

MACROECONOMIC ANALYSIS

Determinants of non-tradable inflation

Chile Unit

- Tradable inflation, which has a high correlation with the exchange rate, has played a major role in accounting for the recent high CPI inflation, but the increase in non-tradable inflation (NTI), generally associated with changes in domestic economic conditions, has also played a not inconsiderable part.
- We have estimated a model for NTI determinants and conclude that there will be strong downward pressure of around 1pp.
- The main determinants of non-tradable inflation are: inflation expectations, the labour market situation (unemployment and/or labour costs) and the prices of imported products expressed in CLP. Public spending and the output gap will not play a major role.
- The exchange rate in various specifications is important in explaining NTI behaviour. This is an indication that it is not only internal conditions which affect NTI, but also parity, through the impact on the production costs of a number of industries which, although producing non-tradable goods and services, use imported inputs. We estimate the exchange rate elasticity of NTI to be around 7%.

1. Introduction

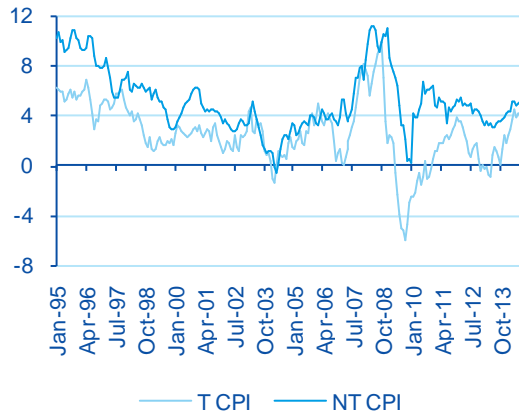
The central bank's inflation target is set in terms of the aggregate consumer price index or total CPI. However, in order to better understand the factors behind inflation performance we need to understand the evolution and determinants of its components. There are a range of ways to disaggregate the CPI and this paper focuses on the division between tradable and non-tradable inflation. Tradable inflation is less affected by domestic economic conditions and more by the prices set in international markets and exchange rate fluctuations. Non-tradable inflation, on the other hand, is more affected by changes in domestic conditions. This type of inflation, according to the National Statistics Institute (INE) definition, considers a set of products which are not sold on the international market, that is, they are only traded on the local market.

The change in tradable and non-tradable inflation reveals major differences, as we see in Figure 1. Indeed, historically non-tradable inflation has a higher average and is less volatile than inflation in tradables. As a benchmark, since 2000, while non-tradable inflation has averaged 4.5%, tradable inflation has averaged only 2.1%. As a whole, inflation growth since the middle of last year is explained by an increase in both inflation components. Between May 2013 and September 2014, total inflation went from 0.9% YoY to 4.9% YoY and, in the same period, tradable inflation leapt from -1.0% YoY to 4.8% YoY, while non-tradable inflation rose from 3.3% YoY to 5.0% YoY.

Within the INE definition, the tradable CPI includes all products which can be sold on the international market. For example, all non-perishable goods fall into this category, which contains 236 products making up 56.36% of the CPI basket. Meanwhile, the non-tradable CPI includes products which cannot be sold internationally, including 85 products making up 43.64% of the CPI basket.

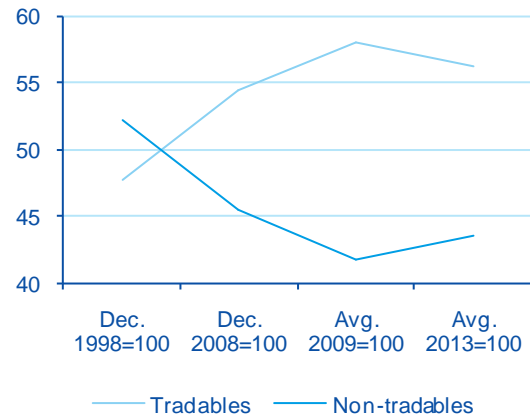
Figure 2 illustrates how the basket in 2013 marks a shift in the relative ratios of tradables and non-tradables over time. To wit, the share of non-tradables goes up, while that of tradables falls, although this reversal is a result more of a change in the methodology used, which has transferred products from one side to another. In this case, as long as the country continues developing, this trend towards a greater stake in non-tradables in the CPI basket ought to continue, in sync with the rise in the relative consumption of services.

Figure 1
Inflation in tradables and non-tradables (var. YoY %)



Source: Central Bank of Chile, BBVA Research

Figure 2
Share of tradables and non-tradables in the CPI basket (%)



Source: INE, BBVA Research

Table 1 shows the share of tradables and non-tradables in the CPI baskets of a selection of developed and emerging countries. We see that the composition of the Chilean basket is something of an exception, since in the other countries analysed, the share of non-tradables is close to 60%.

Table 1
Tradable/non-tradable components in the CPI basket (% of total)

	Tradables	Non-tradables	Regulated
Peru	37%	63%	
New Zealand	42%	58%	
Brazil	45%	27%	29%
Australia	40%	60%	
Chile	56%	44%	

Source: Central Reserve Bank of Peru, Statistics New Zealand, Central Bank of Brazil, INE, ABS, BBVA Research

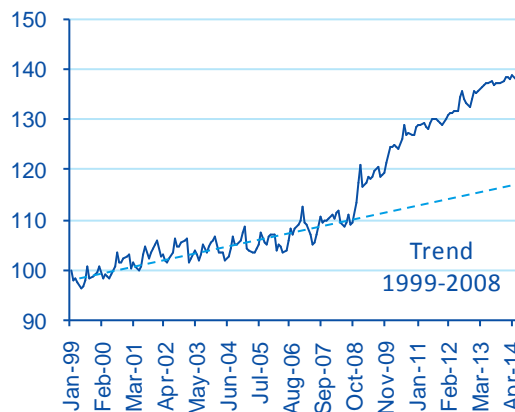
This paper reviews the principal determinants of non-tradable inflation, following the work published by Jacobs & Williams (2014) for Australia¹.

1: D. Jacobs & Williams, T. (2014) The Determinants of Non-tradable Inflation. Reserve Bank of Australia (RBA).

2. A macroeconomic perspective

CPI inflation has run at an average of 3.2% since 2000 in Chile; however, over this period, non-tradable inflation has been much higher than tradable inflation, with the result that there has been a significant increase in the relative prices of non-tradables (Figure 3).

Figure 3
NTCPI/TCPI rate (January 1999 index=100)



Source: INE, BBVA Research

The reasons for this increase can be found on both the supply side and the demand side (Jacobs & Williams 2014).

- On the supply side we have the so-called **Balassa-Samuelson effect**, according to which productivity in the tradable sector tends to grow more quickly than in the non-tradable sector. This growth in tradable productivity pushes demand for work in this sector, and wages throughout the economy, upwards. Higher wages raise the prices of non-tradables, whereas the prices of tradables do not rise so intensely, since they are set in the international markets.
- Another supply-side factor is the **emergence of China** on international markets, which has tended to reduce the prices of tradable goods.
- On the demand side, the **change in consumption patterns** from goods to services, associated with increased wealth, also accounts for the increase in the relative price of non-tradables.
- **The rise in the terms of trade** in the last decade may also be an explanation for the relative increase in the cost of non-tradables, as happened in Australia. Higher terms of trade raise the demand for labour, while higher income raises the demand for non-tradable goods and services. Furthermore, **an appreciation in the local currency** reduces the demand for certain goods produced locally, and also import prices and tradable inflation.
- Finally, there are the **cyclical conditions**. When there is idle capacity in the economy, there tends to be lower wage growth and companies have difficulties in improving their margins. In the case of the Chilean economy, non-tradable inflation was higher between 2009 and 2014 than between 2000 and 2008, coinciding with lower average unemployment in the more recent period, and the resulting greater wage pressures (Table 2).

Table 2
Inflation, unemployment and unit labour costs (ULC)

	2000-08	2009 to date
Non-tradable inflation	4.4%	4.6%
Unemployment rate	9.0%	7.4%
Non-tradable ULCs	-1.7%	1.5%

Source: INE, Central Bank of Chile and BBVA Research

2.1. Econometric approach

Following the analysis proposed by the RBA (Reserve Bank of Australia), there are two alternative models which can be used to understand the change in aggregate inflation: the Phillips curve and margin models. The Phillips curve model considers inflation as a function of utilised capacity, measured by the unemployment rate, whereas the margins model is based on the idea that prices are set with a margin over costs, so that they include the increase in unit labour costs and an estimate of the output gap. Both approaches also consider a measurement for inflation expectations and inflation in imported prices.

Meanwhile, acknowledging the bias towards non-tradables on the part of public-sector spending, according to several empirical papers on the Chilean case², we have incorporated into these estimates the ratio of public spending to GDP, which is expected to be positive. Note that we exclude the output gap and unemployment where applicable on the reduced equation estimates below:

$$(1)\pi_{NT} = \alpha + \beta\pi_e + \rho UNEM + \vartheta\pi_* + \epsilon$$

$$(2)\pi_{NT} = \alpha + \beta\pi_e + \delta ULC + \theta GAP + \vartheta\pi_* + \epsilon$$

Where π_{NT} is the inflation of non tradables, π_e is inflation expectations measured as the central bank's Economic Expectations Survey for one year, ULC is the YoY growth of unit labour costs in the non-tradable sector, GAP is the output gap, π_* is the inflation of imported products and UNEM is the unemployment rate. Appendix 1 provides further detail on the variables used.

Table 2.1 shows the results of our estimate: all the determinants of non-tradable inflation are positive or negative as expected; depending on the version of the model, they account for between 63% and 64% of the variability of this inflation component, a not dissimilar result from Jacob & Williams (2014) for the case of Australia. Overall, the determinants considered are statistically significant, the only exception being the output gap.

We should point out that in both cases the public spending to GDP ratio was used as a determinant of non-tradable inflation, together with imported prices and expected inflation, but the result was not significant. This finding may be due to the non-cyclical nature of public spending or a result of the way in which the cyclically adjusted balance rule works.

2: See for example: Caputo & Fuentes (2012) and Lee, Milesi-Ferretti & Ricci (2008)

Table 2.1
Determinants of non-tradable inflation

	Equation 1	Equation 2
Constant	-0.016	-0.034**
1Y inflation expectations	2.718***	2.505***
Imported inflation in CLP	0.065**	0.072**
Unemployment rate	-0.294**	-
Non-tradable ULCs	-	0.120**
GDP gap	-	0.097
Adjusted R²	0.64	0.63

*, **, *** Denotes significance at 10%, 5% and 1%, respectively. Equation 1 considers unemployment with a quarterly lag, and Imported inflation in CLP with two lags. Equation 2 considers ULC, Imported inflation in CLP and the GDP gap with a quarterly lag.

Source: BBVA Research

To help understand the results, it is useful to interpret the meaning of the resulting parameters. As an example, the coefficient for the unemployment rate (-0.29) obtained from Equation 1 means that a 1pp increase in unemployment — for example from 6.5% to 7.5% — would be consistent with a 0.29pp reduction in non-tradable inflation — for example from 5.0% to 4.7% —, *ceteris paribus*.

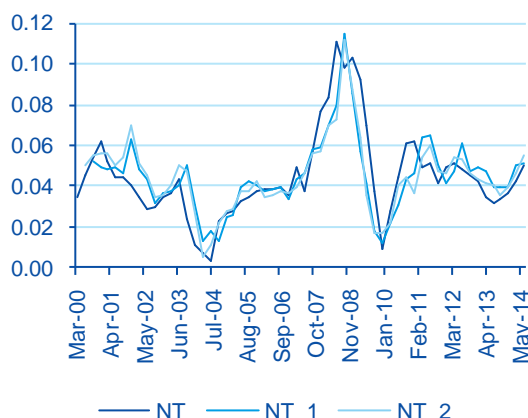
For its part, the coefficient for imported inflation in CLP (around +0.07) obtained from both models means that a 1pp increase in imported inflation, that might be due to both higher dollar prices and a CLP depreciation, would be consistent with an increase of 0.07pp in non-tradable inflation, all other things being equal.

The ULC parameter (0.12) obtained in Equation 2 means that a rise of 1pp in the growth of labour costs (or of real wages on the assumption of constant average productivity), would be consistent with an increase in 0.12pp in non-tradable inflation, *ceteris paribus*.

Finally, the effect of a change in expected inflation within a year is very relevant when accounting for the changes in non-tradable inflation. Thus, if the inflation expectation rises by 0.1pp, for example from 3% to 3.1%, the effect on the inflation of non-tradables is close to 0.3pp.

Figure 4 shows the adjustment of both equations using information to the second quarter of this year, while the section below presents a projection based on these same models.

Figure 4
Adjustment of models 1 and 2



Source: Central Bank of Chile, BBVA Research

2.2. Projections

In this section we make a projection for the next six quarters using the models described in the section above, with the aim of estimating the most probable trajectory for non-tradable inflation consistent with our macroeconomic assumptions.

The findings from this exercise show that, whatever model is used, next year's average non-tradable inflation will be around 1pp lower than the average for this year, which is in line with lower total CPI inflation (Table 3). In the light of these results and the weighting of this component, this projection implies a reduction of around 0.5pp of total CPI inflation for next year.

Naturally, these projections rely on a series of assumptions, some implicit today in asset prices and others in our baseline scenario. In the main, we consider that the average unemployment rate over the next year will be 1pp higher than this; that import inflation in CLP will be lower, consistent with an exchange rate that should close next year at around USDCLP 570; that inflation expectations to one year are averaging at 2.7% and that ULCs will moderate their growth in line with a labour market with more slack capacity.

Table 3
Projections for non-tradable inflation

	2014	2015 (1)	2015 (2)
NT inflation (avg.)	4.8-4.9%	4.10%	3.80%
Determinants:			
Unemployment (avg.)	6.50%	7.50%	-
GDP growth	1.90%	3.10%	3.10%
Imported inflation in CLP (avg.)	14.0%	1.50%	1.50%
1Y Expected inflation (avg.)	2.90%	2.70%	2.70%
Non-tradable ULC (avg.)	2.00%	-	1.00%

Source: BBVA Research

3. Conclusions

Non-tradable inflation represents 44% of the CPI basket and historically presents less volatile behaviour, with a higher average than tradable inflation.

In the inflationary episode we have been experiencing since mid-2013, tradable inflation has risen strongly, which is consistent with the explanation that the uptick is due, to a large degree, to the depreciation in the CLP.

Non-tradable inflation, generally associated with domestic economic conditions, has also experienced significant growth since the middle of last year, despite the deterioration in the economic cycle (rise in unemployment and in the output gap).

In several specifications of models which seek to account for the movements in non-tradable inflation we find that it is the inflation expectations, the labour market conditions (unemployment rate and/or labour costs) and the prices of imported products (expressed in CLP) which best explain their evolution. By contrast, the output gap and public spending are not significant once the variables indicated above have been controlled.

Using these results and the assumptions in our baseline scenario, we have forecast next year's non-tradable inflation, concluding that it will be around 1pp lower than this year. Together with a more expansive labour market, and moderately lower inflation expectations, the expected appreciation of the Chilean peso – even if this only materialises as a slowdown in depreciation – will be a key determinant in this forecast becoming a reality.

The evolution of the exchange-rate impacts inflation not only through the usual channel of tradable goods, but also, added to the other determinants, in accounting to a large degree for the movements in non-tradable inflation. In a scenario in which no additional penalties are levied on the CLP next year, inflation will also give ground in its non-tradable component. The manner in which this effect will be seen is in the impact which the exchange-rate has on production costs of several industries which, while producing non-tradable goods and services, also utilise imported inputs.

References

D. Jacobs & Williams, T. (2014) The Determinants of Non-tradable Inflation. Reserve Bank of Australia (RBA).

R. Caputo & Sources, M. (2012) Government Spending and the Real Exchange Rate: a Cross-Country Perspective. Central bank of Chile. Working Paper N° 655. January.

Ricci, Milesi-Ferretti & Lee (2008) Real Exchange Rates and Fundamentals: A Cross-Country Perspective. IMF Working Paper. January.

Appendix 1

Table A.1

Construction and data sources

Variable	Description	Source
π_{NT}	YoY inflation of the non-tradable component of CPI	Central bank data base
π_e	YoY inflation expected over one year by the market since 4Q01. Data for 1Q00 to 3Q01 were estimated based on the ratio between effective inflation and market projection for one year.	Central bank's Economic Expectations Survey and own estimates for 1Q00 to 3Q01
CLU	YoY growth of unit labour costs in the non-tradable sector. For real wages, the INE total index was used, excluding manufacturing and mining sectors. To calculate average productivity, GDP and employment, excluding the farming and forestry, fishing, mining and manufacturing sectors, were used.	Own calculations, using INE and central bank figures
GAP	GDP gap $(Y-Y^*)/Y^*$. Seasonally adjusted GDP, projected up to 2015, was considered, as well as an HP filter so as to obtain potential GDP growth Y^* .	Own calculations using central bank GDP figures
π_*	YoY variation of the goods imports price index	Central bank data base
$UNEM$	Unemployment rate by percentage. Simple continuation of the new survey (NENE) following on from the earlier one (ENE)	Central bank data base
G	Public budget spending (% of GDP)	Budgetary Office

Source: BBVA Research

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