THE COMMODITIZATION OF CHILEAN ECONOMY: some stylized facts about its economy

MANUEL MADRID-ARIS [*]
Universidad Santa María
Department of Industrial Engineering and Economics
Santiago, Chile.

and

MARCELO VILLENA C.
Universidad Adolfo Ibáñez
Faculty of Sciences and Technology
Santiago, Chile

DATE OF THIS WORKING PAPER: December, 2005

ABSTRACT

This paper resorts to econometric analysis to establish the relationship between the price of copper and the economic growth, nominal exchange rate, trade balance, and the Santiago Stock Exchange indicators. We observe that the economy has developed an important dependency on the price of copper, a phenomenon that has been called commoditization of the economy. Commoditization begins to manifest itself in 1998, becoming deeper in the period 2000-2002, after the introduction of a completely flexible exchange rate regime. The paper also analyzes sectoral labor productivity to explore the causes of commoditization. The conclusions are: (i) as from year 2000, the price of copper is the explanatory variable of the aforementioned economic indicators; (ii) the economy's performance tends to hinge on the important productivity levels experienced by the mining sector; (iii) the growth of both the economy and exchange rate will be exposed to the same cycles as copper; hence, growth with high volatility is to be expected; and (iv) the Chilean economy has become commoditized. Accordingly, results suggest that the commoditized Chilean economy is not in itself an economic development model able to offer sustainable long-term growth with low volatility.

Classification JEL: C50, E10, F43, O11, O47

Keywords: Economic model, economic development, international trade, efficiency, exchange rate, productivity, copper, Dutch disease, small open economy.

[*]The authors are grateful to the comments received from Mauricio Villena and Ernesto Hernández-Cata. We are also grateful to Ignacio Valenzuela, Gonzalo Guajardo, José Miguel Gredilla and Guido Rietta for their valuable research asístanse during the development of the research work. Please send all correspondence to: Manuel Madrid-Aris, e-mail: manuel.madrid@usm.cl.

1. INTRODUCTION

This paper do not pretend in any manner to create a structural economic growth model for the Chilean economy neither to argue that the Chilean economic model has failed. The main objective of this paper is simply to show some several stylized facts in regard to the dependency of Chilean macroeconomics variables with the copper price.

In the mid-70's Chile becomes the Latin American leader when it adopted a model of market-oriented economy, by reducing tariffs unilaterally and creating an outward-oriented model of development. Chile is also one of the leaders in making deep reforms through its structural adjustment program. The public sector gradually gives up its role as a developer and deepens its role as a regulator, leaving the productive activities to the private sector. Measures such as the privatization of State-owned companies, tariff reductions and trade liberalization through a great number of Free Trade treaties, privatization of social security system, private sector participation in health and education, independence of the Central Bank, reorganizing public finances, liberalization of the banking system, opening the capital account, and promoting foreign investing are implemented.[1]

Chile ─ owing to its condition as leader in the process of structural adjustment ─ is resorted to as the model to be used not only by Latin American countries, but also by a great number of underdeveloped countries. In line with this, most of the policies implemented in Chile are the foundations of the economic proposals, which later would become known as the Washington consensus.[2]

With the structural reforms, Chile inserts its economy in the World economy, and globalization becomes the key strategy or pillar of the Chilean development model. Accordingly, through trade liberalization, Chile expects to make the best of the markets, attain economies of scale using the international markets, and use the country's comparative advantages. Broadly speaking, the pillars of the Chilean model can be summed up as follows: (i) resorting to international trade; (ii) opening up the capital account and using the flows of foreign investment; (iii) macroeconomic instability; and (iv) good governance. In the Chilean model, the role of planning loses importance, and markets are allowed to define the comparative advantages of the different sectors of the economy.[3]

The results of the policies implemented by Chile are self-evident; Chile experiences a sustained growth of more than 6% yearly for more than a decade (see Figure 1). Furthermore, during that same period Chile is able to reduce its levels of poverty by a half, experiencing unprecedented improvements in the quality of life of the population.[4] As shown in Figure 1 below, Chile during the period 1984-1998, after having implemented the structural reforms, manages to grow more rapidly than the World average. Chile was able to make a more efficient use of its natural-resources-based comparative advantage. Much has been said about the second stage of exports and the "natural" evolution of the economy to more value added sectors; however such change in the productive structure has not been achieved at all. In actual fact, over the period 1999-2003, Chilean GDP grows at an average rate of only 2.6%, a very low figure

[1] For a review of the economic reforms implemented, see Ramos (1986), Corbo and Melo (1987), Corbo (1993), Birdsall and Jaspersen (1997).

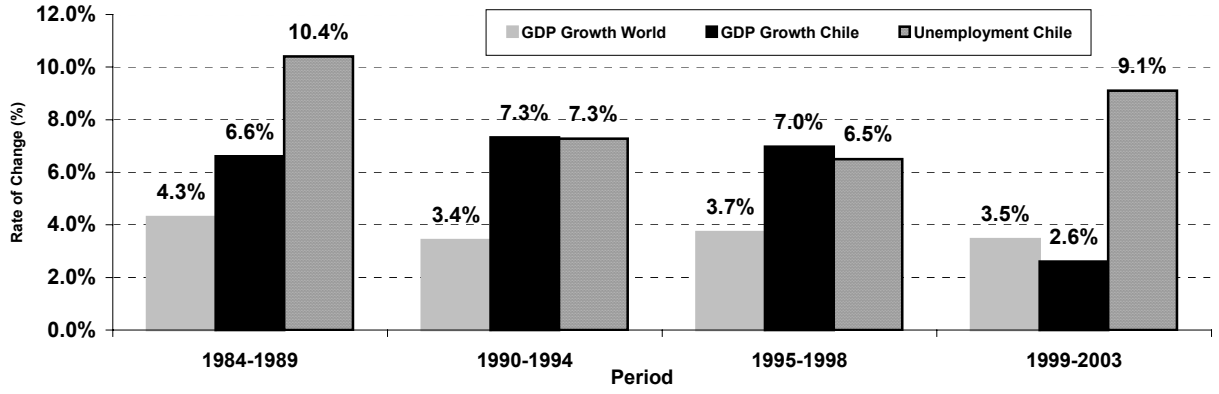
[2] Turn of phrase originated in 1989 by John Williamson from the Institute for International Studies in Washington.

[3] In the case of Chile contrary to Korea (see Amsdem, 1989, 2001), the role of government in the process of planning or defining a long-term development strategy is very limited.

4 The success of Chilean social policy is attained by increasing social spending. This policy has not been praised that much by international agencies; this is attested by the fact that, when it comes to disseminate the so-called "Chilean economic model", this element is not included in the recommendations. For a review, see Villena and Villena (1998).

as compared to the world average. During this period, the average unemployment rate is 9.1%, a figure much larger than the unemployment rate seen in the 1990's. Today's main debate in the public policy arena is the way to reduce the persistent unemployment rate seen in the last 6 years.

Figure1: World GDP growth versus Chilean GDP growth



Source: World GDP from IMF, International Financial Statistics, 2004. Chilean GDP and Unemployment Rate from Chilean Central Bank, Statistical Yearbooks, several years.

Figure 1 shows that it is evident that the Chilean economy loses its dynamism as of the year 1998. Since 1998, Chile has not able to achieve its potential GDP. Even though some experts acknowledge this fact there still persists a lack of analytical and empirical studies in this area. For many, this fact is a temporal symptom, but as shown in this paper this would seem to be a more serious, long-term and structural matter, where the productive structure, the price of copper and productivity are key issues.

It is important to have an understanding of the key role which the mining sector, and especially copper, play in the country's economy. From Table 1, we can appreciate that Chile has considerably increased its participation in the World market. In 1994, Chile accounted for 23.5% of world copper production, whereas 10 years after Chile represents 37.1% of world copper production.

Table 1: World Copper Production, Chilean Market Share and Copper Prices

Year	Production (Thousands of Metric Tons per Year)				Total Production (thousand Metric Tons)	Rate of Change of World Production (%)	Rate of Change of Chilean Production (%)	Chile's Participation in World Production (%)	Participation of Multinational Companies in Total Domestic Production (%)	Average Copper Price (USD/lb)
	Chile	United States	Peru	Australia						
1994	2,220	1,810	399	416	**9,430**			23.5	49	1.05
1995	2,490	1,850	381	437	**10,000**	6.04	12.16	24.9	53	1.33
1996	3,120	1,920	572	525	**11,000**	10.00	25.30	28.4	51	1.04
1997	3,390	1,940	491	545	**11,400**	3.64	8.65	29.7	64	1.03
1998	3,691	1,860	522	604	**12,200**	7.02	8.88	30.3	62	0.75
1999	4,382	1,600	536	735	**12,600**	3.28	18.72	34.8	66	0.71
2000	4,600	1,440	554	829	**13,200**	4.76	4.97	34.8	67	0.83
2001	4,740	1,340	722	869	**13,700**	3.79	3.04	34.6	66	0.71
2002	4,580	1,140	843	883	**13,600**	-0.73	-3.38	33.7	65	0.70
2003	4,900	1,120	831	830	**13,600**	0.00	6.99	36.0	66	0.80
2004	5,380	1,160	1,000	850	**14,500**	6.62	9.80	37.1	66	1.30
Average						**4.4%**	**9.5%**			

Source: U. S. Geological Survey.Mineral Commodity Summaries, several years. Cochilco, Statistical yearbooks, 2004.

The average growth rate of Chilean production (9.5%) is by far much higher than the world growth rate (4.4%). While Chile, Peru and Australia have considerably increased their production, the U.S.A. has lowered its production.[5] On the other hand, foreign participation in 1987 ─ a period, which could be considered as the end of the structural adjustment process - was only 25%. A decade later, the participation of multinational concerns accounts for nearly 66% of domestic production. In this manner, the role of foreign investment in the production of copper begins to attain importance.

Despite the great increase in the production of copper, the participation of mining in internal GDP has not changed considerably since 1987 to date, and neither has its participation changed in total exports (see Table 2). However, it is worth mentioning that mining generates more than 50% of international trade in Chile.

Table 2: Sectoral Participation in Total Ouput and Sectoral Exports

Sector	Sectoral Participation in Total Output (%)			Percentage Variation	Sectoral Participation in Total Exports (%)		
	1987	1995	2004	1987-2004	1987	1995	2004
Tradable	**41.9**	**38.5**	**38.5**	**-8.1**	**100**	**100**	**100**
Mining in General	11.0	9.2	11.6	5.6	53.4	48.8	53.6
Agriculture, Livestock, Forestry and Fishery	10.3	9.9	10.2	-0.8	15.1	9.5	7.9
Industry (manufacturing)	20.6	19.4	16.7	-19.1	31.5	41.7	38.5
Services (Electricity, Water and Gas)	3.1	2.9	2.6	-16.4	0	0	0
Non-tradable	**55.0**	**58.6**	**58.9**	**7.11**	**0**	**0**	**0**
Construction	5.7	6.2	5.3	-7.1	0	0	0
Commerce	17.2	19.8	19.4	12.9	0	0	0
Transport and Communications	7.6	9.1	11.2	46.2	0	0	0
Financial Services	14.5	16.0	16.4	12.8	0	0	0
Municipal and Social Services	10.0	7.4	6.7	-32.8	0	0	0

Source: Estimated by the author based on National Accounts Data from Chilean Central Bank.

From table 2, we can see that the contribution of mining to GDP is almost constant for the period 1987-2004, as well as the contribution of agriculture, forestry, and fishery to GDP. The contribution of the industrial sector to GDP has decreased in the order of 19% since 1987 to date.

The empirical evidence and the models set forth in this paper clearly validate the old concerns that productive structure, development model, and economic development apply very directly to the Chilean case. In this paper, we show that Chile with its economic model implemented during the 70's and 80's, and despite the attempts to diversify its productive base through the process of diversifying exports, has been unable to transform its productive structure and make it more independent from mining.

This research aims to show that copper price is the determinant variable of both Chilean economic growth as well as the exchange rate, trade balance and the valuation of companies that trade their shares on the Santiago Stock Exchange. The paper is organized as follows: section 2 offers a brief review of what economic theory has to say with respect to the effects generated by trade liberalization on static and dynamic efficiency. In section 3, econometric analysis are developed to relate copper to: (1) balance of trade; (ii) nominal rate of exchange; and (iii) valuation of companies. Section 4 offers an analysis of sectoral labor productivity in Chile. Section 5, a simple growth model is calibrated econometrically that

[5] The reduction of production in the U.S.A. is due to the high production cost, which according to the U.S. Geological Survey is in the order of 0.90 USD/lb, which contrasts with the average domestic production cost of 0.59 USD/lb. (information based on Codelco and Escondida balance sheets).

includes the price of copper among other variables and evaluates its importance in the economy. Section 6 systematizes the Chilean phenomenon in a variant of the well-known Dutch disease, which we call the "copper disease". Finally, in the conclusions the policy implications of this paper are discussed.

2.- ECONOMIC THEORY, TRADE LIBERALIZATION, PRODUCTIVE STRUCTURE AND THE CHILEAN ECONOMY

In the first part of this section, a review of the theory of international trade and its relationship to dynamic and static efficiency is summarized. Next, the evidence from Latin America with respect to the liberalization and gains in efficiency is presented. Finally, the case of Chilean liberalization is analyzed by setting forth the existing productivity studies and analyzing its sustainability for long-term economic growth.

2.1 Theory of International Trade, Gains in Efficiency and Growth

Given the fact that many less developed countries (LDCs) have implemented a model similar to the Chilean one ─ in which globalization is the mainstay of their economic model ─ the economic development literature is now discussing which policies ought to be implemented after having liberalized the markets. Thus, it is fundamental to have an understanding of the outcomes of liberalization and its effect on the productive structure, and on dynamic efficiency.

From the economic literature, we know that international trade implies a more efficient resource allocation, which, in turn, involves an increase in social welfare. This allocation implies that some countries could become specialized in those areas in which they are endowed with comparative advantages. On the other hand, we also know that natural-resources based products have a lower productivity growth and face lower income elasticities. Then, if a country specializes in exports of primary goods or natural-resources based products, in the long term it could well suffer a deterioration of its terms of trade, and then would be in no position to reach the initial objective.

International trade generates two effects on efficiency, static and dynamic effects.[6] The increase in static gains relates to David Ricardo's concept of comparative advantage, where gains are established due to concepts of allocative and technical efficiency gains. We know that by cutting down tariffs, long-term static efficiencies are generated and that, therefore, the improvements in static efficiency increase economic growth only temporarily.

On the other hand, the effects or dynamic gains that international trade could generate correspond to long-term effects and are related to total factor productivity (TFP) growth, which, if they do exist, generate a permanent effect on the economic growth of a country. It is argued that this effect is the consequence of, among other aspects, higher permanent rate of investment, higher investment in research and development (R&D), greater technological innovation, higher level of learning, adoption of new technologies and dissemination of knowledge (Krueger, 1998). Another argument that has also been put forth states that liberalization increases competition. However, the impact of an increase in competition on technological change is ambiguous, because competition reduces margins, limiting resources for an increase in investment in general, and in special for investment in R&D (Rodrick, 1995).

[6] International trade would also generate an effect in terms of reducing rent-seeking activities. In addition, it is also argued that international trade creates the conditions for an economy to have a better adjustment to external shocks, which is debatable since a better adjustment to shocks depends on the productive structure, wages and price rigidities, size of the country and exchange rate regime.

In like manner also, the dynamic gains have to do with the scope of the economies of scale. Without any doubt, companies benefit from a larger market created by the liberalization of the economy. However, economies of scale are primarily related to the manufacturing industry. In the specific case of Chile, economies of scales should be predominant mainly in the mining sector. This relationship tends to become attenuated when we speak of natural resource products such as those from agriculture, fishery and other primary sectors. Therefore, the dynamic gains of economies of scale would appear only in those cases where the country has a manufacturing or mining base installed at the moment of the liberalization.

Many LDCs have a static comparative advantage in the production of primary goods, where investment in R&D and innovation do not play an important role, and the economies of scale are not that important. Summing up, developing countries with static comparative advantages in the export of primary and natural resources, that are intensive in non-qualified labor, would not be able to achieve the desired effect of dynamic gains through liberalization (see this line of argument, Dijkstra, 2000).

2.2 Outcomes of Liberalization, Productive Structure and Trends

It is important to analyze the international empirical evidence with respect to liberalization and its effect on static and dynamic gains. In like manner, it is important to understand the gains of liberalizing in the context of market trends and the productive structure of the economy.

Dijkstra (2000) makes a complete revision of all studies applied to Latin America in connection with this matter. The results obtained with liberalization are consistent with the theory. Static gains were stronger in small and medium-sized countries than in large countries such as Mexico and Brazil. Exports of manufactured products increased rapidly in the 90's in large countries, as was expected by the theory, as they were assembly or maquiladora products, which are highly intensive in low-skilled labor, and where productive capacity was already operating at the moment of trade liberalization.

Cole and others (2005) in an interesting paper show how Latin America ─ despite the trade liberalization ─ has not made any significant progress in what regards catching up with developed countries, as the countries of South-East Asia are doing. The stagnation of Latin America is simply the result of the low gains in dynamic efficiency or total factor productivity over the last 40 years. It is argued that the difference in human capital between Latin America and the developed countries is not the main determinant of this difference in productivity, but rather the barriers to competition and the high entry costs to set up a business. Their viewpoint is consistent with that of Engerman and Sokoloff (2000) who argue that the political elite is the group that restricts competition in the developing countries. In this aspect, their view coincides with the one held by Lin and Nugent, who argues that relatively few LDCs have instituted and fully implemented serious efficient institutional reforms that may lead to long-term sustainable growth. The facts that might explain this failure are, the discretionary authority of the ruler, ideological rigidity, bureaucracy problems[7], interest group conflicts, and limitations in social science knowledge (Lin and Nugent, 1995, p. 2337)

Paus (2003) presents statistics of productivity and investment in Latin America and the rest of the World for the decades of the 80's and 90's. He arrives at the conclusion that after 15 years of trade liberalization, Latin America has a poor performance in productivity and the low savings rate with respect to the rest of the World. Paus argues that the endogenous growth theory does not analyze the characteristics of the firms and the general environment required to promote dynamic efficiency or total factor productivity.

[7] Bureaucracy problems deals with the fact that policy making process do not respond rapidly to the preferences (demands) of the people.

Therefore, it becomes necessary to know the capacities required by those firms and entities to absorb or adopt a new technology. This is particularly important for developing economies where technological know-how is not massified and there are not any institutionalized systems that promote technological change or the capacity of the people to adopt technologies. The capacity of the firms to absorb technological change ─ as well as the economic and social setting that facilitates technological change at the firm level ─ are important variables (Lall, 2000; Amsden, 2001). Amsdem (2001) provides an interesting analysis of several countries where the policies implemented during the second part of the XXth century played a predominant role in creating capacity for technological absorption.

If at the moment of liberalizing international trade, the technological capacities are not sufficiently developed in the domestic setting, the firms will not take advantages of the access that they have to imported technologies, and the liberalization of trade shall not lead to gains in dynamic productivity. On the other hand, some studies show that when trade is liberalized, the increase in productivity is due to the exit of inefficient local companies, as a result of the competitive pressure of imported products (Pavcnick, 2002).

There is no doubt that the liberalization of trade in Latin America has generated an increase of exports of primary products or products based on natural resources. The correlation between the composition of the exports and productivity is an aspect that has not been studied exhaustively from the empirical standpoint. The studies developed by the Interamerican Development Bank (IDB) in 2001 and the World Economic Forum in 2002, show a positive and statistically significant relationship between economic growth and the fraction of exports of high technology products.

Paus (2004) puts forth rather interesting evidence showing that the primary products and resource-based products exports have reduced their participation as a percentage of total world exports, from 42% in 1985 to only 28% in the year 2005. On the other hand, the market for products classified as of low and medium technology intensive has increased their participation considerably in the world international trade. If we observe the world trend of the structure of exports from Latin America ─ which has not changed after the trade liberalization ─ it is feasible to conclude that Latin America exports are going against the world trend. This trend is more acute in South America, with the exception of Brazil.

The evidence shows that the structure of Chilean exports is based on primary and resource-based natural products (see Table 1). Chile presents a very low level of exports that incorporate low, medium, and high technology intensity products, with respect to the average rate of Latin American and Asian countries (Paus, 2004, p.433). In Latin America, Brazil, Mexico, Costa Rica and Panama show the highest rates of exports of high technology intensity products. While in the year 2000, the average index of high technology intensity exports from Latin America and Caribbean is 14.3; Chile has an index of only 0.7 and ranks among the worst eight countries in Latin America and the Caribbean. Chile also ranks at a similar level for low and medium technology intensive products. On the other hand, Chile ranks in third place after Venezuela and Ecuador in exports based on primary and natural resource-based products.

In what regards high technology intensive exports, the production both in Latin America and Asia is in the hands of multinational companies, with the exception of Korea. This element implies that if the objective is to increase productivity, this comes indirectly hand in hand with foreign investment, and in that setting the public policy should be to not only facilitate foreign investment as Latin America and Chile has done, but also to generate mechanisms that permit creating incentives to technology transfer which could generate a permanent dynamic efficiency.

2.3 The Case of Chile: Liberalization, Productive Structure and Dynamic Efficiency.

Based on the theory and empirical evidence, What should we expect in terms of gains and efficiencies as a consequence of the liberalization process in Chile, having in consideration the Chilean productive structure? Static gains with short-term temporal effects ─ excepting the mining sector, where economies of scale, cost of capital, investment in R&D, and foreign investment play a more important role in the dynamic efficiency ─ should be expected primarily. Consequently, in the mining sector a long-term dynamic gains effect should be expected. If dynamic productivity of the mining sector were much higher than the rest of the sectors, this sector should be leading a long-term economic growth in Chile, as this sector generates more than 50% of exports.

There are several studies that analyze the impact of liberalization on productivity in Chile (Richards, 1997; Tybout and other, 1991; Marshall, 1992; Gatica Barros, 1989; Pietrobelli, 1994; Valdés, 1992). These studies differ considerably in terms of the definition of productivity, methodologies resorted to and years of the comparisons. Besides, many cases include the great cycles generated by the recessions. Therefore, it is impossible from these studies to arrive at a unique conclusion with respect to this issue.

On the other hand, in the specific case of Chile, it is not feasible to measure TFP at a sectoral level, as there is not any stock of capital time-series disaggregated at sectoral level.[8] With respect to the aggregate analysis of total factor productivity there are several studies (Alvarez and Fuentes, 2004; Chumacero and Fuentes, 2002; Fuentes and others, 2004; De Gregorio, 2004). The results of these studies show that total factor productivity from the year 1985 to the year 2004 would be between 1% and 2%. Madrid-Aris and Villena (2005) argue that the elasticities could well be different to those assumed in previous studies. They estimate elasticities and total factor productivity through three different methods for the period 1984-2004, and with the three methodologies they obtain values of 0.7%. This means that the contribution of total factor productivity to GDP growth would be only 12%. The results of this study are consistent with the results of the study conducted by Hofman (1997).

From the abovementioned studies on total factor productivity, it is possible to draw some conclusions: First, the TFP growth observed in Chile is low when compared to TFP growth observed in Asian countries and to that observed in several developed countries. Second, Chile's economic growth is based more on the accumulation of capital than on gains in productivity, whereby the sustainability of its long-term sustainable economic growth offers some doubts. Third, given the lack of statistics to conduct an analysis of total factor productivity at a sectoral level, nobody is aware of the sector where the dynamic efficiency stems from. Fourth, given that growth of the Chilean economy is based more on the accumulation of factors than on productivity gains, in the future a high volatility may be expected in its economic growth, as capital accumulation depends on the volatility of the prices of commodities, especially on the copper price as will be shown in this research.[9]

Taking into consideration the revision of the literature, the need and urgency arises to stop to consider the underlying issues of the Chilean model.[10] In line with the ideas of the 50's, in the 70's and 80's one of the great debates in the theory of economic development was the understanding of the structural transformations of the economies[11]. The analysis is centered on understanding the rigidities in the

[8] The only attempt to study total factor productivity at a sectoral level corresponds to Vergara and Rivero (2005). The results of this study are to be considered preliminary, because their final value depends directly on the multiple assumptions done to create the capital stock series from a inpu-output matrix. In addition, the period under analysis is very short (1986-2001).

[9] See Dehn, Gilbert and Varangis in Joshua Aizenman and Brian Pinto (eds), who perform a very deep analysis of this phenomenon and warn against the risks which countruies that export commodities are exponed to.

[10] The market does not represent a model or strategy of development *per se*, but rather a mechanism to achieve some of the desirable results, but it is far from being and end in itself.

[11] In reference to the publications of the 40's and 50's, among which it is well worth mentioning Nurske (1953), Hisrchman (1958), Myrdal (1957), and Rosenstein-Rodan (1943).

production structure and the relationship between the historical change of such structure and the performance of the economy (Hirschman, 1977; Leff, 1978; Syrquin, Taylor and Westphal, 1984, Syrquin and Chenery, 1989, Chenery and Taylor, 1968).

With the arrival of the new endogenous growth theory at the end of the 80's, the economists have incorporated the old ideas of the theory of economic growth related to the economies of scale and imperfect competition, in their highly mathematical formal theoretical models. But most of endogenous models consider neither the productive structure of a country and its evolution in time nor its relationship with the performance of the economy. Therefore, there is a lack of empirical validations of the endogenous models to structural aspects. The valuable contribution of the endogenous theory of growth does not correspond to structural aspects, but rather to the models related to the economy of knowledge, adoption of technologies and barriers, spillover or diffusion of knowledge and ideas, research and development, diffusion of international technologies, human capital and productivity.[12]

This paper, rather than develop a new mathematical endogenous model that includes structural aspects of the Chilean economy, seeks to analyze the old notions related to structural aspects of an economy, in order to show the importance of these facts in the Chilean long-run economic growth. The main objective is to show several stylized facts about the Chilean, especially the fact that the economy is commoditized.

3. PROVING THE STYLIZED FACT OF THE COMMODITIZATION OF THE CHILEAN ECONOMY

The main objective of this section es to establish the relationship between the performance of the Chilean economy over the last 15 years and prove that the current productive structure makes the performance of the economy highly dependent on the evolution of the copper price. Thus, using econometric techniques we show how the economy has developed an important dependency on this variable, starting back in 1998 and becoming deeper in the period 2000-2005. This copper price dependency phenomenon has been called the commoditization of Chilean economy by the authors.

In this section, econometric models which use monthly time-series (most of them since January 1990 to August 2005) are tested with the purpose of showing the importance that the price of copper has on: (i) trade balance; (ii) nominal exchange rate; and (iii), valuation of the Chilean companies traded on Stock Exchange.

In order to analyze the aforementioned relationships, first we perform a correlation between the variables under study, the purpose of which is to shed light as to the choice of models and periods under study. In the second place, we perform the unit root and cointregration tests for each one of the models considered. The unit root tests applied correspond to the Engle-Augmented Dickey-Fuller (ADF) and Johansen Tests.[13] The Granger causality test,[14] is also applied with a view to analyze how robust the causality is between the related variables in each model (see technical detail of the econometric methodology in Appendix).

[12] Despite the extensive literature in this field, these topics are very rarely mentioned in the public policy agendas of developing countries.

[13] See Johansen (1988).

[14] See Granger (1986).

3.1 Correlation Analysis

Tables 1 and 2 show a correlation matrix between the price of copper (PCU) and variables such as the nominal exchange rate (EX), trade balance (NX), Santiago Stock Market General Price Index (IGPA), and Santiago Stock Market Selective Shares Price Index (IPSA), for the periods 1990(1)-1997(12) and 1998(1)-2005(8), respectively.

Table 1. Price of Copper and Economic Indicators
Correlation Analysis (Period 1990(1)-1997(12))

	PCU	EX	NX	IGPA	IPSA
PCU	1.0000	-0.1593	0.4960	0.4104	0.3119
EX		1.0000	-0.8077	0.7132	0.7745
NX			1.0000	-0.3748	-0.5129
IGPA				1.0000	0.9817
IPSA					1.0000

Table 2. Price of Copper and and Economic Indicators
Correlation Analysis (Period 1998(1)-2005(8))

	PCU	EX	NX	IGPA	IPSA
PCU	1.0000	-0.4274	0.9577	0.9358	0.9307
EX		1.0000	-0.2963	-0.2521	-0.3286
NX			1.0000	0.9428	0.9246
IGPA				1.0000	0.9859
IPSA					1.0000

It is evident that there is an important increase in the correlation between the price of copper and the nominal exchange rate, net exports, IGPA and IPSA. Specifically, nominal exchange rate, increases its negative correlation with the price of copper from -0.1593 to -0.4274, net exports increase their already important correlation in the period 1990-2005 from 0.496 to a near perfect positive correlation of 0.9577. With respect to the Chilean Stock Exchange Price indicators defined as IGPA and IPSA, the behavior is similar, with the correlation between the price of copper and these indicators increasing from 0.4104 and 0.3119 in the first period (1990-2005), to a correlation of 0.9358 and 0.9307 in the second period, respectively (1998-2005)

Very similar conclusions can be obtained when we analyze some of the determinants of Chilean economic growth and their relationship with the price of copper (PCU) for the period 2000(1)-2005(8). The GDP and labor productivity (PRODL) are correlated positively with the cooper price with coefficients of 0.7388 and 0.6337. These important correlations serve to underscore the need to analyze total factor productivity in the country against the mining sector, in order to analyze the improvements in dynamic efficiencies of the other tradable and non-tradable sectors in the period. The latter point is analyzed at a later stage in this paper

Table 3. Price of Copper and determinants of Chilean Economic Growth:
Correlation Analysis (Period 2000(1)-2005(8))

	PCU	GDP	PRODL
PCU	1.0000	0.7388	0.6337
GDP		1.0000	0.9602

PRODL	1.0000

Note: all variables consider natural logarithms

3.2 Stylized Facts about the Chilean Economy

This section shows the results of econometric models with the purpose of showing some stylized facts about the Chilean economy.

Stylized Fact 1: The Nominal Exchange Rate and Copper Price

We develop a simple nominal exchange rate model and the copper price.

$$\ln TCN_t = \alpha + \beta * \ln P_t^{CU} + \varepsilon_t \qquad (1)$$

Where, EX_t corresponds to a nominal exchange rate, and P_t^{CU} corresponds to the price of copper.[15]

The results are shown in Table 4. Four equations for different periods of time are estimated. Equation 1 clearly indicates that the relationship between the two variables under study was important in the period 1990-2000, though not sufficient enough to explain variations of the exchange rate (EX) on the basis of movements in the price of copper. However, the exchange rate begins to show a stronger correlation with the price of copper as from the year 2002, where it reaches a correlation (R^2) of 0.55, whereas in Equation 4, that considers the period January 2003 to August 2005, it reaches a correlation of 0.82.

Table 4. Results: Model Nominal Exchange Rate and Price of Copper

	Equation 1	Equation 2	Equation 3	Equation 4
Constant (α)	8.368220**	7.366976**	7.592121**	7.774576**
	(35.91)	(66.25)	(87.95)	(70.23)
Coefficient (β)	-0.513467**	-0.199129**	-0.244109**	-0.281233**
	(-10.09)	(-8.13)	(-13.04)	(-12.03)
R^2	0.439	0.550	0.802	0.828
Number observations.	132	56	44	32
Period	90(01)-00(12)	01(01)-05(8)	02(01)-05(8)	03(01)-05(8)

[15] The price of copper was obtained from the London Metal Exchange. The exchange rate value was obtained from the interbanking system.

Note: t-statistics in parenthesis. *(**) denotes statistical significance at 5% and 1% respectively.

Results from Granger causality test for these two variables suggest that there is a causal (robust) and negative relation between the rate of exchange and the price of copper for models 2 and 3, in which we reject the null hypotheses that the price of copper does not Granger-cause the rate of exchange.[16] In other words, an increase in the price of copper tends to appreciate the exchange rate.

These causality hypotheses were rejected for Equations 1 and 4, with a statistic F=1.95851 and a probability=0.10527 for Equation 1 and a Statistic F=1.31378 and probability= 0.29446 for Equation 4.

Table 5. Cointegration ADF (Augmented Dickey-Fuller) Test on the Residuals

	Equation 1	Equation 2	Equation 3	Equation 4
ADF TEST	-1.384158	-2.835427**	-3.313300**	-2.392309**
	(0.153)	(0.005)	(0.001)	(0.018)
Period	90(01)-00(12)	01(01)-05(8)	02(01)-05(8)	03(01)-05(8)

*(**) denotes statistical significance at 5% and 1% respectively. P-values in parenthesis.

Considering the ADF test, equations 2, 3 and 4 cointegrate in a rather robust manner, rejecting at 1% of significance the null hypothesis.

Table 6. Price of Copper and Nominal Rate of Exchange: Multivariate Cointegration Analysis

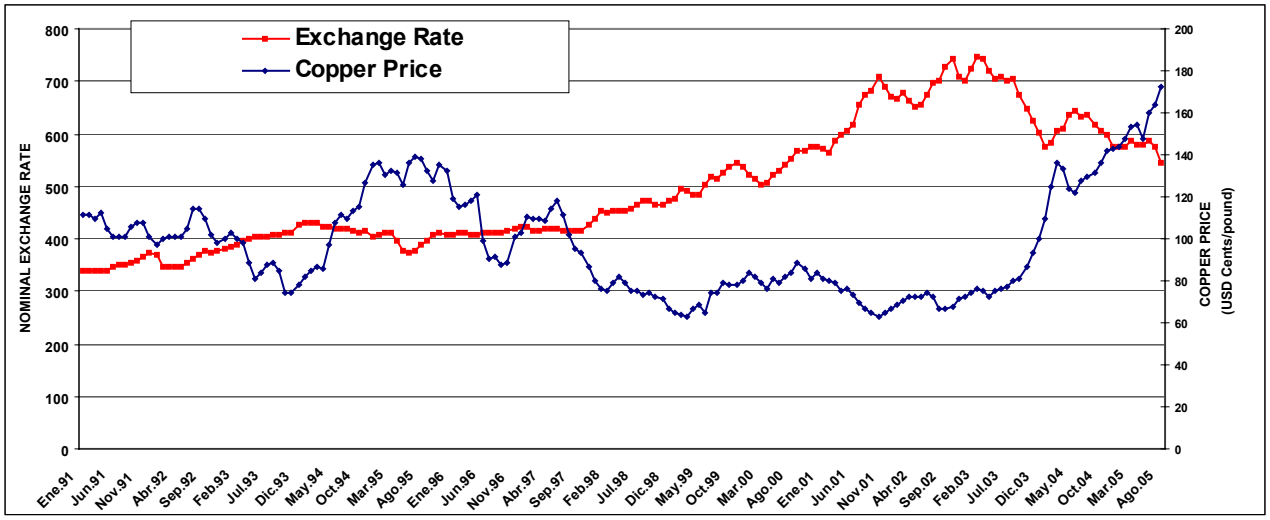
Test of Hypothesis	Equation 1	Equation 2	Equation 3	Equation 4
1. TRACE TEST	10.49222	5.524266	7.005274	17.22343**
	(0.248)	(0.750)	(0.577)	(0.027)
2. PROPER VALUE	8.886242	5.473157	6.864945	17.19347**
	(0.295)	(0.681)	(0.505)	(0.016)
Period	90(01)-00(12)	01(01)-05(8)	02(01)-05(8)	03(01)-05(8)

Note: P-values are given in parenthesis considering Mackinnon's p-values. *(**) denotes statistical significance at 10% and 5%. Results are shown for $r \leq 0$ vs. r=1 y r=0 vs. r=1.

Results from the Johansen test, concludes that there is no cointegration in Equations 1, 2, and 3. Equation 4, however, shows cointegration at 5% level of significance.

[16] Causality test results are: Statistic F=3.59197, probability=0.012 and statistic F=3.12421, probability=0.02680, respectively.

Figure 2. Evolution of Rate of Exchange and Copper Price (1991-2005)



The above figure allows us to see that at the moment when the exchange rate band is eliminated and a free flotation system is implemented (end of the 1999)[17] the Chilean peso begins to depreciate from 1999 until January 2002, when it begins to form an near perfect mirror with the price of copper. There is no doubt that the introduction of the free-floating system exerted a very strong influence in strengthening the relation between the nominal exchange rate and the price of copper. The model proposed suggests that in the face of lower copper prices, the nominal exchange tends to depreciate.

Macroeconomic theory argues that a floating system is that which permits a country to adjust its monetary policy without having to worry about the rate of exchange. A flexible exchange rate regime allows a better response to external shocks, rther than using policies of domestic adjustment that could well have a cost. On the other hand, from the theoretical standpoint, if there is cointegration between two variables implies that the assumption of an efficient market would not be fulfilled (Fama, 1970).[18] In addition to this, two time-series of financial assets should not cointegrate, as happens in the Chilean case, given that with the price of the asset, it is possible to determine the price of another asset, which generated opportunities for arbitrage (Engle and Granger, 1987).

There is no consensus among economists on which type of exchange regime is the most convenient for a developing country. The International Monetary Fund (IMF) resorting to theory and empirical evidence, argues that in adopting an exchange rate regime in developing countries, consideration should be given to factors such as: (i) size and openness of the economy; (ii) level of inflation; (iii) level of flexibility of labor markets; (iv) level of capital mobility; (v) level of development of the financial markets; (vi) credibility in public policy; and (vii) geographic concentration of international trade (IMP, 1997, p.78-97). That is to say, the IMF indirectly includes, in its recommendation for the adoption of an exchange rate regime, the old concerns regarding the structural aspects of the LDCs.

There is nowadays a great debate regarding the convenience of a completely flexible system with respect to a system which is not so flexible or called intermediate level (exchange rate band or dirty flotation) for a small country with a great openness to international trade. Frankel (2002) argues that the big selling points of floating exchange rates – monetary independence and accommodation of terms of trade shocks –

[17] For further details on the Exchange rate regime befote and after the year 1999, see Morande and Tapias (2002).
[18] According to Fama, if the markets are efficient, the prices of assets should reflect the information available in the market.

have not lived up to their promise. He presents a new proposal called PEP: Peg the Export Price. Most applicable for countries that are specialized in the production of a particular mineral or agricultural product, the proposal calls on them to commit to fix the price of that commodity in terms of domestic currency. The argument for PEP is that it simultaneously delivers automatic accommodation to terms of trade shocks, as floating exchange rates are supposed to do, while retaining the credibility-enhancing advantages of a nominal anchor, as dollar pegs are supposed to do.

The empirical evidence presented by Benassy-Quere and Coeure, which analyzes a sample of 92 countries, shows that intermediate foreign exchange rate systems have partially re-emerged lately in developing countries. They also show that the election of a foreign exchange rate regime depends on the level of openness, capital mobility, level of inflation and primarily of the country's structural characteristics. This empirical evidence is consistent with the view of the International Monetary Fund.

The volatility of a flexible exchange rate is not a problem when fluctuations are short-lived, as these volatilities may be absorbed with the use of derivatives (Dodd, 2003). In LDCs the problem begins when the fluctuations have a longer cycle since the lack of derivatives. With the incorporation of emerging economies in the international markets, longer cycles are observed at present. Accordingly, persistent appreciations (depreciations) of the exchange rate in longer cycles tend to generate perverse and irreversible effects on resource allocation and the economy is not able to achieve its potential GDP (Ffrench-Davis, 2005). On the other hand, as proven in this paper, the fact that the exchange rate has become commoditized is a matter of great concern, as this implies that the cycles of appreciation and depreciation of the exchange rate will be consistent with those of copper. In this sense, historical empirical evidence shows that ascending fluctuations in the price of copper are in the order of 2 to 3 years, and descending fluctuations are of 3 to 5 years. In this sense, cycles having similar time frames are to be expected for the exchange rate in Chile in the future as long as commoditization effect still present.

But in the specific case of Chile, if the nominal Exchange rate in Chile has been commoditisized with the price of copper, it is important to pose a question for future research lines: What are the future consequences of having a commoditized flexible exchange rate that creates volatility and generates long cycles of appreciation (depreciation), and which would create uncertainty for investment and international trade? or Is there any negative effect on having a commoditized exchange rate, which generates opportunities for arbitrage at an international level and which could indirectly induces an even greater volatility and deepens the cycles of appreciation (depreciation) to an even greater degree?

The volatility and uncertainty have a cost, which could be very high, and which must be duly counterweighed against the benefits of a fully flexible exchange rate. This paper, in no way expects to put forth recommendations, and less still come to any conclusions as to the adequacy of a fully flexible exchange rate regime for Chile. To the contrary, it only expects to show a stylized fact that there is a commoditization of the exchange rate. Unfortunately, economic theory does not offer any suggestion in this respect, and the empirical evidence on commoditization is limited; accordingly, the issue is seemingly complex. Future research activities should concentrate on the possible negative effects of a commoditisized flexible exchange rate as the one observed in Chile.

Stylized Fact 2: Trade Balance and Price of Copper

In order to establish a correlation between both variables, we set forth the following model:

$$Nx_t = \alpha + \beta * P_t^{CU} + \varepsilon_t \qquad (2)$$

Nx_t Corresponds to the balance of trade or net exports in the period 1990(1)-2005(8). Moving yearly averages are considered.

Four equations for different periods of time are estimated. Equations 1 and 2, as in the case of the exchange rate, clearly indicate that the relation between the balance of payment (NX) and the price of copper was important in the periods 1991-2000 and 1995-2002, though not sufficient to explain the variations of the trade balance on the basis of the movements of the price of copper. However, trade balance begins to establish a stronger correlation with the price of copper as from the year 1999, when it reaches a correlation (R^2) of 0,895. In Equation 4, which considered the period January 2000 to August 2005, it attains a correlation of 0,917, which would seem to indicate a very strong relation between the level of the trade balance and the price of copper.

Table 7. Results: Model for Trade Balance and Copper Price

	Equation 1	Equation 2	Equation 3	Equation 4
Constant (α)	-4632.745**	-4596.824**	-4782.960**	-4136.312**
	(-6.83)	(-5.93)	(-15.23)	(-14.13)
Coefficient (β)	60.08687**	63.39499**	84.15890**	79.15065**
	(8.90)	(8.20)	(25.79)	(27.03)
R^2	0.313	0.347	0.895	0.917
Number of Observations	176	128	80	68
Period	91(01)-00(12)	95(01)-05(8)	99(01)-05(8)	00(01)-05(8)

Note: t-statistics in parenthesis. *(**) denotes statistical significance at 5% and 1% respectively.

Results from the Granger Test for these two variables show that there is a causal (robust) and positive relation between trade balance and price of copper for all models presented, in which the null hypothesis that the price of copper does not Granger-cause net exports is rejected (the statistic F for the four models 3.1047475; 2.35311; 2.81703 and 2.622, respectively, and all significant at least at 5%)

Table 8. Cointegration ADF (Augmented Dickey-Fuller) Test on Residuals

	Equation 1	Equation 2	Equation 3	Equation 4
test ADF	-1.239223	-1.200042	-3.305983**	-3.113418**
	(0.197)	(0.209)	(0.001)	(0.002)
Period	91(01)-00(12)	95(01)-05(8)	99(01)-05(8)	00(01)-05(8)

*(**) denotes statistical significance at 5% and 1%. p-value in parenthesis.

Results show that equations 3 and 4 cointegrate in a rather robust way, by rejecting at 1% of significance the null hypothesis of no integration Thus, we can observe that as from year 1999 that trade balance and the price of copper begin a more permanent long-term relation.

Table 9. Trade Balance of Trade and Copper Price: Multivariate Cointegration Analysis

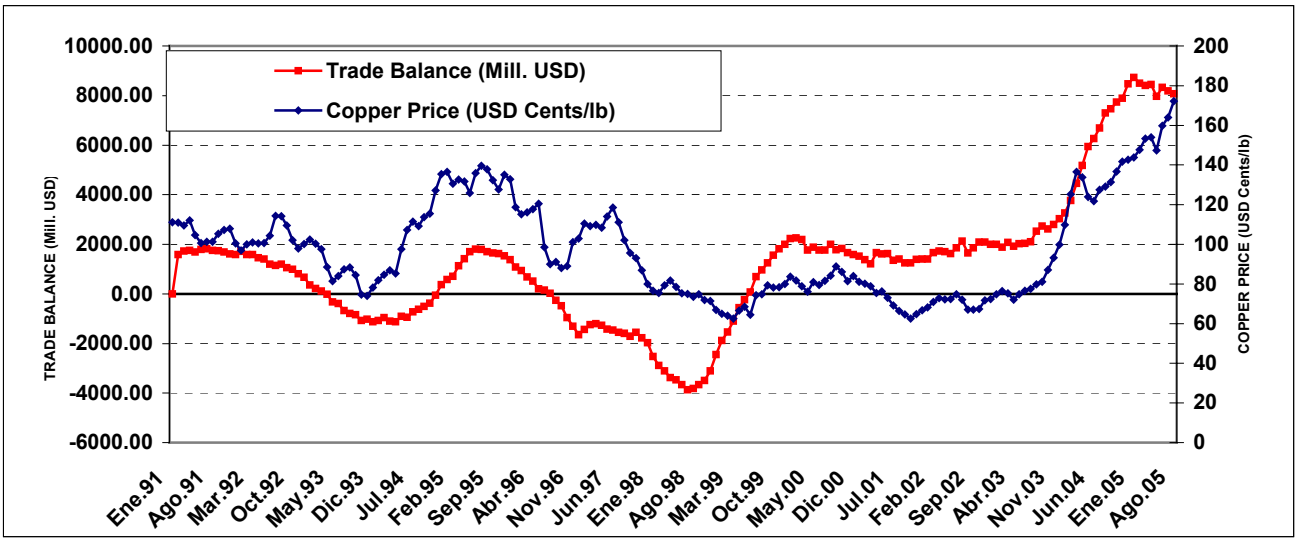
Analysis	Equation 1	Equation 2	Equation 3	Equation 4
TRACE TEST	15.02978*	5.524266**	15.42856**	12.99606*
	(0.058)	(0.036)	(0.051)	(0.115)
PROPER VALUE	13.14210*	11.65838	15.26287**	12.99569*
	(0.074)	(0.124)	(0.034)	(0.078)
Period	91(01)-00(12)	95(01)-05(8)	99(01)-05(8)	00(01)-00(12)

Note: The probability values considering Mackinnon's p-values are shown in parenthesis. *(**) denotes statistical significance at 10% and 5%. The results for r≤0 vs. r=1 y r=0 vs. r=1 are shown.

When we apply the Johansen Test, Equations 3 and 4 cointegrate at 5% and 10%, respectively.

In Figure 3, the behavior of the trade balance and the price of copper are presented. Even though both variables move in a very synchronous manner in all the period of the graph, it is not until mid year of year 1999 when the curve of both the price of copper and the balance of trade move jointly, which was confirmed by goodness of fit tests for models 3 and 4 and cointegration tests.

Figure 3. Evolution of Trade Balance and Copper Price



The above results were to be expected; as shown by Table 1 Chile has been unable to change the structure of its exports after nearly thirty years since the country adopted its openness policy. Nowadays, mining companies still have the same participation in total exports that they had 15 years ago; this is also suggesting that the public policies related to creating incentives with a view to diversify exports were not powerful enough to change the original structure of exports.

Stylized Fact 3: Valuation for Firms Traded at the Stock Exchange and the Copper Price

In order to evaluate the valuation of Chilean companies traded in the Santiago Stock Exchange Market, we consider the indicators IGPA and IPSA. The model proposed is:

$$IGPA_t = \alpha + \beta * P_t^{CU} + \varepsilon_t \quad (3)$$

$$IPSA_t = \alpha + \beta * P_t^{CU} + \varepsilon_t \quad (4)$$

$IPSA_t$: selective price index of shares in the period 1990(1)-2005(8).
$IGPA_t$: general price index of shares in the period 1990(1)-2005(8).

The results of the model are shown in Table 10. Six equations for different periods of time are estimated. Results show that correlation between copper and IGPA is stronger than with IPSA, and that this relation becomes stronger with time. Equations 1 through 4 show that the relation between these two variables was null in the period 1990-2000. In the year 2000, both IGPA as well as IPSA begin to correlate strongly with the copper price, reaching a correlation of 0.87 and 0.86, respectively. In Equations 3 and 6, which considers the period January 2001 to August 2005, it reaches a correlation of 0.90 for IGPA and 0.87 for IPSA, which would seem to indicate a strong relation of causality between the price of copper and the performance indicators of the Santiago Stock Exchange.

Table 10. Results Stock Exchange Index and Copper Price

	Stock Market General Price Index (IGPA)			Stock market Selective Price Index (IPSA)		
	Equation 1	Equation 2	Equation 3	Equation 4	Equation 5	Equation 6
Constant (α)	2506.087	1610.532	1952.363	627.8664	396.9135	442.0954
	(4.39)	(7.03)	(9.18)	(4.74)	(8.45)	(8.79)
Coefficient (β)	22.69937	49.40699	47.44076	3.072223	9.710162	9.451461
	(4.05)	(21.57)	(23.05)	(2.36)	(20.67)	(19.44)
R^2	0.081	0.875	0.907	0.029	0.866	0.874
Number of Observations.	188	68	56	188	68	56
Period	90(01)-00(12)	00(01)-05(8)	01(01)-05(8)	90(01)-00(12)	00(01)-05(8)	01(01)-05(8)

Note: Values in bracket correspond to statistic t. *(**) denotes statistical significance at 5% and 1%.

Results of the Granger causality test for these two variables and the price of copper, suggest that there is no causal relation between IGPA and IPSA and price of copper for all models presented. To put it in other words, it is not possible to reject the null hypothesis that the price of copper does not Granger-cause a change in the indicators for prices of companies. Table 12 gives the results of the causality analysis. In the case of IPSA in the periods 2000 and 2001 it is possible to observe a statistical significance close to 10%.

Table 11. Granger Causality Test
(Null hypothesis: price of copper does not cause IGPA O IPSA)

	Period	F-Statistic	Probability
IGPA	90(01)-00(12)	0.37155	0.828
IGPA	00(01)-05(8)	1.76624	0.147
IGPA	01(01)-05(8)	1.66297	0.174
IPSA	90(01)-00(12)	0.26517	0.899
IPSA	00(01)-05(8)	2.00836	0.104
IPSA	01(01)-05(8)	1.96986	0.114

Table 12. ADF (Augmented Dickey-Fuller) Cointegration Test on Residual

	Stock Market General Price Index (IGPA)			Stock market Selective Price Index (IPSA)		
	Equation 1	Equation 2	Equation 3	Equation 4	Equation 5	Equation 6
ADF	-1.7668	-3.3792**	-4.0675**	-1.0458	-3.9560**	-4.0304**
TEST	(0.073)	(0.001)	(0.000)	(0.266)	(0.000)	(0.000)
Period	90(01)-00(12)	00(01)-05(8)	01(01)-05(8)	90(01)-00(12)	00(01)-05(8)	01(01)-05(8)

*(**) denotes statistical significance at 5% and 1%, respectively. P-values in parenthesis.

The ADF test shows that Equations 2, 3, 5 and 6 cointegrate in a fairly robust manner by rejecting at 1% of significance the null hypothesis, which would support the hypothesis that the local markets for shares begin to cointegrate with price of copper as from the year 2000.

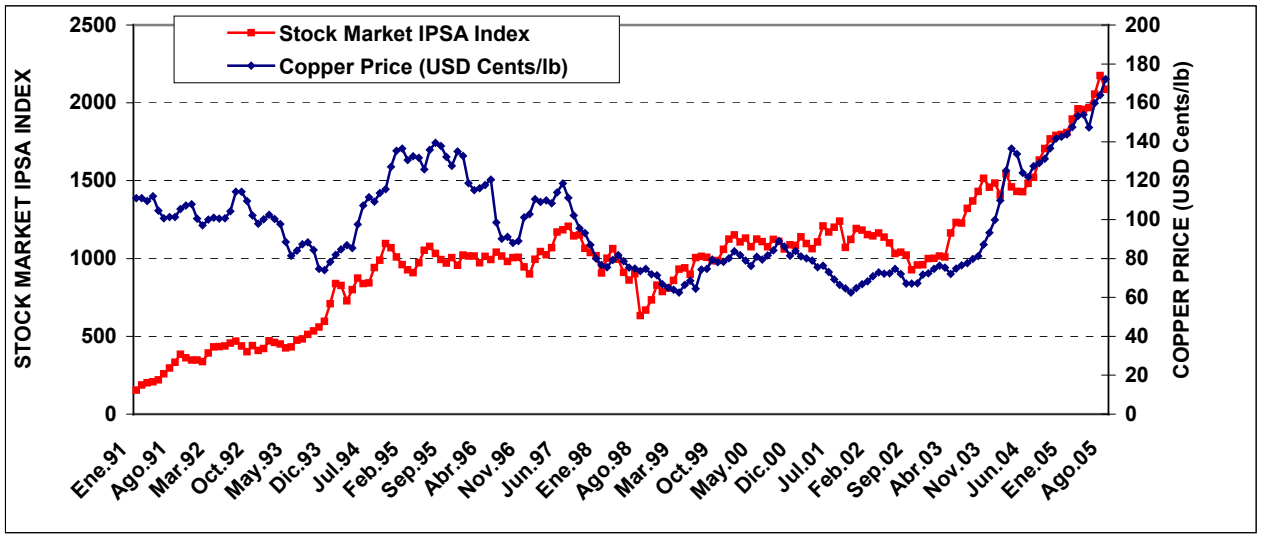
Table 13. Price of Copper and Performance Indicators of the Stock Exchange: Multivariate Cointegration Analysis

Hypothesis Test	Stock Market General Price Index (IGPA)			Stock market Selective Price Index (IPSA)		
	Equation 1	Equation 2	Equation 3	Equation 4	Equation 5	Equation 6
TRACE	10.77397	13.55394*	18.21732**	8.741652	17.506**	17.514**
TEST	(0.225)	(0.096)	(0.019)	(0.389)	(0.024)	(0.024)
PROPER	6.649626	11.21658	16.14210**	4.749885	13.873*	15.067**
VALUE	(0.531)	(0.143)	(0.025)	(0.773)	(0.057)	(0.037)
Period	90(01)-00(12)	00(01)-05(8)	01(01)-05(8)	90(01)-00(12)	00(01)-05(8)	01(01)-05(8)

Note: The likelihood values considering Mackinnon's p-values in parenthesis. *(**) denotes statistical significance at 10% and 5%. Results for r≤0 vs. r=1 y r=0 vs. r=1 are shown.

Results from the Johansen test confirm the results obtained by means of the ADF test. Therefore, it concludes the existence of cointegration in equations 2, 3, 5 and 6 as it rejects the non-cointegration null hypothesis between the IPSA and IGPA and price of copper in the periods 2000-2005 and 2001-2005. Equations 1 and 4, do not cointegrate, demonstrating the non-existence of cointegration between these variables in that period, which correspond to the period 1990-2005.

Figure 4. Evolution of Stock Market IPSA Index and Copper Price



In a graphic manner (see Figure 4), we can perceive that price of copper and the stock exchange indicators move in a joint manner as from the year 1999-2000, which has been confirmed by our

econometric estimates and tests. The fact that copper correlates so highly with the valuation of shares since the year 2000, implies, for instance, that the valuation of companies through non-causal methods, as is the case of the popular fundamental analysis of companies, would not have very good predictive power. In like manner, the hypothesis of efficiency of the markets is seriously compromised, since two financial assets can correlate so well.

The policy implications of the results stand out. Any portfolio of assets belonging to the Chilean capitals market will depend very strongly on copper price, whose price is subject to factors of external demand factors, high volatility and speculative aspects in international commodities markets. This situation is a source of great concern, considering the current composition of the portfolios of the majority of the private pension funds. To put it very simply, with the low level of diversification that is permitted by law to the Private Pensions Funds, particularly in what respects investments abroad, at this moment the level of pension that an affiliate expects to receive in the future is correlated in some way with the future price of copper. In Chile, the investment alternatives are limited, and there is also a lack derivatives for hedging. Given the fact that a good proportion of the capital of the Private Pensions Funds is invested in the Stock Exchange[19], then under an unfavorable copper price, it could adversely affect the level of future pensions.

The high and increasing correlation between IGPA and the price of copper implies volatility and exposes national companies to a high risk, because in the event of observing a descending cycle in the price of copper, investors will tend to sell the shares and in this way the valuation of companies would fall, considerably limiting the indebtedness capacity of Chilean concerns for the development of new projects. In other words, the cointegration observed would emphasize the economic cycles of our economy generating a great volatility that could end in a lower economic activity.

The key reason for this strong correlation could be due to a number of factors, which must be investigated in greater depth. First, there could be the case of foreign investors when they perceive an ascending cycle in the price of the copper; they buy the Chilean Fund traded in NYSE or a pool of Chilean American Deposit Receipts (ADR), which would be equivalent to having copper in their portfolio of investments.[20] In other words, the investors could well be seeing Chile not as a diversified economy, but as an asset equivalent to copper. Second, this correlation also could be due to the increasing participation of hedge funds in total investments. To hedge funds, the cointegration between these two variables is favorable as it allows them to generate earnings through arbitrage positions. Third, the fact that as of 2000-2001 is the beginning of the strong cointegration observed could also be related to the introduction of a flexible exchange rate and the elimination of the cash reserve on foreign investment called encaje. Finally, this cointegration could also be the result of the three aforementioned factors, which could be interacting in a joint manner.

In order to have a better understanding about the origins of this commoditization, the coming section of this paper is devoted to analyzing labor productivity at a sectoral level and discussing the effect that it could have on the commoditization of the economy.

4.- SECTORAL LABOR PRODUCTIVITY ANALYSIS AND COMMODITIZATION OF THE ECONOMY

[19] Aproximately 15.2% of the Pension Funds equity is invested in domestic stocks. In addittion, another 7% of the equity is invested in domestic corporate bonds. (Margozzini, 2005).

[20] Logically, the greater the correlation of the price of sopper with the country's agrégate demand, the yields of local companies will show a greater correlation with this same variable. .

Form the standpoint of the development policy, the long-term effect of economic policies is much more important than the short-term effect. For this same reason, it is important that countries should establish a productive base that ensures productivity and that they benefit from internal and external economies of scale, where the processes of learning and technological change play a key role in adapting its policies. In this sense, the analysis and follow-up of dynamic productivity plays a fundamental role at a sectoral and at firm level. The future analysis of the copper effect on the national economy also plays an extremely important role.

As mentioned in section 2, an analysis at a sectoral level of dynamic productivity is not feasible with the information available in Chile. Therefore, in this section we discuss the performance of productivity because we expect to find some of the answers to the question posed by the high level of correlation found in the preceding section between price of copper and net exports and valuation of companies.

In the table below, the performance of sectoral labor productivity and employment generated by each sector for two periods is shown. It can be clearly inferred that the mining sector is the leader in productivity, with an extraordinary increase in labor productivity, with a yearly average exceeding 9% for the period 1996-2004. In the same period, the copper sector has a yearly average labor productivity of 6.3%, a figure that is considerably higher than the productivity observed in non-tradable sectors. The productivity of other tradables grows at a slower rhythm than mining productivity, with a decreasing trend in time. This could well be a result of the fact that economies of scale are not so important in the other non-tradables (agriculture, fishery, forestry) as they are in mining.

Table 3: Rate of Change of Labor Productivity (%) and Sectoral Employment

	Rate of Change of Yearly Average Labor Productivity (%)		Sectoral Participation in Total Employment (%)		
	1987-1995	1996-2004	1987	1995	2004
Tradables	**4.7**	**4.9**	**37.0**	**34.0**	**28.5**
Mining in General	4,8	9,4	2,1	1,7	1,5
Copper	N. A.	6,3	N. A.	0,8	0,8
Rest of Mining	N. A.	10,4		0,9	0,5
Other Tradables	4,6	3,9	34,9	32,3	27,3
Services (Electricity, Water and Gas)	**5,9**	**3,4**	**0.7**	**0.6**	**0.6**
Non-tradables (Excluding Electricity, Water and Gas)	**3.0**	**1.6**	**62.3**	**65.4**	**70.9**
Construction	0.5	1.2	5.0	7.7	7.7
Trade	5.6	2.4	17.4	18.5	18.8
Transport and Communications	4.4	4.5	6.4	7.6	8.2
Financial Services	0.6	0.2	4.2	6.3	8.3
Municipal and Social Services	2.3	1.1	29.4	25.3	27.8
Copper Physical Productivity (MT/worker)	**4.3**	**2.8**			
Contribution of Mining Productivity to Aggregate (total) Labor Productivity	42%	57%			
Change in Physical Productivity in Mining (MT per worker)	6.20%	9.68%			

Source: Estimates made by author on the basis of information from INE, Cochilco, Codelco, and Reports Chilean Central Bank.
Note: other tradables include Farming and Livestock, Forestry, Fishery and Industry.

National average productivity for the period 1987-1995 was 4.3%, and has gone down to 2.8% for the period 1996-2004. The contribution of the mining sector to national average productivity was 4.2% in the period 1987-1995, and for the period 1996-2004 it was 57%. Consequently, the mining sector in spite of its stable and low participation in total GDP (see Table 2), has contributed lately to a great degree to aggregate average labor productivity (57%).

The productivity of non-tradable sectors has decreased to a considerable extent over the last 8 years, with the sole exception of the Transport and Communications Sector. It is well worth mentioning that while mining increases its labor productivity over time, the other tradables and non-tradables decrease their productivity.

It was to be expected that productivity in the other tradable sectors (industry, fishery, agriculture and forestry) should be lower than in mining, given the former's low productive scale when trade liberalization was implemented, in addition to the effect that they are also sectors which are more intensive in low-skill labor than mining. Seemingly, average labor productivity would be suggesting that the dynamic productivity or total factor productivity would be much lower in the rest of the tradables than in mining. On the other hand, the high growth of productivity observed in the mining sector is consistent with what theory predicts. The increase in productivity in mining could be due to the economies of scale effect, and to the adoption of technologies effect. It is presumable that the adoption of technologies be the result of the spillover effect of technologies introduced by foreign investment. As shown by Table 1, nowadays copper production generated by foreign companies is 66%, while in the year 1990 it was less than 30%.

It could well be argued that the productivity of the copper and mining sector is influenced by the price effect observed in minerals for the period 2003-2005. Due to this reason, another measure of productivity called physical unit per worker has been estimated and which is equivalent to the number of tons of copper per worker As shown in the last line of Table 3, labor productivity per physical unit increases at an average of 9.68%, a figure even higher than average labor productivity.

Normally, dynamic productivity or total factor productivity is in some way correlated with labor productivity, and in that case the greatest contribution of total factor productivity to GDP would have to come from mining. The results seem to validate the assumption that one of the causes of the increase in the correlation of the price of copper within the macroeconomic variables could be the great effect generated by the increase in productivity of mining where the copper sector is the most important.

Finally, it is important to note that the participation of non-tradables in total employment has increased from 62.3% in 1987 to 70.9% in the year 2004. This suggests that the policies relative to incentives to reduce unemployment must be aimed at in these sectors, as they are the dynamic sectors in generating jobs.

5.- COPPER PRICE AND CHILEAN ECONOMIC OUTPUT

As shown in section 3 of this paper, copper price is a key variable to explain the trade balance and the nominal level of the exchange rate. Given that foreign trade plays a predominant role in national output, the price of copper could well explain a part of the economy's growth. The empirical evidence furnished on labor productivity at a sectoral level suggests that it is an important variable in economic growth too. On the other hand, Chile has practically no oil and its transport and productive system are highly dependent on oil. Therefore, the price of oil is related to the level of productive activity and trade balance. The latter suggests including this variable into the model.

Thus, in order to evaluate the importance of the price of copper, the price of oil and average labor productivity, in the Chilean economy are stated as a Cobb-Douglas type of model of Chilean economic growth and it is estimated on the basis of monthly data for the period January 1996-August 2005.

$$Y_t = A * \mathrm{Pr}od_t^{\alpha} * P_{cut}^{\beta} * P_{oilt}^{\delta} \quad (5)$$

$$\ln Y_t = \ln A + \alpha \ln(\mathrm{Pr}od)_t + \beta \ln P_{cut} + \delta \ln * P_{oilt} + \varepsilon_t \quad (6)$$

Y_t corresponds to GDP. $Prod_t$ corresponds to the average index of labor productivity, and P_{oilt} corresponds to WTI (West Texas)[21] price of oil e, for the period 1996(1)-2005(8).

The ad-hoc model proposed is not based on neoclassical economic theory, as it does not include the stock of capital. However, the idea of the previously mentioned model is not to replace or test traditional economic theory, but it only aims at analyzing the predictive power of the variables under analysis and the specific importance of copper price on the performance of the Chilean economy.[22] Estimating the model through ordinary least squares (OLS), we obtain::

$$\ln Y_t = \underset{(394.9^{**})}{13.626} + \underset{(9.04^{**})}{0.0717 \ln(\mathrm{Pr}od)_t} + \underset{(43.83^{**})}{0.9234 \ln P_{cut}} \underset{(-6.20^{**})}{-0.0468 \ln * P_{oilt}} + \varepsilon_t \quad (7)$$

$R^2 = 0.9731$, n=113, sample= 1996(01)-2005(0)5

t-statistic in parenthesis. *(**) denotes statistical significance at 5% and 1%, respectively.

The results of the regression show high levels of statistical significance for the three explanatory variables, which are significant at 1%, underscoring the importance of the variable for price of copper in Chilean economic growth, with a price elasticity of 0.92. On the other hand, the regression as a whole evidences an important predictive power and is robust, with a correlation (R^2) equal to 0.97.

The results of the ADF test for the regression are also quite robust, with a statistic t of -5.506 and a p-value of 0.000 (Mackinnon's, 1996), suggesting an important level of cointegration for the relation. The evidence generated by the Johansen test is less strong. The null hypothesis for the trace has a statistic 41.61466 and is only rejected with 0.1698 of probability. For the case of the proper value, a statistic of 30.05650 is obtained, rejecting the null hypothesis at 0.0236%. Hence, the maximum Eigenvalue test would indicate the existence of cointegratation at 5% of significance.

In terms of economic policy implication of the analysis set forth here, we can speculate about the real control of fiscal and monetary control over the economy all the more so if a high price of copper would guarantee a good performance, and a low price of copper involves a poor growth.[23] The analysis

[21] GDP is estimated on a monthly basis resorting to IMACEC (Monthly Indicator of Economic Activity) of the Chilean Central Bank. Labor productivity is estimated with information from the National Instutute of Statistics (INE) and the Chilean Central Bank. The series of monthly prices of crude oil were obtained from the del U.S. Department of Energy (EIA).

[22] Unfortunately we do not have a proxy of capital on a monthly basis; otherwise, it would have been considered.

[23] Undoubtedly, we return to the times in which a government's performance depended strongly on the external performance of the economy, specifically on the price of copper.

presented proves that the insistence of current economic policy of entrusting the market to define the country's model of development and the development of new comparative advantages is not a strategy that warrants long-term sustainable growth, but to the contrary it could bring about a greater volatility.

6.- COMODITIZATION OF CHILEAN ECONOMY: ¿Dutch Disease or Copper Disease, or both?

Commoditization of the Chilean economy may be defined in a more specific manner as the "copper disease". It could be argued that the hypothesis set forth in this paper corresponds to what is called in the literature on economic development as Dutch disease.[24] In this section, we will illustrate in a very descriptive manner how in several aspects the "copper disease" has an origin different to the "Dutch disease", though some of the adverse effects that copper disease could generate in the economy are similar to those of the "Dutch disease".

The Dutch disease is valid for small economies where there is an export booming sector, which is the leading sector in generating foreign currency. The booming sector normally corresponds to a sector, which exports natural resources products, such as mining or oil. The booming sector generates a surplus of foreign currency and as a consequence, a real over-appreciation of the country's currency is generated. In non-tradables sectors, such as construction, services, trade, health and government spending, as in other tradable sectors, adverse effects as a result of the exporting boom may be generated as a consequence of the real appreciation.

The Dutch disease can be separated into several effects: (i) the demand effect resulted from the additional income generated by the booming exporting sector. This creates an over-demand for non-tradable products and makes the price of non-tradables to increase; (ii) the supply offer, which is generated as a result of the movement of resources from other tradable sectors, (sectors which are in now way affected by the boom) to the tradable sector. Within the Dutch disease framework, the sector experiencing a boom will increase its productivity as well its salary. Should there not be any regulatory or structural barriers, the workers from the other tradable sectors will tend to move into the booming sector. This movement will only exist if there is full employment; (iii) de-industrialization and/or de-agriculturization effect are the adverse result generated by the demand and supply effect complemented with the real appreciation, which affect agricultural and industrial sectors.[25]

The adverse effects of the Dutch disease depend on the country's productive structure and the public policies implemented to fight this effect. When a Dutch disease event occurs, the Government receives extra revenue from the leading tradable sector, and those resources have to be devoted to certain spending or debt service policies. The economic development literature on the Dutch disease is broad in scope and analyzes cases of both countries affected by it as well as the implementation of exchange rate policies and social spending to fight this effect.

Now, after having analyzed the results put forth in this paper, we should ask: Is Chile experiencing a Dutch disease problem or whether the Chilean case could be classified in some other category?

[24] For economic models and aspects related to economic policies to confront the Dutch disease problem, see Corden (1984), Gelb (1988), and Neary (1986).

[25] For instante, the over-appreciation of currency may create adverse effects in other tradable sectors such as agriculture and industry, given the reduction of revenues from exports as a result of the over-appreciation.

The hypothesis of this paper is that the Chilean case represents a series of regularities not studied previously, and though it has some similarities with the Dutch disease, a different conceptualization and modeling is called for. The phenomenon presented in this paper and named as "copper disease", is characterized by an acute dependency or cointegration of economic growth and other key economic variables with the price of the commodity from the booming sector (in our case, copper).

"Copper disease" would be generated by the existing productive structure, the asymmetry of productivity between the booming export sector and non-tradable sectors vis à vis a setting of flexible exchange rate. Therefore, if the "copper disease" is to occur, the following conditions are to be in place: an open and small economy, based on primary exports and/or natural resources, where there is an export sector of importance focused mainly on one product,[26] a flexible exchange rate, the productivity of the leading sector is increasing, and the productivity of other tradable and non-tradable sectors is decreasing over time.

Evidence presented in his paper demonstrate that the "copper disease" begins in 1999, that is to say, under a price of copper setting of only 0.71 USD/lb, which is the lowest price in the last decade (see Table 1). On the other hand, the demand effect of the Dutch disease is the result of a high price of the product exported by the booming sector. This boom increases the demand for non-tradables, generating a price increase in non-tradables. In this sense, as proven, the copper disease does not necessarily result from the effect of a high price of the leading exporting sector (copper), and in Chile it occurred in a depressed price setting for the leading exporting sector. Summing up, the conception or emergence of the "copper disease" effect is quite different to that of the "Dutch disease" effect. Copper disease may exist when there is a low price of the main commodity, whereas Dutch disease would tend to abate or disappear with a low price of the commodity, and copper disease might stay.

Within the context of productivity-salaries-movement of resources, the "copper disease" effect is quite similar to the "Dutch disease", to the extent that price of the main commodity increases, the productivity and salaries increase in the leading export sector in a considerable way with respect to the other sectors, and generates a pressure to increase prices in non-tradable sectors. However, in the Chilean case, automation and technological implementation in the mining sector generates a sustained increase in productivity, and this sector usually hires a lower number of workers as time goes by (see Table 3). Therefore, a movement of labor market to the mining sector is not observed in Chile, and to the contrary, the economy does not substantially modify its productive structure, generating levels of high unemployment as those observed over the last 7 years in Chile.

What is Chile experiencing nowadays? Since the year 1999 it experiences the "copper disease", given its productive structure, where the incubatory effects of that disease correspond to the asymmetry in productivity between the leading sector and the other sectors, and to the effect generated by the introduction of a flexible exchange rate regime. On the other hand, as a result of the high price of copper observed in the years 2004 and 2005, now we observe a high appreciation (see Figure 1), and an increase in the prices of non-tradables. Therefore, at present Chile would be experiencing the copper disease and the beginning of a Dutch disease without a labor movement effect across productive sectors.

Now, somebody could want to know, What other problem could generate the "copper disease" effect? In addition to the expected volatility in GDP?

In a small country, under a perfect mobility of capital as is the case of Chile, with a flexible exchange rate; the monetary policy is highly effective. In this manner, the results of this paper pose questions such

[26]Copper exports represent nearly 40% of total Chilean exports.

as, Is what has been said completely true under an assumption of "copper disease" as the one observed lately in Chile? Obviously, under a setting of copper disease there is room to doubt the high effectiveness of the monetary policy. If the price of copper is high, and in the event of an increase of the interest rates, possibly the reduction of the aggregate demand is not that effective. Obviously, under this setting it could be feasible that the monetary policy should lose some of its effectiveness. To have a better understanding of what was said before, a number of theoretical models to analyze the effectiveness of the monetary policy could be developed, but only the study of empirical evidences from other countries will show us its real effectiveness.

8.- CONCLUSIONS

Several conclusions arise from the empirical analysis submitted in this paper. First, by the end of the previous decade, the Chilean economy loses dynamism as a consequence of the depletion of static efficiencies resulting from trade liberalization. In sum, the Chilean outward oriented model based on exports of natural-resources products presents sign of being worn out. It is then when the Chilean economy tends to commoditize itself as from 1999. Thus, the growth of the country begins to depend strongly and almost exclusively on the price of copper. This commoditization of the economy could well be due to multiple factors, but the evidenced presented in this paper suggests that, the key factor is the country's actual productive structure mostly based on mining exports. Another factor is the high productivity displayed by the mining sector with respect to other tradables as well as non-tradable sectors, which present a decreasing rate of growth in productivity. Finally, with the introduction of a completely flexible exchange rate regime by the end of 1999, the commoditization of the economy becomes more acute.

Second, results from this paper suggest that as long as co-integration between economic variables with the price of copper, it is feasible to predict macroeconomic aggregates of the Chilean economy on the basis of the copper market. To reduce this cointegration will require applying long-term economic policies aims to increase the productivity of other sectors in the economy, and diversify the productive structure of the economy. Consequently, long-term public policies ought to consider incentives for productivity of other sectors in the economy. The need to help the market in this connection becomes evident when we consider the market imperfections required to sustain private R&D policies in LDCs.

Third, by co-integrating economic growth and the exchange rate with the price of copper, the monetary and fiscal policy instruments could partially lose their efficiency. In case there is a recession as a result of a fall in the price of copper, the fiscal policy would have to be aggressive enough to have an effect on growth. This setting is not feasible, given the completely opposite twist taken by the Chilean macroeconomic authority when they reached a consensus as to so-called structural surplus (Marcel and others, 2001). In like manner, given the existing co-integration, when a high price of copper is observed, one would expect an appreciation of the dollar and an increase in the Stock Exchange, and in that case the effect of the monetary policy to slowdown the aggregate demand could well be not so effective, as predicted by economic theory for an economy with a flexible exchange rate.

Fourth, given the lack of hedging instruments at a national level, and the institutional restriction that limits the investment of Private Pension Funds abroad, with the emergence of the phenomenon "copper disease" observed in the Chilean economy, the future pensions of the affiliates in the Private Pension Funds System would be exposed to a high volatility and their equity will be strongly correlated with the price of copper.

Fifth, the fact that the exchange rate should have become commoditized is a source of great concern as it implies that the cycles of appreciation and depreciation of the exchange rate would be consistent with those of the price of copper which have an ascending time frame of 2 to 3 years, whereas the time frames for descending prices of copper are of 3 to 5 years. Therefore, cycles having a similar time frame are to be expected for the exchange rate. A persistent appreciation, (depreciation) of the Exchange rate would tend to generate irreversible effects on resource allocation.

.

Sixth, evidence shows that the country's aggregate labor productivity is influenced by the high value of the productivity of the mining sector. Seemingly, dynamic efficiency in mining is originated from the economies of scale and the transfer of technologies and know-how generated by the spillover as a consequence of foreign investment. Economic theory tells us that a country's long-term economic growth is sustainable on account of the dynamic gains. This leads us to give some thought to the old argument of the theory of dependency; however, now the dependency does not come from price setting or dependency on capital as the old concern, but to the contrary, dependency now is generated by the transfer or spill-over of technology incorporated by foreign investment to the local system needed to generate dynamic productivity. Innovating, transferring ideas, adopting new technologies, and entrepreneurship activities that strongly bear the stamp of the quantity and quality of the human resource, acknowledged keys to success and value-adding. The key question at this point is whether the market by itself can attain dynamic comparative advantages in this domain. In spite of the unrestricted support given to the Chilean original economic model, it has not generated a greater dynamic productivity.

Finally, the general implication of this paper with respect to Chile's economic model is that globalization along with foreign investment even if they are accompanied by good governance are not sufficient to obtain a long-term sustainable growth, as it can well lead us to falling into the hands of a process of commoditization of the economy, as observed in Chile. The latter must go hand in hand with a change in the productive structure, with incentives to dynamically improve productivity and institutions that create incentives for competition, creativity and innovation in the economic agents. Chile has grown on the basis of using international trade and foreign investment; but as Rodrick (2000) has said "the strategic use of international trade and capital inflows is part of a strategy of a development model, but these elements do not substitute it".

If Chile's objective is a long-term sustainable growth with low volatility, this will depend on its ability on: (i) creating incentives to reduce dependency in copper exports; (ii) to create instruments to reduce the volatility of the exchange rate; (iii) to increase its technological and innovative capacity as well institutions to increase dynamic efficiency. The last aspect mentioned make it necessary to consider the important contributions of the endogenous growth theory and the new institutional economics, which prove that the quality of the human factor, sustained investment in innovation and, to a very important extent, institutions are all crucial factors to warrant a sustainable development in the long term.[27]

Future research activities should be focused on detecting other causes on the commoditization of the Chilean economy as from the year 2000. In addition, it is likewise important to have a better understanding of how the flexible exchange rate and the monetary policy operate in a small, open and a fully commoditized economy as the Chilean economy.

[27] Some of the studies in this area are:: North, 1990; Keefer and Knack, 1995; Acemoglu and others, 2002; Acemoglu and others, 2004; Campos and Nugent, 1998; Campos and Nugent, 1999; Rigobon and Rodrik, 2004; Rodrik and others, 2004; Glaeser and others, 2004.

REFERENCES

Acemoglu, D., Johnson S., & Robinson, J. (2002). Reversal of Fortune: geography and institutions in the Making of the Modern World Income Distribution. *The Quarterly Journal of Economics*, Vol 117(4), 1231-1294.

Acemoglu, D., Johnson S., & Robinson, J. (2004). Institutions as the fundamental cause of long-run growth. *NBER* Working Paper 10481, Cambridge, MA.

Agosín, M. R., & French-Davis, R. (1993). Trade liberalization in Latin America. CEPAL Review, 50, 41-62.

Aizenman, J., & Pinto, B. (eds.). (2005) . *Managing Economic Volatility: A Practitioner's Guide*. Cambridge University Press.

Álvarez, R., & Fuentes, R. (2004). Patrones de Especialización y Crecimiento Sectorial en Chile. Serie de Documentos de Trabajo, Banco Central de Chile N° 288.

Aitken, B., & A. Harrison. (1999). Do domestic firms benefit from direct foreign investment?. Evidence from Venezuela. *American Economic Review*, 89, 605-618.

Amsden, A. (1989). *Asia's Next Giant: South Korea and Late Industrialization*. Oxford: Oxford University Press.

Amsden, A. (2001). *The rise of `the rest` challenges to the West from late-industrializing countries.* Oxford: Oxford University Press.

Banco Central de Chile: *Anuario de Cuentas Nacionales.* Varios años, Santiago.

Benassy-Quere, A., & Benoit, C. (2002). The Survival of Intermediate Exchange Rate Regimes. *CEPII Working No 7*, Paris.

Birdsall, N., & Jaspersen, F. (Eds.). (1997). *Pathways to Growth: Comparing East Asia and Latin America*. Washington, D.C. , Inter-American Development Bank.

Borensztein, E., & Reinhart, C. (1994). The Macroeconomics Determinants of Commodity Prices. IMF Staff Papers 41 (2), 236-261.

Burki, J. S., & Perry, G. (1998). *Beyond the Washington Consensus:Institutions Matter*. Washington, DC: World Bank.

Campos, N. & Nugent, J. B. (1998). Institutions and Economic Growth in Latin America: Can Human Capital be a Link. *CEPAL Review, N° 64*, 7-27.

Campos, N. & Nugent, J. B. (1999). Development Performance and Institutions of Governance: evidence from East Asia and Latin America. *World Development, Vol 27,* Issue 3, 439-452.

Chenery, H. B., & Taylor, L. (1968). Development Patterns Among Countries and Over Time. *Review of Economics and Statistics,* 391-416.

Chumacero, R., & Fuentes, R. (2002). On the Determinants of the Chilean Economic Growth. Working Paper, Nº 134, Banco Central de Chile.

Cole, H., Ohanian, L., Riascos, A., & Schmitz, J. (2005). Latin America in the Rearview Mirror. *Journal of Monetary Economics*, 52, 69-107.

Corbo, V., & De Melo. (1987). Lesson From the Southern Cone Policy Reform. *World Bank Research Observer, Vol 2,* 111-142.

Corbo, Vittorio. (1993). Economic Reforms in Chile: an overview. Documento de Trabajo 160. *Universidad Católica de Chile*.

Corden, Max. (1984). Booming Sector and Dutch Disease Economics: Survey and Consolidation. *Oxford Economic Papers, 36,* 359-380.

De Gregorio, J. (2004). Crecimiento Económico en Chile: Evidencias, Fuentes y Perspectivas. *Serie de Documentos de Trabajo,* Banco Central de Chile N° 298.

De Gregorio, J., Gonzalez, H., & Jaque, F. (2005). Fluctuaciones del Dólar, Precio del Cobre, y Términos de Intercambio. *Serie de Documentos de Trabajo*, Banco Central de Chile N° 310.

Dickey, D., & Fuller, W. (1981). Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root. *Econométrica, Vol. 49,* 1057-1129.

Dijkstra, A. (2000). Trade Liberalization and Industrial Development in Latin America. *World Development* Vol. 28, Nº 9, 1567-1582.

Dodd, R. (2003). Derivatives, the shape of international capital flows and the virtues of prudential regulation, en *Las Nuevas Corrientes de Capitales Hacia la América Látina: fuentes, efectos y políticas*. Ffrench-Davis and Griffith-Jones (eds.), Fondo de Cultura Económica.

Echevarria, C. (1997). Changes in Sectoral Composition Associated With Economic Growth. *International Economic Review*.

Edward, S. (1998). Openness, Productivity and Growth: what do we really know?. *The Economic Journal,* 108, 385-398.

Engerman, S., & Sokoloff, K. (2000). History Lessons: institutions, factor endowments, and path of development in the New World. *Journal of Economic Perspectives 14* (3), 217-232.

Engle, F. & Granger, C. (1987). Cointegration and Error Correction: Representation Estimation and Testing. *Econométrica,* Vol. 55, 251-276.

Fama, E. (1970). Efficient Capital Markets: A Review of Theory and Empirical Works. *Journal of Finance,* Vol. 25.

Ffrench-Davis, R. (2005). Políticas Macroeconómicas para el Desarrollo, en *Reformas para América Latina*, Siglo XXI Editores.

Ffrench-Davis, & Griffith-Jones, S. (2003). *Las Nuevas Corrientes de Capitales Hacia la América Látina: fuentes, efectos y políticas*. Ffrench-Davis and Griffith-Jones (eds), Fondo de Cultura Económica.

Frankel, J., & Romer, D. (1999). Does Trade Cause Growth?. *American Economic Review*, 89 (3), 379-99.

Frankel, J., (2002). Proposed Monetary Regime for Small Commodity-Exporters: Peg the Export Price ("PEP"), Paper presented on the Conference on *Stabilization Policy: Why and How*, Council on Foreign Relations, N.Y.

Fuentes, R., Larraín, M., & Schmidt-Hebbel, K. (2004). Fuentes de Crecimiento Económico Chileno. *Serie de Documentos de Trabajo*, Banco Central de Chile N° 287.

Gatica Barros, J. (1989). *De Industrialization in Chile.* Boulder, CO: Westview Press.

Gelb, A. (1988). *Oil Windfalls: Blessing or Curse?*. Washington DC, World Bank, Oxford University Press.

Gilbert, C. (1989). The Impact of Exchange Rates and Developing Country Debt on Commodity Prices. *The Economic Journal 99* (397), 773-784.

Glaeser, E., La Porta, R., Lopez de Silanes, F., & Shleifer, A. (2004). Do Institutions Cause Growth?. *Journal of Economic Growth,* (9), 271-303.

Granger, C. (1986). Development in the Study of Cointegrated Economic Variables. *Oxford Bulletin of Economics and Statistics,* Vol 48.

Granger, C. (1987). *Causal Inference. The New Plagrave: Econometrics*. New York: W.W. Norton.

Grilli, E. (2005). Political Economy and Economic Development in Latin America in the Second Half of the 20th Century. *Journal of Policy Modeling, 27*, 1-31.

Hirschman, A. (1958). *The Strategy of Economic Development.* New Haven: Yale University Press.

Hirschman, A. (1977). A Generalized linkage Approach to Development with Special Reference to Staples. *Economic Development and Cultural Change*, Volume 25.

Hofman, A. (1997). Productividad Total de los Factores en Chile: Una Perspectiva Comparativa. *Documento del Programa de Innovación Tecnológica,* Ministerio de Economía.

Hua, P. (1998). On Primary Commodity Prices: The Impact of Macroeconomic/Monetary Shocks. *Journal of Policy Modeling 20* (6), 767-790.

International Monetary Fund (IMF). *World Economic Outlook*. Washignton D.C., 1997.

Inter-American Development Bank (IADB). (2001). Economic and Social Progress in Latin America. Competitiveness: The Business of Growth . Baltimore: Johns Hopkins University Press.

Johansen, S. (1988). Statistical Analysis of Cointegration Vectors. *Journal of Economic Dynamics and Control,* Vol. 12, 231-285.

Johansen, S., & Juselius, K. (1990). Maximum Likelihood Estimation and Inference on Cointegration With Applications to the Demand for Money. Oxford Bulletin of Economics and Statistics, Vol. 52, 169-210.

Keefer, P. & Knack, S. (1995). Institutions and Economic Performance: Cross-Country Tests Using Alternative Institutional Measures. *Economics and Politics, 7,* 207-227.

Krueger, A. (1998). Why Trade Liberalization is Good for Growth. *The Economic Journal, 109*, 1513-1522.

Krugman, P. (1995). Cycles of Conventional Wisdom on Economic Development. *International Affairs, Vol 71,* 717-732, London.

Krugman, Paul (1997). *Development, Geography and Economic Theory.* Cambridge: The MIT Press.

Lall, S. (2000). The Technological Structure and Performance of Development Country Exports 1985-1998. *Oxford Development Studies, 28,* 337-368.

Leff, N. (1978). Industrial Organization and Entrepreneurship in the Developing Countries. *Economic Development and Cultural Change,* 661-675.

Lin, J., & Nugent, J. (1995). Institutions and Economic Development. *En J. Behrman and T. Srinivasan Eds. Handbook of Development Economics.* Chapter 38, Volume 3A, Elsevier Science Publishers.

Marcel, M., Tokman, M., Valdés, R., & Benavides, P. (2001). Balance Estructural: La Base de la Nueva Regla de Política Fiscal Chilena. *Revista de Economía, Banco Central, Vol.4* , Nº 3.

Madrid-Aris, M., & Villena, M. (2005). Fuentes del Crecimiento Económico de Chile: Acumulación de Factores o Productividad?. *Working Paper Universidad Santa María, Santiago.*

MacKinnon, J. (1991). Critical Values for Cointegration Tests in Long-Run Economic Relationships, en R. F. Engle and C. W. J. Granger (eds.) Oxford University Press, 267-343.

MacKinnon, J. G. (1996). Numerical Distribution Functions for Unit Root and Cointegration Tests. *Journal of Applied Econometrics, 11,* 601-618.

Margozzini, F. (2005). 25 años de la Reforma Previsional en Chile. *Presentación Técnica*. Asociación de AFP.

Marshall, I. (1992). Liberalización Comercial en Chile y su Impacto sobre la Eficiencia Técnica Industrial: 1974-1986. *Colección Estudios CIEPLAN,* 35, 201-245.

Morandé, F., & Tapia, M. (2002). Política Cambiaria en Chile: el abandono de la banda y la experiencia de la flotación. *Economía Chilena, Volumen 5*, Número 3.

Murphy, K., Shleifer, A., & Vishny, R. (1989). Industrialization and the Big Push. *Journal of Political Economy, 97*, 1003-1026.

Myrdal, G. (1957). *Economic Theory and Under-Developed Regions* . London: Duckworth.

Neary, P. (1986). *Natural Resources and the Macroeconomy*. Cambridge: MIT Pres.

North, D. (1990). *Institutions, Institutional Change and Economic Performance.* Cambridge University Press.

Nurske, R. (1953). *Problems of Capital Formation in Underdeveloped Countries*. Oxford: Basil Blackwell.

Ocampo, J. A., & Taylor, L. (1998). Trade Liberalization in Developing Economies: modest benefits but problems with productivity growth, macroprices, and income distribution. *The Economic Journal, 108,* 1523-1546.

Paus, E. (2004). Productivity Growth in Latin America: The Limits of Neoliberal Reforms. *World Development, Vol.32* Nº. *3*, 427-445.

Paus, E., Reinhardt, N., & Robinson, M. (2003). Trade Liberalization and Productivity Growth in Latin American Manufacturing. *Journal of Policy Reform, 6,* 1-16.

Pavcnik, N. (2002). Trade Liberalization, Exit, and Productivity Improvements: Evidence from Chilean Plants. *Review of Economics Studies*, 69 (1), 245-76.

Pietrobelli, C. (1994). Trade Liberalization and Industrial Response: the case of Chile, (1974-1987). *Banca Nazionale del Lavoro Quarterly Review, 47* (191), 431-468.

Prescott, E., & Parente, S. (1994). Barriers to Technology Adoption and Development. *Journal of Political Economy, 102,* 298-32.

Ramos, J. (1986). *Neoconservative Economics in the Southern Cone of Latin America 1973-1983*. Baltimore: The John Hopkins University Press.

Richards, D. G. (1997). Productivity, Exports and External Economic Policy in Chile, 1970-1990. *In Paper presented at the 1997 meeting of the Latin American Studies Association*.

Rigobon, R., & Rodrik, D. (2004). Rule of Law, Democracy, Openness, and Income: estimating the interrelationship. *NBER Working Paper No 10750*.

Rodriguez, F., & Rodrik, D. (2001). Trade Policy end Economic Growth: a skeptics guide to the cross national evidence. *In Bernanke, B . y K. Rogoff (Eds.). Macroeconomic Annual 2000*. MIT Press, New York.

Rodrik, D. (1995). Trade and Industrial Policy Reform. En J. Behrman and T. Srinivasan Eds. *Handbook of Development Economics.* Volume 3B, 2925-2982, Elsevier Science Publishers.

Rodrik, D. (2000). Development Strategies for the Next Century. Unpublished Manuscript.

Rodrik, D., Subramanian, A., & Trebbi, F. (2004). Institutions Rule: The Primacy of Institutions over Geography and Integration in Economic Development. *Journal of Economic Growth, (9),* 131-165.

Rosenstein-Rodan, P. (1943). Problems of Industrialization of Eastern and South-Eastern Europe. *Economic Journal,Vol. 53,* 202-211.

Sánchez, O. (2003). Globalization as a Development Strategy in Latin America?. *World Development*, Vol.31, Nº 12, 1977-1995.

Sjoeholm, F. (1999). Technology Gap, Competition and Spillovers from Direct Foreign Investment: evidence from establishments data. *The Journal of Development Studies, 36,* 53-73.

Syrquin, M., & Chenery, H. (1989). Patterns of Development. *World Bank Discussion Paper No 41,* Washington, DC: The World Bank.

Syrquin, M. (1989). *Patterns of Structural Change*. *En Chenery H. and T. Srinivasan Eds, Handbook of Development Economics.* Chapter 7, Elsevier Science Publishers.

Syrquin, M., Taylor, L., & Westphal, L. (1984). *Economic Structure and Performance.* Academic Press, London.

Tybout, J. (2000). Manufacturing firms in developing countries: How well do they do and why?. *Journal of Economic Literature, 38,* 11-44.

Tybout, J., J. de Melo and V. Corbo: "The Effects of Trade Reforms on Scale and Technical Efficiency, New Evidence from Chile. *Journal of International Economics, 31,* 231-250, 1991.

Valdés, R. (1992). Cuantificación de la Reestructuración Sectorial Generada por la Liberación Comercial Chilena. *Colección Estudios CIEPLAN, 35*.

Vergara, R., & Rivero, R. (2005). Productividad Sectorial en Chile: 1986-2001. *Documento de Trabajo No 286,* Universidad Católica de Chile.

Villena, M.G., & Villena, M.J. (1998). Social Policies and the Quality of Life: Some Lessons from Chile. *Working Paper Series No. 48,* Centre of Latin American Studies, University of Cambridge.

Weiss, J. (1999). Trade Reform and Manufacturing Performance in México: From import substitution to dramatic export growth. *Journal of Latin American Studies, 31* (1), 51-166.

Williamson, J. (1990). *What Washington Means by Policy Reform. In J. Williamson, ed.*, *Latin American Adjustment: How Much Has Happened?*. Washington D. C., Institute for International Economics.