ECONOMÍA CHILENA

Diciembre 2019 volumen 22 N.° 3

ARTÍCULOS

BANCO CENTRAL DE CHILE

El objetivo de ECONOMÍA CHILENA es ayudar a la divulgación de resultados de investigación sobre la economía chilena o temas de importancia para ella, con significativo contenido empírico y/o de relevancia para la conducción de la política económica. Las áreas de mayor interés incluyen macroeconomía, finanzas y desarrollo económico. La revista se edita en la Gerencia de División de Estudios del Banco Central de Chile y cuenta con un comité editorial independiente. Todos los artículos son revisados por árbitros anónimos. La revista se publica tres veces al año, en los meses de abril, agosto y diciembre.

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ECONOMÍA CHILENA

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ÍNDICE

SE CIERRA UN CICLO

Este es el último número de la *Revista de Economía Chilena* (REC). Su origen se remonta a septiembre de 1998, cuando nació como parte de una serie de iniciativas del Banco Central de Chile (BCCh) en materia de investigación económica. En 1996 se lanzó la *Serie de Estudios Económicos*—la que desde el 2006 y hasta la fecha pasó a llamarse *Estudios Económicos Estadísticos*—, en enero de 1997 se lanzó el primer *Documento de Trabajo del Banco Central* (DTBC), y en agosto del mismo año se realizó la primera versión de la *Conferencia Anual del BCCh*. Posteriormente, en el 2001, se creó la serie de *Documentos de Política Económica*, destinada a difundir el pensamiento de las autoridades sobre la economía chilena y la conducción de la política monetaria para un público más amplio que el de los especialistas. Ese mismo año comenzó la *Serie Banca Central, Análisis y Políticas Económicas* difundiendo los artículos presentados en las Conferencias Anuales. Todas estas acciones fueron coordinadas por la Gerencia División de Estudios, hoy *División de Política Monetaria*.

Con el correr de los años, todas estas iniciativas han llevado a posicionar al BCCh como una institución líder en calidad y cantidad de investigación económica, lo que se manifiesta en el continuo interés de este material por la comunidad académica nacional e internacional. Esto ha permitido invitar a Chile a numerosos académicos de prestigio internacional, que han dejado sus contribuciones en seminarios, talleres, conferencias y también en artículos publicados por la REC.

A lo largo de sus 65 volúmenes, publicados en abril, agosto y diciembre de cada año, la REC completó un total de 214 artículos en las áreas de macroeconomía, finanzas, economía internacional y desarrollo económico, con especial énfasis en la economía chilena. En el 2001 se instauró la sección de artículos cortos "*Notas de Investigación Económicas*" (NIE), a cargo de un cuerpo de editores especializados cuya misión fue "divulgar artículos breves escritos por economistas del BCCh" que, "frecuentemente, aunque no exclusivamente responden a peticiones de las autoridades del Banco". Así, se publicó un total de 120 NIE. También, el segundo número del 2002 excepcionalmente incluyó ensayos sobre crecimiento económico a cargo de los renombrados economistas Anne Krueger, Jorge Marshall, Francisco Rosende y Jorge Rodríguez. La sección de revisión de libros estuvo desde siempre presente en la revista, en la que se revisó 108 volúmenes. En el 2008, la REC fue incluida en el selecto listado *Thompson Scientific*, también conocido como *ISI Journal List*. Este hito llevó a los editores a mejorar la selección y evaluación de trabajos, los que cada vez reflejaban una mayor diversidad internacional de autores y temas.

En la búsqueda de una mayor internacionalización y cobertura, en diciembre del 2015 la REC comenzó a publicar artículos en inglés.

El primer número de la REC en 1998 indicó: "Este primer número inicia la publicación de la nueva *Revista de Economía Chilena*. Su objetivo es ayudar a la divulgación de resultados de investigación, preferentemente aquella realizada por economistas del Banco Central de Chile, o por encargo de la institución, acerca de la economía chilena o temas de importancia para ella, con significativo contenido empírico y/o de relevancia para la política económica." Este objetivo se ha cumplido a cabalidad. En estas circunstancias, cabe preguntarse por qué tendría que descontinuarse esta publicación. Hemos observado que, tras 22 años, satisfacer a una nueva generación de lectores requiere emigrar hacia diferentes mecanismos de divulgación.

Todo este tiempo, la conducción de la REC implicó un esfuerzo destacable de su cuerpo editorial, acompañando la labor de investigación del BCCh en distintas etapas. Por hacer posible este logro se agradece a todos los editores de la REC, varios de ellos destacados economistas vinculados a la historia reciente del BCCh. Este listado, en orden cronológico desde sus fundadores son: Klaus Schmidt-Hebbel, Rodrigo Valdés, Luis Felipe Céspedes, Kevin Cowan, Rodrigo Fuentes, Pablo Pincheira, Miguel Fuentes, Roberto Álvarez, Claudio Raddatz, Diego Saravia, Elías Albagli, Rodrigo Caputo, Gonzalo Castex, Álvaro Aguirre y Sofía Bauducco.

El BCCh refuerza su compromiso con la investigación económica potenciando los medios tradicionales de difusión e incorporando elementos facilitados por nuevas plataformas, que permiten una difusión eficiente, global e inclusiva.

Mario Marcel
Presidente
Banco Central de Chile

RESÚMENES

SOBRE LOS EFECTOS DE LA CONFIANZA Y LA INCERTIDUMBRE EN LA DEMANDA AGREGADA: EVIDENCIA DEL CASO CHILENO

Elías Albagli I. / Jorge A. Fornero / Miguel A. Fuentes D. / Roberto Zúñiga V.

El presente artículo estudia los efectos de los *shocks* de expectativas en el consumo privado agregado y en la inversión en Chile. Utilizando microdatos de la encuesta de clima empresarial IMCE y de la encuesta de confianza del consumidor IPEC construimos medidas de confianza e incertidumbre. Un simple análisis empírico muestra que estas medidas son útiles para predecir la actividad con hasta seis trimestres de antelación. Luego, mediante un enfoque SVAR de economía abierta, identificamos los *shocks* de confianza (primer momento) y de incertidumbre (segundo momento). Frente a los primeros, la inversión no reacciona al impacto, sino que muestra una respuesta positiva y persistente en los 12 trimestres siguientes. El consumo privado muestra una respuesta positiva al impacto y vuelve a su nivel de tendencia 8 trimestres más tarde. En tanto, las perturbaciones en la incertidumbre generan una rápida desaceleración y posterior rebrote de la inversión. El consumo privado, en cambio, muestra una débil respuesta negativa a mediano plazo.

¿PUEDEN LAS ENCUESTAS DE PERCEPCIÓN ECONÓMICA MEJORAR LAS PROYECCIONES MACROECONÓMICAS EN CHILE?

Nicolas Chanut / Mario Marcel C. / Carlos A. Medel V.

Comparamos el momento, la representatividad, los cuestionarios y la agregación de las respuestas de cinco encuestas de percepción económica chilenas en sus proyecciones macroeconómicas, observando las deficiencias de los índices agregados que combinan preguntas con diferente enfoque y perspectiva temporal. Proponemos ocho medidas alternativas que distinguen entre el sentimiento actual y las expectativas futuras, y entre las percepciones sobre la situación personal y la del país. Nuestros resultados sugieren que las percepciones futuras a nivel nacional se forman con información distinta del sentimiento presente y personal, y que las segundas se ven afectadas en cierta medida por las primeras. Al analizar su capacidad predictiva para los macroagregados, encontramos una relación bastante sólida entre las percepciones personales y agregadas, los planes de consumo y el consumo real, especialmente de bienes durables, superando la capacidad predictiva del indicador sintético existente. En cuanto a las empresas, las encuestas parecen ser mejores para predecir el empleo que la inversión, y que ambos parecen causar à la Granger las percepciones y expectativas personales. En general, si bien las encuestas de percepciones económicas proporcionan buena información, se debe escoger bien las encuestas y preguntas que mejor revelan el comportamiento económico.

RECOLECCIÓN DE INFORMACIÓN SOBRE LA ACTIVIDAD ECONÓMICA A PARTIR DE ENCUESTAS A EMPRESAS Y CONSUMIDORES EN UNA ECONOMÍA EMERGENTE (CHILE)

Camila Figueroa S. / Michael Pedersen

El presente artículo discute la medida en que las encuestas de percepción a empresas y consumidores contienen información útil para predecir la actividad económica en Chile. Las encuestas utilizadas son las correspondientes a los índices IMCE e IPEC, para las empresas y consumidores, respectivamente. Los ejercicios base consisten en cálculos simples de coeficientes de correlación entre los indicadores extraídos de las encuestas y variables de actividad, pruebas de causalidad a la Granger y modelos de actividad autorregresivos aumentados con datos de encuestas para evaluar si su inclusión mejora el desempeño de las proyecciones. La evidencia sugiere que ambas encuestas, en general, contienen información útil para hacer predicciones de la actividad en Chile, particularmente para los horizontes más largos. Un ejercicio adicional indica que la información de dichas encuestas es complementaria, en el sentido de que las proyecciones mejoran al incluir ambos indicadores en el modelo econométrico.

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ABSTRACTS

ON THE EFFECTS OF CONFIDENCE AND UNCERTAINTY ON AGGREGATE DEMAND: EVIDENCE FROM CHILE

Elías Albagli I. / Jorge A. Fornero / Miguel A. Fuentes D. / Roberto Zúñiga V.

We study the effects of expectation shocks on aggregate private consumption and investment in Chile. We use microdata from the business climate survey IMCE and the consumer confidence survey IPEC to construct measures of confidence and uncertainty. A simple empirical analysis shows that these measures are useful for predicting activity up to six quarters ahead. Then, using an open-economy SVAR approach, we identify confidence (first moment) and uncertainty (second moment) shocks. After a confidence shock, investment does not react on impact, but exhibits a positive and persistent response in the 12 quarters following the shock. Private consumption shows a positive response on impact and returns to its trend level 8 quarters later. Uncertainty shocks generate a rapid slow-down and bounce-back in investment. Private consumption, instead, shows a weak negative response in the medium term.

CAN ECONOMIC PERCEPTION SURVEYS IMPROVE MACROECONOMIC FORECASTING IN CHILE?

Nicolas Chanut / Mario Marcel C. / Carlos A. Medel V.

We compare the timing, representativeness, questionnaires, and response aggregation of five Chilean economic perception surveys for macroeconomic forecasting, noting the shortcomings of composite indices combining questions with different focus and time perspective. We propose eight alternative measures distinguishing between *current sentiment* and *future expectations* and between *personal* and *country-wide perceptions*. Our results suggest that future and country-wide perceptions are formed with information other than personal and current sentiment, and that the latter are somewhat affected by the former. When analyzing its predictive ability for macroaggregates, we find a rather strong relationship between personal and aggregate perceptions, consumption plans and actual consumption, especially of durables, outpacing the predictive ability of the existing synthetic indicator. On the business side, surveys seem to be stronger predicting employment than investment, while employment and investment seem to Granger-cause personal sentiment/expectations. Overall, while surveys of economic perceptions provide rich information, it is necessary to select the surveys and questions that are better revealing economic behavior.

EXTRACTING INFORMATION ON ECONOMIC ACTIVITY FROM BUSINESS AND CONSUMER SURVEYS IN AN EMERGING ECONOMY (CHILE)

Camila Figueroa S. / Michael Pedersen

The present paper discusses the extent to which business and consumer survey observations are useful for predicting the Chilean activity. The two surveys examined are called IMCE and IPEC, after their Spanish abbreviations, for the business and consumer survey, respectively. The baseline exercises consist in simple calculations of cross correlations between the surveys and activity variables, test for Granger causality and augmentation of autoregressive activity models with survey data to evaluate if the now- and forecast-performances are improved. The evidence suggests that both surveys, in general, contain useful information for making predictions of the Chilean activity, particularly for the longer horizons. An additional exercise indicates that the data in the two surveys are complementary in the sense that the longer horizon forecasts improve further when both of them are included in the econometric model.

(continued)

EFECTOS NO LINEALES DE LA POLÍTICA FISCAL CHILENA

Jean-Pierre Allegret / Antonio Lemus

En Chile, la literatura empírica que ha estudiado los efectos de la política fiscal y los multiplicadores fiscales utilizando modelos lineales de vectores autorregresivos encuentra resultados dispares. El presente documento aporta un nuevo elemento a este debate estudiando si el estado en el que se encuentra la economía chilena, "bajo" o "normal", altera la efectividad de la política fiscal. Se encuentra que en el largo plazo el multiplicador del gasto fiscal es mayor que 1 en el estado "bajo" y alrededor de -0,5 en el estado "normal". Además, el multiplicador de impuestos sería aproximadamente cero en ambos estados, sugiriendo que solo el gasto fiscal en períodos de bajo crecimiento económico permitiría impulsar a la economía chilena. Finalmente se estudia brevemente el rol de la tasa de política monetaria en el tamaño de los multiplicadores fiscales, encontrando que estos son ligeramente menores.

DISTRIBUCIÓN DE LA RIQUEZA EN ECONOMÍAS DESARROLLADAS Y EN DESARROLLO: COMPARACIÓN ENTRE ESTADOS UNIDOS Y CHILE UTILIZANDO DATOS DE ENCUESTAS DEL 2007

Sofía Bauducco / Gonzalo Castex / Andrew Davis

Este estudio examina las distribuciones de ingreso, activos, endeudamiento y riqueza en Chile, utilizando datos de la Encuesta Financiera de los Hogares del 2007. Se detalla la desigualdad a nivel agregado y también por una variedad de subgrupos, tales como edad, género, tipo de hogar, tipo de empleo y nivel de educación. En comparación con los datos de la Encuesta de Finanzas del Consumo de Estados Unidos, encontramos que el ingreso y la deuda son más desiguales en Chile que en Estados Unidos, pero los activos y la riqueza se distribuyen más equitativamente en Chile que en Estados Unidos. Nuestros resultados sugieren que, entre las teorías comunes que intentan explicar la desigualdad de la riqueza en EE.UU., las de los altos beneficios e incentivos asociados al emprendimiento son las más plausibles.

NONLINEAR EFFECTS OF THE CHILEAN FISCAL POLICY

Jean-Pierre Allegret / Antonio Lemus

In Chile, the empirical literature studying the effects of fiscal policy and fiscal multipliers, using linear vector autoregression models, disagrees on the effects of government spending and taxes on output. In this paper, we bring a new element to this debate. We study if the state of the Chilean economy, "tight" or "normal" regime, affect fiscal policy effectiveness. We find that, in the long-term, the government spending multiplier is above the unit in the "tight" regime and around -0.5 in the "normal" regime. Moreover, the tax multiplier is about null in both regimes, suggesting that government spending helps to boost the economy in periods of low economic growth. Also, we study the role of the monetary policy interest rate on the size of fiscal multipliers, finding slightly smaller government spending multipliers.

THE WEALTH DISTRIBUTION IN DEVELOPED AND DEVELOPING ECONOMIES: COMPARING THE UNITED STATES TO CHILE USING SURVEY DATA FROM 2007

Sofía Bauducco / Gonzalo Castex / Andrew Davis

This study examines the distributions of income, assets, debt, and wealth within Chile, using data from the 2007 Household Financial Survey. We detail inequality at the aggregate level and also by a variety of subgroups, including age, gender, household type, employment type, and educational attainment. In comparison with data from the US Survey of Consumer Finances, we find that income and debt are more unequally distributed in Chile than in the US, but assets and wealth are more equally distributed in Chile than in the U.S. Our results suggest that, among common theories that seek to explain wealth inequality in the U.S., high payoffs to and the incentives imposed by entrepreneurship are the most plausible.

ON THE EFFECTS OF CONFIDENCE AND UNCERTAINTY ON AGGREGATE DEMAND: EVIDENCE FROM CHILE*

Elías Albagli I.**
Jorge A. Fornero***
Miguel A. Fuentes D.***
Roberto Zúñiga V.***

> *"[E]conomic prosperity is excessively dependent on a political and social atmosphere which is congenial to the average businessman. If the fear of a Labour Government or a New Deal depresses enterprise, this need not be the result either of a reasonable calculation or of a plot with political intent; it is the mere consequence of upsetting the delicate balance of spontaneous optimism. In estimating the prospects of investment, we must have regard, therefore, to the nerves and hysteria and even the digestions and reactions to the weather of those upon whose spontaneous activity it largely depends."*
>
> *John Maynard Keynes (1936)*

> *The state of long-term expectation, upon which our [investment] decisions are based, does not solely depend, therefore on the most probable forecast we can make. It also depends on the confidence with which we make this forecast-on how highly we rate the likelihood of our best forecast turning out quite wrong.*
>
> *John Maynard Keynes (1936)*

I. INTRODUCTION

Confidence indicators play a prominent role in explaining contingent economic developments. These indicators are useful to understand the context, or atmosphere referred by Keynes, in which economic decisions are taken.

The objective of this paper is to analyze the effects of entrepreneurs and consumers' confidence on investment and consumption in Chile using a new

* *We thank Sebastián Olate and Alfonso Barrero for sharing the microdata from the IMCE survey. Vicente Olavarría, as a research intern from Universidad de Chile's School of Economics and Business, provided excellent research assistance.*
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data set of confidence indicators.[1] Following Nowzohour and Stracca (2017), two aspects of sentiments are important for this study: (i) confidence levels; and (ii) dispersion measures calculated from responses recorded in the confidence database (uncertainty).

Confidence indicators

Ample literature documents empirically that confidence indicators lead economic activity measures (see Chanut and Medel, 2018, for the case of Chile). This predictability property can potentially be exploited to get more accurate forecasts. However, the subjective nature of confidence measures raises concerns about the robustness of such empirical correlations. An example will help to understand the general idea. When a given economy is booming, typically we find that entrepreneurs and consumers entertain optimistic views of their business and income, confidence indicators improve and private expenditure is dynamic. The opposite happens in a depression. There are exceptions, of course, where the evolution of private spending does not exactly follow confidence measures, for a variety of reasons.

In standard macroeconomic theory, we find no clear definition of confidence as a variable, neither a fundamental role is assigned to it. More specifically, in standard New Keynesian models, fluctuations in investment are determined by changes in the marginal productivity of capital, changes in relative prices of investment goods, adjustment costs to install capital, etc. (i.e. the effective user costs of capital). When taken to investment data, traditional stylized macroeconomic models are not able to explain certain episodes reasonably. In these situations, experts' judgement can be informed by the level of entrepreneurs' confidence indicators.

Uncertainty

A recent study by Drobetz et al. (2017) finds that the strength of the negative relation between investment and the cost of capital decreases in times of high economic policy uncertainty. Therefore, we use direct or firm level responses to survey questions to construct synthetic confidence indicators as well as to get measures of the dispersions of responses. Regarding the latter, Bachmann et al. (2013), suggest that is a good proxy of uncertainty. The intuition is that in periods of high uncertainty business managers tend to postpone projects and to halt investment expenses. Thus, increasing the amount of dispersion.

Empirical strategy and main results

To support the dynamic analysis that we will develop in section III below, we start by exploring simple correlations in the data. We construct synthetic confidence indicators with responses from entrepreneurs (IMCE database). Analogously,

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1 Gross fixed capital formation (GFCF) is used as proxy of investment.

we study the behavior of consumption and consumers' confidence indicators (IPEC database). We ask whether confidence has the capacity to anticipate, in a predictive sense, the behavior of investment and consumption.[2] Similarly, whether an increase in uncertainty, understood as an increase in the dispersion responses, significantly postpones spending on consumption and investment.

Next, we study more formally the joint dynamics and propagation of investment and consumption resulting from several shocks. We have special interest on confidence and uncertainty shocks. In particular, we specify structural VAR models (SVAR) for consumption and investment along with confidence and uncertainty variables. A motivation to develop this methodology is that results from these econometric models provide timely answers usually faster than traditional structural models.[3]

Finally, we illustrate with two empirical applications how these empirical models contribute to the macroeconomic analysis. The first application seeks to explain the investment cycle by contributions of key drivers (historical decomposition). The second application analyzes whether recent menaces of trade war between leading trading partners of Chile exert a negative influence on domestic confidence and thereby lead to less dynamic investment. These two applications were explained in boxes in the *Monetary Policy Reports* of June 2016 and September 2019, respectively.

We find that after a positive confidence shock, investment does not react on impact, but it exhibits a positive and persistent response in the 12 quarters following the shock. Private consumption shows a positive response on impact and returns to its trend level 8 quarters later. Uncertainty shocks generate a rapid slow-down and bounce-back in investment. Private consumption, instead, shows a weak negative response in the midterm.

This paper uses the same survey data as Chanut, et al. (2018) and Figueroa and Pedersen (2019). However, likewise Albagli and Luttini (2015), we dig into specific questions aiming to anticipate investment better. Due to detailed focus on questions, we leave out the analysis responses taken from mining and construction sectors, whereas we concentrate on retail and manufacturing, whose questions on expected future sales/production levels are alike. Besides, we extend the analysis to examine microdata from consumers' surveys. In one extreme Chanut, et al. (2018) analyze all questions one by one and in the other Figueroa and Pedersen (2019) use published sentiment indicators data; we lay in between: we use synthetic confidence indices.

Regarding the methodology, these two papers and ours use simple Granger causality tests. The others focus on forecasting properties of confidence indicators, while we focus on policy applications, estimating SVAR models to get

2 This paper follows to some extent the empirical strategy by Santero and Westerlund (1996).

3 The sample analyzed covers a period with a stable macroeconomic framework: inflation-targeting with exchange rate flexibility, an independent central bank and a fiscal policy that follows a fiscal rule.

historical decompositions, simulate impulse responses, and perform forecasting exercises. Finally, as in Albagli and Luttini (2015) and Cerda et al. (2018), we study shocks to the uncertainty measure, while the other papers in this volume do not analyze this issue.

The structure of this paper is as follows. In section II, we detail the construction of confidence and uncertainty measures, and study their cyclical properties in a bivariate analysis. In section III, we describe our main empirical setting, and discuss the effects of confidence and uncertainty shocks. Finally, in section IV we present some concluding remarks.

II. MEASURING CONFIDENCE AND UNCERTAINTY

To fix concepts, by confidence we refer to the answers to questions concerning average expected outcome for an activity variable. For instance, we will measure confidence about the future economic situation as the difference between the share of optimistic expectations and the share of pessimistic expectations. Uncertainty, instead, relates to the degree of agreement about that expected outcome. We say there is low uncertainty when agents' expectations are concentrated around a central scenario or, in other words, they share a common view, whether it be optimistic or pessimistic. Conversely, we say there is high uncertainty when agents' expectations are more dissimilar.

We construct confidence and uncertainty measures from entrepreneur and consumer surveys. In the next sub-section, we briefly describe the characteristics of each survey and list the main questions we use. From these questions, we define confidence and uncertainty indicators for '*present,*' '*future,*' and '*nation-wide*' economic outcomes. In the following sub-section, we analyze some cyclical properties of these indicators.

1. Data dfescription

Business confidence and uncertainty: The IMCE survey

We build measures of business confidence and business uncertainty using data from the monthly business confidence survey, IMCE[4]. This survey asks entrepreneurs and business managers about their outlook for national and business-specific economic conditions, current and future perspectives, and other specific indicators such as production levels, inventories, demand, and employment. The sample contains around 600 firms from four sectors of the Chilean economy: retail, manufacturing, mining, and construction, which account for 35% of total GDP. The window period in which companies must respond to the survey is within the month.

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4 IMCE: Indicador Mensual de Confianza Empresarial. The IMCE survey was initially developed in 2003 by the Central Bank of Chile and later outsourced to ICARE, a private organization, and Universidad Adolfo Ibáñez under a tender procedure.

Each question in the IMCE survey has three possible answers: '*favorable*,' '*unfavorable,*' or '*neutral*.' We use the proportion of favorable and unfavorable answers to construct indicators of business confidence and business uncertainty. Let *B* denote the difference between the share of favorable and unfavorable answers:

$$B = \%favorable - \%unfavorable$$

Then, the *confidence* indicator is just a linear transformation of B such that this indicator ranges between 0 and 100, where a value of 0 means that 100% of the answers are unfavorable; a value of 100 means that 100% of the answers are favorable; and a value of 50 indicates that confidence is at a neutral or balanced level.

To construct uncertainty indicators, we follow Bachmann et al. (2013) and use the cross-sectional dispersion of answers, which is:

$$uncertainty = \sqrt{\%favorable + \%unfavorable - \left(\%favorable - \%unfavorable\right)^2} \cdot 100$$

So, for instance, if half the answers are favorable and the other half are unfavorable, there is maximum uncertainty, and our indicator is equal to 100. Contrariwise, if all the answers are favorable, or if all are unfavorable, our uncertainty indicator is equal to 0.

We group questions into three categories based on their content: '*present,*''*future,*' and '*national,*' and compute average confidence and uncertainty indicators for each category. We defined these categories based on the evidence we present in section II.4, where we analyze whether there is a meaningful relation between confidence and uncertainty indicators and aggregate demand variables.

Table 1 lists the questions used to generate our indicators. We focus on answers from the retail and manufacturing sectors (thus excluding the construction and mining sectors) for the following reasons. First, firms in the construction sector are not asked about present or future business-specific economic conditions. Second, we exclude the answers from firms in the mining sector, because these exhibit issues such as high volatility relative to the other sectors.[5] Also, these questions present little correlation with domestic activity (see Figueroa and Pedersen (2019)).

Figure 1 presents the confidence and uncertainty indicators in the top left and right graphs, respectively. Confidence in the present and future situation

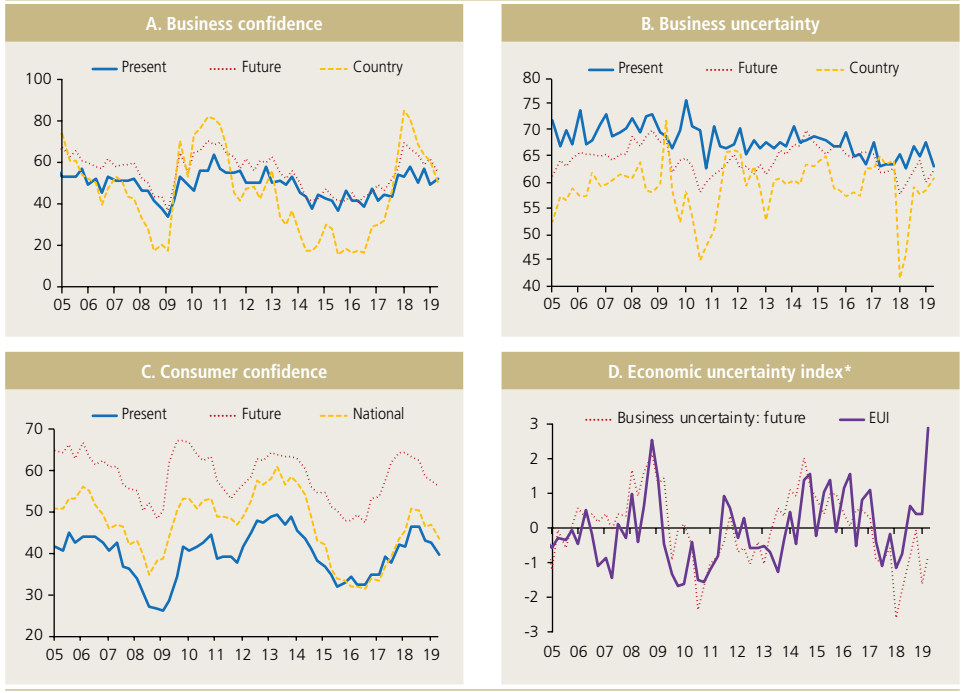
5 The norm is that firms' responses are equally important. The exception is the mining sector, where firms' responses present importance weighting. In effect, Codelco weighs 46%, Collahuasi weighs 6% and any other mining company weighs 1%. These weights will be normalized taking into account the total number of companies surveyed in each month. For example, if in a given month Codelco, Collahuasi and 10 other companies answered, the weighting of Codelco is 0.46 / (0.46 + 0.06 + 10 x 0.01) = 74%. For this reason, the indicator for mining is heavily dependent on Codelco's responses due to the fact that the sample is small. Besides, foreign mining firms are not properly represented.

move closely and steadily around the neutral level of 50. Most of the time, entrepreneurs seem to be slightly more optimistic about the future than they are confident about their present situation. Instead, confidence in the national economic situation exhibits high variation over time.

Similarly, uncertainty about the present and future situation are more stable than uncertainty about the national economy. However, as one could expect, respondents tend to agree more about the national economic situation than on their own situation, which might be subject to idiosyncratic factors.

Figure 1

Confidence and uncertainty measures



Source: Authors' calculations using IMCE and IPEC data.

* In this graph both uncertainty indicators have been standardized for the sake of comparison.

Table 1

Questions of interest in the IMCE survey – retail and manufacturing

Category	Questions
Present	How well will your sales/production evolve this month with respect to the previous one?
Future	How well will your sales/production evolve in the next three months with respect to the current level? How well will your business situation evolve in the next six months with respect to the current situation?
National	How well will the national economic situation evolve in the next six months?

Source: IMCE survey.

Table 2

Questions of interest in the IPEC survey

Category	Questions
Present	1) Current personal economic situation: is it better, worse, or the same as one year ago?
Future	2) Future family economic situation: will it be good, modest, or bad in the next 12 months?
National	3) Current national economic situation: is it good, modest, or bad?

Source: IPEC survey.

Consumer confidence: the IPEC survey

To analyze the effects of confidence on private consumption, we use data from the consumer confidence index, IPEC.[6] The IPEC survey consults about 1,100 people about their perceptions of current and expected, personal and nationwide, economic situation. We focus on three such questions and compute confidence indicators following the same procedure we used to generate business confidence indicators from the IMCE survey. We list these questions in table 2. Questions 1) and 2) relate to the respondent's current and future economic situation, respectively, whereas number 3) relates to her perception of the national economic situation.

The bottom left graph in figure 1 presents the three measures of consumer confidence. Remarkably, consumers perceive their current situation consistently worse than the national economic situation, and below the neutral level. However, when asked about their future situation, consumers are generally optimistic, even during periods of economic downturns, such as 2009.

For the sake of comparability, it would be desirable to compute uncertainty indicators from the dispersion in the IMCE responses. However, we did not have access to the microdata that was needed.

Economic uncertainty index

We complement our set of confidence and uncertainty indicators with the Economic Uncertainty Index (EUI), developed by Cerda et al. (2018), and made available on a monthly basis by Clapes UC[7]. This is a news-based index, which aims to capture the overall uncertainty in the Chilean economy. Relying on this indicator, they study the effects of uncertainty shocks on the Chilean activity.

The bottom right graph in figure 1 shows the economic uncertainty index alongside business uncertainty about the future. For the sake of comparison,

6 IPEC: Índice de Percepción de la Economía. The IPEC is currently collected by GfK Adimark (a private company) and comissioned by the Central Bank of Chile. It is available on a monthly basis since 2002.

7 Índice de Incertidumbre Económica. Available at https://clapesuc.cl/indicador/indice-de-incertidumbre-economica-iiec/

we standardize both indicators in this graph. It stands out a high correlation, between both uncertainty measures, even though both have constructed from completely different methodological procedures.

2. Cyclicality of confidence and uncertainty measures

In this sub-section, we seek to document the empirical relationships between our expectation variables and cyclical measures of activity. In the first set of results, we look at pairwise cross-correlations between lags and leads of each variable. In the second, we perform Granger causality tests to assess whether our synthetic confidence indicators are useful for forecasting private expenditures and activity in general.

Cross-correlograms with activity variables

In table 2 we present the cross-correlations between lags and leads of investment and consumption with the confidence and uncertainty indicators. Negative numbers in the horizontal axis indicate the activity is leading confidence/uncertainty; conversely, positive numbers indicate that confidence/uncertainty is leading activity. Round markers indicate when the correlations are statistically significant at a 1% level.

We compare business confidence with investment in the top-left graph and consumer confidence with private consumption in the top-right[8]. In general, the highest—and statistically significant—correlations are obtained with leads of the confidence indicators. In this sense, these results suggest that confidence might lead investment and consumption. Investment growth correlates the most with confidence about the future situation, when confidence is leading by two quarters, and the correlation is statistically significant until six quarters. Likewise, consumption growth highly correlates with confidence regarding the personal future situation. This correlation peaks when confidence is leading by three quarters. Overall, these results are in line with the findings of Figueroa and Pedersen (2019), who examine the correlations between the IMCE and IPEC questions with GDP by sectors.

In addition, we observe an interesting relationship between consumption and present personal confidence: it is significantly positive when both are approximately contemporaneous, and significantly negative for long-range leads of present confidence. This pattern might indicate that consumers react to transitory income shocks: in the short term, they feel more confident and consume more, while in the long term, when the shock has dissipated, they must adjust their expenditure to their previous level of income.

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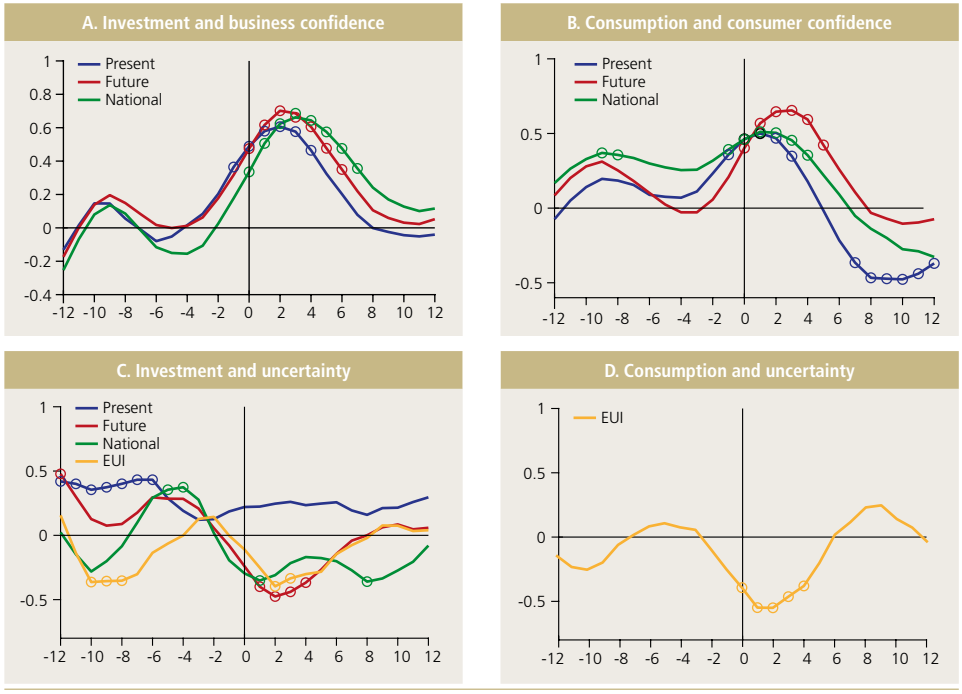
8 In this exercise, both investment and consumption are expressed in real year-on-year growth. All correlations are computed in quarterly frequency.

The bottom-left and bottom-right graphs of figure 2 present the same set of results for uncertainty indicators. In this case, the evidence is heterogeneous. For investment growth, the most negative correlations are observed when future uncertainty is leading activity, which is consistent with the empirical literature on the effects of uncertainty on investment decisions (e.g. Bloom et al. (2007); Bloom (2009)). Similar results are observed when we measure uncertainty using the EUI. However, when we look at the correlations with uncertainty about the future and the nationwide situation, the pattern is less clear or harder to interpret. It is possible that the indicator of uncertainty about the present situation is more a measure of current disparity among firms, and thus need not to be correlated with activity. Finally, the bottom-right graph shows that EUI is a good leading indicator of private consumption. For example, if the EUI diminishes, then consumption tends to be higher.

Figure 2

Cross-correlograms between activity and confidence and uncertainty indicators



Source: Authors' calculations.

Notes: Negative (positive) numbers on the horizontal axis imply that activity (confidence/uncertainty) is leading confidence/uncertainty (activity). A round marker indicates that the correlation is statistically significant when applying a 1% significance level.

3. Granger causality tests

To further explore how informative are synthetic confidence and uncertainty indicators to anticipate activity, we present evidence from Granger causality tests. As activity measures, we use total investment and two of its sub-aggregates: equipment and machinery and construction and infrastructure; private consumption and two of its sub-aggregates: durables and non-durables; and four lines of value-added GDP: manufacturing, construction, retail and financial and business services. We chose these sectors of GDP because they correlate the most with investment and consumption.

Table 3 presents *p*-values for the null hypothesis that confidence/uncertainty indicators do not Granger cause activity variables. Overall, business confidence indicators are useful to anticipate investment, consumption, and up to four lines of value-added GDP; consumer confidence indicators help anticipate consumption and two lines of GDP. Nevertheless, we cannot reject the null hypothesis that uncertainty indicators do not Granger cause activity variables.

A close look shows that confidence about the future robustly anticipates investment, consumption and GDP variables, with the only exception of durable-goods consumption, which does not pass the test at conventional confidence level of 5% (but do pass it at 10%). Also, entrepreneurs' confidence about the national economic situation has a reasonably good predictive power on activity, except for the value-added of construction. Therefore, these findings suggest that questions about the future and the national economic situation convey similar information. This is not surprising since confidence indicators capture a mix of judgments on past, current and expected economic developments. Finally, entrepreneurs' confidence in the present situation Granger causes investment and the added value of manufacturing, construction, and retail.

Consumer confidence indicators tend to be good predictors for consumption and the value-added of the manufacturing and retail sectors. It is also worth noticing that consumer indicators do not Granger cause investment expenditure variables.

Business uncertainty measures associated with the present and the national situation do not Granger cause consumption nor investment. However, there is evidence (at the confidence level of 5%) that uncertainty about the future does Granger cause total investment, its machinery and equipment component, as well as the value-added of manufacturing and financial and business services. For consumption and other lines of value-added, there is no systematic relationship of causation.

Finally, the economic uncertainty index seems to Granger cause private consumption and non-durable consumption, whereas we cannot reject no-causation for investment and value-added sectors.

Table 3

Granger causality in vars of pairs of variables (*p*-values)

H_0: Confidence indicators do not Granger cause activity variables

Rows Granger cause columns	Investment (GFCF)			Private consumption			GDP (1-digit sector)			
	Total	Equipment & machinery	Construction & infrastructure	Total	Non-durables	Durables	Manufacturing	Construction	Retail	Financial & business services
A. Business confidence										
Present	**0.006***	0.022	**0.002***	0.482	0.238	0.585	**0.009***	0.020	0.038	0.143
Future	**0.000***	**0.002***	**0.006***	**0.002***	**0.001***	0.058	**0.000***	**0.006***	**0.004***	**0.004***
National	**0.003***	**0.002***	0.036	**0.004***	**0.002***	0.079	**0.006***	0.251	0.016	**0.006***
B. Consumer confidence										
Present	0.204	0.656	0.106	**0.001***	**0.001***	0.318	0.016	0.321	0.055	0.398
Future	0.564	0.519	0.070	**0.003***	**0.001***	**0.004***	**0.005***	0.075	**0.010***	0.120
National	0.132	0.255	0.083	**0.002***	**0.003***	0.028	**0.009***	0.164	**0.007***	0.205
C. Business uncertainty										
Present	0.365	0.221	0.239	0.277	0.163	0.987	0.851	0.321	0.579	0.053
Future	0.013	0.042	0.347	0.110	0.058	0.230	**0.003***	0.593	0.092	0.039
National	0.419	0.622	0.882	0.021	0.833	0.945	0.918	0.875	0.880	0.128
D. Economic uncertainty										
EUI	0.272	0.343	0.749	0.044	0.029	0.125	0.105	0.606	0.223	0.419

Source: Authors' calculations.

Notes: *p*-values for the null hypothesis of no Granger causality tested in bivariate VAR models with the number of lags selected according to the Schwarz information criteria. Bold numbers indicate rejection of the null when applying a 1% significance level. Activity variables are expressed in real year-on-year growth.

In table 4 we provide evidence in the other direction of causality, namely we test the null hypothesis that activity measures do not Granger cause confidence indicators. Overall, these results do not support reverse causation.

Table 4

Granger causality in vars of pairs of variables (*p*-values)

H_0: Activity variables do not cause confidence indicators

Rows Granger cause columns	Investment			Private consumption			GDP (1-digit sector)			
	Total	Equipment & machinery	Construction & infrastructure	Total	Non-durables	Durables	Manufacturing	Construction	Retail	Financial & business services
A. Business confidence										
Present	0.059	0.438	**0.005***	0.019	0.022	0.142	0.011	**0.007***	0.184	0.517
Future	0.106	0.331	0.013	0.362	0.257	0.572	0.876	0.028	0.031	0.497
National	0.141	0.324	**0.005***	0.118	0.069	0.379	**0.001***	0.011	0.062	0.175
B. Consumer confidence										
Present	0.161	0.943	0.655	0.058	0.040	0.607	0.167	0.763	0.464	0.547
Future	0.039	0.038	0.525	0.124	0.080	0.217	0.585	0.338	0.192	0.801
National	0.971	0.740	0.918	0.320	0.340	0.895	0.572	0.701	0.744	0.959
C. Business uncertainty										
Present	0.947	0.773	0.945	0.417	0.324	0.514	0.634	0.955	0.255	0.051
Future	0.623	0.884	0.033	**0.005***	**0.001***	0.050	0.348	0.098	0.059	0.388
National	0.078	0.056	**0.008***	0.022	0.070	0.034	0.340	0.032	0.146	0.774
D. Economic uncertainty index										
EUI	0.308	0.294	0.297	0.243	0.325	0.186	0.341	0.689	0.210	0.919

Source: Authors' calculations.

Notes: See note to table 3.

III. CONFIDENCE, UNCERTAINTY, AND ACTIVITY: DYNAMIC RELATIONSHIP

In this section, we present and discuss our main results. We examine the dynamics and propagation of activity resulting from structural innovations to confidence and uncertainty variables. In the first sub-section, we briefly describe our empirical approach based on structural vector autoregressions. Then, we provide details on the variables and data transformations involved in our analysis. The following two sub-sections present the responses of investment and consumption to confidence and uncertainty shocks. The last sub-section demonstrates two possible applications for our models.

1. Structural VAR approach

To assess the effects of confidence and uncertainty shocks on investment and private consumption, we use a multivariate setting. More precisely, we estimate a structural VAR (SVAR) with external (foreign) activity and financial shocks, and domestic expectations and activity shocks.

To account for Chile's small open economy features, we impose block exogeneity between external and domestic variables[9]. This condition assures that external variables do not respond to domestic shocks, while domestic variables respond to both foreign and domestic shocks. Thus, the SVAR model[10] can be written as follows:

$$\left[y_t^{*\prime} \; y_t^{\prime} \right] \begin{bmatrix} A_{01} & 0 \\ A_{03} & A_{04} \end{bmatrix} = \left[y_{t-l}^{*\prime} \; y_{t-l}^{\prime} \right] \begin{bmatrix} A_{11} & 0 \\ A_{13} & A_{14} \end{bmatrix} + c + \left[\varepsilon_t^{*\prime} \varepsilon_t^{\prime} \right],$$

where the $n \times 1$ vector y_t^* contains the endogenous variables for the external block, the $n \times 1$ vector y_t contains the endogenous variables for the domestic block (i.e., the small open economy), the matrices A_i and the constant vector are structural parameters. The zero blocks in the system reflect the block exogeneity assumption. Finally, the vectors ε_t^* and ε_t are the structural shocks and follow a Gaussian distribution with a mean of zero and variance-covariance matrix I_{n+n^*} (the identity matrix).

For the identification of the structural shocks, we use a Cholesky scheme. This identification scheme creates a recursive contemporaneous ordering among variables, where any variable in the vector $\left[y_t^{*\prime} \; y_t^{\prime} \right]$ does not depend contemporaneously on the variables ordered after. Since it matters for the identification of structural shocks, we will discuss the ordering of the variables in the following sub-sections.

2. Data description and model specifications

External variables

Beginning with external variables that measure the global economic cycle, we consider two principal components and a proxy for the mining investment cycle.[11] We define *pc*1 as the first principal component of a group of global-activity-related variables. This set includes various purchasing manager's index (PMI) measures, that track real activity of both emerging and advanced economies (including the U.S., European countries, China, Brazil, and a global compound) and real commodity prices (copper and oil relative to a trading partner's price index).[12]

Next, we define *pc*2 as the first principal component of a group of global financial variables. This set gathers the Standard and Poor's stock market value index (S&P500), the asset's price volatility (VXO) and sovereign risk premium measures (EMBI) for Europe, Asia, Latin America, and a global average.

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9 The block exogenity assumption in VAR models was first proposed by Zha (1999).

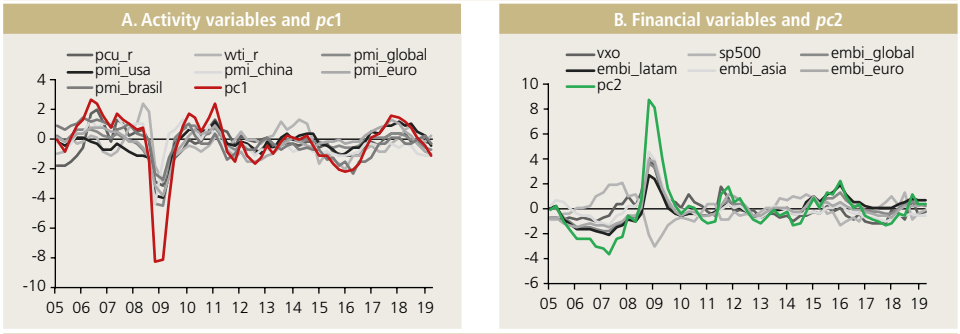
10 Further details on the model and estimation can be found in the appendix.

11 This strategy follows Albagli and Luttini (2015). However, we separate external variables in a subset of real and in another of financial variables. Therefore, we end up with homogeneous variables in each group.

12 PMIs report if business activity is expanding, remaining the same or contracting, according to firms' purchase managers.

Figure 3

Foreign variables and principal components



Source: Authors' calculations using data from Bloomberg and the Central Bank of Chile.

Figure 3 shows the evolution of standardized variables in each group. It is not hard to notice the high correlation between the original variables and the respective principal components. This correlation reflects that a large share of the variance is explained by these principal components: 62% and 76% for *pc*1 and *pc*2, respectively. Thus, we are confident that these two synthetic variables capture a relevant common movement between the whole set of external variables.

We also include in our set of external variables the Australian mining investment, as an exogenous instrument of Chilean mining investment. Our rationale is that the Chilean domestic mining investment cycle is highly correlated with the global mining investment cycle. In turn, this cycle responds to swings in commodity prices and whether investors perceived them as rather transitory or permanent (Fornero and Kirchner, 2018). This assumption is supported by García and Olea (2015), who found that Australia's mining investment behaves well as an instrumental variable for the mining investment cycle in Chile in the last decades.

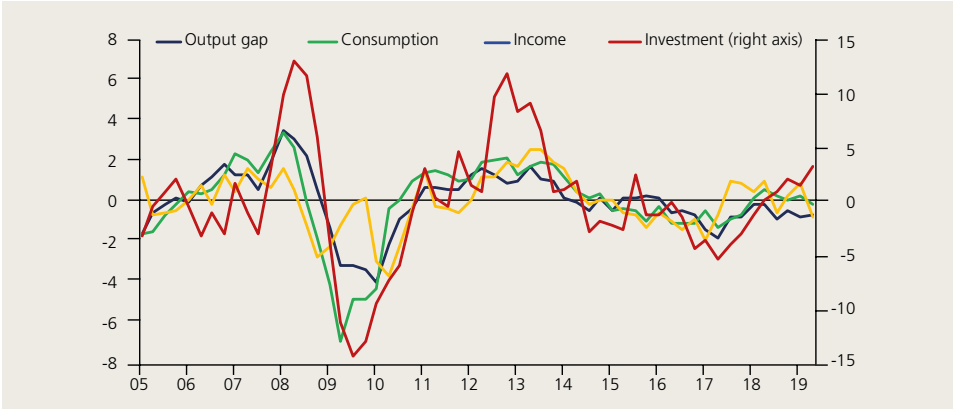
Domestic variables

As domestic macroeconomic variables we include the output gap, real investment, real private consumption, and the real wage bill as a measure of aggregate real income (income, for short). All variables are expressed in logarithms and de-trended with the HP filter (Hodrick and Prescott, 1997). We present the resulting cyclical components in figure 4.

Figure 4

Output gap, private consumption, wage bill and investment

(cycle, %)



Source: Central Bank of Chile.

Model specifications

We estimate two specifications of the SVAR model outlined in section III.2: one for the analysis of investment, and another for consumption. This strategy allows us to better describe the dynamics of each demand component, while avoiding estimating a too large number of parameters.

Both models include seven variables. The SVAR with investment includes *pc*1, *pc*2, and mining investment in the external block. The domestic block considers business confidence, business uncertainty, the output gap, and investment. As measures of business confidence and uncertainty, we use the *future* indicators presented in section II.

The SVAR with consumption also includes *pc*1 and *pc*2 in the external block, while the domestic block consists of consumers confidence, economic uncertainty, the output gap, income, and private consumption. As a measure of consumers confidence, we use the *present* presented in section II, as it led to the highest explanatory performance in our multivariate setting. Since we do not have a consumer-specific uncertainty indicator, we use the economic uncertainty index, which we found to be a relatively good predictor of consumption (cf. sub-section II.1).

The order we used to enounce the variables in the two previous paragraphs is the same ordering we establish in the models. That is, external variables go first, domestic expectational variables (confidence and uncertainty) go second, and domestic activity variables go third. Our decision to place confidence and uncertainty *before* activity is based on the evidence we found in section II (cross-correlograms and Granger causality tests). However, as a robustness check, we

also estimate versions of the models where activity variables precede confidence and uncertainty indicators.[13]

Both models were estimated using quarterly data in the sample period 2005.I-2019.II due to data availability. This sample period offers several methodological advantages: we identify no structural breaks, the macroeconomic framework comprehends an inflation-targeting regime, exchange rate flexibility, an independent central bank, and a fiscal policy that follows a fiscal rule.

Both VAR models are of order one for two reasons. On the one hand, our sample contains 62 observations, while each model includes seven variables. Hence, the number of parameters of a second-order VAR would exceed the number of observations. On the other hand, both Schwarz's and Hannan-Quinn's information criteria support the selection of models with just one lag.

3. Empirical results

In this sub-section, we focus on the effects of two structural shocks: (a) A *confidence shock* that exogenously boosts confidence indicators; and (b) An *uncertainty shock* that exogenously increases the uncertainty index. We present the median response of investment and private consumption after structural shocks of size one-standard-deviation hit the economy.[14]

Empirical results for investment

Figure 5 shows the impulse-response functions of investment after confidence and uncertainty shocks. The graph on the left presents the response to the confidence shock. During the first two quarters following the shock, investment increases by 0.5% over its trend level; in the midrun, this shock has a relatively persistent effect that lasts about 12 quarters. Finally, in the long run, investment returns to its trend level.

The graph on the right shows the response to an uncertainty shock. One quarter immediately after the shock, investment falls by 0.8%, then it returns to its trend level after eight quarters. Overall, these results are consistent the international empirical evidence on the effects of uncertainty shocks (Bloom et al., 2007; Bloom, 2009) and with the 'wait-and-see' hypothesis, according to which higher uncertainty causes firms to temporarily pause investment, which in turn causes a rapid drop and rebound.

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13 Since our measures of confidence and uncertainty correlate, our dynamic methodological approach controls for endogeneity as structural shocks are identified by imposing timing restrictions. Our baseline scheme assumes that uncertainty shocks do not affect confidence contemporaneously, but confidence shocks do affect uncertainty on impact. Alternative schemes, where this relation is reversed, and where one of these variables is taken out, yield similar results.

14 Median responses and standard error bands were estimated following a bootstrap procedure with 1,000 simulations.

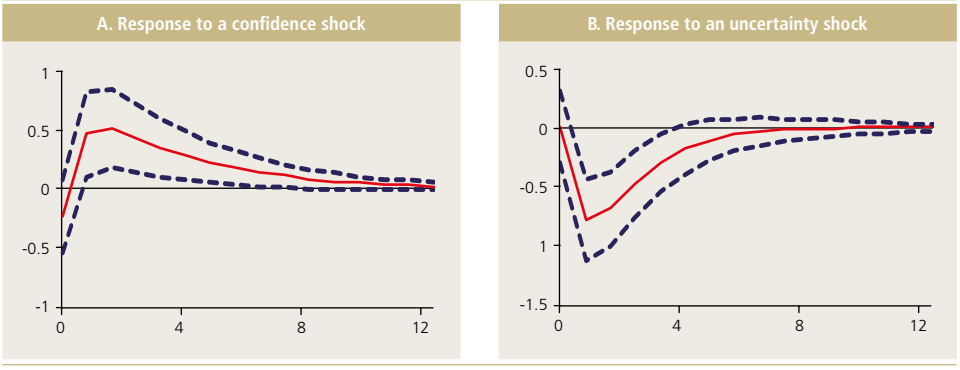
Our estimation of the response to an uncertainty shock is similar in shape and duration to Cerda et al. (2018)'s, who use a similar empirical framework. However, they find a much larger response of investment, of about -2.5% at its peak. Such a difference might come from the use of a different uncertainty measure, a different transformation to measure the cycle (they use real variables in year-to-year growth in comparison with us that define investment cycle), and/or the inclusion of other variables in the model.

Some comments on the findings. First, we notice that investment does not respond immediately to confidence and uncertainty shocks: on impact, the responses are close to zero, while as time passes the propagation yields non-zero effects. It is not trivial that the immediate impact is zero, since our specification allows all shocks to have a contemporary effect over investment. Second, these results are robust to the ordering of the variables; we find similar results when we impose that activity variables are not contemporaneously affected by confidence and uncertainty shocks (see appendix). Third, confidence shocks, in comparison with uncertainty shocks, have a more persistent, though less pronounced, effect on investment. This finding is consistent with the evidence that first-moment productivity shocks have persistent cyclical effects, while second-moment shocks have only temporary effects (Bloom, 2009).

What are the effects of these shocks on confidence and uncertainty indicators? After a one-standard-deviation confidence shock, the confidence indicator undergoes a steep increase of 9.4 points, which rapidly dissipates after four quarters. Business uncertainty decreases by 1.2 points on impact and quickly returns to its previous level. On the other hand, following an uncertainty shock, business uncertainty rises by 1.8 points and then returns to its original level after eight quarters. Confidence does not react by a significant magnitude.

Figure 5

Responses of investment to confidence and uncertainty shocks



Source: Authors' calculations.
Notes: Responses of investment to one-standard-deviation shocks. Dashed lines indicate one-standard-error confidence bands.

Empirical results for private consumption

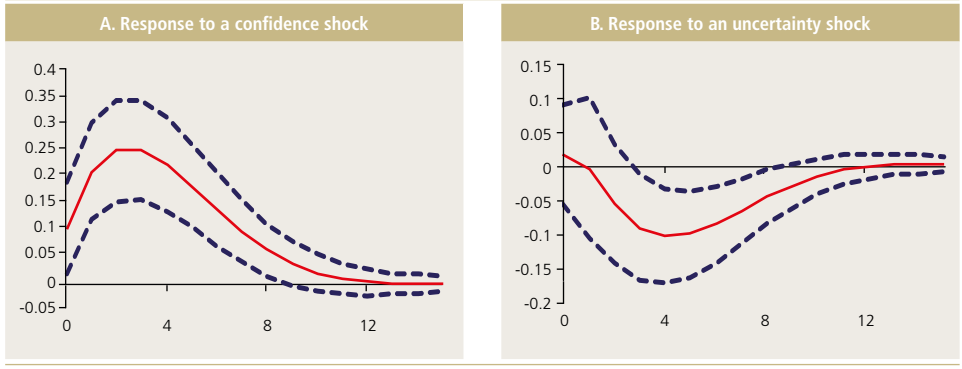
Now we discuss the effects of confidence and uncertainty shocks on consumption. The left graph in figure 6 shows the response of private consumption to a confidence shock. Unlike investment, consumption does react on impact, with a median response of 0.1%. This response is sustained for two years after the shock, after which consumption returns to its trend level. The maximum response is only about 0.25%, half of the effect we found for investment.

The graph on the right presents the response to an uncertainty shock. We find that uncertainty shocks have an almost negligible effect on consumption: the most significant deviation from the trend level is only around -0.1%, by the first year after the shock. Moreover, this response is not statistically significant in most quarters. In contrast, Cerda et al. (2018) report larger effects, with a peak response of consumption around -0.6%.

What are the effects of these shocks on confidence and uncertainty indicators? After a consumer confidence shock, the confidence indicator rises by 3.0 points on impact and then gradually returns to the neutral level after 12 quarters. Economic uncertainty falls by 2 points and quickly reverses. In turn, following an uncertainty shock, economic uncertainty jumps 18.8 points and returns to its starting level after eight quarters. Consumer confidence exhibits a mild decrease of 1 point that lasts two years.

Figure 6

Response of private consumption to confidence and uncertainty shocks



Source: Authors' calculations.
Notes: Responses of private consumption to one-standard-deviation shocks. Dashed lines indicate one-standard-error confidence bands.

4. Applications for policy analysis

In this sub-section, we present two examples that demonstrate how our model can be useful for policy analysis. First, we look at the historical shock decompositions of consumption and investment to understand the determinants of recent demand fluctuations through the lens of the models. From this exercise, we conclude that external shocks might have a key role in explaining the Chilean business cycle, while the role of confidence and uncertainty shocks would be secondary. Second, we examine the responses of demand variables to external shocks (structural innovations to *pc*1 and *pc*2) and analyze how these might help in assessing the effects of global economic developments, such as the recent trade conflict between the United States and China.

Studying cyclical fluctuations of consumption and investment

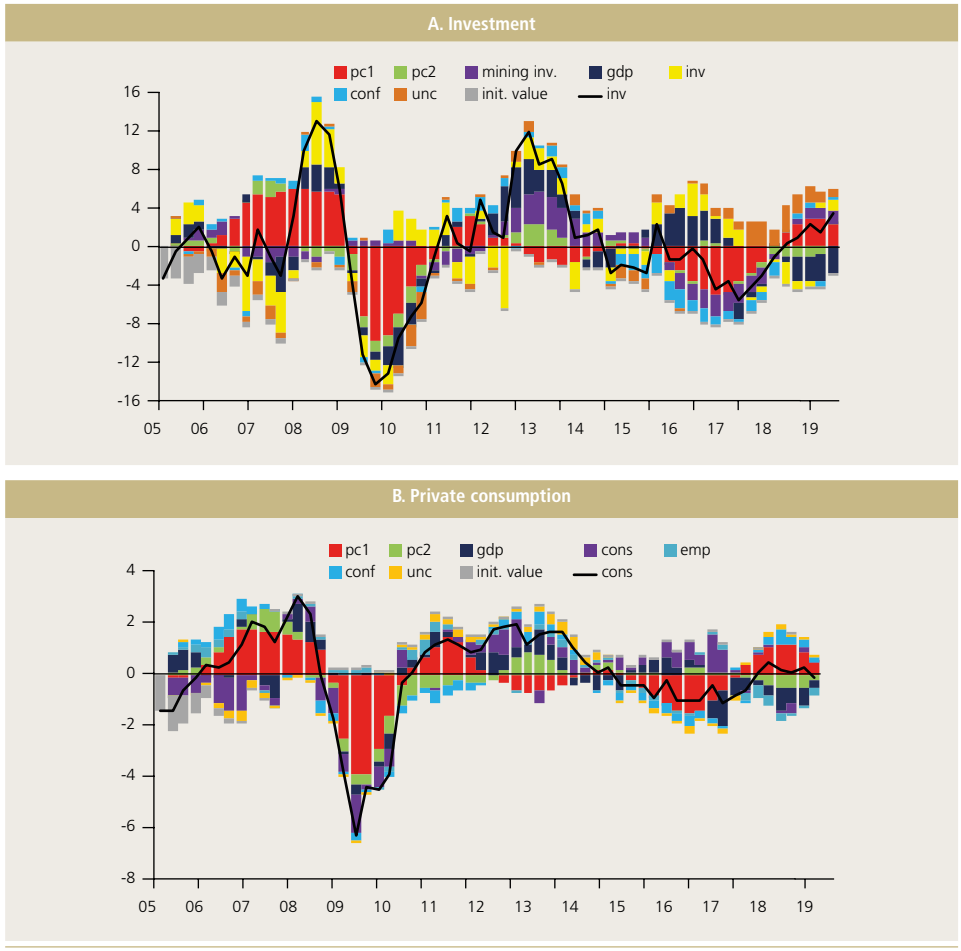
Figure 7 presents the historical shock decompositions derived from our SVAR models. These decompositions represent the contribution of each structural shock to the cyclical stance of the endogenous variables at any given time. We also compute these contributions as a share of the cyclical stance for the whole sample, and for five periods, which we present in table 5. We defined these periods according to the sign of cyclical investment and consumption.

The graph on the top of figure 7 shows the decomposition of investment. First, we notice that external shocks explain the lion's share of cyclical variation, and the main contributors are activity shocks (pc1), which explain approximately 40%. Mining investment shocks present significant contributions in two episodes: the boom of 2013 and the slowdown observed between 2014 and 2017, where it explains about one third of the investment cycle. Domestic shocks have contributed approximately 40% to cyclical fluctuations. In particular, confidence and uncertainty shocks have played a secondary role, with only 20% of the total contribution. However, we observe that confidence shocks explain an important share of the slowdown in investment seen in 2014-17 (approximately 38%).

The graph on the botton shows the historical shock decomposition of private consumption. As investment, consumption is mainly explained by external shocks, which amount to 66% of the total cyclical stance. The contributions of confidence and uncertainty shocks are almost always procyclical, but they only explain about 16% in the whole sample.

Figure 7

Historical shock decompositions of investment and consumption



Source: Authors' calculations.

Notes: This figure presents the contribution of structural shocks to cyclical investment and consumption. Abbreviations: confidence (conf), uncertainty (unc), output gap (gdp), investment (inv), consumption (cons) and income (inc).

Assessing the effects of a decline in world activity

The previous sub-section, we showed that external shocks have had a major role in driving business cycle fluctuations in Chile. In this sub-section, we examine more carefully the effects of an external activity shock and discuss what these results tell us about the possible impacts of a global economic slowdown on the Chilean economy.

Figure 8 presents the responses to a negative one-standard-deviation external activity shock. This shock decreases *pc*1 by 1.3 points on impact and has a persistent effect for about 12 quarters. The size of this shock is consistent with the recent evolution of external activity variables, in the context of the trade conflict between the U.S. and China.[15]

The graph on the top-left and top-right show the responses of business confidence and investment, respectively. There is a significant fall in business confidence, of approximately four points, presumably, because entrepreneurs anticipate a weaker demand. This effect lasts about seven quarters. At the same time, we see a significant and persistent fall in investment, which peaks at -2% after the first year. At least two mechanisms could explain this reaction. First, a trade channel, according to which investment decreases because it is more expensive to import inputs such as equipment and machinery. And second, an expectations channel: entrepreneurs might become more pessimistic and uncertain about future demand, so they either adopt a wait-and-see strategy or stop projects right away.

Table 5

Contributions of structural shocks to cyclical activity

A. Contributions to cyclical investment (%)

Period	*pc*1	*pc*2	mining inv.	conf	unc	gdp	inv
2007.III-2008.IV	49	**-8**	-2	**2**	0	22	38
2009.I-2010.IV	59	13	-3	-1	13	16	-4
2011.I-2014.II	-10	13	34	**16**	7	34	7
2014.III-2018.I	76	3	34	38	-17	-29	-6
2018.II-2019.II	144	-49	50	**16**	105	-142	-24
2005.I-2019.II	**38**	**4**	**15**	**11**	**8**	**9**	**12**

B. Contributions to cyclical consumption (%)

Period	*pc*1	*pc*2	conf	unc	gdp	cons	inc
2006.I-2008.III	84	24	18	-12	3	-18	7
2008.IV-2010.III	63	11	5	0	4	17	0
2010.IV-2014.IV	12	7	0	18	23	25	14
2015.I-2017.IV	99	-14	32	18	21	-68	11
2018.I-2019.II	371	-156	107	62	-196	-13	-75
2005.I-2019.II	**60**	**6**	**10**	**6**	**5**	**4**	**5**

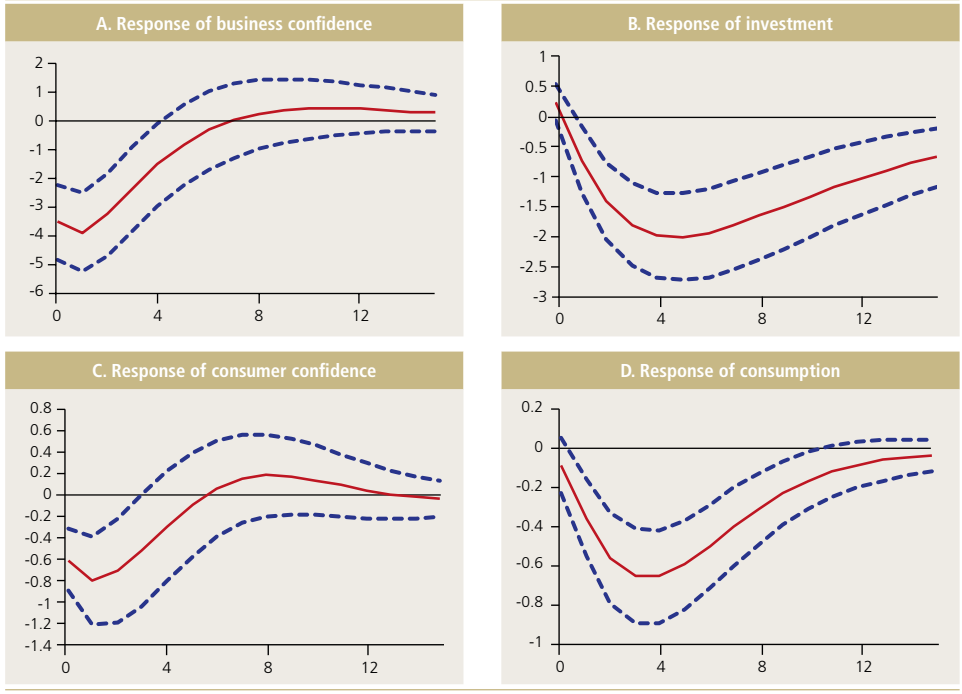
Source: Authors' calculations.

Notes: This table presents the contribution of each shock as a share of the cyclical stance of investment and consumption. A negative value indicates that the shock contributed in the opposite direction during the respective period. The whole sample was divided into five periods were the cyclical investment and consumption change signs. Abbreviations: confidence (conf), uncertainty (unc), output gap (gdp), investment (inv), consumption (cons) and income (inc).

15 *Specifically, between 2018.IV and 2019.II, pc1 has a cumulated decrease of 1.2 points.*

Figure 8

Responses of investment, consumption and confidence to an external activity shock



Source: Authors' calculations.

Notes: Negative (positive) numbers on the horizontal axis imply that activity (confidence/uncertainty) is leading confidence/uncertainty (activity). A round marker indicates that the correlation is statistically significant when applying a 1% significance level.

The bottom-left and bottom-right graphs present the responses of consumer confidence and private consumption. Consumer confidence exhibits a moderate fall of approximately 1.5 points, which reverts after five quarters. In turn, private consumption does not react immediately after the shock. We observe a decrease of 0.7% three quarters after the shock.

IV. CONCLUDING REMARKS

We have studied the effects of expectation shocks on aggregate private consumption and investment in Chile. We used microdata from the business climate survey IMCE and the consumer confidence survey IPEC to construct measures of confidence and uncertainty.

A bivariate analysis showed that these measures are useful for predicting activity up to six quarters ahead. Specifically, Granger causality tests showed that confidence might lead investment and consumption. Investment growth correlates the most with confidence about the future situation, when confidence

is leading by two quarters, and the correlation is statistically significant until six quarters. Likewise, consumption growth correlates the most with confidence in the personal future situation.

Then, using an open-economy SVAR approach, we identified confidence (first moment) and uncertainty (second moment) shocks. After a confidence shock, investment does not react on impact, but it exhibits a positive and persistent response in the 12 quarters following the shock. Private consumption shows a positive response on impact and returns to its trend level 8 quarters later. Uncertainty shocks generate a rapid slow-down and bounce-back in investment. Private consumption, instead, shows a weak negative response in the medium term.

REFERENCES

Albagli, E. and E. Luttini (2015). *Confianza, Incertidumbre e Inversión en Chile: Evidencia Macro y Micro de la Encuesta IMCE*, Central Bank of Chile.

Bachmann R., S. Elstner and E. Sims (2013): *"*Uncertainty and Economic Activity: Evidence from Business Survey Data.*"* *American Economic Journal: Macroeconomics* 5(2): 217–49.

Bloom, N., S. Bond and J. Van Reenen (2007). "Uncertainty and Investment Dynamics." *Review of economic studies* 74(2): 391-415.

Bloom, N. (2009). "The Impact of Uncertainty Shocks." *Econometrica* 77(3): 623–85.

Cerda, R., Á. Silva and J.T. Valente (2018). "Impact of Economic Uncertainty in a Small Open Economy: The Case of Chile." *Applied Economics* 50(26): 2894–908.

Chanut, M. and C. Medel (2018). "Can Economic Perception Surveys Improve Macroeconomic Forecasting in Chile?" Working Paper No. 824, Central Bank of Chile.

Figueroa, C. and M. Pedersen (2019). "Extracting Information of the Economic Activity from Business and Consumer Surveys in an Emerging Economy (Chile)." Working Paper No. 832, Central Bank of Chile.

Fornero, J. and M. Kirchner (2018). "Learning about Commodity Cycles and Saving-Investment Dynamics in a Commodity-Exporting Economy." *International Journal of Central Banking* 14(2): 205–62.

García, P. and S. Olea (2015). *"Inversión Minera y Ajuste Macroeconómico en Australia y Chile."* Documento de Política Económica No. 56, Central Bank of Chile.

Hodrick, R. y E. Prescott (1997). "Postwar U.S. Business Cycles: An Empirical Investigation." *Journal of Money, Credit and Banking*, 29(1): 1–16.

Keynes, J.M. (1936). *The General Theory of Employment, Interest and Money*. New York, NY. Reprint 1964.

Lütkepohl, H. (2011). "Vector Autoregresssive Models." In: *Handbook of Research Methods and Applications in Empirical Macroeconomics*, edited by N. Hashimzade and M.A. Thornton. Cheltenham, U.K.: Edward Elgar Publishing.

Nowzohour, L. and L. Stracca (2017). "More Than a Feeling: Confidence, Uncertainty and Macroeconomic Fluctuations." Working Paper No. 2100, European Central Bank.

Zha, T. (1999). "Block Recursion and Structural Vector Autoregressions." *Journal of Econometrics* 90 (2): 291–316.

APPENDIX

DETAILS ON THE SVAR MODEL

The SVAR model can be written as follows:

$$\left[y_t^{*\prime} y_t'\right]\begin{bmatrix} A_{01} & 0 \\ A_{03} & A_{04} \end{bmatrix} = \sum_{l=1}^{p}\left[y_{t-l}^{*\prime} y_{t-l}'\right]\begin{bmatrix} A_{l1} & 0 \\ A_{l3} & A_{l4} \end{bmatrix} + c + \left[\varepsilon_t^{*\prime} \varepsilon_t'\right],$$

where the $n^* \times 1$ vector y_t^* contains the endogenous variables for the external block, whereas the $n^* \times 1$ vector y_t contains the endogenous variables for the domestic block (i.e. the small open economy). The A_i matrices and the constant vector c are structural parameters, and p denotes the number of lags of the model. The zero blocks in the system reflect the block exogeneity assumption. Finally, the vectors ε_t^* and ε_t are the structural shocks and follow a Gaussian distribution with a mean of zero and variance-covariance matrix I_{n+n^*} (the identity matrix). The structural model may be written in compact form as:

$$Y_t' A_0 = X_t' A_+ + \xi_t'$$

by writing $Y_t' = \left[y_t^{*\prime} y_t'\right]$, $X_t' = \left[Y'_{t-1} \ldots Y'_{t-p} 1\right]$, $A_+ = [A_1' \; A_2' \ldots A_p' \; c']$. The reduced-form VAR is defined as:

$$Y_t' = X_t' B + u_t'.$$

where $B = A_+ A_0^{-1}$, $u_t' = \xi_t' A_0^{-1}$ y $E[u_t u_t'] = \Sigma = \left(A_0 A_0'\right)^{-1}$. The reduced-form parameters B and Σ are obtained by OLS estimation of equation (2) and then an identification scheme must be adopted in order to identify the structural form (1).

Several alternative methods are at hand for the identification of structural VAR models. In this work we will use a recursive identification scheme. We suppose that the variables in the vector Y_t are ordered from the most exogenous to the most endogenous. The structural parameters can be obtained by Cholesky factorization of Σ.

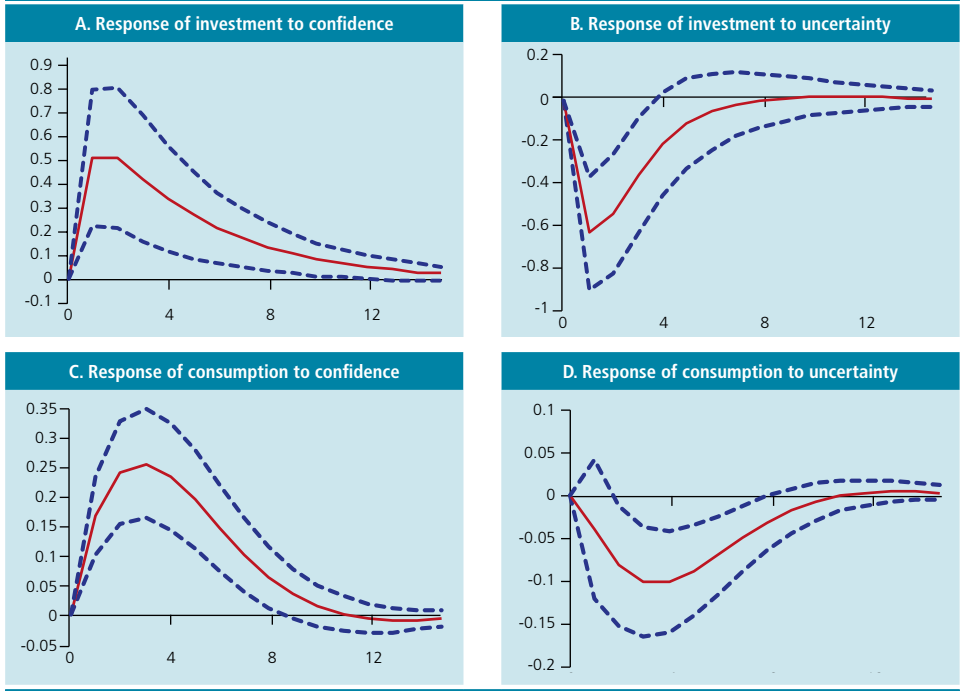
Robustness checks

Order of the variables in the VAR

In figure A1 we replicate the results of sub-section III.3. using an alternative ordering for the variables. In the investment SVAR the ordering of the variables is the following: *pc*1, *pc*2, mining investment, output gap, investment, confidence and uncertainty. In the consumption SVAR we use the following ordering: *pc*1, *pc*2, output gap, income, consumption, confidence and uncertainty. Hence, our results are virtually equivalent to those exposed in the main section.

Figure A1

Responses of investment and consumption to confidence uncertainty shocks



Source: Authors' calculations.

Notes: Responses of investment and private consumption to one-standard-deviation shocks. Dashed lines indicate one-standard-error confidence bands.

CAN ECONOMIC PERCEPTION SURVEYS IMPROVE MACROECONOMIC FORECASTING IN CHILE?*

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I. INTRODUCTION AND BACKGROUND

As in many countries across the world, several economic and statistics institutions in Chile conduct surveys aimed at capturing in near real time the state of the economy and the expectations of its agents. Typically, out of these surveys, one or two synthetic indicators are constructed, to be followed by policymakers and market observers. However, these synthetic indicators may not always reflect a tangible economic expectation or sentiment as they may blend, for instance, expectations about the state of the country's economy in five years' time with the variation of a household's income over the past year. In addition, many short-term forecasting models do not include most of such synthetic indicators because of their alleged lack of explanatory power.[1]

It is important to distinguish between "hard" use, referring to the use of survey indicators in econometric forecasting models, and "soft" use, understood as the use of survey indicators as a way to monitor the economy, along with many other indicators, and for consistency checking model-based projections. Qualitative survey data are mainly used for conjunctural assessment, nowcasting, and short-term forecasting. In order to nowcast and forecast GDP at shorter horizons, many practitioners use three different kinds of models: mixed data sampling models (MIDAS; Ghysels et al., 2007), Bayesian Vector Autoregressions (BVAR; Karlsson, 2013), and *bridge models* (Baffigi et al., 2004).

The use of survey-based expectations for modelling purposes is not a widespread practice among central banks. For instance, the *European Central Bank* (ECB) does not appear to use qualitative, survey-based expectation measures in its

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1 *For the particular case of Chile, see Aguirre and Céspedes (2004) for an example with multivariate dynamic factors, González (2012) using a large-scale Bayesian VAR, González and Rubio (2013) using shrinkage estimators, and Cobb et al. (2011) with bridge models. Some exceptions are Calvo and Ricaurte (2012) making use of one particular question of a survey and, more recently, Riquelme and Riveros (2018) using disaggregated survey indicators to build a coincident indicator of total monthly economic activity.*

models, like the *New Area Wide Model*.[2] However, the ECB regularly mentions the *Business and Consumer Survey*, the *Consensus Economics* surveys and the *Purchasing Managers Surveys* in their monthly reports.

The aim of this document is threefold: i) to assess the quality of the data gathered by the main Chilean qualitative public opinion surveys, ii) to review how they are currently built, and iii) to determine whether differently constructed alternative measures can improve the short-term forecast of macroeconomic variables (i.e. consumption, employment, and investment) when used in conjunction with traditional forecasting statistical models. We also analyze the extent to which action indicators reflect actual investment, hiring, and consumption decisions made by the respondents, an exercise driven by data availability.

It should be noted that, to achieve the goal of capturing the state of the economy, surveys can ask *qualitative* or *quantitative* questions (e.g. "Do you think the state of the economy has improved, stayed the same, or deteriorated over the last year?" versus "What do you think will be the year-on-year rate of CPI inflation for this quarter?"). It is generally believed that qualitative questions, while less precise, are better understood by a non-expert audience and thus better reflect their true sentiment, as opposed to a random guess.

This paper is focused on qualitative surveys only. We are referring to *economic perception or sentiment* indicators, rather than expectations, forecasts, or uncertainty. The Cambridge Dictionary defines sentiment as "a thought, opinion, or idea based on a feeling about a situation, or a way of thinking about something." When applied to economics jargon, this must be understood as economic agents' opinion on future relevant economic developments that may be influenced with actions today; similar to the definition used in Nowzohour and Stracca (2017). This is different to an *economic expectation*, in which agents state their most expected value on a particular targeted variable (e.g. inflation expectation).[3] Moreover, as expectations target a variable, no clear statement is required on the way that value could be achieved; rather it is obtained as the most probable value that a variable could take in the future. As so, the expectation could be computed as the probability-weighted set of *forecasts*. Finally, *economic uncertainty* indicators could be easily understood as the dispersion of those forecasts comprising an expectation.[4]

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2 Instead, such dynamic stochastic general equilibrium models are rather used for long-term forecasting.

3 Note that central banks also run surveys with quantitative questions on future values of key indicators like Chile's Economic Expectations Survey (EEE) and Financial Brokers Survey (EOF).

4 Another related indicator is the Purchasing Managers' Index (PMI). The PMI is a manufacturing-sector indicator based on a survey applied to companies' decision makers, analysts, and purchasing managers, comprising new orders, inventory levels, production, supplier deliveries, and the employment level. As mentioned above, the PMI is not related to an economic sentiment indicator. As will be reviewed later, the PMI measures a subset of the indicators used in this article; also sharing the criticism of putting together information that may be useful at a disaggregate level.

We try to overcome the limitations of the existing synthetic indicators by suggesting eight alternative measures that draw from subsets of questions included in the surveys. In particular, we distinguish between *current sentiment* and *future expectations* as well as between *personal* and *country-wide* measures.

The results suggest that there is not a strong relation between *personal* and *country-wide* alternative indicators, and indicators about the future consistently seem to lead corresponding current-situation indicators. In addition, a Granger causality analysis across surveys does not bring significant results, meaning that indicators are more often than not independently constructed. Hence, for the same economic phenomena, different appraisals are obtained depending on the consulted survey. This is analyzed in terms of survey representativeness and other dimensions.

Also, a multistep out-of-sample exercise is conducted to compare the predictive gains of using the newly proposed measures versus the existing indicators. In particular, we forecast *private consumption*, plus its two components (*non-durable* and *durable*), making use of the measures constructed using consumer expectations surveys, and compare them to the existing indicator and the no-indicator-augmentation cases. Similarly, we forecast investment (*gross fixed capital formation*, *machinery and equipment*, and *construction and works*) making use of the measures from business surveys. Finally, a similar exercise for *total employment* is also conducted.

Our predictive results reveal the usefulness of our proposed alternative measures. This is mostly shown for the case of total and non-durable consumption, particularly at the larger horizons considered, using the *country-wide current* measure and the *personal future* measure, where major and significant predictive gains are noticed. Regarding investment, predictive gains—yet non-significant—are found with the existing synthetic aggregate indicator for total investment and its two components; a secondary role is found for the *overall* (*country* and *personal*) *current sentiment* measure when forecasting *aggregate investment* and *construction and works* at longer horizons. Hence, business surveys do not necessarily describe the investment dynamics within our general econometric framework. We also find that, in general, hiring plans and investment actions are caused mainly by the country's future situation indicator. In turn, the actions cause, in general, personal situation indicators at both current and future horizons.

The remainder of the article proceeds as follows. Section 2 gives an overview of the different Chilean public opinion surveys and analyzes in more depth five of them. Section 3 constructs and analyzes new alternative measures from the five mentioned surveys. In section 4, an empirical exercise is conducted, aimed at identifying the forecasting power of newly proposed alternative measures as well as the extent to which macroaggregates are related to action indicators. Section 5 concludes and suggests directions for future work.

II. ECONOMIC PERCEPTION SURVEYS IN CHILE: BASIC OVERVIEW

1. Main surveys

Three distinct types of organizations conduct public opinion surveys that are aimed at or contain questions on economic perceptions in Chile: universities (*Centro de Microdatos*—Universidad de Chile, Universidad Adolfo Ibáñez [UAI], and Universidad del Desarrollo), non-governmental organizations and public companies (Cadem, *Centro de Estudios Públicos* [CEP], and *Instituto Chileno de Adminstración Racional de Empresas* [Icare]), and private companies (e.g. *Adimark*, *Ipsos*).

In this article, five different surveys are scrutinized: i) the monthly index of business confidence elaborated by Icare-UAI (hereafter, IMCE), ii) the economic perception index elaborated by *Adimark* (IPEC), iii) the survey on economic perceptions and expectations elaborated by *Centro de Microdatos*, University of Chile (UChile), iv) the index elaborated by the *Centro de Estudios Públicos* (CEP), and v) the marketing-research company Cadem's "*Plaza Pública*" survey ("*Public Square*" (Cadem).[5]

2. Methodological features

Data representativeness

From table 1, we can see that all surveys use robust statistical methods to make sure the target universe is well represented. However, this sometimes represents only a fraction of the Chilean population or the economy. For instance, the IMCE focuses on only four sectors (mining, manufacturing, construction, and commerce[6]) and ignores services, which accounts for a large percentage of Chilean GDP (close to 39% using the 2013-2016 average). In the same vein, the UChile survey focuses on the Santiago area, which only accounts for approximately 40% of the overall Chilean population. The IPEC ignores inhabitants without landlines, meaning that it leaves lower-income categories out of the sample.[7] While these are mainly unavoidable due to practical limitations, it is important to bear them in mind when interpreting the indicators resulting from these surveys.

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5 The consumer perception index (Índice de Percepción del Consumidor, IPeCo), the business confidence index (Índice de Confianza Empresarial, ICE), and the private companies' data are left for further research as they require special treatment due to sampling and timing concerns. Regarding private companies, there are five different conducting generalist consumer market-related surveys in Chile: Adimark/GfK–conducting the monthly IPEC; Ipsos; Kantar Ibope Media–conducting the half-yearly Target Index Group; Mori; and Nielsen–conducting the half-yearly consumer confidence, and spending intention report. Apart from Adimark, their data are not freely available to the public and are gathered for marketing purposes.

6 Wholesale and retail trade.

7 In this regard, it is worth noting that top international surveys, such as the University of Michigan's Survey of Consumers or the European Consumer Surveys have gradually switched to mobile phone registers to better penetrate the population.

Table 1

Data representativeness description for the five public opinion surveys analyzed

Survey	IMCE	IPEC	UChile	CEP	Cadem
Institution	Icare	Adimark	Centro de Microdatos - Universidad de Chile	Centro de Estudios Públicos	Cadem Plaza Pública
Universe	Private companies in the trade, construction, manufacturing, and mining sectors. These sectors account for 38% of GDP (2015)	Inhabitants over 18 living in a dwelling with a landline	Inhabitants over 14 living in the Santiago Metropolitan Region and in Puente Alto and San Bernardo - about 40% of Chilean population in 2013	Inhabitants over 18	Inhabitants over 18 living in one of the 73 cities with more than 50,000 inhabitants (71% of Chilean population, 2014)
Sample	611 businesses (200 in trade, 100 in construction, 300 in manufacturing, 11 in mining)	Approximately 1,000 individuals	3,060 households	About 1,450 individuals	710 individuals
Sample method	Panel	Stratified random sampling	Stratified random sampling, with some panel data component	Stratified random sampling	Stratified random sampling
Collection technique	Email	Phone calls	Face-to-face interview	Face-to-face interview	Telephone and face-to-face
Answer rate	100%	Unknown	77.4% (March 2014)	77% (November 2015)	Unknown
Representativeness with respect to universe	Good, assuming businesses account for a large part of their sectors	Good, although there is a bias toward older people (mobile phone call would greatly enhance representativity)	Very good	Very good	Very good
Overall representativeness (Chile)	Medium - adding transport and financial, personnal and dwelling services in the universe would raise its representativity to 79% of GDP (2015)	Good	Medium, as it focuses only on Santiago	Very good	Very good

Source: Authors' calculations.

Frequency and timing

Table 2 compares the frequency of the different surveys and the timing of their questions. As regards frequency, it is important to note that the CEP survey follows no definite pattern, whereas the Cadem survey, although done on a weekly basis, started only in March 2014. Also, most surveys began in the 2000s, but some questions have been included later. Therefore, there is a distinction between the *start date* and the *full data availability date*, which is defined as the first period in which all the currently asked questions became available.

Table 2

Frequency and timing for the five public opinion surveys analyzed

Survey	IMCE	IPEC	UChile	CEP	Cadem
			Frecuency		
Frequency	Monthly	Monthly	Quarterly	No definite pattern (usually half-yearly)	Weekly
Start date	November 2003	Annual: 1981 Quarterly: 1986 Monthly: 2002	March 2001	March 2000	March 2014
Full data availability date	June 2004	June 2002	March 2001	December 2007	June 13, 2014
			Timing		
12M ago	-	-	Country economy	-	-
3M ago	-	-	Durable good	-	-
Currently	State of business Inventory Sales / activity Demand Utilized capacities Production	Country situation Business situation Personal situation Time to buy Saving	Income Indebtedness	Country situation Personal situation	Country situation Personal situation Time to buy Employment
3M ahead	Country-wide economy Employment Sales Costs and prices Production	-	Durable goods	-	-
6M ahead	Country-wide economy Business situation Investment Wages Financial situation	-	-	-	-
12M ahead	-	Country-wide economy Personal situation Saving Unemployment Inflation	Country-wide economy Inflation Buy house	Country-wide economy Personal situation	-
5Y ahead	-	Country situation	-	-	-

Source: Authors' calculations.

In terms of the time scope of questions, there is a clear difference between the IMCE, which asks shorter-term forward-looking questions (3 to six months) and the other surveys (12 months or 5 years). Except for UChile (and due to the different formulation of its questions), all surveys ask contemporaneous rather than backward-looking questions, even if the answers to contemporaneous questions are evaluated relative to a past situation. It is important to note that the 5-year-ahead question in the IPEC survey is not relevant for our objective of short-term forecasting.

Survey questions

We can categorize the questions asked by each of these surveys into two dimensions. First, the *temporal dimension* distinguishes between questions aimed at capturing a current or backward-looking sentiment and questions aimed at identifying forward-looking expectations ("Is the economic situation of your household better, the same, or worse than one year ago?" versus "In one year, do you think the economic situation of your household will be better, the same or worse than now?") The second dimension discriminates between questions focusing on the *individual agent*, be it households or firms, and *country-wide questions* ("Is the economic situation of your household better, the same, or worse than one year ago?" versus "Is the economic situation of the country better, the same, or worse than one year ago?")

Table 3 presents the number of questions asked by the five surveys across the two dimensions. We can first note that the three specialized surveys on economic perceptions—IMCE, IPEC, and UChile—, ask a total of 16, 14, and 12 questions respectively, whereas CEP and Cadem, which include economic perceptions within a broader opinion survey, only ask 5 and 7 economic-oriented questions. In addition, the IPEC, UChile, and CEP surveys ask at least one question in each of the four sub-categories, whereas IMCE does not ask any country-wide, backward-looking question. More precisely, IMCE and UChile almost exclusively ask personal questions (15 out of 16, and 9 out of 12 respectively), while IPEC mainly focuses on forward-looking questions (11 out of 14), and Cadem focuses on the current situation (6 out of 7). Only the CEP survey is balanced in terms of the number of questions asked by category but with substantially lower frequency.

Table 3

Typology of survey's questions

	Country	Personal	Total
Current and backward-looking	IMCE: 0 IPEC: 2 UChile: 2 CEP: 2 Cadem: 4	IMCE: 6 IPEC: 1 UChile: 4 CEP: 1 Cadem: 2	IMCE: 6 IPEC: 3 UChile: 6 CEP: 3 Cadem: 6
Forward-looking	IMCE: 1 IPEC: 6 UChile: 1 CEP: 1 Cadem: 1	IMCE: 9 IPEC: 5 UChile: 5 CEP: 1 Cadem: 0	IMCE: 10 IPEC: 11 UChile:6 CEP: 2 Cadem: 1
Total	IMCE: 1 IPEC: 8 UChile: 3 CEP: 3 Cadem: 5	IMCE: 15 IPEC: 6 UChile: 9 CEP: 2 Cadem: 2	IMCE: 16 IPEC: 14 UChile: 12 CEP: 5 Cadem: 7

Source: Authors' calculations.

Table 4

Classification of questions per survey*

	IMCE			IPEC		
	General questions	Individual questions	Individual questions requiring action	General questions	Individual questions	Individual questions requiring action
Backward-looking question	-	2. How is the current state of your business?	-	17. How is the current situation of the country? (5 choices)	26. How is the economic situation of your household compared to one year ago?	-
	-	3. How is the state of your inventory? (except construction)	-	18. What is the current situation of businesses? (implied: compared to before)	-	-
	-	4. How did your sales evolve compared to last month? (commerce, industry and mining) How did the activity of your company evolve in the past 3 months? (construction)	-	-	-	-
	-	5. How is the demand faced by your business currently? (construction and mining)	-	-	-	-
	-	6. How has the production of your company evolved compared to last month? (industry and mining)	-	-	-	-
	-	7. What is the percentage of your utilized capacities? (industry and mining)	-	-	-	-
Forward-looking question	1. How will the general economic situation of the country evolve in the next 6 months Commerce)?	8. How will the state of your business evolve in the next 6 months? (except construction)	14. How will the employment in your company evolve in the next 3 months?	20. What will be the economic situation of the country in 12 months? (5 choices)	28. How will the economic situation of your household evolve in the next year?	-
	... In the next 3 months (construction)?	9. How will your sales evolve in the next 3 months? (commerce only)	15. How will the investments of your company evolve in the next 6 months? (except construction)	21. What will be the economic situation of the country in 5 years? (5 choices)	29. What is the probability that you will be able to save money within the next 12 months? (5 choices)	-
	… The economic activity of the country in the next 6 months? (industry and mining)	10. How will the price of your inputs evolve in the next 3 months?	16. How will the average wage in your company evolve in the next 6 months? (except commerce)	22. What is most likely to occur with the economic situation in the next 5 years? (be fine continuously / periods of recessions and high unemployment)	30. Is this a good time to buy a property?	-
	-	11. How will the price of your sales evolve in the next 3 months?	-	23. How will the level of unemployment evolve in the next 12 months?	31. Is this a good time to buy a car?	-
	-	12. How will your financial situation evolve in the next 6 months (commerce)? In the next 3 months (construction)?	-	24. By how much will the prices evolve in the next 12 months? (a lot, a bit)	32. Is this a good time to buy large items?	-
	-	13. How will your production evolve in the next 3 months (industry and mining)?	-	25. Given the actual situations of the country, is it a good time to save?	-	-

Table 4 (continued)

Classification of questions per survey*

	CEP			UChile			Cadem Plaza Pública		
	General questions	Individual questions	Individual questions requiring action	General questions	Individual questions	Individual questions requiring action	General questions	Individual questions	Individual questions requiring action
Backward-looking question	33. How is the current economic situation of the country?	36. How do you qualify your current economic situation?**	-	38. How was the economic situation of the country a year ago? (better, same, worse)	41. How did the income of your household vary in the last 12 months?	45. Did a member of your household buy a durable good in the past 3 months?	48. Taking into account all political, social and economic aspects, do you think the country is on a good or bad trajectory?	53. How would you rate the current economic situation of yourself and your household?	-
	34. Do you think Chile is progressing, stagnating, or in decline?	-	-	39. What are the three main problems of the country?	42. How is the situation of your household in term of indebtedness? (complicated, average, no problem)	45.b If so, how have you financed it? (credit or cash)	49. Do you think that the Chilean economy is progressing, stagnating or declining?	54. How would you rate the economic situation of consumers to purchase goods and services?	-
	-	-	-	-	-	-	50. How would you rate the current economic situation of businesses?	-	-
	-	-	-	-	-	-	51. How would you rate the current situation of employment in the country?	-	-
Forward-looking question	35. How will the economic situation of the country evolve in the next 12 months?	37. In one year, how do you think your economic situation will be compared to today?**	-	40. In one year, how will be the economic situation of the country compared to today?	43. How will the income of your household vary within the next 12 months?	46. Will a member of your household buy a durable good in the next 3 months?	52. In general, how do you feel about the future of the country?	-	-
	-	-	-	-	44. What will be the CPI inflation rate in 12 months?	46.b If so, how will it be financed? (credit or cash)		-	-
	-		-	-	-	47. Are you or a member of your household thinking of buying a house in the next 12 months?		-	-

Source: Authors' calculations.
* Dark beige cells: Questions asked in the formation of existing aggregate indicators. Light beige cells: Questions asked in the formation of new indicators (in addition to existing questions). Unless indicated otherwise, all questions about future or past states are answered in comparison to the current state.
** Those questions are irregularly asked

Table 4 complements table 2 by delving into the precise formulation of the questions. It is important to note that no questions are consistent across surveys: even if they target the same concept or mean the same thing, the wording is not exactly the same, thereby reducing the comparability of the answers across surveys. For instance, in a question about the future economic situation of the country, the wording can vary across many dimensions: the time frame (three months for IMCE questions for the construction sector, six months for the commerce sector or 12 months for the IPEC) or the precise object of the question ("The general economic situation of the country" for IMCE questions aimed at the commerce sector, "the economic activity of the country" for IMCE questions aiming at the manufacturing and mining sectors). In addition, in a question about the current economic situation of the household, the point of comparison can be relative, as in the IPEC ("Better, the same, or worse than one year ago"), or absolute as in the Cadem survey ("Very good, good, bad, or very bad"). Similarly, for questions about past or future consumption, IPEC's wording is general and not targeted at the individual's intention to consume ("Do you think now is a good time to buy a car?") while UChile is more precise ("Do you think you or a member of your family will be buying a car in the next three months?"). However, while the wording is heterogeneous across surveys, it is worth noting that it remains consistent across time within each survey.

Synthetic indicators

It is important to look at the way the different institutions transform the qualitative answers to their questions into quantitative indicators. We must distinguish two steps: the first step consists in aggregating the individual answers to the same question to get a number, called in our case the *balance statistic*, while the second step is to aggregate the balance statistic of each question to form the synthetic indicator.

The methodology used by all surveys for the first step is to compute the balance statistic for each question. Intuitively, the balance statistic is the difference between the percentage of positive answers and the percentage of negative answers. Formally, it is defined as $\textit{balance statistic} = 100\left(\sum_1^n j_i x_i\right)$ where n is the total number of individuals surveyed, j_i is the weight of the i-th sample unit, and x_i is the response of the i-th sample unit, taking value one when the answer is "yes" or "increase", minus one when the answer is "no" or "decrease", and zero when the answer is "stable", or "I don't know". The weight of the i-th sample unit is chosen in such a way that the sample is representative: the weight is inversely proportional to the probability of unit i to be drawn; hence if the sample is random, the weight is simply $1/n$.

To construct their aggregate indicator (step 2) all surveys simply take the average of the balance statistics of the questions composing the indicators. In the case of the IMCE, there is a third step: steps 1 and 2 are done at the sector level only, leading to a sectorial indicator. To construct an economy-wide indicator, *Adimark* (IPEC) weights the sector indicators according to their relative importance in the Chilean GDP. However, it is important to note that these weights were constructed in 2005 and have not been updated since.

While the balance statistic is the easiest and most common way to transform qualitative data into quantitative aggregates (it is used, among others, by the University of Michigan and the *Directorate General for Economic and Financial Affairs* of the European Commission, which conducts the *Business Consumer Survey*), it is not the only possibility, and research shows that this easiness comes at a loss of information.

For instance, a neutral index can either mean a strong disagreement (50% of positive and 50% of negative answers), or a strong neutral feeling (100% of neutral answers). Two main other alternatives (Nardo, 2003) have been developed by academics, namely the Carlson and Parkin (1975) *probability method*, and the Pesaran (1984) *regression approach*; the balance statistic being a special case of the former. Intuitively, the probability method takes a latent variable approach, if agents report a change only when their true expectation is above or below a threshold to be estimated.

The regression approach instead tries to estimate the quantitative value of the underlying qualitative answer by assuming that expectations and realization behave the same way and, in particular, are dependent on the past percentage of people answering positively and negatively. As these different approaches also have their own limitations (linked to strong assumptions), the balance statistic method remains the standard approach among practitioners. While the issue will not be discussed further, one would be advised to check for robustness of results obtained using the balance statistic approach. Importantly, we should note that the balance statistics reported by the organizations conducting the surveys are normalized so that the values lie between 0 and 100 and a neutral indicator is 50.

We turn to the analysis of the existing synthetic indicators. First, note that the Cadem survey does not construct any indicators from its questions and reports them directly. In turn, the IPEC, IMCE, and CEP use less than half of their available questions to construct their indicators, as shown in tables 4 and 5. In addition, the number of different indicators reported by each survey is quite varied. While the IPEC and CEP only report one indicator, the IMCE reports six different ones: one for each sector, an aggregate indicator, and an aggregate indicator minus mining. The idea in this sub-section is to report the same indicator for the different sectors (and considering the peculiarity of the mining sector) rather than to distinguish between the different temporal components of the indicator. Therefore, the fact that IMCE reports a high number of different indicators does not help address the issue raised in this sub-section. On the other hand, the UChile survey reports five indicators, four of them corresponding to one of the cells in table 3; the last one being an aggregate indicator. The UChile indicators fit into the decomposition of questions into two different dimensions made above.

In sum, while not all surveys lead to a single, symmetric indicator, most of them produce composite indicators that combine questions with different focuses and time perspectives. This may seriously compromise the rational meaning and usefulness of such indicators for economic forecasting.

Table 5

Existing synthetic indicators used for constructing alternative measures

Survey	IMCE	IPEC	UChile	CEP	Cadem
Number of indicators	6 One for each sector, an aggregate, an aggregate without mining	1	5 One aggregate and four sub-indices: Current and expected situation; family and country situation	1	None
Number of questions used	6 out of 16	5 out of 14	8 out of 11	2 out of 5	-
Questions used	Current state of business Current inventory Current demand Future state of business Future production Future employment (construction)	Current country situation Current personal situation Future country situaton (12M) Future country situation (5Y) Time to buy large items	Current country situation Current income Past purchase Indebtedness Future country situation Future income Future purchase (house and items)	Current country situation Future country situation	-

Source: Authors' calculations.

III. DECONSTRUCTION AND DESIGN OF ALTERNATIVE MEASURES

The review of the main surveys of economic perceptions in Chile suggests that despite non-traditional differences in sampling (*i.e.* differences at the same time in the universe, the sample, and collection technique) and questionnaires, they provide a rich set of data that should be helpful in monitoring perceptions that can provide insights into economic performance. The challenge, however, is how to organize such data in order to extract meaningful and robust data for economic forecasting. In this section, we propose a set of measures constructed with the aim of better reflecting particular expectations. They are henceforth referred as "alternative measures", as opposed to the "existing synthetic" or "aggregate" indicators being currently used.

1. Conceptual structure and alternative measures

We now return to the categorization of survey questions across alternative directions. In particular, we consider two dimensions—focus and timeframe—with two alternative states each: *country/personal* and *current/future*, respectively. These give rise to a number of combinations. For instance, one could be interested in knowing the individual's current sentiment about the economic situation of the country, the individual's future expectations of his or her personal situation, or even the overall current sentiment of the country, both at individual and country-wide level. Following this logic, eight new alternative measures can be constructed, as represented in table 6.

Table 6

Schematic representation of the alternative measures across country/personal and current/future dimensions*

Indicator	Country	Personal	Overall
Current	CCSI	PCSI	OCSI
Future	CFEI	PFEI	OFEI
Overall	OCI	OPI	

Source: Authors' calculations.

* The acronyms correspond to: Country Current Sentiment Indicator: CCSI, Personal Current Sentiment Indicator: PCSI, Country Future Expectation Indicator: CFEI, Personal Future Expectation Indicator: PFEI, Overall Future Expectation Indicator: OFEI, Overall Current Sentiment Indicator: OCSI, Overall Country Indicator: OCI, and Overall Personal Indicator: OPI.

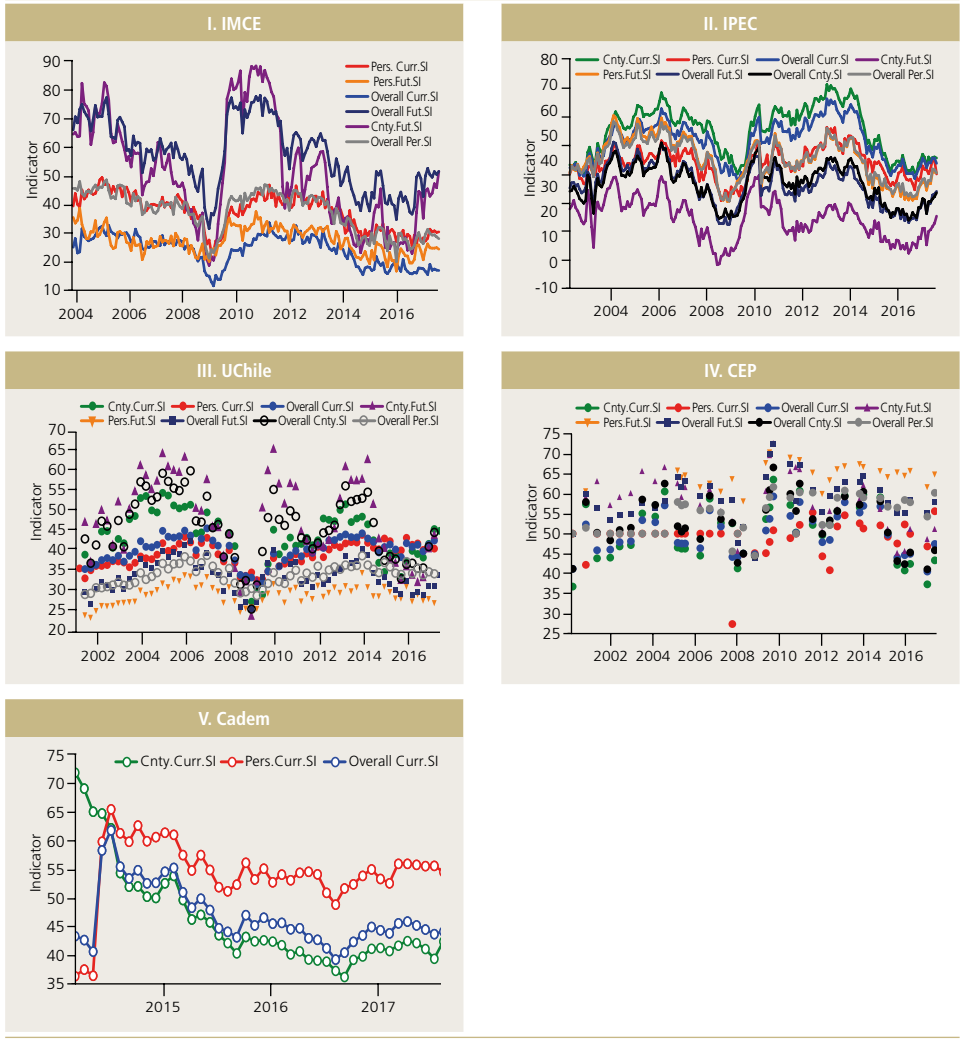
The time series for each of these measures are plotted in figure 1. The name of each alternative indicator is chosen so as to make it self-explanatory. The names distinguish between current sentiment and future expectation as well as between personal and country-wide indicators. The alternative measures starting with "Overall" aim at averaging one dimension (*personal*/*country* or *sentiment*/*expectation*) to provide a further indicator for the other dimension. In terms of table 6, all cells have now their own indicators except the lower right-hand cell. This cell would correspond to an "Overall overall" indicator that would make no sense for two reasons: first, it goes against the idea of deconstructing aggregate indicators in order to gain a better insight of one particular dimension; second, this often corresponds to the existing synthetic indicator.

The construction of the alternative measures is detailed in appendix A; there are however a few things to note. First, the measures suggested here are simply a new way to average the balance statistics for each question and are not a new way to quantify qualitative data. Indeed, as detailed above, the balance statistic is a standard tool, and on a more practical level, the microdata of the different surveys were not available or exploitable when this paper was elaborated.

Second, the theoretical construction exposed above is limited by data availability. For instance, the IMCE survey does not ask backward-looking questions about the state of the country. As a result, three alternative measures cannot be constructed: the *Country Current Situation Indicator* (CCSI), the *Overall Current Sentiment Indicator* (OCSI) and the *Overall Country Indicator* (OCI). Similarly, the quality of an alternative measure can vary across surveys. Indeed, as the question's wording differs across surveys, the indicator might reflect very similar, but still different concepts (*e.g.* the question "How did the income of your household vary in the last 12 months?" is used as a proxy to form the *UChile_PCSI*). Similarly, an alternative measure can be constructed out of only one question or out of five, which has an influence on its variance (although the precise effect on the variance, even assuming positive covariance between two questions composing a same indicator, is ambiguous). As regards the CEP, the alternative measures are of lower quality because of the uneven gaps between two observations. Concerning the IMCE, weights for the whole sequence are constructed using the 2015 GDP; that is, weights are not changed every year.

Figure 1

Alternative measures per survey, full (individual) sample



Source: Authors' calculations.

Finally, even if table 2 made it clear that expectation questions were aimed at different horizons, we compute expectation indicators using questions from the same survey. The rationale behind it is that qualitative questions are vague by nature; and so is the time horizon. It can reasonably be argued that, in answering the question "In one year, will the economic situation of your household be better, the same or worse than today?", economic agents have a rather vague notion of "one year", and if they expect their economic situation to improve in 9 or 15 months from now, they are very likely to answer the same way.

Alternative measures

We turn to the analysis of the newly constructed alternative measures. This is done in three different ways. First, we consider the new measures as a univariate time series and examine its properties. Second, we can compare the measures of the same survey, answering questions such as "Do expectation indicators lead or lag situation indicators?" Third, we compare the same alternative measures from different surveys, and examine whether they behave consistently across surveys. Throughout this section, we only compare measures between one another, and, by now, not with economic aggregates.

Table 7 reports the standard deviation and a unit root test for the new alternative measures of the five different surveys. The unit root test used is the Philips-Perron test, robust to unspecified autocorrelation or heteroscedasticity in the error term. Several regularities are worth noting. First, the personal current sentiment has a smaller variance than the overall current indicator (except for Cadem). The same holds for the personal future expectations, to a lesser extent. On the other hand, the country's current sentiment always exhibits a greater variance than the personal current sentiment, and, except for the IPEC, country future expectations exhibit similar properties relative to personal future expectations. This seems to indicate that individual respondents' answers vary less when answering personal questions than when answering country-wide questions. However, there is no clear ranking in terms of variability between current sentiment and future expectations indicators. For example, the personal current sentiment indicator has a greater variance than personal future expectation in IMCE and UChile, but the contrary is true for IPEC and CEP. Similar results hold for country current situation and country future expectation measures, as well as for overall current sentiment and overall future expectations.

Statistical testing cannot reject the hypothesis of a unit root for most alternative measures. Note, however, that it cannot be correct that the true process underlying these alternative measures is a unit root: by construction, it is bounded by 0 and 100. The test is conducted nonetheless to underline the variability of most alternative measures, particularly in their persistence level. This issue is particularly important to remark, as a persistent result implies that respondents do answer consecutively above (or below) a situation abstractedly built by themselves. In bounded series like these, this result implies that local trends exist.

Figure 1 illustrates the differences in the trajectory of different measures. In some cases, they differ at the high frequency level; in others in the magnitude of cycles, trends, or levels. This suggests that there must be distinct information contained in each measure.

Table 7

Standard deviation and unit-root test statistical inference*

Survey	Indicator	IMCE	IPEC	UChile	CEP	Cadem
Standard deviations	Current Indicator	7.58	7.19	10.27	4.72	-
	Country Current Sentiment	-	9.84	6.24	7.14	8.93
	Personal Current Sentiment	6.35	6.06	2.91	4.65	6.09
	Country Future Expectations	19.29	8.04	10.36	7.23	-
	Personal Future Expectations	4.43	8.68	2.50	7.63	-
	Overall Current Sentiment	-	8.37	3.26	5.02	5.22
	Overall Future Expectations	12.03	8.04	4.01	5.72	-
	Overall Country	-	7.71	7.77	6.66	-
	Overall Personal	7.25	7.92	2.55	4.58	-
Unit root test (Philips-Perron unit root test at 5% significance level)	Current Indicator	YES	YES	YES	Gaps in time series	-
	Country Current Sentiment	-	YES	YES	Gaps in time series	YES
	Personal Current Sentiment	NO	NO	YES	Gaps in time series	YES
	Country Future Expectations	YES	YES	YES	Gaps in time series	-
	Personal Future Expectations	NO	YES	NO	Gaps in time series	-
	Overall Current Sentiment	-	YES	YES	Gaps in time series	YES
	Overall Future Expectations	YES	NO	NO	Gaps in time series	-
	Overall Country	-	YES	YES	Gaps in time series	-
	Overall Personal	YES	YES	YES	Gaps in time series	-

Source: Authors' calculations.

* Upper panel: Dark beige cells = smaller than existing synthetic indicator. Light beige cells = standard deviation greater than 10.

Lower panel: Dark beige cells = no unit root found. Light beige cells = presence of unit root.

Same-survey analysis

The comparison of these newly constructed measures within surveys can answer several interesting questions. Do personal indicators (PCSI, PFEI, OPI) indicate the same matter as country-wide indicators (CCSI, CFEI, OCI)?, where "indicate" needs to be properly defined. If so, does it indicate the same thing within the same period, with a lead or with a lag? Similarly, how are current situation indicators (CCSI, PCSI, OCSI) related to expectation indicators (CFEI, PFEI, OFEI)? Are expectation indicators leading current indicators, or are they rather contemporaneously related? This would provide interesting hints as to how the economic agents form their expectations. A further interesting issue is the relation of these newly built alternative measures with the existing synthetic indicator: which of the new measures are the most similar? which one behaves differently?

Two different statistical tools are used in the comparison: the correlation coefficient and a bivariate Granger causality test. In what follows, when stated "indicator X Granger causes indicator Y", it is implied that the test result is significant at the 5% level. Such causality, in time, is defined in a statistical dimension, that is, the degree of independence in their distribution, rather than economic causality. So, when a variable A "causes" variable B, it means that current values of A are statistically related with future values of B. Conversely,

when a variable *A* does "not cause" variable *B*, it means that the distribution of the latter is not affected by the former, which could be interpreted as being generated by a different process.

As this sub-section is about within-survey comparison, the frequency used is the original frequency of the surveys: quarterly for UChile, monthly for IMCE and IPEC, monthly with gaps for CEP, and weekly for Cadem. Finally, it is worth noting that the levels of any two indicators cannot be compared, for two reasons. First, for some indicators (such as the *personal current sentiment index* in IMCE, see appendix A), some questions enter negatively, thereby changing the neutral value of the indicator. Second, and more importantly, the level of an indicator does not per se provide much information about what is indicating. For instance, an improvement in the business situation is not reflected by a merely "high" level, but a "higher-than-normal" level.

Table 8 presents the comparison between *personal* and *country-wide measures* within surveys. The first thing to do when analyzing the table is to recognize that, for each compared pair of measures, they have no questions in common, so, there is no embedded artificial correlation. Interestingly, the UChile and CEP surveys display very similar levels of correlation between any two compared indicators, while the IPEC correlation coefficients are always greater. A possible explanation could be that households surveyed by IPEC tend to respond similarly to all questions, but this is less the case for CEP and UChile surveys. In terms of Granger causality, there is no consistent link across surveys between personal and country measures: while *country sentiment* Granger causes *personal sentiment* in IPEC, the reverse is true in UChile, and the Granger causality test in Cadem reveals that neither causes the other. In addition, the most common result of Granger causality tests between a *personal* indicator and a *country-wide* indicator is that neither Granger causes the other. Intuitively, it means that past values of an indicator *X* cannot bring additional explanatory power to the current value of indicator *Y* when past values of indicator *Y* are already taken into account. Therefore, *personal* indicators (whether *current sentiment* or *future expectations*) do not tend to lead or lag *country-wide* indicators, while for all available surveys (that is, only IPEC and UChile), the former Granger causes the latter. This suggests that perceptions at the country-wide level tend to be formed independently of perceptions at the individual level.

Table 9 compares *current sentiment* indicators with *future expectation* indicators. As in table 8, any pair of compared alternative measures has no overlapping questions. Strikingly, there is a relatively stable relationship across surveys in the correlation coefficients between *personal current sentiment* and *personal future expectation*, and between *country current sentiment* and *country future expectation* (and, as a result, between *overall current sentiment* and *overall future expectations*). Indeed, the alternative measure most correlated with *personal current sentiment* is always *personal future expectations*, and not *country* or *overall future expectations*. For *country current sentiment*, the same is true (*country future expectation* is the most correlated alternative measure), with the exception of IPEC, in which the most correlated alternative measure is the

personal future expectation, in line with the result of the previous sub-section. This reinforces the notion that there is a little connection between personal and country-wide perceptions, possibly responding to different processes.

Table 8

Personal versus country-wide alternative measures: correlation and Granger causality

Survey		IMCE	IPEC	UChile	CEP	Cadem
Personal versus Country-wide indicators (Country Current Sentiment, Personal Current Sentiment, Country Future Expectations, Personal Future Expectations, Overall Country, Overall Personal)						
Personal current sentiment	Country Current Sentiment	-	Correlation: 0.862 Granger causality: Country Sentiment causes Personal Sentiment	Correlation: 0.498 Granger causality: Personal Sentiment causes Country Sentiment	Correlation: 0.012 Granger causality: Too many gaps in time series	Correlation: 0.863 Granger causality: Neither causes the other
	Country Future Expectation	Correlation: 0.714 Granger causality: Country Expectations causes Personal Sentiment	Correlation: 0.662 Granger causality: Country Expectation causes Personal Sentiment	Correlation: 0.278 Granger causality: Neither one causes the other	Correlation: 0.171 Granger causality: Too many gaps in time series	-
	Overall Country	-	Correlation: 0.854 Granger causality: Both cause each other	Correlation: 0.386 Granger causality: Personal Sentiment causes Overall Country	Correlation: 0.071 Granger causality: Too many gaps in time series	-
Personal future expectation	Country Current Sentiment	-	Correlation: 0.786 Granger causality: Personal Expectation causes Country sentiment	Correlation: 0.581 Granger causality: Personal Expectation causes Country Sentiment	Correlation: 0.397 Granger causality: Too many gaps in time series	-
	Country Future Expectation	Correlation: 0.808 Granger causality: Country Expectations causes Personal Expectations	Correlation: 0.826 Granger causality: Neither one causes the other	Correlation: 0.600 Granger causality: Neither one causes the other	Correlation: 0.184 Granger causality: Too many gaps in time series	-
	Overall Country	-	Correlation: 0.918 Granger causality: Neither one causes the other	Correlation: 0.633 Granger causality: Neither one causes the other	Correlation: 0.350 Granger causality: Too many gaps in time series	-
Overall personal	Country Current Sentiment	-	Correlation: 0.822 Granger causality: Neither one causes the other	Correlation: 0.547 Granger causality: Overall Personal causes Country Sentiment	Correlation: 0.338 Granger causality: Too many gaps in time series	-
	Country Future Expectation	Correlation: 0.827 Granger causality: Country Expectations causes Overall Personal	Correlation: 0.825 Granger causality: Neither one causes the other	Correlation: 0.419 Granger causality: Neither one causes the other	Correlation: 0.240 Granger causality: Too many gaps in time series	-
	Overall Country	-	Correlation: 0.935 Granger causality: Neither one causes the other	Correlation: 0.499 Granger causality: Overall Personal causes Overall Country	Correlation: 0.328 Granger causality: Too many gaps in time series	-

Source: Authors' calculations.

Table 9

Current situation versus future expectations alternative measures: correlation and Granger causality

Survey		IMCE	IPEC	UChile	CEP	Cadem
Current Situation versus Future Expectations indicators (Country Current Sentiment, Personal Current Sentiment, Country Future Expectations, Personal Future Expectations, Overall Current Sentiment, Overall Future Expectation)						
Personal current sentiment	Personal Future Expectation	Correlation: 0.663 Granger causality: Expectations causes the Current Situation	Correlation: 0.774 Granger causality: Expectation causes Current Sentiment	Correlation: 0.769 Granger causality: Neither causes the other	Correlation: 0.056 Granger causality: Too many gaps in time series	-
	Country Future Expectation	Correlation: 0.715 Granger causality: Expectations causes the Current Situation	Correlation: 0.663 Granger causality: Expectation causes Current Situation	Correlation: 0.279 Granger causality: Neither causes the other	Correlation: 0.172 Granger causality: Too many gaps in time series	-
	Overall Future Expectation	Correlation: 0.796 Granger causality: Expectations causes the Current Situation	Correlation: 0.761 Granger causality: Both cause each other	Correlation: 0.540 Granger causality: Neither causes the other	Correlation: 0.146 Granger causality: Too many gaps in time series	-
Country current sentiment	Personal Future Expectation	-	Correlation: 0.787 Granger causality: Expectation causes Current Situation	Correlation: 0.581 Granger causality: Personal Expectation causes Country Sentiment	Correlation: 0.398 Granger causality: Too many gaps in time series	-
	Country Future Expectation	-	Correlation: 0.546 Granger causality: Expectation causes Current Situation	Correlation: 0.734 Granger causality: Neither causes the other	Correlation: 0.695 Granger causality: Too many gaps in time series	-
	Overall Future Expectation	-	Correlation: 0.719 Granger causality: Expectation causes Current Situation	Correlation: 0.747 Granger causality: Overall Expectation causes Country Sentiment	Correlation: 0.704 Granger causality: Too many gaps in time series	-
Overall current sentiment	Personal Future Expectation	-	Correlation: 0.804 Granger causality: Expectation causes Current Situation	Correlation: 0.768 Granger causality: Neither causes the other	Correlation: 0.711 Granger causality: Too many gaps in time series	-
	Country Future Expectation	-	Correlation: 0.589 Granger causality: Expectation causes Current Situation	Correlation: 0.497 Granger causality: Neither causes the other	Correlation: 0.320 Granger causality: Too many gaps in time series	-
	Overall Future Expectation	-	Correlation: 0.748 Granger causality: Expectation causes Current Situation	Correlation: 0.681 Granger causality: Neither causes the other	Correlation: 0.712 Granger causality: Too many gaps in time series	-

Source: Authors' calculations.

The Granger causality tests provide another interesting insight: whenever an alternative measure Granger causes another, it is always the *expectation* indicator causing the *current sentiment* alternative measure. This result is very

strong for the IPEC and IMCE surveys: out of all possible comparisons, the *expectation indicator* Granger causes the *current sentiment indicator*, whereas the reverse does not hold. This regularity is less strong for the UChile indicator, in which out of nine possible pairs of indicators to be compared, the Granger causality test is inconclusive in seven cases (neither variable causes the other). However, in the cases it is conclusive (*personal future expectations*/*country current sentiment* and *country current sentiment*/*overall future expectations*), *expectations* Granger-cause the *current sentiment* indicator. This is a clear indication that *future expectations* do lead *current sentiment*. Assuming that current sentiment indicators do indeed reflect the current state of the economy, it implies that agents, when forming their expectations about the future, do not simply refer to their current situation (*i.e.* their expectations are not simply adaptive) but do engage in some forecasting process which, in turn, has some influence on their perceptions of the current situation. In other words, expectations about the future, which draw from external information, tend to influence the interpretation of the current situation.

Table 10 compares the newly built alternative measures and the currently used synthetic indicator. Unlike in table 8 or 9, some questions are often used to construct both alternative measures in a pair. Therefore, in these cases where the correlation is calculated with indicators sharing the same questions, their relationship is artificially strong. In order to take this into account and to better interpret the results, an indicator of common questions is constructed and shown in parentheses. In cases where this indicator is higher than 25% are highlighted. In calculating the percentage of common questions, we take into account the possibility that not all alternative measures are built with the same number of questions, and a probability-like formula is thus used.[8]

Bearing this limitation in mind, we can however underline an interesting fact in table 10. The relation between the existing synthetic indicator and personal or overall alternative measures is not very clear in terms of Granger causality. This is probably because the existing indicator aggregates all questions (in particular current sentiment and expectation questions) and thus each alternative measure partly influences and is influenced by the existing synthetic indicator. Indeed, there is a tendency for expectation indicators to Granger cause aggregate indicators (IMCE and IPEC), reflecting the fact that existing indicators incorporate current sentiment questions.

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8 The construction of the common questions index is as follows: Let X and Y be two different alternative measures, #X and #Y be the number of questions asked to build alternative measures X and Y, respectively, and #C be the number of common questions. The index I of common questions is constructed using the following formula: $I(X,Y) = \#C / (\#X + \#Y - \#C)$. As $\#C \leq \min(\#X, \#Y)$, $I(X,Y)$ lies always between 0 and 1 when indicator X is made of a subset of questions asked to construct the alternative measure Y, then $= \#C = \#X$ and $I(X,Y) = \#X/\#Y$. The drawback of this indicator is that when $\#X = \#Y$ but $X \neq Y$, then $I(X, Y) < \#C/\#X$ and thus underestimates the percentage of common questions.

Table 10

Existing synthetic indicators and alternative measures: correlation and Granger causality*

Survey	IMCE	IPEC	UChile	CEP	Cadem
			Relation to current Indicator		
Country current sentiment	-	Correlation: 0.931 (17) Granger causality: Neither causes the other	Correlation: 0.857 (13) Granger causality: Indicator causes Country Sentiment	Correlation: 0.781 (50) Granger causality: Too many gaps in time series	-
Personal current sentiment	Correlation: 0.936 (50) Granger causality: Personal Sentiment causes Indicator	Correlation: 0.914 (20) Granger causality: Both cause the other	Correlation: 0.714 (38) Granger causality: Neither causes the other	Correlation: 0.404 (00) Granger causality: Too many gaps in time series	-
Country future expectations	Correlation: 0.772 (14) Granger causality: Country Expectations causes Indicator	Correlation: 0.752 (14) Granger causality: Country Expectations causes Indicator	Correlation: 0.850 (13) Granger causality: Neither causes the other	Correlation: 0.698 (00) Granger causality: Too many gaps in time series	-
Personal future expectations	Correlation: 0.793 (18) Granger causality: Neither causes the other	Correlation: 0.866 (13) Granger causality: Personal Future Expectations causes Indicator	Correlation: 0.861 (38) Granger causality: Neither causes the other	Correlation: 0.718 (00) Granger causality: Too many gaps in time series	-
Overall current sentiment	-	Correlation: 0.951 (33) Granger causality: Neither causes the other	Correlation: 0.865 (50) Granger causality: Neither causes the other	Correlation: 0.805 (33) Granger causality: Too many gaps in time series	-
Overall future expectations	Correlation: 0.878 (30) Granger causality: Overall Expectation causes Indicator	Correlation: 0.856 (20) Granger causality: Overall Expectations causes Indicator	Correlation: 0.953 (50) Granger causality: Neither causes the other	Correlation: 0.920 (00) Granger causality: Too many gaps in time series	-
Overall country	-	Correlation: 0.946 (25) Granger causality: Overall Country causes Indicator	Correlation: 0.911 (25) Granger causality: Overall Country causes Indicator	Correlation: 0.765 (50) Granger causality: Too many gaps in time series	-
Overall personal	Correlation: 0.979 (80) Granger causality: Both cause the other	Correlation: 0.899 (25) Granger causality: Neither causes the other	Correlation: 0.811 (75) Granger causality: Neither causes the other	Correlation: 0.804 (00) Granger causality: Too many gaps in time series	-
Inflation expectations	Correlation: 0.649 (00) Granger causality: Both cause the other	Correlation: -0.286 (00) Granger causality: Neither causes the other	-	-	-
Investment expectations	Correlation: 0.575 (33) Granger causality: Index causes Investment Expectations	Correlation: 0.872 (00) Granger causality: Neither causes the other	-	-	-
Consumption expectations	Correlation: 0.926 (20) Granger causality: Both cause the other	Correlation: 0.850 (14) Granger causality: Neither causes the other	Correlation: 0.853 (63) Granger causality: Neither causes the other	-	-
Employment expectations	Correlation: 0.661 (14) Granger causality: Index causes Employment Expectation	Correlation: 0.798 (00) Granger causality: Neither causes the other		-	-

Source: Authors' calculations.

* In parentheses the percentage of common questions asked to form any two alternative measures. Brown-shaded cells=variables having more than 25% of questions in common.

Cross-survey analysis

We turn to the analysis of each alternative measure across different surveys. Unlike with the previous analysis, we are now interested in finding out whether alternative measures behave in the same way across surveys. One additional issue when comparing alternative measures across surveys is the time frequency of these surveys. As shown in table 11, we choose to compare surveys at the lowest frequency because of an aggregation issue. It is indeed easier to go from monthly to quarterly data using the quarterly average rather than the other way around. Therefore, comparisons with UChile are made on a quarterly basis, whereas the other comparisons are made on a monthly basis. It is also important to note that for some comparisons (such as between Cadem and UChile, or Cadem and CEP), very few common periods are available, leading to small-sample bias.

In this analysis, we cannot use the same statistical tools as in previous sections. The Granger causality analysis is hindered by the few possible comparisons, either because there is no indicator available, or because of the gaps or low number of common observations. However, a graphical comparison such as that of figure 2 plus the correlation analysis of table 12 reveal some stylized facts. First, the existing synthetic IPEC, CEP, and UChile indicators, which focus on households, do co-move greatly together. This is naturally less the case for the IMCE current indicator, as it focuses on businesses.

Table 11

Frequency and time range of comparison across surveys

	IMCE	IPEC	UChile	CEP
IPEC	monthly 06/2004 - 07/2017 (165 periods)	-	-	-
UChile	quarterly 2004q3 - 2017q2 (55 periods)	quarterly 2002q1 - 2017q2 (62 periods)	-	-
CEP	monthly 12/2003 - 05/2017 (34 periods)	monthly 07/2002 - 05/2017 (37 periods)	quarterly 03/2014 - 05/2017 (19 periods)	-
Cadem	monthly 03/2014 - 08/2017 (41 periods)	monthly 03/2014 - 08/2017 (41 periods)	quarterly 03/2014 - 08/2017 (14 periods)	monthly 07/2014 - 08/2017 (8 periods)

Source: Authors' calculations.

Figure 2

Time series of the new alternative measures across surveys

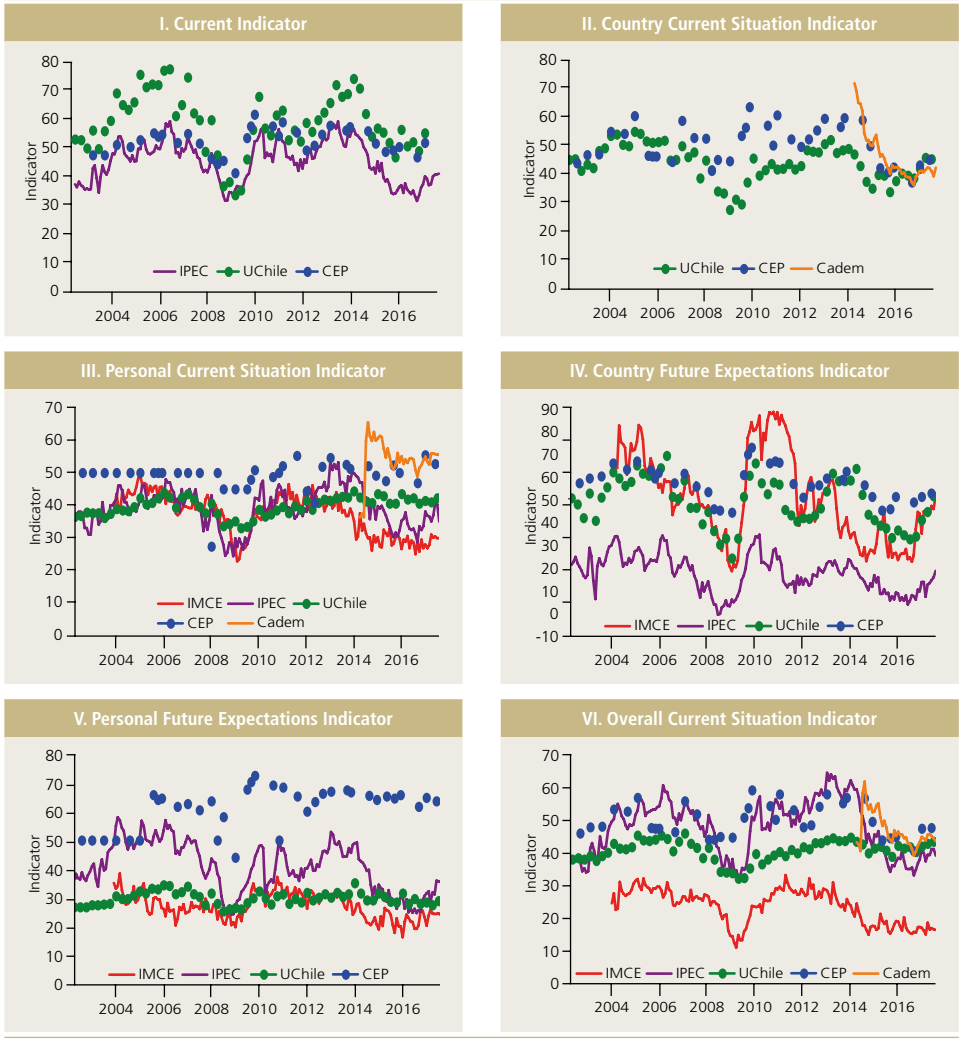
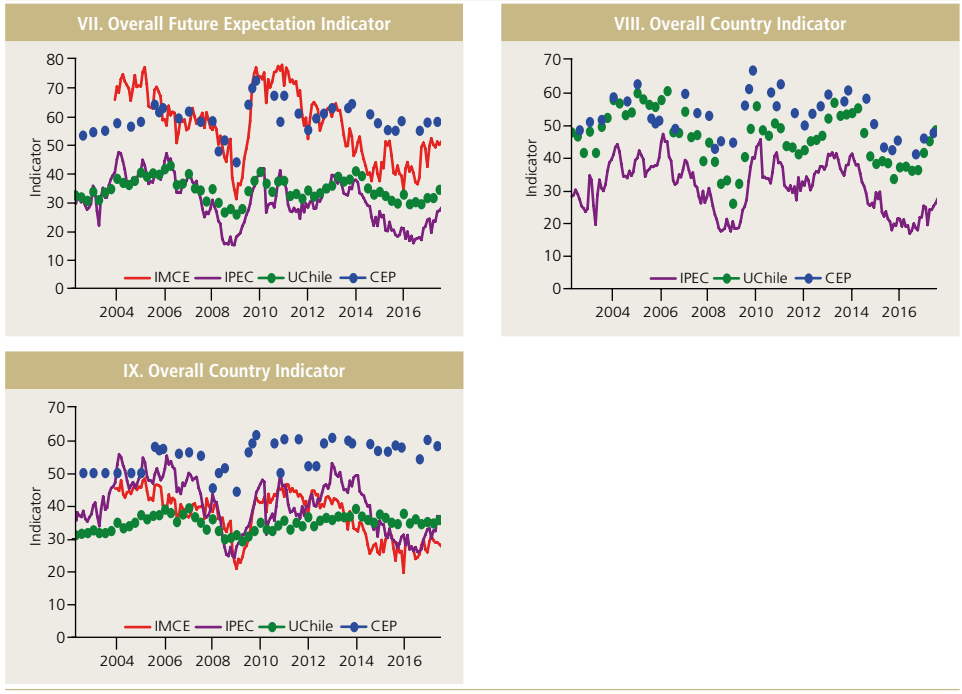


Figure 2 (continued)

Time series of the new alternative measures across surveys



Source: Authors' calculations.

If we focus on the correlation of the household surveys' alternative measures, the correlation is higher for *country-wide* rather than for *personal* indicators. Compare, for instance, the correlation from *personal future expectation*, *overall personal indicator* with their *country-wide* counterpart. Interestingly, the *country current situation indicator* is relatively poorly correlated across surveys, with the exception of the Cadem survey. This lower correlation, however, does not necessarily contradict the claim that country-wide questions are measuring the same concept across surveys, being the different surveyed sample the most plausible explanation for these lower correlations. Nevertheless, this casts doubts on the capacity of the personal indicators to be representative: ideally, all indicators should be the same across surveys. There is however no similar relationship between *current situation* and *expectation* indicators, even if the indicator with the highest correlation across all surveys is the *country future expectation* indicator.

Finally, it is important to note that these relationships are not transitive at all. For instance, even if the existing *country current situation* indicator is highly correlated between Cadem and IPEC (0.932) and IPEC and UChile (0.649), the correlation coefficient between Cadem and UChile is 0.366. We can find a similar non-transitive relationship with the *overall personal* indicator between IPEC and IMCE (0.852), UChile and IPEC (0.790), and CEP and IMCE (0.182).

Table 12

Comparison of alternative measures across surveys: correlation coefficient*

	Correlation											
	IMCE	IPEC	UChile	CEP	IMCE	IPEC	UChile	CEP	IMCE	IPEC	UChile	CEP
	Current Indicator				Country Future Expectation Index				Overall Future Expectation Index			
IMCE	1	-	-	-	1	-	-	-	1	-	-	-
IPEC	0.733†	1	-	-	0.834†	1	-	-	0.874†	1	-	-
UChile	0.789†	0.879†	1	-	0.894†	0.942†	1	-	0.865†	0.947†	1	-
CEP	0.492†	0.758†	0.696†	1	0.915†	0.945†	0.953†	1	0.687†	0.676†	0.752†	1
Cadem	-	-	-	-	-	-	-	-	-	-	-	-
	Country Current Situation Index				Personal Future Expectation Index				Overall Country Index			
IMCE	-	-	-	-	1	-	-	-	1	-	-	-
IPEC	-	1	-	-	0.873†	1	-	-	-	1	-	-
UChile	-	0.649†	1	-	0.641	0.828†	1	-	-	0.921†	1	-
CEP	-	0.626†	0.427†	1	0.147	0,182	0.294†	1	-	0.828†	0.754†	1
Cadem	-	0.932†	0.366†	0.955†	-	-	-	-	-	-	-	-
	Personal Current Situation Index				Overall Current Situation Index				Overall Personal Index			
IMCE	1	-	-	-	1	-	-	-	1	-	-	-
IPEC	0.536†	1	-	-	0.759†	1	-	-	0.852†	1	-	-
UChile	0.077	0.620†	1	-	0.448†	0.648†	1	-	0.596	0.790†	1	-
CEP	-0.015	0.180†	0.226	1	0.421†	0.608†	0.493	1	0.182	0.292	0.295	1
Cadem	0.396	-0.141	-0.013	0.267	0.011	0.405†	0.047	0.927†	-	-	-	-

Source: Authors' calculations.

* †=statistically significant at 5%.

IV. ASSESSING FORECASTING CAPACITY

1. Perceptions and anticipated behavior

The main purpose of this paper is to assess how much economic perceptions surveys can contribute to macroforecasting. In this section, we focus on this ability to forecast key macro aggregates. First, we examine whether IMCE-based alternative indicators provide a significant advantage in forecasting investment, within a traditional statistical forecasting model. Second, we perform the same exercise replacing investment by total employment. Finally, we turn to IPEC alternative measures for private consumption multi-horizon forecasting. In all cases, we take an agnostic point of view regarding the alternative measures usage, in the sense that we have no any *a priori* bias towards a certain alternative measure. Instead, we are interested in unravelling the predictive ability of IMCE and IPEC.

More precisely, we compare whether using alternative measures provides forecasting gains compared to the existing synthetic indicators, and when using no indicator of any type at all. By doing so, we analyze the merits of using alternative measures, closely following the methodology of Medel et al. (2016) for the case of domestic inflation predicted with versus without global factors.

Table 13

Relative root mean squared error comparison: consumption, employment, and investment *

Private consumption: Total										
IPEC	CCSI	PCSI	CFEI	PFEI	OCSI	OFEI	OCI	OPI	Aggregate (†)	No factor (††)
$h = 1$	1.009	1.058	0.856	1.021	1.017	1.011	1.027	1.076	0.889	1.271
$h = 2$	0.672	1.012	0.959	0.734	0.791	1.321*	0.739*	0.764	1.362*	0.792
$h = 3$	0.741	0.930	0.879	0.772	0.803	0.941	0.811	0.819	1.096*	1.579
$h = 4$	0.499*	0.920	1.203	0.805	0.656	1.186	0.608	0.806	1.013*	1.297
Adjusted R^2	0.982	0.987	1.009	0.979	0.985	0.995	0.994	0.975	1.042	0.832
Private consumption: Non-durable										
IPEC	CCSI	PCSI	CFEI	PFEI	OCSI	OFEI	OCI	OPI	Aggregate (†)	No factor (††)
$h = 1$	1.083	1.238**	0.885	1.238**	1.109**	1.075	1.004	1.262**	0.716	1.785
$h = 2$	0.832**	1.152*	0.979	1.026	0.916	0.973	0.907	1.043	0.681	2.249
$h = 3$	0.903	1.188	0.965	1.027	0.956	0.936	0.957	1.071	0.551	2.846
$h = 4$	1.080	1.272	1.653*	1.278	1.077	1.237	1.171	1.441**	0.308	3.347
Adjusted R^2	0.973	0.970	1.024	0.948	0.974	0.982	1.003	0.949	1.137	0.707
Private consumption: Durable										
IPEC	CCSI	PCSI	CFEI	PFEI	OCSI	OFEI	OCI	OPI	Aggregate (†)	No factor (††)
$h = 1$	1.092	0.952	0.986	0.878	1.003	0.913	1.186	1.023	0.751	4.677
$h = 2$	0.906	0.866	1.014	0.813*	0.851*	0.911	1.062	0.823*	1.144***	4.869
$h = 3$	0.763*	0.917	0.870	0.744**	0.766**	0.809*	0.977	0.756*	1.225***	6.304
$h = 4$	0.699	0.978	0.818**	0.654*	0.723**	0.736	0.892	0.639*	1.755***	5.060
Adjusted R^2	0.987	0.990	1.011	0.997	0.989	1.004	0.998	0.991	1.041	0.861
Employment										
IMCE	CCSI	PCSI	CFEI	PFEI	OCSI	OFEI	OCI	OPI	Aggregate (†)	No factor (††)
$h = 1$	-	0.902	0.994	1.214	1.000	1.255	-	1.177	0.916*	0.638
$h = 2$	-	0.967	1.398*	1.297	0.781	1.734**	-	1.593**	0.686**	1.030
$h = 3$	-	1.144	1.786**	1.390	0.774	2.229**	-	2.038*	0.494**	1.301
$h = 4$	-	1.077	1.587*	1.035	0.741	2.014**	-	1.964*	0.414**	1.620
Adjusted R^2	-	0.992	1.059	1.017	0.982	1.046	-	1.012	1.033	0.759
Gross Fixed Capital Formation: Total										
IMCE	CCSI	PCSI	CFEI	PFEI	OCSI	OFEI	OCI	OPI	Aggregate (†)	No factor (††)
$h = 1$	-	1.181	1.095	1.234	1.008	1.168	-	1.136	0.734	5.972
$h = 2$	-	1.623**	0.979	1.423	1.182	1.173	-	1.379*	0.495*	8.280
$h = 3$	-	1.059	0.782	1.118	0.477***	0.954	-	1.202	0.518***	8.854
$h = 4$	-	1.367	0.792	1.632*	0.824	0.631***	-	1.232	0.319***	9.853
Adjusted R^2	-	0.993	0.980	0.959	0.994	0.977	-	0.992	1.069	0.843
Gross fixed capital formation: Machinery and equipment										
IMCE	CCSI	PCSI	CFEI	PFEI	OCSI	OFEI	OCI	OPI	Aggregate (†)	No factor (††)
$h = 1$	-	1.281**	0.905	1.350	1.136	1.120	-	0.963	0.816	12.518
$h = 2$	-	1.539***	0.806	1.479	1.244	1.122	-	1.157	0.536	19.553
$h = 3$	-	1.239	0.937	0.952	0.851	1.330	-	1.364	0.370	21.215
$h = 4$	-	1.462**	1.156	1.947	1.321	1.400**	-	1.373	0.243	26.831
Adjusted R^2	-	0.968	0.998	0.945	0.987	0.988	-	1.000	1.088	0.768
Gross fixed capital formation: Construction and works										
IMCE	CCSI	PCSI	CFEI	PFEI	OCSI	OFEI	OCI	OPI	Aggregate (†)	No factor (††)
$h = 1$	-	1.239	1.128	1.050	1.078	1.065	-	1.106**	0.750	2.870
$h = 2$	-	1.340	1.262	1.187	1.166	1.152	-	1.130	0.615	5.276
$h = 3$	-	1.165	1.156	1.167	0.979	1.086	-	1.067**	0.617	7.085
$h = 4$	-	1.015	1.159	1.220	0.879	1.015	-	0.888	0.571	7.831
Adjusted R^2	-	0.996	0.954	0.961	1.004	0.964	-	0.985	1.058	0.855

Source: Authors' calculations.

* For models augmented with CCSI, PCSI, CFEI, PFEI, OCSI, OFEI, OCI, and OPI: Relative RMSFE between alternative measure-augmented model and model augmented with existing synthetic indicator (Harvey-Leybourne-Newbold test: ***: p<1%, **: p<5%, *: p<10%). (†) For "Existing" model: Relative RMSFE between existing synthetic indicator-augmented model and no-augmentation model (Clark-West test: ***: p<1%, **: p<5%, *: p<10%). (††) Root mean squared forecast error.

Besides private consumption and investment aggregates, we also distinguish between the components of both series. For consumption, we perform the same exercise for *non-durable* and *durable* goods. For investment, we distinguish between *machinery and equipment* and *construction and works*.

The whole forecasting exercise is detailed in appendix B. Due to the small-sample bias, the statistical inference is based on Harvey et al. (1997)'s test of forecast accuracy. It is also complemented with Clark and McCracken's (2007) test of model adequacy. These both tests are described in appendix C. Notice that forecast accuracy is assessed in relative terms to ease a comparison across the different alternative measures, the existing synthetic indicator, and the forecast made without the information of any factor.

The measure used to compare is the traditional root mean squared forecast error (RMSFE) statistic. When comparing the influence of any alternative measure with respect to the existing synthetic indicator on forecast accuracy, the RMSFE ratio of the former upon the latter is used. Similarly, the influence of the existing synthetic indicator is compared upon the RMSFE of the forecast without any survey—*i.e.* that based on the information exclusively contained in the series. Forecast horizons are h =1, 2, 3, and 4-quarters-ahead, where h=1 corresponds to the case of nowcasting given the early availability of the survey prior to the macroaggregates.

In terms of the econometric model of private consumption and its relationship with IPEC, both in-sample adjustment and predictive results are presented in the upper three panels of table 13 (total private consumption, non-durable, and durable). In-sample results are referred to the *Adjusted* R^2 goodness-of-fit coefficient, which is also presented in relative terms (alternative measure versus existing synthetic indicator, and existing synthetic indicator versus no-survey-augmentation case). More in-sample diagnostics are presented in appendix B. The last column of table 13 ("*No factor*") shows the RMSFE by itself and the *Adjusted* R^2 row not in relative terms but in their original measuring units.

Regarding total private consumption, the goodness-of-fit coefficient plus the relative RMSFE of the existing synthetic indicator compared to the no-factor case, reveal the usefulness of re-defining the indicators contained in the IPEC survey. While the in-sample adjustment does improve when more information is included in the model, the predictive performance is spoiled out when the existing synthetic indicator is used, being statistically outperformed by the no-factor case at h>1. At h=1, all alternative measures are outperformed by the no-factor case, except for the *country future sentiment* indicator (CFEI)—but not in a statistically significant manner. However, at h>1, the results are reverted and almost all alternative measures display predictive gains of a non-negligible size. Particularly interesting is the case of the *current country* indicator (CCSI) displaying predictive gains (=1 – *Relative RMSFE*%) of 33%,

26%, and 50% across the horizon.[9] Despite some other remarkable predictive gains, such as 27% at h=2 with PFEI and 39% at h=4 with OCI, no case is statistically superior. Importantly, despite the different sample span used for the estimation, both the goodness-of-fit coefficient and the RMSFE improve with respect to the estimates shown in Cobb et al. (2011) for this aggregate.

Regarding non-durable consumption, the results are less promising compared to the previous case. In other words, due to the smoothness of this series, it is easier to capture their dynamic with past information estimating fewer regressors. Hence, the space available for exogenous information to explain the remaining dynamic is thus reduced. The goodness-of-fit coefficient reveals no particularly bigger explanatory power gains when using the alternative measures. These (relative) coefficients fluctuate between 0.948 and 1.024. Remarkably, the first, and the most important, difference with respect to the previous case is that the existing synthetic indicator provides the biggest predictive gains for each horizon. These are increased as the horizon lengthens, achieving 28.4%, 31.9%, 44.9%, and 69.2%, respectively. Note, however, that none of these predictive gains is statistically significant.

A more positive prospect for alternative measures is observed with durable consumption. In opposition to the non-durable component, there is enough space for the influence of external variables, noting a standard deviation five times greater (16.13 versus 3.14). Despite some minor explanatory gains accounted for by the goodness-of-fit coefficient, there are only 6 out of 32 cases in which the alternative measures do not outperform the existing synthetic indicator out-of-sample; these six cases, however, are not statistically significant.[10] Notice that, same with the aggregate consumption, *current indicator* performs poorly both in- and out-of-sample. The best forecasting results are obtained with the *personal future* (PFEI) and *personal overall* (OPI) alternative measures, which make sense in the context that durable consumption reflects personal level forward-looking spending.

In sum, the usefulness of building and using IPEC alternative measures in a "hard" manner for forecasting purposes is shown particularly in the case of aggregate and non-durable consumption, especially at longer horizons with the *country-wide current* and the *personal future* alternative measures.

The results for *total employment* are depicted in the middle panel of table 13. The results across the considered horizons are always favorable when using the existing synthetic indicator, exhibiting substantial predictive gains which

9 However, no case is statistically significant according to the Harvey et al. (1997) test. Instead, when using the original Diebold and Mariano (1995) test—without any correction—the candidate forecast is statistically significant at h=4.

10 Notice that when using the Diebold and Mariano (1995) test, nine cases become statistically significant. By horizons, these are: h=2: [OCSI,OPI], h=3: [PFEI,OFEI,OPI], and h=4: [CFEI,PFEI,OCSI,OPI].

are statistically significant. Yet, two alternative measures turn out to be even better than the synthetic: PCSI at h={1,6} and OCSI for all horizons (considering h=1 as a tie). Notice that both personal (PCSI) and overall (OCSI) indicators are referring to the current situation, which may be interpreted as that hiring decisions are based exclusively on what is currently happening instead of being a more forward-looking decision. This is consistent with research showing a high prevalence of short-term contracts and high turnover in the Chilean labor market (see Marcel and Naudon, 2016).

Regarding gross fixed capital formation, the results favor the use of the existing synthetic indicator over the no-augmentation case for forecasting purposes, as the predictive gains are considerable: from 26.6% to 68.1%, at h=1 and 4; the latter becoming the biggest of the whole exercise. In just one case (h=1), these gains are not statistically significant. Notice that these predictive gains are obtained in a context where only the existing indicator helps to explain in-sample investment dynamics, as the goodness-of-fit coefficient increases 7% whereas it is reduced with the alternative measures. The only cases where alternative measures improve over the existing indicator are: the *overall current sentiment* indicator (OCSI) at h=3 and *overall future* indicator (OFEI) at h=4. These cases exhibit gains of 52.3% and 36.9%, being the former statistically superior to the existing indicator at the 5% confidence level.

At first sight, the results for *machinery and equipment* look similar to the previous case, but with important differences in the use of the existing synthetic and alternative measures. First, despite the notorious predictive gains of the existing indicator—achieving a high 75.7% at h=4—none of them is statistically significant. Second, none of the six (out of 24) cases which actually display predictive gains is statistically significant. Finally, in three cases the alternative measure is statistically *inferior* to the existing synthetic indicator forecast. Overall, the evidence for IMCE as a predictor of *machinery and equipment* is pretty weak; complemented also with lower goodness-of-fit enhancements.

Finally, the case of *construction and works* is presented in the lower panel of table 13. This case is even more dramatic than *machinery and equipment* because existing synthetic indicator gains are lower than in the two previous cases, and there are virtually no obvious gains when using alternative measures. Note that small predictive gains are obtained with the same alternative measure that delivers positive results in the aggregate case, *i.e. overall current sentiment* indicator (OCSI). The goodness-of-fit coefficient is also weak to support the influence of alternative measures as a driver of *construction and works* fluctuations.

Overall, major—while non-significant—predictive gains are found with the existing indicator for the three variables, a secondary role is found for the OCSI alternative measure when forecasting total investment and *construction and works* at h=3 and 4. Hence, IMCE surveys do not necessarily describe the investment dynamics according to this analysis.

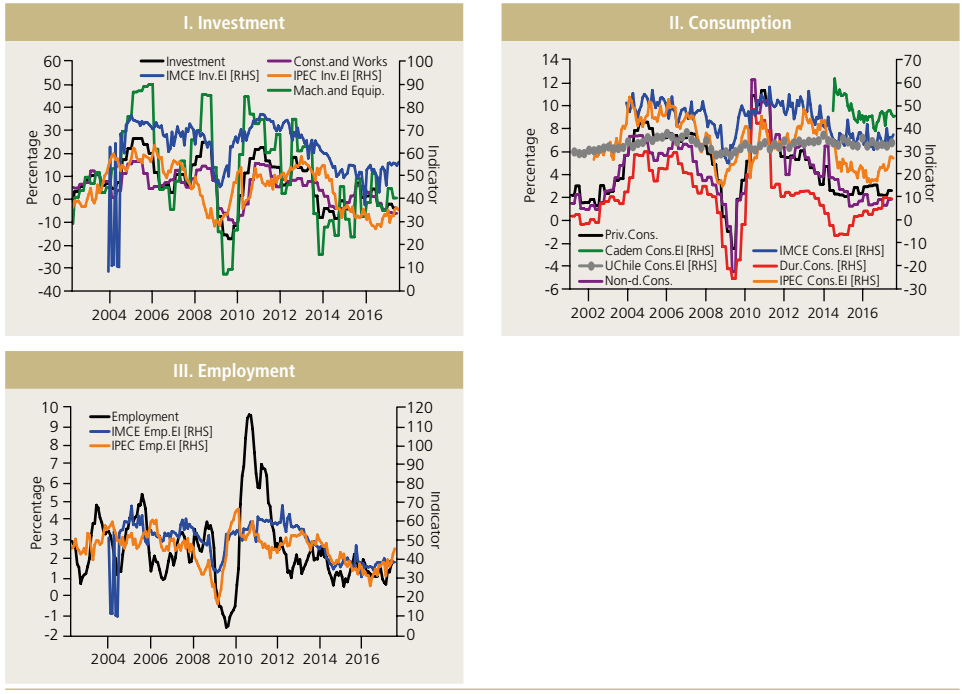
2. Macro aggregate action indicators

In this sub-section, we examine *macro aggregate action* indicators and their relationship with the proposed alternative measures and actual macro aggregates. The *macroaggregate action* indicators simply consist in group-specific questions aiming to target a macroeconomic aggregate. We refer to them as action indicators on two grounds. First, because they rely on some questions that refer directly to ongoing or planned actions (*e.g.* "How will your production evolve in the next three months?") Second, because other questions refer to perceptions on what others may be doing or opportunities to act, which, on the basis of behavioral economics, have proven very likely to prompt own actions. This could be understood as a *herding behavior* by survey respondents. Banerjee (1992) suggests that herding occurs when individuals do what everyone else does, even when their private information suggests they should take a different path.

This is an exclusively within-survey analysis, making use of the indicators of each survey constructed as shown in appendix D. Figure 3 depicts macro aggregate action time series as well as the growth rate of the macro aggregates they target.

Figure 3

Macroaggregate action indicators per macroeconomic aggregate, full (individual) available sample



Source: Authors' calculations.

We also integrate *economic action* indicators. By this, we mean potential decisions and/or actions by economic agents as measured by responses to questions related to plans, attitudes, or timing to make economic decisions, like consumption, employment, and investment. To undertake this task, we make use of the "individual questions requiring action" of table 4, becoming an exclusively within-survey analysis. Notice that, according to table 4, the analysis is possible to perform only for IMCE. Moreover, we concentrate on question 14: "How will the employment of your company evolve in the next three months?" and question 15: "How will the investments of your company evolve in the next six months?" (for commerce and manufacturing) aiming to explore if these answers are preceded by prospective personal/country alternative measures or vice versa. For this analysis, we exclude the mining sector because of the small number of surveyed individuals.

Tables 14-16 compare each macroaggregate action indicator with the previously analyzed alternative measures and the remaining macro aggregate action indicators in terms of correlation and Granger causality. Notice that the investment action indicator (table 14) is highly correlated with the employment indicator in IMCE. This is also true for IPEC although it is even more correlated with the consumption action indicator due to the "time to buy" questions (table 4). This result is also in line with the finding of Ceballos and González (2012), that the IPEC question on "time to buy" is significant among a group of high-frequency variables to build an economic conditions indicator for the Chilean economy. Interestingly, *personal expectation* alternative measures seem to lead and Granger cause investment actions more than do *country-wide* indicators (although there is not enough data in IMCE to strongly support the claim).

Further, overall expectations alternative measures Granger cause and lead investment action indicators both in IMCE and IPEC surveys, whereas investment actions Granger cause the alternative measures. This would indicate that both companies and households become prepared to invest only when they have been expecting economic improvement for at least one period. This is further supported by the fact that the investment question in IMCE has the same time horizon as business expectation questions (six months).

Consumption action indicators (table 15) are trickier to interpret due to the way they are constructed. For IMCE, this is essentially a demand/sales measure. The Granger causality test results are never constant across the surveys, even if the results are relatively similar for IPEC and UChile. This action indicator is indeed highly correlated with other indicators in the cases of IPEC and Cadem, but less in the case of IMCE. Moreover, there is no particular difference in the relationship between personal or general indicators and employment action.

Table 14

Investment action indicator and alternative measures: correlation and Granger causality*

Survey		IMCE	IPEC	UChile	CEP	Cadem
Macroaggregate action indicator: Investment						
Investment action	Country current sentiment	-	Correlation: 0.885 Granger Causality: Neither causes the other	-	-	-
	Personal current sentiment	Correlation: 0.607 Granger Causality: Business Sentiment causes Investment Action	Correlation: 0.790 Granger Causality: Investment Action causes Personal Situation	-	-	-
	Country future expectations	Correlation: 0.440 Granger Causality: Country Expectations causes Investment Action	Correlation: 0.719 Granger Causality: Country Expectations causes Investment Action	-	-	-
	Personal future expectations	Correlation: 0.385 Granger Causality: Personal Expectations causes Invesment Expectations	Correlation: 0.957 Granger Causality: Personal Expectations causes Investment Action	-	-	-
	Overall current sentiment	-	Correlation: 0.885 Granger Causality: Investment Action causes Overall Sentiment	-	-	-
	Overall future expectations	Correlation: 0.479 Granger Causality: Overall Expectations causes Investment Action	Correlation: 0.898 Granger Causality: Overall Expectations causes Investment Action	-	-	-
	Overall country	-	Correlation: 0.901 Granger Causality: Overall Country causes Investment Action	-	-	-
	Overall personal	Correlation: 0.563 Granger Causality: Overall Personal causes Investment Action	Correlation: 0.960 Granger Causality: Neither causes the other	-	-	-
	Consumption action	Correlation: 0.582 Granger Causality: Consumption Expectations causes Investment Action	Correlation: 0.965 Granger Causality: Neither causes the other	-	-	-
	Employment action	Correlation: 0.926 Granger Causality: Employment Action causes Investment Action	Correlation: 0.787 Granger Causality: Neither causes the other	-	-	-

Source: Authors' calculations.

* Brown-shaded cells=variables having more than 25% of questions in common.

Table 15

Consumption action indicator and alternative measures: correlation and Granger causality*

Survey		IMCE	IPEC	UChile	CEP	Cadem
Macroaggregate action indicator: Consumption						
Consumption action	Country current sentiment	-	Correlation: 0.794 Granger Causality: Consumption Action causes Country Sentiment	Correlation: 0.606 Granger Causality: Consumption Action causes Country Sentiment	-	Correlation: 0.807 Granger Causality: Neither causes the other
	Personal current sentiment	Correlation: 0.928 Granger Causality: Both cause the other	Correlation: 0.765 Grnger Causality: Consumption Action causes Personal Sentiment	Correlation: 0.905 Granger Causality: Neither causes the other	-	Correlation: 0.962 Granger Causality: Neither causes the other
	Country future expectations	Correlation: 0.767 Granger Causality: Country Expectations causes Consumption Action	Correlation: 0.776 Granger Causality: Neither causes the other	Correlation: 0.500 Granger Causality: Neither causes the other	-	-
	Personal future expectations	Correlation: 0.758 Granger Causality: Personal Expectations causes Consumption Action	Correlation: 0.994 Granger Causality: Neither causes the other	Correlation: 0.927 Granger Causality: Neither causes the other	-	-
	Overall current sentiment	-	Correlation: 0.808 Granger Causality: Consumption Action causes Overall Sentiment	Correlation: 0.898 Granger Causality: Neither causes the other	-	Correlation: 0.899 Granger Causality: Neither causes the other
	Overall future expectations	Correlation: 0.850 Granger Causality: Overall Expectations causes Consumption Action	Correlation: 0.945 Granger Causality: Neither causes the other	Correlation: 0.757 Granger Causality: Neither causes the other	-	-
	Overall country	-	Correlation: 0.890 Granger Causality: Neither causes the other	Correlation: 0.577 Granger Causality: Neither causes the other	-	-
	Overall personal	Correlation: 0.916 Granger Causality: Overall Personal causes Consumption Action	Correlation: 0.989 Granger Causality: Neither causes the other	Correlation: 0.974 Granger Causality: Neither causes the other	-	-
	Investment action	Correlation: 0.582 Granger Causality: Consumption Action causes Investment Action	Correlation: 0.965 Granger Causality: Neither causes the other	-	-	-
	Employment action	Correlation: 0.663 Granger Causality: Consumption Action causes Employment Action	Correlation: 0.761 Granger Causality: Neither causes the other	-	-	Correlation: 0.880 Granger Causality: Neither causes the other

Source: Authors' calculations.

* Brown-shaded cells=variables having more than 25% of questions in common.

The case of UChile survey depicts two remarkable facts. First, the consumption action indicator is highly correlated with personal alternative measures both current and expected, and consequently with the overall personal indicator. Second, a high correlation with the overall current alternative measure but below that excluding the country dimension (*i.e.* overall personal current indicator) reveals that UChile respondents strongly associate their personal situation with their own consumption rather than with the general country situation; a fact reinforced by the relatively low correlation with the country current and future measures.

Finally, table 16 shows the results for the employment indicator, which is available for IMCE, IPEC, and Cadem only. As mentioned above, the IMCE employment action indicator is highly correlated and Granger causes the investment action indicator. This is not the case with the remaining IMCE indicators. When analyzing IPEC, it is more common to find a high correlation coefficient with the overall and the prospective (country-wide and personal) indicators than with the current ones. The results for Cadem are more difficult to read since the four computable correlations are high (possibly due to small-sample bias), and neither indicator Granger causes the other.

In sum, both employment and investment action indicators are mostly correlated between them within the entrepreneurs IMCE survey, and with country-based alternative measures both current and expected. From the consumer's point of view, IPEC's investment actions are highly correlated with consumption actions because of "time to buy" questions. At the same time, UChile-based consumption actions reflect well the personal rather than country situation, which is reverted in the analysis of employment actions.

We now turn to analyze the single-question-based economic action indicators. In particular, we proceed with the Granger causality tool to estimate if *country-future* and *personal-current, personal-expected* and *personal-overall* indicators Granger cause actions regarding investment and employment. As Granger causality could be considered a generalist model-free view on the effect of one variable on another, we are not investigating how many months the respondent takes to make a decision of some magnitude of influence. Instead, we are investigating if there is systematic evidence that indicators anticipate actions (or the other way around). This is possible to make as variables have a memory, and not all lags must be necessarily included in the Granger causality regression. Hence, Granger causality emerges as a valid tool for our purposes.

The results for employment actions are presented in table 17. For the commerce sector, two feedback results are obtained: those of PFEI and OPI interacting with hiring plans at a 3-month horizon. Thus, country future sentiment Granger causes hiring plans, which in turn cause personal current sentiment. Similar building blocks are obtained in the manufacturing sector. The only difference is that 3-month hiring plans cause not only current but also future personal situation.

Table 16

Employment action indicator and alternative measures: correlation and Granger causality*

Survey		IMCE	IPEC	UChile	CEP	Cadem
Macroaggregate action indicator: Employment						
Employment action	Country current sentiment	-	Correlation: 0.702 Granger Causality: Employment Action causes Country Sentiment	-	-	Correlation: 0.930 Granger Causality: Neither causes the other
	Personal current sentiment	Correlation: 0.680 Granger Causality: Business Situation causes Employment Action	Correlation: 0.717 Granger Causality: Employment Action causes Personal Sentiment	-	-	Correlation: 0.883 Granger Causality: Neither causes the other
	Country future expectations	Correlation: 0.507 Granger Causality: Country Expectations causes Employment Action	Correlation: 0.878 Granger Causality: Neither causes the other	-	-	-
	Personal future expectations	Correlation: 0.492 Granger Causality: Personal Expectations causes Employment Action	Correlation: 0.800 Granger Causality: Neither causes the other	-	-	-
	Overall current sentiment	-	Correlation: 0.723 Granger Causality: Employment Action causes Overall Sentiment	-	-	Correlation: 0.945 Granger Causality: Neither causes the other
	Overall future expectations	Correlation: 0.563 Granger Causality: Overall Expectations causes Employment Action	Correlation: 0.870 Granger Causality: Neither causes the other	-	-	-
	Overall country	-	Correlation: 0.907 Granger Causality: Neither causes the other	-	-	-
	Overall personal	Correlation: 0.646 Granger Causality: Overall Personal causes Employment Action	Correlation: 0.812 Granger Causality: Neither causes the other	-	-	-
	Investment action	Correlation: 0.926 Granger Causality: Employment Action causes Investment Action	Correlation: 0.787 Granger Causality: Neither causes the other	-	-	-
	Consumption action	Correlation: 0.663 Granger Causality: Consumption Expectations causes Employment Action	Correlation: 0.761 Granger Causality: Neither causes the other	-	-	Correlation: 0.882 Granger Causality: Neither causes the other

Source: Authors' calculations.

* Brown-shaded cells=variables having more than 25% of questions in common.

A major detour is observed with the construction sector. This case works in the opposite direction, in the sense that the personal and overall current situation index cause 3-month employment actions; but the latter does not cause any indicator. This last result may suggest that respondents do not believe that their future decisions will affect the overall perceived state of the economy, despite that increasing employment in the construction sector is traditionally attached to a general business cycle upswing. Notice that an important flaw of the IMCE indicator is that it actually does not elaborate on question 15 (that of 6-month-ahead investment actions) for the construction sector. Hence, this idiosyncratic result is harder to stress out with investment future decisions.

The results for investment are presented in table 18, for two sectors surveyed by IMCE with this variable in which question 15 exists (excluding mining). The results reveal similarities on the role of investment actions across the sectors. Following our results, for the case of commerce, investment decisions six months ahead are driven by the country future situation which, in turn, causes the personal situation currently and in the future. In this case, thus, it is expected that the overall current situation of the economy will result in investment actions heading to an improved personal situation at any horizon. Interestingly, the out-of-sample results of table 13 show that when using overall current and future sentiment alternative measures for gross fixed capital formation, the results are the best helping forecast accuracy. This contrasts the results for personal (current and future) alternative measures showing the worst performance. Apparently, gross fixed capital formation would help to better forecast personal alternative measures; but not the other way around.

Table 17

Granger causality analysis: Question 15 on Employment and IMCE alternative measures*

		Personal			Country	Result
		Current Sentiment Index	Personal Future Expectation Index	Overall Index	Future Expectations Index	Schematic Granger causality results
		PCSI	PFEI	OPI	CFEI	
Question 14: How will the employment in your company evolve in the next 3 months?	Commerce	Employment in 3 months causes Personal Current Sentiment Index	Both causes the other	Both cause the other	Country Future Expectations Index causes Employment in 3 months	Country/Future → Employment +3m → Personal/Current
	Manufacturing	Employment in 3 months causes Personal Current Sentiment Index	Employment in 3 months causes Personal Future Expectation Index	Both cause the other	Country Future Expectations Index causes Employment in 3 months	Country/Future → Employment +3m → Personal/Current and Future
	Construction	Personal Current Sentiment Index causes Employment in 3 months	Neither one causes the other	Overall Personal Index causes Employment in 3 months	Neither one causes the other	Personal/Overall and Current → Employment +3m

Source: Authors' calculations.

* Level of significance: 5%.

Table 18

Granger causality analysis: Question 15 on investment and IMCE alternative measures*

		Personal			Country	Result
		Current Sentiment Index	Personal Future Expectation Index	Overall Index	Future Expectations Index	Schematic Granger causality results
		PCSI	PFEI	OPI	CFEI	
Question 15: How will the investments of your company evolve in the next 6 months?	Commerce	Retail investments in 6 months causes Personal Current Sentiment Index	Retail investments in 6 months causes Personal Future Expectation Index	Both cause the other	Country Future Expectations Index causes Retail investments in 6 months	Country/Future → Investment +6m → Personal/Current and Future
	Manufacturing	Both causes the other	Industry investments in 6 months causes Personal Future Expectation Index	Both cause the other	Industry investments in 6 months causes Country Future Expectation Index	Investment +6m → Personal and Country/Current

Source: Authors' calculations.

* Level of significance: 5%.

Finally, for manufacturing, two cases of simultaneity are found (with PCSI and OPI). The remaining cases go, to a certain extent, in the same direction with respect to commerce. That is, investment actions six months ahead cause personal current situation indicator; but, this time country current situation is also caused by investment actions. In sum, 6-month investment causes all alternative measures; a fact that could be read as that industry-sector respondents believe that both personal and country situations are defined, to a considerable extent, by their own attitude towards investment decisions. This could imply that personal alternative measures may actually not be helpful when predicting investment disaggregates, a result found for the two lower panels of table 13.

Overall, and excluding the case of construction, planned hiring decisions and investment actions are caused mainly by the country future situation indicator. In turn, the intentions cause, in general, personal situation indicators at both current and future horizons.

3. Do action indicators lead actual investment, hiring, and consumption?

In this sub-section we analyze the extent to which single-question action indicators lead to actual movements in the targeted variables in a simple econometric framework. That is, if question 14, question 15, and now including consumers' question 28 (table 4), actually lead the series of total employment, investment (including its two main components), and private consumption (also including its two main components), correspondingly. Unlike the Granger causality analysis, the aim now is to answer how much time and to what extent alternative measures statistically anticipate the mentioned macroaggregates.

The analysis is thus circumscribed to estimating the following regression (l being the key parameter differing from previous analyses):

$$y_t = \alpha + \varphi \cdot y_{t-1} + \varepsilon_t - \theta \cdot \varepsilon_{t-1} - \theta_E \cdot \varepsilon_{t-4} + \theta\theta_E \cdot \varepsilon_{t-5} + \gamma_l \cdot f_{t+l}, \quad (1)$$

where y_t corresponds to a stationary transformation of the macro aggregates (*private consumption*, *non-durable consumption*, *durable consumption*, *employment*, *investment*, *machinery and equipment*, and *construction and works*), f_{t+l} is the l-step-ahead action indicator with l={1,...,8}, and ε_t is a white noise. The coefficients $\{\alpha, \varphi, \theta, \theta_E, \gamma_l\}$ are parameters to-be estimated through the *least squares method* using the Newey-West heteroskedasticity and autocorrelation correction for standard errors. Hence, the action indicator f_{t+l} leads the macroaggregate y_t in l periods if γ_l are statistically significant at traditional levels of confidence. The integer l may not necessarily be significant exactly at the question's horizon, but instead for a longer time span persistently contributing to describe the macro aggregate's dynamic. For internal coherence and to control for seasonality, the baseline specification (without augmentation) is the same used in the forecasting exercise. Also, note that the IPEC (question 28) does not distinguish between consumers, and hence, an aggregate indicator is used. For IMCE, the answers to questions 14 and 15 are weighted using the 2015 GDP weights for representativeness.

The results for *private consumption*, making use of the IPEC indicator, are reported in table 19. The upper panel displays the results for total consumption. Note that up to six quarters, the IPEC action indicator turns out to be significant, despite being 40% the size of the contemporaneous coefficient. A common element shared across consumption variables is the decline in the alternative measure's influence on the macroaggregate as the horizon l lengthens, being the contemporaneous coefficient of the greatest size.

Non-durable consumption mimics the profile described for total consumption, as it represents the larger proportion of the aggregate, and exhibiting a small variance compared to the remaining portion. These results imply that the current IPEC action indicator influences consumption dynamics. However, as a persistent and habit-based variable, the lagged coefficient (around 0.80; not shown) is still the parameter commanding the dynamic of the series.

A different outlook is found for *durable consumption*. In this case, the coefficient associated with the leading variable oscillates in terms of size and significance. Notice that, as a more volatile series, the persistence is less pronounced, and the lead coefficient achieves up to four times that of the non-durable consumption. This implies that the IPEC-based action indicator leads a greater portion of the non-durable consumption, at the cost of doing so at shorter horizons for a volatile series. This oscillating behavior, however, could be due to a number of reasons to be explored: presence of residual seasonality and the inability of the airline model to capture intra-annual movements, small sample bias, or (more likely for longer values of l) spuriousness.

Table 19

Consumption estimates augmented with IPEC action indicator (leads)*

Private consumption: Total										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Leads	**No indicator**	***lead*=0**	***lead*=1**	***lead*=2**	***lead*=3**	***lead*=4**	***lead*=5**	***lead*=6**	***lead*=7**	***lead*=8**
IPEC (t+l)	-	**0.103****	**0.086****	**0.065****	**0.041***	**0.052****	**0.055****	**0.042***	0.024	0.035
	-	**(0.016)**	**(0.014)**	**(0.020)**	**(0.019)**	**(0.019)**	**(0.014)**	**(0.017)**	(0.020)	(0.019)
Adj. R-sq.	0.854	0.872	0.868	0.853	0.843	0.849	0.854	0.844	0.852	0.855
DW Stat.	1.854	1.947	1.971	1.893	1.930	1.930	1.940	1.863	1.895	1.881
Obs.	82	63	64	64	64	64	64	64	64	64
Private consumption: Non-durable										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Leads	**No indicator**	***lead*=0**	***lead*=1**	***lead*=2**	***lead*=3**	***lead*=4**	***lead*=5**	***lead*=6**	***lead*=7**	***lead*=8**
IPEC (t+l)	-	**0.100****	**0.087****	**0.073****	**0.042***	**0.049****	**0.056****	**0.045****	0.004	0.010
	-	**(0.016)**	**(0.017)**	**(0.019)**	**(0.017)**	**(0.017)**	**(0.015)**	**(0.015)**	(0.018)	(0.021)
Adj. R-sq.	0.762	0.769	0.780	0.758	0.736	0.745	0.756	0.738	0.746	0.745
DW Stat.	1.996	2.010	2.059	1.918	2.005	2.004	2.020	1.927	1.996	1.997
Obs.	82	63	64	64	64	64	64	64	64	64
Private consumption: Durable										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Leads	**No indicator**	***lead*=0**	***lead*=1**	***lead*=2**	***lead*=3**	***lead*=4**	***lead*=5**	***lead*=6**	***lead*=7**	***lead*=8**
IPEC (t+l)	-	**0.436****	**0.274****	0.203	**0.228***	**0.321****	0.134	0.101	0.188	0.270**
	-	**(0.069)**	**(0.083)**	(0.120)	**(0.112)**	**(0.079)**	(0.094)	(0.097)	(0.110)	(0.070)
Adj. R-sq.	0.867	0.885	0.862	0.858	0.865	0.881	0.861	0.859	0.867	0.878
DW Stat.	1.787	1.852	1.899	1.854	1.854	1.865	1.873	1.856	1.893	1.894
Obs.	82	63	64	64	64	64	64	64	64	64

Source: Authors' calculations.
* Sample: 2003.IV-2017.II. Coefficient standard errors in parentheses. ***: p <1%, **: p <5%, *: p <10%.

The results when using the IMCE action indicators are presented in table 20. The upper panel displays the results for *total employment*. Notice that the results are somewhat better behaved compared to durable consumption.

An oscillatory pattern for coefficient size is found, but not for statistical significance, which is consistently found up to the fifth lead. Actually, the highest lead influence occurs at $l = 1$ (instead of $l = 0$), and the second-highest coefficient is at $l = 3$, and $l = 5$ then. As figure 3 suggest, this oscillatory behavior could be due to a non-standard intra-annual pattern displayed by the employment series and not captured by the econometric specification. This is added to the previously found fact that hiring plans largely respond to the current state of the economy; thus, incorporating all short-term business cycle fluctuations.

The three lower panels of table 20 are devoted to *gross fixed capital formation*. For total investment, the results are significant for all the horizons, except l=5. In terms of size, the coefficients display an asymmetric U-shaped distribution with the contemporaneous coefficient being the highest. Notice that, similarly to total consumption, the persistence of the series is still the commanding coefficient of the series; but in this case, the leading coefficient plays a larger role compared to that of total consumption.

Table 20

Employment and investment estimates augmented with IMCE action indicators (*leads*)*

Employment										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Leads	**No indicator**	***lead*=0**	***lead*=1**	***lead*=2**	***lead*=3**	***lead*=4**	***lead*=5**	***lead*=6**	***lead*=7**	***lead*=8**
IMCE (t+l)	-	**0.040****	**0.067****	**0.035***	**0.062****	**0.033***	**0.051***	0.028	0.042	0.018
	-	**(0.014)**	**(0.013)**	**(0.014)**	**(0.018)**	**(0.016)**	**(0.023)**	(0.021)	(0.024)	(0.020)
Adj. R-sq.	0.755	0.771	0.793	0.768	0.791	0.765	0.782	0.758	0.773	0.754
DW Stat.	2.007	1.952	1.949	2.027	1.923	2.012	1.962	2.003	1.950	1.987
Obs.	61	55	56	56	56	56	56	56	55	54
Gross fixed capital formation: Total										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Leads	**No indicator**	***lead*=0**	***lead*=1**	***lead*=2**	***lead*=3**	***lead*=4**	***lead*=5**	***lead*=6**	***lead*=7**	***lead*=8**
IMCE (t+l)	-	**0.383****	**0.223****	**0.288****	**0.065***	**0.221****	0.100	**0.191***	**0.115***	**0.159***
	-	**(0.068)**	**(0.073)**	**(0.086)**	**(0.031)**	**(0.077)**	(0.064)	**(0.076)**	**(0.054)**	**(0.074)**
Adj. R-sq.	0.846	0.889	0.848	0.863	0.873	0.849	0.844	0.854	0.843	0.854
DW Stat.	2.014	2.042	2.109	2.146	2.046	2.114	2.128	2.147	2.078	2.036
Obs.	82	56	57	57	57	57	57	57	57	57
Gross fixed capital formation: Machinery and equipment										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Leads	**No indicator**	***lead*=0**	***lead*=1**	***lead*=2**	***lead*=3**	***lead*=4**	***lead*=5**	***lead*=6**	***lead*=7**	***lead*=8**
IMCE (t+l)	-	**0.765****	**0.637****	**0.578***	**0.782****	**0.505****	**0.585****	**0.372***	**0.636****	**0.374***
	-	**(0.155)**	**(0.176)**	**(0.242)**	**(0.123)**	**(0.173)**	**(0.083)**	**(0.155)**	**(0.098)**	**(0.137)**
Adj. R-sq.	0.826**	0.817	0.787	0.784	0.809	0.782	0.796	0.777	0.786	0.789
DW Stat.	(0.047)	2.157	2.284	2.226	2.078	2.228	2.342	2.198	2.218	2.039
Obs.	82	56	57	57	57	57	57	57	57	57
Gross fixed capital formation: Constuction and works										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Leads	**No indicator**	***lead*=0**	***lead*=1**	***lead*=2**	***lead*=3**	***lead*=4**	***lead*=5**	***lead*=6**	***lead*=7**	***lead*=8**
IMCE (t+l)	-	**0.192****	**0.102***	**0.146****	**0.099****	**0.090***	0.034	**0.084***	0.059	0.039
	-	**(0.035)**	**(0.043)**	**(0.031)**	**(0.036)**	**(0.039)**	(0.039)	**(0.039)**	(0.035)	(0.040)
Adj. R-sq.	0.808	0.897	0.867	0.873	0.850	0.842	0.839	0.847	0.835	0.836
DW Stat.	1.972	1.972	2.051	1.945	1.950	1.966	1.982	1.962	1.961	1.926
Obs.	82	56	57	57	57	57	57	57	57	57

Source: Authors' calculations.
* Sample: 2003.IV-2017.II. Coefficient standard errors in parentheses. ***: p <1%, **: p <5%, *: p <10%.

When disaggregating gross fixed capital formation, it becomes clear that the explanatory gains come from the *machinery and equipment* rather than the *construction and works* side. *Machinery and equipment* replicates the asymmetric U-shaped distribution of coefficient size found for the aggregate, but it does so consistently at greater coefficient levels. For *construction and works*, the lead coefficient's size is always below those of the total, but the longest significant horizon achieves a non-negligible figure at six quarters.

In sum, *non-durable consumption* and *machinery and equipment* are fairly anticipated by IPEC and IMCE action indicators at horizons comprising two years. For *durable consumption*, *construction and works*, and *employment*,

however, the action indicators show a reduced range surrounding a year; however, depicting an oscillatory evidence to be taken with greater care.

V. SUMMARY OF MAIN FINDINGS AND OPPORTUNITIES FOR FUTURE RESEARCH

Surveys of economic perceptions from business and the general public have become a standard component of macroeconomic monitoring in many countries. PMIs and other surveys are commonly examined by authorities, analysts, and the press seeking insights on the evolution of the economy. For nearly 15 years similar surveys have been applied in Chile but little attention has been paid to their ability to anticipate economic developments and/or the behavior of economic agents.

This document was aimed at assessing the quality of the data gathered by the main Chilean qualitative public opinion surveys, reviewing how they are currently built, and determining whether differently constructed alternative measures can improve the short-term forecast of macroeconomic variables (consumption, employment, and investment).

We address the shortcomings of existing synthetic indicators that mix different focuses and time perspectives. To overcome them, we assess eight alternative measures that draw from subsets of questions included in the surveys. In particular, we distinguish between *current sentiment* and *future expectations* as well as between *personal* and *country-wide* measures. In addition, we analyze action indicators, formed on the basis of questions that refer to behavior related to macroaggregates.

The results indicate that such synthetic indicators evolve with sufficient independence so as to potentially add predictive value and consistency to existing data. In particular, our results suggest that future and country-wide perceptions are formed with distinct information from personal and current sentiment, while the latter are somewhat affected by the former. In addition, for the same economic phenomena, different appraisals are obtained depending on the consulted survey. This is analyzed in terms of survey representativeness and other dimensions.

The main results for the newly proposed eight alternative measures are summarized in table 21. Granger causality results reveal the interesting insight that expectation measures cause the current sentiment measures. This implies that, when forming their expectations about the future, agents engage in some forecasting process going beyond the adaptive expectations hypothesis. The results of such forecast then influences perceptions of the current situation. Regarding personal and country-wide overall indicators, they share the common feature that no indicator Granger causes another, and both are caused by the country-wide current measure. As both overall indicators do not anticipate any other, the results suggest that these indicators tend to be formed independently at the individual level.

Table 21

Summary results for the proposed alternative measures*

	Granger caused by:	Granger cause:	Highest correlation between existing aggregate indicator and indicated measure:	Highest correlation across surveys for the indicated measure:	Same-survey correlations: Highest correlation with Current Indicators:	Same-survey correlations: Highest correlation with Future Indicators:	Predicts better (at horizon):
Personal and Country-wide Indicators							
Personal future PFEI	CFEI	CCSI, PCSI, OCSI	0.866 (IPEC)	IMCE - IPEC	**P:** 0.774 (IPEC) **C:** 0.786 (IPEC)	**P:** - **C:** 0.826 (IPEC)	Private Consumption (*h*=1)
Personal current PCSI	PFEI, CFEI, OFEI, CCSI	CCSI, OCSI	0.936 (IMCE)	IPEC - UChile	**P:** - **C:** 0.862 (IPEC)	**P:** 0.774 (IPEC) **C:** 0.715 (IMCE)	Durable Consumption (*h*=2)
Country future CFEI	-	PCSI, PFEI, OPI, CCSI, OCSI	0.850 (UChile)	UChile - CEP	**P:** 0.715 (IMCE) **C:** 0.734 (UChile)	**P:** 0.826 (IPEC) **C:** -	GFCF (*h*=3)
Country current CCSI	PCSI, PFEI, OPI	PCSI	0.931 (IPEC)	CEP - Cadem	**P:** 0.863 (Cadem) **C:** -	**P:** 0.786 (IPEC) **C:** 0.734 (UChile)	Private Consumption (*h*=4)
Overall Indicators							
Overall future OFEI	CCSI, PCSI	OCSI, CFEI	0.953 (UChile)	IPEC - UChile	**P:** 0.796 (IMCE) **C:** 0.747 (UChile)	**P:** 0.976 (IPEC) **C:** 0.969 (UChile)	GFCF (*h*=4)
Overall current OCSI	-	CCSI, PCSI	0.951 (IPEC)	CEP - Cadem	**P:** 0.918 (IPEC) **C:** 0.992 (IPEC)	**P:** 0.970 (IPEC) **C:** 0.938 (IPEC)	GFCF (*h*=3)
Overall personal OPI	CCSI	-	0.979 (IMCE)	IMCE - IPEC	**P:** 0.956 (UChile) **C:** 0.910 (UChile)	**P:** 0.995 (IPEC) **C:** 0.828 (IMCE)	Durable Consumption (*h*=4)
Overall country OCI	CCSI, OFEI	-	0.946 (IPEC)	IPEC - UChile	**P:** 0.855 (IPEC) **C:** 0.966 (CEP)	**P:** 0.918 (IPEC) **C:** 0.962 (UChile)	Private Consumption (*h*=4)

Source: Authors' calculations.

* Full balanced sample: 2003.IV-2017.II. Granger causality results and same-survey correlations consider all possible cases. "P" stands for *Personal* and "C" for *Country*. "Overall indicators" correlations not previously shown. Forecasting baseline model: *airline model* (for a comparison with versus without 4-term factor-augmentation).

Notice also that, when considering the highest correlation computations within each survey, the information contained in the proposed alternative measures actually differs between them, reflecting the different dimensions measured (and taking into account that the comparison is made with the *highest* instead of the *lowest* correlation). Finally, personal rather than country-wide sentiment measures tend to better predict household-based expenditures.

We also conduct a forecasting exercise to analyze the extent to which the newly proposed alternative measures enhance the predictive ability of the existing synthetic indicator within a general econometric framework, when forecasting investment, consumption, and employment.

Our predictive results reveal the usefulness of our proposed measures, as shown in the summary table 22. This is mostly shown for the case of total and non-durable consumption, particularly at the larger horizons considered, using the *country-wide current* and the *personal future* measure, where major and significant predictive gains are noticed. Regarding investment, predictive gains—yet non-significant—are found with the existing synthetic aggregate

indicator for total investment and its two components; a secondary role is found for the *overall* (*country* and *personal*) *current sentiment* measure when forecasting *aggregate investment* and *construction and works* at longer horizons. Hence, business surveys do not necessarily describe the investment dynamics within our general econometric framework. We also found that, in general, hiring plans and investment intentions are caused mainly by the country future situation indicator. In turn, the intentions cause, in general, personal situation indicators at both current and future horizons.

Finally, *non-durable consumption* and *machinery and equipment* are fairly anticipated by IPEC and IMCE action indicators at horizons comprising two years. For *durable consumption*, *construction and works*, and *employment*, however, the action indicators show a reduced range surrounding a year, although depicting an oscillatory evidence to be taken with greater care.

Further research could consider incorporating alternative measures in *bridge models* to nowcast/forecast macroaggregates, instead of using existing synthetic indicators. By taking advantage of the early availability of the sentiment indicators and the leading characteristic of the action indicators, a bridge regression with mixed data frequency could incorporate some of the proposed monthly indicators to forecast a quarterly variable; typically known with a time lag. This task goes beyond the exercise of Cobb et al. (2011) as now a complete set of predictive indicators is available to incorporate into the analysis. This same exercise could be performed with the *mixed data sample* (MIDAS) modelling technique introduced by Ghysels et al. (2007) in a richer economic environment.

Second, it is suggested to use the UChile and IPEC alternative measures together as instruments in a measurement-error framework to improve the forecast accuracy through efficiency corrections. That is, when using an independent variable measured with a stochastic error, ordinary least square estimates are biased and, therefore, instrumental variables are needed. This could be the case of private consumption where the proposed alternative measures naturally emerge as candidate instruments. An extension considering other household surveys' indicators and combinations with the proposed alternative measures could also contribute to deliver predictive gains through bias reduction for private consumption forecasting models.

It is also suggested to use the more sophisticated statistical methods to optimally combine alternative measures to forecast macroeconomic aggregates. In other words, make use of a blended indicator considering all relevant related alternative measures within and across surveys by using some specialized techniques to capture most of a macroaggregate dynamic (e.g. principal component). Moreover, question/survey weights may change according to the forecasting horizon at which they are targeted. The resulting factors compound a richer set of alternative variables for both testing economic theory (i.e. the employment action indicator to test Okun's Law, or consumption indicators to test the *Consumption Capital Asset Pricing Model*), and forecasting.

Table 22

Macroaggregates and economic action indicators: Granger causality, predictive, and leading quarter results

	Best predicted with:		Intentions/Plans (IMCE only) Sector:	Granger caused by:	Granger cause:	Leaded up to (quarters):	Expectations measures mostly correlated with:
1. Private consumption	*h*=1:	CFEI	-	-	-	**6** (IPEC)	**0.994** (IPEC: PFEI)
	h=2:	CCSI					
	h=3:	CCSI					
	h=4:	CCSI					
1.1. Non-durable consumption	*h*=1:	CFEI	-	-	-	**6** (IPEC)	-
	h=2:	CCSI					
	h=3:	CCSI					
	h=4:	-					
1.2. Durable consumption	*h*=1:	PFEI	-	-	-	**Oscillatory** (IPEC)	-
	h=2:	PFEI					
	h=3:	PFEI					
	h=4:	OPI					
2. Employment	*h*=1:	PCSI	**Commerce:**	CFEI	PCSI	**5** (IMCE)	**0.945** (IPEC: OCSI)
	h=2:	OCSI	**Manufacturing:**	CFEI	PCSI, PFEI		
	h=3:	OCSI	**Construction:**	PCSI, OPI	-		
	h=4:	OCSI					
2. Gross fixed capital formation	*h*=1:	-	**Commerce:**	CFEI	PFEI, PCSI	**8** (IMCE)	**0.960** (IPEC: OPI)
	h=2:	CFEI	**Manufacturing:**	-	PCSI, CCSI		
	h=3:	OCSI	**Construction:**	-	-		
	h=4:	OFEI					
2.1. Machinery and equipment	*h*=1:	CFEI	-	-	-	**8** (IMCE)	-
	h=2:	CFEI					
	h=3:	CFEI					
	h=4:	-					
2.2. Construction and works	*h*=1:	-	-	-	-	**6** (IMCE)	-
	h=2:	-					
	h=3:	OCSI					
	h=4:	OCSI					

Source: Authors' calculations.

REFERENCES

Aguirre, A. and L.F. Céspedes (2004). "Uso de Análisis Factorial Dinámico para Proyecciones Macroeconómicas." *Economía Chilena* 7(3): 35–46.

Albagli, E. and E. Luttini (2015). "Expectativas e Inversión." Box V.1 in *Monetary Policy Report*, first half, Central Bank of Chile.

Baffigi, A., R. Golinelli, and G. Parigi (2004). "Bridge Models to Forecast the Euro Area GDP." *International Journal of Forecasting* 20: 447–60.

Banerjee, A. (1992). "A Simple Model of Herd Behavior." *Quarterly Journal of Economics* 107(3): 797–817.

Box, G.E.P. and G.M. Jenkins (1970). *Time Series Analysis: Forecasting and Control*, first edition, Holden Day, San Francisco, USA.

Calvo, G. and M. Ricaurte (2012). "Indicadores Sintéticos para la Proyección de Imacec en Chile." Working Paper No. 656, Central Bank of Chile.

Carlson, J.–A. and M. Parkin (1975). "Inflation Expectations." *Economica* 42: 123–38.

Ceballos, L. and M. González (2012). "Indicador de Condiciones Económicas." *Economía Chilena* 15(1): 105–17.

Clark, T.E. and M.W. McCracken (2001). "Tests of Equal Forecast Accuracy and Encompassing for Nested Models." *Journal of Econometrics* 105: 85–110.

Clark, T.E. and M.W. McCracken (2005). "Evaluating Direct Multistep Forecasts." *Econometric Reviews* 24: 369–404.

Clark, T.E. and K.D. West (2007). "Approximately Normal Tests for Equal Predictive Accuracy in Nested Models." *Journal of Econometrics* 138(1): 291–311.

Cobb, M., G. Echavarría, P. Filippi, M. García, C. Godoy, W. González, C.A. Medel, and M. Urrutia (2011). "Short–term GDP Forecasting using Bridge Models: A Case for Chile." Working Paper No. 626, Central Bank of Chile.

Diebold, F.X. and R.S. Mariano (1995). "Comparing Predictive Accuracy." *Journal of Business and Economic Statistics* 13: 253–63.

Ghysels, E., D. Osborn, and P.M. Rodrigues (2006). "Forecasting Seasonal Time Series." In *Handbook of Economic Forecasting*, volume 1, edited by G. Elliot, C.W.J. Granger, and A. Timmermann. Elsevier, North Holland.

Ghysels, E., A. Sinko, and R. Valkanov (2007). "MIDAS Regressions: Further Results and New Directions." *Econometric Reviews* 26(1): 53–90.

González, W. (2012). "Un Gran VAR Bayesiano para la Economía Chilena." *Economic Analysis Review* 27(2): 75–119.

González, W. and H. Rubio (2013). "Pronósticos con Métodos *Shrinkage* utilizando una Gran Base de Datos." Working Paper No. 2013, Central Bank of Chile.

Harvey, D., S. Leybourne, and P. Newbold (1997). "Testing the Equality of Prediction Mean Squared Errors." *International Journal of Forecasting* 13: 281–91.

Karlsson, S. (2013). "Forecasting with Bayesian Vector Autoregression." In *Handbook of Economic Forecasting*, volume 2, edited by G. Elliot and A. Timmermann H Part B, Elsevier, North–Holland.

Marcel, M. and A. Naudon (2016). "Transiciones Laborales y la Tasa de Desempleo en Chile." Working Paper No. 787, Central Bank of Chile.

Medel, C.A., M. Pedersen, and P.M. Pincheira (2016). "The Elusive Predictive Ability of Global Inflation." *International Finance* 19(2): 120–46.

Nardo, M., (2003). "The Quantification of Qualitative Survey Data: A Critical Assessment." *Journal of Economic Surveys* 17(5): 645–68.

Nowzohour, L. and L. Stracca (2017). "More Than a Feeling: Confidence, Uncertainty and Macroeconomic Fluctuations." Working Paper No. 2100, European Central Bank.

Pesaran, M.H. (1984). "Expectation Formation and Macroeconomic Modelling." In *Contemporary Macroeconomic Modelling*, edited by P. Malgrange and P.A. Muet. Oxford: Blackwell.

Pincheira, P.M. (2014). "Predicción del Empleo Sectorial y Total en Base a Indicadores de Confianza Empresarial." *Economía Chilena* 17(1): 66–87.

Riquelme, V. and G. Riveros (2018). "Un Indicador Contemporáneo de Actividad (ICA) para Chile." *Economía Chilena* 21(1): 134–49.

APPENDIX A

CONSTRUCTION OF ALTERNATIVE MEASURES

All questions are referenced according to the nomenclature of table 4.

I. NEW IMCE ALTERNATIVE MEASURES

Preliminary remarks

- All new indicators use new sectoral weights, proportional to their relative importance in the 2015 GDP (whereas the usual IMCE index uses weights based on the 2003 GDP).
- The terms "industry" and "manufacturing" are used interchangeably.
- Q16 about wages is not included in the construction of indicators as an increase in wages is not easily interpreted.

1. Country's Future Expectation Indicator: *IMCE_CFEI*

Questions asked

- Q1: How will the general economic situation of the country evolve in the next six months (commerce only)?
- Q1: How will the general economic situation of the country evolve in the next three months (construction only)?
- Q1: How will the economic activity of the country evolve in the next six months (industry and mining only)?

Calculation

The CFEI index is a weighted average of those questions, normalized to lie between 0 and 100.

$$IMCE\_CFEI_t = w_1 \mathrm{Q1}t_t + w_2 \mathrm{Q1}c_t + w_3 \mathrm{Q1}i_t + w_4 \mathrm{Q1}m_t, \quad \text{(A1)}$$

where w_1, w_2, w_3, and w_4, are the 2015 weights for commerce, construction, industry, and mining, respectively, and the letters t, c, I, and m after the question number refer to the sectors.

2. Overall Personal Indicator: *IMCE_OPI*

Questions asked

- Q2: How is the current state of your business (all sectors)?
- Q8: How will the state of your business evolve in the next six months (all sectors except construction)?
- Q12: How will your financial situation evolve in the next six months (commerce only)?

- Q12: How will your financial situation evolve in the next three months (construction only)?
- Q13: How will your production evolve in the next three months (industry and mining only)?
- Q3: How is the state of your inventory (all sectors except construction)?
- Q5: How is the demand faced by your business (construction only)?

Calculation
The OPI index is a weighted average of those questions, normalized to lie between 0 and 100.

$$IMCE\_OPI_t = w_1 \frac{Q2t_t + Q8t_t + Q12t_t - Q3t_t}{4} + w_2 \frac{Q2c_t + Q5c_t + Q12c_t}{3} + w_3 \frac{Q2i_t + Q8i_t + Q13i_t - Q3i_t}{4} + w_4 \frac{Q2m_t + Q8m_t + Q13m_t - Q3m_t}{4}. \quad (2A)$$

3. Overall Current Sentiment Indicator: *IMCE_OCSI*

Questions asked
- Q2: How is the current state of your business?
- Q3: How is the state of your inventory? (except construction)
- Q4: How did your sales evolve compared to last month? (commerce, industry, and mining)
- Q4: How did the activity of your company evolve in the past three months? (construction)
- Q5: How is the demand faced by your business currently? (construction and mining)
- Q6: How has the production of your company evolved compared to last month? (industry)

Calculation
The CSI is a weighted average of these questions.

$$IMCE\_OCSI_t = w_1 \frac{Q2t_t - Q3t_t + Q4t_t}{3} + w_2 \frac{Q2c_t + Q4c_t + Q5c_t}{3} + w_3 \frac{Q2i_t - Q3i_t + Q4i_t + Q6i_t}{4} + w_4 \frac{Q2m_t - Q3m_t + Q4m_t + Q5m_t}{4}. \quad (3A)$$

4. Overall Future Expectation Indicator: *IMCE_OFEI*

Questions asked

- Q1: How will the general economic situation of the country evolve in the next six months (commerce)?
- Q1: How will the general economic situation of the country evolve in the next three months (construction)?
- Q1: How will the economic activity of the country evolve in the next six months (industry and mining)?
- Q8: How will the state of your business evolve in the next six months?
- Q9: How will your sales evolve in the next three months? (commerce)
- Q13: How will your production evolve in the next three months? (industry and mining)
- Q14: How will the employment in your company evolve in the next three months (construction)?
- Q12: How will your financial situation evolve in the next three months (construction)?
- Q12: How will your financial situation evolve in the next six months (commerce)?

Calculation

The OFEI is a weighted average of these questions.

$$IMCE\_OFEI_t = w_1 \frac{Q1t_t + Q8t_t + Q9t_t + Q12t_t}{4} + w_2 \frac{Q1c_t + Q12c_t + Q14c_t}{3} + w_3 \frac{Q1i_t + Q8i_t + Q13i_t}{3} + w_4 \frac{Q1m_t + Q8m_t + Q13m_t}{3}. \quad (4A)$$

5. Personal Current Sentiment Indicator: *IMCE_PCSI*

Questions asked

- Q2: How is the current state of your business?
- Q3: How is the state of your inventory? (except construction)
- Q4: How did your sales evolve compared to last month? (commerce, industry, and mining)
- Q4: How did the activity of your company evolve in the past three months? (construction)
- Q5: How is the demand faced by your business currently? (construction and mining)
- Q6: How has the production of your company evolved compared to last month? (industry and mining)

Calculation

$$IMCE\_PCSI_t = w_1 \frac{Q2t_t - Q3t_t + Q4t_t}{3} + w_2 \frac{Q2c_t + Q4c_t + Q5c_t}{3} + w_3 \frac{Q2i_t - Q3i_t + Q4i_t + Q6i_t}{4} + w_4 \frac{Q2m_t - Q3m_t + Q4m_t + Q5m_t + Q6m_t}{5}. \quad (5A)$$

6. Personal Future Expectation Indicator: *IMCE_PFEI*

Questions asked

- Q8: How will the state of your business evolve in the next six months? (except construction)
- Q9: How will your sales evolve in the next three months? (commerce only)
- Q10: How will the price of your inputs change in the next three months?
- Q11: How will the price of your sales change in the next three months?
- Q12: How will your financial situation evolve in the next six months (commerce)?
- Q12: How will your financial situation evolve in the next three months (construction)?
- Q13: How will your production evolve in the next three months (industry and mining)?

Calculation

$$IMCE\_PFEI_t = w_1 \frac{Q8t_t + Q9t_t - Q10t_t + Q11t_t + Q12t_t}{5} + w_3 \frac{Q11c_t - Q10c_t + Q8c_t + Q13c_t}{4} + w_2 \frac{Q11c_t - Q10c_t + Q12c_t}{3} + w_4 \frac{Q11m_t - Q10m_t + Q8m_t + Q13m_t}{4}. \quad (6A)$$

7. Country's Current Sentiment Indicator: *IMCE_CCSI*

- No questions available

8. Overall Country Indicator: *IMCE_OCI*

- No questions available

II. NEW IPEC ALTERNATIVE MEASURES

Preliminary remarks

- Questions about saving (Q25 and Q29) are not used in constructing the indicators because an increase in savings has different possible economic causes.
- Question about long-term country situation (Q22) is not used as it is a forecast too far into the future.
- The indicator is a simple average of the balance statistics of the above questions.

1. Country's Current Sentiment Indicator: *IPEC_CCSI*

Questions asked
- Q17: How is the current situation of the country?
- Q18: What is the current situation of businesses?

2. Country's Future Expectation Indicator: *IPEC_CFEI*

Questions asked
- Q20: What will be the economic situation of the country in 12 months?
- Q23: How will the level of unemployment will evolve in the next 12 months?
- Q24: By how much will the prices change in the next 12 months? (a lot, a bit)

Remark
The 5-year horizon is too long for our purposes. In addition, the literature shows that there is no additional predictive power for such variable. Question about saving is ambiguous.

3. Personal Current Sentiment Indicator: *IPEC_PCSI*

Question asked
- Q26: How does the economic situation of your household compare to one year ago?

4. Personal Future Expectation Indicator: *IPEC_PFEI*

Questions asked
- Q28: How will the economic situation of your household evolve in the next year?
- Q30: Is this a good time to buy a property?
- Q32: Is this a good time to buy large items?
- Q31: Is this a good time to buy a car?

5. Overall Future Expectation Indicator: *IPEC_OFEI*

Questions asked
- Q20: What will be the economic situation of the country in 12 months?
- Q23: How will the level of unemployment evolve in the next 12 months?
- Q24: By how much will the prices change in the next 12 months? (a lot, a bit)
- Q28: How will the economic situation of your household evolve in the next year?
- Q30: Is this a good time to buy a property?
- Q32: Is this a good time to buy large items?
- Q31: Is this a good time to buy a car?

6. Overall Current Sentiment Indicator: *IPEC_OCSI*

Questions asked
- Q17: How is the current situation of the country?
- Q18: What is the current situation of businesses?
- Q26: How does the economic situation of your household compare to one year ago?

7. Overall Personal Indicator: *IPEC_OPI*

Questions asked
- Q26: How does the economic situation of your household compare to one year ago?
- Q28: How will the economic situation of your household evolve in the next year?
- Q30: Is this a good time to buy a property?
- Q32: Is this a good time to buy large items?
- Q31: Is this a good time to buy a car?

8. Overall Country Indicator: *IPEC_OCI*

Questions asked
- Q17: How is the current situation of the country?
- Q18: What is the current situation of businesses?
- Q20: What will be the economic situation of the country in 12 months?
- Q23: How will the level of unemployment evolve in the next 12 months?
- Q24: By how much will the prices change in the next 12 months?

III. NEW UCHILE ALTERNATIVE MEASURES

Preliminary remarks
- Previous data on expected CPI inflation is missing (was asked from June 2005 onwards).
- The quarterly data used dates back to March 2003, whereas UChile data on their website dates back to 1997.
- Q39 "What are the three main problems of the country?" will not be used for obvious reasons.
- UChile uses extensively its data so there are not many new indices to create.
- The indicator is a simple average of the balance statistics of the mentioned questions.
- The *Overall Personal*, *Overall Country*, *Overall Future Expectations* and *Overall Current Sentiment* indicators are already constructed and reported by UChile. They are labeled "Family situation," "Country situation," "Expected situation," and "Current situation," respectively.

1. Country's Current Sentiment Indicator: *UChile_CCSI*

Question asked

- Q38: How was the economic situation of the country a year ago?

2. Country's Future Expectation Indicator: *UChile_CFEI*

Question asked

- Q40: In one year, how will be the economic situation of the country compared to today?

3. Personal Current Sentiment Indicator: *UChile_PCSI*

Questions asked

- Q41: How did the income of your household vary within the last 12 months?
- Q42: How is the situation of your household in terms of indebtedness?
- Q45: Did a member of your household buy a durable good in the past three months?

4. Personal Future Expectation Indicator: *UChile_PFEI*

Questions asked

- Q43: How will the income of your household vary within the next 12 months?
- Q46: Will a member of your household buy a durable good in the next three months?
- Q47: Are you or is a member of your household thinking of buying a house in the next 12 months?

IV. NEW CEP ALTERNATIVE INDICATORS

Preliminary remark

- The indicator is a simple average of the balance statistics of the mentioned questions.

1. Country's Future Expectation Indicator: *CEP_CFEI*

Question asked

- Q35: How will the economic situation of the country evolve in the next 12 months?

2. Personal Future Expectation Indicator: *CEP_PFEI*

Question asked

- Q37: In one year, how do you think your economic situation will be compared to today?

3. Current Country Sentiment Indicator: *CEP_CCSI*

Questions asked
- Q33: How is the current economic situation of the country?
- Q34: Do you think Chile is progressing, stagnating, or in decline?

4. Personal Current Sentiment Indicator: *CEP_PCSI*

Question asked
- Q36: How do you qualify your current economic situation?

5. Overall Future Expectation Indicator: *CEP_OFEI*

Questions asked
- Q35: How will the economic situation of the country evolve in the next 12 months?
- Q37: In one year, how do you think your economic situation will be compared to today?

6. Overall Current Sentiment Indicator: *CEP_OCSI*

Questions asked
Q33: How is the current economic situation of the country?
Q34: Do you think Chile is progressing, stagnating, or in decline?
Q36: How do you qualify your current economic situation?

7. Overall Country Indicator: *CEP_OCI*

Questions asked
Q33: How is the current economic situation of the country?
Q34: Do you think Chile is progressing, stagnating, or in decline?
Q35: How will the economic situation of the country evolve in the next 12 months?

8. Overall Personal Indicator: *CEP_OPI*

Questions asked
- Q36: How do you qualify your current economic situation?
- Q37: In one year, how do you think your economic situation will be compared to today?

V. NEW CADEM ALTERNATIVE INDICATORS

Preliminary remarks
- Cadem has no current aggregate indicator: it reports the balance statistic for each question.

- Two questions out of seven are non-useable to construct economic indicators as they encompass economic, social and political issues.
- The indicator is a simple average of the balance statistics of the mentioned questions.

1. Current Country Sentiment Indicator: *Cadem_CCSI*

Questions asked

- Q49: Do you think that the Chilean economy is progressing, stagnating or declining?
- Q50: How would you rate the current economic situation of businesses?
- Q51: How would you rate the current situation of employment in the country?

2. Personal Current Sentiment Indicator: *Cadem_PCSI*

Questions asked

- Q53: How would you rate the current economic situation of you and your household?
- Q54: How would you rate the economic situation of consumers to purchase goods and services?

3. Overall Current Sentiment Indicator: *Cadem_OCSI*

Questions asked

- Q49: Do you think that the Chilean economy is progressing, stagnating, or declining?
- Q50: How would you rate the current economic situation of businesses?
- Q51: How would you rate the current situation of employment in the country?
- Q53: How would you rate the current economic situation of yourself and your household?
- Q54: How would you rate the economic situation of consumers to purchase goods and services?

4. Country's Future Expectation Indicator: *Cadem_CFEI*

- No questions available

5. Personal Future Expectation Indicator: *Cadem_PFEI*

- No questions available

6. Overall Future Expectation Indicator: *Cadem_OFEI*

- No questions available

7. Overall Country Indicator: *Cadem_OCI*

- No questions available

8. Overall Personal Indicator: *Cadem_OPI*

- No questions available

APPENDIX B

FORECASTING EXERCISE

The forecasting exercise is conducted as follows. First, we consider the two main components of domestic demand which are targeted by the IMCE and IPEC surveys: private consumption (*pc*) and investment (*i*). At the same time, we consider the two components of private consumption: *non-durable* (*ndc*) and *durable* (*dc*) consumption. Then the same is done for investment (gross fixed capital formation), compounded by *machinery and equipment* (*meq*) and *construction and works* (*cw*). Finally, as IMCE deals with entrepreneurs' plans, for both investment and hiring, we also consider total employment (*emp*) as predicted by the IMCE and its alternative measures. All these six series (*pc*, *ndc*, *dc*, *i*, *meq*, and *cw*) are transformed into annual percentage changes to achieve stationarity (and depicted in figure 3).

Second, by using the sample covered from 2003.IV to 2014.II (43 observations in quarterly frequency), we estimate a version of the so-called *airline model* (Box and Jenkins, 1970) for each of the seven variables, which makes use of the information exclusively contained in the same series, including a four-term exogenous factor augmentation. The baseline specification thus is:

$$y_t = \alpha + \psi(L) f_t + \phi y_{t-1} + \varepsilon_t - \theta\varepsilon_{t-1} - \theta_E\varepsilon_{t-4} + \theta\theta_E\varepsilon_{t-5}, \qquad (1B)$$

where $\{\alpha, \phi, \theta_E, \psi_l,\}$ are to-be-estimated parameters, f_t corresponds to IMCE or IPEC *existing* or *alternative measures*, and is a white noise. Notice that the polynomial $\psi(L)$—where L is a lag operator, —is a four-term coefficient set with L=3. In other words, the alternative measures are included contemporaneously plus three lags, completing a year of information. This is possible because data availability of surveys are four to five months prior to macroeconomic aggregates. Obviously, y_t could be {*pc*, *ndc*, *dc*, *emp*, *i*, *meq*, *cw*}, and f_t the list of options in table 6 depicted in figure 1 (without any kind of transformation).[11] The use of this general econometric specification obeys to the arguments given in Ghysels et al. (2006), as the Box-Jenkins *airline model* comes out as a suitable representation of the majority of seasonal macroeconomic series.

11 Notice that in just a few occasions the F-test rejects that the coefficients of the exogenous factor are jointly equal to zero. By considering the evaluation sample for each case, this account is: Private Consumption: Total (1: CCSI; 2: PFEI; 1: OCSI; 6: OPI); Employment (1: PCSI, 1: OCSI); Gross Fixed Capital Formation: Total (3: PFEI); Gross Fixed Capital Formation: Machinery and equipment (1: PFEI); and Gross Fixed Capital Formation: Construction and works (2: CFEI; 2: PFEI). These numbers indicate the number of times in which the exogenous factor is not statistically significant out of a total of 12 observations.

These results complement those of Pincheira (2014), in which original IMCE sectorial indicators are used to help forecast sectorial employment. Traditional *Adjusted* R^2 statistic is used as an in-sample goodness-of-fit measure. Notice that Albagli and Luttini (2015) analyze the in-sample role of IMCE included in a VAR model (including investment fundamentals) also finding an in-sample role for the existing overall indicator.

Third, we make use of the remaining sample available, from 2014.III to 2017.II (12 observations in quarterly frequency) as the evaluation sample for one- to four-step-ahead forecasts. The forecast evaluation statistic used is the root mean squared forecast error (RMSFE) defined as:

$$RMSFE_h = \left[\frac{1}{P(h)} \sum_{t=R}^{T+1-h} \left(y_{t+h} - \hat{y}_{t+h|t} \right)^2 \right]^{\frac{1}{2}}, \tag{2B}$$

where $\hat{y}_{t+h|t}$ represents the forecast of y_{t+h} made with information known up until time t. We generate a total of $P(h)$ forecasts, satisfying $P(h) = T + 2 - h - R$, where h is the forecast horizon, $h = \{1,2,3,4\}$, and R is the number of observations in the estimation sample.

Finally, most of the results are reported using the *Relative RMSFE* coefficient to ease a comparison across the alternative measures. The *Relative RMSFE* is computed as follows:

$$Relative\ RMSFE_h = \frac{RMSFE_h\left(Sub-indicator\right)}{RMSFE_h\left(Existing\,indicator\right)}, \tag{3B}$$

isolating the forecasting gain due to the alternative measure beyond that already provided by the existing indicator. Figures lower than one imply a better performance of the alternative measure relative to the existing aggregate indicator. For these comparisons, where the baseline specification is the same for both components, the Harvey et al. (1997) test is used.

Similarly, for the case where no factor is used, the following *Relative RMSFE* is used:

$$Relative\ RMSFE_h = \frac{RMSFE_h\left(Existing\,indicator\right)}{RMSFE_h\left(No\,indicator\right)}. \tag{4B}$$

Hence, figures lower than one imply a better performance of the existing indicator relative to the no-indicator case.

APPENDIX C

FORECAST EVALUATION FRAMEWORK

As above-mentioned, we evaluate the predictive ability of the proposed alternative measures in two dimensions. The first consists in comparing the information that the alternative measure forecast provides beyond that of the existing indicator, whereas the second compares the alternative measure forecast with a version with no any augmentation. For the former case, the Harvey, Leybourne, and Newbold (1997; HLN) test of equal predictive ability is used, which consists in a small-sample-corrected version of the Diebold and Mariano (1995) test. For the latter case, the Clark and West (2007; CW) test is used because it consists of an adjusted root mean squared forecast error (RMSFE) comparison due to model encompassing. Also, with the HLN test we plainly evaluate *forecast accuracy* and not *model adequacy*, whereas the CW test evaluates the opposite: model adequacy instead of forecast accuracy. Notice that the CW is not appropriate for small sample environments due to a reduction of its power. However, no similar correction to the HLN for the Diebold-Mariano has been proposed. Thus, we use it as good as it gets of a better alternative.

The CW test can be considered as both an encompassing test or an adjusted comparison of the MSFE. The adjustment is made to make a fair comparison between nested models. Intuitively, the CW test removes a term that introduces noise when a parameter, that should be zero under the null hypothesis of equal MSFE, is estimated.

The core statistic of the CW test is constructed as follows:

$$\hat{z}_{t+h} = \left(\hat{e}_{1,t+h}\right)^2 - \left[\left(\hat{e}_{2,t+h}\right)^2 - \left(\hat{y}_{1,t+h|t} - \hat{y}_{2,t+h|t}\right)^2\right], \tag{1C}$$

where

$$\hat{e}_{1,t+h} = y_{t+h} - \hat{y}_{1,t+h|t}, \tag{2C}$$
$$\hat{e}_{2,t+h} = y_{t+h} - \hat{y}_{2,t+h|t},$$

represent the corresponding forecast errors. Notice that $\hat{y}_{1,t+h|t}$ and $\hat{y}_{2,t+h|t}$ denote the h-step-ahead forecasts generated from two models under consideration. "Model 1" is the parsimonious or *small* model without indicator-augmentation that is nested in the *larger* "Model 2". In other words, Model 2 would become Model 1 if some of its parameters were set to zero.

With a little algebra, it is straightforward to show that could also be expressed as follows:

$$Sample\,MSFE-Adjusted=\frac{2}{P(h)}\sum_{t=R}^{T+1-h}\hat{e}_{1,t+h}\left(\hat{e}_{1,t+h}-\hat{e}_{2,t+h}\right). \tag{3C}$$

This statistic is used to test the following null hypothesis, against the alternative:

$$\begin{aligned} H_0 &: \mathbb{E}\left[Sample\,MSFE-Adjusted\right]=0, \\ H_1 &: \mathbb{E}\left[Sample\,MSFE-Adjusted\right]>0. \end{aligned} \tag{4C}$$

The CW test suggests a one-sided test for a *t*-type statistic based upon the core statistic in (C1), i.e. asymptotically normal critical values. In most of the CW analysis, it follows Clark and McCracken (2001, 2005). Theoretical results in those papers require the models to be estimated with *nonlinear least squares*, which we use in this article, and also that multistep forecasts be made with the direct method. As we make use of the iterated forecast method, we show the results at more than one-step-ahead horizon just for reference.

Secondly, we focus in the HLN test of equal predictive ability. We do so given our concern for evaluating forecast accuracy instead of model adequacy in a small sample environment. According to the Diebold-Mariano original test, we focus on testing the following null hypothesis against the alternative:

$$\begin{aligned} H_0 &: \mathbb{E}\left[\hat{d}_{t(h)}\right]=0, \\ H_1 &: \mathbb{E}\left[\hat{d}_{t(h)}\right]\neq 0, \end{aligned} \tag{5C}$$

where

$$\hat{d}_{t(h)}=\left(y_{t+h}-\hat{y}_{1,t+h|t}\right)^2-\left(y_{t+h}-\hat{y}_{2,t+h|t}\right)^2. \tag{6C}$$

Our null hypothesis posits that forecasts generated from the nested model perform equally to those generated from the larger model. As noted by HLN, using an approximately unbiased estimator of the variance of the mean of leads to a modified Diebold-Mariano test statistic:

$$HLN_{(h)}=\left[\frac{n+1-2h+n^{-1}h(h-1)}{n}\right]^{\frac{1}{2}}\left(\bar{d}_{(h)}/\hat{\sigma}_{d(h)}\right), \tag{7C}$$

which must be contrasted with critical values from a Student's *t* distribution with (n–1) degrees of freedom. It is important to emphasize that the two tests differ in a number of aspects. One of the most important differences, is that they are designed for different purposes. Consequently, we expect these two tests to deliver different results. Most likely, the CW test will be able to show more rejections of the null hypothesis than the HLN test.

APPENDIX D

CONSTRUCTION OF ACTION INDICATORS

All questions are referenced according to the nomenclature of table 4.

I. NEW IMCE ACTION INDICATORS

1. Investment Action Indicator: *IMCE_InvAI*

Remark
It aims at capturing the (qualitative) investment expectations of businesses. Given that the National Accounts' definition of investment is the sum of "construction and other investment works" and "machinery and equipment," we use questions reflecting the health of the construction sector in general. Surprisingly, there is no question about construction's expected production or state of the business.

Questions asked
- Q15: How will the investments of your company evolve in the next six months (all sectors except construction)?
- Q5: How is the demand faced by your business (construction only)?
- Q2: How is the current state of your business (construction only)?
- Q12: How will the financial situation of your business evolve in the next three months (construction only)?
- Q14: How will the employment in your company evolve in the next three months (construction only)?

Calculation
The *InvAI* is a weighted average of those questions, normalized to lie between 0 and 100.

$$IMCE\_InvAI_t = w_1 \mathrm{Q15}t_t + w_2 \frac{\mathrm{Q5}c_t + \mathrm{Q2}c_t + \mathrm{Q12}c_t + \mathrm{Q14}c_t}{4} + w_3 \mathrm{Q15}i_t + w_4 \mathrm{Q15}m_t. \quad (1D)$$

2. Consumption Action Indicator: *IMCE_CAI*

Remark
It aims at capturing the future evolution of consumption, given businesses' expectations. Assuming that the mining sector's production is bought only by companies, it is not used in generating this index. For the construction sector, we also have no data on the respective share of final and intermediate consumption in the added value. It is only possible to find the share of land built for households and businesses (*INE.cl > Inicio > Laborales > Edificación:*

Superficie Autorizada). In 2015, roughly 70% (69.68%) of the surface built was for households, so we will weight by 70%. We thus assume that the average price of office space is the same as the average price of housing.

Questions asked

- Q9: How will your sales evolve in the next three months (commerce only)?
- Q13: How will your production evolve in the next three months (industry only)?
- Q12: How will your financial situation evolve in the next three months (construction only)?
- Q5: How is the demand faced by your business (construction only)?
- Q4: How have your sales evolved compared to last month (commerce and industry)?
- Q4: How has the activity of your company evolved in the past three months (construction only)?

Calculation

The CAI is a (differently) weighted average of those questions, normalized to lie between 0 and 100.

$$IMCE\_CAI_t = \left[\frac{w_1}{w_1+w_2+w_3}\right]\times\frac{\text{Q9}t_t+\text{Q4}t_t}{2}+\left[\frac{w_2}{w_1+w_2+w_3}\right]\times\frac{\text{Q12}c_t+\text{Q5}c_t}{2} + \left[\frac{w_3}{w_1+w_2+w_3}\right]\times\frac{\text{Q13}i_t+\text{Q4}i_t}{2}. \quad (2D)$$

3. Employment Action Indicator: *IMCE_EAI*

Remark

Even though the wage level affects employment negatively, we can assume that businesses take this into account when answering questions about employment, so questions about wages are not used. Surprisingly, there is no information available for wage level in the commerce sector.

Question asked

- Q14: How will the employment in your company evolve in the next three months (all sectors)?

Calculation

The EAI is a weighted average of this question.

$$IMCE\_EAI_t = w_1\text{Q14}t_t + w_2\text{Q14}c_t + w_3\text{Q14}i_t + w_4\text{Q14}m_t \ . \quad (3D)$$

II. NEW IPEC ACTION INDICATORS

1. Investment Action Indicator: *IPEC_InvAI*

Questions asked
- Q30: Is this a good time to buy a property?
- Q18: What is the current situation of businesses?

2. Employment Action Indicator: *IPEC_EAI*

Question asked
- Q23: How will the level of unemployment evolve in the next 12 months?

Remark
Even if it asks about unemployment, it is still usable: only the sign will change in correlations or regressions.

3. Consumption Action Indicator: *IPEC_CAI*

Questions asked
- Q30: Is this a good time to buy a property?
- Q31: Is this a good time to buy a car?
- Q32: Is this a good time to buy large items?

III. NEW UCHILE ACTION INDICATORS

1. Consumption Action Indicator: *UChile_CAI*

Questions asked
- Q42: How is the situation of your household in term of indebtedness?
- Q43: How will the income of your household vary within the next 12 months?
- Q45: Did a member of your household buy a durable good in the past three months?
- Q46: Will a member of your household buy a durable good in the next three months?
- Q47: Are you or a member of your household thinking of buying a house in the next 12 months?

2. Investment Action Indicator: *UChile_InvAI*

- No qualitative question available.

3. Employment Action Indicator: *UChile_EAI*

- No qualitative question available.

IV. NEW CEP ACTION INDICATORS

1. Consumption Action Indicator: *CEP_CAI*

- No questions available

2. Investment Expectation Indicator: *CEP_InvAI*

- No questions available

3. Employment Expectation Indicator: *CEP_EAI*

- No questions available

V. NEW CADEM ACTION INDICATORS

1. Employment Action Indicator: *Cadem_EAI*

Question asked

- Q51: How would you rate the current situation of employment in the country?

2. Investment Action Indicator: *Cadem_InvAI*

No questions available

3. Consumption Action Indicator: *Cadem_CAI*

Questions asked

- Q54: How would you rate the economic situation of consumers to purchase goods and services?

EXTRACTING INFORMATION ON ECONOMIC ACTIVITY FROM BUSINESS AND CONSUMER SURVEYS IN AN EMERGING ECONOMY (CHILE)*

Camila Figueroa S.**
Michael Pedersen**

I. INTRODUCTION

Business and consumer surveys are designed to evaluate the people's sentiments about the current state of the economy as well as their expectations for the nearest future. The outcomes of the surveys are used by policy makers and the private sector to assess the respondents' perception of the economy and the overall business environment. Several studies are devoted to evaluating the informational content of the surveys and the present paper contributes to this line of research with an empirical analysis with Chilean observations. More precisely, it analyzes whether the business and consumer surveys contain useful information about current and future economic activity compared to what is already included in historical observations.

In general, the results suggest that the Chilean sentiments surveys lead activity indicators in the sense that they Granger-cause activity, whereas the activity indicators do not seem to cause the surveys. As for short-term forecasting (up to one year ahead), simple autoregressive distributed lag (ADL) models suggest that the surveys generally do have some predictive content, especially for the longer horizons. There are some indications that the surveys are complementary in the sense that the predictions for the longer horizons seem to improve when both of them are included in the model.

Since results of tendency surveys are published in a relatively timely fashion, they are useful in the assessment of the conjunctural analysis as economic activity data are published with, on some occasions, considerable, time delay. Furthermore, surveys usually contain questions on future economic developments and, indeed, there seems to be consensus in the literature that

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they do contain information useful for predicting actual activity.[1] With respect to consumer surveys, early studies such as Fuhrer (1993), Carroll et al. (1994) and Matsusaka and Sbordone (1995) document a link between consumer confidence and future economic activity. In a recent study, Ahmed and Cassou (2016) argue that consumer confidence shocks are likely to reflect news during economic expansions and are consistent with animal spirit during contractions. Kim (2016) finds that consumer sentiments can be driven by economic as well as non-economic factors, such as the emotional state.[2] Likewise, business surveys have been shown to contain information that helps to predict macroeconomic activity, for example by Garcia-Ferrer and Bujosa-Brun (2000) for six OECD countries, Hansson et al. (2005) and Österholm (2014) for Sweden, and Kaufmann and Scheufele (2017) for Switzerland.

The existing evidence of surveys' usefulness for tracking and predicting activity is mainly for developed countries, where surveys have been conducted for longer periods than in most emerging economies.[3] Some exceptions are those of Vázquez et al. (2009) for Uruguay and de Mello and Figueiredo (2014) for Brazil. For Chile, OECD (2011) includes components of the Chilean Business Survey in the composite leading indicator for this country,[4] while Central Bank of Chile (2015) analyzes the connection between Chilean business expectations and investment. Pincheira (2014) applies Chilean data from 2003 to 2013 to study the relation between total and sectorial employment and business confidence. He finds some evidence that the survey data contain useful information for predicting employment, more so for the total employment than for specific sectors of the economy. In a recent application, Chanut et al. (2018) focus on sub-indicators of five Chilean qualitative opinion surveys. The study contains a thorough description of the surveys, explores interdependence between them and performs forecast exercises for consumption and investment. The authors calculate twelve new sub-indicators based on the surveys, and their results suggest some predictive gains when employing them.

In line with these studies, the one in hand analyzes whether a business survey and a consumer survey from Chile contain useful information, compared to that already included in historical observations, for now- and forecasting the overall macroeconomic activity as well as variables that are related to the survey questions. In this respect, the study updates and expands that of Pedersen

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1 The usefulness of survey indicators, combined with other economic variables, in now- and forecasting economic activity has been demonstrated by e.g. Giannone et al. (2008), Lahiri and Monokroussos (2013), and Christiansen et al. (2014) for the U.S.; Frale et al. (2010), Banbura and Rünstler (2011), Carriero and Marcellino (2011), and Keeney et al. (2012) for Europe and the euro area; Bragoli (2017) for Japan; Matheson (2010) for New Zealand; Luciani and Ricci (2014) for Norway; Modugno et al. (2016) for Turkey; and Dahlhaus et al. (2017) for BRIC countries and Mexico.

2 Pedersen (2019) employs sentiments as proxies for forecasters´ mood and shows that they can explain the biases in their output growth and inflation nowcasts.

3 The paper by Gallardo and Pedersen (2008) contains an evaluation of business surveys for the manufacturing sector in Latin American countries.

4 The composite leading indicators for Chile calculated by Gallardo and Pedersen (2007) and Pedersen (2009a) do not include sentiment indicators because of too few data available.

(2009b), which was made with less than six years of Chilean business survey data available. Similar analyses are those by Deitz and Steindel (2005) with U.S. data, Klein and Özmucur (2010) for European countries and de Mello and Figueiredo (2014) for Brazil.

After a brief description of the surveys in section II, section III presents some exercises with the purpose of assessing the extent to which the Chilean business and consumer surveys anticipate economic activity. The last section offers some concluding remarks. The data employed are described in appendix A, while the appendices B to D report the results of tests and robustness exercises.

II. THE SURVEYS

Generally speaking, business surveys consult managers about the current and future state of their companies or organizations. The questions refer to the enterprises' assessment of current production, orders, employment and/or inventories, as well as expectations for the immediate future. Consumer confidence surveys, on the other hand, measure how optimistic or pessimistic consumers are with respect to their current and future personal situation and their assessment of the national economy. This section presents, firstly, the Chilean business survey employed in the analysis and, secondly, that of the consumers.[5]

1. The business survey

The business survey applied in this paper (Imce[6]) was developed by the Central Bank of Chile and outsourced to Icare[7] and Universidad Adolfo Ibáñez under a tender procedure. The survey was launched in November 2003 and covers private and public companies from four sectors of the economy: retail, manufacturing, mining, and construction, which together account for approximately 35% of the Chilean economy. Table 1 shows the sectors' participation and number of surveyed firms. The sampling considers forced inclusion of the biggest companies and random selection of the others; forced inclusion is based on value added in the case of mining and sales in the rest of the sectors.

5 While other business and consumer surveys do exist in Chile (see e.g. Chanut et al. (2018)), the ones analyzed in the present document were chosen because of their monthly frequencies and the availability of historical observations.

6 For its Spanish acronym: Indicador Mensual de Confianza Empresarial.

7 A private organization whose mission is to promote principles, values and concepts, which inspires the development of private firms and agents of national progress and stands for the rational administration of enterprises.

Table 1

IMCE sectors' participation

Economic sector	No. of firms	Sector participation	Measure of participation
Retail	179	23%	Sales
Manufacturing	281	35%	Sales
Mining	11	74%	Aggregate value
Construction	136	21%	Sales
Total	607	16%	Weighted sum

Source: Technical specifications, http://www2.icare.cl/imce/ficha.htm. The weights are from 2010.

The survey is conducted monthly and the questionnaires were designed as recommended by the Handbook of the Organization for Economic Co-operation and Development (OECD, 2003) with some exceptions; for example, the Chilean respondents are not asked to adjust their answers to account for seasonal effects, as recommended by the OECD, and in Chile questions about "order books" are formulated in terms of demand. These modifications were done for the sake of clarity of the questions.[8] Furthermore, because of its economic importance, the mining sector is included in the survey.

The confidence indicators are constructed from response balances (B_j), based on the principle that every variable is a function of the percentage of favorable (F_j), unfavorable (U_j) and neutral (N_j) answers: $B_j = F_j - U_j$. Each B_j is standardized to a scale of 0 to 100, where levels above 50 indicate optimism, 50 neutrality and below 50 pessimism. The indicators consider the following variables:

1. Future production trends: will it increase, decrease or remain the same?
2. Demand level (current orders): is it above, below or at the "normal" level?
3. Inventory level (negative sign): is it excessive, adequate or insufficient?
4. Current business situation: is it good, satisfactory or poor?
5. Business expectations (3 months ahead): will it be less favorable, more unfavorable or unchanged?
6. Expected employment evolution: will it increase, decrease or remain the same?

The four sectorial indices are calculated as shown in table 2.

8 *See also Gallardo and Pedersen (2008).*

Table 2

IMCE sectorial indices calculation

Index definition	Components
Retail: $ICOM = \frac{1}{2}\left(\frac{SEA + SEF - IPV}{3} + 100\right)$	SEA/SEF: the general situation of the firm's current and future state, respectively. IPV: the balance of inventories for sale.
Manufacturing: $ICIN = \frac{1}{2}\left(\frac{PE + DT - IPT}{3} + 100\right)$	PE: the balance of the expected production. DT: the balance of current production. IPT: the balance of current inventories.
Mining: $ICMI = \frac{1}{2}\left(\frac{PE + DT - IPT}{3} + 100\right)$	PE: the balance of the expected production. DT: the balance of current production. IPT: the balance of current inventories.
Construction: $ICOT = \frac{1}{2}\left(\frac{DT + E}{2} + 100\right)$	DT: the balance of current production. E: the balance of expected employment.

Source: Icare website (*http://www2.icare.cl/imce/faq.htm*).

The overall index of business confidence (IMCE) is then calculated as:

$$IMCE = w_1 ICOM + w_2 ICIN + w_3 ICMI + w_4 ICOT,$$

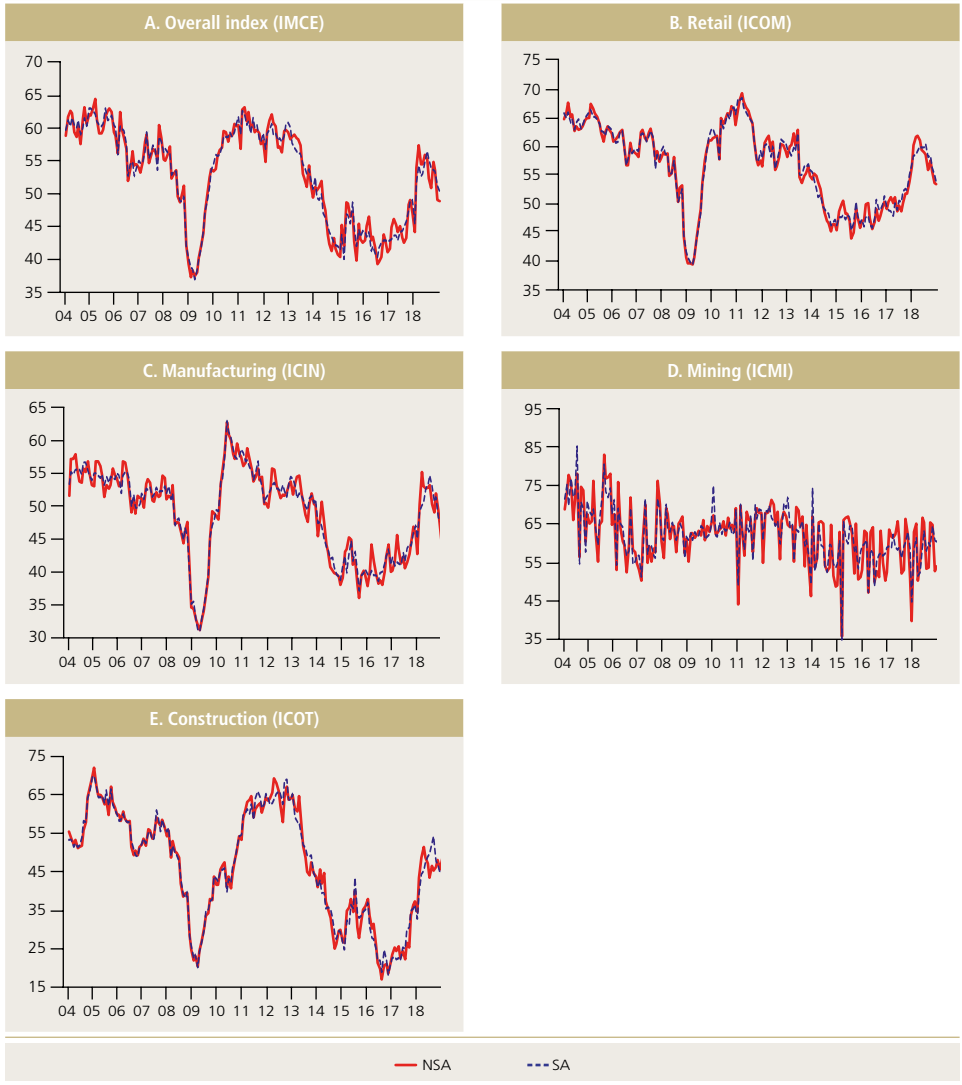
where w_i (i = 1,2,3,4) is the sectorial weight defined as the share of each sector in the value added of the four sectors in the GDP, last time updated in 2010. As mentioned earlier, the survey questions are formulated without taking into account the common seasonality and, hence, the indices may be expected to show seasonal patterns. This is indeed the case shown in figure 1 with the original non-seasonally (NSA) and seasonally (SA) adjusted series, and supported by the tests reported in table B1 in appendix B.[9] Note the relatively high volatility in ICMI, which is due to relatively few companies in the sample such that a missing reply from a firm may have a large impact on the index.[10]

9 For robustness the now- and forecast exercises were also performed with NSA observations. The results are presented in appendix C. Generally the results with SA data do not change much if applying NSA data.

10 Three firms produce approximately two thirds of the copper in Chile.

Figure 1

IMCE diffusion indices



Source: Authors' calculations.

Notes: Observations from November 2003 to December 2018. SA series are calculated with X-13-ARIMA.

2. The consumer survey

The Chilean consumer confidence index utilized in this analysis (IPEC[11]) measures the perception of current and expected personal and nationwide economic situation. The design of the survey is based on the "Index of Consumer

11 *From its Spanish abbreviation: Índice de Percepción de la Economía.*

Sentiment" of the Michigan University. It is available on a yearly basis from 1981 to 1985, quarterly from 1986 to 2001, and monthly thereafter. It is collected by GfK Adimark (a private company) and commissioned by the Central Bank of Chile. The survey sample is random and considers around 1,100 people over 18 years old, residing in 18 of the largest cities in Chile.

The overall IPEC index is constructed as an average of five sub-indices, calculating the net optimism fraction of answers. The index is distributed in the range between 0 and 100.
IPEC sub-indices are based on the following questions:[12]

1. Current national economic situation: is it good, modest, or bad?
2. Future national economic situation: will it be good, modest, or bad in the next 12 months?
3. Expected national economic stability: the most probable economic situation in the next five years is that it will be consistently good or there will be periods with high unemployment and recession?
4. Current personal economic situation: is it better, worse or the same as one year ago?
5. Willingness to purchase durable goods: is it a good or bad moment to buy goods for your household?

For each of these questions, the following index is constructed: X_i = (*% positive – % negative*) + 100. Then, the IPEC index is calculated as follows:[13]

$$IPEC = \frac{1}{10}\sum_{i=1}^{5} X_i .$$

As with the business surveys, the indices calculated for the Chilean consumer surveys are not adjusted by seasonality. Figure 2 shows the original IPEC index and sub-indices, and the indices seasonally adjusted using the X-13-ARIMA method. According to figure 2, responses referring to the current personal and national economic situation, willingness to purchase durable goods and future national economic situation (12 months' expectation) seem to be those mostly affected by seasonality. Table B2 in appendix B presents the tests for seasonality.

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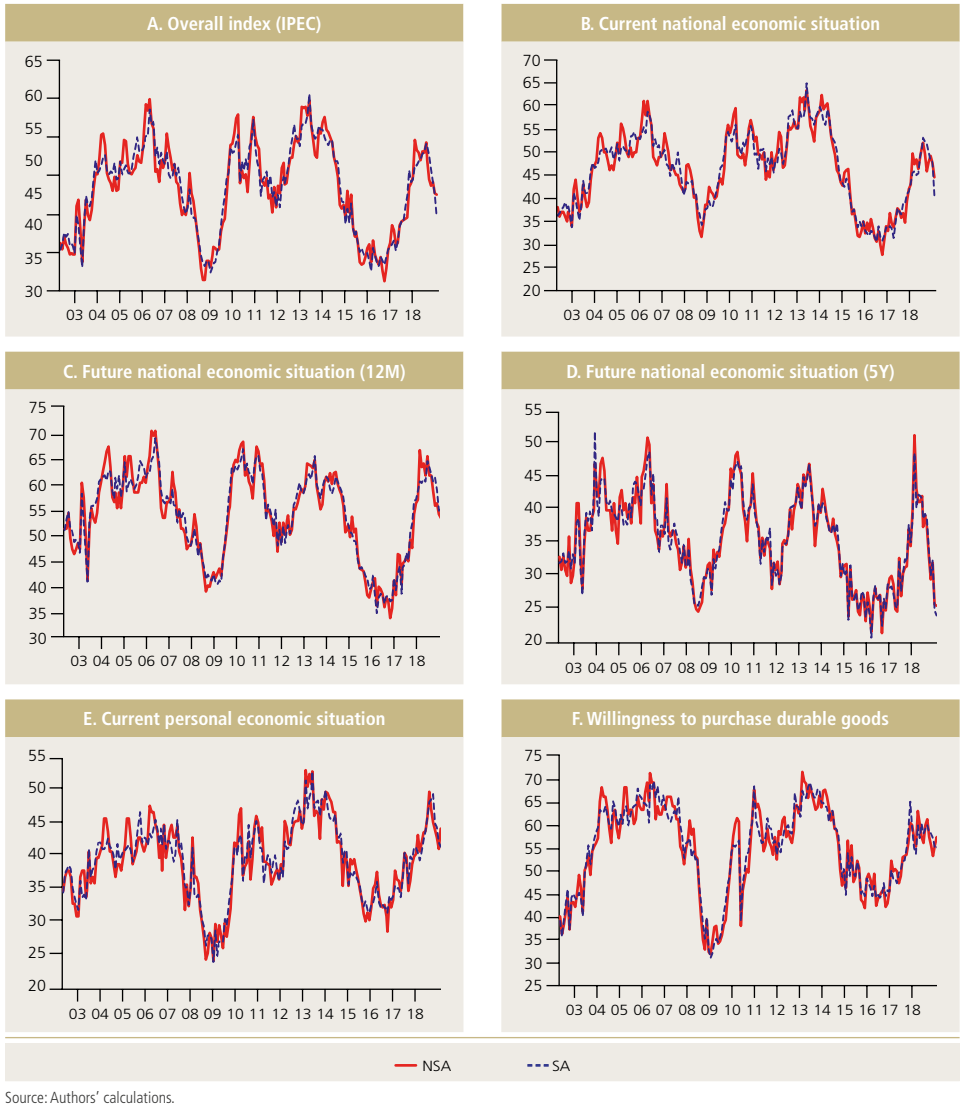
12 Other questions in the survey not included in the IPEC calculation are: (1) Is the business economic situation better, worse or the same as 1 year ago? (2) Will there be more, less or the same level of unemployment in the next 12 months? (3) Will prices increase in the next 12 months (% of "much")? (4) Will the family's economic situation be better, worse or the same as now in the near future? (5) Is it a good or bad moment to buy durable goods? (6) Is it a good or bad moment to buy a house? (7) Is it a good or bad moment to buy a car?

13 There is also a sub-index for each question, which is constructed as Xi = [1 / 2]{(% positive – %negative) + 100}.

Figure 2

IPEC index and sub-indices



Source: Authors' calculations.

Notes: Observations from March 2002 to December 2018. SA series are calculated with X-13-ARIMA.

III. SURVEYS' INFORMATION ON CHILEAN ACTIVITY

This section studies the usefulness of Chilean business and consumer surveys for assessing the current economic situation and forecasting different macroeconomic indicators. This is done by four exercises: (1) cross correlations with activity indicators, (2) tests for Granger causality in simple bivariate vector autoregressive (VAR) models, (3) estimations of simple ADL models to evaluate the extent to which the survey contains useful information for now- and forecasting activity, (4) evaluation of information contained in sub-indicators i.e. indicators based on individual questions. Sub-section III.1 presents the results for the business survey, sub-section III.2 those for the consumer survey, while sub-section III.3 discusses the complementarity of the two surveys.[14]

1. Extracting information from the business survey

This sub-section discusses the information included in the IMCE with respect to now- and forecasting. The exercises presented in the first two sub-sections are updates of those in Pedersen (2009b). After presenting the cross correlations and tests for Granger causality in sub-section III.1, the following one includes the results of the now- and forecasting experiments. The last sub-section studies an alternative way of extracting information from the answers to the survey.

Cross correlations and Granger causality

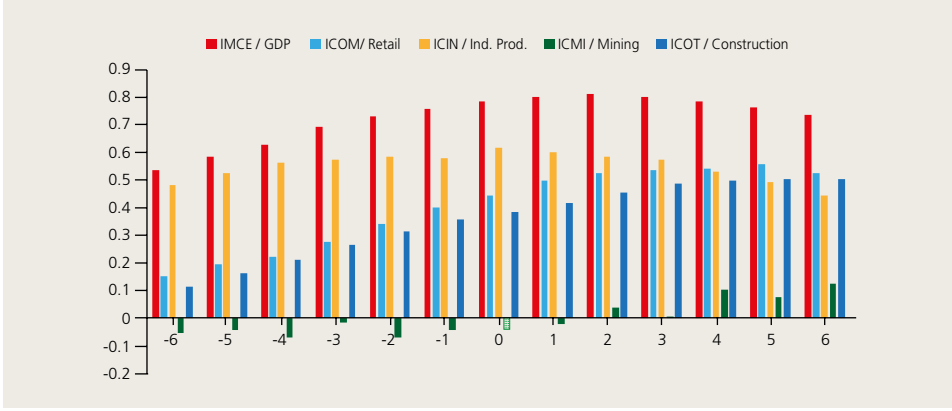
The cross correlations between different lags and leads of activity variables[15] with the business survey, aggregated and by sectors, are presented in figure 3. Overall, the survey seems to be leading economic activity in the sense that the highest correlations are obtained with leads of the activity indicators. In general the IMCE index presents the highest correlation for all horizons with a peak when leading GDP with two months. The retail and construction sectors show similar patterns of increasing cross correlations, with maximums when leading their correspondent activity indicators with between three and five months. For the manufacturing sector, the coefficient is rather stable around 0.5, while the mining sector shows relatively small coefficients for all horizons.

14 A priori one might expect business surveys to contain better predictive contents than consumer surveys as the questions in the former are formulated about specific economics variables, while those of the consumer survey are often about the perceptions of a current state.

15 The activity variables are the monthly GDP on the supply side published by the Central Bank of Chile (see Pozo and Stanger, 2009). The data was extracted from the website of the Central Bank of Chile and does not include real-time updates, which is the case for all variables employed in the paper and should be taken into account when interpreting the results. In this sense it may be considered as an exercise of forecasting the final observations of published data (or the best estimate of final observations at the time of conducting the exercise), which seems to be the appropriate use of consumer and business survey observations. A detailed description of the data is presented in appendix A.

Figure 3

Business survey: Cross correlation coefficients



Source: Authors' calculations.

Notes: Negative (positive) numbers on the horizontal axis imply that activity (the survey) is leading the survey (activity). A filled bar indicates that the correlation is statistically significant when applying a 5% significance level.

Tests for Granger causality[16] are presented in table 3.[17] They indicate that the general index, retail, manufacturing and construction Granger cause the respective activity indicators. For mining, nothing can be concluded with respect to Granger causality. All in all, the evidence presented in this sub-section suggests that the surveys do seem to be leading indicators of activity, with the exception of the mining sector.

Table 3

Business survey: Tests of Granger causality (*p*-values)*

	IMCE	Retail	Manufacturing	Mining	Construction
Activity ⟶ survey	0.46	0.67	0.77	0.42	0.57
Survey ⟶ activity	**0.00**	**0.00**	**0.00**	0.53	**0.01**

Source: Authors' calculations.

* *p*-values for the null hypothesis of *no* Granger causality tested in bivariate VAR models with the number of lags selected according to the Schwarz information criteria. Data are seasonally adjusted. Bold numbers indicate rejection of the null when applying a 10% significance level.

16 To obtain Gaussian errors, impulse dummies were included to control for outliers detected by visual inspection. The tests for causality show the same results with or without dummies. Further information of the specific outliers is available upon request.

17 As noted by Gayer (2010), survey indicators are stationary by nature. In limited samples, however, the series may behave as non-stationary. In fact, tests often point to non-stationarity for the series applied in the present study. For robustness, the tests for Granger causality were also carried out with Hodrick and Prescott (1997) filtered survey series. The results, which are available upon request, are, unless noted otherwise, similar to the ones reported.

The usefulness of the business survey for now- and forecasting economic activity

The correlations and tests for Granger causality presented in the previous sub-section may indicate some predictive contents in most of the business indices. In this sub-section, the predictive power is investigated by means of simple ADL models, which include lags of the annual growth rate of the macroeconomic indicator (x_t) and contemporaneous and lagged effects of the relevant business and consumer surveys (y_t), correspondingly:

$$x_{t+h} = c + \sum_{i=1}^{p} \alpha_i x_{t-i} + \sum_{j=0}^{q} \beta_j y_{t-j} + \varepsilon_t, \quad (1)$$

where ε_t are the errors and the numbers of lags, p and q are determined by Schwarz information criteria. The exercise consists of evaluating the out-of-sample forecasts, and the benchmark used is the simple autoregressive (AR) model,[18] i.e. (1) with $\beta_t = 0$ for $j = 0,1,...,q$. Estimations use observations from 2003 to 2013 and the forecast period covers from December 2013 to October 2018.[19] The results are shown in table 4, where root mean square error (RMSE)[20] numbers lower than one indicate that the business survey contains information which is useful for predicting activity.

Table 4

Business survey: Out-of-sample forecasting exercise*

		IMCE[a]	Ret.	Manuf.	Min.	Const.
Nowcast	RMSE	**0.965**	1.005	**1.009**	0.997	0.947
59 obs.	SM better	48.8%	44.2%	51.2%	53.5%	60.5%
1M ahead	RMSE	**1.020**	**0.978**	**1.013**	**0.957**	**0.661**
58 obs.	SM better	45.2%	45.2%	52.4%	64.3%	54.8%
3M ahead	RMSE	**0.829**	**1.010**	**1.015**	**0.806**	**0.203**
56 obs.	SM better	57.5%	47.5%	57.5%	42.5%	60.0%
6M ahead	RMSE	**0.619**	**1.006**	**0.859**	**0.747**	**0.159**
53 obs.	SM better	70.3%	56.8%	67.6%	54.1%	54.1%
1Y ahead	RMSE	**0.523**	**0.888**	**0.810**	**0.740**	**0.101**
47 obs.	SM better	87.1%	64.5%	80.6%	58.1%	77.4%

Source: Authors' calculations.

*"RMSE": RMSE of the survey model divided by the RMSE of the AR model. "SM better": percentage of the observations where the survey model predicts better than the AR model. Bold numbers indicate that the difference is statistically significant when applying a 5% confidence level of the Clark and West (2007) test. (a) Includes two more observations. Shaded cell indicates a ratio lower than one, i.e. the RMSE of the survey model is lower than the RMSE of the benchmark model.

18 It can always be debated whether the chosen benchmark model is appropriate and in the present exercise it was chosen to employ autoregressive models, to evaluate the extent to which the prediction can be improved by adding to the history of the predicted series. For robustness, the exercises were also carried out with an ARMA(1,1) model, estimated in STATA, as the benchmark. The results are presented in appendix D and, in general, they are robust to the change of the benchmark model.

19 When data were available at the time of doing the exercises, the forecast period included observations up to December 2018.

20 $RMSE = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(E(x_t) - x_t)^2}$, *where $E(x_t)$ is the projection of the variable xt and n is the number of available predictions.*

Measured by the RMSE, the models including the business survey generally forecast better than the simple AR models, especially for longer horizons, where differences are statistically significant when using the Clark and West (2007) test.[21] For nowcasting and one and three months ahead forecasting, on the other hand, the results are mixed. For the overall, mining and construction indices there are rather large gains when projecting six and twelve months ahead. Finally, when looking at the percentages of cases in which the survey models (SM) make better predictions, the evidence is most clear for the one-year-ahead projections. The overall conclusion is that the Chilean business surveys do contain useful information for forecasting activity indicators, particularly for longer horizons.

Separating between the current and future situation

The IMCE general index contains questions regarding the current situation of the business and expectations of the short-term state of the business. A valid question regarding this calculation is if it would improve the predictive power of the business survey to split the indices into current and future situation indices. To assess this question, the German ifo Business Climate Index is taken as reference, and an evaluation of the current business situation and business expectations (next six months) is made. According to the ifo methodology, three indices are defined for each sector: general current business situation (current), general business expected situation (future) and business climate (BC), which is defined as:

$$BC = \sqrt{(current + 200)(\text{future} + 200)} - 200$$

The exercises of sub-section III.1 are replicated for the total and each of the sectors separately. Figure 4 presents the cross correlations of the current situation and expectation indices for each sector, while table 5 reports the ADL model results for the general current business situation and the general business expectations, respectively.

21 The results of these tests are, however, only indicative as the distribution is only approximate (see Rogoff and Stavrakeva, 2008). Furthermore, the sample of predictions is rather limited, especially for the longer-horizon forecasts.

Figure 4

Business survey and ifo type index: Cross correlation coefficients

Source: Authors' calculations.
Note: See figure 3.

Figure 4A shows that, compared with the original indicator, the current situation index has a higher correlation with past GDP, but the overall IMCE has higher coefficients with GDP leads. For the four sectors included in the business survey, the results are similar, the current situation index seems to better explain past GDP values, while there is little difference between the correlation coefficients when considering leads of the activity indicators. For the mining sector the correlations are relatively small. The ADL model exercises presented in table 5 confirm the apparently non-significant differences in using the original indices and the ifo-inspired ones for making predictions. In fact, the main part of the statistically significant differences are in favor of the models that include the original surveys. There are, however, a couple of observations where the ifo-inspired models makes better forecasts.

Table 5

Business survey: Out-of-sample forecasting ifo business climate exercise*

A. General current business situation

		IMCE[a]	Ret.	Manuf.	Min.	Const.
Nowcast	RMSE	**1.074**	0.997	**1.238**	1.001	0.989
59 obs.	ifo better	51.2%	58.1%	34.9%	51.2%	44.2%
1M ahead	RMSE	0.953	0.988	**1.124**	1.001	0.999
58 obs.	ifo better	54.8%	59.5%	26.2%	45.2%	47.6%
3M ahead	RMSE	0.962	0.991	**1.034**	1.009	0.922
56 obs.	ifo better	42.5%	55.0%	22.5%	55.0%	55.0%
6M ahead	RMSE	1.022	1.009	**1.022**	1.034	**0.892**
53 obs.	ifo better	45.9%	40.5%	37.8%	43.2%	62.2%
1Y ahead	RMSE	1.001	1.003	1.083	0.999	0.973
47 obs.	ifo better	58.1%	38.7%	51.6%	48.4%	48.4%

B. General business expected situation

		IMCE[a]	Ret.	Manuf.	Min.	Const.
Nowcast	RMSE	1.011	0.996	1.003	1.001	1.023
59 obs.	ifo better	51.2%	58.1%	39.5%	48.8%	41.9%
1M ahead	RMSE	**0.953**	1.006	1.002	1.003	1.011
58 obs.	ifo better	61.9%	52.4%	35.7%	45.2%	42.9%
3M ahead	RMSE	1.009	1.003	**1.056**	0.999	0.906
56 obs.	ifo better	42.5%	52.5%	32.5%	50.0%	55.0%
6M ahead	RMSE	1.028	1.008	**1.084**	1.009	0.968
53 obs.	ifo better	43.2%	48.6%	37.8%	43.2%	45.9%
1Y ahead	RMSE	0.982	0.987	1.011	1.006	0.921
47 obs.	ifo better	61.3%	64.5%	48.4%	45.2%	61.3%

Source: Authors' calculations.

* "RMSE": RMSE of the ADL model that includes the ifo inspired measure divided by the RMSE of the ADL model that includes the survey indicator. "ifo better": Percentage of the observations where the ifo-type model predicts better than the AR model augmented by the survey observations. Bold numbers indicate that the difference is statistically significant according to the Diebold and Mariano (1995) test with the small sample correction of Harvey et al. (1997) when applying a 5% confidence level. (a) Includes two more observations. Shaded cell indicates a ratio lower than one, i.e. RMSE of the survey model is lower than the RMSE of the benchmark model.

2. Extracting information from the consumer survey

The exercises for the consumer survey presented in this sub-section mirror those discussed in the previous one with respect to correlations, causality and predictions. The last sub-section evaluates the informational content in consumer survey questions that are not included in the overall IPEC calculation.

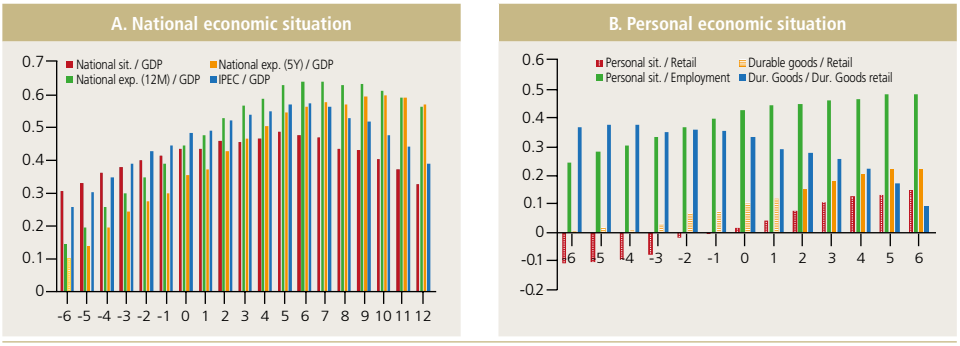
Cross correlations and Granger causality

Since the questions included in the consumer survey are not associated with a specific sector, as they are in the business survey, different economic variables are used to calculate the correlation coefficients. Questions regarding the national economic situation are evaluated with respect to the GDP, while the questions about the personal situation are compared, separately, with retail sales and the employment rate. The question about the willingness to purchase durable goods is compared with the retail sales and the durable goods retail sales.

The cross correlations between the consumer survey and lags and leads of economic activity are presented in figure 5. In general, the survey seems to be leading activity as the highest correlation coefficients are obtained with leads of the growth and employment indicators. Figure 5A contains the questions about the current and expected national economic situation, where the correlation coefficients are similar with an increasing path that peaks when leading the GDP with around seven months. It is the "national expectation (12 months ahead)" question that has the highest correlation for all leading horizons. For questions regarding the personal economic situation, shown in figure 5B, the results are mixed. The personal situation's correlation with employment is increasing with a peak when leading activity with five to six months. The correlation between willingness to purchase durable goods and durable goods retail sales is lower and decreasing.

Figure 5

Consumer survey: Cross correlation coefficients



Source: Authors' calculations.

Note: See figure 3.

Table 6

Consumer survey: Tests of Granger causality (*p*-values)

A. National economic situation and the Imacec

	IPEC	Current economic sit.	Future economic sit. (12M)	Future economic sit. (5Y)
Activity ⟶ survey	0.26	0.70	0.10	0.64
Survey ⟶ activity	**0.01**	**0.08**	**0.00**	**0.01**

B. Personal economic situation (survey question / activity variable)

	Current personal sit./ Retail	Current personal sit./ Employment	Durable goods / Retail	Durable goods / Dur. goods
Activity ⟶ survey	0.72	0.72	0.39	**0.03**
Survey ⟶ activity	**0.04**	**0.06**	0.11	0.28

Source: Authors' calculations.

* See table 3.

Tests for Granger causality, separated by personal and national economic situation, are presented in table 6. In general, the tests indicate that the IPEC questions as well as the general index Granger cause the respective activity indicators, while the opposite seems to be the case for the questions regarding the planned purchases of durables goods and retail sales of durable goods. Nothing can be concluded with respect to Granger causality for the question regarding durable goods and overall retail sales.[22] Similarly to the results obtained for the IMCE indicators, the evidence presented in this sub-section suggests that the consumer survey could be leading activity and employment indicators.

The usefulness of the consumer survey for now- and forecasting economic activity

The correlations and tests for Granger causality presented in the previous sub-section may indicate some predictive contents in most of the consumer survey indices. In this sub-section, the predictive capacity is investigated by replicating the simple ADL exercise of sub-section III.1. Again, the estimations are made from 2002[23] to 2013 and the forecast period covers from December 2013 to October 2018. The results are shown in table 7, where RMSE numbers lower than one indicate that the consumer survey contains information which is useful for predicting activity.

22 When the survey series are HP filtered, the test indicates that the durable goods survey series Granger causes the retail sales series. In this case, it is not evident that the question of current personal situation causes the employment as the test cannot be rejected with a p-value of 0.11.

23 The series of durable goods retail sales is only available as from 2005.

Table 7

Consumer survey: Out-of-sample forecasting exercise*

A. National Economic situation and GDP(a)

		IPEC	Current economic sit.	Future economic sit. (12M)	Future economic sit. (5Y)
Nowcast	RMSE	0.996	1.004	0.994	0.981
59 obs.	SM better	46.5%	46.5%	44.2%	44.2%
1M ahead	RMSE	0.992	0.994	1.002	**0.972**
58 obs.	SM better	54.8%	50.0%	47.6%	47.6%
3M ahead	RMSE	**0.827**	**0.823**	**0.841**	**0.806**
56 obs.	SM better	50.0%	50.0%	55.0%	57.5%
6M ahead	RMSE	**0.623**	**0.624**	**0.640**	**0.638**
53 obs.	SM better	67.6%	67.6%	73.0%	70.3%
1Y ahead	RMSE	**0.524**	**0.527**	**0.511**	**0.508**
47 obs.	SM better	83.9%	83.9%	83.9%	83.9%

B. Personal economic situation (survey question / activity variable)

		Current personal sit./ Retail	Current personal sit./ Employment	Durable goods/ Retail	Durable goods/ Dur. goods
Nowcast	RMSE	0.996	1.030	0.990	0.998
59 obs.	SM better	60.5%	48.8%	62.8%	44.2%
1M ahead	RMSE	0.989	0.991	**0.983**	**0.987**
58 obs.	SM better	54.8%	50.0%	61.9%	83.3%
3M ahead	RMSE	**1.021**	**0.531**	**1.017**	**1.056**
56 obs.	SM better	52.5%	65.0%	52.5%	50.0%
6M ahead	RMSE	**1.021**	**0.477**	**1.016**	**0.932**
53 obs.	SM better	51.4%	70.3%	51.4%	59.5%
1Y ahead	RMSE	**0.885**	**0.479**	**0.884**	**0.921**
47 obs.	SM better	64.5%	77.4%	67.7%	51.6%

Source: Authors' calculations.

* See table 4.

Measured by the RMSE, the models that include the consumer survey generally forecast better than the simple AR, especially when predictions are for three or more months ahead, even though there are a couple of exceptions. For nowcasting and one month ahead forecasting the results are mostly favorable for the ADL models, although often the differences are not statistically significant. All in all, the evidence presented in this sub-section suggests that the Chilean consumer survey does contain some useful information for forecasting activity indicators, in particular for longer horizons.

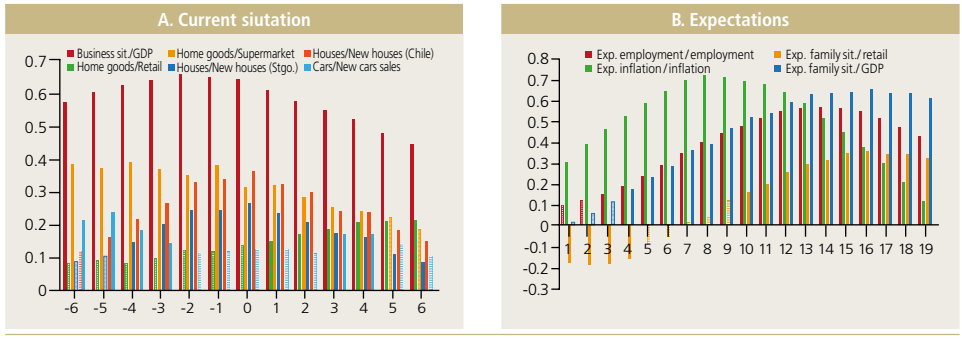
The informational content in individual questions

As mentioned earlier, there are additional questions in the Chilean consumer survey, which are not included in the IPEC calculation, about business economic situation, expected employment, expected inflation, family economic situation, purchase of goods for the household, purchase of a house and purchase of a car. The exercise in this sub-section studies the usefulness of these questions to predict the following economic variables: GDP, inflation, retail activity, supermarket sales, new house sales and new car sales; the variables referred to in the questions or the ones that are closest to in case of more general formulated questions.

Figure 6 presents the cross correlations of the indices of the additional question and the corresponding economic indicators, separated into questions referring to the current situation and questions about expectations. Figure 6A shows that the question regarding business economic situations has the highest correlation with GDP for all horizons, with a relatively stable coefficient around 0.6 for past and present GDP, and then decreasing for its leads. Although somewhat lower, the purchase of household goods index also presents a similar path of correlations with supermarket sales, around 0.4 for past and present values and decreasing for leads of sales. The other indices for current situation – purchase of house or car – have lower and more volatile correlations across horizons. On the other hand, figure 6B shows an initially increasing correlation coefficient for expected values of employment, with a peak around 0.5-0.6 with the seven-months-ahead employment rate. The expected family's (or household's) economic situation correlation with GDP is increasing, with a peak, also around 0.5, for longer horizons. Finally, expected inflation shows a similar path but with higher correlation coefficients for shorter horizons, reaching 0.7 with the one-month-ahead inflation rate.

Figure 6

Consumer survey: Cross correlation coefficient with other questions



Source: Authors' calculations.

Note: See figure 3.

Table 8 reports the results of the prediction exercises. With some exceptions, including the survey observations in the econometric models generally seems to improve the forecast performance and, especially for horizons longer than one month, the improvements are often statistically significant. Particularly the survey questions on home goods (with respect to sales in supermarkets), houses (nationwide), expected inflation and expected family situation (with respect to GDP) seem to contain useful information for predicting the relevant macroeconomic variables for all the horizons analyzed. On the other hand, it is not evident that the question about the expected family situation should be used to forecast growth in the retail sector, except for the one-year-ahead horizon.

Table 8

Consumer survey: Out-of-sample forecasting exercise for other questions

(survey question / activity variable)

		Business sit./ GDP[a]	Household goods / Retail	Household goods/ Smkt.[a]	Houses/ New houses Stgo.[a]	Houses/ New houses Chile
Nowcast	RMSE	0.984	0.992	**0.981**	0.972	**0.909**
59 obs.	SM better	51.2%	58.1%	62.8%	60.5%	67.4%
1M ahead	RMSE	0.992	0.986	**0.965**	0.960	**0.903**
58 obs.	SM better	59.5%	64.3%	73.8%	61.9%	71.4%
3M ahead	RMSE	**0.823**	**1.016**	**0.940**	**0.773**	**0.730**
56 obs.	SM better	47.5%	55.0%	57.5%	72.5%	65.0%
6M ahead	RMSE	**0.636**	**0.999**	**0.764**	**0.692**	**0.639**
53 obs.	SM better	64.9%	51.4%	67.6%	83.8%	83.8%
1Y ahead	RMSE	**0.543**	**0.871**	**0.673**	**0.716**	**0.646**
47 obs.	SM better	80.6%	67.7%	71.0%	77.4%	83.9%
		Cars/ New car sales[a]	**Exp. employ./ Employ.[a]**	**Exp. inflation/ Inflation[a]**	**Exp. family sit./ Retail**	**Exp. family sit./ GDP[a]**
Nowcast	RMSE	1.211	1.023	**0.911**	0.991	**0.975**
59 obs.	SM better	55.8%	48.8%	67.4%	53.5%	58.1%
1M ahead	RMSE	1.482	0.989	**0.967**	0.992	**0.962**
58 obs.	SM better	33.3%	52.4%	66.7%	59.5%	50.0%
3M ahead	RMSE	**0.851**	**0.547**	**0.493**	**1.039**	**0.837**
56 obs.	SM better	62.5%	62.5%	75.0%	52.5%	52.5%
6M ahead	RMSE	**0.686**	**0.497**	**0.422**	**1.018**	**0.624**
53 obs.	SM better	62.2%	73.0%	89.2%	56.8%	70.3%
1Y ahead	RMSE	**0.700**	**0.547**	**0.316**	**0.864**	**0.514**
47 obs.	SM better	64.5%	74.2%	93.5%	67.7%	83.9%

Source: Authors' calculations.

(a) See table 4. "Smkt": supermarket sales.

3. Joint information in the two surveys

The last exercise consists of comparing the predictive power of a model that includes both the IMCE and IPEC indices with respect to the GDP. Table 9 reports the ADL model results when comparing with the projections of the AR model and the models that include each of the indices individually. The table also includes a comparison of the individual survey models. The results indicate that a model including both the IMCE and IPEC general indices performs better than a simple AR model for nowcasts and predictions of the horizons of three, six and, especially, twelve months. For the two longest horizons there seem to be gains in employing both surveys, while it is not evident that either one of them contains better information for forecasting than the other.

Table 9

IMCE and IPEC: Out-of-sample forecasting exercise*

		IMCE-IPEC / AR	IMCE-IPEC / IMCE	IMCE-IPEC / IPEC	IMCE / IPEC
Nowcast	RMSE	**0.966**	1.002	**0.971**	0.969
61 obs.	IM-IP better	48.8%	44.2%	48.8%	51.2%
1M ahead	RMSE	**1.017**	0.997	**1.026**	1.028
60 obs.	IM-IP better	47.6%	50.0%	45.2%	45.2%
3M ahead	RMSE	**0.848**	1.023	1.023	1.000
58 obs.	IM-IP better	55.0%	40.0%	47.5%	55.0%
6M ahead	RMSE	**0.601**	**0.971**	**0.978**	1.007
55 obs.	IM-IP better	70.3%	45.9%	48.6%	51.4%
1Y ahead	RMSE	**0.520**	0.996	0.991	0.994
49 obs.	IM-IP better	90.3%	54.8%	58.1%	58.1%

Source: Authors' calculations.

*"RMSE": RMSE the ADL model that includes the survey to the left of the "/" divided by the RMSE of the ADL (AR) model that included the variables to the right of the "/". "IM-IP better": percentage of the observations where the model to the left of the "/" predicts better than the model indicated to the right of the "/". Bold numbers indicate that the difference is statistically significant when applying a 5% confidence level of the Clark and West (2007) test. Shaded cell indicates a ratio lower than one, i.e. RMSE of the survey model is lower than the RMSE of the benchmark model. The last column compares the IMCE general index model with the IPEC general index model. In this case the test applied is that of Diebold and Mariano (1995) with the small sample correction of Harvey et al. (1997).

IV. FINAL REMARKS

The exercises presented in this paper represent a step in the direction of understanding better the usefulness of survey data for predicting Chilean activity. The evidence provided suggested that the business survey as well as the consumer survey contain useful information for making the predictions. This evidence was obtained by investigating cross correlations with different lags and leads, testing for Granger causality and estimating augmented autoregressive models for activity with the survey observations. A final exercise also revealed that the information contained in the surveys seems to be complementary in the sense that it is possible to make better projections for the longest horizons when including information of both surveys in the econometric model.

The research on the informational content of Chilean survey data is still quite limited and there is plenty of scope for further investigation. The econometric models employed in this study are quite simple and it would be interesting to investigate the extent to which the surveys may also contribute to the forecasting performance of multivariate vector autoregressive (VAR) models and dynamic stochastic general equilibrium (DSGE) models. The challenge in the DGSE case would be to incorporate expectations in the theoretical framework. Another issue, which was not discussed in the present paper, is the extent to which the information in the survey applied may be complementary to that of other Chilean surveys. The framework applied in this study could be utilized for such an analysis. These and other issues are left for future research.

REFERENCES

Ahmed, M.I. and S.P. Cassou (2016). "Does Consumer Confidence Affect Durable Goods Spending during Bad and Good Economic Times Equally?" *Journal of Macroeconomics* 50: 86–97.

Banbura, M. and G. Rünstler (2011). "A Look into the Factor Model Black Box: Publication Lags and the Role of Hard and Soft Data in Forecasting GDP." *International Journal of Forecasting* 27(2): 333–46.

Bragoli, D. (2017). "Now-casting the Japanese Economy." *International Journal of Forecasting* 33(2): 390–402.

Carroll, C.D., J.C. Fuhrer and D.W. Wilcox (1994). "Does Consumer Sentiment Forecast Household Spending? If so, why?" *American Economic Review* 84(5): 1397–408.

Carriero, A. and M. Marcellino (2011). "Sectoral Survey-based Indicators for Europe." *Oxford Bulletin of Economics and Statistics* 73(2): 175–206.

Central Bank of Chile (2015). *Monetary Policy Report*, June.

Chanut, N., M. Marcel and C.A. Medel (2018). "Can Economic Perception Surveys Improve Macroeconomic Forecasting in Chile?" Working Paper No. 824, Central Bank of Chile.

Christiansen, C., J.N. Eriksen and S.V. Møller (2014). "Forecasting US Recessions: The Role of Sentiments." *Journal of Banking and Finance* 49: 459–68.

Clark, T. and K. West (2007). "Approximately normal tests for equal predictive accuracy in nested models." *Journal of Econometrics* 138(1): 291–311.

Dahlhaus, T., J.-D. Guénette and G. Vasishtha (2017). "Nowcasting BRIC+M in Real Time." *International Journal of Forecasting* 33(4): 915–35.

De Mello, E.P.G. and F.M.R. Figueiredo (2014). "Assessing the Short-term Forecasting Power of Confidence Indices." Working Paper No. 371, Banco Central do Brasil.

Deitz, R. and C. Steindel (2005). "The Predictive Abilities of the New York Fed's Empire State Manufacturing Survey." *Current Issues in Economics and Finance* 11(1): Federal Reserve Bank of New York.

Diebold, F. and R. Mariano (1995). "Comparing Predictive Accuracy." *Journal of Business and Economic Statistics* 13(3): 253–63.

Fuhrer, J.C. (1993). "What Role does Consumer Sentiment Play in the U.S. Macroeconomy?" *New England Economic Review* (Jan-Feb): 32–44.

Frale, C., M. Marcellino, G.L. Mazzi and T. Proietti (2010). "Survey Data as Coincident or Leading Indicators." *Journal of Forecasting* 29(1-2): 109–31.

Gallardo, M. and M. Pedersen (2007). "Un Sistema de Indicadores Líderes Compuestos para la Región de América Latina." Estudios Estadísticos y Prospectivos N° 51, Cepal/ECLAC.

Gallardo, M. and M. Pedersen (2008). "Encuestas de Opinión Empresarial del Sector Industrial en América Latina." Estudios Estadísticos y Prospectivos N° 64, Cepal/ECLAC.

Garcia-Ferrer, A. and M. Bujosa-Brun (2000). "Forecasting OECD Industrial Turning Points Using Unobserved Components Models with Business Survey Data." *International Journal of Forecasting* 16(2): 207–27.

Gayer, C. (2010). "Report: The Economic Climate Tracer. A Tool to Visualise the Cyclical Stance of the Economy Using Survey Data." *Report*, European Commission, Directorate General for Economic and Financial Affairs. *http://www.oecd.org/sdd/leading-indicators/39578745.pdf*. Retrieved 2019-02-13.

Giannone, D., L. Reichlin and D. Small (2008). "Nowcasting: The Real-time Informational Content of Macroeconomic Data." *Journal of Monetary Economics* 55(4): 665–76.

Hansson, J., P. Jansson and M. Löf (2005). "Business Survey Data: Do They Help in Forecasting GDP Growth?" *International Journal of Forecasting* 21(2): 377–89.

Harvey, D., S. Leybourne and P. Newbold (1997). ´Testing the Equality of Prediction Mean Squared Errors." *International Journal of Forecasting* 13(2): 281–91.

Higginson, J. (1975). "An F-test for the Presence of Moving Seasonality when Using Census Method II-X-11 Variant." Research Paper, Seasonal Adjustment and Time Series Staff, Statistics Canada.

Hodrick, R. and E.C. Prescott (1997). "Postwar U.S. Business Cycles: An Empirical Investigation." *Journal of Money, Credit, and Banking* 29(1): 1–16.

Kaufmann, D. and R. Scheufele (2017). "Business Tendency Surveys and Macroeconomic Fluctuations." *International Journal of Forecasting* 33(4): 878–93.

Keeney, M., B. Kennedy and J. Liebermann (2012). "The Value of Hard and Soft data for Short-term Forecasting of GDP." *Economic Letters* 11/EL/12, Central Bank of Ireland.

Kim, J. (2016). "Consumer Confidence and Economic Activity: What Causes What?" *Korea and the World Economy* 17(2): 183–212.

Klein, L. and S. Özmucur (2010). "The Use of Consumer and Business Surveys in Forecasting." *Economic Modelling* (Elsevier) 27(6): 1453–62.

Kruskal, W.H. and W.A. Wallis (1952). "Use of Ranks in One-criterion Variance Analysis." *Journal of the American Statistical Association* 47(260): 583–621.

Lahiri, K. and G. Monokroussos (2013). "Nowcasting US GDP: The Role of ISM Business Survey." *International Journal of Forecasting* 29(4): 644–58.

Lothian, J. and M. Morry (1978). "A Test for the Presence of Identifiable Seasonality when Using the X-11 Program." *StatCan Staff Paper STC2188*, Seasonal Adjustment and Time Series Staff, Statistics Canada.

Luciani, M. and L. Ricci (2014). "Nowcasting Norway." *International Journal of Central Banking* 10(4): 215–48.

Matheson, T.D. (2010). "An Analysis of the Informational Content of New Zealand Data Releases. The Importance of Business Opinion Surveys." *Economic Modelling* 27(1): 304–14.

Matsusaka, J.G. and A.M. Sbordone (1995). "Consumer Confidence and Economic Fluctuations." *Economic Inquiry* 33(2): 296–318.

Modugno, M., B. Soybilgen and E. Yazgan (2016). "Nowcasting Turkish GDP and News Decomposition." *International Journal of Forecasting* 32(4): 1369–84.

OECD (2003): *Business Tendency Surveys. A Handbook*.

OECD (2011): *OECD Composite Leading Indicators. Chile*.

Österholm, P. (2014). "Survey Data and Short-term Forecasts of Swedish GDP Growth." *Applied Economic Letters* 21(2): 135–39.

Pedersen, M. (2009a). "Un Indicador Líder Compuesto para la Actividad Económica en Chile." *Monetaria* 22(2): 181–208.

Pedersen, M. (2009b). "Use of Chilean Business Surveys in Conjunctural Assessment and Short-term Forecasting." Paper prepared for the fourth joint European Commission (EC) – OECD workshop on business and consumer opinion surveys held in Brussels 12-13 October 2009.

Pedersen, M. (2019). "Anomalies in Macroeconomic Prediction Errors. Evidence from Chilean private forecasters." *International Journal of Forecasting* 35(3): 1100-1107.

Pincheira, P.M. (2014). "Predicción del Empleo Sectorial y Total en Base de Indicadores de Confianza Empresarial." *Economía Chilena* 17(1): 66–87.

Pozo, P. and F. Stanger (2009). "Metodología y Resultados de la Mensualización del PIB Sectorial Trimestral en el Período 1996-2008." Estudios Económicos Estadísticos N° 78, Central Bank of Chile.

Rogoff, K.A. and V. Stavrakeva (2008). "The Continuing Puzzle of the Short Horizon Exchange Rate Forecasting." NBER Working Paper No. 14071.

Vázquez, S., S. García and C. Rocha (2009). "Confianza del Consumidor: ¿Qué Nos Dice sobre la Economía Uruguaya?" *Cuaderno de Economía* 4: 121–47.

APPENDIX A

DATA DESCRIPTION

The main source of the data utilized is the Central Bank of Chile (CBC). The Chilean business survey (IMCE) and consumer confidence indices (IPEC) were extracted from the CBC's website.[24] Monthly data of economic activity by sector (retail, manufacturing, mining and construction) were constructed using three different series with reference years 2003, 2008 and 2013. Monthly series of economic activity by sector (index 2003 = 100) for the period January 2003 to June 2009 were provided by the Macroeconomic Analysis Department of the CBC. The two more recent series (with reference years 2008 and 2013) are published at the CBC's website. The monthly index of national economic activity (Imacec, for its Spanish acronym) is the spliced series with the 2013 benchmark published by the CBC.

The retail indices series for real durable and non-durable goods were constructed using series from the CBC and Chile's National Statistics Institute (INE). The INE indices (reference year 2005) cover the period from January 2005 to December 2009. To complete the retail index series until December 2018, the indices published by the CBC, reference years 2009 and 2014, were employed. Other monthly series extracted from the CBC website are the following: national unemployment rate, supermarket sales general index (reference year 2014), total new car sales (units), total new house sales (units), new house sales in Santiago (units), and the headline inflation, annual rate.

24 https://si3.bcentral.cl/Siete/secure/cuadros/home.aspx?Idioma=en-US.

APPENDIX B

TESTS FOR SEASONALITY

Table B1

Business survey – Tests for seasonality*

	Parametric[a]	Moving seasonality[b]	Nonparametric[c]	Combined[d]
IMCE	**7.475**	**2.953**	**0.0000**	Not present
Retail	**3.565**	**1.873**	**0.0000**	Not present
Manufacturing	**10.440**	1.616	**0.0000**	Present
Mining	2.628	**2.970**	**0.0005**	Not present
Construction	**4.003**	**5.169**	**0.0000**	Not present

Source: Authors' calculations.

* Results of tests reported in the X-13-ARIMA routine in Eviews (see Lothian and Morry, 1978) for the full samples. (a) *F*- statistic for the test for presence of seasonality assuming stability. The null hypothesis is no stable seasonality. (b) Higginson (1975) *F*-statistic for the presence of moving seasonality. The null is that no moving seasonality is present. (c) *p*-value of the Kruskal and Wallis (1952) nonparametric test for the presence of seasonality. The null is that *identifiable* seasonality is not present. (d) Combined test for the presence of identifiable seasonality as illustrated in appendix F in Lothian and Morry (1978). Bold numbers indicate that the test suggests presence of seasonality when applying a 10%/5%/1% significance level in the case of (a)/(b)/(c), the ones applied in the combined test.

Table B2

Consumer survey – Tests for seasonality*

	Parametric[a]	Moving seasonality[b]	Nonparametric[c]	Combined[d]
IPEC	**21.680**	**1.926**	**0.0000**	Present
CPES[i]	**18.910**	**1.281**	**0.0000**	Present
WtPDG[ii]	**9.885**	**4.227**	**0.0000**	(Not present)
CNES[iii]	**27.556**	**1.179**	**0.0000**	Present
FNES (12M)[iv]	**14.513**	**1.372**	**0.0000**	Present
FNES (5Y)[v]	**4.699**	**1.698**	**0.0000**	(Not present)

Source: Authors' calculations.

* See table B1. (i) Current Personal Economic Situation. (ii) Willingness to Purchase Durable Goods. (iii) Current National Economic Situation. (iv) Future National Economic Situation (12 Months ahead). (v) Future National Economic Situation (5 Years ahead). "(Not present)" indicates that the combined test suggests that *identifiable* seasonality is probably not present.

APPENDIX C

COMPARING PREDICTION PERFORMANCES OF MODELS WITH SA AND NSA OBSERVATIONS

Table C1

Comparison table 4 – RMSE ratios*

	IMCE	Ret.	Manuf.	Min.	Const.
Nowcast	1.007	1.003	1.013	0.999	0.992
1M ahead	1.016	1.001	1.035	1.001	0.999
3M ahead	0.985	1.001	1.001	1.002	1.012
6M ahead	1.000	0.998	1.000	1.001	0.975
1Y ahead	0.999	1.001	1.000	0.999	1.007

Source: Authors' calculations.

* A ratio lower than one indicates that the RMSE of the model with SA observations is lower. Bold numbers (of which there are none in table C1) indicate that the difference is statistically significant according to the Diebold and Mariano (1995) test with the small sample correction of Harvey et al. (1997) when applying a 10% confidence level.

Table C2

Comparison table 5 – RMSE ratios*

A. General current business situation

	IMCE	Ret.	Manuf.	Min.	Const.
Nowcast	1.012	1.004	1.014	1.002	0.993
1M ahead	1.004	1.001	1.009	1.006	1.004
3M ahead	0.994	0.997	1.019	1.002	0.991
6M ahead	1.005	0.997	1.001	1.003	0.995
1Y ahead	0.999	1.002	1.055	0.999	1.004

B. General business expected situation

	IMCE	Ret.	Manuf.	Min.	Const.
Nowcast	1.008	1.003	1.015	1.001	0.995
1M ahead	1.008	1.001	1.027	1.001	1.001
3M ahead	0.996	1.002	1.007	0.999	0.983
6M ahead	1.007	1.001	0.998	1.001	0.971
1Y ahead	1.000	1.001	1.003	0.999	0.998

Source: Authors' calculations.

* See table C1

Table C3

Comparison table 7 – RMSE ratios*

(survey question / activity variable)

A. National economic situation and the Imacec

	IPEC/ GDP	National sit./ GDP	Exp. National sit. (12M)/ GDP	Exp. National sit. (5Y)/ GDP
Nowcast	1.004	1.009	1.009	1.003
1M ahead	1.002	1.006	1.009	1.000
3M ahead	1.002	1.000	1.010	1.003
6M ahead	0.991	0.994	0.994	0.993
1Y ahead	0.997	0.997	0.998	0.999

B. Personal economic situation

	Personal sit./ Retail	Personal sit./ Employment	Durable goods/ Retail	Durable goods/ Dur. Goods
Nowcast	0.999	1.001	1.001	0.999
1M ahead	1.001	0.999	1.001	0.999
3M ahead	0.998	0.999	1.001	**0.964**
6M ahead	0.998	1.001	1.000	1.003
1Y ahead	1.000	1.001	0.997	1.046

Source: Authors' calculations.

* See table C1.

Table C4

Comparison table 8 – RMSE ratios*

(survey question / activity variable)

	Business sit./ GDP	Household goods/ Retail	Household goods/ Smkt.	Houses/ New houses Stgo.	Houses/ New houses Chile
Nowcast	0.999	1.002	0.999	0.999	0.995
1M ahead	0.998	1.001	1.001	0.999	0.999
3M ahead	0.999	0.999	1.000	0.999	0.998
6M ahead	1.002	1.000	**1.006**	1.000	1.000
1Y ahead	0.998	0.997	1.003	0.999	0.993
	Cars/ New car sales	**Exp. employ./ Employ.**	**Exp. inflation/ Inflation**	**Exp. family sit./ Retail**	**Exp. family sit./ GDP**
Nowcast	**1.220**	1.006	0.996	1.001	0.999
1M ahead	**1.152**	1.004	1.002	1.004	1.016
3M ahead	0.997	1.006	0.997	0.998	1.003
6M ahead	0.994	0.996	1.009	1.002	0.993
1Y ahead	**1.045**	1.062	1.008	0.998	0.995

Source: Authors' calculations.

* See table C1. "Smkt": supermarket sales.

Table C5

Comparison table 9 – RMSE ratios*

	IMCE-IPEC / GDP
Nowcast	1.010
1M ahead	1.017
3M ahead	0.995
6M ahead	0.953
1Y ahead	0.997

Source: Authors' calculations.

* See table C1.

APPENDIX D

COMPARING PREDICTION PERFORMANCES EMPLOYING AN ARMA (1,1) AS BENCHMARK

Table D1

Table 4 with ARMA(1,1) as benchmark model*

		IMCE[a]	Ret.	Manuf.	Min.	Const.
Nowcast	RMSE	**0.937**	1.002	**0.960**	0.999	0.989
59 obs.	SM better	67.4%	48.8%	48.8%	58.1%	65.1%
1M ahead	RMSE	**1.009**	**0.942**	**0.977**	**0.964**	**0.617**
58 obs.	SM better	57.1%	54.8%	57.1%	76.2%	61.9%
3M ahead	RMSE	**0.818**	**0.995**	**0.972**	**0.786**	**0.234**
56 obs.	SM better	57.5%	50.0%	47.5%	45.0%	65.0%
6M ahead	RMSE	**0.661**	**0.973**	**0.913**	**0.727**	**0.217**
53 obs.	SM better	67.6%	62.2%	59.5%	51.4%	67.6%
1Y ahead	RMSE	**0.535**	**0.839**	**0.825**	**0.700**	**0.223**
47 obs.	SM better	74.2%	67.7%	64.5%	54.8%	74.2%

Source: Authors' calculations.

* See table 4.

Table D2

Table 5 with ARMA(1,1) as benchmark model*

A. General current business situation

		IMCE[a]	Ret.	Manuf.	Min.	Const.
Nowcast	RMSE	**1.102**	1.008	**1.182**	1.017	0.993
59 obs.	ifo better	39.5%	44.2%	41.9%	39.5%	39.5%
1M ahead	RMSE	0.951	**0.981**	**1.075**	0.993	0.997
58 obs.	ifo better	52.4%	71.4%	35.7%	45.2%	38.1%
3M ahead	RMSE	0.984	1.014	**1.037**	1.006	0.950
56 obs.	ifo better	40.0%	50.0%	35.0%	60.0%	55.0%
6M ahead	RMSE	0.942	**1.005**	1.016	1.018	0.953
53 obs.	ifo better	45.9%	27.0%	43.2%	51.4%	54.1%
1Y ahead	RMSE	0.972	0.999	1.093	0.997	1.006
47 obs.	ifo better	61.3%	48.4%	54.8%	58.1%	51.6%

B. General business expected situation

		IMCE[a]	Ret.	Manuf.	Min.	Const.
Nowcast	RMSE	1.047	0.995	0.970	0.999	1.010
59 obs.	ifo better	46.5%	53.5%	60.5%	46.5%	34.9%
1M ahead	RMSE	0.979	1.032	1.007	0.994	1.018
58 obs.	ifo better	52.4%	50.0%	54.8%	45.2%	35.7%
3M ahead	RMSE	0.982	0.992	1.006	1.008	0.954
56 obs.	ifo better	42.5%	52.5%	40.0%	50.0%	55.0%
6M ahead	RMSE	0.963	1.007	1.029	1.000	1.017
53 obs.	ifo better	43.2%	35.1%	48.6%	43.2%	51.4%
1Y ahead	RMSE	0.980	0.997	0.994	1.008	0.952
47 obs.	ifo better	58.1%	41.9%	58.1%	61.3%	38.7%

Source: Authors' calculations.

* See table 4.

Table D3

Table 7 with ARMA(1,1) as benchmark model*
(survey question / activity variable)

A. National economic situation and GDP[a]

		IPEC / GDP[a]	National sit. / GDP	Exp. National sit. (12M) / GDP	Exp. National sit. (5Y) / GDP
Nowcast	RMSE	**0.977**	0.986	**0.975**	0.990
59 obs.	SM better	53.5%	53.5%	62.8%	53.5%
1M ahead	RMSE	**0.980**	**0.988**	**0.976**	0.994
58 obs.	SM better	64.3%	81.0%	59.5%	54.8%
3M ahead	RMSE	**0.803**	**0.804**	**0.815**	**0.797**
56 obs.	SM better	47.5%	42.5%	50.0%	42.5%
6M ahead	RMSE	**0.597**	**0.610**	**0.598**	**0.618**
53 obs.	SM better	67.6%	64.9%	70.3%	67.6%
1Y ahead	RMSE	**0.520**	**0.522**	**0.519**	**0.516**
47 obs.	SM better	74.2%	77.4%	77.4%	77.4%

B. Personal economic situation

		Personal sit./ Retail	Personal sit./ Employment[a]	Durable goods/ Retail	Durable goods/ Dur. Goods
Nowcast	RMSE	1.004	1.005	0.997	0.997
59 obs.	SM better	46.5%	55.8%	53.5%	46.5%
1M ahead	RMSE	**0.985**	**0.982**	1.001	**0.985**
58 obs.	SM better	71.4%	59.5%	50.0%	57.1%
3M ahead	RMSE	**0.985**	**0.569**	**0.992**	**1.012**
56 obs.	SM better	52.5%	70.0%	47.5%	50.0%
6M ahead	RMSE	**0.975**	**0.458**	**0.963**	**0.840**
53 obs.	SM better	54.1%	70.3%	64.9%	64.9%
1Y ahead	RMSE	**0.843**	**0.480**	**0.847**	**0.840**
47 obs.	SM better	67.7%	74.2%	71.0%	64.5%

Source: Authors' calculations.

* See table 4.

Table D4

Table 8 with ARMA(1,1) as benchmark model*

(survey question / activity variable)

		Business sit./ GDP[(a)]	Home goods / Retail	Home goods / Smkt.[(a)]	Houses/ New houses Stgo.[(a)]	Houses/ New houses Chile
Nowcast	RMSE	**0.881**	0.991	1.022	0.961	0.952
59 obs.	SM better	65.1%	65.1%	53.5%	55.8%	48.8%
1M ahead	RMSE	**0.953**	**0.985**	1.069	**0.951**	**0.937**
58 obs.	SM better	50.0%	57.1%	50.0%	61.9%	81.0%
3M ahead	RMSE	**0.816**	**0.992**	**0.972**	**0.770**	**0.711**
56 obs.	SM better	50.0%	47.5%	60.0%	70.0%	75.0%
6M ahead	RMSE	**0.620**	**0.966**	**0.939**	**0.673**	**0.620**
53 obs.	SM better	64.9%	59.5%	59.5%	81.1%	83.8%
1Y ahead	RMSE	**0.523**	**0.844**	**0.987**	**0.695**	**0.615**
47 obs.	SM better	74.2%	67.7%	61.3%	80.6%	83.9%
		Cars/ New car sales[(a)]	**Exp. Employ. / Employ.[(a)]**	**Exp. Inflation/ Inflation[(a)]**	**Exp. Family sit./ Retail**	**Exp. Family sit./ GDP[(a)]**
Nowcast	RMSE	1.574	0.997	**0.919**	**0.962**	**0.965**
59 obs.	SM better	34.9%	55.8%	67.4%	53.5%	58.1%
1M ahead	RMSE	1.495	**0.969**	**0.973**	**0.937**	**0.955**
58 obs.	SM better	42.9%	54.8%	59.5%	54.8%	52.4%
3M ahead	RMSE	**0.900**	**0.572**	**0.509**	**1.003**	**0.809**
56 obs.	SM better	62.5%	67.5%	72.5%	47.5%	52.5%
6M ahead	RMSE	**0.733**	**0.464**	**0.433**	**0.991**	**0.613**
53 obs.	SM better	62.2%	73.0%	83.8%	56.8%	75.7%
1Y ahead	RMSE	**0.652**	**0.492**	**0.325**	**0.843**	**0.511**
47 obs.	SM better	61.3%	74.2%	90.3%	67.7%	80.6%

Source: Authors' calculations.

* See table 4. "Smkt": supermarket sales.

Table D5

Table 9 with ARMA(1,1) as benchmark*

		IMCE-IPEC/ AR	IMCE-IPEC/ IMCE	IMCE-IPEC/ IPEC	IMCE/ IPEC
Nowcast	RMSE	**0.934**	0.997	**0.956**	0.959
61 obs.	IM-IPM better	62.8%	53.5%	58.1%	58.1%
1M ahead	RMSE	0.996	1.006	1.016	1.010
60 obs.	IM-IPM better	54.8%	45.2%	50.0%	54.8%
3M ahead	RMSE	0.785	1.002	**0.977**	0.975
58 obs.	IM-IPM better	67.5%	47.5%	62.5%	67.5%
6M ahead	RMSE	0.613	**0.952**	1.027	1.079
55 obs.	IM-IPM better	64.9%	59.5%	59.5%	35.1%
1Y ahead	RMSE	0.534	1.003	1.026	1.023
49 obs.	IM-IPM better	77.4%	58.1%	51.6%	41.9%

Source: Authors' calculations.

* See table 9.

NONLINEAR EFFECTS OF THE CHILEAN FISCAL POLICY*

Jean-Pierre Allegret**
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I. INTRODUCTION

In recent years a relatively new strand of literature has questioned whether the state of the economy is a determinant of the effects of fiscal policy on output and the size and sign of fiscal multipliers (Afonso et al., 2011; Baum and Koester, 2011; Auerbach and Gorodnichenko, 2012; Batini et al., 2012; Baum et al., 2012; International Monetary Fund, 2012; Auerbach and Gorodnichenko, 2013; Riera-Crichton et al., 2014; among others). This literature, focusing mostly on developed economies (Germany: Baum and Koester, 2011; the United States: Auerbach and Gordonichenko, 2012; a group of G-7 countries: Batini et al., 2012; Baum et al., 2012; International Monetary Fund, 2012; and Auerbach and Gordonichenko, 2013), has found that the effects of fiscal policy on output are likely nonlinear with fiscal multipliers being larger in recession than in expansion periods.[1] A contribution studying both developed economies and emerging markets (a sample of thirty OECD countries including developing economies such as Chile, Hungary, Mexico, Poland, and Turkey) by Riera-Crichton et al. (2014) also finds evidence of fiscal policy being more effective to boost the output during recessions than in expansions. Other recent papers studying developing economies and specifically Latin American countries, are Vargas et al. (2015) and Carrillo (2017), for Colombia and Ecuador, respectively. They find similar results to those for developed economies. In this paper, we focus in the case of Chile, an emerging market that possesses several interesting economic characteristics, and for which no evidence exists of the effects of fiscal policy on output and the size and sign of fiscal multipliers (hereafter, fiscal policy and fiscal multipliers) considering the state of the economy.

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1 *G-7 is a group of countries consisting of Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States.*

Chile is a very open economy to the world markets. Its deep financial integration into foreign markets and its orientation to commodity exports have made it historically affected by shocks coming from international sources. On the one hand, such economic integration has dramatically benefited the Chilean economy by increasing its exports and capital inflows. On the other hand, however, it also has brought essential risks such as greater domestic macroeconomic instability. As a policy response, during the last decades, the Chilean economic authorities have progressively built a sound and effective macroeconomic policy framework comparable to those in place in commodity-exporting developed economies, such as Australia, New Zealand, and Norway. Nevertheless, despite its sound macroeconomic policy framework, the Chilean economy is still very exposed to shocks coming from abroad. Thus, to guarantee its macroeconomic stability, the country's fiscal policy is a crucial tool, with the effects of fiscal policy and fiscal multipliers being a relevant subject.[2]

This paper seeks to contribute to the literature by studying the effects of fiscal policy and fiscal multipliers in emerging markets. It considers a nonlinear approach to study Chile's fiscal policy effectiveness. It estimates fiscal multipliers depending on the state of the economy, either low economic growth ("tight" regime) or when the economy is growing at a more reasonable rate ("normal" regime). Also, by building on a nonlinear approach, it questions the influence of the short-term (monetary policy) interest rate on the size and sign of fiscal multipliers.

To respond if the state of the economy, "tight" or "normal", matters in the effects of Chile's fiscal policy and fiscal multipliers, we apply a nonlinear time series analysis, concretely Threshold Vector Autoregression (TVAR) models. Using the definition of government spending and taxes in the seminal paper by Blanchard and Perotti (2002) and closely following the contribution by Batini et al. (2012), we estimate a TVAR model we called "baseline model". To obtain the impulse-response functions, we determine the state of the economy— "tight" or "normal"—depending on the real GDP growth, to then calculate fiscal multipliers of government spending and taxes.[3] The period of study comprises from the first quarter of 1990 to the fourth quarter of 2017.

We find that fiscal multipliers independent of the state of the economy do not differ much at impact, but in the long term, government spending multipliers

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2 The Chilean macroeconomic policy framework includes: (i) A Central Bank utterly independent of the government in office decisions, responsible for monetary and exchange rate policies; (ii) A flexible exchange rate regime aiming at working as the first defensive line against foreign shocks; (iii) An inflation targeting regime to anchor prices and give certainty to the economic agents; (iv) A structural balance fiscal rule guiding short-term government spending depending on the economy's medium-term fundamentals, notably output and copper prices, allowing to isolate government spending from politically populist driven pressures; (v) Sovereign wealth funds successfully used under exceptional cases; and (vi) Low public debt to GDP ratio, both compared to OECD and Latin American peer economies, allowing the country access to credit in convenient conditions.

3 Other papers, such as Baum and Koester (2011), Baum et al. (2012), and International Monetary Fund (2012) define the state of the economy using the output gap. Further extensions of this paper could include this measure instead of the real GDP growth as we do.

are positive and above the unit in the "tight" regime, and negative and about -0.5 in the "normal" regime. Tax multipliers are about 0.2 in the long term when the economy is in the "tight" regime.

Next, we study the interaction between fiscal and monetary policies, depending on the state of the economy. Building on the baseline model and including the short-term (monetary policy) interest rate, we estimate a TVAR model we called "extended model." We find that when including the short-term (monetary policy) interest rate, fiscal multipliers are slightly smaller compared to when it is not the case.

The remaining of this paper is structured as follows. Section II reviews the international literature studying the effects of fiscal policy and fiscal multipliers using nonlinear vector autoregression models and discusses the literature studying the case of Chile. Section III presents the data, discusses the analytical approach we use (TVAR models), and explains how we compute fiscal multipliers. Then section IV presents the results of the baseline model, finding that Chile's fiscal multipliers, and therefore fiscal policy effectiveness, differ depending on the state of the economy ("tight" or "normal"), with government spending multipliers above the unit in the "tight" regime and around -0.5 in the "normal" regime. Tax multipliers do not statistically differ from zero in both regimes ("tight" and "normal"). Section V provides the results of the extended model, finding that government spending multipliers are slightly smaller compared to those not considering the monetary policy stance. Last, section VI concludes.

II. LITERATURE REVIEW

In this section, we review the international literature studying the effects of fiscal policy and fiscal multipliers using nonlinear vector autoregression models, and we discuss the literature examining the case of Chile.

Most of the literature estimating the effects of fiscal policy and fiscal multipliers using vector autoregression models follows the seminal contribution of Blanchard and Perotti (2002). These authors, developing a Structural Vector Autoregression (SVAR) model with data for the United States, find that government spending has a positive impact on output, and the opposite happening when raising taxes. Since Blanchard and Perotti (2002), a vast literature using linear vector autoregression models has studied the effects of fiscal policy and fiscal multipliers (Perotti, 2005; Caldara and Kamps, 2008; Ilzetzki and Végh, 2008; González-García et al., 2013; Ilzetzki et al., 2013; among others).

A significant literature review by Spilimbergo et al. (2009) argues that: (i) the size of fiscal multipliers is far from being homogenous among countries; (ii) fiscal multipliers are bigger if a small part of the stimulus is spent on imports or saved by the private sector, the interest rate does not increase as a result of the fiscal expansion, and the country's fiscal position is perceived as sustainable

by private agents; (iii) a rule of thumb government spending multiplier (assuming a constant interest rate) is of 1.5 to one for large countries, one to 0.5 for medium-sized countries and 0.5 or less for small open economies, with tax multipliers being about the half of government spending multipliers; (iv) The risk of "simultaneity biased" is reduced when using data with a frequency quarterly or higher.

As the global financial crisis proved the inaccuracy and ineffectiveness of vector autoregression linear models in predicting the effects of fiscal policy and the size and sign of fiscal multipliers, a new strand of literature developed nonlinear vector autoregression models able to capture the effectiveness of fiscal policy depending on the state of the economy. This literature includes contributions by Afonso et al. (2011), Baum and Koester (2011), Auerbach and Gorodnichenko (2012), Batini et al. (2012), Baum et al. (2012), International Monetary Fund (2012), Auerbach and Gorodnichenko (2013), for developed economies, and by Vargas et al. (2015) and Carrillo (2017), for developing countries, among others. In general, this new strand of literature finds substantial differences in the size of fiscal multipliers, with fiscal policy being more effective during periods of recession or slow economic growth, or "tight" regime, compared to periods of economic growth, or "normal" regime.

Among single-country studies, two early contributions are Baum and Koester (2011) and Auerbach and Gordnichenko (2012). Baum and Koester (2011), using a TVAR model, compute fiscal multipliers for Germany, finding that government spending multipliers are much more significant in the case of a negative output gap, and tax policy having a limited effect. Meanwhile, Auerbach and Gordnichenko (2012), for the United States, compute fiscal multipliers from a Markov switching vector autoregression (MSVAR) model, finding that the government spending multiplier at impact is similar during "tight" and "normal" regimes (about 0.5), but presents substantial differences in the long term (25 quarters), over 2.5 in the "tight" regime and about zero in the "normal" regime.

Alternatively, papers studying a group of countries and estimating TVAR models include studies by Afonso et al. (2011), Batini et al. (2012), Baum et al. (2012), and International Monetary Fund (2012), among others. Afonso et al. (2011), using a financial stress indicator proposed by Cardarelli et al. (2011) as the threshold variable, and quarterly data for Germany, Italy, the United Kingdom, and the United States, study whether the effects of fiscal policy differ depending on the financial conditions. They find a nonlinear response of output to a fiscal shock associated with different behaviors across regimes. Batini et al. (2012), using a TVAR model, estimate the impact of fiscal adjustments in the United States, Europe, and Japan, finding government spending multipliers much larger in downturns than in upturns. Baum et al. (2012), using the output gap as the threshold variable and quarterly government spending and tax data for Canada, France, Germany, Japan, the United Kingdom, and the United States, find that fiscal policy shocks on output depend not only on the state of the economy (with government spending and tax multipliers being more significant in "tight" regimes than in "normal" regimes) but also on their

size and direction. Similarly, the International Monetary Fund (2012), for the G-7 countries except Italy, finds evidence suggesting that the impact of fiscal policy on output varies with the business cycle, that the average fiscal multipliers are much more significant in times of negative output gaps, with government spending multipliers being more significant in absolute value than tax multipliers.

Subsequently, for a group of thirty OECD countries, including both developed economies and emerging markets, Riera-Crichton et al. (2014) explore whether the effects of fiscal policy and fiscal multipliers depend on the state of the business cycle or not. They find not only that government spending multipliers are higher during a "tight" regime than in a "normal" regime, but also that government spending multipliers are even higher during a "tight" regime and when government spending is increasing.

Country-specific contributions focusing on Latin America include Vargas et al. (2015) for Colombia and Carrillo (2017) for Ecuador. Both studies, in line with the literature focusing on developed economies, find that fiscal policy is more effective in "tight" regimes than in "normal" regimes, with government spending being more efficient to boost output than tax cuts.

In the case of Chile, the literature studying the effects of fiscal policy and fiscal multipliers has mostly used linear models, then not considering the effectiveness of the fiscal policy depending on the state of the economy.

The literature studying the effects of Chile's fiscal policy and fiscal multipliers, using quarterly frequency data, to the best of our knowledge, includes four main contributions (Cerda et al., 2005; Restrepo and Rincón, 2006; Céspedes et al., 2011; Fornero et al., 2019) with very different results, leaving the question about the effects of fiscal policy and fiscal multipliers far from being conclusive.[4]

Cerda et al. (2005) made the first attempt to estimate the effects of Chile's fiscal policy using quarterly data. These authors, using an SVAR model and data for the period 1986.I-2001.IV, find that a positive shock to government spending reduces output at impact and then dies out and that a positive shock to taxes has a negative and minimal effect on output at impact.[5] Thus, according to Cerda et al. (2005), fiscal policy in Chile has a null and even slightly adverse effect on output.

Later, Restrepo and Rincón (2006) also using an SVAR model, for the period 1989.I-2005.II find that one Chilean peso spent by the government generates about USD 1.9 at impact that stabilizes at about USD 1.4 in the long term and

4 Alternatively, Correa et al. (2014) employ a "narrative approach."

5 In Cerda et al. (2005), government spending corresponds to the total spending, including transfers, social security, financial investment, public debt services, and other fiscal spending. Taxes include all taxes net of subsidies, i.e., income taxes, value-added tax, trade taxes, excise taxes, juridical acts taxes, and other taxes.

that an increase in taxes of one Chilean peso reduces GDP by about USD 0.4 at impact, being not much different from zero in the long term.[6] Hence, Restrepo and Rincón (2006) conclude that in Chile, while government spending might have a positive effect on output, taxes do the opposite.

Céspedes et al. (2011), using a Vector Autoregression (VAR) model, estimate government spending multipliers for the period 1990.I-2010.I, finding a government spending multiplier of 0.7 at impact and a cumulative multiplier of 2.8 after eight quarters.[7] The results of Céspedes et al. (2011) suggest that government spending multipliers are high and positive, with fiscal policy being quite useful to boost the Chilean economy.

In a recent paper, Fornero et al. (2019) estimate government spending multipliers and specific multipliers for government consumption, public transfers, and government investment using an SVAR for the period 1996.I-2015.IV, they find a government spending multiplier of 0.2 at impact and about 0.6 in the long term.

Summing up, the results in the literature using linear vector autoregression models to estimate the effects of fiscal policy and fiscal multipliers in Chile are far from conclusive. Cerda et al. (2005) conclude that the Chilean fiscal policy has a null or even adverse effect on economic activity (both government spending and taxes). Restrepo and Rincón (2006) suggest that government spending might be useful, but taxes not. Céspedes et al. (2011) find that government spending is quite capable of boosting the Chilean economy. Fornero et al. (2019) suggest that government spending has a positive effect on the economy, but with government spending and investment being particularly useful. We guess that the methodological choices might explain the differences in the results, i.e., the period of study, the alternative models used, the variables included, the number of lags the models have, and the government spending and tax definitions considered. Appendix A presents a summary.

III. METHODOLOGY

In this section, we present the data, describe the variables and their arrangements, list the statistical tests we apply to them, and the number of lags selected and included in our estimations. Then we describe the analytical approach we use (TVAR model) discussing its strengths and weaknesses. Last, we describe how we calculate the fiscal multipliers (at impact, after a year, after two years, and in the long term) presented later in sections IV and V.

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6 Restrepo and Rincón (2006) define government spending as wages and salaries, goods and services, and investment, and taxes as total taxes net of subsidies and grants, interest payments, social security payments, and capital transfers.

7 Céspedes et al. (2011) understand government spending as the sum of government consumption and government investment.

1. Data

This paper covers the period 1990.I-2017.IV. The data have a quarterly frequency, which means one hundred and twelve observations, sourced by the Chilean Budget Office (Dipres), the National Institute of Statistics (INE), the Central Bank of Chile (BCCh) and the OECD. The nominal government spending and taxes data come from Dipres; the BCCh and the OECD provide the nominal GDP, consumer price index (of all items), and the short-term (monetary policy) interest rate; the population comes from the INE.[8]

The variables included in the baseline model of section IV are the log of real per capita GDP in differences $d\log Y_t$, the log of real per capita government spending in differences $\text{dlog } G_t$, and the log of real per capita taxes in differences T_t. In section V, the extended model builds on the baseline model by adding the short-term (monetary policy) interest rate in percentage and differences di_t. To get these variables, except the short-term (monetary policy) interest rate, we deflate the nominal time series by the consumer price index (of all items), divided by the population, transformed into logarithms, seasonally adjusted using the Census X-12 seasonally adjustment method, and set their differences to achieve stationarity.[9]

Following, to check stationarity, we implement the standard Augmented Dickey-Fuller, Elliot-Rothenberg-Stock, and the Phillips-Perron unit root tests. Meanwhile, the time series in logarithms show non-stationarity, i.e., unit root, the series in percentages observes mixed results meaning stationarity and non-stationarity depending on the specific test, and the data in differences are stationary in almost all cases. Appendix B reports these unit root tests.

It is well-known that the lag choice has important quantitative implications for the accuracy of the vector autoregression models and their impulse-response functions (Ivanov and Kilian, 2005). At the same time, however, the number of lags chosen by the existent criteria (Schwarz Information Criterion (SIC), Hannan-Quinn Information Criterion (HQC), and Akaike Information Criterion (AIC), among others) can be somewhat contradictory. In the related literature using quarterly data, four lags are usually chosen (see for instance: Balke, 2000; Blanchard and Perotti, 2002; Caldara and Kamps, 2008; Ilzetzki et al., 2013; González-García et al., 2013; and Karagyozova-Markova et al., 2013; among others); however, such practice does not consider the specificities of the data used.

In this paper, we follow a more "statistical" approach for choosing the number of lags included in our models. This approach starts by selecting the maximum number of lags, depending on the data frequency. As we use quarterly data, the maximum number of lags is four. Then, we choose the number of lags using the

8 We use the data built on the "accrual principle," meaning government spending and taxes recorded at the time the activity that generates the obligation to pay them occurs.

9 This procedure follows what has been extensively implemented in the literature (see, for example; Cerda et al., 2005; Restrepo and Rincón, 2006; Baum and Koester, 2011; Céspedes et al., 2011).

existent information criteria, but these give different answers to this question. Hence, we follow Ivanov and Kilian (2005), who recommend when using semi-structural vector autoregression models based on quarterly data, as we do, use the number of lags suggested by the HQC.

2. Analytical approach

The empirical literature studying the effects of fiscal policy and fiscal multipliers uses three main approaches: (i) the estimations based on vector autoregression models; (ii) structural model-based evaluations as dynamic stochastic general equilibrium models (DSGE); and (iii) case studies based on well-documented changes in government spending and taxes. Among the vector autoregression models, four strands stand out (Jemec et al., 2011): (i) short-term restrictions as the recursive Cholesky decomposition of the variance-covariance matrix of the model's residuals (Fatás and Mihov, 2001); (ii) SVAR models based on institutional information coming out of the model (Blanchard and Perotti, 2002); (iii) sign restrictions on the variables in the model (Mountford and Uhlig, 2009) and (iv) "event studies" requiring long data series of well-established exogenous shocks (Ramey and Shapiro, 1998).

We estimate TVAR models, with Cholesky decomposition as the identification strategy, because these models allow incorporating the state of the economy ("tight" and "normal" regimes) to study the effects of fiscal policy and fiscal multipliers. Also, TVAR models are now considered a standard tool in modern applied macroeconomics (Afonso et al., 2011; Baum and Koester, 2011; Batini et al., 2012; Baum et al., 2012; among others), scarcely implemented in emerging markets such as Chile.

TVAR models are nonlinear vector autoregression models capable of separating observations into different regimes depending on a threshold, where the models are linear within each regime (International Monetary Fund, 2012). In these models, parameters can switch depending on whether the "threshold variable" crosses or not an estimated threshold. In recent years TVAR models have become increasingly popular as these models can overcome the problem of nonlinearity among variables that traditional linear vector autoregression models cannot deal with.[10] Nevertheless, despite their advantage over linear vector autoregression models, TVAR models have the drawback of potential arbitrariness in the threshold selection (Riera-Crichton et al., 2014).

TVAR models can be expressed as follows:

$$W_t = I_{\{c_{t-d}<\gamma\}}\left[B^1 Z_t + F^1(L) Z_{t-1}\right] + I_{\{c_{t-d}\geq\gamma\}}\left[B^2 Z_t + F^2(L) Z_{t-1}\right] + \varepsilon_t \quad (1)$$

where Z_t is a vector of endogenous variables. In this paper, meanwhile, the baseline model of section IV includes dlog G_t, dlog Y_t, and dlog T_t, the extended model of section V, building on the baseline model, includes dit as well. Also,

10 Alternative approaches modeling nonlinear dynamic relationships are MSVAR models.

as in Batini et al. (2012), the GDP growth, dlog Y_t, is both an endogenous and the "threshold variable."

Consequently, B^1 and B^2 represent the contemporaneous structural relationships in the two regimes we study, "tight" and "normal", $F^1(L)$ and $F^2(L)$ are lag polynomial matrices, and ε_t are the structural disturbances. c_{t-d} represents the threshold determining in which regime the system $1_{\{c_{t-d} \geq \gamma\}}$ is an indicator function that equals one when $c_{t-d} \geq \gamma$ and zero otherwise. Following Balke (2000), Afonso et al. (2011) and Batini et al. (2012), among others, we set the parameter $d = 1$ because we need at least one lag of the threshold variable to feed the TVAR models recursively and because our interest is in response to fiscal shocks when a regime switch has just occurred (Batini et al., 2012).

We achieve identification through Cholesky decomposition. The variables ordering in the baseline model of section IV consider dlog G_t first, dlog Y_t second, and dlog T_t last, following early contributions using Cholesky decomposition for identification (Fatás and Mihov (2001), Caldara and Kamps (2008), among others). The extended model of section V follows the ordering of the variables in the baseline model with the exception that dlog T_t goes third and dit is placed last, as in Caldara and Kamps (2008) and Batini et al. (2012). To allow comparability with the results in section IV, the number of lags included in the extended model is also two.

3. Fiscal multipliers

To check the effects of fiscal policy on output, we estimate TVAR models, obtaining impulse-response functions and computing fiscal multipliers of government spending and taxes.

Aware of the existence of alternative ways to compute fiscal multipliers, in this paper we follow the definition in Spilimbergo et al. (2009), meaning the ratio of a change in output to an exogenous change in government spending or taxes, with respect to their respective baselines (as Batini et al. (2012), González-García et al. (2013), and Ilzetzki et al. (2013), among others).

Hence, we compute two alternative multipliers, the impact multiplier (IM) and the cumulative multiplier (CM). While the IM considers the effects of fiscal policy on output in the very short-term, the CM summarizes the total effect that a fiscal policy shock has on output over a specified period. The IMs of government spending (equation 2) and taxes (equation 3) are defined as follows:

$$IM\ spending\ = \frac{dY_t}{dG_t} \tag{2}$$

$$IM\ taxes\ = \frac{dY_t}{dT_t} \tag{3}$$

where dY_t is the change in output followed by a change in government spending, dG_t, or taxes, dT_t, in the very short-term (at impact).

Subsequently, the CMs represent the sum effects of government spending and taxes on output at a specified time horizon after impact. These are defined as following:

$$CM\ spending\ = \frac{\sum_{j=1}^{N} dY_{t+j}}{\sum_{j=1}^{N} dG_{t+j}} \tag{4}$$

$$CM\ taxes\ = \frac{\sum_{j=1}^{N} dY_{t+j}}{\sum_{j=1}^{N} dT_{t+j}} \tag{5}$$

where dY_{t+j} is the change in output concerning the baseline j periods after the fiscal shock, and dG_{t+j} and dT_{t+j} are the changes in government spending and taxes j periods after the fiscal shock (Spilimbergo et al., 2009; Batini et al., 2012). The fiscal shock we study corresponds to a positive one-standard-deviation shock to government spending and taxes.

Then, in addition to the IMs of government spending and taxes, we also compute the CMs of government spending and taxes after ten quarters as Céspedes et al. (2011) and Fornero et al. (2019), contributions using the same type of data we use in this paper. In the following sections, we alternatively report impact and cumulative government spending and tax multipliers. We define the long term cumulative multiplier when it reaches ten quarters.[11]

To compute the IMs and the CMs from the impulse-response functions, we use the following standard transformations (Céspedes et al., 2011; González-García et al., 2013):

$$IM\ spending\ = \frac{dY_t}{dG_t} = \frac{d\log Y_t}{d\log G_t} * \frac{\overline{Y}}{\overline{G}} \tag{6}$$

$$IM\ taxes\ = \frac{dY_t}{dT_t} = \frac{d\log Y_t}{d\log T_t} * \frac{\overline{Y}}{\overline{T}} \tag{7}$$

$$IM\ spending\ = \frac{\sum_{j=1}^{N} dY_{t+j}}{\sum_{j=1}^{N} dG_{t+j}} = \frac{\sum_{j=1}^{N} d\log Y_{t+j}}{\sum_{j=1}^{N} d\log G_{t+j}} * \frac{\overline{Y}}{\overline{G}} \tag{8}$$

$$CM\ taxes\ = \frac{\sum_{j=1}^{N} dY_{t+j}}{\sum_{j=1}^{N} dT_{t+j}} = \frac{\sum_{j=1}^{N} d\log Y_{t+j}}{\sum_{j=1}^{N} d\log T_{t+j}} * \frac{\overline{Y}}{\overline{T}} \tag{9}$$

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11 The long term multiplier corresponds to the multiplier when $N \to \infty$, but in practice, after a sufficiently large number of periods the CM reaches a constant level.

where $d\log Y_t$, $d\log G_t$, and $d\log T_t$ come from the impulse-response function estimates by the TVAR models and approximate $[Y_t - Y_{t-1}]/Y_{t-1}$, $[Gt - G_{t-1}]/G_{t-1}$ and $[T_t - T_{t-1}]/T_{t-1}$, respectively. Finally, $\overline{Y}$, $\overline{T}$ and $\overline{G}$ are respectively the average output, average government spending, and average taxes, in the period of study.

IV. BASELINE MODEL

In this section, we present and discuss the results of estimating the baseline model. To do so we closely follow the paper by Batini et al. (2012), using the method developed initially by Balke (2000), and estimating a TVAR model that changes its structure according to the GDP growth (our threshold variable), to obtain regime dependent impulse-response functions and hence fiscal multipliers in the "tight" and "normal" regimes. The baseline model includes the three endogenous variables defined in section III, meaning $d\log G_t$, $d\log Y_t$ and $d\log T_t$. Identification is achieved through Cholesky decomposition, with $d\log G_t$ ordered first, followed by $d\log Y_t$, and last $d\log T_t$.[12]

The baseline model includes a constant and two lags, as discussed in the previous sections following the HQC. We set the parameter describing the delay of the threshold variable, "*d*", equal to one as our interest is in the response to fiscal shocks when a regime switch has just occurred, same as Balke (2000), Calza and Souza (2006), Afonso et al. (2011), and Batini et al. (2012).

The threshold value, endogenously estimated from our data, sets a value for the GDP growth rate equal to 1.13%. It means that when the Chilean economy is growing below 1.13%, it is in the "tight" regime, and if it is growing above 1.13%, it is in the "normal" regime.

Figure 1 presents the baseline model results. As expected, both fiscal multipliers (government spending and taxes) differ depending on whether the Chilean economy is in the "tight" or the "normal" regime. Meanwhile, the government spending multiplier at impact is positive, and about 0.35 in the "tight" regime and 0.22 in the "normal" regime, the cumulative multiplier differs substantially, being above the unit (1.23) when the economy is in the "tight" regime and negative (-0.56) when the economy is in the "normal" regime.

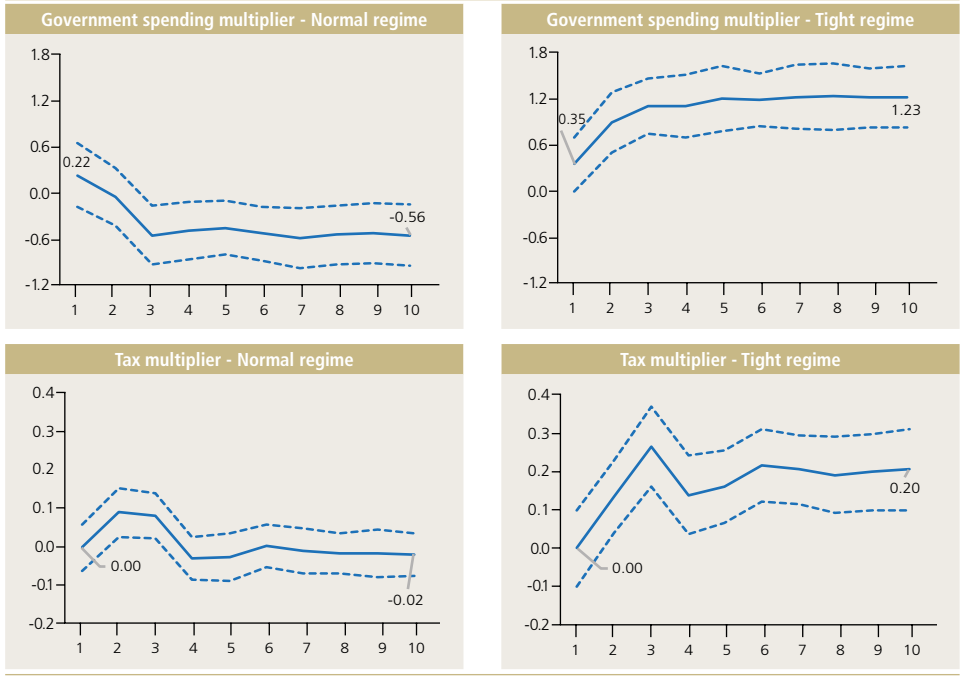
12 Appendix C presents alternative estimations with $d\log T_t$ ordered first, followed by $d\log G_t$, and last $d\log Y_t$ (see Baum and Koester, 2011; Baum et al, 2012; IMF, 2012; among others). In this case, while the government spending multiplier is slightly bigger in the "normal" regime and less negative in the "tight" regime, tax multipliers are bigger in both regimes.

These results suggest, on the one hand, that government spending seems capable of boosting the Chilean economy when the GDP growth rate is below 1.13% and ineffective when the opposite occurs. That linear models underestimate the effects of a government spending shock during a period of slow growth and overestimate its effects in periods of more robust growth. On the other hand, tax multipliers in the "tight" and the "normal" regimes are zero at impact, as we assume that tax multipliers affect neither government spending nor output contemporaneously, though in the long term cumulative tax multipliers differ, being slightly positive in the "tight" regime (0.20) and statistically not different than zero in the "normal" regime (-0.02).

Figure 1

Baseline model: Government spending and tax multipliers

(threshold GDP growth = 1.13%)



Source: Authors' calculations.

Note: The vertical axis represents the size of the fiscal multipliers, the horizontal axis represents the number of quarters since the shock, and the dotted lines represent the confidence intervals at 95% of statistical significance based on bootstrap simulations (500 repetitions).

Consequently, figure 1 shows that: (i) fiscal multipliers and therefore the effectiveness of the Chilean fiscal policy differ depending if the economy is in the "tight" or the "normal" regime, in line with the international literature where fiscal policy seems to have different effects depending on the state of the economy; (ii) the results confirm that the effects of Chile's fiscal policy are nonlinear, with fiscal multipliers, particularly government spending multipliers, being positive and above the unit in the "tight" regime and negative and about -0.5 in the "normal" regime; and (iii) tax multipliers are slightly effective in the "tight" regime.

V. EXTENDED MODEL

The literature studying the dynamic effects of fiscal policy and fiscal multipliers on occasions includes variables other than government spending, taxes, and output, to investigate possible interactions between fiscal and other macroeconomic variables. In this sense, evidence on the interaction between fiscal and monetary policies, as a determinant of the effects of fiscal policy on output (Ahrend et al., 2006; Spilimbergo et al., 2009; Canova and Pappa, 2011; Batini et al., 2012; Ilzetzki et al., 2013; Fornero et al., 2019), relates the monetary policy stance with the size and sign of fiscal multipliers.

Building on the baseline model of section IV, this section estimates a model that also includes the short-term (monetary policy) interest rate to consider possible interactions between the Chilean fiscal and monetary policies, and to study if short-term (monetary policy) interest rate has had a role on the size and sign of fiscal multipliers. We include the short-term (monetary policy) interest rate because of the notion that monetary accommodation plays a crucial role in the expansionary effect of fiscal policy, that turns out to be related to those studies showing that fiscal multipliers are larger when central banks' policy interest rate is at the zero-lower bound. We called this model the extended model. It includes four variables: government spending, taxes, output, and the short-term (monetary policy) interest rate.

The model changes its structure depending on the GDP growth rate (our threshold variable) into two regimes, "tight" and "normal". The ordering of the variables included in the model is the following: first dlog G_t, then $d\log Y_t$, dlog T_t, and dit last.[13] This ordering follows Batini et al. (2012), and identification is achieved through Cholesky decomposition. In this case the threshold value, endogenously estimated for the GDP growth rate, is equal to 1.07%. Then if the Chilean economy grows below 1.07%, it is in the "tight" regime, and if it grows above 1.07%, it is in the "normal" regime. Finally, the extended model includes a constant and two lags to allow comparability with the fiscal multipliers presented in figure 1.

13 Alternatively, table C2 in appendix C presents estimates with the ordering with dlog Tt ordered first, followed by dlog G_t, dlog Y_t, and dit. In this case, government spending multipliers are slightly bigger in the "normal" regime and less negative in the tight regime, and tax multipliers are bigger in both regimes.

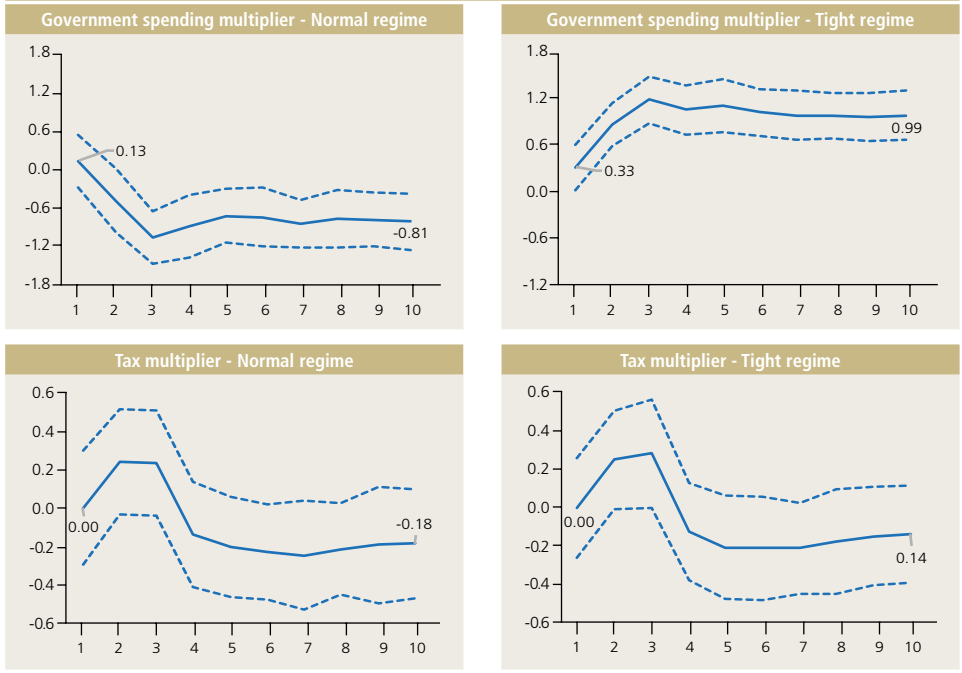
Figure 2 presents the extended model's fiscal multipliers. The results show that government spending multipliers at impact are similar, 0.33 in the "tight" regime, and about 0.13 in the "normal" regime, nevertheless statiscally not significant in this latter case. Subsequently, in the long term, while the government spending multiplier in the "tight" regime is about the unit (0.99), it is negative and about -0.81 in the "normal" regime. Regarding the tax multiplier, it is zero at impact (Cholesky decomposition assumption to achieve identification) and about -0.2 in the long term in both regimes, but statistically not significant. In brief, from comparing the baseline model (figure 1) and extended model (figure 2) fiscal multipliers, we observe that when including the short-term (monetary policy) interest rate we obtain slightly smaller fiscal multipliers compared to those not including it, with long term government spending multipliers remaining statistically significant.

Figures 1 and 2 display the fiscal multipliers in the baseline and extended models, respectively. We find that independently of the regime in which the economy is in, the government spending multipliers are slightly smaller when the short-term (monetary policy) interest rate is considered (extended model) compared to when it is not included (baseline model). Meanwhile, tax multipliers are zero at impact and slightly smaller when estimated using the extended model vis-à-vis using the baseline model. However, these multipliers are statistically not significant except for the tax multiplier in the "tight" regime using the baseline model.

Figure 2

Extended model: government spending and tax multipliers

(threshold GDP growth = 1.07%)



Source: Authors' calculations.

Note: The vertical axis represents the size of the fiscal multipliers, the horizontal axis represents the number of quarters since the shock, and the dashed lines represent the confidence intervals at 95% of statistical significance based on bootstrap simulations (500 repetitions).

VI. CONCLUSIONS

In this paper, we estimate nonlinear vector autoregression models (TVAR) using quarterly data and calculating fiscal multipliers of government spending and taxes, depending on the state of the Chilean economy, with GDP growth as our "threshold variable".

The "baseline model," which includes the government spending, GDP and taxes, as endogenous variables, find that in the long term the government spending multiplier is above the unit when the economy is in the "tight" regime, and it is about -0.5 in the "normal" regime. Furthermore, in the long term, the tax multiplier is slightly positive only in the "tight" regime. The "extended model" finds government spending multipliers a bit smaller when the short-term (monetary policy) interest rate is considered.

Possible avenues for future research might include the estimation of fiscal multipliers using alternative nonlinear models such as MSVAR and the use of different threshold variables, for instance, the output gap.

REFERENCES

Afonso, A., J. Baxa, and M. Slavik (2011). "Fiscal Developments and Financial Stress: A Threshold VAR Analysis." Working Paper Series N° 1319, European Central Bank, Frankfurt.

Ahrend, R., P. Catte, and R. Price (2006). "Interactions between Monetary and Fiscal Policy: How Monetary Conditions Affect Fiscal Consolidation." OECD Economics Department Working Paper N° 52.

Auerbach, A. and Y. Gorodnichenko (2012). "Measuring the Output Responses to Fiscal Policy." *American Economic Journal: Economic Policy* 4(2): 1–27.

Auerbach, A. and Y. Gorodnichenko (2013). "Fiscal Multipliers in Recession and Expansion." In *Fiscal Policy after the Financial Crisis*, edited by A. Alesina and F. Giavazzi. Cambridge, MA: National Bureau of Economic Research.

Balke, N. (2000). "Credit and Economic Activity: Credit Regimes and Nonlinear Propagation of Shocks." *Review of Economics and Statistics* 82(2): 344–49.

Blanchard, O. and R. Perotti (2002). "An Empirical Characterization of the Dynamic Effects of Changes in Government Spending and Taxes on Output." *Quarterly Journal of Economics* 17(4): 1329–68.

Batini, N., G. Callegari, and G. Melina (2012). "Successful Austerity in the United States, Europe and Japan." IMF Working Paper WP/12/190.

Baum, A. and G. Koester (2011). "The Impact of Fiscal Policy on Economic Activity over the Business Cycle – Evidence from a Threshold VAR analysis." Discussion Paper Series 1: Economic Studies N° 03/2011, Deutsche Bundesbank, Frankfurt.

Baum, A., M. Poplawski-Ribeiro, and A. Weber (2012). "Fiscal Multipliers and the States of the Economy." IMF Working Paper WP/12/286.

Caldara, D. and C. Kamps (2008). "What are the Effects of Fiscal Policy Shocks? A VAR-Based Comparative Analysis." Working Paper Series N° 877, European Central Bank, Frankfurt.

Calza, A. and J. Souza (2006). "Output and Inflation Responses to Credit Shocks: Are There Threshold Effects in the Euro Area?" *Studies in Nonlinear Dynamics and Econometrics* 10(2): 1–21.

Canova, F. and E. Pappa (2011). "Fiscal Policy, Pricing Frictions and Monetary Accommodation." *Economic Policy* 26(68): 555–98.

Cardarelli, R., S. Elekdag, and S. Lall (2011). "Financial Stress and Economic Contractions." *Journal of Financial Stability* 7(2): 78-97.

Carrillo, M. (2017). "El Efecto de la Política Fiscal en Expansión y Recesión para Ecuador: Un Modelo MSVAR." *Cuadernos de Economía* 36(71): 405–39.

Cerda, R., H. González, and L. Lagos (2005). "Efectos Dinámicos de la Política Fiscal." *Cuadernos de Economía* 42(mayo): 63-77.

Céspedes, L.F., J. Fornero, and J. Galí (2011). "Aspectos No Ricardianos de la Política Fiscal en Chile." *Economía Chilena* 14(2): 79–107.

Correa, J., C. Ferrada, P. Gutiérrez, and F. Parro (2014). "Effects of Fiscal Policy on Private Consumption: Evidence from Structural-Balance Fiscal Rule Deviations." *Applied Economics Letters* 21(11): 776–81.

Fatás, A. and I. Mihov (2001). "The Effects of Fiscal Policy on Consumption and Employment: Theory and Evidence." Discussion Paper N° 2760, Centre for Economic Policy Research, London.

Fornero, J., J. Guerra-Salas, and C. Pérez (2019). "Multiplicadores Fiscales en Chile." *Economía Chilena* 22(2): 58–80.

González-García, J., A. Lemus, and M. Mrkaic (2013). "Fiscal Multipliers in the ECCU." IMF Working Paper WP/13/117.

Ilzetzki, E. and C.A. Végh (2008). "Procyclical Fiscal Policy in Developing Countries: Truth or Fiction?" NBER Working Paper N° 14191.

Ilzetzki, E., E. Mendoza, and C.A. Végh (2013). "How Big (Small?) Are Fiscal Multipliers?" *Journal of Monetary Economics* 60(2): 239–54.

International Monetary Fund (2012). "Balancing Fiscal Policy Risks." *Fiscal Monitor*, April.

Ivanov, V. and L. Kilian (2005). "A Practioner's Guide to Lag Order Selection for VAR Impulse Response Analysis." *Studies in Nonlinear Dynamics and Econometrics* 9(1): article 2.

Jemec, N., A. Strojan, and A. Delakorda (2011). "How Do Fiscal Shocks Affect Macroeconomic Dynamics in the Slovenian Economy?" Prokazi in Analize 2/2011, Bank of Slovenia, Ljubljana.

Karagyozova-Markova, K., G. Deyanov, and V. Iliev (2013). "Fiscal Policy and Economic Growth in Bulgaria." Discussion Papers DP/90/2013, Bulgarian National Bank, Sofia.

Mountford, A. and H. Uhlig (2009). "What are the Effects of Fiscal Policy Shocks?" *Journal of Applied Econometrics* 24(6): 960–92.

Perotti, R. (2005). "Estimating the Effects of Fiscal Policy in OECD Countries." CEPR Discussion Paper N° 4882, Centre for Economic Policy Research, London.

Ramey, V.A. and M.D. Shapiro (1998). "Costly Capital Reallocation and the Effects of Government Spending." *Carnegie-Rochester Conference Series on Public Policy* 48(1): 145–94.

Restrepo, J.E. and H. Rincón (2006). "Identifying Fiscal Policy Shocks in Chile and Colombia." Working Papers N° 370, Central Bank of Chile.

Riera-Crichton, D., C.A. Végh, and G. Vuletin (2014). "Fiscal Multipliers in Recession and Expansions: Does it Matter whether Government Spending is Increasing or Decreasing?" Policy Research Working Paper N° 6993, World Bank Group, Washington D.C.

Spilimbergo, A., S. Symansky, and M. Schindler (2009). "Fiscal Multipliers." Staff Position Note SPN/09/11, International Monetary Fund.

Vargas, H., A. González, and I. Lozano (2015). "Macroeconomic Gains from Structural Fiscal Policy Adjustments: The Case of Colombia." *Economía* 15(2): 39-81.

APPENDIX A

DATA, APPROACHES, VARIABLES, AND RESULTS IN THE LITERATURE STUDYING THE CASE OF CHILE

	Cerda et al. (2005)	Restrepo and Rincón (2006)	Céspedes et al. (2011)	Fornero et al. (2019)
Period of study	1986.I-2001.IV	1989.I-2005.II	1990.I-2010.I	1996.I-2015.IV
Frequency	Quarterly	Quarterly	Quarterly	Quarterly
Approach	SVAR	SVAR	VAR	SVAR
Number of lags included in the vector autoregression model	8 (Akaike information criterion)	Not mentioned	4 (Criterion not mentioned)	2 (Akaike and Hannan-Quinn information criteria)
Variables included	Government spending, taxes and GDP	Government spending, taxes and GDP	Government spending, private consumption, public deficit and GDP	Government spending, GDP, short-term (monetary policy) interest rate, real exchange rate
Government spending definition	Total spending less transfers, social security, financial investment, debt interests and other fiscal expenditure	Wages and salaries, goods and services, and investment; i.e. government spending net of transfers	Government consumption and investment	Government consumption and investment
Taxes definition	Income taxes, value added tax, trade taxes, taxes to specific products, taxes to juridical actions, and other taxes net of subsidies	Taxes are net of subsidies and grants, interest payments, social security payments and capital transfers	Not studied. Instead they study the dynamic effects of government transfers	Not studied. Instead they study the dynamic effects of goverment consumption, public transfers, and government investment
Results of a positive government spending shock	Small and negative effect on output	Positive effect on output	High and positive effect on output	Positive effect on output
Results of a positive tax shock	Small and negative effect on output	Small and negative effect on output	Not studied	Not studied

Source: Authors' calculations.

Note: Céspedes et al. (2011) use GDP data, excluding copper and other natural resources. Regarding the fiscal data sources, Cerda et al. (2005) use data collected under the "cash principle" (government spending and taxes recorded at the time the transaction occurs), sourced by the government's payment office (Tesorería General de la República). Whereas Restrepo and Rincón (2006), Céspedes et al. (2011) and Fornero et al. (2019) use data provided by the Chilean Budget Office (Dipres) built on the "accrual principle" (government spending and taxes recorded at the time of the activity that generates the obligation to pay them).

APPENDIX B

UNIT ROOT TESTS

Table B1

Variables in levels

		Augmented Dickey-Fuller	Phillips-Perron	Elliot-Rothenberg-Stock
GDP	Evidence of unit root	Yes	Yes	Yes
	t-statistic	-2.21	-1.99	-2.24
	critical value 1%	-4.05	-4.04	-3.57
	critical value 5%	-3.45	-3.45	-3.02
	critical value 10%	-3.15	-3.15	-2.73
Government spending	Evidence of unit root	Yes	Yes	Yes
	t-statistic	-2.26	-3.18	-2.25
	critical value 1%	-4.05	-4.04	-3.57
	critical value 5%	-3.45	-3.45	-3.02
	critical value 10%	-3.15	-3.15	-2.73
Taxes	Evidence of unit root	No	No	No
	t-statistic	-3.64	-3.60	-3.20
	critical value 1%	-4.04	-4.04	-3.57
	critical value 5%	-3.45	-3.45	-3.02
	critical value 10%	-3.15	-3.15	-2.73

Source: Authors' calculations.

Note: "No" indicates the absence of evidence of unit root at a 5% critical value; "Yes" means the opposite. After data inspection, we decided to apply the unit root tests with intercept and trend to the variables in levels and with neither intercept nor trend to the variables in differences.

Table B2

Variables in differences

		Augmented Dickey-Fuller	Phillips-Perron	Elliot-Rothenberg-Stock
GDP	Evidence of unit root	No	No	No
	t-statistic	-5.56	-5.63	-4.69
	critical value 1%	-2.59	-2.59	-2.59
	critical value 5%	-1.94	-1.94	-1.94
	critical value 10%	-1.61	-1.61	-1.61
Government spending	Evidence of unit root	Yes	No	Yes
	t-statistic	-1.51	-13.05	-1.37
	critical value 1%	-2.59	-2.59	-2.59
	critical value 5%	-1.94	-1.94	-1.94
	critical value 10%	-1.61	-1.61	-1.61
Taxes	Evidence of unit root	No	No	No
	t-statistic	-12.50	-12.49	-3.04
	critical value 1%	-2.59	-2.59	-2.59
	critical value 5%	-1.94	-1.94	-1.94
	critical value 10%	-1.61	-1.61	-1.61

Source: Authors' calculations.

Note: "No" indicates the absence of evidence of unit root at a 5% critical value; "Yes" means the opposite. After data inspection, we decided to apply the unit root tests with intercept and trend to the variables in levels and with neither intercept nor trend to the variables in differences."

Table B3

Variables in percentages

		Augmented Dickey-Fuller	Phillips-Perron	Elliot-Rothenberg-Stock
Short-term interest rate	Evidence of unit root	No	Yes	Yes
	t-statistic	-3.72	-2.85	-1.37
	critical value 1%	-3.49	-3.49	-2.59
	critical value 5%	-2.89	-2.89	-1.944
	critical value 10%	-2.58	-2.58	-1.615
D (Short-term interest rate)	Evidence of unit root	No	No	No
	t-statistic	-6.84	-5.60	-6.87
	critical value 1%	-2.59	-2.59	-2.59
	critical value 5%	-1.94	-1.94	-1.94
	critical value 10%	-1.61	-1.61	-1.61

Source: Authors' calculations.

Note: "No" indicates an absence of evidence of unit root at a 5% critical value; "Yes" means the opposite. D(Short-term interest rate) denotes the short-term interest rate in differences.

APPENDIX C

GOVERNMENT SPENDING AND TAX MULTIPLIERS

Table C1

Baseline model: Government spending and tax multipliers
(threshold GDP growth = 1.13 percent)

	Regime	IM	CM (4th quarter)	CM (8th quarter)	CM (10th quarter)
Government spending	Tight	0.48	1.60	1.73	1.71
	Normal	0.31	-0.29	-0.28	-0.29
Taxes	Tight	0.23	0.68	0.75	0.76
	Normal	0.15	0.46	0.50	0.51

Source: Authors' calculations.

Note: The baseline model includes a constant and the number of lags suggested by the HQC, i.e.: two lags. IM denotes the impact multiplier and CM the cumulative multiplier.

Table C2

Extended model: Government spending and tax multipliers
(threshold GDP growth = 1.07 percent)

	Regime	IM	CM (4th quarter)	CM (8th quarter)	CM (10th quarter)
Government spending	Tight	0.43	1.39	1.21	1.25
	Normal	0.31	-0.37	-0.22	-0.16
Taxes	Tight	0.31	0.78	0.74	0.78
	Normal	0.16	0.33	0.29	0.33

Source: Authors' calculations.

Note: The extended model includes a constant and the number of lags suggested by the HQC, i.e.: two lags. IM denotes the impact multiplier and CM the cumulative multiplier.

THE WEALTH DISTRIBUTION IN DEVELOPED AND DEVELOPING ECONOMIES: COMPARING THE UNITED STATES TO CHILE USING SURVEY DATA FROM 2007

Sofía Bauducco*
Gonzalo Castex**
Andrew Davis***

I. INTRODUCTION

In this study we report and analyze the differences in the distributions of wealth, income, assets, and debt between a developing economy, Chile, and a developed economy, the United States. For Chile, we use the 2007 Household Financial Survey (*Encuesta Financiera de Hogares*, EFH), while for comparison purposes we use the 2007 Survey of Consumer Finances (SCF) of the United States. We then extend our empirical results to discuss the causes of financial inequality in each country.

Both data sources are comparable in that they are similarly-designed surveys intended to provide a detailed picture of households' financial status. The SCF is widely used for academic as well as policy work. It has been used to analyze life-cycle savings and consumption (Huggett, 1996), intergenerational transmission of earnings (Quadrini 2000), inequality (Heathcote et al., 2010) and other applications. The EFH, on the contrary, is a relatively new data source that has not yet been extensively employed. Our main objective is to characterize and compare the distribution of wealth, income, assets, and debt using data sources from two countries that differ in many aspects, particularly their level of economic development.

At an aggregate level, the U.S. is noticeably richer than Chile in terms of income and assets. The U.S. population does carry more debt, but remains much wealthier in terms of net assets. The inequality of how these are distributed across the respective populations, however, is not quite so clear cut. We find that the U.S. has more inequality than Chile in terms of assets (Chilean Gini: 0.70, U.S. Gini: 0.76) and net wealth (Chile: 0.74, U.S.: 0.82), but Chile has more inequality in terms of income (Chile: 0.57, U.S.: 0.53) and debt (Chile: 0.85, U.S.: 0.70). These distributions are plotted in figures 1, 2, 3, and 4.

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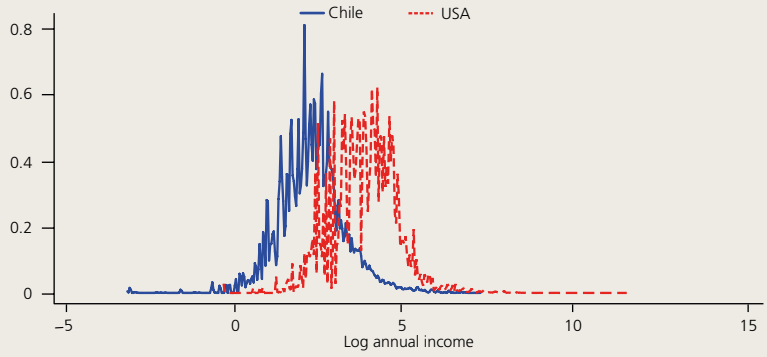
Figure 1

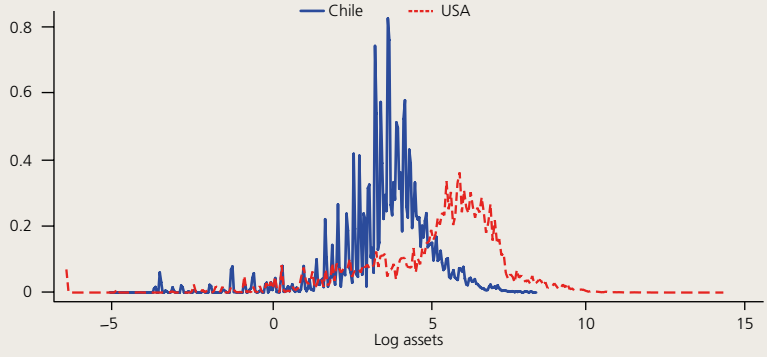
Income distribution



Source: Authors' calculations.

Figure 2

Asset distribution

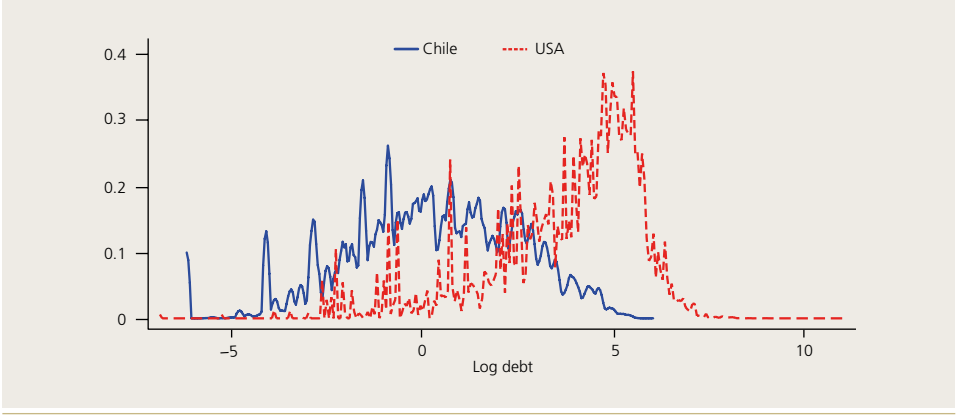


Source: Authors' calculations.

We apply our data findings to understanding the root causes of inequality in Chile and the U.S. We take several prominent theories on the source of inequality from the existing literature and see which are consistent with the data. Our results suggest that earnings risk is not a very plausible channel to explain inequality, given the observed differences between the two countries. Driving inequality through bequest motives also runs into some conflicts with the data. However, explaining inequality through access and returns to entrepreneurship is entirely consistent with our detailed data findings.

Figure 3

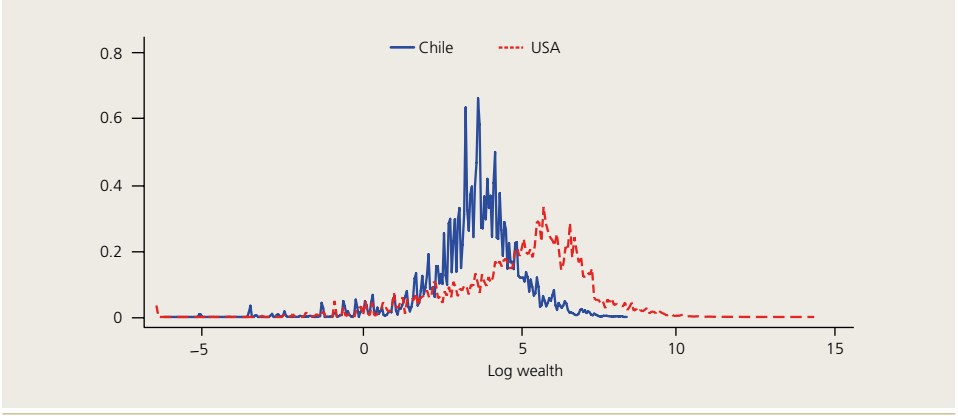
Debt distribution



Source: Authors' calculations.

Figure 4

Wealth distribution



Source: Authors' calculations.

As a way to examine the consistency of this hypothesis, we conduct an empirical exercise where we recompute inequality measures for Chile after imposing American payoffs to entrepreneurship and find that this channel is strong enough to fully explain the observed difference in wealth inequality, lending further support to our analysis of the data.

We conduct our analysis at the aggregate level but also examine the data in more detail along several dimensions. We dissect the income, asset, debt, and wealth distributions by income level and also by personal demographic characteristics of the head of household: age, gender, household type, employment type,

and educational attainment. Our results on each of these fronts are briefly summarized below.[1]

Age: Financially, age has less meaning in Chile. American income and wealth is more stratified across different age groups than in Chile. Chilean households of all working ages report roughly the same earnings —within 10% of USD 15,000, while American households steadily earn more as they age. Correspondingly, Americans accumulate much more wealth as they age relative to Chileans, except in retirement, where Americans spend down wealth and Chilean households do not. This is potentially a key issue in our analysis of inequality being generated through bequests.

Gender of head of household: Based on the self-identified 'head of household', we find that male-led households earn more, and hold more assets, debt, and wealth. The gender gap is larger in the U.S. than in Chile: relative to the population as a whole, male households are richer with higher incomes in the U.S. than in Chile. In both countries, there is marginally less inequality among women across the board, particularly in the incomes of American women, except that debt is very unequal among women in both Chile and the U.S.

Marital status: Married households hold more assets, more debt, more wealth, and have higher incomes in both Chile and the U.S. In terms of inequality, inequality within married households (as measured by the Gini coefficient) is generally similar in all four dimensions to the aggregate statistics —within a few percentage points— with the exception of debt, where U.S. married households display significantly less inequality than the U.S. population as a whole.

Employment status: Self-employment is common in Chile relative to in the U.S., but in Chile it is more likely to be present among secondary household members. The U.S. sees less self-employment, but has a larger fraction of self-employed household heads. Across the board —income, assets, debt, wealth— we see more inequality among self-employed households than traditionally employed households, and in particular the income Gini among American self-employed households is 9 points higher than the population, while for Chile self-employed households have the same Gini as the population as a whole. Aside from inequality, American self-employed households accumulate far more wealth as well: they have 30 times as much as their Chilean counterparts, compared to only 8.5 times as much for employed workers. This stark difference among entrepreneurs mirrors the observed differences in inequality between the U.S. and Chile and seems the most plausible channel to explain the observed inequality.

Educational attainment: Chilean households are consistently less educated than American households: approximately half as many heads of household

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1 Our measure of wealth for the Chilean economy does not include expected wealth due to future social transfers from social retirement schemes.

have a university degree. College education is more of a guarantee of a high-percentile income in Chile, but lack of education is more of a guarantee of low income in the U.S. Wealth inequality is particularly high in both countries among college dropouts, but education is not a strong predictor of inequality, as American college graduates and high school dropouts have almost identical degrees of wealth inequality.

We characterize the Chilean distributions of income, wealth, assets, and debt in aggregate form and across all these discussed subgroups in considerable detail in sections II and III, respectively.

There is not a well-established literature on inequality in Chile. The only other literature making use of our data source, the Household Financial Survey (*Encuesta Financiera de Hogares*, EFH) is, to the best of our knowledge, Uribe and Martínez (2016), which characterizes some determinants of wealth in Chile, for example age and bequests. Beyond this, Fairfield and Jorratt De Luis (2015) access Chilean tax return data, but are limited in that they only examine the very top of the income and wealth distributions, reporting no information on any segment of the population not in the top 10% of either distribution. Sanhueza and Mayer (2011) characterize the evolution of top incomes as well, but rely on survey data that is likely not nationally representative. To this end, our basic analysis of the Household Financial Survey is a significant improvement on the existing literature.

In terms of characterizing the American distributions of income and wealth, there is a vast literature on this topic. Two recent and influential papers dealing with it in considerable detail are Heathcote et al. (2010) and Saez and Zucman (2014). We do not aim to contribute to this literature, but rather are interested in the comparison between the United States and Chile, and seeing whether or not any differences might potentially cast light on the causes of inequality more broadly.

The second part of our paper attempts to draw inference on the nature and drivers of inequality based upon the differences between the U.S. and Chile. There is a large body of literature that has attempted to explain the observed inequality in the wealth distribution of the U.S. For an overview, Cagetti and de Nardi (2008) provide a comprehensive survey of the main empirical results regarding wealth inequality and the most relevant explanations that have been explored in the literature for this phenomenon.

One mechanism that has been evaluated as an explanation for inequality is the existence of uninsurable earnings shocks. Quadrini and Ríos-Rull (1997) argue that models with just income risk are unlikely to provide good matches for the observed wealth distribution, though Domeij and Heathcote (2004) later managed to construct an earnings process for individuals that generates a wealth distribution inside an Aiyagari-style model that closely resembles the one in the U.S., where labor income uncertainty is still consistent with empirical

estimates from microdata.[2] Cordoba (2008) shows that between the two financial frictions of uninsurable risks and a borrowing constraint often found in such models, the incomplete markets with respect to income are the key factor.

Entrepreneurship is another potential explanation for wealth inequality in the U.S. Quadrini (2000) introduces entrepreneurial choice in an Aiyagari model, where the opportunity to start a business may influence saving behavior and entrepreneurship generates different returns than employment. He finds that a calibrated version of his model can generate wealth concentration that is largely consistent with the observed data. Cagetti and de Nardi (2006) assume that the amount entrepreneurs can borrow is a function of their own wealth, which acts as collateral. This allows them to obtain a somewhat better fit of the upper tail of the wealth distribution.

Another strand of literature has analyzed the importance of introducing bequests, both involuntary and voluntary, to explain the high saving rates of the richest fractions of populations. Huggett (1996) formulates a benchmark OLG model in which people save to insure against earning risks, both for retirement and in case they outlive their life expectancy. In this setup, people that die prematurely leave accidental bequests. While Huggett (1996) succeeds in matching the Gini coefficient of the wealth distribution in the U.S., the model generates too little wealth in the upper tail of the wealth distribution. Voluntary bequests and human capital are then introduced by de Nardi (2004). She finds that voluntary bequests can help explain the upper tail of the wealth distribution.

The facts presented in this paper shed light over the plausibility of some of these proposed mechanisms for inequality. As mentioned, while income is more unequal in Chile than in the U.S., wealth is more unequal in the U.S. than in Chile. This may be due to higher earnings risk in Chile, or to higher inequality within, for example, the college premium. However, our results indicate that the college premium in the U.S. is higher than in Chile. Moreover, it is hard to imagine that markets to insure against idiosyncratic earnings risk are more incomplete in the U.S. than in Chile, given that Chile is a developing economy and financial markets in general are less developed than in the U.S.[3] Our results on the debt distributions in Chile and the U.S. seem to corroborate this idea: debt is much more unequally distributed in Chile than in the U.S., and in Chile those households who hold debt are the relatively wealthy. These findings pose serious doubts about the validity of earnings risks to explain inequality in the U.S., since the apparently higher earnings risk in Chile should indicate higher wealth inequality in Chile, which contradicts what we observe in the data.

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2 In particular, they match estimates from the Panel Study of Income Dynamics (PSID), a widely-used data source to estimate earnings processes.

3 Other alternative explanations for the high wealth inequality observed in the U.S., such as heterogeneity in preferences and progressive taxation, can be ruled out by similar reasoning.

Second, we also find evidence that the bequest motive is larger in Chile than in the U.S., as the wealth of individuals over 65 years old is larger on average than the wealth of any other age group, while in the U.S. the richest age group is the 55-64 age cohort. U.S. households, on average, spend down assets in retirement, while Chilean households do not. This fact also casts doubts on the plausibility of the bequest motive to explain the high wealth inequality present in the U.S. These results lead us to conclude that entrepreneurship is probably the most reasonable argument to explain wealth inequality in the U.S.[4]

This paper proceeds as follows. Section II reports the data sources used in the analysis and briefly examines the aggregate distributions of income, assets, debt, and wealth. Section III then considers each of these distributions by age, gender, marital status, employment type, and educational attainment. Section IV ties these results together to hypothesize about the causes of inequality in Chile and the U.S. Section V concludes the paper.

II. DATA AND AGGREGATE DISTRIBUTIONS

Our primary data source is the Chilean 2007 Household Financial Survey (EFH).[5] For comparison purposes with the United States, we also employ the familiar Survey of Consumer Finances.

The aforesaid survey was developed and carried out for the first time in 2007. The survey was again collected in 2008, 2009, 2011, and 2014, though the 2014 results are not available as of this writing. The 2007 EFH collects information on 4,021 households. It is representative at the national level and surveying was completed between November 2007 and January 2008 (we consider the values reported to be expressed in December 2007 prices). The survey collects basic information at the household level, including demographic characteristics, educational attainment, and employment status. More importantly, the EFH also collects extensive information on the household's financial situation, including income, assets, and liabilities.

The American SCF is a cross-sectional triennial survey developed for the first time in 1983 that collects information on assets, liabilities, income, and demographic characteristics of U.S. households. The 2007 survey collected information on 5001 households and was carried out between May 2007 and March 2008. We consider values to be expressed in 2007 prices for our analysis (more than 90% of all interviews were conducted before December 2007). We do not exploit more recent versions of the EFH and SCF due to concerns over the financial crisis in the U.S., and because other SCF years (2010, 2013) do not line up with EFH years.

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4 In this respect, the group of self-employed households, which is the group to which entrepreneurs belong in the U.S., in Chile is mostly constituted of informal workers. Therefore, comparability between this group of households in Chile and the U.S. can be very misleading.

5 Translated from Spanish. In the original, Encuesta Financiera de Hogares. We abbreviate it as EFH throughout the paper.

Both surveys are cross-sectional surveys that provide detailed information on the finances of households. In each country, these surveys provide unique information that is not collected by any other available study. The SCF for the U.S. is widely used for academic as well as policy work. The EFH, on the contrary, is a relatively new data source that has not yet been extensively employed.[6]

The main variables of interest for this analysis are income, assets, liabilities, and wealth. We provide detailed information on the precise data definitions of each variable of interest as they are introduced. Distributions for each variable are plotted as figures 1, 2, 3, 4. For all monetary figures, we use annual income denominated in 2007 U.S. dollars. Values in the EFH have been transformed into December 2007 dollars to achieve comparability with the U.S. data. In addition, we follow Guner et al. (2014) to transform pre-tax income reported in the SCF into after-tax income as it is reported in the EFH.

1. Income distribution

Table 1 shows a variety of statistics characterizing the annual income distributions for Chile (upper panel) and the U.S. (lower panel). In the case of Chile, we use the monthly after-tax income variable, which is directly reported on the EFH survey, and transform it to annual terms by multiplying the reported value by 12. The upper panel in table 1 shows that average annual after-tax income in Chile is USD 15,375.[7] The average income level in the U.S. was USD 71,000.[8] Thus, average income in the U.S. is around 4.5 times higher than in Chile.

The income distributions in Chile and United States differ in many respects. The income Gini coefficient for Chile is 0.57 whereas for the United States it is 0.53. The coefficient reflects a somewhat more unequal distribution in Chile. This finding is mirrored in other commonly used measures of inequality. The top 1% to 40% ratio for Chile is 69 (61 in the U.S.), the mean to median ratio for Chile is 1.78 while it is 1.62 for the U.S., and the location of the mean is the 76th percentile in Chile but the 72nd percentile in the U.S. All these statistics consistently point toward Chile having a somewhat more unequal income distribution than the United States.

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6 Some exceptions are Madeira (2011) and Alfaro et al. (2010), among others.

7 This figure is obtained using a CLP/US$ exchange rate of 485.92 reported as of December 31st, 2007.

8 To make reported income in the U.S. comparable to reported income in Chile, we transformed pre-tax U.S. income to after-tax income using the methodology described in Guner et al. (2014).

Table 1

Income distribution in Chile and the United States

	Income quintiles					
	1st	2nd	3rd	4th	5th	Total
Chile						
Minimum	0.000	3.872	7.115	10.668	17.186	0.000
Maximum	3.848	7.084	10.668	17.184	1,258.522	1,258.522
Median	2.420	5.246	8.640	13.311	29.043	8.640
Mean	2.172	5.370	8.684	13.528	47.050	15.375
Std	1.237	0.910	1.069	1.853	63.351	32.674
United States						
Minimum	0.677	20.002	34.860	54.748	87.657	0.677
Maximum	19.822	34.754	54.708	87.530	91,575.730	91,575.730
Median	12.283	27.159	44.028	68.504	122.472	44.028
Mean	12.416	27.192	44.273	69.671	201.542	71.199
Std	4.391	4.279	5.785	9.548	429.950	204.621

Source: Survey of Consumer Finance 2007 for the U.S. and *Encuesta Financiera de Hogares* for Chile. Values in thousands dollars of 2007.

Table 2

Asset distribution in Chile and the United States

	Income quintiles					
	1st	2nd	3rd	4th	5th	Total
Chile						
Minimum	0.0	0.0	0.0	0.0	0.0	0.0
Maximum	1,206	2,091	1,206	1,524	3,486	3,486
Median	18	16	22	30	68	24
Mean	33	29	34	43	145	57
Std	56	65	60	75	254	135
United States						
Minimum	0.0	0.0	0.0	0.7	0.1	0.0
Maximum	6,477	14,209	40,120	20,568	1,411,730	1,411,730
Median	14	80	184	337	791	213
Mean	89	171	277	507	2,184	654
Std	179	346	641	674	7,240	3,396

Source: Survey of Consumer Finance 2007 for the U.S. and *Encuesta Financiera de Hogares* for Chile. Values in thousands of dollar of 2007.

2. Asset distribution

The aggregate statistics for the asset distribution are displayed in table 2, calculated by income quintiles and on aggregate. The average asset level in the U.S. is around 11 times larger than in Chile. Assets are more equally distributed in Chile: the Gini coefficient for the U.S. is 0.76 while in Chile it is 0.70. Other inequality measures, such as the coefficient of variation, top 1% to bottom 40% ratio, location of the mean (percentile) and mean to median ratio, all consistently point towards the same pattern of relative inequality.

Unsurprisingly, income is strongly correlated with assets, and the extra inequality in the U.S. relative to Chile is driven entirely through the uppermost income percentiles. Moving from the 4th to the 5th income quintile in Chile increases the standard deviation of assets by a factor of approximately 3, but by a factor of more than 10 in the United States.

3. Debt distribution

Table 3 portrays the aggregate debt distribution for both countries and also by income quintile. The mean debt level of the U.S. is around 16 times higher than in Chile, and the median is 91 times higher in the U.S. While Chileans in the lowest two quintiles hold a lot of debt for their income relative to the U.S., and Chileans in the third and fourth hold little, the difference in the aggregate populations again comes from the top quintile, as top quintile earners dominate debt holdings.

Debt is remarkably unequally distributed in Chile, much more so than in the U.S. The Gini coefficient of the debt distribution in Chile is 0.85, compared to 0.70 in the U.S. All other measures of dispersion we compute point in the same direction. The mean is located in the 78th percentile in Chile, which is an indication of a distribution very skewed to the right. In the U.S. the distribution is less skewed, with the mean located in the 68th percentile. The significantly lower average debt holdings relative to income in Chile are consistent with the idea of less complete financial markets in Chile, such as reduced ability to borrow against future income.

Table 3

Debt distribution in Chile and the United States

	Income quintiles					
	1st	2nd	3rd	4th	5th	Total
Chile						
Minimum	0.000	0.000	0.000	0.000	0.000	0.000
Maximum	232.677	78.001	246.723	243.980	407.660	407.660
Median	0.002	0.151	0.383	0.726	2.319	0.303
Mean	1.429	1.586	3.508	5.324	17.069	5.782
Std	6.093	5.082	10.319	11.246	31.648	17.119
United States						
Minimum	0.000	0.000	0.000	0.000	0.000	0.000
Maximum	934.200	1,037.000	960.000	1,200.000	59,150.000	59,150.000
Median	0.035	6.300	35.900	101.000	173.400	27.500
Mean	13.301	29.603	67.529	126.164	234.977	94.985
Std	37.607	59.778	85.663	135.631	316.572	181.929

Source: *Encuesta Financiera de Hogares* and Survey of Consumer Finance. Values in thousands of dollars of 2007.

4. Wealth distribution

Table 4 shows the general statistics of both wealth distributions. With wealth being the sum of assets net of debt, the wealth distribution can almost be inferred from the prior discussion. Mean wealth in the U.S. is 11 times higher than in Chile, but the median is only six times higher in the U.S.

Wealth is very unequally distributed in both countries but, in contrast to the debt distribution, it is more unequally distributed in the U.S. than in Chile. The Gini coefficient of the wealth distribution in Chile is 0.74, while the Gini coefficient of the U.S. wealth distribution is 0.82. Since assets are much larger than debt, wealth largely reflects assets. All other measures of dispersion show a similar pattern, and the mean is located in the 77th percentile of the distribution in Chile and in the 82nd percentile in the U.S., indicating the additional right-skewness in the U.S. distribution.

The means of the extreme income quintiles are the ones that differ the most among the U.S. and Chile: the mean of the fifth income quintile is 15.3 times higher in the U.S. than in Chile. Notably, the median of the first income quintile actually indicates higher wealth in Chile, reflecting the much greater holding of debt in the U.S.

Given that asset and debt holdings are dominated by the high-income, so is wealth. But why the additional inequality in the U.S. over Chile? We first examine some breakdowns of inequality by a variety of subgroups, and then move to tackle this question in the subsequent section.

Table 4

Wealth distribution in Chile and the United States

	Income quintiles					
	1st	2nd	3rd	4th	5th	Total
Chile						
Minimum	-158.964	-37.059	-198.319	-214.906	-211.219	-214.906
Maximum	1,206.083	2,087.187	1,206.083	1,511.174	3,486.144	3,486.144
Median	16.135	13.086	19.120	23.597	51.430	20.169
Mean	31.369	27.373	30.302	37.598	127.519	50.786
Std	55.564	65.431	58.661	74.530	250.304	131.450
United States						
Minimum	-162.720	-473.700	-238.900	-84.380	-251.650	-473.700
Maximum	6,006.500	14,209.370	40,119.500	20,368.000	1,411,730.000	1,411,730.000
Median	8.100	39.550	87.950	200.900	594.930	121.000
Mean	76.004	141.222	209.805	380.884	1,948.790	558.791
Std	166.765	341.236	628.564	662.267	7,171.825	3,348.326

Source: *Encuesta Financiera de Hogares* and Survey of Consumer Finance. Values in thousands of dollars of 2007.

III. SUBGROUP BREAKDOWNS

We now analyze the distributions of income, assets, debt, and wealth in the context of several demographic characteristics: age, marital status, gender of household head, employment status, and educational attainment. These results provide further insight into the full nature of Chilean inequality, but also will connect with our discussion on the causes and nature of inequality in the next section.

1. Age

We first focus on looking at differences in the populations by age. In general, Chile sees more within-age-group inequality relative to the population as a whole compared to the U.S. That is, age is less informative of financial status —there is more noise in each age group— in Chile than in the U.S.

Table 5 reports the income distribution for Chile and the U.S. by age group of the head of household. We see immediately that in Chile most households in the lowest income quintile are 65 years or older (37%), while only 10% are younger than 35, i.e. the ranks of the low income are dominated by older households. In the U.S. it is still the case that a large fraction of individuals aged 65 or older belong to the lowest income quintile (36%), but 25% of households that are younger than 35 belong to this quintile too. Low-income households in Chile are relatively older.

In the case of the highest income quintile, in Chile 29% of such households heads are between 45 and 54 years old. Only 14% belong to the youngest group (less than 35 years old) and 13% belong to the oldest group (more than 65 years old). Middle-aged households dominate the highest income group in Chile. The U.S. is similar: 31% of households in the highest income quintile are between 45 and 54 years old, 12% of households are below 35 years old, and 12% are over 65. These highest incomes are consistent with the normal life-cycle pattern of earnings.

The oldest age group presents very similar patterns in both countries in terms of composition. A large fraction of this group belongs to the first income quintile: 33% in both countries, and 12% belong to the last income quintile, again in both countries. Conversely, younger Chilean households are relatively high earners, with almost twice as many (20% to 11%) in the top quintile.

When analyzing the asset distribution by age, as displayed in table 6, we see that the asset distribution for households between 35 and 44 years old is more unequal in Chile than in the U.S., unlike all other age groups. The average asset level in the U.S. for individuals up to 44 years old is eight times higher than for Chilean households, and this ratio increases to 14 for households between 45 and 64 years old. Within each age bracket, we also —unsurprisingly— observe a higher asset level as income increases. Assets held by the youngest Chilean households in the fifth income quintile are seven times larger than the youngest households in the first income quintile.

Table 5

Income distribution by age bracket

	Chile						United States					
	Income quintiles						Income quintiles					
Age of household head	1st	2nd	3rd	4th	5th	Total	1st	2nd	3rd	4th	5th	Total
34 and under												
% of households per Income group	10	14	15	15	14	13	25	27	25	19	12	22
% of households per category	14	21	22	23	20	100	23	25	23	18	11	100
Median	2.904	5.325	8.546	13.311	25.412	9.681	11.762	28.046	43.757	68.261	108.453	35.896
Mean	2.627	5.504	8.715	13.677	38.998	14.463	11.849	27.621	43.965	69.291	136.283	47.165
Std	1.144	0.904	1.093	1.772	58.470	29.284	4.622	4.325	5.619	9.532	90.108	47.616
Gini						0.49						0.42
Coef. Variation						2.02						1.01
Top 1% to bottom 40% ratio						46						20
Location of mean (percentile)						71						64
Mean to median ratio						1.49						1.31
35-44												
% of households per Income group	13	23	23	21	22	21	14	15	21	25	23	20
% of households per category	12	23	23	21	21	100	14	16	21	25	24	100
Median	2.904	5.365	8.728	13.311	31.100	9.354	13.170	28.046	44.195	70.335	116.564	53.116
Mean	2.761	5.417	8.691	13.368	47.629	16.544	12.928	27.983	44.390	70.915	168.724	72.879
Std	1.007	0.911	1.075	1.851	61.900	33.148	4.316	4.072	5.861	9.471	273.220	143.164
Gini						0.54						0.45
Coef. Variation						2.00						1.96
Top 1% to bottom 40% ratio						55						36
Location of mean (percentile)						77						66
Mean to median ratio						1.77						1.37
45-54												
% of households per Income group	18	24	30	27	29	26	13	14	20	26	31	21
% of households per category	13	19	24	21	23	100	13	13	19	24	30	100
Median	12.202	12.425	12.706	13.109	14.429	12.807	12.691	27.631	46.339	68.261	126.886	58.279
Mean	12.190	12.441	12.718	13.128	16.055	13.448	12.338	27.543	46.066	69.543	206.025	92.967
Std	12.104	12.076	12.093	12.152	17.528	15.019	4.906	4.314	5.578	9.815	401.199	232.388
Gini						0.56						0.52
Coef. Variation						2.09						2.50
Top 1% to bottom 40% ratio						63						54
Location of mean (percentile)						77						73
Mean to median ratio						1.79						1.60
55-64												
% of households per Income group	23	15	16	16	22	18	12	16	16	17	23	17
% of households per category	24	17	18	17	24	100	14	20	19	20	28	100
Median	12.202	12.424	12.715	13.150	14.763	12.715	11.762	26.271	42.962	67.852	130.476	50.385
Mean	12.167	12.435	12.721	13.134	16.374	13.478	12.060	26.410	43.630	69.715	229.243	91.228
Std	12.109	12.070	12.085	12.166	17.933	15.328	3.878	4.280	5.537	9.399	515.479	281.409
Gini						0.63						0.57
Coef. Variation						2.25						3.08
Top 1% to bottom 40% ratio						97						74
Location of mean (percentile)						77						74
Mean to median ratio						2.07						1.81
Over 65												
% of households per Income group	37	25	16	20	13	22	36	28	17	13	12	21
% of households per category	33	23	14	18	12	100	33	27	16	12	12	100
Median	2.170	5.421	8.664	13.251	26.276	6.293	12.451	26.271	42.894	66.982	132.957	28.046
Mean	1.904	5.418	8.791	13.500	41.825	10.568	12.758	26.633	43.066	68.067	263.425	57.095
Std	1.168	0.929	0.980	1.832	46.695	20.276	4.159	4.188	5.925	9.110	679.542	243.282
Gini						0.56						0.59
Coef. Variation						1.92						4.26
Top 1% to bottom 40% ratio						69						95
Location of mean (percentile)						69						77
Mean to median ratio						1.68						2.04

Source: Survey of Consumer Finance 2007 for the U.S. and *Encuesta Financiera de Hogares* for Chile. Values in thousands of dollars of 2007.

Table 6

Asset distribution by age

	Chile						United States					
	Income quintiles						Income quintiles					
Age of household head	1st	2nd	3rd	4th	5th	Total	1st	2nd	3rd	4th	5th	Total
34 and under												
% of households per Income group	10	14	15	15	14	13	25	27	25	19	12	22
% of households per category	14	21	22	23	20	100	23	25	23	18	11	100
Median	0.202	0.403	3.227	8.067	31.261	6.051	5.230	15.000	81.860	233.900	412.600	35.100
Mean	8.924	7.404	17.933	19.932	59.574	23.354	25.042	47.314	132.474	318.502	769.089	190.180
Std	12.764	12.300	29.361	24.967	149.077	72.352	71.198	86.132	169.671	613.278	1,536.347	624.584
Gini						0.73						0.75
Coef. Variation						3.10						3.28
Top 1% to bottom 40% ratio						5518						641
Location of mean (percentile)						71						70
Mean to median ratio						3.86						5.42
35-44												
% of households per Income group	13	23	23	21	22	21	14	15	21	25	23	20
% of households per category	12	23	23	21	21	100	14	16	21	25	24	100
Median	10.084	16.135	20.169	24.202	65.548	20.189	4.800	31.640	163.600	295.070	625.600	207.720
Mean	15.760	21.740	40.191	32.288	140.942	52.990	32.516	74.324	196.214	385.993	1,264.913	453.994
Std	20.108	33.721	77.475	48.281	293.344	151.031	93.003	103.293	263.104	366.302	4,036.982	2,029.288
Gini						0.73						0.70
Coef. Variation						2.85						4.47
Top 1% to bottom 40% ratio						391						320
Location of mean (percentile)						77						75
Mean to median ratio						2.62						2.19
45-54												
% of households per Income group	18	24	30	27	29	26	13	14	20	26	31	21
% of households per category	13	19	24	21	23	100	13	13	19	24	30	100
Median	12.101	12.101	24.202	28.236	73.615	24.202	9.000	115.100	188.300	365.350	754.500	295.800
Mean	16.979	22.021	32.706	39.314	140.254	54.645	87.232	152.413	264.556	479.918	1,956.152	792.298
Std	19.916	36.056	69.896	49.860	245.681	134.293	275.686	173.649	365.084	504.093	5,850.780	3,328.086
Gini						0.70						0.72
Coef. Variation						2.46						4.20
Top 1% to bottom 40% ratio						268						291
Location of mean (percentile)						76						80
Mean to median ratio						2.26						2.68
55-64												
% of households per Income group	23	15	16	16	22	18	12	16	16	17	23	17
% of households per category	24	17	18	17	24	100	14	20	19	20	28	100
Median	31.261	20.169	26.219	33.682	81.481	34.287	40.000	123.080	275.650	401.000	1,057.400	346.630
Mean	50.610	42.723	33.081	53.750	162.220	73.219	122.453	191.107	414.881	603.884	2,862.597	1,042.952
Std	72.901	113.211	37.515	65.207	227.029	138.585	207.539	280.494	850.158	867.187	8,232.607	4,502.238
Gini						0.66						0.75
Coef. Variation						1.89						4.32
Top 1% to bottom 40% ratio						119						314
Location of mean (percentile)						77						83
Mean to median ratio						2.14						3.01
Over 65												
% of households per Income group	37	25	16	20	13	22	36	28	17	13	12	21
% of households per category	33	23	14	18	12	100	33	27	16	12	12	100
Median	30.253	26.219	31.261	37.110	106.894	31.261	89.500	230.450	331.700	706.400	1,596.100	251.000
Mean	41.356	45.782	42.008	68.126	218.592	68.509	146.683	339.080	477.466	941.312	4,592.829	867.585
Std	65.113	79.181	47.047	130.247	299.987	141.873	179.285	553.471	1,159.034	953.409	13,282.550	4,783.226
Gini						0.64						0.76
Coef. Variation						2.07						5.51
Top 1% to bottom 40% ratio						103						341
Location of mean (percentile)						77						83
Mean to median ratio						2.19						3.46

Source: Survey of Consumer Finance 2007 for the U.S. and *Encuesta Financiera de Hogares* for Chile. Values in thousands of dollars of 2007.

Table 7

Debt distribution by age

	Chile						United States					
	Income quintiles						Income quintiles					
Age of household head	1st	2nd	3rd	4th	5th	Total	1st	2nd	3rd	4th	5th	Total
34 and under												
% of households per Income group	10	14	15	15	14	13	25	27	25	19	12	22
% of households per category	14	21	22	23	20	100	23	25	23	18	11	100
Median	0.111	0.403	0.524	2.138	4.034	0.605	0.500	9.400	36.300	139.990	230.000	20.200
Mean	1.231	3.442	3.486	6.577	18.185	6.848	12.968	28.837	77.726	155.058	252.473	83.759
Std	3.955	11.239	7.920	11.235	30.823	17.285	31.872	54.752	95.690	163.265	223.017	138.921
Gini						0.82						0.71
Coef. Variation						2.52						1.66
Top 1% to bottom 40% ratio						3533						417
Location of mean (percentile)						78						69
Mean to median ratio						11.32						4.15
35-44												
% of households per Income group	13	23	23	21	22	21	14	15	21	25	23	20
% of households per category	12	23	23	21	21	100	14	16	21	25	24	100
Median	0.061	0.262	0.605	3.630	5.723	0.740	0.700	9.000	65.300	130.100	220.100	75.800
Mean	3.865	1.354	5.266	8.371	23.953	8.843	20.142	32.402	83.869	147.769	261.221	124.687
Std	13.449	2.801	15.400	12.463	38.497	22.262	66.804	52.697	90.092	124.321	286.972	184.153
Gini						0.82						0.61
Coef. Variation						2.52						1.48
Top 1% to bottom 40% ratio						3018						153
Location of mean (percentile)						78						62
Mean to median ratio						11.95						1.64
45-54												
% of households per Income group	18	24	30	27	29	26	13	14	20	26	31	21
% of households per category	13	19	24	21	23	100	13	13	19	24	30	100
Median	0.121	0.202	0.750	0.910	4.192	0.504	1.700	19.500	45.000	105.100	169.000	73.860
Mean	1.156	1.982	4.440	5.438	18.534	6.981	19.396	50.715	67.157	131.617	238.898	126.710
Std	3.664	4.253	10.706	12.893	32.166	18.615	39.101	66.314	72.761	139.652	300.753	201.684
Gini						0.83						0.62
Coef. Variation						2.67						1.59
Top 1% to bottom 40% ratio						3295						126
Location of mean (percentile)						79						66
Mean to median ratio						13.85						1.72
55-64												
% of households per Income group	23	15	16	16	22	18	12	16	16	17	23	17
% of households per category	24	17	18	17	24	100	14	20	19	20	28	100
Median	0.061	0.030	0.121	0.645	2.168	0.202	1.500	11.000	28.910	68.000	162.500	31.500
Mean	1.941	1.255	1.874	5.386	14.910	5.492	14.025	34.503	57.249	105.463	232.051	104.594
Std	5.215	3.054	4.531	11.602	28.027	15.849	25.981	84.629	79.871	116.276	355.944	217.504
Gini						0.86						0.71
Coef. Variation						2.89						2.08
Top 1% to bottom 40% ratio						70142						455
Location of mean (percentile)						81						70
Mean to median ratio						27.23						3.32
Over 65												
% of households per Income group	37	25	16	20	13	22	36	28	17	13	12	21
% of households per category	33	23	14	18	12	100	33	27	16	12	12	100
Median	0.000	0.020	0.016	0.020	0.070	0.000	0.000	0.000	1.800	4.190	30.000	0.000
Mean	0.464	0.605	0.773	0.948	4.700	1.134	8.328	15.637	42.444	58.839	164.129	40.125
Std	2.768	1.273	2.789	2.309	16.936	6.400	25.248	40.789	76.508	94.203	389.653	150.723
Gini						0.90						0.86
Coef. Variation						5.64						3.76
Top 1% to bottom 40% ratio						-						-
Location of mean (percentile)						84						80
Mean to median ratio						-						-

Source: Survey of Consumer Finance 2007 for the U.S. and *Encuesta Financiera de Hogares* for Chile. Values in thousands of dollars of 2007.

Comparing the debt distributions by age (table 7), we observe that in the U.S., debt is more equally distributed within each age group than as a whole, except in the last age group (over 65 years old). In the case of Chile, debt is less equally distributed within each age group. On average, households less than 35 years old have 12 times more debt in the U.S. than in Chile. This number increases for each age group, and households over 65 years old in the U.S. have 35 times, on average, more debt than in Chile.

The households that hold on average the largest levels of debt, both in the U.S. and in Chile, are households between the ages of 35 and 44. Peculiarly, households in this age group in Chile, in the first quintile of income, are more indebted on average than households in the second quintile. This is also the case for households older than 55 years old, while senior households (65+) are less indebted in both Chile and the U.S.

Considering wealth by age (table 8), wealth is very unequally distributed in the first age group, both in the U.S. and in Chile: the Gini coefficients are 0.9 in both cases. For the rest of the age groups, in the U.S. the distributions are more equal than the whole population, while in Chile they are as unequally distributed as the whole population. It is worth noting that for households whose head is 65 years old or more, the Gini coefficient in Chile is 0.64, considerably lower than the Gini of the overall population. On the contrary, in the U.S. the Gini is 0.78, which is in line with the U.S. population's Gini coefficient.

On average, households 34 years old and less have 6.4 times more wealth in the U.S. than in Chile. This figure increases as the age of the household increases: households that are 65 years old and more hold, on average, 12.3 times more wealth in the U.S. than in Chile.

Finally, while in Chile, households in the 55-64 age group and the 65+ age group hold almost exactly the same average wealth, in the U.S. the 55-64 households hold about 12% more wealth than senior households. This may be an indication that the bequest motive is stronger in Chile than in the U.S., to which we will return later.

2. Marital status

Our second dimension of interest is marital status. Unsurprisingly, married households are much better off financially, though more so in the U.S. than in Chile. Marital status does not make much difference in terms of inequality measures for the U.S., though in Chile married households display somewhat less inequality.

The income distribution of each country by marital status is presented in table 9. We observe a higher average income for married households for both the Chilean and the U.S. economy. Married Chilean households report an average annual income of USD 18,079, much lower than married households in the U.S., whose average annual income is USD 95,101. The income drop for singles is stronger in the U.S., with single households earning 61% less, compared to 41% in Chile, relative to married household heads.

Table 8

Wealth distribution by age

	Chile						United States					
	Income quintiles						Income quintiles					
Age of household head	1st	2nd	3rd	4th	5th	Total	1st	2nd	3rd	4th	5th	Total
34 and under												
% of households per Income group	10	14	15	15	14	13	25	27	25	19	12	22
% of households per category	14	21	22	23	20	100	23	25	23	18	11	100
Median	0.202	0.000	2.703	2.420	13.992	2.158	2.000	6.700	16.260	63.970	214.400	11.750
Mean	7.693	3.961	14.447	13.355	41.389	16.505	12.074	18.478	54.747	163.445	516.616	106.421
Std	12.860	11.759	28.760	22.097	144.177	68.694	61.107	58.265	116.505	587.072	1,505.484	583.848
Gini						0.90						0.90
Coef. Variation						4.16						5.40
Top 1% to bottom 40% ratio						-115						-591
Location of mean (percentile)						70						80
Mean to median ratio						7.65						9.09
35-44												
% of households per Income group	13	23	23	21	22	21	14	15	21	25	23	20
% of households per category	12	23	23	21	21	100	14	16	21	25	24	100
Median	10.084	13.977	11.889	16.135	42.511	15.721	2.501	14.750	54.300	143.060	411.000	88.650
Mean	11.895	20.387	34.925	23.917	116.989	44.147	12.374	41.921	112.345	238.223	1,003.692	329.307
Std	19.664	33.720	71.271	45.120	283.499	143.658	35.658	73.236	224.823	319.334	3,980.983	1,981.481
Gini						0.78						0.78
Coef. Variation						3.25						6.02
Top 1% to bottom 40% ratio						12751						1225
Location of mean (percentile)						79						79
Mean to median ratio						2.81						3.72
45-54												
% of households per Income group	18	24	30	27	29	26	13	14	20	26	31	21
% of households per category	13	19	24	21	23	100	13	13	19	24	30	100
Median	10.084	9.076	21.521	20.442	53.999	19.985	5.000	57.600	106.660	234.240	578.730	185.500
Mean	15.822	20.039	28.266	33.876	121.721	47.664	67.836	101.699	197.399	348.301	1,717.254	665.587
Std	19.704	35.968	70.688	49.626	242.636	130.941	249.705	147.056	349.085	436.974	5,756.855	3,257.240
Gini						0.76						0.78
Coef. Variation						2.75						4.89
Top 1% to bottom 40% ratio						4226						593
Location of mean (percentile)						76						82
Mean to median ratio						2.39						3.59
55-64												
% of households per Income group	23	15	16	16	22	18	12	16	16	17	23	17
% of households per category	24	17	18	17	24	100	14	20	19	20	28	100
Median	24.200	18.282	25.856	30.253	66.758	29.648	35.500	88.300	210.200	313.800	863.430	254.150
Mean	48.669	41.467	31.207	48.363	147.310	67.727	108.428	156.604	357.632	498.421	2,630.546	938.358
Std	73.074	113.307	36.454	63.111	222.562	134.815	195.838	258.464	813.905	865.630	8,126.509	4,426.996
Gini						0.69						0.78
Coef. Variation						1.99						4.72
Top 1% to bottom 40% ratio						161						519
Location of mean (percentile)						76						83
Mean to median ratio						2.28						3.69
Over 65												
% of households per Income group	37	25	16	20	13	22	36	28	17	13	12	21
% of households per category	33	23	14	18	12	100	33	27	16	12	12	100
Median	30.061	26.189	31.261	34.387	104.534	31.261	81.690	219.550	262.900	660.300	1,427.400	220.800
Mean	40.892	45.178	41.236	67.177	213.892	67.375	138.355	323.443	435.021	882.473	4,428.700	827.460
Std	63.242	79.269	46.917	130.345	299.958	141.093	174.045	554.026	1,159.894	959.921	13,219.550	4,749.559
Gini						0.65						0.78
Coef. Variation						2.09						5.74
Top 1% to bottom 40% ratio						108						434
Location of mean (percentile)						77						83
Mean to median ratio						2.16						3.75

Source: Survey of Consumer Finance 2007 for the U.S. and *Encuesta Financiera de Hogares* for Chile. Values in thousands of dollars of 2007.

Table 9

Income distribution by marital status

	Chile						United States					
	Income quintiles						Income quintiles					
Marital status of household head	1st	2nd	3rd	4th	5th	Total	1st	2nd	3rd	4th	5th	Total
Married												
% of households per Income group	43	63	69	66	74	63	23	44	60	79	87	59
% of households per category	13	21	22	21	23	100	8	15	20	26	30	100
Median	2.666	5.246	8.640	13.311	30.808	9.681	14.396	27.764	44.924	69.590	124.146	61.744
Mean	2.328	5.399	8.684	13.591	50.931	18.079	14.195	27.735	44.778	70.341	206.557	95.101
Std	1.246	0.904	1.073	1.849	70.323	38.737	3.950	4.342	5.876	9.504	431.851	248.187
Gini						0.57						0.50
Coef. Variation						2.14						2.61
Top 1% to bottom 40% ratio						68						50
Location of mean (percentile)						78						74
Mean to median ratio						1.87						1.54
Single												
% of households per Income group	57	37	31	34	26	37	77	56	40	21	13	41
% of households per category	30	21	17	18	14	100	37	28	19	10	6	100
Median	2.251	5.240	8.640	13.069	25.654	6.922	11.762	27.027	43.329	65.874	114.539	26.271
Mean	2.052	5.322	8.683	13.407	36.018	10.740	11.875	26.761	43.519	67.184	165.606	37.003
Std	1.217	0.917	1.061	1.855	34.637	17.072	4.377	4.179	5.563	9.303	414.510	107.996
Gini						0.53						0.46
Coef. Variation						1.59						2.92
Top 1% to bottom 40% ratio						50						32
Location of mean (percentile)						68						68
Mean to median ratio						1.55						1.41

Source: Survey of Consumer Finance 2007 for the U.S. and *Encuesta Financiera de Hogares* for Chile.

In both countries, the majority of households are married: in Chile 63% of households are married, as are 59% in the U.S. Given that singles earn less, it is unsurprising that marriage predicts income quintile: 57% of Chilean households in the first income quintile are single, and considerably higher in the U.S. at 77%. Conversely, households in the highest income quintile are mainly married: 74% in Chile and 87% in the U.S. All the dispersion measures are higher for the Chilean economy and larger for single households.

Table 10 breaks down asset holdings by marital status. Married households in Chile hold about USD 63,271 in assets, while the figure is 14 times larger in the U.S., at USD 893,744. Asset holdings for singles in Chile are lower than for the married group, just as in the U.S., consistent with the general married-single dynamics. Single households in Chile hold on average about USD 45,000, and about seven times more in the U.S. at roughly USD 311,000. As income increases the asset level also increases for both married and single households. Chilean households in the fifth income quintile hold about four times more assets than households in the first income quintile, compared to a ratio of 22 in the U.S.

Table 10

Asset distribution by marital status

	Chile						United States					
	Income quintiles						Income quintiles					
Marital status of household head	1st	2nd	3rd	4th	5th	Total	1st	2nd	3rd	4th	5th	Total
Married												
% of households per Income group	43	63	69	66	74	63	23	44	60	79	87	59
% of households per category	13	21	22	21	23	100	8	15	20	26	30	100
Median	20.169	14.118	20.572	29.446	72.204	26.219	27.000	84.400	187.200	318.200	778.800	304.000
Mean	41.206	27.199	30.969	41.382	157.192	63.271	103.467	171.311	285.756	486.504	2,227.407	893.744
Std	62.280	63.174	56.820	71.009	277.581	154.435	179.967	430.098	772.713	641.524	7,491.945	4,242.612
Gini						0.70						0.74
Coef. Variation						2.44						4.75
Top 1% to bottom 40% ratio						246						291
Location of mean (percentile)						78						82
Mean to median ratio						2.41						2.94
Single												
% of households per Income group	57	37	31	34	26	37	77	56	40	21	13	41
% of households per category	30	21	17	18	14	100	37	28	19	10	6	100
Median	16.135	18.152	24.202	30.253	54.455	24.202	11.500	77.850	174.350	404.860	900.600	97.000
Mean	26.366	31.924	40.157	45.906	108.761	45.080	84.997	170.439	264.753	583.410	1,893.764	311.273
Std	50.204	68.475	67.056	81.822	166.275	91.316	177.957	260.650	364.765	780.465	5,262.423	1,451.790
Gini						0.67						0.75
Coef. Variation						2.03						4.66
Top 1% to bottom 40% ratio						207						792
Location of mean (percentile)						74						76
Mean to median ratio						1.86						3.21

Source: Survey of Consumer Finance 2007 for the U.S. and *Encuesta Financiera de Hogares* for Chile.

Asset inequality in Chile is higher for married households, while in the U.S. it is marginally higher for single households. Numerically, the Gini coefficient for married households in Chile is 0.7 (0.74 in the U.S.), while it is 0.67 for single households (0.75 in the U.S.).

Moving to debt, table 11 shows that, in the U.S., debt is more equally distributed for married households than for single households. In Chile, debt is very unequally distributed in both groups. There are large differences in mean debt levels held by different income quintiles of married and single households, both in Chile and in the U.S. Married households hold more debt on average than single households: in Chile, married households hold about 2 times more debt than single households, while in the U.S. they hold 3 times more debt. Married households in the first quintile of income in Chile are very indebted: they hold more debt, on average, than married households in the second quintile.

Finally, table 12 shows the wealth distribution by marital status of the head of household. There are some remarkable similarities between the U.S. and Chilean

wealth distributions by marital status. In the U.S., the Gini coefficient for both married and single households is 0.80. Nevertheless, the distribution seems to be more skewed to the right for married households, as the mean is located in the 84th percentile for marrieds, while it is located in the 78th percentile in the case of single households. In Chile, we see more inequality among married households, who have a Gini coefficient of 0.75 versus 0.7 for singles. However, the right-skew for married households remains, with the location of the mean being in the 78th percentile, while it is in the 74th percentile for singles.

Another similarity between the U.S. in Chile is that married households hold, on average, more wealth than single households, just as per assets: in the U.S. they hold 2.9 times more wealth than single households, and in Chile this number is 1.4. The differences in wealth levels between the countries are more noticeable in the case of married households, as married U.S. households hold 13.6 times more wealth, on average, than married Chilean households. For single households this difference falls to 6.4 times more wealth in the U.S. than in Chile.

Table 11

Debt distribution by marital status

	Chile						United States					
	Income quintiles						Income quintiles					
Marital status of household head	1st	2nd	3rd	4th	5th	Total	1st	2nd	3rd	4th	5th	Total
Married												
% of households per Income group	43	63	69	66	74	63	23	44	60	79	87	59
% of households per category	13	21	22	21	23	100	8	15	20	26	30	100
Median	0.054	0.236	0.524	1.065	3.771	0.504	0.500	6.000	39.750	105.100	189.000	70.000
Mean	2.163	1.687	3.436	5.740	19.160	7.070	19.702	35.791	70.249	130.004	245.402	129.773
Std	8.385	5.829	8.297	11.621	33.641	19.263	46.041	74.359	88.180	139.637	322.174	214.819
Gini						0.84						0.64
Coef. Variation						2.72						1.66
Top 1% to bottom 40% ratio						6,067						204
Location of mean (percentile)						79						65
Mean to median ratio						14.02						1.85
Single												
% of households per Income group	57	37	31	34	26	37	77	56	40	21	13	41
% of households per category	30	21	17	18	14	100	37	28	19	10	6	100
Median	0.000	0.061	0.121	0.305	0.905	0.101	0.005	6.800	33.150	77.480	90.000	6.300
Mean	0.868	1.416	3.669	4.516	11.127	3.575	11.354	24.690	63.465	111.892	165.705	45.332
Std	3.319	3.473	13.802	10.434	24.166	12.315	34.413	44.363	81.624	118.571	266.435	101.406
Gini						0.88						0.78
Coef. Variation						3.45						2.24
Top 1% to bottom 40% ratio						-						12,074
Location of mean (percentile)						84						74
Mean to median ratio						35.45						7.20

Source: Survey of Consumer Finance 2007 for the U.S. and *Encuesta Financiera de Hogares* for Chile. Values in thousands of dollars of 2007.

Table 12

Wealth distribution by marital status

	Chile						United States					
	Income quintiles						Income quintiles					
Marital status of household head	1st	2nd	3rd	4th	5th	Total	1st	2nd	3rd	4th	5th	Total
Married												
% of households per Income group	43	63	69	66	74	63	23	44	60	79	87	59
% of households per category	13	21	22	21	23	100	8	15	20	26	30	100
Median	19.316	12.424	18.172	22.286	55.060	21.601	16.300	37.600	88.280	183.470	576.600	180.700
Mean	39.043	25.512	27.533	35.643	138.032	56.201	83.765	135.520	215.507	356.500	1,982.006	763.971
Std	62.737	63.385	57.155	70.943	273.335	150.550	162.210	422.591	758.248	624.509	7,421.790	4,187.726
Gini						0.71						0.83
Coef. Variation						2.68						5.48
Top 1% to bottom 40% ratio						839						766
Location of mean (percentile)						78						84
Mean to median ratio						2.60						4.23
Single												
% of households per Income group	57	37	31	34	26	37	77	56	40	21	13	41
% of households per category	30	21	17	18	14	100	37	28	19	10	6	100
Median	16.135	13.553	21.782	26.219	39.355	20.068	7.060	39.620	86.600	258.670	696.400	52.280
Mean	25.498	30.508	36.488	41.391	97.634	41.506	73.643	145.749	201.289	471.518	1,728.060	265.941
Std	48.568	68.627	61.442	80.901	164.821	88.947	168.089	259.085	355.742	780.701	5,212.067	1,427.414
Gini						0.71						0.80
Coef. Variation						2.14						5.37
Top 1% to bottom 40% ratio						453						12,467
Location of mean (percentile)						74						78
Mean to median ratio						2.07						5.09

Source: Survey of Consumer Finance 2007 for the U.S. and *Encuesta Financiera de Hogares* for Chile. Values in thousands of dollars of 2007.

3. Gender

We now consider households by the self-reported gender of the head of household. Table 13 gives details on income by gender and shows that in Chile, 65% of household heads are male, compared to 72% in the U.S. Lower-income household heads in both countries are more likely to be women. Households in the first income quintile in Chile are evenly distributed between male and female heads, while in the U.S. we observe even fewer male households in the lowest income quintile (43%). As income rises, the fraction of male households increases, reaching 72% in Chile and 93% in the U.S. in the highest income quintile.

In both countries, average income for female households is lower compared to male. The gender gap is larger in the U.S., where male households earn 165% more. In Chile the average gender income gap is much smaller at 49%. In both countries this income differential is being driven by households in the fifth quintile, with minimal differences in the first four quintiles between genders. Turning to assets, Chilean female households hold on average about USD 50,000

in assets while male households own about 20% more. In the U.S., males also save more than female households, but the ratio is more dramatic. Females have assets of USD 270,000 on average, while males have close to three times more with approximately USD 800,000. The gender pattern of inequality is quite similar between Chile and the U.S. American male households exhibit marginally more asset inequality (Gini: 0.75) than female ones (Gini: 0.73), and similarly for Chile, 0.70 for male households versus 0.69 for female.

Looking at the gradient in assets with respect to income, average assets for female Chilean households increase from USD 26,000 in the first income quintile to USD 140,000 (increasing by a factor of 5.4) for the highest income group (table 14). The increase for male households is less dramatic in percentages, moving from USD 40,000 in the first quintile to USD 146,000 for the fifth quintile (increasing by a factor of 3.65). However, in the U.S., this dynamic is reversed and more pronounced: male households see larger increases in assets with income, increasing by a factor of 13.3 from lowest to highest income quintile (USD 60k to USD 800k), while female households, moving from average assets of USD 93,833 to USD 269,727, slightly less than tripling.

Table 13

Income distribution by gender

	Chile						United States					
	Income quintiles						Income quintiles					
Gender	1st	2nd	3rd	4th	5th	Total	1st	2nd	3rd	4th	5th	Total
Female												
% of households per Income group	50	35	32	30	28	35	57	38	24	13	7	28
% of households per category	28	21	18	17	16	100	40	28	17	9	5	100
Median	2.360	5.325	8.778	13.311	26.808	7.261	11.762	26.271	43.239	66.715	107.218	23.597
Mean	2.116	5.378	8.784	13.458	38.102	11.645	12.192	26.412	43.410	67.591	137.508	32.451
Std	1.201	0.945	1.134	1.872	32.390	17.701	4.199	4.193	5.505	9.361	169.198	46.184
Gini						0.54						0.42
Coef. Variation						1.52						1.42
Top 1% to bottom 40% ratio						49						21
Location of mean (percentile)						71						66
Mean to median ratio						1.60						1.38
Male												
% of households per Income group	50	65	68	70	72	65	43	62	76	87	93	72
% of households per category	15	21	21	22	22	100	12	17	21	24	26	100
Median	2.662	5.204	8.582	13.311	29.527	9.411	12.691	27.764	44.619	69.140	124.671	54.708
Mean	2.228	5.366	8.637	13.558	50.451	17.369	12.713	27.668	44.549	69.979	205.782	85.951
Std	1.270	0.890	1.035	1.844	71.402	38.201	4.618	4.262	5.846	9.539	441.494	237.086
Gini						0.57						0.51
Coef. Variation						2.20						2.76
Top 1% to bottom 40% ratio						71						54
Location of mean (percentile)						78						73
Mean to median ratio						1.85						1.57

Source: Survey of Consumer Finance 2007 for the U.S. and *Encuesta Financiera de Hogares* for Chile.

Table 14

Asset distribution by gender

	Chile						United States					
	Income quintiles						Income quintiles					
Gender	1st	2nd	3rd	4th	5th	Total	1st	2nd	3rd	4th	5th	Total
Female												
% of households per Income group	50	35	32	30	28	35	57	38	24	13	7	28
% of households per category	28	21	18	17	16	100	40	28	17	9	5	100
Median	16.135	20.169	21.177	30.253	62.119	24.202	11.060	84.000	187.800	439.300	934.500	94.140
Mean	26.007	32.749	32.312	48.273	139.622	50.337	93.833	174.773	257.092	599.156	1,633.465	269.727
Std	50.436	70.247	47.823	82.489	255.134	123.119	191.787	270.590	379.896	845.838	3,879.454	1,005.496
Gini						0.69						0.73
Coef. Variation						2.45						3.73
Top 1% to bottom 40% ratio						263						776
Location of mean (percentile)						75						73
Mean to median ratio						2.08						2.87
Male												
% of households per Income group	50	65	68	70	72	65	43	62	76	87	93	72
% of households per category	15	21	21	22	22	100	12	17	21	24	26	100
Median	20.169	14.118	22.185	28.236	70.590	26.219	16.300	78.630	181.600	328.600	787.900	270.500
Mean	39.668	26.897	34.506	40.641	146.476	59.899	83.313	168.422	283.809	493.453	2,224.475	800.393
Std	60.796	62.248	65.306	71.290	253.894	140.753	159.276	384.753	704.454	644.336	7,427.089	3,933.736
Gini						0.70						0.75
Coef. Variation						2.35						4.91
Top 1% to bottom 40% ratio						233						368
Location of mean (percentile)						76						81
Mean to median ratio						2.28						2.96

Source: Survey of Consumer Finance 2007 for the U.S. and *Encuesta Financiera de Hogares* for Chile.

Table 15 breaks down debt holdings by gender, which broadly follow the same patterns. The Gini coefficient for Chilean female households is 0.88 but somewhat less at 0.84 for males. Similarly, the debt of American female households is also distributed more unequally than the debt of male households, with respective Gini coefficients of 0.77 and 0.67. Female households in Chile and in the U.S. hold less debt than male households: in Chile, male households hold 1.4 times more debt than female households. In the U.S., this number rises to 2.8 times as much debt. Overall, U.S. female households hold nine times more debt than their Chilean peers, while male households in the U.S. hold 18 times more debt than in Chile. Again looking at the income gradient, the mean debt level in Chile by income quintile is similar among female and male households, and also in the U.S. as well, i.e. no clear pattern of more debt conditional on income for either gender. The difference in mean debt levels arises from composition: there are many more female households in the lowest income quintiles than there are male households.

Table 15

Debt distribution by gender

	Chile						United States					
	Income quintiles						Income quintiles					
Gender	1st	2nd	3rd	4th	5th	Total	1st	2nd	3rd	4th	5th	Total
Female												
% of households per Income group	50	35	32	30	28	35	57	38	24	13	7	28
% of households per category	28	21	18	17	16	100	40	28	17	9	5	100
Median	0.002	0.061	0.343	0.323	1.498	0.161	0.010	6.600	44.000	98.700	69.600	5.200
Mean	1.239	0.897	3.763	4.684	16.225	4.587	12.740	26.064	65.098	126.062	126.711	41.801
Std	6.525	2.013	13.444	9.655	32.015	15.845	38.522	46.656	68.802	132.024	203.090	85.159
Gini						0.88						0.77
Coef. Variation						3.45						2.04
Top 1% to bottom 40% ratio						78,402						13,365
Location of mean (percentile)						84						74
Mean to median ratio						28.43						8.04
Male												
% of households per Income group	50	65	68	70	72	65	43	62	76	87	93	72
% of households per category	15	21	21	22	22	100	12	17	21	24	26	100
Median	0.000	0.202	0.403	1.008	3.025	0.403	0.110	6.300	34.000	102.200	181.900	50.300
Mean	1.622	1.961	3.389	5.596	17.390	6.421	14.043	31.758	68.306	126.180	242.986	115.288
Std	5.616	6.106	8.482	11.849	31.501	17.730	36.363	66.430	90.394	136.176	321.957	203.652
Gini						0.84						0.67
Coef. Variation						2.76						1.77
Top 1% to bottom 40% ratio						11,071						351
Location of mean (percentile)						80						66
Mean to median ratio						15.92						2.29

Source: Survey of Consumer Finance 2007 for the U.S. and *Encuesta Financiera de Hogares* for Chile.

For wealth, table 16 reports the Gini coefficient among male households in Chile is 0.72, while that of female households is slightly higher, 0.74. In the U.S., both Gini coefficients are higher with again a marginal gender difference (0.79 and 0.81, respectively), reflecting the higher overall inequality in wealth in the U.S.. The skewness of the distributions of male and female households are similar in Chile, but in the U.S. the distribution of males is more skewed to the right than the distribution of females: the location of the mean for males is the 84th percentile and the one for females is the 75th percentile.

Male households in Chile and the U.S. hold more wealth than female households, but this difference is even wider in the U.S.: in Chile, males hold, on average, 1.17 times more wealth than female households. This figure rises to 3 in the U.S. Wealth held by different income quintiles also differs between Chile and the U.S. along gender lines. In Chile, males in the first quintile are the ones holding larger amounts of wealth than females in the same quintile, while in the U.S. the last quintile is the one that sees the largest difference between males and females, since in this quintile males hold 1.3 times more wealth, on average, than females. Finally, female households in Chile and the U.S. are

relatively close in terms of wealth holdings: females in the U.S. hold only five times more debt than females in Chile. However, this difference broadens in the case of males, as males in the U.S. hold almost 13 times more wealth than males in Chile. U.S. inequality is thus particularly driven by inequality among males relative to Chile, with more inequality among male households, and with male households making up a larger fraction of the population.

Table 16

Wealth distribution by gender

	Chile						United States					
	Income quintiles						Income quintiles					
Gender	1st	2nd	3rd	4th	5th	Total	1st	2nd	3rd	4th	5th	Total
Female												
% of households per Income group	50	35	32	30	28	35	57	38	24	13	7	28
% of households per category	28	21	18	17	16	100	40	28	17	9	5	100
Median	16.034	15.899	20.112	29.413	47.366	20.169	6.840	48.230	79.000	271.630	660.200	48.390
Mean	24.768	31.852	28.549	43.589	123.397	45.750	81.093	148.709	191.994	473.093	1,506.754	227.925
Std	48.742	70.344	40.209	81.573	251.052	119.420	181.255	267.306	374.115	841.293	3,841.181	986.007
Gini						0.72						0.79
Coef. Variation						2.61						4.33
Top 1% to bottom 40% ratio						575						-6811
Location of mean (percentile)						76						75
Mean to median ratio						2.27						4.71
Male												
% of households per Income group	50	65	68	70	72	65	43	62	76	87	93	72
% of households per category	15	21	21	22	22	100	12	17	21	24	26	100
Median	20.058	12.101	19.120	21.802	53.104	20.259	12.300	36.500	88.400	187.300	587.800	155.600
Mean	38.046	24.936	31.117	35.045	129.085	53.478	69.270	136.664	215.503	367.273	1,981.489	685.105
Std	60.981	62.462	65.470	71.165	250.002	137.374	145.181	379.243	690.409	630.588	7,357.688	3,881.071
Gini						0.74						0.81
Coef. Variation						2.57						5.67
Top 1% to bottom 40% ratio						817						24
Location of mean (percentile)						77						84
Mean to median ratio						2.64						4.40

Source: Survey of Consumer Finance 2007 for the U.S. and *Encuesta Financiera de Hogares* for Chile.

4. Employment status

One important determinant of financial status is employment, and some forms of employment, particularly entrepreneurship, have been linked to inequality in the literature, as mentioned. Overall, we see stark differences in the financial status of employed versus self-employed, potentially indicating a role for entrepreneurship in explaining inequality.

Table 17 shows the income distribution for Chile and the U.S. by employment status of the head of household. We partition employment status into five groups: employed workers, self-employed, unemployed, retired, and other labor force inactives, with the first two groups being of primary interest. In both countries, employed workers form the plurality: 47% in Chile and 61% in the U.S.. Average income for Chilean employed households is about USD 17,809, around one fourth the corresponding average income in the U.S., and income inequality for employed workers is higher in Chile than in the U.S. The Gini coefficient for this subpopulation is 0.53 in Chile but only 0.44 in the USA, and the rest of our income inequality measures are also consistent with this.

Chile's low share of employed workers is mirrored in a correspondingly high share of self-employed households: 10% of household heads are self-employed in the U.S. compared to 24% in Chile. The difference in average income is in this case about eight times larger in the U.S.—double relative to the employed workers. Further, the direction of inequality is flipped: the population of Chilean self-employed workers have a Gini coefficient of 0.57 compared to 0.63 for the U.S.. More strikingly, self-employment in Chile is much less likely to put a household in the top income quintile: 24% of self-employed Chilean households are in the top income quintile, compared to 14% in the lowest. In the U.S., only 9% of self-employed households belong to the lowest quintile and 40% belong to the highest quintile. This highlights the differential nature of self-employment between these countries. In the U.S. most self-employed households are entrepreneurs, while in Chile a significant fraction of self-employed households perform informal low-productivity tasks or are small farmers or fishermen.

Chilean employed households also accumulate fewer assets than American households, on average about USD 50k, compared to more than USD 450k in the U.S. Despite this large difference in asset owned, we observe a very similar degree of dispersion across countries (details in table 18). The Gini coefficient for assets is 0.70 in both countries, with the mean located in the 76th percentile for Chile and the 75th percentile for the U.S. Despite this similarity, Chilean households "sort" much less by income: the asset gap between the lowest and highest income quintiles is a factor of six, compared to a factor of 36 in the U.S.

For self-employed households, the data follow a similar pattern. While employed households have nine times more assets in the U.S., self-employed American households have over twenty times the assets. Moving from the lowest income quintile to the highest income quintile sees average assets increasing by a factor of 7 in Chile (similar to employed households), but by a factor of 31 in the U.S., with the highest income quintile in the U.S. averaging over 4.5 million in assets.

Table 17

Income distribution by employment status

	Chile						United States					
	Income quintiles						Income quintiles					
Employment status	1st	2nd	3rd	4th	5th	Total	1st	2nd	3rd	4th	5th	Total
Employed												
% of households per Income group	22	49	52	56	56	47	33	58	71	73	68	61
% of households per category	9	21	22	24	24	100	11	20	23	24	23	100
Median	3.098	5.325	8.664	13.114	28.559	10.178	13.315	28.046	44.195	68.774	114.539	51.498
Mean	2.902	5.437	8.740	13.430	46.437	17.609	13.015	27.855	44.468	70.054	163.949	71.244
Std	0.820	0.921	1.067	1.840	66.898	36.607	4.440	4.163	5.745	9.579	315.432	160.009
Gini						0.53						0.44
Coef. Variation						2.08						2.25
Top 1% to bottom 40% ratio						56						33
Location of mean (percentile)						77						67
Mean to median ratio						1.73						1.38
Self-employed												
% of households per Income group	18	22	27	25	29	24	5	7	8	12	21	10
% of households per category	14	19	22	20	24	100	9	14	15	22	40	100
Median	3.033	5.082	8.471	13.694	32.170	9.681	12.691	25.169	44.028	69.590	166.992	70.019
Mean	2.878	5.296	8.521	13.697	51.895	18.705	12.573	26.176	44.643	69.872	315.367	150.764
Std	0.796	0.842	1.037	1.761	65.601	37.574	4.754	4.354	6.073	9.532	657.153	432.163
Gini						0.57						0.62
Coef. Variation						2.01						2.87
Top 1% to bottom 40% ratio						64						85
Location of mean (percentile)						78						78
Mean to median ratio						1.93						2.15
Unemployed												
% of households per Income group	8	3	2	0	1	3	6	3	2	1	1	3
% of households per category	57	22	12	3	6	100	44	26	11	11	8	100
Median	1.694	5.402	8.783	14.521	31.301	3.429	10.820	24.235	45.820	66.111	120.035	21.415
Mean	1.708	5.441	8.650	15.309	50.997	6.552	10.958	25.177	44.830	68.529	163.048	32.921
Std	1.282	1.012	1.114	1.352	50.923	16.513	4.790	3.834	5.324	8.914	139.096	47.964
Gini						0.64						0.49
Coef. Variation						2.52						1.46
Top 1% to bottom 40% ratio						141						37
Location of mean (percentile)						73						72
Mean to median ratio						1.91						1.54

Table 17 (continued)

Income distribution by employment status

	Chile						United States					
	Income quintiles						Income quintiles					
Employment status	1st	2nd	3rd	4th	5th	Total	1st	2nd	3rd	4th	5th	Total
Retired												
% of households per Income group	17	12	9	12	8	12	31	24	14	12	9	18
% of households per category	29	22	15	20	15	100	34	27	16	13	10	100
Median	2.178	5.550	9.391	13.251	25.124	7.001	12.691	26.271	43.130	65.996	130.182	27.909
Mean	2.209	5.442	8.992	13.589	37.526	11.362	12.834	26.669	42.961	67.669	240.965	51.303
Std	0.893	0.959	1.100	1.948	33.034	17.109	4.134	4.245	5.597	9.167	522.486	177.971
Gini						0.53						0.56
Coef. Variation						1.51						3.47
Top 1% to bottom 40% ratio						48						77
Location of mean (percentile)						68						76
Mean to median ratio						1.62						1.84
Inactive (non-retired)												
% of households per Income group	35	14	10	7	5	14	24	6	4	2	1	8
% of households per category	48	21	15	10	7	100	62	17	11	6	4	100
Median	1.331	5.082	8.471	13.069	24.422	4.284	10.829	24.216	45.479	62.619	129.185	14.830
Mean	1.431	5.182	8.566	13.504	38.703	6.934	11.424	25.412	44.723	67.379	165.163	24.737
Std	1.294	0.874	1.073	2.022	41.269	14.074	4.229	4.152	6.201	9.534	213.956	44.308
Gini						0.60						0.47
Coef. Variation						2.03						1.79
Top 1% to bottom 40% ratio						112						30
Location of mean (percentile)						67						72
Mean to median ratio						1.62						1.67

Source: Survey of Consumer Finance 2007 for the U.S. and *Encuesta Financiera de Hogares* for Chile.

Table 18

Asset distribution by employment status

	Chile						United States					
	Income quintiles						Income quintiles					
Employment status	1st	2nd	3rd	4th	5th	{Total}	{1st}	{2nd}	{3rd}	{4th}	{5th}	{Total}
Employed												
% of households per Income group	22	49	52	56	56	47	33	58	71	73	68	61
% of households per category	9	21	22	24	24	100	11	20	23	24	23	100
Median	10.508	11.899	16.135	25.816	60.506	20.471	5.950	27.700	153.200	299.100	642.500	202.400
Mean	20.025	21.945	29.748	33.782	113.538	48.148	36.052	85.913	204.651	380.257	1304.804	456.667
Std	40.422	40.093	65.483	45.916	207.028	116.294	84.794	127.138	240.931	368.228	3895.261	1934.444
Gini						0.70						0.70
Coef. Variation						2.42						4.24
Top 1% to bottom 40% ratio						311						337
Location of mean (percentile)						76						75
Mean to median ratio						2.35						2.26
Self-employed												
% of households per Income group	18	22	27	25	29	24	5	7	8	12	21	10
% of households per category	14	19	22	20	24	100	9	14	15	22	40	100
Median	20.169	12.101	27.228	30.253	86.501	30.253	20.400	153.800	344.300	497.200	1899.100	543.400
Mean	28.161	28.380	37.754	45.265	192.360	73.713	143.791	336.811	567.698	834.061	4526.776	2151.035
Std	30.845	89.607	58.672	62.458	326.939	183.670	431.268	923.230	1236.299	1251.785	12505.310	8217.110
Gini						0.72						0.75
Coef. Variation						2.49						3.82
Top 1% to bottom 40% ratio						284						302
Location of mean (percentile)						80						78
Mean to median ratio						2.44						3.96
Unemployed												
% of households per Income group	8	3	2	0	1	3	6	3	2	1	1	3
% of households per category	57	22	12	3	6	100	44	26	11	11	8	100
Median	12.101	10.084	5.244	22.185	55.464	16.135	3.000	33.810	58.600	251.000	462.150	35.500
Mean	25.894	19.481	28.405	36.796	101.370	29.337	50.762	139.999	103.264	287.526	788.035	165.012
Std	33.455	16.647	53.677	36.063	95.093	43.672	103.390	240.914	172.734	378.729	1,228.639	445.855
Gini						0.64						0.76
Coef. Variation						1.49						2.70
Top 1% to bottom 40% ratio						153						1,418
Location of mean (percentile)						70						73
Mean to median ratio						1.82						4.65

Table 18 (continued)

Asset distribution by employment status

	Chile						United States					
	Income quintiles						Income quintiles					
Employment status	1st	2nd	3rd	4th	5th	Total	1st	2nd	3rd	4th	5th	Total
Retired												
% of households per Income group	17	12	9	12	8	12	31	24	14	12	9	18
% of households per category	29	22	15	20	15	100	34	27	16	13	10	100
Median	28.735	36.304	31.261	40.337	100.843	32.270	107.500	239.200	332.200	701.100	1267.400	251.000
Mean	38.995	46.270	48.733	78.658	191.114	72.176	166.485	331.749	513.950	989.414	3,777.121	734.502
Std	83.467	51.177	53.366	157.157	247.886	139.730	203.050	360.361	1,250.230	994.458	9,231.807	3,171.859
Gini						0.62						0.72
Coef. Variation						1.94						4.32
Top 1% to bottom 40% ratio						78						237
Location of mean (percentile)						75						79
Mean to median ratio						2.24						2.93
Inactive (non-retired)												
% of households per Income group	35	14	10	7	5	14	24	6	4	2	1	8
% of households per category	48	21	15	10	7	100	62	17	11	6	4	100
Median	24.202	16.135	24.202	31.288	53.447	24.202	7.801	121.950	119.500	328.220	410.700	27.500
Mean	41.898	40.953	32.108	47.961	135.918	47.009	63.412	178.764	209.095	575.710	1,184.994	170.629
Std	60.469	95.095	37.074	71.739	201.466	86.956	127.877	278.808	214.739	439.426	3,329.308	717.375
Gini						0.66						0.77
Coef. Variation						1.85						4.20
Top 1% to bottom 40% ratio						139						1700
Location of mean (percentile)						71						73
Mean to median ratio						1.94						6.20

Source: Survey of Consumer Finance 2007 for the U.S. and *Encuesta Financiera de Hogares* for Chile.

Turning to debt, Chilean debt is very unequally distributed within the different labor force types, mimicking the extreme dispersion in the aggregate Chilean population. Details are reported in table 19. In the U.S., debt is more evenly distributed among the employed and self-employed than in the population as a whole. In the U.S., the self-employed hold more debt on average than the employed, which is potentially a reflection of debt taken on to develop entrepreneurial activities. On the contrary, in Chile employed and self-employed households hold similar levels of debt. U.S. employed households hold, on average, 14 times more debt than Chilean employed households, while self-employed households in the U.S. hold 26 times more debt than in Chile.

As with debt, wealth is very unequally distributed for different categories of employment status, both in Chile and in the U.S., as per table 20. In both countries, wealth is more unequal among the employed and self-employed relative to the population. The largest differences between the U.S. and Chile are with the self-employed, who on average in the U.S. hold almost 30 times more wealth than in Chile. Employed households have only eight times more wealth in the U.S. than in Chile.

Table 19

Debt distribution by employment status

	Chile						United States					
	Income quintiles						Income quintiles					
Employment status	1st	2nd	3rd	4th	5th	cTotal	1st	2nd	3rd	4th	5th	Total
Employed												
% of households per Income group	22	49	52	56	56	47	33	58	71	73	68	61
% of households per category	9	21	22	24	24	100	11	20	23	24	23	100
Median	0.121	0.303	0.565	1.207	4.034	0.706	1.200	9.150	48.000	111.000	183.600	57.800
Mean	1.944	2.176	4.249	6.369	17.911	7.360	18.501	30.051	73.082	132.083	225.520	107.734
Std	6.914	6.660	12.502	12.123	31.012	18.705	48.941	50.724	80.390	128.256	227.597	153.650
Gini						0.82						0.63
Coef. Variation						2.54						1.43
Top 1% to bottom 40% ratio						2297						169
Location of mean (percentile)						78						63
Mean to median ratio						10.43						1.88
Self-employed												
% of households per Income group	18	22	27	25	29	24	5	7	8	12	21	10
% of households per category	14	19	22	20	24	100	9	14	15	22	40	100
Median	0.061	0.016	0.242	0.726	2.380	0.262	0.300	20.000	51.300	117.930	189.340	90.600
Mean	2.061	1.078	3.669	5.236	19.448	7.104	16.344	71.150	107.291	159.509	314.139	188.986
Std	5.067	3.366	8.739	11.961	34.565	19.825	50.816	118.749	146.855	175.107	506.003	356.797
Gini						0.85						0.66
Coef. Variation						2.79						1.89
Top 1% to bottom 40% ratio						82594						199
Location of mean (percentile)						80						69
Mean to median ratio						27.10						2.09
Unemployed												
% of households per Income group	8	3	2	0	1	3	6	3	2	1	1	3
% of households per category	57	22	12	3	6	100	44	26	11	11	8	100
Median	0.256	0.202	2.195	0.121	17.555	0.403	0.000	10.400	23.000	113.300	40.000	8.000
Mean	3.395	1.618	2.267	1.383	30.701	4.323	12.116	34.817	37.376	101.162	278.498	52.015
Std	7.337	3.791	4.065	6.665	38.380	12.693	44.863	60.742	38.548	55.840	432.181	150.106
Gini						0.83						0.80
Coef. Variation						2.94						2.89
Top 1% to bottom 40% ratio						4530						18,184
Location of mean (percentile)						83						76
Mean to median ratio						10.72						6.50

Table 19 (continued)

Debt distribution by employment status

	Chile						United States					
	Income quintiles						Income quintiles					
Employment status	1st	2nd	3rd	4th	5th	cTotal	1st	2nd	3rd	4th	5th	{Total}
Retired												
% of households per Income group	17	12	9	12	8	12	31	24	14	12	9	18
% of households per category	29	22	15	20	15	100	34	27	16	13	10	100
Median	0.002	0.038	0.046	0.037	0.343	0.030	0.000	0.000	0.400	16.000	5.000	0.000
Mean	0.832	0.706	0.525	2.337	5.023	1.673	9.248	13.429	28.476	51.128	141.480	32.087
Std	4.160	1.548	0.945	5.410	16.168	7.199	23.823	29.017	54.755	81.551	293.266	109.029
Gini						0.89						0.86
Coef. Variation						4.30						3.40
Top 1% to bottom 40% ratio						-						-
Location of mean (percentile)						83						79
Mean to median ratio						55.31						-
Inactive (non-retired)												
% of households per Income group	35	14	10	7	5	14	24	6	4	2	1	8
% of households per category	48	21	15	10	7	100	62	17	11	6	4	100
Median	0.000	0.030	0.146	0.215	0.121	0.000	0.390	11.000	20.000	111.000	18.800	3.000
Mean	0.620	1.114	2.091	2.648	9.030	1.696	11.614	39.434	46.954	172.290	94.378	32.388
Std	6.317	2.274	5.311	6.583	31.296	9.837	27.973	93.640	56.836	232.510	119.900	85.800
Gini						0.91						0.82
Coef. Variation						5.80						2.65
Top 1% to bottom 40% ratio						-						41,356
Location of mean (percentile)						84						81
Mean to median ratio						-						10.80

Source: Survey of Consumer Finance 2007 for the U.S. and *Encuesta Financiera de Hogares* for Chile. Values in thousands of dollars of 2007.

Table 20

Wealth distribution by employment status

	Chile						United States					
	Income quintiles						Income quintiles					
Employment status	1st	2nd	3rd	4th	5th	Total	1st	2nd	3rd	4th	5th	Total
Employed												
% of households per Income group	22	49	52	56	56	47	33	58	71	73	68	61
% of households per category	9	21	22	24	24	100	11	20	23	24	23	100
Median	10.084	8.277	13.553	19.985	40.337	16.135	3.300	15.260	56.150	150.500	434.000	91.030
Mean	18.081	19.769	25.499	27.413	95.627	40.788	17.552	55.861	131.569	248.173	1,079.284	348.933
Std	40.869	40.209	63.065	45.020	202.463	112.188	59.881	113.386	220.850	338.898	3,845.853	1,893.189
Gini						0.77						0.79
Coef. Variation						2.75						5.43
Top 1% to bottom 40% ratio						-1292						1507
Location of mean (percentile)						77						79
Mean to median ratio						2.53						3.83
Self-employed												
% of households per Income group	18	22	27	25	29	24	5	7	8	12	21	10
% of households per category	14	19	22	20	24	100	9	14	15	22	40	100
Median	20.058	10.780	23.462	27.606	68.573	24.202	19.940	77.050	209.200	378.960	1723.550	390.360
Mean	26.100	27.302	34.086	40.029	172.912	66.609	127.447	265.661	460.407	674.552	4,212.637	1,962.049
Std	29.923	89.737	57.554	60.641	323.366	179.406	394.133	909.953	1,182.032	1,219.702	12,389.700	8,118.780
Gini						0.76						0.78
Coef. Variation						2.69						4.14
Top 1% to bottom 40% ratio						822						554
Location of mean (percentile)						78						79
Mean to median ratio						2.75						5.03
Unemployed												
% of households per Income group	8	3	2	0	1	3	6	3	2	1	1	3
% of households per category	57	22	12	3	6	100	44	26	11	11	8	100
Median	10.084	10.084	3.049	22.131	48.806	10.084	2.600	10.300	11.300	162.610	238.180	10.300
Mean	22.499	17.863	26.137	35.413	70.669	25.014	38.646	105.182	65.888	186.364	509.537	112.997
Std	31.303	17.340	52.849	35.842	79.149	38.504	81.625	190.101	156.516	378.607	936.345	341.223
Gini						0.69						0.81
Coef. Variation						1.54						3.02
Top 1% to bottom 40% ratio						925						-530
Location of mean (percentile)						69						75
Mean to median ratio						2.48						10.97

Table 20 (continued)

Wealth distribution by employment status

	Chile						United States					
	Income quintiles						Income quintiles					
Employment status	1st	2nd	3rd	4th	5th	Total	1st	2nd	3rd	4th	5th	Total
Retired												
% of households per Income group	17	12	9	12	8	12	31	24	14	12	9	18
% of households per category	29	22	15	20	15	100	34	27	16	13	10	100
Median	24.200	36.304	31.261	36.354	90.759	31.261	100.080	229.400	329.200	634.120	1,260.300	233.000
Mean	38.162	45.564	48.208	76.321	186.091	70.503	157.238	318.320	485.473	938.286	3,635.642	702.414
Std	80.451	51.297	53.110	157.441	245.299	138.076	195.987	360.852	1,249.985	998.435	9,194.972	3,148.511
Gini						0.63						0.73
Coef. Variation						1.96						4.48
Top 1% to bottom 40% ratio						83						287
Location of mean (percentile)						74						80
Mean to median ratio						2.26						3.02
Inactive (non-retired)												
% of households per Income group	35	14	10	7	5	14	24	6	4	2	1	8
% of households per category	48	21	15	10	7	100	62	17	11	6	4	100
Median	24.200	16.135	22.907	31.286	43.236	21.972	4.415	71.000	72.900	188.400	181.700	14.200
Mean	41.278	39.839	30.017	45.313	126.889	45.313	51.798	139.330	162.141	403.420	1,090.617	138.241
Std	60.652	95.234	35.990	71.395	189.008	84.606	116.865	292.867	202.575	415.502	3,311.311	704.038
Gini						0.67						0.85
Coef. Variation						1.87						5.09
Top 1% to bottom 40% ratio						172						-601
Location of mean (percentile)						72						77
Mean to median ratio						2.06						9.74

Source: Survey of Consumer Finance 2007 for the U.S. and *Encuesta Financiera de Hogares* for Chile.

In terms of income, assets, debt, and wealth, we thus see a story that points towards the self-employed behaving differently in the U.S. than in Chile, in a manner consistent with a different model of entrepreneurship. We return to this in the next section.

Turning to non-employed households, the fraction of unemployed workers is similar between the two countries, around 3%. The average income for unemployed workers is about five times larger in the U.S., and the unemployed are much less unequal in the U.S. than Chile. This difference may stem from the characteristics of unemployment benefit programs in each country. While in Chile the replacement ratio declines from 50% in the first month to 20% at the sixth month, in the U.S. the replacement ratio is 60% for nine months.[9] The U.S. economy also has a larger fraction of retired households, 18% compared to 12% in Chile. Income inequality for retired households is lower in Chile (Gini coefficient is 0.53 compared to 0.56 in the U.S.), but the average income is about 4.5 times higher in the U.S.

9 *For details of the unemployment system in Chile see Berstein (2010).*

Not surprisingly, the majority of unemployed households, both in Chile and the U.S., belong to the first income quintile (57% and 44%, respectively). This is also true for retired and inactive households. In Chile, 29% of retired households and 48% of inactive households are in the lowest income quintile. In the U.S., 34% of retired households and 62% of inactive households belong to the first income quintile.

While U.S. unemployed households see considerably more asset inequality and hold five times as many assets as Chilean unemployed households —very similar to income— they do not consist of a sufficiently large share of the population to move the needle on aggregate statistics. The more numerous retired households hold more assets than unemployed ones in both countries. Average asset holdings for Chilean retired households are USD 72,176. This number is ten times bigger for the U.S., where inequality is also higher.

For debt, the retired and inactive groups are quite similar in the aggregate, both in Chile and in the U.S. However, in Chile inactive households in the fifth income quintile hold much more debt than retired households in the same quintile. This relation is reversed in the U.S.: high-income retired households hold more debt than inactive ones. For retired and inactive households, U.S. households hold 19 times more debt than Chilean households.

In Chile, the group that holds the largest level of wealth is the retired subpopulation, while in the U.S. it is the self-employed. Unemployed households hold four times more wealth in the U.S. than in Chile, three times as much for inactive households, and 10 times as much for retired households (relative to 11 times for the population). This serves as some evidence that the bequest motive is marginally stronger in Chile.

5. Educational attainment

Breaking down household financial status by education shows that inequality increases consistently with education.

In general, Chilean households are less educated than U.S. households (see table 21). About one third of heads of household in Chile have less than 12 years of education compared to only 14% for the U.S. Mean income in Chile for less educated households (did not complete high school) is USD 7,325, while in the U.S. it is four times as much: almost USD 30k. Income inequality among these households is similar across countries, though much lower than the aggregate population in either country.

Households with a high-school education comprise 46% of the Chilean economy, which is a higher percentage compared to the U.S. (33%). Average income for the high-school educated households is also four times higher in the U.S. compared to Chile and again income inequality is much lower within this group compared to the population at large in both countries. In Chile, income inequality for high-school educated households is higher (Gini of 0.47) compared to those without high school (0.41), while in the U.S. we observe the same inequality measure (0.42) within each of these groups.

Table 21

Income distribution by educational level

	Chile						United States					
	Income quintiles						Income quintiles					
Education level	1st	2nd	3rd	4th	5th	Total	1st	2nd	3rd	4th	5th	Total
Less than high school												
% of households per Income group	44	41	27	21	7	28	31	18	11	6	2	14
% of households per category	30	30	19	15	5	100	45	27	16	8	3	100
Median	2.420	5.090	8.471	13.311	21.914	5.639	11.749	26.703	41.228	66.079	116.737	22.058
Mean	2.281	5.255	8.500	13.385	26.395	7.325	11.871	26.850	42.215	69.509	135.626	29.589
Std	1.065	0.896	1.078	1.882	12.785	6.633	4.186	4.282	5.350	9.985	125.160	34.387
Gini						0.41						0.42
Coef. Variation						0.91						1.16
Top 1% to bottom 40% ratio						17						18
Location of mean (percentile)						64						64
Mean to median ratio						1.30						1.34
High school												
% of households per Income group	45	50	54	51	31	46	39	42	39	28	16	33
% of households per category	19	22	23	22	13	100	24	26	24	17	10	100
Median	2.420	5.522	8.713	13.251	24.574	8.350	12.691	27.027	44.028	66.982	112.161	34.985
Mean	2.110	5.502	8.755	13.453	36.286	11.485	12.685	27.114	44.151	69.005	149.023	46.371
Std	1.317	0.916	1.035	1.825	46.884	20.132	4.271	4.347	5.779	9.755	332.433	108.749
Gini						0.47						0.42
Coef. Variation						1.75						2.35
Top 1% to bottom 40% ratio						41						23
Location of mean (percentile)						68						65
Mean to median ratio						1.38						1.33
Some college												
% of households per Income group	3	3	7	8	9	6	17	20	20	19	15	18
% of households per category	11	9	24	26	30	100	18	23	22	20	17	100
Median	3.509	5.210	8.471	13.367	27.591	12.101	12.691	27.159	44.028	68.721	110.260	42.440
Mean	2.951	5.539	8.614	13.686	47.450	20.527	12.903	27.087	44.718	69.155	163.130	59.318
Std	1.144	0.860	1.098	1.882	70.561	42.387	4.605	4.259	5.824	9.167	466.482	195.954
Gini						0.54						0.46
Coef. Variation						2.06						3.30
Top 1% to bottom 40% ratio						63						41
Location of mean (percentile)						76						67
Mean to median ratio						1.70						1.40
College												
% of households per Income group	5	6	11	20	53	19	12	20	30	47	67	35
% of households per category	5	6	12	21	56	100	7	11	17	26	39	100
Median	2.178	4.961	8.955	13.594	35.577	20.011	11.762	28.046	45.279	69.232	131.512	71.773
Mean	1.767	5.133	8.936	13.790	56.355	35.772	12.249	27.783	44.880	70.296	224.091	116.474
Std	1.382	0.810	1.101	1.849	72.605	58.976	4.817	4.099	5.747	9.485	445.256	289.697
Gini						0.55						0.52
Coef. Variation						1.65						2.49
Top 1% to bottom 40% ratio						50						54
Location of mean (percentile)						72						77
Mean to median ratio						1.79						1.62

Source: Survey of Consumer Finance 2007 for the U.S. and *Encuesta Financiera de Hogares* for Chile.

The college dropout rate is lower in Chile than in the U.S.: only 6% of households have some college education (but not a completed degree) in Chile, compared to 18% in the U.S. A college dropout in the U.S. earns about three times more than a college dropout in Chile. Income inequality for this group is higher in Chile. The Gini coefficient is about 0.54 while in the U.S. it is only 0.46.

The U.S. has almost twice as many college-educated households as Chile: 35% to 19%, and they earn more than three times as much as their Chilean counterparts. According to the Gini coefficient, these highly educated households face marginally more inequality in Chile than in the U.S. (0.55 vs 0.52, respectively).

As expected, income is highly correlated with the educational attainment of the head of household. In Chile, 60% of no-high-school households are in the bottom two quintiles, but only 20% in the top two. Conversely, among those with college degrees, 83% are in the top two quintiles. In the U.S., 72% of those without high school are in the bottom two quintiles, compared to only 11% in the top two, and 65% with a college education are in the top two income quintiles. In Chile, with less education overall, having little education does not stand out as much relative to the population, but having a degree does, and vice versa in the U.S.: those without high school dominate the lower quintiles, but with more education a degree is less of a guarantee of high income.

Assets largely mirror income when considered by educational status of household head as well (table 22). Average asset holdings for households with no high-school education in Chile are USD 32,735 while in the U.S. this figure is more than five times larger, reaching almost USD 175,000. The higher U.S. asset holdings are accompanied by more inequality. The Gini coefficient for the U.S. is 0.74 but only 0.62 for Chile.

Households with a high-school education hold more assets. Chilean households with high-school education possess on average USD 46,696 (40% more than the least educated group). The gap between Chile and the U.S. widens, however, with corresponding U.S. households holding 6.8 times as much: USD 316,516 on average. Both groups report a Gini of 0.67, but this is a considerable step down in inequality from those without high school in the U.S., but more inequality for Chile.

Assets continue to increase with education and so does the gap; 7.5 times as many assets for U.S. households with some college education, and ten times as many for U.S. households who have completed college relative to Chile. However, inequality does not rise in step. The college dropouts have the highest inequality (Gini of 0.75 in Chile and 0.74 in the U.S.), but the Gini among those with a full degree is 0.67 in Chile and 0.72 in the U.S. Asset inequality overall varies considerably more by educational level in Chile than in the United States.

Table 22

Asset distribution by educational level

	Chile						United States					
	Income quintiles						Income quintiles					
Education level	1st	2nd	3rd	4th	5th	Total	1st	2nd	3rd	4th	5th	Total
Less than high school												
% of households per Income group	44	41	27	21	7	28	31	18	11	6	2	14
% of households per category	30	30	19	15	5	100	45	27	16	8	3	100
Median	14.118	16.437	20.774	30.253	36.304	20.169	7.600	51.900	123.170	301.000	538.200	49.500
Mean	23.317	31.539	28.495	41.205	84.883	32.735	54.206	149.453	183.406	431.403	1,277.581	174.588
Std	34.433	77.242	34.316	54.254	151.642	64.914	86.791	241.972	208.748	497.781	2,979.443	636.332
Gini						0.62						0.74
Coef. Variation						1.98						3.64
Top 1% to bottom 40% ratio						123						972
Location of mean (percentile)						73						72
Mean to median ratio						1.62						3.53
High school												
% of households per Income group	45	50	54	51	31	46	39	42	39	28	16	33
% of households per category	19	22	23	22	13	100	24	26	24	17	10	100
Median	22.185	16.135	20.975	27.268	54.657	24.202	16.300	98.070	175.700	304.300	618.950	156.200
Mean	38.567	29.329	31.098	44.526	117.923	46.696	92.719	160.152	264.958	425.507	1,207.561	316.516
Std	56.068	59.054	49.428	84.344	238.608	109.288	169.891	204.647	776.844	476.116	3,830.660	1,314.217
Gini						0.67						0.67
Coef. Variation						2.34						4.15
Top 1% to bottom 40% ratio						225						270
Location of mean (percentile)						72						72
Mean to median ratio						1.93						2.03
Some college												
% of households per Income group	3	3	7	8	9	6	17	20	20	19	15	18
% of households per category	11	9	24	26	30	100	18	23	22	20	17	100
Median	24.202	0.000	4.639	11.617	57.481	24.202	9.700	49.100	187.710	303.500	558.200	181.600
Mean	34.877	8.155	48.392	29.175	123.820	60.497	84.885	111.397	265.041	444.729	1,568.862	453.565
Std	36.917	16.873	140.270	35.283	254.475	161.805	163.799	183.346	407.464	481.987	6,245.899	2,636.202
Gini						0.75						0.74
Coef. Variation						2.67						5.81
Top 1% to bottom 40% ratio						1735						543
Location of mean (percentile)						73						79
Mean to median ratio						2.50						2.50
College												
% of households per Income group	5	6	11	20	53	19	12	20	30	47	67	35
% of households per category	5	6	12	21	56	100	7	11	17	26	39	100
Median	20.169	5.042	32.270	36.304	90.658	51.430	39.120	117.600	202.280	383.800	922.700	435.300
Mean	55.475	15.944	51.554	45.876	172.636	115.781	173.294	274.692	336.479	589.931	2,582.758	1,255.909
Std	143.353	30.218	72.805	78.762	271.231	219.477	316.875	644.614	670.198	832.342	8,081.028	5,171.976
Gini						0.67						0.72
Coef. Variation						1.90						4.12
Top 1% to bottom 40% ratio						157						227
Location of mean (percentile)						74						83
Mean to median ratio						2.25						2.89

Source: Survey of Consumer Finance 2007 for the U.S. and *Encuesta Financiera de Hogares* for Chile.

Debt immediately becomes interesting due to the linkage between obtaining college education and the potential accumulation of debt. Details are displayed in table 23. The more educated the head of household, the larger the average level of debt of the household, but perhaps surprisingly debt is more equally distributed among these more educated households.

Chilean households differ in their debt holdings more markedly among educational levels than U.S. households. Chilean households with a college education hold 2.4 times more debt on average than households with some college, 3.9 times more than households with a high-school education, and 9.7 times more debt than households without high school. More importantly, debt relative to income is increasing as well, from debt being 22% of average income for those without a high-school education, to 44.8% among those with degrees. While debt increases with education as well in the U.S., the level is completely different: debt to income is 103% for American households with no high school, and 132% for households with a degree, much less of an increase in relative terms. Notably, debt of American dropouts is particularly burdensome: 144% of income.

Putting assets and debt together for net wealth, the lowest debt inequality is among those with no high school in both countries, with Gini coefficients of 0.64 and 0.74 for Chile and the U.S., respectively. The most wealth inequality is among college dropouts, again in both countries with a Gini of 0.80 in Chile and 0.81 in the U.S. (table 24).

As established, wealth is increasing with education, but wealth scales with education more aggressively in the U.S. In Chile, household heads with a degree hold only 2.3 times as much wealth as those with just high school, compared to 4.4 times as much in the U.S. This is also true between countries: the high-school households hold six times as much wealth in the U.S., but the college educated hold 11 times more wealth.

Table 23

Debt distribution by educational level

	Chile						United States					
	Income quintiles						Income quintiles					
Education level	1st	2nd	3rd	4th	5th	Total	1st	2nd	3rd	4th	5th	Total
Less than high school												
% of households per Income group	44	41	27	21	7	28	31	18	11	6	2	14
% of households per category	30	30	19	15	5	100	45	27	16	8	3	100
Median	0.000	0.031	0.161	0.262	0.383	0.054	0.000	4.530	10.300	55.000	120.000	1.000
Mean	0.707	1.421	1.564	2.051	7.377	1.641	7.785	20.589	37.629	114.938	165.580	30.474
Std	1.870	6.616	4.041	6.946	20.774	7.028	24.164	47.794	51.587	175.528	155.642	78.890
Gini						0.87						0.83
Coef. Variation						4.28						2.59
Top 1% to bottom 40% ratio						-						-
Location of mean (percentile)						82						79
Mean to median ratio						30.31						30.47
High school												
% of households per Income group	45	50	54	51	31	46	39	42	39	28	16	33
% of households per category	19	22	23	22	13	100	24	26	24	17	10	100
Median	0.002	0.222	0.605	0.807	1.412	0.363	0.010	4.030	34.460	103.000	149.000	15.000
Mean	1.718	1.684	3.690	5.541	10.114	4.136	9.723	25.249	68.493	124.596	181.744	64.071
Std	7.318	3.708	8.906	10.806	20.960	11.135	24.693	50.662	89.132	139.503	196.419	113.265
Gini						0.83						0.72
Coef. Variation						2.69						1.77
Top 1% to bottom 40% ratio						5658						1202
Location of mean (percentile)						79						68
Mean to median ratio						11.39						4.27
Some college												
% of households per Income group	3	3	7	8	9	6	17	20	20	19	15	18
% of households per category	11	9	24	26	30	100	18	23	22	20	17	100
Median	0.202	0.000	0.121	0.605	2.319	0.403	2.000	10.350	50.080	67.600	166.200	25.000
Mean	0.862	0.812	2.601	6.056	14.126	6.554	16.699	35.908	69.118	108.137	220.307	85.359
Std	5.512	1.529	5.185	13.725	25.982	16.939	34.355	67.902	70.406	134.572	300.475	160.897
Gini						0.83						0.69
Coef. Variation						2.58						1.89
Top 1% to bottom 40% ratio						10425						459
Location of mean (percentile)						78						68
Mean to median ratio						16.25						3.41
College												
% of households per Income group	5	6	11	20	53	19	12	20	30	47	67	35
% of households per category	5	6	12	21	56	100	7	11	17	26	39	100
Median	0.871	1.052	0.565	1.714	5.042	2.017	2.350	15.000	41.100	114.500	184.000	90.000
Mean	5.967	2.545	8.274	8.058	23.099	16.009	33.985	40.606	76.014	135.632	253.138	153.532
Std	13.135	4.074	22.171	13.905	37.296	30.785	76.717	74.566	97.368	127.099	343.987	245.123
Gini						0.77						0.62
Coef. Variation						1.92						1.60
Top 1% to bottom 40% ratio						1501						137
Location of mean (percentile)						75						65
Mean to median ratio						7.94						1.71

Source: Survey of Consumer Finance 2007 for the U.S. and *Encuesta Financiera de Hogares* for Chile.

Table 24

Wealth distribution by educational level

	Chile						United States					
	Income quintiles						Income quintiles					
Education level	1st	2nd	3rd	4th	5th	Total	1st	2nd	3rd	4th	5th	Total
Less than high school												
% of households per Income group	44	41	27	21	7	28	31	18	11	6	2	14
% of households per category	30	30	19	15	5	100	45	27	16	8	3	100
Median	14.118	15.570	20.169	28.740	30.253	19.382	4.600	36.800	79.860	157.800	308.630	33.100
Mean	22.610	30.118	26.931	39.154	77.506	31.094	46.421	128.863	145.778	316.464	1,112.001	144.113
Std	34.121	77.423	34.211	52.649	142.021	63.271	79.886	238.142	197.030	464.042	2,949.062	615.799
Gini						0.64						0.78
Coef. Variation						2.04						4.27
Top 1% to bottom 40% ratio						164						24882
Location of mean (percentile)						71						75
Mean to median ratio						1.60						4.35
High school												
% of households per Income group	45	50	54	51	31	46	39	42	39	28	16	33
% of households per category	19	22	23	22	13	100	24	26	24	17	10	100
Median	20.169	13.086	15.577	20.197	44.371	20.027	12.500	49.800	81.700	181.360	441.800	80.500
Mean	36.849	27.645	27.409	38.985	107.809	42.561	82.997	134.903	196.464	300.910	1,025.817	252.444
Std	56.469	59.223	49.257	84.192	238.147	108.552	164.721	202.618	774.066	459.176	3,780.709	1,287.409
Gini						0.72						0.74
Coef. Variation						2.55						5.10
Top 1% to bottom 40% ratio						791						736
Location of mean (percentile)						73						74
Mean to median ratio						2.13						3.14
Some college												
% of households per Income group	3	3	7	8	9	6	17	20	20	19	15	18
% of households per category	11	9	24	26	30	100	18	23	22	20	17	100
Median	23.906	0.000	4.034	8.067	34.287	18.172	4.900	18.070	85.030	169.130	355.500	84.600
Mean	34.016	7.343	45.791	23.119	109.694	53.943	68.185	75.488	195.923	336.593	1,348.555	368.205
Std	37.021	16.793	140.440	35.521	243.816	155.701	154.758	176.648	400.192	451.509	6,189.333	2,599.677
Gini						0.80						0.81
Coef. Variation						2.89						7.06
Top 1% to bottom 40% ratio						-583						3989
Location of mean (percentile)						76						81
Mean to median ratio						2.97						4.35
College												
% of households per Income group	5	6	11	20	53	19	12	20	30	47	67	35
% of households per category	5	6	12	21	56	100	7	11	17	26	39	100
Median	13.311	5.026	23.799	27.525	63.852	36.304	25.200	71.700	107.900	238.000	701.700	285.400
Mean	49.508	13.399	43.280	37.819	149.537	99.772	139.309	234.085	260.465	454.299	2,329.619	1,102.377
Std	138.383	31.018	61.022	78.594	268.056	214.458	288.851	637.727	639.746	828.048	8,008.294	5,110.498
Gini						0.74						0.78
Coef. Variation						2.15						4.64
Top 1% to bottom 40% ratio						784						522
Location of mean (percentile)						75						83
Mean to median ratio						2.75						3.86

Source: Survey of Consumer Finance 2007 for the U.S. and *Encuesta Financiera de Hogares* for Chile.

IV. ASSESSING CAUSES OF INEQUALITY

We now briefly recap some of our findings from our analysis of the income, asset, debt, and wealth distributions in Chile and the U.S. in order to try and speak to the causes and nature of financial inequality in both these countries. We touch on a few of the prominent explanations for American inequality advanced in the literature and see if they are consistent with our data.

1. Earnings risk

As discussed in the context of the literature earlier, one hypothesized cause of wealth inequality is earnings risk. If earnings are a volatile process, that would impart a degree of inequality to the distribution of income and consequently of assets, especially if the process is persistent. Furthermore, if some jobs require extra compensation due to earnings volatility, that provides a second channel for earnings risk inequality.

Within our dataset, however, we established that Chile displays marginally more income inequality than the United States. Conditioning on age, all pre-retirement age groups also exhibit more income inequality in Chile than in the U.S., and employed workers are more unequal in terms of income as well, though in the U.S. self-employed workers face more inequality, a point we will return to momentarily when discussing entrepreneurship and inequality. There is also more income inequality by educational type in Chile.

We earlier asserted that financial markets to insure against these risks are almost certainly more complete in the U.S. relative to Chile. In our debt discussion, we pointed out that Americans, regardless of income, carry much more debt as a percentage of income relative to Chileans. This provides support to this hypothesis, and if financial markets are more complete in the U.S., the compensation for earnings risk should be lower.

Consequently, if earnings risk was really driving inequality in wealth in the United States, we should expect to see more inequality in wealth in Chile, with Chile having more variance in income across the board regardless of how the working age population is sliced. However, wealth is more equally distributed in Chile than the United States by a nontrivial margin—Ginis of 0.74 and 0.82, respectively—so we conclude that either inequality is being driven by very different processes in these countries or that earnings risk is not a compelling explanation for the observed inequality.[10]

10 Moreover, research on earnings risk dynamics using one-year income changes from the National Employment Survey (ENE) finds that earnings risk in Chile is more or less similar to that of the United States, (Madeira, 2015). This makes the hypothesis that earnings risk is driving the results more implausible.

2. Bequest motive

Another briefly mentioned potential driver of financial inequality is the existence of a strong bequest motive. Bequests provide an impetus for asset accumulation and hence asset and wealth inequality if the bequest motive is not homogeneous across actors. If lifespan cannot be perfectly predicted, even with homogeneous bequest motives, realized bequests would end up being quite different and correspondingly generating inequality, though accidental bequests have not been found to be a plausible explanation in the inequality literature.

A strong bequest motive implies a strong desire to hold onto wealth towards the end of the life cycle. American households hold roughly 11 times as much wealth, on average, than Chilean households. However, American households actually draw down their wealth in retirement - average wealth decreases by 12% from the 55-64 cohort to the 65+ cohort. Conversely, Chilean households do not - average Chilean wealth decreases by only 0.5% moving from the 55-64 age group to the 65+ group. Overall, Chilean households seem to have much stronger bequest motives.

That said, wealth inequality among senior American households is much higher than in Chile, with Gini coefficients of 0.78 and 0.65, respectively. This indicates that there is more potential for inequality in bequests in America than in Chile. Wealth inequality is very similar in Chile and the U.S. for age groups under 55, at which point inequality decreases significantly in Chile and does not decrease in the U.S.

So, whereas there seems to be a stronger bequest motive in Chile in that households of all types generally try to hold more wealth through retirement, there seems to be a potential for more inequality in bequests in the United States, where despite a general drawdown of wealth, among seniors wealth is distributed much more unevenly. This leaves mixed messages for the bequest motive, which we now attempt to reconcile.

3. Entrepreneurial choice

A third factor considered by the literature to explain the high degree of observed inequality revolves around entrepreneurship, and there are significant differences in traditionally employed and self-employed households in the data. American entrepreneurs exhibit more income inequality than any other labor force group in either country despite lower income inequality on aggregate in the U.S.

The American self-employed also display significant disparity in terms of wealth. Chilean entrepreneurs hold 63.3% more wealth than the Chilean employed, but American entrepreneurs hold on average 462% more wealth than American employed workers. This difference is driven by the top end of the distribution. 24.3% of Chilean self-employed households are in the top income quintile—barely more than if the distribution was uniform—but 40.3%

of American entrepreneurs are, and while there is minimal income premium to entrepreneurship in Chile (6.2%), there is a 112% premium in the United States.

While wealth is dominated by assets, the debt dynamics surrounding entrepreneurship are also notable. Chilean traditionally employed households actually hold more debt than their self-employed counterparts (3.5% more), but American entrepreneurs hold 75% more debt than employed households. This debt possibly reflects greater opportunity for American entrepreneurs to grow their businesses with help from financial markets, and also possibly greater inequality in outcomes among American entrepreneurs.

In addition to this, despite the financial outcomes of entrepreneurship in the United States, fewer households are self-employed. In Chile, 47.2% of households are traditionally employed, compared to 24.2% self-employed. The corresponding percentages for the U.S. are 60.8% and 10.5%. Since fewer American households are engaged in entrepreneurship, the outsize earnings and wealth of those who do create significant inequality in the aggregate distribution.

Returning to the bequest motive, it may be tougher to draw down wealth generated by self-employment than from traditional employment, if much of the wealth is tied up in a business or some other entrepreneurial activity. Consequently, entrepreneurship may be driving the difference in life-cycle profiles of inequality between the U.S. and Chile, and thus the potential for unequal bequests as well.

Overall, our data is entirely consistent with greater and possibly more unequal access and returns to self-employment in the U.S. generating greater wealth inequality in the U.S. than in Chile.

To further analyze the self-employment role in explaining the differences in assets and wealth distributions across Chile and the U.S., we carry out a computational exercise that asks 'if we imposed American returns to self-employment on Chile, what would wealth inequality look like in Chile'? To do this, we adjust the Chilean income distribution to mimic the one observed in the U.S. in terms of employed versus self-employed, as described below. We use the new income distribution to project assets and wealth in Chile using the covariates obtained for the U.S., which lets us create hypothetical inequality measures.

We carry out this exercise by first computing self-employment relative income for each country by dividing the income of each self-employed worker by the average income of the entire economy. This standardizes away the level differences in all types of income between the two countries. Second, we adjust the weights for this new Chilean relative income distribution to mimic the relative income distribution observed in the U.S.

To construct the weights, we follow the methodology developed in DiNardo et al. x (1996). We pool data from both surveys and use probit models to estimate

the probability that an observation of a certain income, age, and educational attainment is in the Chilean data. The estimated probabilities are used to construct the weights $\psi(Z) = P(dchile \mid Z)/[1\text{-}P(dchile \mid Z)]$, where Z is the vector of these variables, $dchile = 0,1\}$ equals 1 when an observation is taken from the Chilean data and 0 otherwise, and $P(dchile \mid Z)$ is the conditional probability of appearing in the Chilean data conditional on observable characteristics Z. The weight function, $\psi(Z)$, is used to reweight the observations in the Chilean data to obtain nearly equal distributions of the variables of interest across the two countries.

Once we obtain the new set of weights, we estimate the relationship between relative income and assets and between relative income and wealth as described by equation (1) (only for self-employed workers):

$$y_i = \beta_0 + \beta_1 income_i + \beta_2 income_{2i} + \beta_3 age_i + \varepsilon_i \qquad (1)$$

where y_i is either assets or wealth and income is relative income. We estimate equation (1) for both Chile and the U.S. Estimates are reported in table 25. All the coefficients are significant at the 1% level.

We use these estimates to carry out two projection exercises. First, we use βb_{chile} to project assets and wealth for Chile. These projected measures for assets and wealth capture the effect of the updated relative income distribution that imposes that Chilean entrepreneurs have the same income distribution relative to average income as American entrepreneurs. Using the generated series we compute the Gini coefficients for assets and wealth. The updated Gini coefficient for assets is 0.856 and for wealth it is 0.930, both higher than the observed U.S. measures.

Then, we go one step further and we project assets and wealth for Chile but using the $\hat{\beta}_{US}$(estimated covariates using the U.S. data). This exercise captures the effect of giving the Chilean self-employed the same relative income, and in addition giving them the American relationship between self-employed income and self-employed wealth. Once again we compute the Gini coefficients for assets and wealth. The resulting Gini coefficient for assets is 0.624 and for wealth it is 0.654.

Table 25

Income effect on assets and wealth

	Constant	Income	Income2	Age
Assets U.S.	-1,659.3	1,040.8	-0.613	32.66
Assets Chile	-43.11	54.85	-1.599	1.119
Wealth U.S.	-1,821,803	1,021,604	-591.4	32,926
Wealth Chile	-45.12	47.90	-1.364	1.162

Source: Authors' calculations.

We take from this exercise that the returns to entrepreneurship in the U.S. are a huge factor, more than sufficient to explain the difference in assets and wealth inequality between Chile and the U.S. Currently, Chile's relative income between employed and self-employed is almost 1:1, in part because the Chilean self-employed income is being dragged down by low-income low-education service providers. Conversely, U.S. self-employed income is more than twice U.S. mean employed income (table 17) Giving these returns to Chilean entrepreneurs then creates a much fatter tail in the Chilean distribution, generating much more inequality than we observe in either country.

This implies that there may be other factors besides returns to entrepreneurial services that contribute to the differences in inequality between Chile and the U.S. As discussed, these include earnings shocks and bequest motives. What we take away from this exercise and our prior discussion, however, is that the magnitude of the change in Chilean assets and wealth distributions is substantial, implying that returns to entrepreneurship seems much more plausible as a major factor relative to these other hypotheses.

Note that when we also impose the U.S. link between entrepreneurial income and entrepreneurial wealth, the estimated Chilean inequality drops dramatically, below the levels of either country. Chilean entrepreneurs save considerably more than American entrepreneurs of comparable relative income. This enforces that it is not the saving behavior of U.S. entrepreneurs that is generating the wealth inequality, but rather just their much higher incomes that matter —the payoffs to entrepreneurship.

One possibility is that the lack of a well developed financial system may induce Chilean entrepreneurs to self insure via asset accumulation, as discussed when dissecting the debt distribution. Other possible contributors to this relationship include the lack of social mobility in Chile, compared to the U.S., and the seemingly stronger bequest motive observed in Chile.

4. Other

There are a variety of other explanations for the observed degree of financial inequality that we could consider. One possible explanation is that Chile may be an economy that has not reached its steady-state level but is instead converging towards it. If this is the case, as the economy converges to its steady state, the wealth distribution may change and start to exhibit characteristics more similar to the observed U.S. distributions. Demographic characteristics may also explain the differences across countries (see, for example, Bover (2010) for a comparison of wealth between the U.S. and Spain). We do not, however, have the data to tackle either of these hypotheses seriously in this paper.

An additional explanation for the lesser inequality observed in Chile may be due to the fact that the household groups that belong to the first income quintile in Chile are benefiting from significant housing subsidies. Since real estate is the main wealth source for the low-income groups in Chile, and is financed to

some extent by the government, this may explain in part our previous results in terms of inequality among lower financial quintiles being generally lower in Chile than in the U.S. However, given that inequality is largely driven by the very upper financial echelons in both countries, this cannot explain much of the aggregate inequality observed.

Finally, our ability to make comparisons across countries is limited by the repeated cross-sectional nature of these datasets. Even with further collections of the EFH and SCF in the same year, the inability to link households across these surveys will likely limit how much can be said in other studies.

V. CONCLUSIONS

In this paper we analyze the income, asset, debt, and wealth distributions in Chile and the U.S. as reported by the Chilean Household Financial Survey and the American Survey of Consumer Finances, respectively. While Chile reports significantly less financial capability across the board, the results are not as black and white in terms of the inequality embedded in these distributions. We find that the U.S. sees more inequality than Chile in terms of assets (Chilean Gini: 0.70, U.S. Gini: 0.76) and net wealth (Chile: 0.74, U.S.: 0.82), but Chile sees more inequality in terms of income (Chile: 0.57, U.S.: 0.53) and debt (Chile: 0.85, U.S.: 0.70).

We extend our analysis of these distributions to a variety of demographic subgroups. In particular, we consider breakdowns by age, marital status, gender of household head, employment status, and educational attainment. We use these quantitative findings to shed light on the plausibility of different mechanisms proposed in the literature to explain the high level of inequality in the U.S.

We argue that arguments based on earnings risk seem unrealistic because the income process in Chile seems to be more risky than in the U.S., as the income distribution in Chile is more unequal. Moreover, it seems reasonable to assume that financial markets to insure against these risks are less developed in Chile than in the U.S., a claim that seems to be validated by our results on the debt distribution in both countries.

Another well-known explanation for the observed extreme upper tail of the wealth distribution is based on bequests, both accidental and voluntary. However, we find indication that the bequest motive is, if anything, stronger in Chile than in the U.S., which raises doubts about the significance of this channel in explaining observed inequality.

Conversely, our data suggests that we cannot discard the idea that entrepreneurial choice can account for the wealth inequality observed in the U.S. In both countries, self-employed households are considerably richer. Relative to the U.S., traditionally employed Chilean workers hold approximately 8.5 times less wealth. But self-employed American households hold roughly 30 times the

wealth of their Chilean counterparts. We carry out a quantitative exercise that increases the returns to entrepreneurship in Chile to American levels to show that it is a plausible mechanism that can fully explain the observed difference in wealth inequality. We consequently believe it is important to analyze in more detail the savings behavior of the entrepreneurial sector in Chile and in the U.S. We leave this for future research.

REFERENCES

Alfaro, R., N. Gallardo, and R. Stein (2010). "The Determinants of Household Debt Default." Mimeo.

Berstein, S. (editor) (2010). *Unemployment Insurance in Chile*. Santiago, Chile: Superintendencia de Pensiones.

Bover, O. (2010). "Wealth Inequality and Household Structure: U.S. vs. Spain." *Review of Income and Wealth* 56(2): 259–90.

Cagetti, M. and M. de Nardi (2006). "Entrepreneurship, Frictions and Wealth." *Journal of Political Economy* 114(322): 835–70.

Cagetti, M. and M. de Nardi (2008). "Wealth Inequality: Data and Models." *Macroeconomic Dynamics* 12: 285–313.

Cordoba, J.C. (2008). "U.S. Inequality: Debt Constraints or Incomplete Asset Markets? *Journal of Monetary Economics* 55: 350–64.

De Nardi, M. (2004). "Wealth Inequality and Intergenerational Links." *Review of Economic Studies* 71: 743–68.

DiNardo, J., N.M. Fortin, and T. Lemieux (1996). "Labor Market Institutions and the Distribution of Wages, 1973-1992: A Semiparametric Approach." *Econometrica* 64(5): 1001–44.

Domeij, D. and J. Heathcote (2004). "On the Distributional Effects of Reducing Capital Taxes." *International Economic Review* 45: 523–54.

Fairfield, T. and M. Jorratt De Luis (2015). "Top Income Shares, Business Profits, and Effective Tax Rates in Contemporary Chile." *Review of Income and Wealth* 62(1): 120–44.

Guner, N., R. Kaygusuz, and G. Ventura (2014). "Income Taxation of U.S. Households: Facts and Parametric Estimates." *Review of Economic Dynamics* 17(4): 559–81.

Heathcote, J., F. Perri, and G.L. Violante (2010). "Unequal We Stand: An Empirical Analysis of Economic Inequality in the United States, 1967–2006." *Review of Economic Dynamics* 13(1): 15–51.

Huggett, M. (1996). "Wealth Distribution in Life-Cycle Economies." *Journal of Monetary Economics* 38(3): 469–94.

Madeira, C. (2011). "Computing Population Weights for the EFH Survey." Mimeo.

Madeira, C. (2015). "Identification of Earnings Dynamics using Rotating Samples over Short Periods: the Case of Chile." Working Paper No. 754, Central Bank of Chile.

Quadrini, V. (2000). "Entrepreneurship, Saving, and Social Mobility." *Review of Economic Dynamics* 3(1): 1–40.

Quadrini, V. and J.-V. Ríos-Rull (1997). "Understanding the U.S. Distribution of Wealth." *Federal Reserve Bank of Minneapolis Quarterly Review* 21(2): 1–21.

Saez, E. and G. Zucman (2014). "Wealth Inequality in the United States since 1913: Evidence from Capitalized Income Tax Data." Technical Report, National Bureau of Economic Research.

Sanhueza, C. and R. Mayer (2011). "Top Incomes in Chile using 50 Years of household Surveys: 1957-2007." *Estudios de Economía* 38(1): 169–93.

Uribe, F. and F.E. Martinez (2016). "Determinants of Household Position in the Wealth Distribution in Chilean Households.

PUBLICACIONES

- Análisis Teórico del Impacto de la Crisis Petrolera. 1980.
- Anuario de Cuentas Nacionales. Publicación anual desde 1997 a 2003. Discontinuada a partir de 2004 y reemplazada por la publicación Cuentas Nacionales de Chile.
- Aplicación de la Ley N° 19.396 sobre Obligación Subordinada. 1996.
- Aspectos Relevantes de la Inversión Extranjera en Chile. Decreto Ley N° 600. 1984.
- Balanza de Pagos de Chile. Publicación anual. Desde la edición 2012 solo en versión digital. Discontinuada a partir del 2014 y reemplazada por la publicación Balanza de Pagos, Posición de Inversión Internacional y Deuda Externa.
- Balanza de Pagos, Posición de Inversión Internacional y Deuda Externa. Publicación anual. Disponible solo en versión digital.
- Balanza de Pagos, Posición de Inversión Internacional y Deuda Externa. Publicación trimestral. Disponible solo en versión digital.
- Banca Central, Análisis y Políticas Económicas. Volúmenes 1 al 26.
- Banco Central de Chile 1925-1964: Una Historia Institucional. Volumen I. 2019.
- Banco Central de Chile 1964-1989: Una Historia Institucional. Volumen II. 2019.
- Banco Central de Chile. 1995.
- Banco Central de Chile: Preceptos Constitucionales, Ley Orgánica y Legislación Complementaria. 2000.
- Boletín Estadístico. Publicación bimensual. Disponible solo en versión digital.
- Boletín Mensual. Publicación mensual. Desde la edición de julio del 2013, solo en versión digital. Reemplazado a contar de marzo del 2018 por la publicación Boletín Estadístico.
- Características de los Instrumentos del Mercado Financiero Nacional. Diciembre 2005.
- Catálogo de Monedas Chilenas. 1991.
- Comisión Nacional Encargada de Investigar la Existencia de Distorsiones en el Precio de las Mercaderías Importadas. 1994.
- Comisión Nacional Encargada de Investigar la Existencia de Distorsiones en el Precio de las Mercaderías Importadas. Antecedentes Estadísticos. 1981-2015. 2016. Edición en español y en inglés.
- Constitutional Organic Act of the Central Bank of Chile, Law N° 18,840. 2002.
- Crecimiento Tendencial: Proyección de Mediano Plazo y Análisis de sus Determinantes. Septiembre 2017. Disponible solo en versión digital.
- Cuantificación de los Principales Recursos Minerales de Chile (1985-2000). 2001.
- Cuentas Ambientales: Metodología de Medición de Recursos Forestales en Unidades Físicas 1985-1996. 2001.
- Cuentas Financieras de la Economía Chilena 1986-1990. 1995.
- Cuentas Nacionales de Chile 1960-1983. 1984.
- Cuentas Nacionales de Chile 1974-1985. 1990.
- Cuentas Nacionales de Chile 1985-1992. Síntesis Anticipada. 1993.
- Cuentas Nacionales de Chile 1985-1992. 1994.
- Cuentas Nacionales de Chile. Compilación de Referencia 2013. 2016.
- Cuentas Nacionales de Chile. Métodos y Fuentes de Información. 2017.
- Cuentas Nacionales de Chile. Publicación anual. Desde la edición 2008-2012, solo en versión digital.
- Cuentas Nacionales de Chile. Publicación trimestral. Disponible solo en versión digital.
- Cuentas Nacionales por Sector Institucional. Publicación trimestral. Disponible solo en versión digital.
- Cuentas Nacionales Trimestralizadas: 1980-1983. 1983.
- Chile: Crecimiento con Estabilidad. 1996.
- Deuda Externa de Chile. Publicación anual. Edición bilingüe. Desde la edición 2012, solo en versión digital. Discontinuada a partir del 2014 y reemplazada por la publicación digital anual Balanza de Pagos, Posición de Inversión Internacional y Deuda Externa.
- Disposiciones sobre Conversión de Deuda Externa. 1990.
- Documentos de Política Económica. N°s 1 al 68.
- Documentos de Trabajo. N°s 1 al 858.
- Economía Chilena. Publicación cuatrimestral.
- Economía para Todos. Octubre 2016.
- Economic and Financial Report. Publicación mensual desde 1983 a 2003. Discontinuada a partir de enero de 2004.
- Estatuto de la Inversión Extranjera DL 600. 1993.
- Estudios Económicos Estadísticos. N°s 50 al 130.
- Estudios Monetarios. I al XII. 1996.
- Evolución de Algunos Sectores Exportadores. 1988.
- Evolución de la Economía y Perspectivas. Publicación anual desde 1990 a 1999. Discontinuada a partir del 2000.
- Evolución de las Principales Normas que Regulan el Mercado Financiero Chileno. Período: Septiembre 1973-Junio 1980. 1981.
- Evolución de los Embarques de Exportación. 1988.
- General Overview on the Performance of the Chilean Economy: The 1985-1988 Period. 1989.
- Gestión de Pasivos del Banco Central de Chile. 2012. Edición en español. En inglés, disponible sólo en versión digital.
- Gestión de Reservas Internacionales del Banco Central de Chile. 2012. Edición en español. En inglés, disponible sólo en versión digital.
- Gestión de Sistemas de Pagos de Alto Valor del Banco Central Chile. 2018. Edición en español y en inglés, disponibles sólo en versión digital.
- Guía de Estilo en Inglés. 2017.
- Iconografía de Monedas y Billetes Chilenos. Noviembre 2009.
- Indicadores de Comercio Exterior. Publicación mensual hasta diciembre de 2003 y trimestral a partir del 2004. Desde la edición del segundo trimestre del 2013, solo en versión digital.
- Indicadores Económicos y Sociales de Chile 1960-2000. 2001. Edición en español y en inglés.
- Indicadores Económicos y Sociales Regionales 1980-1989. 1991.
- Indicadores Económicos y Sociales Regionales de Chile 1980-2010. 2012. Disponible sólo en versión digital.
- Indicadores Macroeconómicos / Indicadores Coyunturales. Publicación trimestral. Edición en español e inglés. Disponible sólo en versión digital. Discontinuada a partir del 2019.
- Índices de Exportación: 1986-1999. 2000.
- Informativo Diario de Operaciones Financieras Nacionales. Edición en español. Desde el 2013, disponible sólo en versión digital.
- Informe de Estabilidad Financiera. Publicación semestral. Desde la edición del segundo semestre del 2012, disponible solo en versión digital.
- Informe de Percepciones de Negocios. Publicación semestral hasta mayo del 2014 y trimestral a partir de agosto del 2014. Edición en español. Disponible sólo en versión digital.
- Informe de Política Monetaria. Publicación cuatrimestral hasta septiembre del 2009 y trimestral a partir de diciembre del 2009. Desde la edición del tercer trimestre del 2012, disponible solo en versión digital.
- Informe Económico de Chile. Publicación anual desde 1981 a 1984. Discontinuada a partir de 1985.
- Informe Económico y Financiero. Publicación quincenal desde 1981 al 2003. Discontinuada a partir de enero del 2004.
- Informe Mensual de Estadísticas del Mercado Cambiario. Disponible sólo en versión digital.
- Informe Mensual de Estadísticas del Mercado de Valores. Disponible sólo en versión digital.
- Informe Mensual de Estadísticas Monetarias y Financieras. Disponible sólo en versión digital.
- Investigación al Día. Edición trimestral en español. Disponible sólo en versión digital.
- Invirtiendo en Chile. 1991.
- La Emisión de Dinero en Chile. Colección de Monedas y Billetes del Banco Central de Chile. Julio 2005.
- La Política Monetaria del Banco Central de Chile en el Marco de Metas de Inflación. 2007. Edición en español y en inglés.
- Legislación Económica Chilena y de Comercio Internacional. 1982.
- Legislación Económica y Financiera. 2006. Disponible solo en versión digital.
- Ley Orgánica Constitucional del Banco Central de Chile. 2016.
- Matriz de Insumo Producto para la Economía Chilena 1986. 1992.
- Matriz de Insumo Producto para la Economía Chilena 1996. 2001.
- Memoria Anual del Banco Central de Chile. Publicación anual. Edición en español. En inglés, disponible sólo en versión digital.
- Mercado Laboral: Hechos Estilizados e Implicancias Macroeconómicas. Diciembre 2018. Disponible solo en versión digital.
- Modelos Macroeconómicos y Proyecciones del Banco Central de Chile. 2003.
- Nueva Familia de Billetes para Chile. 2013. Edición bilingüe español-inglés.
- Pintura Chilena Colección del Banco Central de Chile. Octubre 2004.
- Política Monetaria del Banco Central de Chile: Objetivos y Transmisión. 2000. Edición en español y en inglés.
- Políticas del Banco Central de Chile 1997-2003. 2003.
- Presentation of the Bill on the Constitutional Organic Law of the Central Bank of Chile. 1989.
- Principales Exportaciones y Países de Destino. Publicación anual desde 1980 a 1982. Discontinuada a partir de 1983.
- Proyecto de Ley Orgánica Constitucional del Banco Central de Chile. 1988.
- Publicaciones Académicas. 2010. Edición bilingüe. Discontinuada a partir de agosto del 2004.
- Recopilación de la Legislación Bancaria Chilena. 1980.
- Serie de Comercio Exterior 1970-1981. 1982.
- Serie de Datos Bancarios. Edición mensual. Disponible sólo en versión digital.
- Serie de Estudios Económicos. 1 al 49. Publicación redenominada, a partir del número 50, con el nombre de Estudios Económicos Estadísticos.
- Series Monetarias. 1979.
- Síntesis de Normas de Exportación y Otras Disposiciones Legales. 1987.
- Síntesis Estadística de Chile. Publicación anual. Edición en español y en inglés.
- Síntesis Monetaria y Financiera. Publicación anual. Discontinuada a partir del 2012 y reemplazada por las publicaciones digitales Informe Mensual de Estadísticas Monetarias y Financieras, el Informe Mensual de Estadísticas del Mercado Cambiario, y el documento Serie de Datos Bancarios.

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