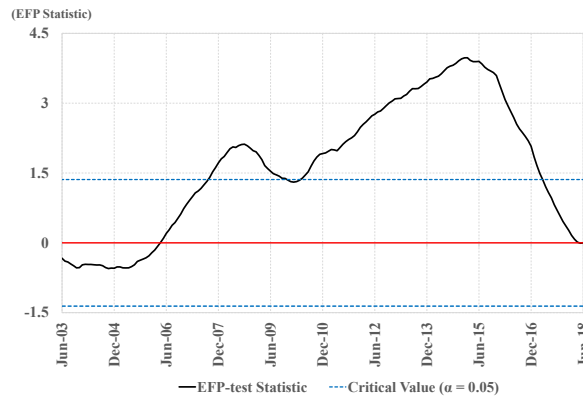


Figure A2: Rolling Empirical Fluctuation Process test Statistic.
Source: Author's computations.

Breakpoints Structural Change test (Bai and Perron, 1998, 2003)

H_0 : m breakpoints present in the time series.

m	0	1	2	3	4	5
SSR	39.980	18.896	16.057	13.411	10.850	10.493
BIC	1.523	1.395	1.376	1.353	1.324	1.329

Table A1: Optimal $(m + 1)$ segments partition.
Source: Author's computations.

B.2 Augmented Dickey-Fuller Tests

We perform augmented Dickey-Fuller tests to check for non-stationarity in the CCI and PC series in the SFAVAR. Lag length P is selected for each variable according to the Akaike Information Criterion (AIC). Significance is assessed for the unit root parameter (γ) and the autoregressive coefficients (δ_p) in the following model:

$$\Delta y_t = \gamma y_{t-1} + \sum_{p=1}^P \delta_p \Delta y_{t-p} + e_t,$$

Variable	γ	t-value*	$Pr(> t)$	Lag order (AIC)	F-stat.
F1	-0,02821	-2,508	0,0131	1	51,76
F2	-0,03142	-2,223	0,0275	1	16,49
F3	-0,03631	-4,571	0,0000	1	252,20
F4	-0,01296	-2,256	0,0253	1	126,40
F5	-0,00727	-2,181	0,0305	1	324,60
F6	-0,02539	-2,738	0,0068	1	97,58
CCI	-0,12976	-3,107	0,0022	1	5,08

Table A2: Unit-root test results for SFAVAR variables.
*The critical value for this one-tailed t-test is -1,95 ($\alpha = 0,05$).
(Series are quadratically detrended).
Source: Author's computations.

B.3 SFAVAR Results

Results for the SFAVAR with $\mathbf{Z}'_t = [\mathcal{F}_{1t}, \mathcal{F}_{2t}, \mathcal{F}_{3t}, \mathcal{F}_{4t}, \mathcal{F}_{5t}, \mathcal{F}_{6t}, \text{CCI}_t]'$:

Lags: 4
AIC: 742,00
BIC: 1387,91

Jarque-Bera's Test for CCI residuals: $\chi^2 = 3,82$, dof = 2, p-value = 0,149 (Null: Normality)

Engle's Lagrange multiplier ARCH test for CCI residuals: $\chi^2 = 9,70$, dof = 16, p-value = 0,882 (Null: Homoscedastic)

C. SFAVAR Variables

Group/Factor	Variable	Description	Source
Factor 1: External conditions	TRM	Nominal exchange rate (COP/USD)	Superfinanciera
	BRAMEAI	Brazilian monthly economic activity indicator	Bloomberg
	PERMEAI	Preuvian monthly economic activity indicator	Bloomberg
	USMEAI	US monthly economic activity indicator	Bloomberg
	TOT	Terms of trade index	Banco de la República
	REER	Real exchange rate	Banco de la República
	OPWTI	Oil price (WTI, USD)	Bloomberg
	OPBRENT	Oil price (Brent, USD)	Bloomberg
	COALP	Coal price (USD)	Bloomberg
	COFFP	Coffee price (USD)	Bloomberg
	CDS	Colombian credit default swap	Bloomberg
	RAICOL	Colombian bonds' risk appetite index	Banco de la República
	USCCIMI	University of Michigan Consumer Sentiment Index (U.S)	U. Michigan
	USCCICB	Conference Board Consumer Confidence Index (U.S)	The Conference Board, Inc.
	CCIEUR	Euro zone Consumer Confidence Index	Bloomberg
	CCIPER	Perú: Consumer Confidence Index	Bloomberg
	CCIARG	Argentina: Consumer Confidence Index	Bloomberg
CCICHL	Chile: Consumer Confidence Index	Bloomberg	
CCIMEX	Mexico: Consumer Confidence Index	Bloomberg	
Factor 2: Domestic conditions	COLMEAI	Colombian monthly economic activity indicator	DANE
	RETTOT	Real retail index (total)	DANE
	RETNVH	Real retail index (excluding vehicles)	DANE
	RETVH	Real retail index (vehicles)	DANE
	IPI	Real industrial production index (total)	DANE
	CCDNOVIS	Constructor credit disbursements for non-social housing	Banco de la República
	TOTEXP	Total exports (mill. USD)	DANE
	GOVEXP	Government expenditure (mill. COP)	DNP, DGPM-MHCP
Factor 3: Labor market conditions	URHHD	Unemployment rate for household heads	DANE
	URTOT	Unemployment rate	DANE
	OBUEHHD	Objective underemployment, household's head	DANE
	OBUEHHD I	Objective underemployment, household's head (by income)	DANE
	OBUEHHD H	Objective underemployment, household's head (by hours)	DANE
	HURHHD	Hidden unemployment - household's head	DANE
	LBPR	Labor participation rate	DANE
	UNDUR	Unemployment duration	DANE, Authors' comp.
	AVGHHIN	Average real household income	DANE, Authors' comp.
	AVGHHDI	Average real income - household's head	DANE, Authors' comp.
	AVGHOURL	Average real hourly wage	DANE, Authors' comp.
	EMPLO	Number of employees	DANE
	NONEMPLO	Number of non employees	DANE
	REALMINW	Real minimum wage	Authors' computations
Factor 4: Financial conditions	LHADNOVIS	New loans for housing acquisition, non-social housing	Banco de la República
	LHADVIS	New loans for housing acquisition, social housing	Banco de la República
	IGBVC	Stock market index	BVC
	INTRATM	Nominal interest rate, mortgages	Banco de la República
	INTRATC	Nominal interest rate, consumption	Banco de la República
	INTRATCC	Nominal interest rate, credit card	Banco de la República
	INTRATMIC	Nominal interest rate, microloans	Banco de la República
	FSI	Financial stability index	Banco de la República
	INTSPR	Intermediation spread	Superfinanciera
	DQUALIC	Debt quality index, consumption	Superfinanciera
	DQUALIM	Debt quality index, mortgages	Superfinanciera
	DQUALIMIC	Debt quality index, microloans	Superfinanciera
	DQUALITOT	Debt quality index, total debt	Superfinanciera
	CDIC	Credit default index, consumption	Superfinanciera
	CDIM	Credit default index, mortgages	Superfinanciera
CDIMIC	Credit default index, microloans	Superfinanciera	
DISCCD	Disbursements, credit card	Banco de la República	
TDINTRAT	Term deposit nominal interest rate	Banco de la República	
Factor 5: Taxation conditions	VATCOLL	Value Added Tax (VAT) collection	DIAN
	RENTCOLL	Rent tax collection	DIAN
	TAXCOLL	Internal taxes collection	DIAN
Factor 6: Cost of living conditions	PIFC	Producer price index, final consumption goods	DANE
	CPITOT	Consumer price index, total	DANE
	CPIEXP	Inflation expectations, anual variation	Banco de la República

Table A3: Variables included in the Principal Component Analysis.

