



NOTAS DE INVESTIGACIÓN

Esta sección tiene por objetivo divulgar artículos breves escritos por economistas del Banco Central de Chile sobre temas relevantes para la conducción de las políticas económicas en general y monetarias en particular. Las notas de investigación, de manera frecuente, aunque no exclusiva, responden a solicitudes de las autoridades del Banco.

THE USE OF FOREIGN EXCHANGE DERIVATIVES BY EXPORTERS AND IMPORTERS: THE CHILEAN EXPERIENCE*

Faruk Miguel L.**

I. INTRODUCTION

This research note analyses the use of foreign exchange (FX) derivatives by Chilean exporters and importers (EXIM) that conduct international transactions in foreign currencies. It seeks to answer the questions of how many derivatives are used, how are they used and what are their characteristics. These questions are highly relevant as EXIM firms generate currency mismatches between their assets and liabilities and potentially increase their exposure to financial instability due to exchange rate fluctuations.

In practice, firms can hedge their currency mismatches by using different types of financial instruments, including foreign-denominated debt and FX derivatives. As an example, exporters can take advantage of natural hedges by aligning their revenues in foreign currency with foreign-denominated debt obligations. On the other hand, both exporters and importers may reduce the uncertainty of their expected cash flow by fixing a future exchange rate with FX derivatives. Indeed, Allayannis and Ofek (2001) show that “exposure through foreign sales and trade” is the only significant determinant of the usage level of FX derivatives.

One of the most important lessons learned from the Global Financial Crisis (GFC) was the need for policy makers to have access to a wide range of reliable,

* This is a revised version of an original paper prepared for the 8th IFC Conference on “Statistical implications of the new financial landscape” held at the Bank for International Settlements in Basel, Switzerland on 8-9 September 2016. The paper has benefitted from helpful comments from Alejandro Jara, Erika Arraño, Paulina Rodríguez, Pablo Filippi, and Alexander Hynes. The views expressed in this note do not necessarily represent those of the Central Bank of Chile.

** Statistics Division, Central Bank of Chile. E-mail: fmiguel@bcentral.cl

timely and detailed financial statistics (BIS, 2010). Consistent with this idea, this paper exploits a database of FX derivatives catalogued by the Central Bank of Chile (CBC) at the contractual level and studies the FX coverage strategies employed by EXIM firms from 2000 to 2015. This database is unique in the revised literature in terms of the scope of businesses covered and the length of time analyzed.

By taking advantage of contract-by-contract data from more than 5,600 firms over the sample period, this paper seeks to gain a better understanding of the structural characteristics of the FX derivatives markets in developing countries. Moreover, a solid set of stylized facts regarding the use of FX derivatives at the micro level are established in order to study the FX risk management strategies followed by EXIM firms in Chile.

The paper establishes clear evidence of high concentration in the use of FX derivatives among EXIM firms, as well as a visible differentiation among their strategies. The paper shows a positive relation between firm size and the number of firms that use FX derivative hedging strategies. Furthermore, a direct relationship is observed between the level of foreign trade flows and turnover in the FX derivatives market. The most common instruments used are Chilean peso against U.S. dollar forward agreements maturing in less than 180 days.

The remainder of the paper is organized as follows. The next section reviews the literature on existing studies of the FX derivatives markets. Section III describes relevant details regarding the Chilean FX derivatives market. Section IV discusses the data used. Sections V and VI outline aggregate FX derivatives usage and analyze the data at the micro level. Finally, the conclusions and main findings are summarized in section VII.

II. LITERATURE REVIEW

The literature presenting stylized facts on FX derivatives use by EXIM firms is limited, especially for emerging or developing economies. Some exceptions include cross-country studies as well as some specific case studies for countries like England, New Zealand, the Czech Republic, Uruguay, Brazil and Chile.

Bartram et al. (2009) compare the use of derivatives for a wide range of countries. This study relies on accounting information from 7,000 non-financial corporations to show that 60% of the firms in their sample use some type of derivative. In particular, 45% use FX derivatives, 33% use interest rate derivatives and only 10% use commodity price derivatives. The latter two show a marked difference across industry types, while those that use FX derivatives show more widespread usage across industries. Across all countries, large firms tend to use more coverage than their smaller counterparts.

The Bank of England (1998) looks at survey information in order to characterize the use of derivatives by exporters in England. They show that 78% of exporters,



especially larger ones, hedge themselves against exchange rate risk exposures, while smaller exporters are less inclined to do so. The coverage type taken is also shown to differ depending on firm size, with smaller firms typically hedging through standardized products such as bank overdrafts and loans. This is related to the fact that smaller firms possess more limited resources to identify, understand and manage exchange rate risk.

On the other hand, Briggs (2004) uses interviews with large banks and 42 EXIM firms in New Zealand as a principal input to show that exchange rate hedging is more important for smoothing revenue as opposed to generating net gains. Fabling and Grimes (2008) also consider New Zealand but only focus on exporting firms in a wide ranging database. They show that exporters hedge approximately 65% of their exposure and that hedging is positively correlated with firm size. They also find a positive relationship between export intensity and hedging which is related to the larger balance sheet risk arising from currency fluctuations.

More recently, Čadek et al. (2011) analyze the hedging behavior of 184 Czech exporting firms, relying on information from surveys and bank interviews. The vast majority of exporters (approximately 60%, covering over 88% of exports) hedge their FX exposures with natural hedging or derivatives contracts. Forwards and zero-cost options are the most widely-used instruments in maturities ranging from three months to one year. They find that hedging increases with firm size as well as with the foreign sales (exports) to sales ratio.

Buscio et al. (2011) use survey data to show that the use of FX derivatives by Uruguayan firms ranges between 6% and 7%. This use is positively related with the size of the firm, the firm's orientation towards exports and whether or not the firm is publicly listed. They attribute this moderate use of FX derivatives to a poor awareness of exchange rate exposures and the implicit insurance produced by official interventions in the FX market. Specifically, EXIM firms tend to have income and cost structures in foreign currency that provide natural coverage.

Júnior (2007) uses accounting information from publicly traded firms in Brazil (more than half of which are exporters) to present evidence of increasing hedging using FX derivatives.¹ Currency swaps are found to be the most commonly utilized instrument, pointing to the importance of coverage versus speculation. The authors also find a negative relationship between hedging and the foreign sales (exports) to sales ratio. Factoring in natural coverage, the author associates low FX derivatives usage with the belief by exporters that there is a low probability of appreciation of the Brazilian real.

Finally, there are several studies that analyze the use of derivatives in EXIM firms in Chile. Acharán et al. (2009) finds evidence that lower global activity

¹ *The increase in exchange rate hedging is associated with the adoption of a floating exchange rate regime in Brazil.*

after the fall of Lehman Brothers did not produce a reduction in the usage of FX derivatives by exporters, irrespective of size. Rodríguez and Villena (2009) show that for different EXIM firm sizes there was an acceleration in the growth of FX derivatives usage between 1998 and 2008.

This note expands on these previous works to analyze the use of FX derivatives in Chile. Whereas previous papers used aggregate data to analyze the number and size of Chilean EXIM firms using derivatives, as well as their behavior during the GFC, this article employs transaction-level data to highlight the different types of instruments, currencies and maturities used. It also draws attention to new evidence that presents the different net derivative positions (NDPs) between exporters and importers at the aggregate, sectoral and individual firm levels. Furthermore, a micro-level analysis examines the degree of concentration of EXIM firms, as well as the relationship between foreign trade and activity in the FX derivatives market. This unique examination yields micro-based evidence confirming the aggregate conclusions found in previous literature, which is that the usage of FX derivatives in Chile by EXIM firms is growing. This is particularly true for larger-sized firms or firms that conduct more foreign trade.

III. THE CHILEAN FX DERIVATIVES MARKET

This section benefits greatly from Villena and Salinas (2014) in order to provide an overview of the general characteristics of the Chilean FX derivatives market within which Chilean EXIM firms carry out their hedging activities. They observe significant growth in this market between 1998 and 2013. In particular, the volume of derivatives market activity grew from US\$76 billion to US\$903 billion during the period studied. From an international perspective, Chile shows greater levels of depth² than both emerging economy and Latin American averages. This development is explained by a variety of general and specific factors: the elimination of capital controls in 2001, a higher level of international trade and greater stocks of assets and liabilities outside the country throughout the sample and, perhaps most importantly, the need to hedge growing pension fund investments.³

This article shows that, for the year 2013, derivatives operations were undertaken almost only in over-the-counter (OTC) markets and that the most used FX derivatives are forward contracts and FX swaps, which account for 96% of the total amount traded. The remaining 4% corresponds to currency swaps and options. Almost all (98%) transactions are Chilean pesos against U.S. dollars. In terms of settlement of non-interbank transactions, the vast majority of contracts are cash-settled (98%) with the remaining (2%) being physically

² Measured as notional amounts normalized by GDP.

³ Avalos and Moreno (2013) present evidence that the greater depth and liquidity in the Chilean FX market is due largely to the necessity to cover pension funds.



delivered. The decomposition of the outstanding positions by sector shows that pension funds constitute the most relevant sector, followed closely by real sector and financial companies (excluding banks and institutional investors), and then insurance companies.

IV. DATA DESCRIPTION

Since 1992, the CBC has collected daily information on FX derivatives transactions made through the Formal Foreign Exchange Market (FEM).⁴ Using this database, the CBC produces separate series on turnover and amounts outstanding and is used as a main input in understanding the FX derivatives market in Chile. For this article, a monthly series was created from 2000 to 2015 for turnover, amounts outstanding, contractual term length, currency type and instrument. Additionally, the database of the National Customs Service was utilised to identify FX derivatives contracts between FEM institutions and EXIM firms.⁵

The aggregate analysis performed at the CBC shows that FX derivatives contracts with maturities less than seven days can be associated with a speculative nature. Given that the focus of this article is to study the use of FX derivatives for hedging purposes, the analysis excludes contracts with maturities shorter than seven days. This is also justified by the fact that most international trade by EXIM firms has payment timeframes longer than 30 days.

In order to identify EXIM firms, the “net” definition of exporters (importers) is used. Thus, those firms having a level of exports (imports) higher than imports (exports)⁶ during a calendar year are considered exporters (importers)⁷ in that year. This permits a correct interpretation of the expected FX derivatives position of a particular type of business. Furthermore, because data are difficult to obtain and, in line with Briggs (2004), this investigation does not consider international trade in services.

As a result of the definition of an EXIM firm used, the database yielded a sample of more than 5,600 FX derivatives-using companies. The revised literature on FX derivatives usage stresses the convenience of having access to more detailed

⁴ According to CBC surveys, 96% of Chilean market transactions take place through FEM channels. The institutions that make up the FEM include banks and banking institutions (other financial firms) that are legally obligated to make daily reports on all signed foreign exchange derivatives contracts. See Orellana and Rodríguez (2009) for a description of the statistical collection methodology utilized by the CBC.

⁵ Counterparty information is matched with National Customs Service data via the unique tax identification number (RUT) held by all legal persons and entities residing in Chile. Furthermore, firms were matched to sectors using the CBC directory using the same legal ID. It is important to note that both databases contain individuals. For simplicity, these are treated as businesses here.

⁶ Čadek et al. (2011) use an alternative definition of exporters for the Czech Republic: firms that have a share of exports in total sales greater than 50%, or those whose nominal exports sum to more than CZK 1 billion.

⁷ This paper is focused on “direct” exporters. A firm that sells a product to another national firm, which exports said product, is an “indirect” exporter, not considered here.

information such as larger databases or administrative contract registries (Čadek et al. (2011), Fabling and Grimes (2008), Briggs (2004) and Bank of England (1998)). This database, which utilizes contract-by-contract information from bank administrative records combined with a sample of all Chilean EXIM firms from 2000 to 2015, makes this work unique in this research area due to the sheer number of companies included and the breadth of time covered.

1. General aspects of EXIM firms

International goods trade growth in Chile has averaged 7.7% annually over the past 16 years, even as it was interrupted briefly by the GFC where exports and imports contracted by 19% and 31% respectively from peak to trough. The number of importers reached a peak of more than 160,000 firms in 2015 with an average annual growth rate of 19% between 2008 and 2015. This compares with an annual growth rate of 2% before the GFC⁸ (2000 to 2008). For their part, the number of exporters is substantially lower, with a sample peak of 8,400 in 2014.

In order to gain insight into the structure of EXIM firms, the gross amounts of exports and imports were calculated for each firm over the entire sample period. This provided a number of exporters and importers on a “gross” basis. After applying the “net” definition of an EXIM firm, the number of exporters was reduced by 40% and the number of importers was reduced by 6%. This net effect confirms that exporters generally import goods as well, as they often require inputs from abroad.⁹

Throughout the sample period, a total of 25,058 exporters and 558,818 importers were observed including both hedgers and non-hedgers. The differences that exist in the composition of EXIM firms by size are shown in table A1 of the appendix. On average, more than 93% of importers are small (importing less than US\$500,000 worth of goods annually) while only 66% of exporters are small (exporting less than US\$500,000 worth of goods annually). Furthermore, the rotation of businesses and individuals that enter and exit the sample annually was greater for exporters. For exporters, 47% remained in the sample for at least four years with only 3% in all 16 sample years. On the other hand, 65% of importers remained in the sample for at least four years with only 5% in all 16 years (table A2 of the appendix).

⁸ This difference is explained, in part, by the incorporation of small importers once several bilateral free trade agreements became active.

⁹ Rébora and Vivanco (2016) confirm this finding by showing that Chilean exporters have made significant use of imported goods in recent years.

V. DO EXIM FIRMS HEDGE?

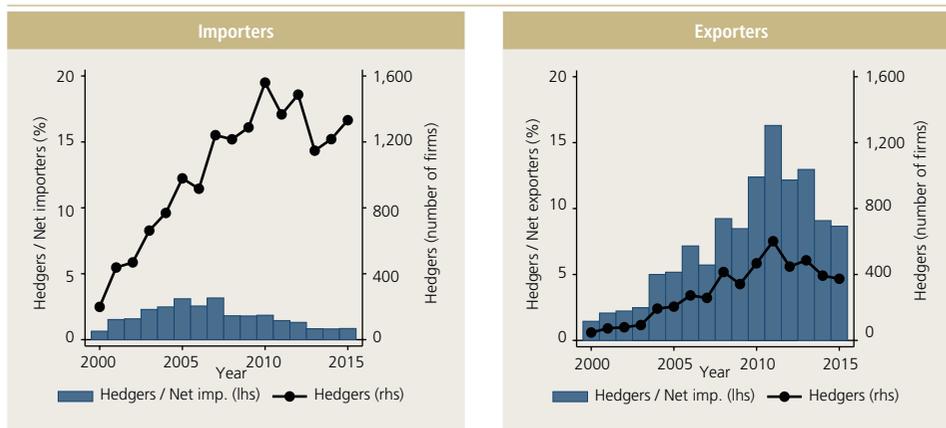
1. FX derivatives usage

Figure 1 shows the number of EXIM firms that use FX derivative contracts (hedgers) as well as the proportion of hedgers within exporters and importers over time. Increasing usage of FX derivatives by both exporters and importers is observed over this sample period. In 2000 only 48 exporting companies utilized derivatives contracts (hedgers). Eleven years later this figure reached a peak of 602. For its part, the number of hedging importers went from 199 in 2000 to a sample peak of 1,560 in 2010.

As importers outnumber exporters 22:1 in the sample, and even more so if we consider only smaller firms, the utilization rate is smaller for importers than for exporters. This rate is measured as the number of firms that use derivatives (hedgers) divided by the total number of firms (hedgers and non-hedgers). For exporters, the figure exhibits a clear upward trend in the utilization rate which is also in line with the growth in the total number of hedgers. This reveals that new exporting firms entering the sample tend to use FX derivatives. This same trend in the utilization rate is observed for importers, but only until 2007. From then on the rate decreases due to the incorporation of far more smaller importing firms¹⁰ that tend not to use FX derivatives.

Figure 1

Derivatives usage



Source: Author's calculations using CBC data.

¹⁰ The large growth in smaller importing firms is associated with the entry into force of free trade agreements between Chile and its trading partners during this period.

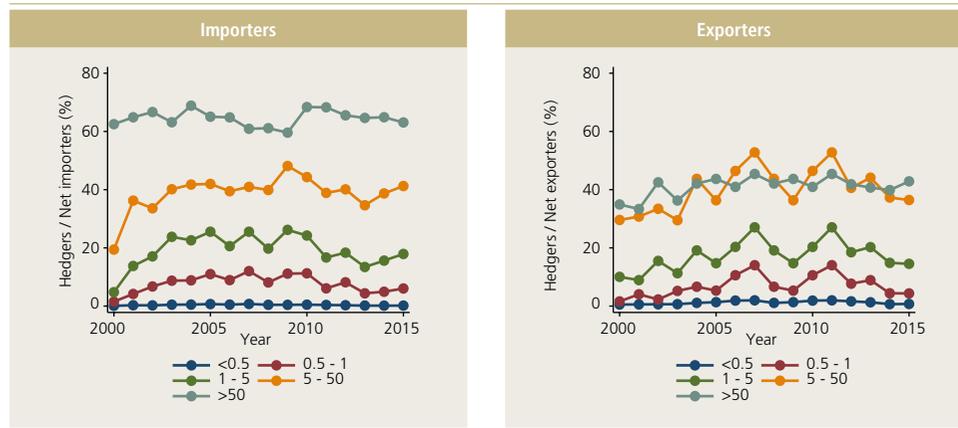
As shown in figure 2, the utilization rate is not homogeneous among different-sized firms. Following Rodriguez and Villena (2009) and Acharán et al. (2009), firm size is calculated as the total value exported for exporting firms and the total value imported for importing firms. These firm sizes are classified into five groups ranging from values of less than US\$500,000 to values of more than US\$50 million. The utilization rate is then calculated as the number of hedgers divided by the total number of firms within each tranche. Larger sized firms exhibit higher utilization rates than their smaller counterparts.

As noted previously, firms that import less than US\$500,000 per year exhibit very low utilization rates. This compares with firms importing more than US\$50 million that exhibit utilization rates of between 60% and 70%. Similarly, larger exporters display higher utilization over the entire sample. However, exporting firms in the two largest groups by firm size only present utilization rates between 40% and 50%. While Rodriguez and Villena (2009) use a different methodology to define EXIM firms, their results regarding the use of FX derivatives are consistent with the results of this paper.

The fact that smaller firms exhibit lower utilization rates is expected as implementation of exchange rate hedging requires a more sophisticated level of financial management. Furthermore, due to the credit lines associated with FX derivatives usage, the greater inherent credit risk of smaller firms restricts their participation in the market. The fixed cost of this type of product is another factor limiting their use by smaller firms as the relative cost of hedging is higher when the amounts to cover are lower.

Figure 2

Derivatives utilization rates by firm size



Source: Author's calculations using CBC data.
 Note: Legend numbers refer to millions of USD.



For the specific case of small exporters, the Bank of England (1998) provides an analysis of vulnerabilities to an appreciation in the domestic currency. This includes the facts that they have less negotiating power in external markets, their sales are generally concentrated in only a few markets, it is more difficult for them to cut prices in order to maintain market share and they use fewer imported inputs, which diminishes the benefits received when import prices fall. That smaller firms may be more vulnerable, and therefore more likely to hedge, runs counter to the observed results in this paper which shows a low utilization by small exporting firms.

2. Long or short?

The previous subsection showed that both exporters and importers use financial derivative instruments; however, the strategies employed by each vary across business types. This section outlines expected strategies that would be employed by an exporter. It then tries to empirically verify whether or not the evidence supports this expected behavior for both exporting and importing firms at the aggregate level and by sector.

Assuming an exporter sells US\$5 million in goods on 31 March and both parties agree that payment should be made in 90 days. At the current exchange rate of 650 pesos per dollar the equivalent value in pesos is CLP3,250 million. In 90 days, if the Chilean peso falls to 600 pesos per dollar, the equivalent value in pesos would be CLP3,000 million. Without hedging, this would create an unfavorable difference for the exporter of CLP250 million. In order to avoid uncertainty about future cash flows, the exporter could sign an FX derivatives contract in which the exporter agrees to sell the US\$5 million at a fixed exchange rate of 640 pesos per dollar. This “short position” would guarantee a cash flow of CLP3,200 million in 90 days.

This hypothetical situation is reversed for the case of importers because they are interested in fixing the exchange rate for the future purchase of foreign currency. This “long position” can guarantee a fixed cost for the importer in the future.

International trade operations generate FX risks because the exchange rate can vary between the moment an obligation occurs and when the payment is made.¹¹ Derivatives contracts allow firms to reduce this uncertainty and stabilize their cash flows by providing protection against unexpected exchange rate movements. It should be noted that derivatives do not guarantee a better result than simply waiting and making the transaction via the spot market. Nonetheless, the elimination of uncertainty allows firms to focus on and optimize core business elements.

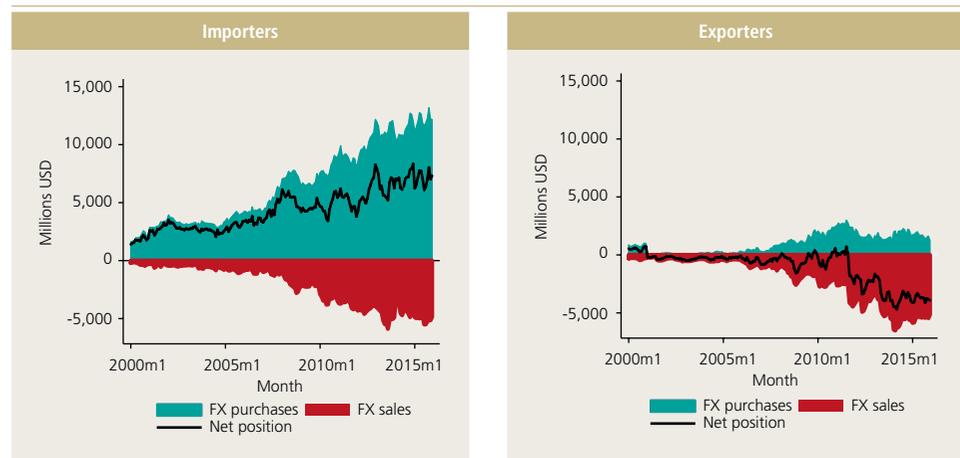
¹¹ Buscio et al. (2011) show that the reasons for derivatives use in Uruguay are 1) to cover operating expenses in foreign currency and 2) to cover costs.

Figure 3 presents the gross positions for purchases and sales, as well as net positions (purchases minus sales), of foreign currency by EXIM firms. On average, the observed NDP is negative (short) for exporters and positive (long) for importers throughout the period, as expected. Importers display a markedly positive NDP throughout the period. However, exporters show occasional periods where the NDP is positive. Reasons for the latter include: (i) exporters also hedge their imports; (ii) it is normal to close or terminate contracts by taking the opposite position; (iii) large companies that use derivatives usually have natural hedges via obligations (liabilities) in foreign currency. Also noted are the large gross positions held by importers as compared to exporters.

The amount of coverage chosen by these companies, measured as the NDP divided by the net flow of foreign trade, averages around 9% for exporters and 19% for importers.¹² Note that this only considers hedging through FX derivatives, so effective coverage is underestimated. With broader coverage measures, Fabling and Grimes (2008) and Čadek et al. (2011) found higher coverage ratios in more developed countries.

Figure 3

Gross positions for purchases and sales and net derivative position

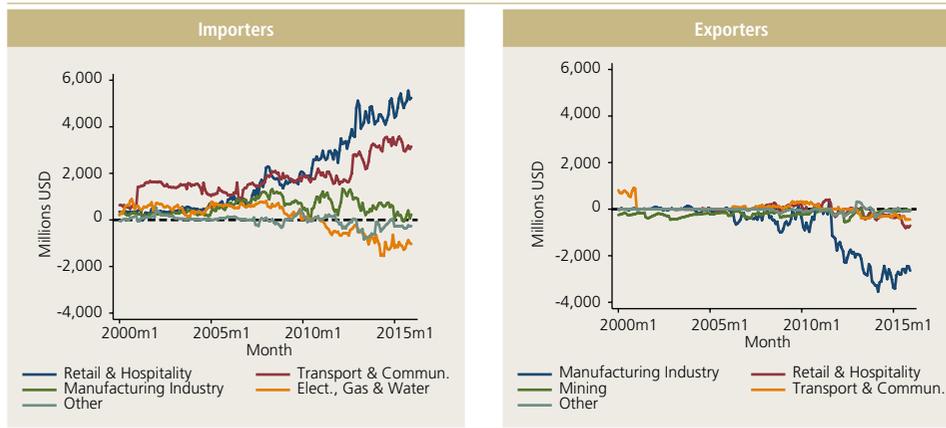


Source: Author's calculations using CBC data.

¹² Using Chilean firms from 2008 and 2009, Acharán et al. (2009) find that smaller firms display higher coverage than their larger counterparts because the latter tend to utilize more natural hedges.

Figure 4

Net derivatives position by sector



Source: Author's calculations using CBC data.

The expected NDP for importers is displayed across the majority of economic activities and/or sectors¹³ (figure 4). Indeed, 92% of the NDP is explained by four sectors: Commerce, Restaurants and Hotels (32%); Transportation and Communication (26%); Manufacturing industry (18%); and Electricity, gas and water (16%). For their part, exporters show a higher grade of concentration with 90% NDP held across just three sectors: Manufacturing industry (67%); Commerce, restaurants and hotels (14%); and Mining (9%). It should be noted that even though mining is the highest exporting sector in Chile,¹⁴ it has a relatively low participation in derivative markets. This is so probably because of strong natural hedging due to currency matching of foreign-denominated assets and liabilities in the industry. Specifically, a large part of the mining industry's liabilities are held in foreign currency while many make utility payments in that same foreign currency, as in many cases they are owned by foreign firms.¹⁵

3. Contract characteristics

FX derivatives contracts are characterized by annual turnover by instrument, currency and maturity. The shares of each characteristic are presented in figures 5 and 6.

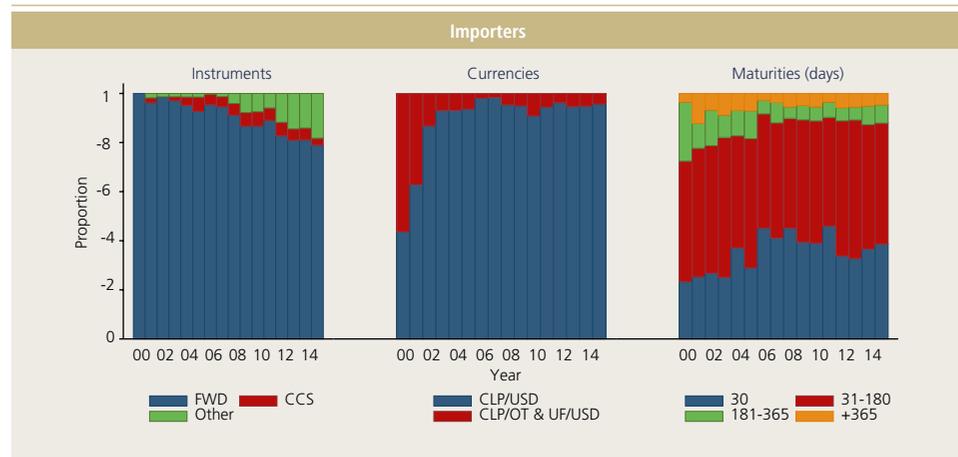
¹³ Firms are grouped using a CBC characterization method with the following categories: Manufacturing industry; Retail and hospitality; Mining; Transport and communications; Agriculture; Business and financial services; Fishing; Electricity, gas and water; Construction; Personal services; and Others.

¹⁴ In 2015 the mining industry accounted for more than 50% of total exports.

¹⁵ According to Bank of England (1998), hedging in each industry depends on contract length in each industry, each firm's capacity to project cash flow, and the cost of hedging.

Figure 5

Contract characteristics for importers



Source: Author's calculations using CBC data.

The FX derivative instruments contracted by both types of firm have similar characteristics. The vast majority of contracts are forwards with an average share of over 80% for the entire period.¹⁶ A greater diversification into more sophisticated instruments has been observed however over the sample period. Among them, cross-currency swaps (CCS) have played an important role, along with options, FX swaps and combinations thereof (classified as "Other").

The most traded currency pair by far is the CLP/USD. However, the figures show a high proportion of contracts other than CLP/USD at the beginning of the sample period, which includes both currency pairs labelled as CLP/OT (other currencies) and UF¹⁷/USD. For the purposes of this analysis, the latter currency pair can be considered a transaction between the national currency and the U.S. dollar. As such, almost all of the coverage includes the U.S. dollar on one side of the transaction. Within "Other foreign currencies", the euro and the Japanese yen make up the most significant proportion.

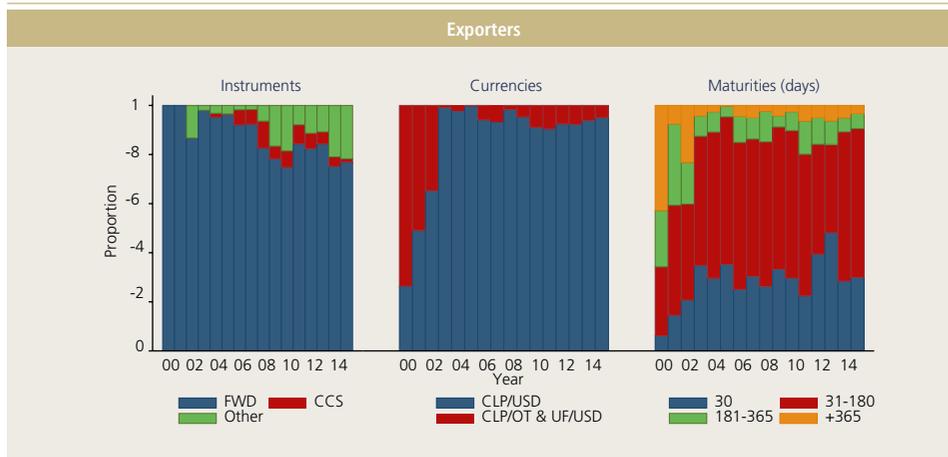
On average, more than 80% of contracts have maturities of less than 180 days. Of these, two-thirds are between 31 and 180 days. Those with longer maturities (more than one year) are mostly CCS's. This is related to the use of CCS's as a debt hedging instrument which regularly have longer-term obligations.

¹⁶ The high popularity of forward contracts is due to their simplicity and low entry costs, as no payment is required at the beginning of the operation.

¹⁷ The UF (Unidad de Fomento) is an indexed measure widely used in Chilean financial markets that varies daily with past inflation. This tool was particularly important before the nominalization of Chilean monetary policy in August 2001 (Jara et al., 2003).

Figure 6

Contract characteristics for exporters



Source: Author's calculations using CBC data.

VI. MICRO-LEVEL ANALYSIS

This section studies the behavior of FX derivatives use at the micro level. Firstly, the degree of concentration of the total amount outstanding is analyzed. The expected NDP is then studied to see if it is satisfied at the individual level. Subsequently, the relationship between the magnitude of foreign trade flows and derivatives market activity exhibited by EXIM firms is examined.

To measure the degree of concentration, a graphical representation of the distribution of wealth, known as the Lorenz curve (Lorenz, 1905), is used. As an application of this study, the wealth variable is replaced by the gross derivative position (purchases + sales).¹⁸ The concentration analysis reveals that 80% of exporters and importers accumulate less than 1% of the total gross positions throughout the period. The related Gini coefficient (Gini, 1912), which measures the degree of inequality based on the Lorenz curve, shows a value of 0.886 for importers and 0.872 for exporters, implying a high degree of concentration in both cases.¹⁹

The high level of concentration could lead one to think that the NDPs observed at the aggregate level (figure 3) do not correspond to the hedging strategies taken by most companies. However, this is ruled out by analyzing the empirical distributions of NDPs for the last month of each year (figure 7), represented by

18 Figure A1 of the appendix shows the Lorenz curves for exporters and importers.

19 This index ranges from 0 to 1, where 0 represents perfect equality and 1 represents perfect inequality.

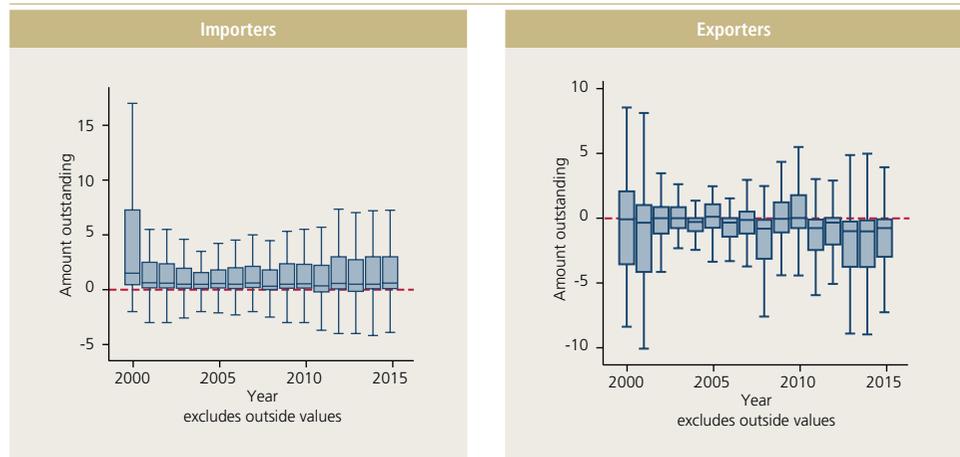
a boxplot. These distributions confirm that the expected behavior also holds at the individual level. It is noted that on average 75% of importers display their expected NDPs. Exporters also display their expected NDPs, never falling below 50% in any of the sample years. Put another way, from the first quartile upwards (denoted by the lower limit of the box), the distribution of importers exhibits a NDP greater than zero; and for exporters, from at least the median line and below (denoted by the band inside the box), the NDP distribution is negative.

Figure 8 presents some key points in the relationship between the flow of foreign trade of each company and the frequency of FX derivatives transactions. The horizontal axis shows gross exports and imports while the vertical axis shows turnover of FX derivatives, with both classified into 20 quantiles. The colors simulate the density of companies through an index ranging from 0 to 100. Cooler colors represent a lower density of firms with warmer colors representing a higher density.

Warmer colors dominate the lower quantiles of trade flows and turnover. This implies a greater density of EXIM firms with low levels of foreign trade flows and turnover in the derivatives market compared to the total of companies analyzed. In other words, a high number of small EXIM firms display lower activity in the FX derivatives markets.

Figure 7

Distribution of net derivative positions

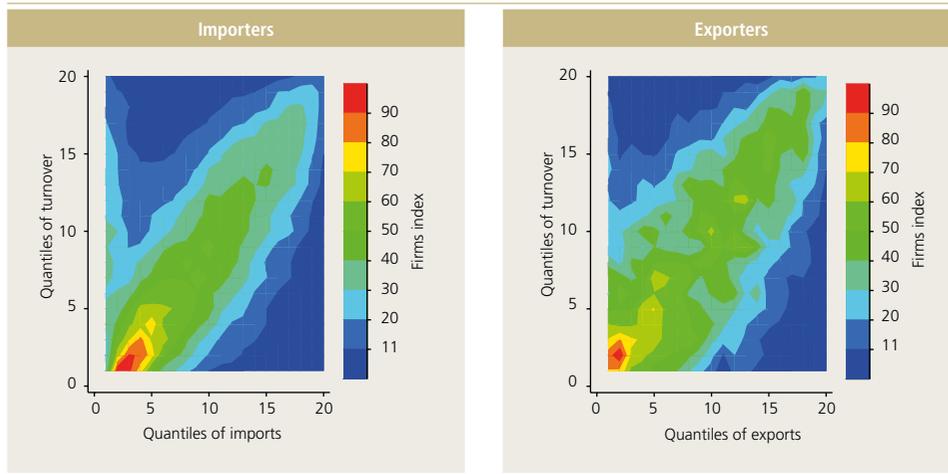


Source: Author's calculations using CBC data.

Note: Excludes outlier values. The limits of the internal box are the first and third quartiles with the band inside representing the median. The upper whisker represents the highest value still within 1.5 times the interquartile range (IQR) of the upper quartile. The lower whisker represents the lowest value still within 1.5 times the IQR of the lower quartile. This is often called the Tukey boxplot (Tukey, 1977).

Figure 8

Quantiles of foreign trade flows and turnover, 2000-2015



Source: Author's calculations using CBC data.

Furthermore, the cold colors are concentrated in two distinct areas: (1) high turnover and low levels of foreign trade flows, (2) low turnover and high levels of foreign trade flows. Therefore, a positive relationship is observed between the level of foreign trade and activity in the FX derivatives market. This is in line with previous empirical evidence and literature.²⁰ This result also corroborates Villena and Salinas (2014), who suggest that the increased activity noticed in the Chilean FX market between 1998 and 2013 was influenced by greater international trade flows during this period.

VII. CONCLUSIONS

A unique micro-level database has been exploited in order to characterize the structure of FX derivatives usage by EXIM firms in Chile. Evidence is presented of a growing number of EXIM firms utilizing FX derivatives as a hedging strategy against exchange rate risk. Furthermore, the research note shows a positive relation between firm size and the number of firms that use FX derivative hedging strategies. A direct relationship is also observed between the level of foreign trade flows and turnover in the FX derivatives market.

The development of hedging strategies is in line with the currency mismatches experienced by different firms. Thus, importers exhibit net purchase (long)

²⁰ In figure A2 of the appendix this figure is broken down into sub-periods of the sample (three 5-year periods) and the conclusions remain consistent. Nevertheless, the relationship is less obvious exporters in the period 2000-2005 due to the smaller number of observations (there is an average of 115 hedgers in the 2000-2005 sub-period as compared to an average of 460 hedgers in the 2011-2015 sub-period).

positions on FX derivatives while exporters exhibit net sale (short) positions. In both cases, the expected net derivatives position is found to hold for most sectors and for the majority of individual firms. The latter is true despite the high concentration in the FX derivatives market, where 80% of EXIM firms hold less than 1% of the total amount outstanding.

Even though there is a general trend towards the use of more diversified and sophisticated financial instruments, forward contracts are by far the principal instruments used by EXIM firms in Chile (with maturities of less than 180 days). This is consistent with the maturities of outstanding accounts payable or receivable in foreign trade operations. Breaking down these contracts by maturity shows that about two-thirds of them are between 31 and 180 days. Companies also cover foreign-denominated debt using cross-currency swaps with maturities longer than one year. Most exchange rate protection measures are taken against the U.S. dollar.

The database constructed for this project as well as the initial evidence presented in this article can be used as a starting point for future research questions. These elements, used in conjunction with the financial statements of companies, could be used to examine in more detail the determinants of FX derivatives usage in Chile. This database could also shed light on the financial results of currency hedging made by EXIM firms. Finally, given the amount of available information in the dataset, analysis could be undertaken on how hedging strategies evolve over time due to changes in exchange rate volatility.



REFERENCES

- Acharán, M.G., R. Álvarez and J.M. Villena (2009). “Crisis Financiera y Uso de Derivados Cambiarios en Empresas Exportadoras.” Working Paper No. 552, Central Bank of Chile.
- Allayannis, G., and E. Ofek (2001). “Exchange Rate Exposure, Hedging, and the Use of Foreign Currency Derivatives.” *Journal of International Money and Finance* 20(2): 273–96.
- Avalos, F.H. and R. Moreno (2013). “Hedging in Derivatives Markets: The Experience of Chile.” *BIS Quarterly Review*, March.
- Bank of England (1998). “Smaller Exporters.” *Special Report*, January, Bank of England.
- Bartram, S.M., G. Brown and F.R. Fehle (2009). “International Evidence on Financial Derivatives Usage.” *Financial Management* 38(1): 85–206.
- Bank for International Settlements (2010). “Research on Global Financial Stability: The Use of BIS International Financial Statistics.” *Committee on the Global Financial System* No. 40.
- Briggs, P. (2004). “Currency Edging by Exporters and Importers.” *Reserve Bank of New Zealand Bulletin* No. 67.
- Buscio, V., H. Kamil and N. Gandelman (2011). “Determinantes del Uso de Coberturas Cambiarias de las Empresas Uruguayas.” *XXVI Jornadas Anuales de Economía, Central Bank of Uruguay*.
- Čadek, V, H. Rottová and B. Saxa (2011). “Hedging Behavior of Czech Exporting Firms.” Czech National Bank Working Paper Series No. 14.
- Fabling, R. and A. Grimes (2008). “Do Exporters Cut the Hedge? Who Hedges and Why.” Occasional Paper 8(02), Ministry of Business, Innovation and Employment of New Zealand.
- Gini, C.W. (1912). “Variability and Mutability, Contribution to the Study of Statistical Distribution and Relations.” *Studi Economico-Giuridici della R.*
- Jara, A., K. Schmidt-Hebbel, M. Tapia and E. Arraño (2003). “Efectos de la Nominalización de la Política Monetaria en Chile.” Working Paper No. 197, Central Bank of Chile.

Júnior, J.L.R. (2007). "The Use of Currency Derivatives by Brazilian Companies: An Empirical Investigation." *Revista Brasileira de Finanças* 5(2): 205–32.

Lorenz, M.O. (1905). "Methods of Measuring the Concentration of Wealth." *Publications of the American Statistical Association* 9(70): 209–219.

Orellana, V. and P. Rodríguez (2009). "Methodology for Measuring Derivatives at the Central Bank of Chile." IFC Bulletin No. 31, July.

Rébora, S. and D. Vivanco (2016). "Valor Agregado Doméstico y Contenido Importado de las Exportaciones: Evidencia de las Matrices Insumo-Producto de Chile 2008-2012." *Studies in Economic Statistics* No. 115, Central Bank of Chile.

Rodríguez, P. and J.M. Villena (2009). "El Mercado Cambiario Chileno en el Período 1998-2008." *Studies in Economic Statistics* No. 75, Central Bank of Chile.

Tukey, J.W. (1977). "Exploratory Data Analysis" Reading, MA: Addison-Wesley.

Villena, J.M. and J.M. Salinas (2014). "Mercado Cambiario Chileno, Una Comparación Internacional: 1998 a 2013." *Studies in Economic Statistics* No. 106, Central Bank of Chile.

APENDIX A

Table A1

Average concentration of EXIM firms by firm size, 2000 – 2015

	Firm size by amount imported or exported (US\$ million)				
	<0.5	0.5 - 1	1-5	5-50	>50
Importers	93.2%	2.3%	3.0%	1.3%	0.2%
Exporters	66.6%	7.6%	14.4%	9.2%	2.2%

Source: Author's calculations using CBC data.

Table A2

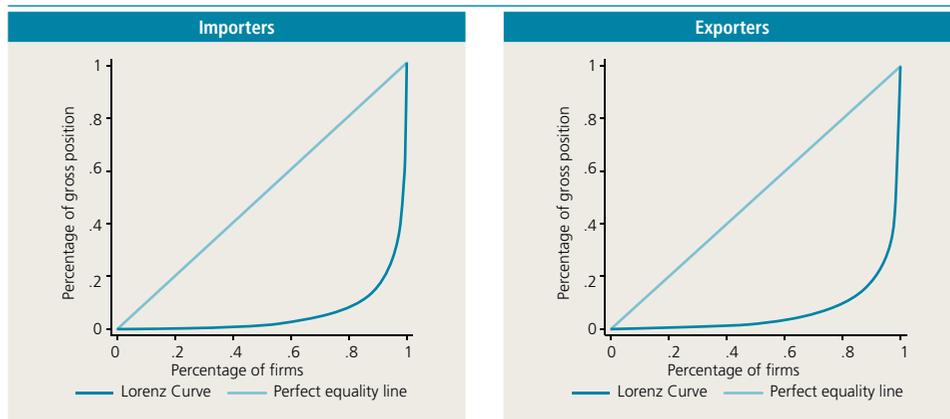
Turnover of EXIM firms (hedgers and non-hedgers) within the sample period

Years in the sample	Exporters		Importers	
	Number	Percent	Number	Percent
1-4	31,457	46.9%	749,814	65.5%
5-8	14,472	21.6%	206,491	18.0%
9-12	8,854	13.2%	83,932	7.3%
13-16	12,359	18.4%	105,195	9.2%

Source: Author's calculations using CBC data.

Figure A1

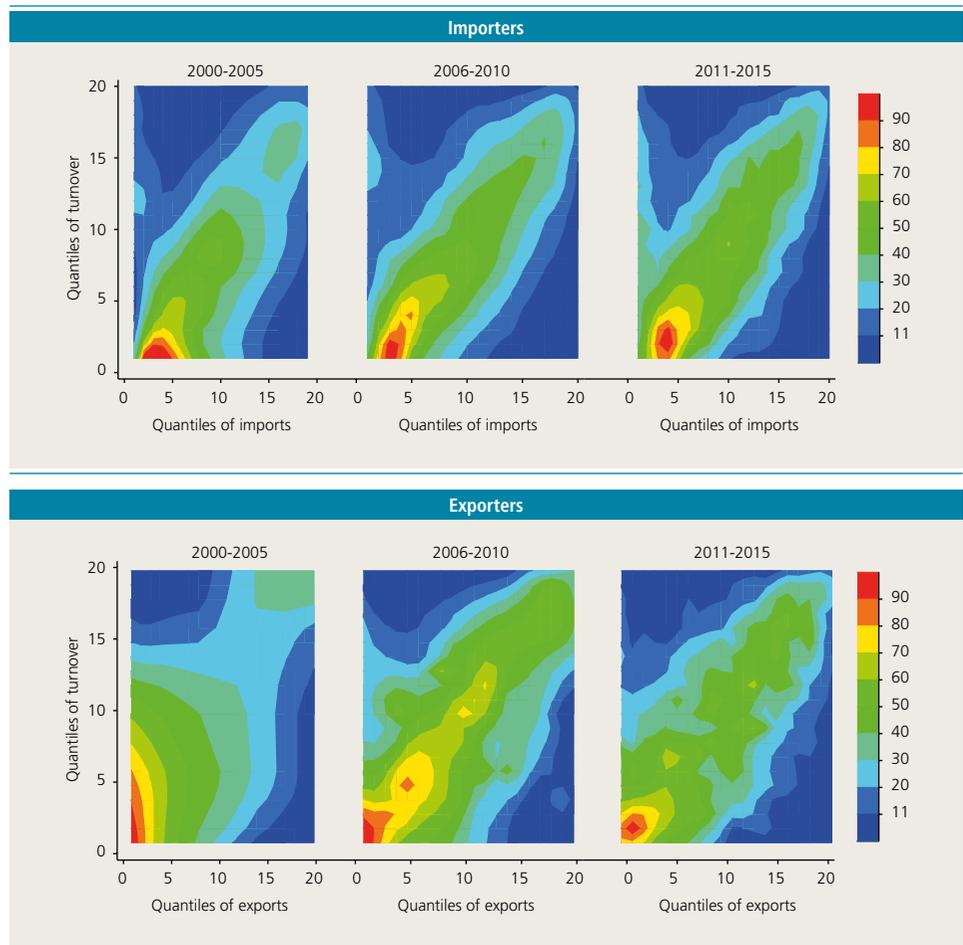
Lorenz Curve for EXIM firms



Source: Author's calculations using CBC data.

Figure A2

Quantiles of foreign trade flows and turnover



Source: Author's calculations using CBC data.