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Can correcting for real exchange rate misalignment help countries escape the middle-income-trap? An analysis of a natural resource-based economy: Chile*

A correção do desalinhamento da taxa de câmbio real pode ajudar os países a escapar da armadilha da renda média? Uma análise de uma economia baseada em recursos naturais: Chile

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RESUMO: O Chile é classificado como um país de alta renda, mas sofre das mesmas fraquezas que afetam os países de renda média. As mesmas políticas que estimularam a dependência dos recursos naturais e restringiram a expansão da base produtiva e exportadora, impediram a utilização da política cambial como instrumento de desenvolvimento econô-

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mico e social. O desempenho da economia é fortemente determinado pela evolução dos termos de troca que se correlaciona negativamente com a taxa de câmbio real. Além disso, a taxa de câmbio nominal tem sido usada principalmente como instrumento para fins de estabilidade de preços e não para desenvolvimento econômico. Com base nos conceitos de desalinhamento cambial desenvolvidos pelo Novo Desenvolvimentismo, a análise mostra que, no nível macroeconômico, a taxa de câmbio real se valorizou ao longo do tempo. No entanto, as evidências também mostram que o setor industrial/manufatureiro possui uma vantagem competitiva de preço externo em relação ao restante da economia. Isso levanta a questão mais ampla de até que ponto a competitividade de preços é um incentivo poderoso o suficiente para uma mudança estrutural de base ampla em direção à inovação e à produção mais intensiva em conhecimento, necessária para escapar da armadilha da renda média.
PALAVRAS-CHAVE: Chile; taxa de câmbio real de equilíbrio industrial; desalinhamento da taxa de câmbio real; taxa de câmbio real consistente com o equilíbrio da balança comercial; armadilha da renda média; termos de troca.

ABSTRACT: Chile is classified as a high-income country but suffers from the same weaknesses affecting middle-income countries. The same policies that have encouraged the dependency on natural resources and restricted the expansion of the productive and export base, have prevented the use of exchange rate policy as an instrument of economic and social development. The performance of the economy is greatly determined by the evolution of the terms-of-trade which is negatively correlated with the real exchange rate. Also, the nominal exchange rate has been used mainly as an instrument for price stability purposes rather than for economic development. Building on the exchange rate misalignment concepts developed by the New Developmentalism, the analysis shows that, at the macroeconomic level, the real exchange rate has appreciated over time. However, the evidence also shows that the industrial/manufacturing sector has an external price competitive advantage in relation to the rest of the economy. This raises the broader question as to what extent is price competitiveness a powerful enough incentive for a broad-based structural change towards innovation and more knowledge intensive production which is needed to escape the middle-income trap.
KEYWORDS: Chile; industrial equilibrium real exchange rate; real exchange rate misalignment; real exchange rate consistent with equilibrium in balance of trade; middle-income trap; terms of trade.
JEL Classification: E32; F41; O11; O24; O54.

INTRODUCTION

Chile is classified as a high-income country but suffers from the very same weaknesses that characterize middle-income countries including low levels of productivity, a narrow technology and research base, and an economic structure based on comparative advantage rather than on knowledge intensive production.[1] These

[1] The middle-income trap (MIT) refers to countries that cannot compete on the basis of low wages, but

features severely limit the country's capacity to compete and narrow its economic and social gaps with more advanced economies. In this sense, as is the case with other of Latin American economies, Chile is stuck in the middle-income trap.

This outcome is the result of roughly five decades of free market-oriented policies (1973-2021) which encouraged the expansion of production based on comparative advantage. This has made the economy highly dependent on natural resources and, particularly, on mining. At the same time, these policies have not strengthened the linkages between natural resources and other sectors of the economy and have restricted the space and scope for diversification along non-traditional lines of production.

This paper argues that these policies have also prevented the use of exchange rate policy as an instrument of economic and social development.

The dependency on natural resources implies that the performance of the economy is determined to a great extent by the evolution of the terms-of-trade. The observed tendency of the changes in the terms-of-trade to negatively correlate with the real exchange rate creates an important conflict between the incentives benefiting natural resource-based sectors and non-natural resource-based industry and manufacturing. An increase in the terms-of-trade has a positive effect of natural resource-based sectors but, at the same time, since it is accompanied by an appreciation of the real exchange rate limits the possibilities of developing the manufacturing sector. The fact that the terms-of-trade are determined to large extent by financial factors underscores the dependency of economic and social development on the vagaries of financial external conditions.

Another important aspect to take into consideration is the use of nominal exchange rate as a tool to maintain nominal stability. This has been the main role assigned to the nominal exchange rate since the adoption of free market policies in Chile. Initially, during the period ranging from the 1980s until 1998, the authorities' opted for a managed floating exchange rate regime within which the exchange rate acted as a nominal anchor along with the price level.

Later, in consonance with the adoption of an inflation targeting regime in 1999, the exchange rate was allowed to freely float. Within an inflation targeting framework fluctuations in the nominal exchange rate act as a buffer stock that insulates the domestic economy from the vagaries of external conditions. This has made the variation in the nominal and real exchange rate dependent on the changes in financial flows but also risk perceptions as happened during the series of crisis that affected Latin American economies in the second half of the 1990s including the Asian Crisis, Russian and Brazilian Crises.

The overall evidence shows that, as a result, of these constraints, the real exchange rate has witnessed an appreciating trend over time and, also over the business cycle. Business cycle analysis shows that while there is no difference in the

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that, at the same time, have not developed the necessary capabilities to compete on the basis of innovation, technological change and knowledge intensive goods and services (Paus, 2012) intensity with which the real exchange rate appreciates or depreciates, the periods of appreciation last longer than the periods of depreciation. A further examination of the misalignment of the real exchange rate (computed as the deviation of the real exchange rate *RER* from the real exchange rate that is consistent with the equilibrium in the balance of trade of goods and services (RER_{BT}) reinforces this finding. The most important period of appreciation which corresponds to the commodity super-cycle combined increases in the terms-of-trade within a free-floating exchange rate regime.

Despite the macroeconomic policy and institutional constraints affecting the potential development of the non-natural resource sector, there are sectoral price incentives that could benefit the manufacturing/industrial sector. The empirical evidence shows that the industrial equilibrium exchange rate ($IERER_{CL}$) which reflects the relative external price-competitiveness of the manufacturing/industrial sector is undervalued relative to the observed real exchange rate (*RER*) which is a proxy for the price-competitiveness of all the sectors of the economy, and also with respect to the real exchange rate consistent with current account equilibrium (RER_{CA}). This also implies that the economy has space for expansionary policies without undercutting, up to a point, the external competitiveness of this sector.

These findings raise a bigger question, that is, to what extent, is price competitiveness a powerful enough incentive to change the country's productive structure and incentivize a broad-based structural change towards innovation and more knowledge intensive production which is needed to escape the middle-income trap.

This paper is divided into seven sections. The second section presents a series of economic and social indicators which show that Chile faces the same challenges and weaknesses as other middle-income countries. The third section provides a brief explanation of the main building blocks of the Chilean development model highlighting the role of the exchange rate. The fourth section analyzes the evolution of the trend in the real exchange rate over time and its cycle characteristics.

The fifth and sixth sections build on real exchange rate indicators and misalignment measures developed by the New Developmentalism. The fifth section presents the econometric estimation of the real exchange rate consistent with the balance-of-trade in goods and services equilibrium (RER_{BT}). The section then goes on to compare the RER_{BT} with the observed real exchange rate (*RER*) explaining the misalignment between both. The sixth section introduces the industrial equilibrium real exchange rate ($IERER_{CL}$) and contrasts its behavior with that of the observed real exchange rate and the real exchange rate consistent with equilibrium in the balance-of-trade of goods and services (*RER* and RER_{BT}). This section also analyzes the composition of Chile's export basket underscoring the difficulty involved in changing the production and export structure. The final thoughts are presented in seventh section.

AN ANALYSIS OF THE PERFORMANCE OF THE CHILEAN ECONOMY: THE RESULTS

Since the implementation of free market-oriented policies Chile steadily increased its income per capita and narrowed the income gap with developed countries. In the 1980s, GDP per capita averaged US$ 1,946 dollars which represented 18% of that of OECD member states. During the period 2010-2020, it had reached US$ 13,785 dollars (roughly 37% that of OECD members states). In 2011 one year after joining the OECD, Chile made the transition from a middle to a high-income country.

However, an in-depth analysis of the different dimensions of Chile's economic, technological, and social development and their evolution over time show that, as things stand, the country shares many of the same development gaps and challenges that characterize middle-income countries (Table 1).

Available evidence indicates that since the early 1990s, the Chilean economy exhibits a persistent decline in its long-term growth rate. The trend rate of growth of GDP declined on average from 6.6 per cent in the 1990s, to 4.4 per cent in the 2000s to a 2.9 per cent in the period 2010-2020. In 2020, the COVID-19 Pandemic produced the biggest drop in GDP growth (-6.8%) since the 1980s Debt Crisis (-11.0% in 1983).

Economic activity for the period 1990-2019, is in turn, explained by a deteriorating performance in the main determinants of long-term growth, including investment and productivity.

Investment contributes to long-term growth through three channels. Investment can increase the growth in the capital stock which in turn usually increases the economy's ability to generate and sustain employment. Investment also has an induced effect of investment on the other components of aggregate demand. A larger investment spending multiplier generates greater demand for inputs and finished products, and this then acts as a further stimulus to investment (i.e., it acts as an accelerator). Finally, investment can generate productivity gains. As capital is accumulated, the successive units of capital stock put to use in the production process absorb greater technological progress and innovation which impact positively on productivity.

The evolution of investment and of its most important component, machinery, and equipment (the component with the highest technology content, and that can contribute most to growth in the economy), show a loss of dynamism since the 1990s. Total investment averaged 24.8%, 21.6%, and 23% of GDP for the 1990s, 2000s, and 2010-2020. For its part trend investment growth averaged 10.7%, 8.4% and 2.7% for the periods respectively.

In line with these observations, factor productivity expanded at a rate equal to 2.94%, 0.21% and -0.16% for the 1990s, 2000s and 2010-2019. Relative labor productivity of Chile with respect to that of the United States has remained below 30% for the entire period under consideration.

Table 1: Chile: selected economic and social indicators (1980-2019; averages)

	1980s	1990s	2000s	2010-2020a/
Growth and income				
GDP growth trend (percentages) b/	3.4	6.6	4.4	2.9
GNI per capita (US$) b/	1,946	4,093	6,634	13,785
Composition of GDP by sector of economic activity				
Natural resources (per cent of GDP)	15	23.9	23.4	17.5
Mining (per cent of GDP)	9.0	20.2	19.7	14.0
Manufacturing (per cent of GDP)	20.8	14.7	12.3	10.3
Finance (per cent of GDP)	9.1	14.9	17.8	20.5
Investment (per cent of GDP)	18.0	24.8	21.6	23.0
Terms-of-trade				
Terms-of-trade	95.7	93.0	94.4 98.0	101.4
Rate of growth of terms-of-trade	1.2	-0.6	0.6 2.8	0.5
Price of Copper ($/mt)	2,728	2,583	4,616	6,508
Rate of growth of price of copper	100.9	97.2	116.3	102.4
Terms-of-trade, real exchange rate and economic activity (correlation)				
Terms-of-trade and real exchange rate	-0.30	-0.07	-0.59	-0.37
Real exchange rate and economic activity	…	-0.52	-0.21	-0.26
Real exchange rate and mining economic activity	…	-0.04	0.11	0.03
Real exchange rate and industrial economic activity	…	-0.28	-0.32	-0.22
Productivity c/				
Productivity growth	-1.28	2.94	0.21	-0.16
Relative productivity	21.8	25.9	28.9	28.7
Research and development expenditure (per cent of GDP) d/	…	…	…	0.36
Technological intensity e/				
Economic Complexity Index (ECI)	0.04	0.05	-0.11	-0.02
Engineering intensity Index (EII)	18.1	20.4	24.8	31.2
Poverty and inequality f/				
Poverty	45.1	27.4	31.5	14.2
GINI	56.2	55.8	49.7	45.2

Note: a/ 2020 or latest year available.

b/The GDP growth trend was computed using a Hendrick-Prescott filter. GDP and its composition by sector expressed in constant 2010 US$ dollars. GNI per capita is expressed in current US$ dollars using the Atlas method.

d/ Productivity refers to labour productivity. Relative productivity refers to Chile's labour productivity relative to that of the United States.

e/ Corresponds to the average for the period 2007-2017.

f/ EII is the ratio between the share of high technology exports in total manufacturing exports for Chile relative to the share of high technology exports in total manufacturing exports for the United States. Higher values of both indices imply greater technological intensity. For EII the data reported for the 2000s decade correspond to the 2007-2009 average.

e/ Poverty headcount ratio at national poverty lines (per cent of population). For GINI the data reported for the 1980s decade corresponds to the point value for 1987.

Source: Authors' own computations on the basis of data from the World Bank (WDI, 2022), Observatory of Economic Complexity (OEC, 2020) y CEPALSTAT (2020).

The poor performance of productivity is a part of the technological lag that characterizes the Chilean economy relative to developed countries. This is illustrated in the decline and low values of the economic complexity and engineering intensity indices.

The former reflects information regarding the diversity and sophistication of a country's exports. The latter captures the share of high technology manufacturing of a country's exports as a percentage of total manufacturing exports relative divided by the share of United States high technology manufacturing exports as a percentage of its total manufacturing exports. In the case of the engineering intensity index, the value obtained by Chile for the 2000s means that its proportion of high technology manufacturing exports relative to the total represents 31.2% per cent of that of the United States.

THE CHILEAN MODEL AND EXCHANGE RATE POLICY

The entrenchment of Chile at middle income levels is the product of fifty years of neoliberal free market policies.[2] These have focused on comparative advantage as the key principle on which to sustain the country's development, fostering natural resource-based specialization. This has made the performance of the economy highly dependent on the fluctuations in the terms-of-trade and, particularly on the evolution of the price of copper.

The focus placed on natural resources has gone hand in hand with increased privatization and price flexibility over the productive apparatus including agriculture, mining, manufacturing, and services. Mining has been largely privatized through a system of concessions, despite of the fact that the constitution gives explicit ownership of all mines to the Chilean state. The private sector has the majority ownership of telecommunications, financial, transport and maritime services. Social services such as health, education, and pensions, where the government has had a historically important presence, have also been privatized.[3]

Improvements in the external conditions necessary for the expansion of natural resource-based production and exports do not coincide with those, such, as for example, a competitive real exchange rate, which may be required for the development of non-natural based production and exports. The available evidence for the period 1980-2020 shows that the correlation coefficient between variations in the real exchange rate and industrial activity is statistically significant (Table 1). Yet, the terms-of-trade tend to move inversely with the real exchange rate. With the exception, of the 1990s decade, variations in the terms-of-trade show a statistically significant negative correlation with variations in the real exchange rate (Table 1).

In addition, by significantly constraining the use of exchange rate policy as an

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[2] Chile adopted free market policies in 1973.

[3] The pension system was privatized in 1981.

instrument of economic and social policy, free market policies, have penalized the development of other sectors, such as manufacturing, that are considered central to spur growth and development. In this sense, the focus placed on natural resource-based sectors has failed to establish the required linkages and spill overs, between these and the rest of economic activity.

Exchange rate policy has served the interests of nominal stability rather than those of productive development. Since the middle of the 1980s until 1999, the adoption of a managed float provided a basis for the use of the exchange rate as a nominal anchor. Thereafter, Chile switched to a free-floating exchange rate regime consistent with full-fledged inflation targeting.

According to inflation targeting the hierarchical objective of monetary policy is to maintain price stability by dampening aggregate demand fluctuations around a long-term supply determined trend. Within this monetary framework, the exchange rate has been given the role of a shock absorber isolating the impact of external disturbances on the domestic economy which become more prevalent with increased commercial and financial integration with the rest of the world.

Achieving these objectives requires the credibility and reputation of the central bank which can only be gained by having the status of an independent and autonomous body free from political influences and control. The Central Bank of Chile became autonomous in 1989.

The use of the exchange rate for nominal stability is, thus part, of a broader macroeconomic strategy which also includes a rules-based fiscal policy which adjusts public spending levels in accordance with the long-run behaviour of the economy. The aim is to achieve fiscal balance over the cycle to ensure an adequate external risk credit rating of the economy and provide the required space for the functioning of monetary policy.[4]

THE EVOLUTION OF EXCHANGE RATE REGIMES: TREND AND CYCLE

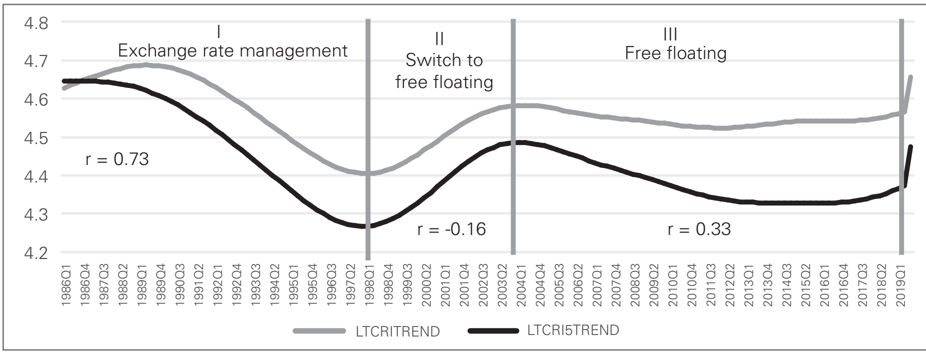
The available empirical evidence regarding the behavior of the trend in the real exchange rate ranging from the beginning of 1986 until the end of 2020 shows the existence of three distinct stages.

The first one includes the period ranging from 1986 until the beginning of 1998 and is characterized by a sustained real exchange rate appreciation. During this stage, the exchange rate acted as a nominal anchor. The appreciation of the exchange rate coincides with a significant decline from a two to a one-digit annual inflation rate (19.5% to 5.1% for 1986 and 1998 respectively). The simple correlation coefficient between the rate of inflation and the rate of change in the nominal exchange

[4] Within this strategy, the role of government is recognized as being subsidiary to that of the market, and its interventions are limited to providing a minimal social safety net and correcting for market imperfections.

rate is 0.73 which is statistically significant at the 1% level of confidence and is the highest throughout the entire period (Figure 1).

Figure 1: Chile – Evolution of the trend in real exchange rate indices (1986=100) in logarithms 1986q1-2020q4



Note: LTCRITREND= logarithm of the real exchange rate trend. It represents a measure of the nominal value of the peso against a broad basket of foreign currencies, weighted according to the flow of international trade. The calculation of the weights is based on the shares of each trading partner, according to the flow of trade registered in the previous year. LTCRI5TREND= logarithm of the real exchange rate trend that includes the currencies of: United States, Japan, United Kingdom, Canada, and those of the countries of the Euro Zone. The trend was obtained using a Hodrick-Prescott filter.
Source: Authors' own on the basis of Central Bank of Chile (2022) and FRED (2022).

The use of the exchange rate as a nominal anchor was instrumentalized by establishing exchange rate bands which prevailed since 1984, until the adoption of inflation targeting regime in 1999.

Following the establishment of the autonomy of the central bank in 1989, the authorities initially managed the exchange rate (1991-1992) through a crawling peg in relation to the dollar accompanied by daily devaluations according to the internal-external inflation differential. Thereafter, the exchange rate regime switched to a target zone around a basket peg. The central parity was tied to a basket of currencies including the United States dollar, the Deutsche Mark and the Japanese Yen. Thereafter during 1992-1999, there were several and frequent modifications to the central parity, to the currency basket weighs and to the bands. In fact, overall, from 1992 until 1999, there were ten different changes to the parameters of the exchange rate target zone regime (see Table 2 below).

The period of exchange rate appreciation ended abruptly with the onset of the East Asian Financial Crisis (1997-1998) and its impact across developing regions including in Latin America. This marks the beginning of the second stage in the evolution of the real exchange trend. This second stage is characterized by a depreciation of the real exchange rate lasting until the beginning of 2003.

As a result of the East Asian Crisis, Chile experienced, in 1998, at the same time a terms-of-trade shock and significant capital outflows. These were reflected in a widening of the current account deficit from 4% to 5% of GDP for 1997 and 1998, and in a reduction in the surplus in the financial account of the balance-of-

-payments from 8% to 2% of GDP respectively. During this time the exchange rate witnessed a rapid depreciation in both nominal and real terms. The resulting deficit in the balance-of-payments position had to be covered by reserves. The change in international reserves which was positive in 1997 representing 4% of GDP turned negative in 1998 reaching (3% of GDP).

To avoid further deterioration in the reserve position of the country the central bank raised its policy interest rate from 6.9% in January to 12.8% in October 1999, which provoked a contraction in aggregate demand reflected mostly in a contraction in investment (-18% in real terms in 1999) and a decline in the rate of growth of GDP (1% in 1999). The consequent contraction in income passed through to imports, managing eventually to redress the balance of payments imbalance and in 1999 Chile recorded a surplus in its current account balance (equivalent to 0.1% of GDP). The depreciation of the real exchange rate lasted until the end of 2003.

During this second stage, the empirical evidence reveals a clear decoupling between the inflation rate and the rate of change in the nominal exchange rate. The simple correlation coefficient between both variables is negative (-0.16). This reflects the switch in exchange rate regime strategy from a managed float to a free float consistent with the tenets of a full-fledged inflation targeting regime which Chile adopted in 1999.

The third stage is characterized by the implementation of a full-fledged inflation targeting regime. Inflation targeting is traditionally defined as a monetary policy strategy framework consisting in the public announcement of numerical targets for the inflation rate, acknowledging that price stability is the fundamental goal of monetary policy and a firm commitment to transparency and accountability.[5]

According to this framework, the hierarchical goal of the monetary authorities is price stability which should be the only nominal anchor having priority over other goals such as exchange rate stabilization. Similarly, any other type of measure such as those pertaining to exchange rate policies should not conflict with price stability. For these reasons the most advisable exchange policy in principle is that which nears a free float.

This type of regime also ensures that variations in the nominal exchange rate are meant to reflect the fluctuations in external conditions and absorb their impact so as, to shield the domestic economy from their impact. As explained by the Cen-

[5] Bernanke et al. (1999, p.4) define inflation targeting as a: "framework for monetary policy characterized by the public announcement of official quantitative targets (or target ranges) for the inflation rate over one or more time horizons, and by the explicit acknowledgement that low, stable inflation is monetary policy's primary goal." According to Mishkin (2004) inflation targeting comprises five distinct but interrelated aspects: "(i) the public announcement of medium-term numerical targets for inflation; (ii) an institutional commitment to price stability as the primary goal of monetary policy; (iii) an information inclusive strategy in which many variables, and not just monetary aggregates or the exchange rate, are used for deciding the setting of policy instruments; iv) increased transparency of the monetary policy strategy through communication with the public and the markets about the plans, objectives, and decisions of the monetary policy authorities; and v) increased accountability of the central bank for attaining its inflation objectives." Svenson (2007) provides a similar definition.

Table 2: Chile: exchange rate regime, policy changes and target and actual inflation (1989-1999)

Date	Exchange rate regime	Exchange rate policy changes	Target inflation	Actual rate of inflation
End of 1989	Central parity of peso with the US$ dollar with daily devaluations reflecting the internal-external price differential. Bands of 5% around parity.		....	17.4%
April 1991	Central parity of peso with the US$ dollar with daily devaluations reflecting the internal-external price differential. Bands of 5% around parity.	2% revaluation of central parity.	15%-20%	19.2%
January 1992	Central parity of peso with the US$ dollar with daily devaluations reflecting the internal-external price differential. Bands of 10% around parity.	Increase in the bands widths from 5% to 10%. Revaluation of central parity by 5%.	13%-16%	16.7%
March 1992	Central parity of peso with the US$ dollar with daily devaluations reflecting the internal-external price differential. Bands of 10% around parity. Managed float.	Adoption of managed float.	13%-16%	15.9%
July 1992	Central parity of a basket of currencies with daily devaluations reflecting the internal-external price differential. Bands of 10% around parity. Managed float.	The exchange rate is determined on the basis of a basket of currencies. The weights for the central parity are as follows: 50% U.S. dollar; 30% the Deutsche Mark; 20% the Japanese Yen.	13%-16%	11.8%
November 1994	Central parity of a basket of currencies with daily devaluations reflecting the internal-external price differential. Bands of 10% around parity. Managed float.	Changes in the weights of currencies determining the central parity The weights are as follows: 45% U.S. dollar; 30% the Deutsche Mark; 25% the Japanese Yen. Revaluation of central parity by 9.7%.	9%-11%	7.8%
December 1995	Central parity of a basket of currencies with daily devaluations reflecting the internal-external price differential. Bands of 10% around parity. Managed float.	Revaluation of central parity by 2%.	9.0%	7.5%

Date	Exchange rate regime	Exchange rate policy changes	Target inflation	Actual rate of inflation
January 1997	Central parity of a basket of currencies with daily devaluations reflecting the internal-external price differential. Bands of 12.5% around parity. Managed float.	Revaluation of central parity 4%. Widening of the band to 12.5%. Changes in the weights of currencies determining the central parity. The weights are as follows: 80% U.S. dollar; 15% the Deutsche Mark; 5% the Japanese Yen.	5.5%	6.1%
June 1998	Central parity of a basket of currencies with daily devaluations reflecting the internal-external price differential. Asymmetric Bands of +2 and -3% around parity. Managed float.	Revaluation of 2%. Establishment of an asymmetric band with parameters of +2% and -3.5%.	4.5%	4.6%
September 1998	Central parity of a basket of currencies with daily devaluations reflecting the internal-external price differential. Band of 5% around parity. Managed float.	Establishment of a new 3.5% band increasing to a 5% band by the end of the year. Past inflation is replaced by target inflation for the computation of the central parity.	4.5%	4.0%
December 1998	Central parity of a basket of currencies with daily devaluations reflecting the internal-external price differential. Band of 8% around parity. Managed float.	Widening of the band to 8%.	4.5%	4.0%
January 1999	Central parity of a basket of currencies with daily devaluations reflecting the internal-external price differential. Band of 8% around parity. Managed float.	Changes currencies that determining the central parity. The currencies and respective weights are as follows: 45% U.S. dollar; 30% the Euro; 25% the Japanese Yen.		3.8%
September 1999	Free floating.			2.7%

Source: On the basis of Frankel et al. (2000), Mishkin (2004); Fontaine (2000); Central Bank of Chile (2009).

tral Bank of Chile: "The main advantages of a floating exchange rate regime are to facilitate the adjustment of the economy to real shocks, to prevent steep misalignments in the exchange rate (excessive rises or falls), to avoid a more costly adjustment in terms of product variability and, in principle, to reduce speculative capital movements."[6]

This strategy materialized in practice into an appreciating real exchange rate. During this period, the real exchange rate registered an appreciating trend, visible from the beginning of 2004 until the beginning of 2016.

The examination of the real exchange rate trend is complemented by an analysis of its cycle properties. This follows the classical cycle methodology which characterizes fluctuations (in our case of the real exchange rate) in terms of duration and intensity.[7] The duration (D) of an expansion is defined as the ratio the total number of quarters of expansion to the total number of peaks in a series. That is,

$$D = \frac{\sum_{t=1}^{T} S_t}{\sum_{t=1}^{T-1}(1 - S_{t+1})S_t} \qquad (1)$$

Where, S is a binary variable which takes a 1 during an expansion and 0 during a contraction. The numerator in (1)$(\sum_{t=1}^{T} S_t)$ denotes the total duration of expansions and the denominator $(\sum_{t=1}^{T-1}(1 - S_{t+1})S_t)$ measures the number of peaks in the series. For its part the intensity or amplitude (A) of the expansion is measured as the ratio of the total change in aggregate economic activity to the total number of peaks. That is,

$$A = \frac{\sum_{t=1}^{T} S_t \Delta Y_t}{\sum_{t=1}^{T-1}(1 - S_{t+1})S_t} \qquad (2)$$

Where, Y is a measure of economic activity (GDP in our cases) and the numerator in (4) $(\sum_{t=1}^{T} S_t \Delta Y_t)$ is the total change in economic activity.

In accordance with the analysis of trend of the real exchange rate, the results computed on a monthly basis, for the period January 1986-December 2919, show, the exchange rate shows a greater tendency to appreciate (which corresponds to a

[6] See https://www.bcentral.cl/en/web/banco-central/areas/monetary-politics.

[7] The Classical Cycle methodology was used. The Classical Methodology views the cycle as a set of turning points of a time series representing the level of aggregate economic activity without consideration to a trend. The inflection points of the series are then used as a basis to analyze the cycle in terms of a series of indicators such as the duration, intensity of an expansion (trough-to-peak) and a contraction (peak-to-trough) and the degree of coincidence between two given time series. Central to this approach is the identification of the turning points of a series. The turning points of a series are usually identified using the Bry-Boschan algorithm (1971) developed originally for monthly data and adapted to deal with quarterly observation by Harding and Pagan (2002). The algorithm consists in identifying local maxima and minima for a given series following a logarithmic transformation using specific censoring rules (Bry-Boschan, 1971; in the case of quarterly data these include the specification of two quarters for a minimum duration for a single phase, and a minimum duration of five quarters for a complete cycle (Harding and Pagan, 2002).

contraction) than to depreciate (which corresponds to an expansion) Table 3. According to the cycle analysis, the intensity of the periods of appreciation and depreciation are very similar, for both real exchange rate indices included in the analysis (-12.9% and 12.8% for LTRCI; -16%; and 14% for LTCRI5). However, according to the duration indicator, periods of appreciation tend to last longer than those of depreciation (15.3 and 12.7 months for LTCRI; 17.4 and 12.5 months for LTCRI5).

Table 3: Chile – Cycle indicators for real exchange rate (LTCRI, LTCRI5), terms-of-trade (LTOT) and mining and industrial activity (LACTMIN and LACTIND). 1986-2019. Monthly data

	Duration		Amplitude		Cumulation	
	Expansion	Contraction	Expansion	Contraction	Expansion	Contraction
LTCRI	12.7	15.3	0.128	-0.129	0.91	-1.21
LTCRI5	12.5	17.4	0.14	-0.16	0.98	-1.83
LTOT	12.6	13.5	0.05	-0.04	0.48	-0.31
LACTMIN	12.3	11.5	0.15	-0.13	1.32	-0.64
LACTIND	17.4	14.4	0.13	-0.09	1.75	-0.63

Note: LTCRI= logarithm of the real exchange rate It represents a measure of the nominal value of the peso against a broad basket of foreign currencies, weighted according to the flow of international trade. The calculation of the weights is based on the shares of each trading partner, according to the flow of trade registered in the previous year. LTCRI5= logarithm of the real exchange rate that includes the currencies of: United States, Japan, United Kingdom, Canada, and those of the countries of the Euro Zone. LTOT= Logarithm of the terms-of-trade. LACTMIN and LACTIND= logarithm of the index of mining and industrial activity.
Source: Authors' own computations using EViews 10 on the basis of Central Bank of Chile (2022).

BALANCE OF TRADE EQUILIBRIUM EXCHANGE RATE

This section explains and presents the estimation of the balance of trade equilibrium exchange rate, that is, the real exchange rate level that guarantees the intertemporal balancing of the country's balance of trade in goods and services account (RER_{BA}). It then compares the evolution of this measure of the real exchange rate with the observed real exchange rate (RER) The analysis builds on the conceptual framework of the New Developmentalism (Bresser-Pereira et al., 2020; Nassif et al., 2011, 2017).

Data and methodology

The methodology follows a two-step procedure. The first step consists in estimating a long run cointegrating relationship between the real exchange rate (RER), and a set of independent variables that capture both the influence of real and financial factors (Bresser-Pereira et al., 2021). Then, on this basis, in a second step, the real exchange rate consistent with the balance of trade in goods and services is computed (RER_{BA}).

The set of independent variables included in the estimation corresponding to the first step includes the terms of trade (*TOT*), the balance the trade balance of goods and services scaled by GDP (*BT*), and the Emerging Market Bond Index calculated by JP Morgan and used as a proxy of risk (*EMBI*).[8] Formally,

$$LREER = l\left(RER, \underset{-}{TOT}, \underset{+}{BT}, \underset{+}{EMBI}\right) \qquad (3)$$

Where LREER is the log of the real exchange.

In line with the argument made throughout the paper, the terms of trade (*TOT*), captures the influence of commodity prices on the real exchange rate (*RER*) (De Gregorio and Wolf, 1994; Cashin et al. 2004; Coudert et al., 2008). Due to the fact that primary commodities dominate the exports of developing countries, fluctuations in world commodity prices have the potential to explain a large share of movements in their terms of trade, a key determinant for real exchange rate fluctuations (Khan and Montiel, 1987; Clark and Macdonald, 1999). In the case of Chile, the evolution of the terms-of-trade depends to a great extent on the price of copper (De Gregorio and Labbé, 2011).

The response of the real exchange rate to commodity prices depends mainly on the price elasticities of supply and demand in the nontraded sectors and, also on the income elasticity of demand (Neary, 1988). On the one hand, tradable goods are subject to international competition and as a result their prices respond to world demand and supply. Small peripheral economies do not have any influence over commodity prices. On the other hand, non-tradable goods depend only on domestic demand and supply.

When commodity prices rise in international markets, commodity producers benefit from an income effect that leads to higher demand for non-tradable goods. Additionally, wages may also increase in the commodity sector of the producing country without loss of profitability (Couldert et al., 2008). The pay rise can spread to the other sectors, further increasing demand for local goods and raising the domestic price level. This mechanism is similar to that the "Balassa-Samuelson" effect (Balassa, 1964; Samuelson, 1964). Overall, an increase in commodity prices improves the terms of trade and appreciates the real exchange rate.

The evolution of commodity prices, and thus indirectly the real exchange rate (*RER*) are also driven by financial factors. For commodity exporters that are financially integrated with global markets, an increase in commodity prices may increase international investors' appetite for local financial assets. The higher desire to hold domestic assets translates into a greater volume of cross-border flows toward bonds, equities, and derivatives markets. Higher demand for local assets leads, in

[8] Unlike Bresser-Pereira et al. (2021), we do not include in our estimation per capita GDP and the interest rate differential with the U.S. The former represents a proxy of the Balassa-Samuelson effect (Balassa, 1964; Samuelson, 1964), while the latter captures the Central Bank's monetary policy. We tested both variables in our initial estimation, and we found no statistically significant evidence of their relevance. We interpret this result as a result of collinearity with other fundamentals. Indeed, the GDP per capita reflects many socioeconomic factors that may interfere with other variables. For the case of the interest rate differential, there exists a strong correlation with risk premium, as the latter depends on the former. Therefore, we opted for dropping both from our model.

turn, to greater demand for local currency, which appreciates the exchange rate in nominal terms as a result. Assuming domestic prices will remain unchanged, the nominal appreciation translates into RER appreciation. For the case of Chile, Nalin and Yajima (2021) argue that in the recent commodity boom period (2003-2013), Chile experienced rising commodities prices and, in turn, foreign investors shifted part of their portfolio composition toward the country.

Unlike past episodes, more integrated financial markets allowed international players to invest in broader financial instruments, such as derivative contracts and commodity-linked securities (CLNs). Ultimately, this caused the real exchange rate to follow the price of CLNs closely and experience a boom-and-bust trajectory. In this sense, the so-called phenomenon of financialization of the commodity markets (Chen and Xion, 2014) is an additional element to consider when analyzing the relationship between the real exchange rate, cross-border flows, and commodity prices. Indeed, a rise in the price of commodities may be the reflection of higher capital flows into commodity futures markets.

The inclusion of the balance of trade in goods and services (BT) reflects the fact that an overvalued RER makes imports cheaper and exports less competitive, thereby widening the current account deficit or narrowing the surplus. Contrarily, a higher level of the RER(depreciation) improves the current account in the long run. As a result, one would expect to find a positive long-run relationship between the RER and the balance of trade on goods and services (BT).

Equation(3) was estimated through cointegration techniques following Johansen's (1999) methodology[9]covering the period 2000-2019 and using quarterly data. All variables were estimated in logarithmic form. Equation 4 below reports the long run Vector Error Correction (VEC) model, which passes all the canonical specification tests:[10]

$$\begin{array}{llllll} RER_t = & 4.445 & -0.153 * TOT_t & +0.387 * BT & +0.170 * EMBI_t + e_t & \\ (t) & (8.260) & (-2.073) & (2.520) & (2.512) & \end{array} \qquad (4)$$

$$ECM = -0.103, \quad t = -2.777$$

In line with the theoretical framework of Equation (3), all dependent variables considered are found to have the right sign and be statistically significant at the one percent level.

The terms of trade report an elasticity coefficient -0.15; its negative sign supports the hypothesis that when Chile experiences an improvement in terms of trade, the

[9] Johansen's (1999) cointegration analysis requires that all variables have a unit root process, that is, that they are not stationary in their mean and variance (Enders, 2012). We perform the canonical Augmented Dickey-Fuller (ADF) and Phillipps-Perron (PP) tests, reported in the Annex. All variables are I(1), we thus proceed to the estimation of the VECM.

[10] One cointegrating vector; Trace = 45.17 (0.029), Max Eigenvalue = 65.66(0.00); LM(8) = 18.51 (0.56); HTSC(NCT) = 195.64 (0.086); Lutkepohl = 11.04 (0.20); White n.c. = 195.64 (0.087).

real exchange rate appreciates as a result. This result is in line with the previous empirical exercise[11] for Chile that estimated a coefficient for TOT within the range -0.13 to -0.89.

As suggested by the New-Developmentalism framework, the coefficient corresponding to the balance of trade in goods and services (*BT*) yields the highest level of statistical significance (in absolute terms) among the three determinants used in the VEC model.

In the case of EMBI, the coefficient is 0.17, that is, an increase in the government risk premium of ten percent corresponds to a real currency depreciation of 1.7%. Thus, as argued above, when the risk premium rises, the currency depreciates not only in in nominal terms, but also in real terms. To the extent of our knowledge, this is the first attempt to include *EMBI* as a determinant of the real exchange rate (*RER*) in Chile.

Impulse response functions (IRFs), reported in the Annex and calculated over a 30-quarter horizon, corroborate the sign for each coefficient obtained in Equation (4).

A one standard deviation shock (improvement) in the real exchange rate (*RER*) results in an appreciation by five consecutive quarters before reverting to its mean. For its part, a shock in the *EMBI* has a long-lasting effect on the real exchange rate (*RER*). Indeed, the results show that following an *EMBI* shock, the real exchange rate (*RER*) does not return to its previous levels, suggesting a hysteresis effect of financial risk on the exchange rate.

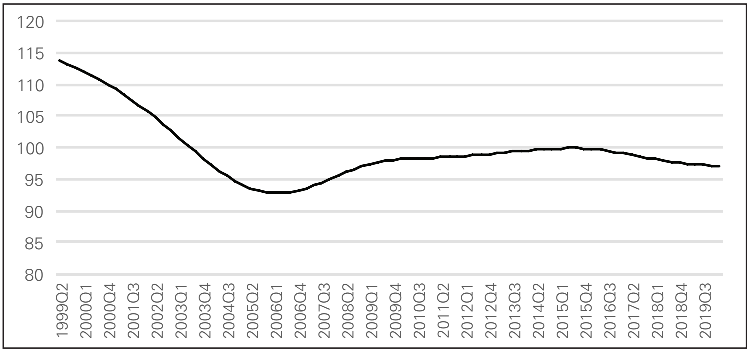
In order to obtain the real exchange rate that is consistent with equilibrium in the balance of trade in goods and services (RER_{BT}) two further steps are required. First, the computation of (RER_{BT}) requires that the balance of trade in goods and services be in equilibrium. As a result, the coefficient of the balance of trade in goods and services (*BT*) obtained in Equation (4) needs to be equal to zero. Second, the rest of the coefficients need to be multiplied by the long-run component of the observed independent variables, which is obtained by applying the Hodrick-Prescott filter to each of these variables.

Figure 2 shows the evolution of the observed real exchange rate (*RER*) and the real exchange rate for Chile consistent with equilibrium in the balance of trade in goods and services (RER_{BT}). From 1999 to 2006, the RER_{BT} recovers from the historical highs caused by the financial turmoil experienced globally at the end of the 1990s as a result of a sequence of financial crises including the East Asian (1997-1998), Russian (1998), Brazil (1999) crises.

Two factors explain the appreciation of theRER_{BT} by almost twenty percent during the 1999-2001 period. Risk premiums for emerging markets such as Chile decreased systematically as no significant financial turmoil hit the global economy until the Great Financial Crisis (2007-2008). Also, Latin American commodity producers and exporters, including Chile, benefitted from the commodities price

[11] De Gregorio y Labbé (2011), Caputo and Nuñez (2008), Calderón (2004), Caputo y Dominichetti (2005), Céspedes and De Gregorio (1999), and Soto y Valdés (1998).

Figure 2: Chile – Real exchange rate consistent with the balance of trade in goods and services equilibrium (RER_{BT})



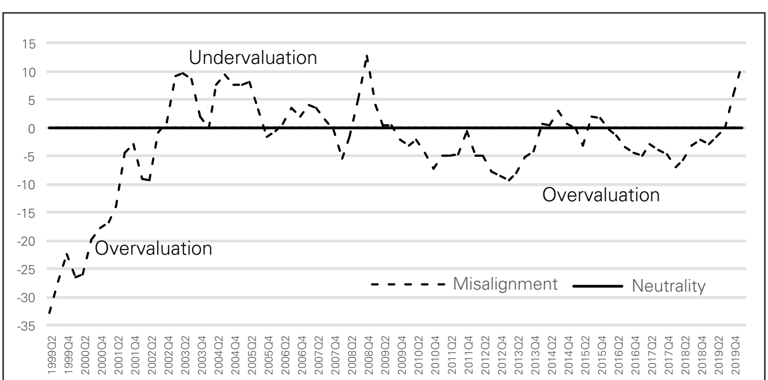
Source: Authors' own calculations on the basis of Central Bank of Chile (2020.

super-cycle during the 2000s decade leading to an improvement in the terms of trade and a consequent real exchange rate appreciation.

The Global Financial Crisis (2008-2009) marks an upward correction in the RER_{BT} due to its effect on EMBI, which spiked in response to this financial shock. In the aftermath of the crisis and until 2019, the RER_{BT} stabilized.

The comparison between the observed real exchange rate (RER) and the real exchange rate consistent with equilibrium in the balance of trade in goods and services (RER_{BT}) determines the degree of under or overvaluation of the currency. When the level of (RER) is above (below) the RER_{BT} the currency is undervalued (overvalued). Thus, the difference between the two variables defines the real exchange rate misalignment. This is shown in Figure 3.

Figure 3: Chile – Real exchange rate misalignment (1999-2019)
(Basis points. 2005= 100 Annual data)



Source: Authors' own calculations on the basis of Central Bank of Chile (2020).

The evidence shows that periods of overvaluation (negative misalignment) tend to predominate over those of undervaluation (positive misalignment). The former includes 1999-2002 and 2010-2019, and the later 2002-2009.

During 1999-2002, the economy registered the highest level of overvaluation in 1999 explained on the one hand, by the impact of the different financial crises mentioned above, that affected Latin American economies including Chile, and which is reflected in the increase in sovereign risk (i.e., in the EMBI). This in turn caused a rise in the RER_{BT}. On the other hand, as explained in Figure 1 above, the exchange rate regime that prevailed up until 1999, translated in an appreciation of the observed real exchange rate. Between 1999 and 2002, the degree of overvaluation diminished as sovereign risk (EMBI) declined and, also as a result of the depreciation in the observed real exchange rate (from 1999 to 2003) following the adoption of a full-fledged inflation targeting regime.

The second period of overvaluation (2010-2019) coincides with the tempering of the commodity boom and concomitantly in the rise of the terms-of-trade roughly around 2011. Also, the observed real exchange shows an appreciating trend (Figure 1).

The 2002-2009 undervaluation is mainly explained by the commodity boom and the rise in the terms-of-trade. This resulted in an appreciation in both the observed real exchange rate and in the real exchange rate consistent with equilibrium in the balance of trade in goods and services (RER and RER_{BT} respectively). However, the effect of the terms-of-trade was felt with greater intensity in RER_{BT} than in RER

THE INDUSTRIAL EQUILIBRIUM REAL EXCHANGE RATE ($IRER_{ULC}$)

This section introduces the industrial equilibrium exchange rate ($IRER_{ULC}$) which is defined as the ratio between the unit labor cost in manufacturing in Chile and its trade partners. The IEER[12] represents that level of the real exchange rate that guarantees that manufacturing producers will be competitive at the international level. Formally,

$$ucl^{CHl} = \frac{ucl^{partners}}{E} \Leftrightarrow IERER = \frac{ucl^{partners}}{ucl^{CHl}} \qquad (5)$$

Where,

$$E = \frac{Currencies\ foreign}{CHL\ peso}$$

$$ucl^{CHl} = unit\ cost\ laboral\ in\ manufactuting\ in\ Chile$$

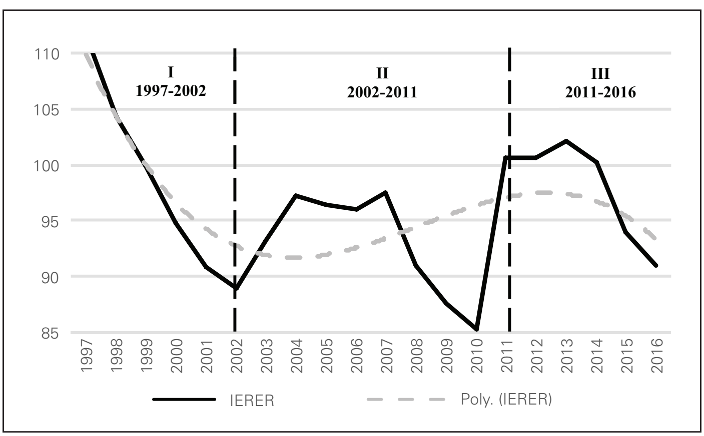
[12] We follow Marconi (2012) in terms of the IEER definition, from which producers maintain their competitiveness in international markets, at the point, were assuming that the prices of tradable manufacturing goods are uniform, the mark up on average unit costs calculated as a percentage of the price is equal both in the exporting country and in the countries with which it competes.

Following the methodology proposed by Marconi (2012; 2021) the behavior of the industrial equilibrium exchange rate ($IERER$) is compared to that of the observed real exchange rate (RER), and, to the real exchange rate that is consistent with the equilibrium in the balance of trade in goods and services (RER_{BT})

Figure 4 shows the behavior of the industrial equilibrium exchange rate ($IERER$) in manufacturing for the period 1997-2016[13] In line with the earlier findings, phases of appreciation of the $IERER$ (Phases I (1992-2002) and III (2011-2016)) are more prevalent than phases of depreciation (Phase II (2002-2007 and 2010-2011)). This reflects the fact that on average, the unit costs of Chilean manufacturing production maintained a higher growth rate relative to that of its trading partners.

In turn, this behavior can be associated both with changes in productivity and changes in the weights of trading partners. In the case of Phase I, the most important trade partners included the United States and Japan, and Brazil. During Phase II, China began to have much more relevance in the share of commerce with Chile, while Brazil reached its highest share for the entire period under analysis. Finally, in the last phase, China became the most important trade partner of Chile while the United States registered the lowest share amongst Chile's trade partners.

Figure 4: – Chile: evolution of the industrial equilibrium real exchange rate (IERER) 1997-2016. Annual data.



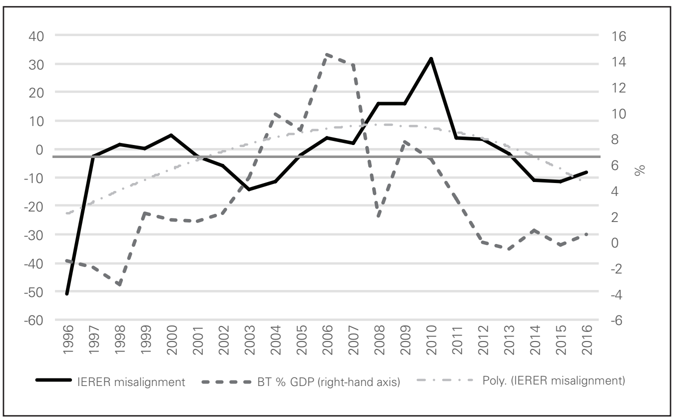
Note: Poly (IERER) refers to a polynomial adjustment of the IERER
Source: Authors' own estimates, on the basis, of the Central Bank of Chile (2022).

[13] The RER_UCL was constructed based on available information on unit labor cost per hour in manufacturing for 19 of Chile's 29 main trading partners. The information was obtained from International Comparisons of Hourly Compensation Costs in Manufacturing and Sub-Manufacturing Industries of the Conference Board. The unit cost per labor hour for manufacturing in China was constructed from information available in the statistical reports of the National Bureau of Statistics of China. Values for Chile were constructed from the Wage Index and Labor Cost Index and "La Encuesta Estructural de 2006 y 2014" of National Institute of Statistic (INE). s proposed by Marconi (2012) the REER will be at a satisfactory level when it is equal to the unit cost ratio, i.e., at that level it is guaranteed to maintain the competitiveness of the producers of manufactured goods in the international market. Formally, $E * \frac{\frac{1}{P^{partners}}}{\frac{1}{P^{CHL}}} = \frac{ucl^{partners}}{ucl^{CHl}} * \frac{\frac{1}{P^{partners}}}{\frac{1}{P^{CHL}}}$. Here it is assumed that $\frac{\frac{1}{P^{partners}}}{\frac{1}{P^{CHL}}} = 1$.

The misalignment of the industrial equilibrium real exchange rate (the difference between the industrial equilibrium real exchange rate and the observed real exchange rate based on unit labor costs (*IERER* and RER_{BT}) does not seem to have a relationship with the external performance of the economy reflected in the evolution of the balance of trade of goods and services.[14] This is explained by the fact that the balance of trade in goods and services is determined mainly by the behavior of the terms-of trade (Figure 5).

Throughout most of the period under consideration the balance of trade in goods and services posted a surplus. The increase and decline in the surplus coincide with the commodity boom which began in 2002 and lasted until 2011, interrupted by the impact of the Global Financial Crisis (2009).[15]

Figure 5: Chile – evolution of the IERER misalignment and the balance of trade and services as percentage of GDP. 1996-2016. Annual data



Note: Poly (IERER) refers to a polynomial adjustment of the IERER. The misalignment refers to the difference between the real exchange rate based on un unit costs RER_{ULC} and the industrial equilibrium real exchange rate *(IERER).* Source: Authors' own estimates, on the basis, of the Central Bank of Chile (2022).

Finally, Figure 6 shows the behavior of the industrial equilibrium real exchange rate (*IEER*) and the real exchange rate consistent with balanced trade in goods and services (RER_{BT}). Consistently with the above explanation there is no evident correlation between both equilibrium variables. Nonetheless, with the exception, of the period between 1999 and 2002, the *IEER* has always been above the RER_{BT}.

This finding shows that despite the existing macroeconomic policy and institutional constraints to the development of the industrial/manufacturing sector the

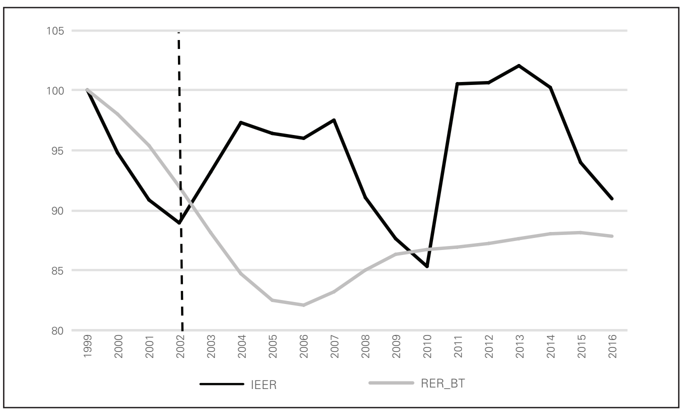
[14] In the case of Chile, the trade balance of goods and services is a better measure of external performance than the current account whose result reflects to a large extent the behavior of the income account of the balance of payments (i.e., profit repatriation).

[15] With the exception, of natural gas, the average prices for these commodities have trended upwards since the 2000s. In the minerals and metals sector the price of iron and of copper increased, on average, from US$ 59 to 103 and from US$ 3,563 to 6,844 dollars per metric ton between 2000 and 2018.

evidence indicates that this sector (as captured by the *IEER*)enjoys a relative price advantage over the rest of the sectors (as captured by the RER_{BT}). Greater price competitiveness for the industrial/manufacturing sector is an avenue to promote its development and expansion.

This last result raises a broader question as to whether relative price advantage can act as a linchpin for economic and social development, broad based upgrading and as a policy to escape the middle-income trap, especially when the productive and export structure, is still largely dominated by natural resources.

Figure 6: Chile – evolution of the industrial equilibrium real exchange rate (*IREER*) and the real exchange rate that is consistent with equilibrium in the balance of trade of goods and services (*IREER*) 1999-2016.



Note: For both variables 1999=100.
Source: Authors' own calculations on the basis of Central Bank of Chile (2022).

An analysis of the composition of Chilean exports export basket underscores the deep dependency on natural resources not only due to their weight in the overall export basket but also because these have gained importance over time reflecting a clear process of reprimarization. The evidence shows that mining has reached almost two-thirds of the total exports (Table 3). In 2003 copper represented 37% of total exports increasing to 51% in 2020. Moreover, manufacturing exports that are not natural resource based (such as for example chemicals), represent a small and declining percentage of the total.

Table 4: Chile – composition of exports 2003-2020. In percentages of the total

Exports	2003	2005	2010	2015	2020
Mining	40%	52%	62%	52%	57%
Agriculture, forestry and fisheries	10%	6%	6%	8%	9%
Manufacturing	50%	42%	31%	40%	35%
Food	15%	11%	8%	13%	13%
Beverages and tobacco	4%	2%	3%	4%	3%
Forestry and wood furniture	6%	4%	3%	4%	3%
Pulp, paper and other	6%	4%	4%	5%	4%
Chemicals	11%	13%	7%	7%	6%
Basic metal industry	1%	2%	2%	1%	1%
Metal products, machinery and equipment	4%	3%	3%	4%	3%
Other industrial products	3%	2%	1%	2%	1%

Source: Authors' own calculations on the basis of Central Bank of Chile (2022).

CONCLUSIONS

Chile's development strategy rests upon the belief that, free market forces, underpinned by the potential of private initiative, result in optimal outcomes for society as a whole. Within this view, the allocation of resources guided by relative prices is central to ensure an efficient and balanced productive structure, providing the linchpin for future development. This development model has imposed binding constraints on the use of the exchange rate as an instrument of productive diversification. The success of this model depends, to a great extent, on the favorable evolution of the price of copper and the terms-of-trade which penalizes the expansion of non-natural based resource activities due to its negative correlation with the real exchange rate. In addition, the adoption of a managed float in the 1980s and 1990s followed by an inflation targeting regime from 1999 onwards, has given a key role to the exchange rate in maintaining nominal stability.

The empirical evidence provided in the paper including trend and cycle analysis and an estimation of the misalignment of the observed real exchange rate (*RER*) from the real exchange rate consistent with equilibrium in the balance-of-trade of goods and services (RER_{BT}) indicates that periods of appreciation predominate over periods of depreciation. The evidence also shows that (RER_{BT}) is driven by financial factors and, most importantly, by the evolution in the terms-of-trade.

As a result, this type of misalignment depends directly to a great extent on the fluctuations in the terms-of-trade and indirectly on the influence of the terms-of-trade on the balance of trade of goods and services. In so far as the terms-of-trade are driven, at least partly by financial factors, these determine their evolution, the RER_{BT}, and the misalignment. This further underscore the difficulties, within this development model, of targeting the real exchange rate for developmental purposes.

A positive note of the analysis in the paper, is that despite the macroeconomic and institutional constraints, the industrial/manufacturing sector has an external price competitiveness advantage over the rest of the economy. The available empirical evidence shows that the industrial equilibrium real exchange rate (*IERER*) tends to be, for the most part, undervalued relative to the observed real exchange rate (*RER*), and relative to the real exchange rate compatible with balance of trade equilibrium in goods and services (RER_{BT}).

This poses the question of whether relative price incentives can act as a linchpin for changing the productive and export composition of the economy and for broad based productive diversification. This question gains increasing relevance in the case of an economy like Chile, since the export composition (even when considering manufacturing) is anchored in natural resources and non-natural resource exports represent a small share of the total.

Most likely, any relative price advantage will have to be accompanied by a set of broader policy measures including greater strategic intervention by the government, measures to foster productive investment. This requires a change in the orientation and design of productive development policies which have been conceived and focused mainly on addressing market failures.

ANNEX 1

DATA SOURCES

Variable	Acronym	Source
Real Effective Exchange Rate	RER	Central Bank of Chile.
Terms of Trade	TOT	Central Bank of Chile.
Goods and Services Trade, net (as % of GDP)	CA	IFS-IMF. More specifically – Balance of Payments, Current Account, Goods and Services, Net [BPM6], US Dollar. For GDP: See note on GDPpc. Both series were accumulated 12m. before constructing the ratio.
embi +	EMBI	World Bank

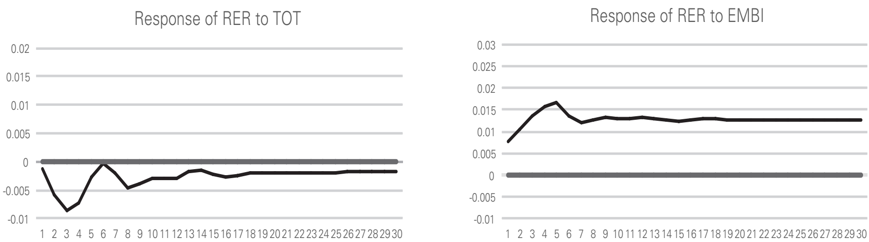
Note: All data are set to be quarterly data. In the case of monthly series, the transformation done was taking the average of the period (unless otherwise specified). For Chile, the final model is estimated using data from the third quarter of 2000 to the fourth quarter of 2019.

Table 5: UNIT ROOT TEST RESULTS (ADF)
Null Hypothesis: the variable has a unit root

	At Level				
		RER	TOT	EMBI	CA
With Constant	t-Statistic	-0.8841	-4.0072	-3.1869	-4.6528
	Prob.	0.7659	0.0085	0.0447	0.0025
		n0	***	**	***
With Constant & Trend	t-Statistic	-4.4910	-3.9713	-2.9993	-4.2468
	Prob.	0.0136	0.0334	0.1688	0.0208
		**	**	n0	**
Without Constant & Trend	t-Statistic	2.9440	1.1830	0.1132	-1.3134
	Prob.	0.9978	0.9313	0.6999	0.1670
		n0	n0	n0	n0
	At First Difference				
		d(RER)	d(TOT)	d(EMBI)	d(CA)
With Constant	t-Statistic	-6.9040	-1.4963	-4.7270	-2.2191
	Prob.	0.0000	0.5096	0.0038	0.2074
		***	n0	***	n0
With Constant & Trend	t-Statistic	-6.7799	-6.3479	-4.8007	-2.0027
	Prob.	0.0003	0.0006	0.0132	0.5563
		***	***	**	n0
Without Constant & Trend	t-Statistic	-1.7455	-1.3871	-5.0253	-2.4390
	Prob.	0.0768	0.1474	0.0001	0.0185
		*	n0	***	**

Notes: Ka: (*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1% and (no) Not Significant; b: Lag Length based on SIC; c: Probability based on MacKinnon (1996) one-sided p-values.

Figure 7: Impulse Response Functions (IRFs)
Response to Generalized One S.D. Innovations



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