GDN Working Paper Series

Role of Copper in the Chilean & Zambian Economies: Main Economic and Policy Issues

Patricio Meller & Anthony M. Simpasa
(with the collaboration of Bernardo Lara & Gonzalo Valdés)

Working Paper No. 43

June 2011

About GDN

The **Global Development Network (GDN)** is a leading International Organization of developing and transition country researchers, policy and research institutes promoting the generation, sharing, and application to policy of multidisciplinary knowledge for the purpose of development. Founded in 1999, GDN is now headquartered in New Delhi, with offices in Cairo and Washington.

This Working Paper has been prepared as part of the GDN's first Inter-regional Research Project *Latin America and Africa: Cross-Regional Dialogue on the Effects of Commodity Dependence.* The project has been funded by the World Bank and the UK Department for International Development (DFID). The views expressed in this publication are those of the author(s) alone.

Role of Copper in the Chilean & Zambian Economies: Main Economic and Policy Issues

Patricio Meller & Anthony M. Simpasa[1]

(with the collaboration of Bernardo Lara & Gonzalo Valdés)

Abstract

Chile and Zambia both have abundant copper deposits. The availability of natural resources (NR) in general - and copper in particular - constitutes an important asset (or source of wealth) for a developing country. Thus, the existence of copper could be considered a sort of "divine blessing" capable of solving problems of underdevelopment. On the other hand, different conceptual currents have presented the hypothesis of the "curse of NR," complemented with empirical information from studies suggesting that (developing) countries that are rich in NR perform relatively worse (i.e. lower growth rates). In addition, there are a number of (developing) nations that do not possess NR and which have experienced high levels of growth. The examples of Chile and Zambia are two apparently opposing cases that will serve to back the hypothesis of the "blessing" or the "curse" of NR. The "curse of NR" predominates when the country in question fails to benefit from the availability of NR. So, it is important to know which factors make some (developing) countries take advantage of NR to foster their development, while others fail in the attempt. This is one of the main goals of this paper. Not only have the "curse of NR" and "Dutch disease" hypotheses oversimplified things, they are also misleading caricatures. It is not the case that a country's economic growth and exchange rate depend exclusively on what happens with its main export commodity. Furthermore, as we have seen, empirical evidence from Chile and Zambia refutes the central ideas underlying these hypotheses.

[1] The authors thank Mauricio Cárdenas, Olusanya Ajakaiye, Anamaria Pieschacon for their comments, as well as members of the Brookings network "Effects of Commodity Dependence-Latin American & Africa Inter-regional Research Project and the participants in the GDN Workshop (Prague, January 15-18, 2010). As usual, the authors are the sole parties responsible for the contents of this article.

Role of Copper in the Chilean & Zambian Economies: Main Economic and Policy Issues

Table of Contents

I. Introduction

A. Main Issues

Chile and Zambia both have abundant copper deposits. The availability of natural resources (NR) in general - and copper in particular - constitutes an important asset (or source of wealth) for a developing country. Thus, the existence of copper could be considered a sort of "divine blessing" capable of solving problems of underdevelopment.

On the other hand, different conceptual currents have presented the hypothesis of the "curse of NR," complemented with empirical information from studies suggesting that (developing) countries that are rich in NR perform relatively worse (i.e. lower growth rates). In addition, there are a number of (developing) nations that do not possess NR and which have experienced high levels of growth.

The examples of Chile and Zambia are two apparently opposing cases that will serve to back the hypothesis of the "blessing" or the "curse" of NR. The "curse of NR" predominates when the country in question fails to benefit from the availability of NR (Soros, 2007). So, it is important to know which factors make some (developing) countries take advantage of NR to foster their development, while others fail in the attempt. This is one of the main goals of this paper.

Let us briefly examine the existing differences between the problems of abundance and dependence on NR. Chile and Zambia's comparative advantages are associated with the abundance of copper. Obviously this is exogenous to the country. The persistence of the comparative advantages of copper over time could give rise to the "problem of dependence." This suggests two different phenomena:

(i) Can copper become an "inescapable fate" for the Chilean and Zambian economies? (World Bank, 2001) In other words, now and in the future these countries will only have comparative advantages; therefore, they cannot join the new economy of knowledge and information. Since copper is a nonrenewable product, these countries would allegedly be condemned to stagnation in the future. However, the dichotomy between copper production and the use (or learning) of information and knowledge technologies is false. Furthermore, as the World Bank (2001) has said, the important thing for long-term growth is

"not what is produced, but how it is produced." Briefly put, the "problem of dependence" does not exist.

(ii) The second phenomenon states that the local economy begins to depend on what happens with copper, especially its price on the international market. Given copper's importance to the local economy, the high volatility of the international price of copper has harmful effects on the local economic cycle, including "Dutch disease." In this article we will review the effects of the international price of copper on the Chilean and Zambian economies and the mechanisms used to neutralize these effects.

In other words, the abundance of copper (exogenous phenomenon) does not mean that a country cannot implement measures and mechanisms to neutralize the potentially harmful effects that dependence (on copper) has on the development pattern and the economic cycle.

One thing that Chile and Zambia's experiences with copper have in common is the role of foreign investment. Furthermore, this is to be expected considering that mining activities are capital-intensive and require modern technology, in addition to the existence of significant economies of scale. Thus, it is no coincidence that developed countries' major corporations and consortiums predominate in this sector. The significant presence of foreign companies in a sector where local firms would have comparative advantages, is enough to generate tension between foreign investors and the host government. What accentuates this is the fact that the exploitation of NR generates "Ricardian rents" (i.e. there can be a considerable gap between the cost of extracting the mineral and its international price). This creates incentives for opportunistic behavior on the part of the economic agents involved. The tensions and conflicts between foreign investors and host governments in the 20th century ended in expropriation and nationalization processes that came at the same time in both countries: Zambia nationalized copper in 1970 and Chile did so in 1971. However, at the moment, in the 21st century, foreign companies are once again playing a predominant role in copper mining in both countries.

A fundamental dilemma that governments with abundant NR must resolve is administering and using the profits generated, in addition to distributing them inter-temporally. There are three separate but interrelated issues. First, the capacity of the host country must be developed to (i) maximize the (local) society's wellbeing from copper

production and (ii) simultaneously manage to attract the necessary foreign investment for mining operations. Second, the politicians in the developing country in question have an incentive to maximize the use of resources in the present or "to spend too much too soon" (Humpreys et.al. 2007, pg.17); this behavior maximizes their chances at reelection. Mechanisms to prevent this opportunistic behavior are needed. Third, given that copper is a nonrenewable resource, rules are needed to ensure an inter-generational distribution of the benefits derived from copper.

Briefly put, to deal with the dilemmas described in the previous paragraph, this paper examines diverse long-term rules like Sovereign Funds, copper royalties and short-term macro fiscal and monetary rules.

B. Chile and Zambia: Basic Facts.

Let's first look at the similarities between Chile and Zambia. Copper is the main export product in both countries, representing 50% of Chile's export mix in 2008 and 80% of Zambia's exports. In addition, Chile and Zambia have territories covering similar areas, or just over 750,000 km^2, and a similar population (2010): Chile has 17.2 million inhabitants and Zambia has 12.2 million.

But there are significant differences in their respective economic and social variables. Chile's per capita income (PPP) is close to US$ 15,000, while Zambia's is just over US$ 1,600. Social indicators contrast by a differential of 9.2 times (see Table I.1). The infant mortality rates per 1,000 children (under the age of 5) are 9 and 170 for Chile and Zambia, respectively. Life expectancy (at birth) is 78 and 45 years of age in Chile and Zambia, respectively. Briefly put, these indicators reveal that Chile is a medium-upper income developing country, while Zambia is a low-income country.

Chile's GDP (2010) is over US$ 250 billion and Zambia's GDP is somewhat less than US$ 20 billion. Thus, the Chilean economy is 13 times larger than that of Zambia and a similar situation can be observed in the case of the relative amount of total exports: Chile exports US$ 66 billion while Zambia exports amounted to US$ 5 billion in 2009.

Table I. 1: Basic Data for Chile and Zambia

	Chile	Zambia
Population (2010; millions)	17.2	12.2
Territory (km2)	755,839	752,614
GDP per capita (2009; US$ PPP)	14,992	1,616
GDP (2009; billions US$ PPP)	256.5	19.7
Mortality rate under-5 (2007; per 1000)	9	170
Life expectancy at birth, total (2007; years)	78	45
Total Exports (2008; billions US$)	66	5
Copper Exports (2008; billions US$)	33	4
World Copper Reserves Share (2008)	36% (1st)	3.5% (9th)

Source: IMF, World Bank WDI, COCHILCO, Central Bank of Chile, CSO - Monthly Bulletin of Statistics; Bank of Zambia and Ministry of Finance and National Planning

Table I. 2: Copper Output (kMT) in Chile and Zambia in the 60s

Year	Chile	Zambia
1960	532	568
1965	585	696
1970	692	819

Source: COCHILCO, CSO - Monthly Bulletin of Statistics; Bank of Zambia and Ministry of Finance and National Planning

It is interesting to note in Table I.2 that between 1960s and 1970 Chile and Zambia produced similar amounts of copper per annum: around 550,000 MT of copper in 1960 and around 700,000 MT to 800,000 MT of copper in 1970. Zambia even showed higher levels of production than Chile during this period. It makes a comparative analysis of what happened in Chile and Zambia particularly interesting when we consider that 50 years ago both countries produced similar amounts of copper.

Furthermore, a global comparative perspective of what happened with the ownership of copper mining in Chile and Zambia during the 20th century reveals remarkable inter-temporal similarities. Both countries have gone through the same stages (Table I.3): (i) 1900-1970, with the majority of copper deposits owned by foreign companies; (ii) 1970-71, the

copper nationalization process; (iii) the 1990s, with a major increase in foreign investment associated with a process of re-privatization in Zambia and the exploration of new deposits in Chile.

Table I. 3: Copper Ownership Stages in Chile and Zambia

Years	Chile	Zambia
1900 – 1970	Foreign Private Ownership	
1970/71	Nationalization	
1990s	Major Increase in Foreign Investment (Coexistence Public/Private firms)	Privatization Foreign Investment

In synthesis, Chile and Zambia's levels of copper production were similar in the 1960s and the two countries have also shown a similar evolution in the stages of copper deposit ownership. However, their economic performance has been very different. Chile has continually increased copper production since the 1970s, while Zambia has remained practically stagnant. This paper will review the fundamental factors in this divergence and the potential lessons to be learned, especially with regard to the state's role and capacity to contribute to the generation of positive economic evolution.

C. World Copper Production

In this subsection we will produce a synthetic view of the global copper market and the roles played by Chile and Zambia in production and international exports. In addition, we will provide data on copper reserves that allows us to picture the future of both countries in the sector. This will be complemented with information on demand. That is, copper imports in the main consumer countries.

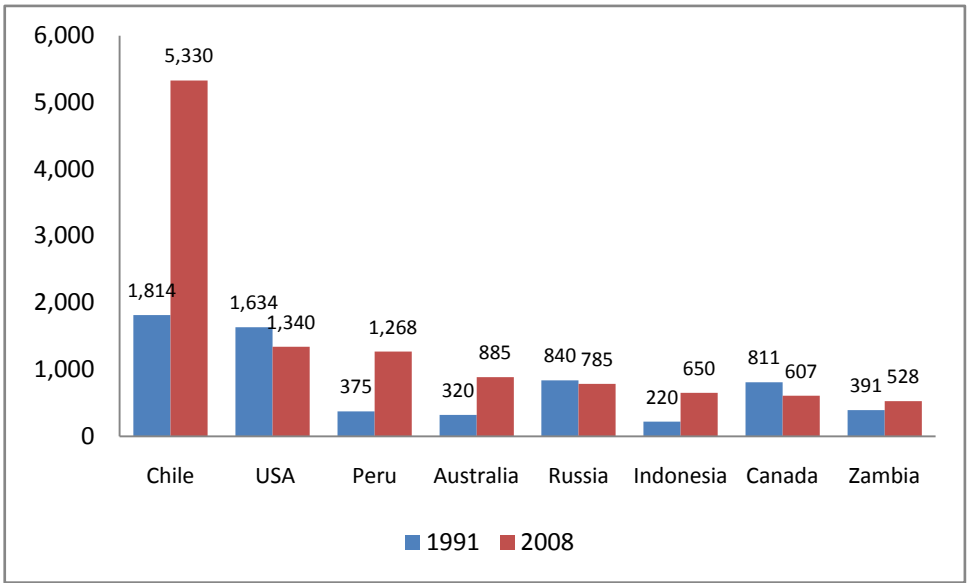
1. Copper Production and Copper Exports

Worldwide copper production has almost doubled over the last two decades. While developed producer countries have not increased their production significantly during this period, countries such as Chile, Peru and Indonesia have, as shown in Figure I.1.

Chile, USA, Russia and Canada were the world's four biggest copper producers in the early 1990s. Chilean copper production was 10% higher than that of the USA; Russia and

Canada produced amounts equivalent to 45% of Chilean production. Almost two decades later, copper production in Chile has tripled while falling 20% in Canada and USA and 7% in Russia.

Figure I. 1: Copper Mine Production - Main countries (kMT Copper Content)



Source: -World Metal Statistics March 2009 and Yearbook 2008
- Chile data: Chilean Copper Commission.

As you might observe in Figure I.1, there is a big difference in production between Chile and Zambia at the year 2008, with Chile producing almost 10 times more copper than Zambia.

In Chile, the period of higher increases in copper production coincides with a return to democracy, political stability and an increase in investor confidence, factors that, along with others will be discussed later in this work, transformed Chile into the largest copper producer in the world by 2008, responsible for 34.2% of world production.

On the other hand, Zambia's share of world copper production decreased sharply from 6% at the beginning of the 1980s to below 2% in 2000. Its share has increased since then, reaching almost 4% in 2008.

From the perspective of world exports, Chile is the greatest exporter of copper in the world, with a participation in global exports that has varied between 37.8% and 40.4% over the last ten years. Zambia is also among the leading countries with a growing participation in

global exports, increasing from 1.9% in 1999 to 4.2% in 2008. This can be seen in Table I.4, which shows the data for the other ten leading copper export countries.

Table I. 4: Share of World Copper Exports (%)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008(p)
Leading Exporters	**97.2**	**97.5**	**96.8**	**96.9**	**97.1**	**97.2**	**97.2**	**97.5**	**96.3**	**97.4**
Chile	**39.3**	**38.8**	**37.8**	**38.2**	**39.6**	**44.3**	**39.9**	**38.7**	**40.4**	**39.1**
Peru	4.6	4.2	4.5	6.9	6.4	6.6	7.8	6.9	7.8	8.6
Australia	4.7	5.0	5.8	5.5	5.6	5.0	5.4	5.0	4.8	5.9
Canada	5.9	7.1	8.2	5.2	4.0	4.3	4.8	4.4	4.3	5.2
Zambia	**1.9**	**1.9**	**2.5**	**2.9**	**3.1**	**3.2**	**3.2**	**3.5**	**3.5**	**4.2**
Indonesia	5.2	6.7	6.6	7.2	6.7	4.4	6.6	5.1	4.3	4.0
Japan	3.3	3.0	3.8	3.6	2.5	1.6	1.9	2.4	3.1	3.2
USA	1.2	2.6	0.8	0.7	1.4	1.6	1.7	3.9	2.6	2.6
Kazakhstan	3.3	3.7	3.5	3.7	3.7	3.8	3.3	2.8	2.9	-
Poland	2.0	2.1	1.8	2.2	2.4	2.3	2.2	2.1	1.7	2.2
South Africa	0.5	0.3	0.6	0.4	0.3	0.2	0.3	0.5	0.6	2.0
Belgium	1.7	1.9	2.1	1.7	2.9	1.5	1.8	1.8	1.5	2.0
Other countries	23.6	20.3	18.9	18.5	18.5	18.5	18.4	20.3	18.7	18.5

(1) Includes global exports of copper concentrates and blister and refined copper.
(p) Estimated.
Source: World Metal Statistics April 2009 and Yearbook 2008.
- Chile data: Chilean Copper Commission.

2. World Copper Reserves

The percentages of participation in global copper reserves are shown in Table I.5, with Chile (36%) and Zambia (4%) representing around 40% of these. Other countries also have significant reserves, such as Peru (12%), the USA (7%) and China (6%). It is worth noting that the State-owned Chilean company, CODELCO owns 17% of global reserves.

Table I. 5: World Copper Reserves Country Shares (%)

	Reserves[a]			
	1995	2000	2005	2008
Chile	**26.7**	**24.6**	**38.3**	**36**
Peru	3.9	6.2	6.4	12
United States	14.8	13.8	7.4	7
China	1.3	5.7	6.7	6.3
Poland	5.9	5.5	5.1	4.8
Australia	3.8	3.5	4.6	4.3
Mexico	4.4	4.2	4.3	4
Indonesia	2.5	3.8	4	3.8
Zambia	**5.6**	**5.2**	**3.7**	**3.5**
Russia	4.9	4.6	3.2	3
Kazakhstan	3.3	3.1	2.1	2.2
Canada	3.8	3.5	2.1	2
Other	19.2	16.9	11.7	11
World Total	100	100	100	100

a.- Reserve Base.—That part of an identified resource that meets specified minimum physical and chemical criteria related to current mining and production practices, including those for grade, quality, thickness, and depth.
Source: Elaborated from data from USGS

It is economically feasible to exploit global copper reserves as long as there is a positive gap between the price and production cost. Given current world prices, copper production is a highly profitable business. Copper world prices have been over US$3 per pound on average in the last five years even accounting for the effect of the global economic recession on the copper price. On the other hand, the unit cost of copper production has fluctuated around US$1.20/pound in Chile and around US$1.60/pound in Africa (Brook Hunt Ltd). Therefore, there are important Ricardian rents in copper production in the present, and given the world demand composition, they could prevail in the near future.

3. Copper importing countries

With respect to copper importing countries, China tops the ranking after taking the lead as the biggest global importer in 2002; the share of China imports increased from 11.4% (2000) to 23.6% (2008). Now China imports are larger than the combined imports of USA and Germany together. In 2008, China, Japan, Germany and the USA represented more than

44% of global imports. On the other hand, while India´s imports tripled between 2000 and 2008 its copper import share is less than 4% of the total. South Korea is a country that has maintained its copper import share in the last decade at close to 7% of total world copper imports.

Table I. 6: Share of Global Copper Imports (%)

	2000	2002	2004	2006	2008(p)
Leading Importers	**96.9**	**98.0**	**96.7**	**96.7**	**98.1**
China	11.4	16.0	17.6	14.4	23.6
Japan	14.4	12.3	11.8	11.2	11.5
Germany	8.2	6.7	7.6	9.6	9.0
USA	11.1	12.7	7.6	9.9	7.2
South Korea	7.0	7.4	7.5	6.6	6.7
Italy	5.6	5.7	6.0	6.1	4.9
Taiwan	5.8	5.8	6.0	5.1	4.7
France	5.4	5.1	5.1	4.0	3.5
India	1.2	1.6	2.0	4.9	3.3
Brazil	2.6	1.9	2.5	2.5	3.0
Spain	2.6	2.7	2.3	2.7	2.9
Turkey	1.8	1.7	2.1	1.4	2.6
Thailand	1.4	1.7	1.9	2.1	2.1
Belgium	2.3	2.2	2.7	2.3	2.1
Other countries	16.3	14.3	14.1	14.0	11.1

(1) Includes global imports of copper concentrates and blister and refined copper.
(p) Estimated.

Source: World Metal Statistics.

II. Role of Copper in the Chilean & Zambian economies

This section is divided into two parts. The first contains a descriptive analysis of the evolution in local copper production and also copper's quantitative effect on exports, fiscal revenue, investment, share of GDP and employment. The second part engages in a simplified

empirical analysis to examine the relevance of the hypotheses of the "curse/blessing" of copper and "Dutch disease" in Chile and Zambia.

A. Copper links to Domestic Economy

1. Copper production in Chile and Zambia

We reiterate the fact that in the 1960s the level of copper production was similar in Chile and Zambia: in the range of 540,000 to 750,000 tons per year. However, copper production in both countries had an opposite trend from 1980 on. In the 1980s and 1990s the level of copper production in Zambia decreased at an annual rate of -3.4% to -5.0% per year. Levels of Zambian copper production in 2000s were one-third what they were in 1970. On the other hand, copper production in Chile increased at 4.1% per year in the 1980s and 11.0% per year in the 1990s. Chile became the most important copper producing country in the world with an annual production of 4,600,000 tons by year 2000, almost seven times the level in 1970.

Table II. 1: Copper production - Annual growth, Chile and Zambia (%)

	Annual growth.- Zambia	Chile annual growth
Decade 60	7.29%	2.66%
Decade 70	2.87%	4.44%
Decade 80	-3.41%	4.05%
Decade 90	-5%	11%
2000-2008	11%	1.85%

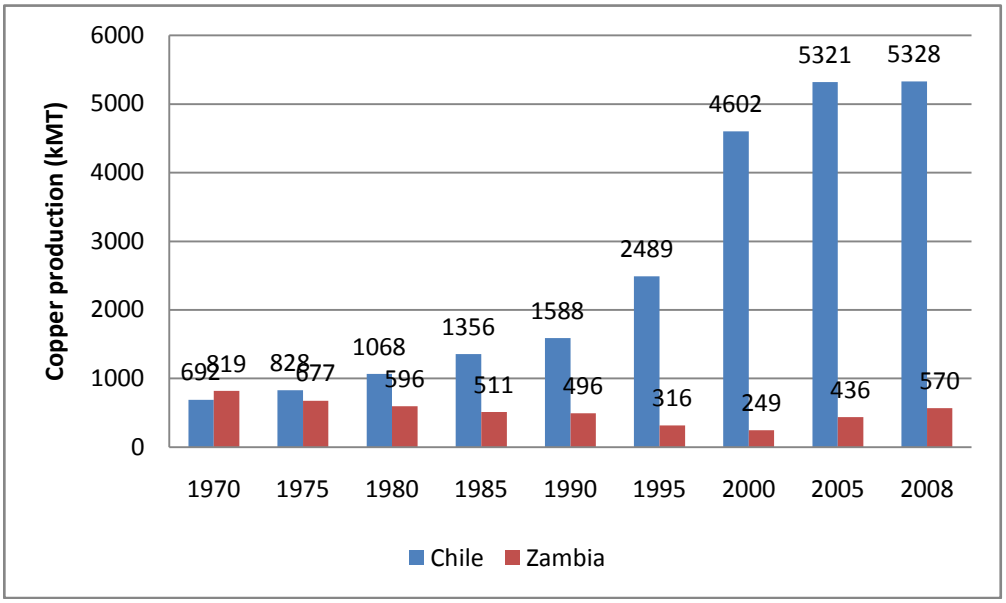
Source: COCHILCO, CSO - Monthly Bulletin of Statistics; Bank of Zambia and Ministry of Finance and National Planning.

In other words, Chilean production has increased exponentially over the last 50 years. This growth can be illustrated by considering that an increase in production of 500,000 tons took 20 years, during the 1960s and 1970s. This same increase in production of 500,000 tons took ten years in the eighties. By the nineties, this increase in 500,000 tons took less than two years. In short, the greatest growth in production occurred in the 1990s.

After 2000, Zambia copper production significantly reversed the downward trend: average annual growth was 11% in 2000-2008. Thus, in 2008, Zambia regained the level of copper output that it produced in 1980. Chile's annual (average) growth rate of copper output

was 1.9% in 2000-2008; given the high output levels attained after the large investments of the 1990s, there had to be a slowdown.

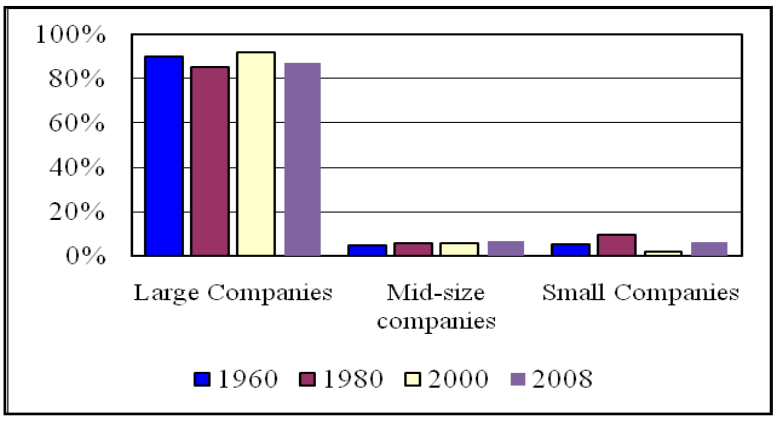
Figure II. 1: Copper Production – Chile and Zambia (kTM)



Source: COCHILCO, CSO - Monthly Bulletin of Statistics; Bank of Zambia and Ministry of Finance and National Planning

Copper in Chile has two important features that characterize this activity. First, copper has been produced mainly by large firms (producing more than 50,000 tons per year). In the last fifty years, more than 85% of Chilean copper production has been related to large firms. Second, since the 1970s (after the "Nationalization" process of 1971), state and private firms have coexisted in copper mining. This issue will be discussed in greater detail later on.

Figure II. 2: Production by type of companies in Chile



Source: COCHILCO

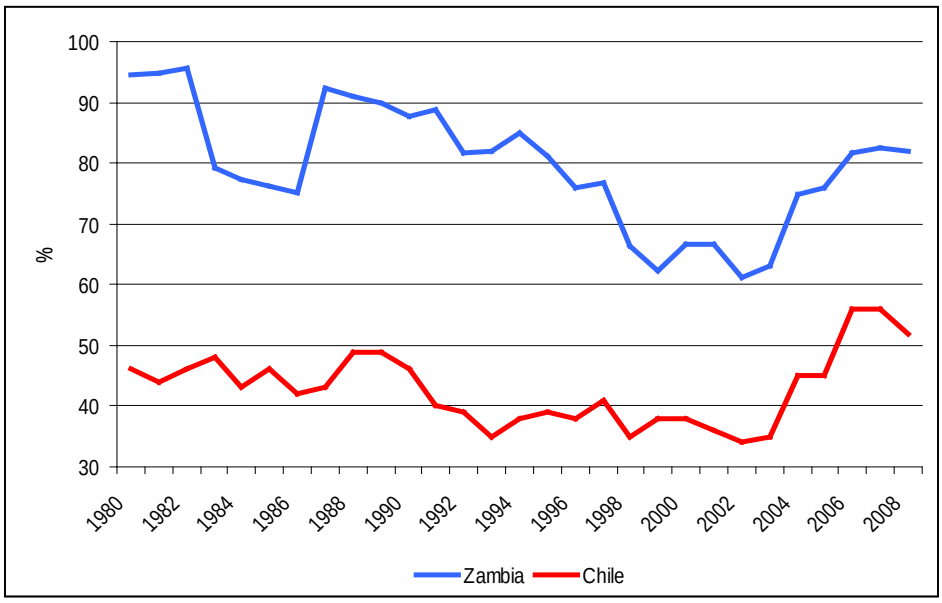
2. Exports

The participation of copper as a percentage of the Chilean export basket has diminished considerably over the last 50 years. Until the seventies, copper played an important role in the export basket, with participation as much as 70%, but this had dropped to 35% by 2002 (of total exports). This drop in copper's participation in total exports is considered to be an indicator of the success in the diversification of the economy. That is, the Chilean economy depends less on copper now than it did in the 1970s.

This sharply contrasts with the case of Zambia where the diversification strategy has failed to yield tangible results due to general lack of commitment to policy reforms, particularly in the late 1970s and early 1980s when the state controlled a sizable section of the economy through ownership of key strategic enterprises which often enjoyed soft budgets support from the central government. The Government's failure to break away from copper dependence tragically incapacitated the economy from making a meaningful structural sectoral shift to reduce the size of copper exports on the economy. It must be noted, however, that in terms of value added and contribution to GDP, copper was small relative to other sectors of the economy and its share shrunk precipitously over the years of economic recession. One would therefore argue that the interventionist policy environment which characterized the Zambian economy was more damaging than productive.

Then, due to the recent boom in copper prices, the share in the export basket increased to a peak of 57% in 2006, not because of increased production but chiefly as a result of the price effects.

Figure II. 3: Chilean and Zambian Copper Exports/Export Basket (%)



OBS: For 1985 the data has been interpolated using information from years 1984 and 1986.
Source: - Central Bank, save for copper
- Copper data by Chilean Copper Commission.
- Monthly Bulletin of Statistics; Bank of Zambia and Ministry of Finance and National Planning.

In summary, since 1990 copper has been almost 40% of Chilean export basket and this percentage has increased over 50% since 2006, and the forecast for the near future is that it will remain there.

In the case of Zambia, copper had a share close to 95% of total exports in the period prior to 1982. From then on, copper's share fell to 60% of total exports. From 2006 to 2008, the share of copper exports has increased again, accounting for more than 80% of the total Zambian export basket. The fall in the proportion of copper exports in the 1980s was a combination of lower prices and drastic fall in output, the latter dominating the price effect. In the present situation, the uptake in the proportion of copper exports to the export basket is once again due to price and output effects, but both playing an important role, as price and output have increased momentously since 2003.

Given the significant contribution of copper in the export basket, fluctuations in the price of copper can generate pressure on the exchange rate and other macroeconomic factors. In the particular case of Chile, the macroeconomic policies have been fundamental for

dealing with the high copper prices and its pressures for the appreciation of the peso. This phenomenon will be examined in later sections of this work; it is highly relevant since it requires adequate policy and institutional mechanisms in order to neutralize the variations in the price of copper and its effect on economic growth and the stability (smoothing) of consumption of Chilean economic agents.

3. Fiscal Revenues

Copper in both Chile and Zambia could be highly relevant to fiscal revenue. Prior to 2000, there were several years when copper accounted for a double-digit share of fiscal revenue. In Chile in 1985-92 there were three years where copper taxes represented more than 20% of fiscal revenues and there were five years where this percentage was 10%. In the Zambian case there were five years where copper represented 10% to 13% of fiscal revenues. However, there were several years in Zambia when copper provided 3% or less of total fiscal revenue. In other words, there were a number of years when copper's share of fiscal revenue was around 1% in Zambia and less than 4% in Chile (Table II.2).

There has been an increase in the fiscal income (taxation) from private companies involved in copper production in the recent boom years (2004-2008) in Chile. Copper's share of fiscal revenues has been in the range of 20.7% to 31.1%, peaking in 2006 (31.1%). On the other hand, because of tax concessions mining companies were not remitting any mineral taxes to the Zambia state coffers. Therefore, Zambia's fiscal benefit from the boom was virtually absent. For the duration of the four year long boom period (2004-2007), revenues from copper as a share of total fiscal revenue was equal to or below 1%. Only after the revision of the fiscal regime in 2008 did this share increase to 3.4%.[1] These statistics do not, however, identify the share of wage taxes or value added tax (VAT) attributable to the mining sector. Rather, they reflect direct taxation on mining activity. Therefore, when wage based taxes and VAT are taken into account, the revenue from mining sector is higher. Considering the composition of fiscal income, there is a cyclical component associated with copper revenue. The fiscal income in Chile generated by cupriferous activity reached 20% in 1990, fell to 3% in 1998, and then reached a peak of 31% in 2006. If the lowest copper prices

[1] A full account of the implications of the development agreements between the Zambian government and the foreign mining companies is given below under the discussion of privatization and foreign investment.

from the period of the Asian crisis are considered, at constant prices fiscal income from copper has since increased by 15.8 times. This phenomenon generates the evident concern for anti-cyclical policies to minimize the turbulence from the price cycle and the ensuing fiscal income and government expenditure cycles. This type of policy will be analyzed later in this work, but the special mechanisms used are the structural fiscal surplus and sovereign funds.

Table II. 2: Total Fiscal Income composition

	Chile		Zambia	
	Copper Share of Fiscal Revenue (%)	**Copper Revenue/GDP (%)**	**Copper Share of Fiscal Revenue (%)**	**Copper[1] Revenue/GDP (%)**
1994	8.3%	1.6%	1.1%	0.5%
1995	12.2%	2.5%	3.0%	0.6%
1996	7.9%	1.4%	2.8%	0.5%
1997	8.5%	1.4%	3.0%	0.4%
1998	2.9%	0.5%	1.5%	0.3%
1999	3.1%	0.4%	11.8%	2.1%
2000	5.8%	0.9%	12.9%	2.8%
2001	3.4%	0.5%	11.4%	0.1%
2002	3.5%	0.5%	0.1%	0.0%
2003	6.4%	10.0%	0.3%	0.0%
2004	18.6%	3.1%	0.1%	0.0%
2005	20.7%	3.8%	0.7%	0.1%
2006	31.1%	5.7%	0.7%	0.1%
2007	25.7%	4.8%	1.0%	0.2%
2008	24.6%	4.0%	3.4%	0.6%

Source: DIPRES, CSO - Monthly Bulletin of Statistics, Ministry of Finance and National Planning

\1; Includes mining company tax, mining license and royalty

A different indicator to examine the magnitude of fiscal copper revenues is its relative importance with respect to GDP. In the 1990s, Chilean and Zambian copper revenue's share of GDP was 1.5% (GDP) and 0.6% (GDP), respectively. Unlike in Chile where share of copper revenue to GDP increased to an average of 5.2% during the price boom period (2003-2008), in Zambia, due to tax breaks and other incentives enshrined in the mining agreements, the increase was negligible. Therefore, fiscal revenue from copper as a proportion of GDP amounted to only 0.2% over the boom period. Thus, over the boom

period, the small revenue take was largely due to the generous tax incentives granted to the foreign mining companies.

4. Investment

Another relevant aspect for the domestic economy is investment in mining. In Chile's case the flow of investment in mining increased to over US$ 1 billion per year from 1990 onward; there were several years where this figure was over US$ 2 billion and US$ 3 billion per year and it was over US$ 4 billion in 2008.

Chilean investment in mining (of copper) has three intertemporal stages that is, in general, show an alternation between the levels of public and private investment. In the first stage, which covers the period between 1976 and 1987, state investment was greater than private investment. This was the period following nationalization (1971), when private investment was low and there was little incentive due to the expropriation experience and the military dictatorship. While public investment fluctuated in this period around an annual amount of US$ 300 million, private investment was almost half of this amount.

In the second period, between 1988 and 2002, foreign investment increased remarkably due to explicit guarantees for foreign investment and the return to democracy and institutional stability (signalled by the plebiscite in 1988). Foreign investment (in copper) was over US$ 1 billion annually for several (8) years. State investment by CODELCO was less than half.

The third stage includes the period between 2003 and 2008, during which state firm's investment was once again greater, probably motivated by high copper prices and the large CODELCO (copper) reserves.

In other words, in the case of state companies, recent investment has increased almost 5.5 times with respect the levels of investment from ten years ago. In 1999, public investment represented 27% of private investment (in copper). Ten years later, public investment represents 85% of private investment and 47% of total mining investment in Chile.

Table II. 3: Mining Investment in Chile (Millions of Current US$)

	State enterprises (1)	Private firms (2)	TOTAL
1976	111	2	113
1980	278	155	434
1985	377	81	458
1990	386	762	1,148
1995	409	1,706	2,116
2000	495	233	729
2005	1,852	588	2,441
2008	2,021	2,366	4,387

Note: Public investment in 2005 includes Codelco's US$393-million Ventanas Smelter & Refinery acquisition.
(1) Includes CODELCO and ENAMI.
(2) Foreign direct investment (FDI) DL600.
Source: - CODELCO y ENAMI.
- Foreign Investment Committee.

5. Copper, GDP and Employment

The importance of copper in GDP, considering constant prices, has been and is relatively low in Chile; value added of copper (in GDP) fluctuates between 6 and 7% (Table II.3). In Chile, the value added by copper mining sector is less than that of other sectors such as manufacturing, construction, commerce, financial services and others.

Table II. 4: Sector Share of GDP at Constant Prices[a]

Sector of Economy	1996		2000		2002		2004		2006		2008	
	Chile	Zambia	Chile	Zambia	Chile	Zambia	Chile	Zambia	Chile	Zambia	Chile	Zambia
Copper Mining*	5.6	12.1	7	4.1	6.7	3.5	7.0	3.1	6.1	5.2	5.5	8.4
Agriculture	4.2	15.5	4.2	19.9	4.4	20	3.7	21.4	3.9	20.2	3.7	12.2
Manufacturing	17.5	11.8	16.4	10.2	15.9	10.4	16.6	10.9	16.5	10.2	15.8	10
Construction	9.3	3.5	7.9	5	8	6.6	6.7	9.2	7.0	12.6	7.5	11.5
Commerce	11.1	17.5	10.8	18.7	10.6	18.5	9.8	18.6	10.3	17.2	10.5	16.4
Other	52.2	39.6	53.7	42.2	54.4	41	56.2	36.7	56.3	34.6	57.1	41.5

(a) 1996-2002 at constant 1996 prices. 2003-2008 at constant 2003 prices.
* In the case of Zambia it is metal mining
Source: Central Bank of Chile and Central Statistical Office (CSO), Zambia.

In the Zambian case, the copper sector's share of GDP (at constant prices) fluctuates quite a lot; with a median value of 4% (GDP) in the years prior to the recent price boom, to

more than 8% (GDP) in 2008. The values of copper sector's share are lower than those observed in the other main economic activities (agriculture, manufacturing, construction, commerce).

In Zambia, the copper sector was an important job generator. In the 1980s more than 16% of the people worked in the copper sector but this be viewed in the context of overall ZCCM employment levels, which included non-core mining activities. This percentage has decreased from 1995 on; the recent copper employment share has fluctuated between 7% and 11% mainly because of shedding off of labor in non-mining activities in post-privatization period.

With regard to employment, copper is not important to Chile; at a national level it does not represent a significant source of employment. Direct employment associated with copper accounts for 1% of the labor force, that is to say, around 60,000 people. In addition, indirect employment accounts for around 1 to 1.5% of the labor force.

B. Effect of the Price of Copper on Macro Issues

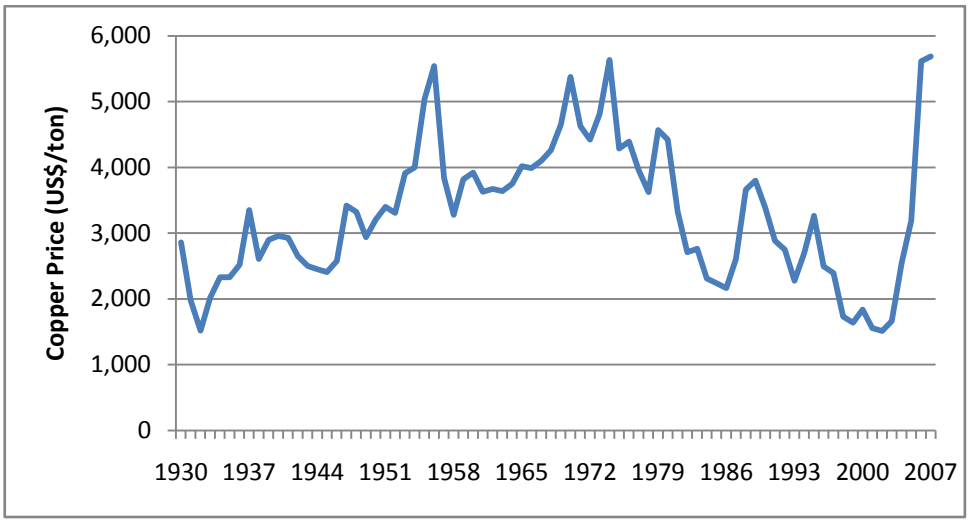
As previously mentioned in this subsection, we will review the empirical validity of the hypotheses of the "curse/blessing" of copper and "Dutch disease" in Chile and Zambia. To this end, we will first examine the effect that copper price variations have on trade balances. In an economy that is solely dependent on a single commodity and absent any response of quantity exported to changes in the price, a a rise or fall in the price of copper should generate trade surpluses or deficits. However, in practice, although copper exports account for a large share of exports receipts in both Chile and Zambia, improvements in non-copper exports, foreign investment, and flows of financing, especially in recent years, have also been sources of foreign currency and may produce compensatory effects of variations in copper price on the external balance account. Second, we will look at the relationship between the evolution of copper prices and the real exchange rate: an appreciating exchange rate suggests the presence of "Dutch disease." In addition, we will examine what happens with the evolution of manufacturing exports: if they increase even in the presence of "Dutch disease" then the effect of that phenomenon would not be significant. Lastly, we will verify the direct relationship between the price of copper and the local rate of economic growth: a

positive (negative) relationship would back the hypothesis of the "blessing" ("curse") of copper for the local economy.

In short, in this section we will analyze the empirical evidence for the relationship between the evolution of the price of copper and its volatility and the behavior of the economy. An important aspect of the effect of copper prices and its dynamics relates to the boom-bust cycles.

Economies such as those of Chile and Zambia, which depend to a great extent on a commodity such as copper, are exposed to considerable volatility. This volatility can be seen in Figure II.4 which shows the evolution of the price of copper between 1930 and 2007, where it fluctuates in the range of 1.5 to 5.5 (US$/ton).

Figure II. 4: Copper Price 1930-2007



Source: World Development Indicators and U.S. Geographical Survey.

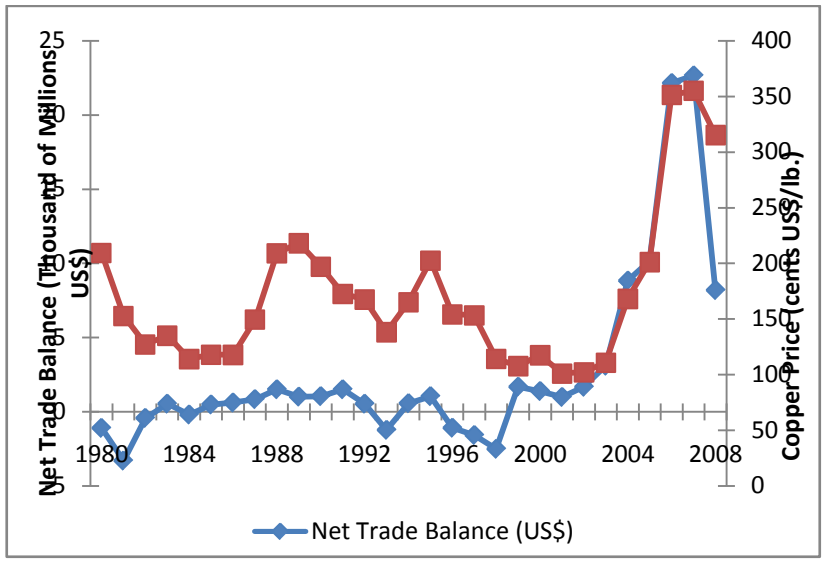
1. Trade Balance & Capital Flows

Let us review the evolution of the components of the Balance of Payments, the net trade balance and the relative magnitude of the capital account components. The main export product of Chile and Zambia is copper, and hence their trade balance fundamentally depends on the price of this commodity. As can be observed in Figure II.5 and II.6, Chilean and Zambian trade balance is highly correlated to the price of copper. More specifically, during the last copper boom, an unprecedented trade surplus has been generated. The problem is that this surplus could be sharply reduced if the copper price falls. Moreover, the existence of

a high trade surplus stimulates the expansion of imports; this new higher level will be difficult to sustain if the price of copper returns to the values observed prior to 2004.

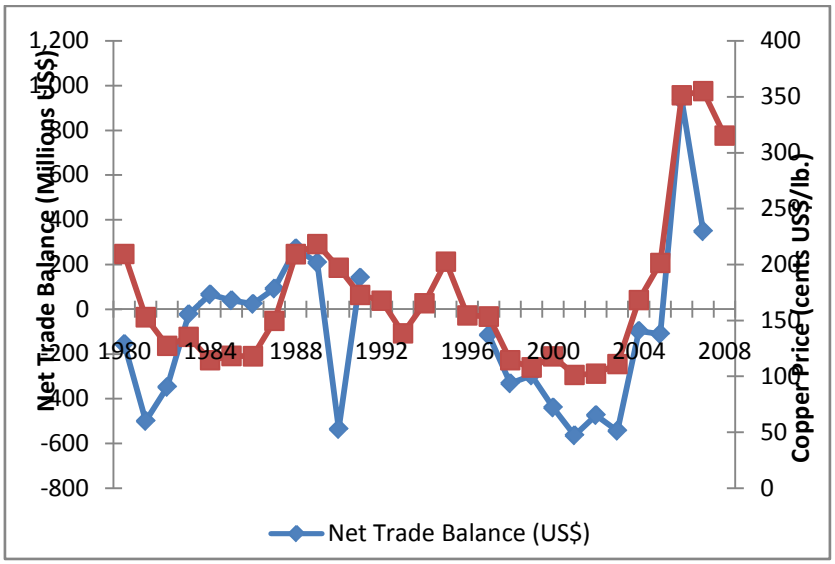
While the trade balance is strongly dependent on the copper price, this does not mean that the only inflow of foreign exchange to Chile and Zambia is via copper exports. In Chile there has been a major expansion in the Capital Account since 1990, which has been reflected in a large increase in inflows of direct foreign investment and financial capital. This has meant that the large inflow of capital also plays a fundamental role in determining the exchange rate. In the case of Zambia, foreign aid has been an important source of foreign exchange.

Figure II. 5: Chile –Net Trade Balance and Copper Price



Source: Central Bank of Chile and COCHILCO.

Figure II. 6: Zambia –Net Trade Balance and Copper Price



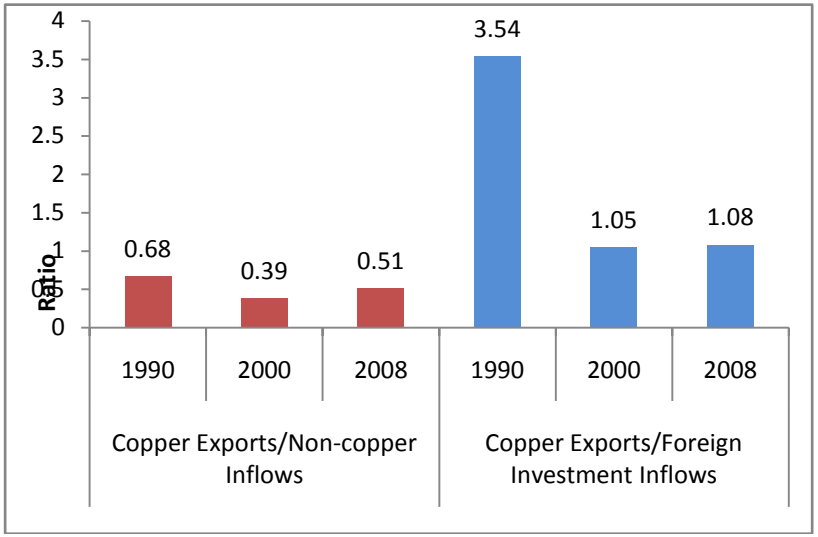
Source: World Development Indicators.

In order to get an idea of the relative amount of foreign exchange inflows related to copper exports and other sources, we can look at Figure II.7, which shows the Copper Exports/Foreign Capital Flows ratios (including direct investment and financial flows) to Chile. In this Figure it is observed that in 1990 for each US$ 0.7 of copper exports, US$1.0 was generated by non copper exports; in the years 2000 and 2008 this ratio diminished to 0.4 and 0.5 respectively. Considering only foreign capital flows, in 1990 for each US dollar of foreign flows, copper exports generated US$ 3.5. This situation changed in the years 2000 and 2008, where there were similar magnitudes for foreign exchange inflows generated by copper exports and foreign capital flows.

A similar analysis for Zambia shows the following in Figure II.8: in 1997 US$ copper exports were similar to those generated by non copper exports; in 2000 this ratio diminished to 0.6 while in 2008 it increased to 1.6. In other words, during the boom years, foreign exchange generated by copper exports was 60% higher than those of non-copper exports inflows. Considering only foreign investment flows in 1990, for each US dollar of foreign flows, copper exports generated US$ 4.5. This situation remains similar in 2000 and 2008, where magnitudes for foreign exchange inflows generated by copper exports were four times larger than those of foreign investment flows.

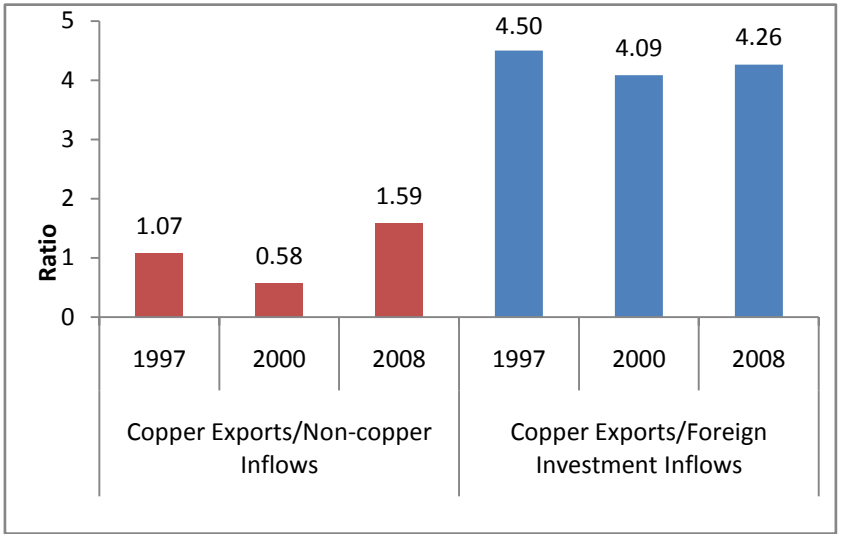
Therefore, copper exports are not the only (and main) mechanism in Chile for inflows of foreign exchange while in Zambia copper exports are still the main factor for generating foreign exchange.

Figure II. 7: Chile - Ratios of Copper Exports (USD) / Non-copper Inflows (USD)



Foreign Investment Inflows: Sum of direct and indirect foreign investment.
Non-copper Inflows: Foreign Investment Inflows plus non-copper exports.
Source: Central Bank of Chile and COCHILCO.

Figure II. 8: Zambia - Ratios of Copper Exports (USD) / Non-copper Inflows (USD)



Foreign Investment Inflows: Sum of direct and indirect foreign investment.
Non-copper Inflows: Sum of Foreign Investment Inflows, non-copper exports and Foreign Aid.
Source: CSO - Monthly Bulletin of Statistics, Bank of Zambia and World Bank – WDI, OECD.

2. Price of copper & the exchange rate

In this section we will review the effect of the price of copper upon the exchange rate. More specifically, we will examine the presence of a "Dutch disease" phenomenon.

"Dutch disease" is generated by a boom in the price of a commodity, i.e. a sharp increase in the price of copper increases the amount of currency in the local economy generating an appreciation in the real exchange rate. The wealth effect generated by the inflow of dollars makes consumers want to consume more tradable and non-tradable products. Due to the limited supply of non-tradable products, there is an appreciation in the real exchange rate, more specifically, the price of non-tradable goods increases with respect to that of tradable ones. As a result, there is a reduction in the relative prices of the tradable sector not connected with the commodity, provoking a reallocation of productive factors from the non-boom tradable sector (usually agriculture and manufacturing) to the non-tradable (construction, retail and services). Below we will examine the validity of this hypothesis with respect to the Chilean and Zambian economies.

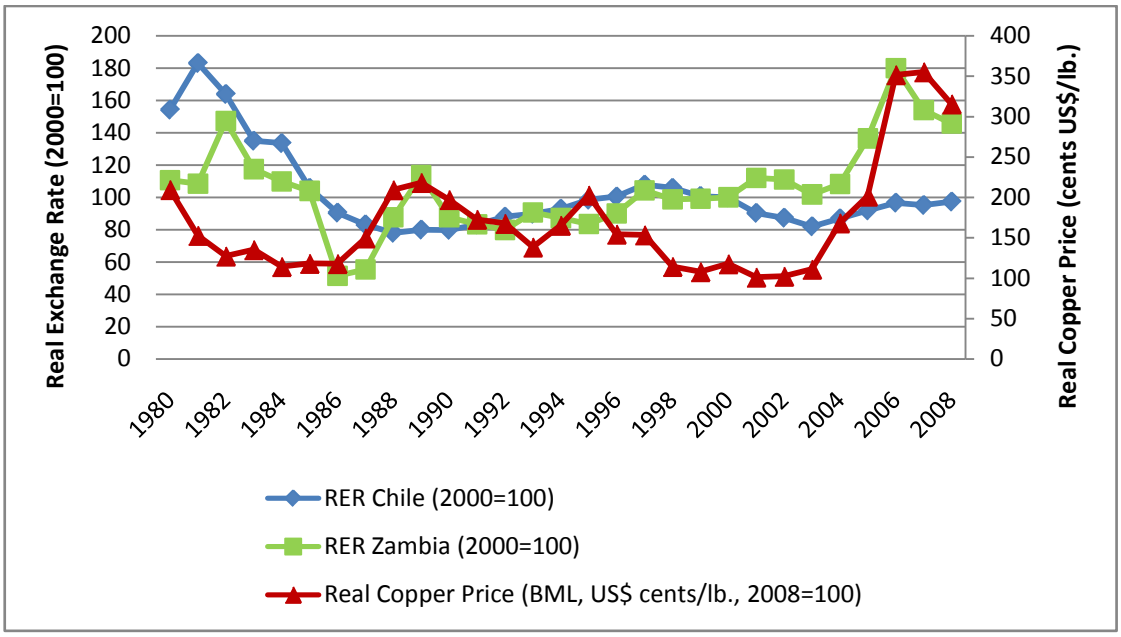
The exchange rate is the key mechanism for the Dutch disease argument to be valid. Thus the level of the exchange rate's dependence on the price of copper will help to check the existence of a Dutch disease syndrome in Chile. As can be seen in Figure II.9, since 1985 the exchange rate in Chile has not shown high sensitivity with respect to the copper price. In fact, it did not increase significantly during the current copper boom.

Let's now take an econometric look at the effect of copper prices on exchange rates.[2] In doing so we assume that the international price of copper is exogenous to the local economy. In other words, we premise that the price of copper is determined by the interaction between global supply and demand conditions. While Chile is of major importance in world production, this cannot be translated into an ability to "manage" copper

[2] As a matter of uniformity, all econometric specifications in this paper are conducted on a sample period spanning from 1980 to 2008, inclusive. Relevant times series tests are also conducted before proceeding with the estimation process. Due to the low frequency of the data (annual observations), vector autoregressive regression (VAR) analysis was not an option. Instead, the results are conducted on traditional ordinary least squares (OLS). Whilst this approach suffers from some econometric shortcomings, it nonetheless provides a basic structure of economic analysis and results so obtained yield important benchmarks for future exposition of economic relationships involving tests of the Dutch disease and Resource Curse hypothesis.

prices, considering that Chilean copper production is distributed among diverse private foreign multinational and domestic companies and one state company (CODELCO). Collusion among all these companies is simply unviable (and illegal).

Figure II. 9: Chile and Zambia – Real Exchange Rate and Copper Price



Source: Central Bank of Chile, Central Bank of Zambia and COCHILCO.

We will use a simplified model in which the real exchange rate depends on the price of copper and the lagged dependent variable. There are two implicit premises: (i) The price of copper is not associated with other variables that might affect the real exchange rate. (ii) The lagged dependent variable includes the effect of other variables (excluded) on the real exchange rate. This type of simplified model and premises will be used in the following analyses on the effect of copper on diverse variables. We add to this the impact of a boom dummy affecting the variables in a linear way, as well as through its interaction with the price of copper.

The following econometric model is used:

$$Ln(e_t) = \alpha + \mu \cdot b + \beta \cdot Ln(P_t) + \eta \cdot b \cdot Ln(P_t) + \gamma \cdot Ln(e_{t-1}) + \varepsilon_t ,$$

Where $\boldsymbol{e_t}$ is the real exchange rate in year t, P_t is the price of copper in year t, b is a dummy variable that corresponds to the recent price boom (2004-08) and which affects both the intercept as well as the slope (interactive effect); ε_t is the random term. We do need to include b as a control, since otherwise it might bias the coefficient of the interaction term $b \cdot Ln(e_{t-1})$, which will explain what effect does the copper price during the boom.

The result for Chile in an annual econometric regression for the period 1981-2008 is (test t in parenthesis):

$$Ln(e_t) = \underset{(0.7)}{-0.4397} + \underset{(1.34)}{1.0385 \cdot b} + \underset{(1.86)}{0.1455 \cdot Ln(P_t)} - \underset{(1.35)}{0.1929 \cdot b \cdot Ln(P_t)} + \underset{(12.03)}{0.9334 \cdot Ln(e_{t-1})} \quad \text{(Chile)}$$

The key estimator, β, indicates that the effect of copper prices on the exchange rate[3] is **positive;** i.e., increases in copper prices cause exchange rate depreciation. But this effect is only statistically significant at 10%. An Augmented Dickey-Fuller test for unit root does not reject the null hypothesis that RER in Chile or Zambia follows a unit root process. See Appendix for more details.

In sum, it could be said that there is no empirical evidence to suggest the presence of "Dutch disease" in Chile's case. On the other hand, the dummy variable of the recent boom caused the price of copper to have a negative effect on the real exchange rate; i.e., there was impact in terms of exchange rate appreciation during the recent boom period, but its effect was statistically not significant. Briefly put, one cannot reject the null hypothesis that the (international) price of copper does not affect the real exchange rate. This immunization of the exchange rate with regard to the copper price is due, in addition to the macroeconomic policies that will be explained later, to the type of foreign exchange regimes implemented in Chile.

Let us briefly review the role of the exchange rate, exchange rate regimes and policies in the Chilean economy. Most of the time, variations in the exchange rate are mostly related to macroeconomic problems not linked to copper prices.

[3] The exchange rate is defined as amount of domestic currency per unit of a US dollar, i.e., pesos per US dollar ($/US$). This means that higher (lower) real exchange rate levels implies depreciation (appreciation).

Chile has used the exchange rate for diverse purposes: i) As a tax instrument for foreign companies owning cupriferous deposits; ii) as an instrument for compensating the lowering of import tariffs, i.e. as an instrument for the protection of the production of tradable goods; iii) as a stimulus for the expansion of exports; and iv) as an anti-inflationary instrument, either as a guide for expectations for the future evolution of prices, or as a nominal anchor for the economy.

To implement these objectives, Chile has used a wide variety of exchange rate regimes and exchange rate policies. Moreover, there were foreign exchange controls, multiple exchange rates (at the same time) and a "black market" of dollars during a long part of the 20th Century (1930-1980). The annual rate of inflation fluctuated (on average) in the range of 20% to 30%. In this macroeconomic environment, a nominal exchange rate regime generates a deterioration of the value of the exchange rate with respect to the evolution of the rest of domestic prices; moreover, when there are foreign exchange controls, there are incentives for the emergence of a "black market for dollars" and an increase in the value of the "unofficial dollar". This situation generates pressure for sharp devaluations, which have adverse effects on the economic and political levels; the Minister of Finance who implements devaluation loses his job within a quarter. In 1960s the (passive) crawling peg mechanism was created, which indexed the exchange rate to the previous month's CPI (Consumer Price Index); in this way there is a stability of the relative prices in the tradable goods producing sector. In the 1970s the passive crawling peg mechanism was replaced by the active crawling peg (the "tablita" invented by Argentina) where the exchange rate was readjusted by a lower level than the inflation rate in order to guide inflationary expectations. The final solution is to have a nominal fixed exchange rate that became the nominal anchor of all prices (1979-1982). However, again this generated problems for the tradable goods producing sector. In the mid 1980s, Chile went back to the passive crawling peg mechanism that prevailed until the beginning of the 1990s. The large inflow of foreign exchange induced a new change of the exchange rate policies.

In the period prior to 1999, the use of a free exchange rate regime was uncommon; the few times that it was implemented, it failed. Since the beginning of the 21st century, a (clean

float) free exchange rate regime has prevailed and this is another indicator of the Chilean economy's solidity. [4]

Now let us see what happens in Zambia's case. Analogous to the Chilean case, the result of the econometric regression (annual for the period 1981-2008) for Zambia is (test t in parenthesis):

$$Ln(e_t) = \underset{(1.34)}{2.1709} - \underset{(0.28)}{0.5829}\cdot b + \underset{(0.11)}{0.0213}\cdot Ln(P_t) + \underset{(0.37)}{0.1459}\cdot b\cdot Ln(P_t) + \underset{(2.48)}{0.4991}\cdot Ln(e_{t-1}) \quad \text{(Zambia)}$$

In this case, the key estimator, β, indicates that copper prices have a positive effect on the real exchange rate[5] but that it is not statistically significant; i.e., increases in copper prices do not cause real exchange rate to appreciate. Likewise, none of the variables related to the boom is statistically significant; therefore we cannot reject the null hypothesis that the price of copper does not affect the real exchange rate. Once again in this case one would have to affirm that there is no econometric evidence suggesting the presence of "Dutch disease" in Zambia.

Let us now review the exchange rate situation in Zambia. Zambia's economic policies in the 1970-1980s were biased toward state intervention in the allocation and provision of resources. With regard to the exchange rate, Zambia pursued a fixed exchange rate system from 1964 to 1985, after which a quasi-floating rate was experimented with during the two-year auction period to 1987. However, the auction period was accompanied by severe macroeconomic instability, including high rate inflation. This offset the rate of devaluation recorded at the auctions, resulting in real exchange rate appreciation. These ill-conceived policy choices created a profound anti-export bias in economic policy towards the non-mining sector thereby undercut the competitiveness of non-traditional exports. However,

[4] When a free float regime was implemented, the Central Bank reserved itself the right to intervene in the foreign exchange market. These interventions are reserved for exceptional periods during which, for different reasons, high volatility and uncertainty arise. The Central Bank intervened in the exchange market in only a few circumstances. An interesting aspect of these interventions is the level of support for the Central Bank: public opinion had a high level of credibility regarding the eventual effect of these interventions, which contrasts with the skeptical attitude they met with in academic circles.

[5] Zambian Kwacha per US dollar ($/US$). A higher (lower) real exchange rate levels implies depreciation (appreciation).

this bias was unwound following the dismantling of numerous forms of economic control in 1991. In the foreign exchange market, the liberalization of the exchange rates paved way for a market-based exchange rate system.[6] Broadly, the reforms induced sound macroeconomic management critical for sustaining economic growth and promoting export performance. With inflation subsiding from a historical record of more than 200 percent in 1993 to only 8.9 percent at end-2007, this induced optimism for private sector investment.

3. The performance of non-traditional exports

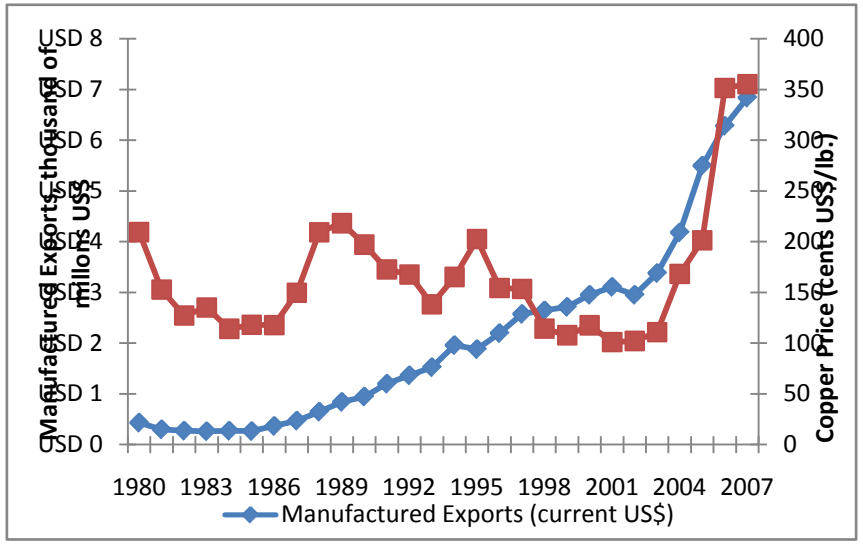
From the conceptual perspective, the negative consequences of the "Dutch disease" phenomenon have to do with reduced production in the non-copper tradable sector. We will empirically examine what specifically happened to manufacturing exports in Chile and Zambia to test this assertion. As noted in the previous section, an increase in the international price of copper did not generate an appreciation in the exchange rate, so we might also anticipate that it is not likely to cause the aforementioned negative consequence.

Figures II.10 and II.11 illustrate trends in manufacturing exports in Chile (1980-2007) and Zambia (1999-2008). One can see at a glance that there is no negative relationship between what happens to copper prices and growth in manufacturing exports in either country.

In other words, despite the booms and busts in the copper price, growth in manufactured exports has increased constantly in Chile since 1985. In the last few years, during the latest commodity price boom (after 2004), manufacturing exports have risen significantly, which would be the opposite of the prediction of the Dutch disease hypothesis. This situation is similar in both countries, Chile and Zambia.

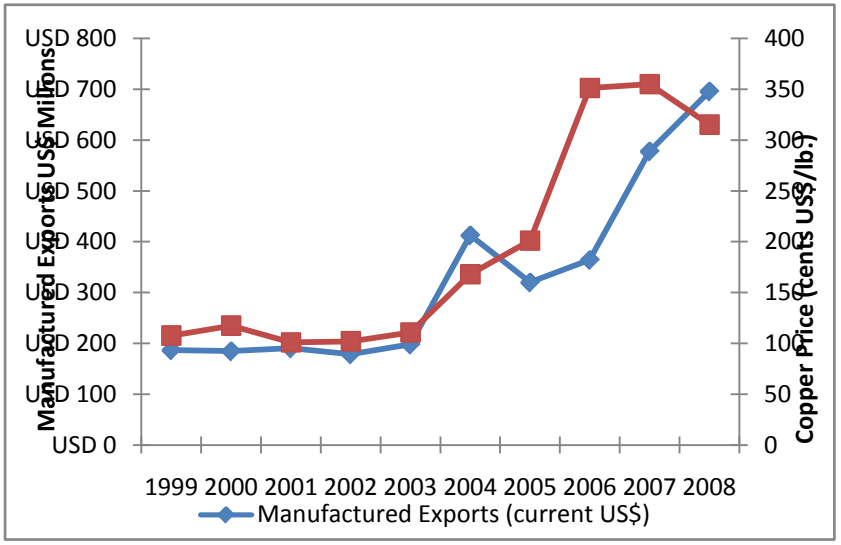
[6] For details on the exchange rate episodes and reforms, see Musonda, 2008.

Figure II. 10: Chile – Manufactured exports and Copper Price 1980-2007



Source: Central Bank of Chile and COCHILCO.

Figure II. 11: Zambia – Manufactured Exports and Copper Price 1999-2008



Source: World Trade Organization and COCHILCO.

We calculate the following econometric estimates for Chile and Zambia by once again applying a simplified model in which exports of manufactured goods depend on copper prices, the lagged dependent variable and the existence of a boom; *Xm* is equivalent to manufacturing exports; annual data 1981-2008 for Chile and 1999-2008 for Zambia; (test t in parenthesis):

$$\underset{}{Ln(Xm_t)} = \underset{(1.22)}{-1.3156} + \underset{(1.57)}{2.2637 \cdot b} + \underset{(1.64)}{0.2242 \cdot Ln(P_t)} - \underset{(1.57)}{0.4208 \cdot b \cdot Ln(P_t)} + \underset{(29.12)}{1.0143 \cdot Ln(Xm_{t-1})} \quad \text{(Chile)}$$

$$\underset{}{Ln(Xm_t)} = \underset{(1.06)}{13.9386} - \underset{(0.04)}{0.4151 \cdot b} + \underset{(0.06)}{0.1418 \cdot Ln(P_t)} + \underset{(0.08)}{0.1827 \cdot b \cdot Ln(P_t)} + \underset{(0.57)}{0.2336 \cdot Ln(Xm_{t-1})} \quad \text{(Zambia)}$$

These results suggest that copper prices would tend to have a positive effect on expanding manufacturing exports in both Chile as well as in Zambia. However, this result only becomes statistically significant at 10% in Chile's case and not at all in Zambia's. Also, the boom variables would not generally be statistically significant. A greater effect can only be seen in Chile, with a linear positive effect that has a negative interaction with copper prices. An Augmented Dickey-Fuller test for unit root does not reject the null hypothesis that manufactured exports in Chile or Zambia follows a unit root process. See Appendix for more details. In conclusion, the aforementioned empirical results do not support the hypothesis that copper prices have a negative effect on manufactured exports.

The positive albeit insignificance of Zambia's estimates refutes the pessimism expressed by Weeks (2008) and others about Dutch disease effects of the booming sector on non-traditional exports. Rather, what accounts for relatively low performance of manufactured exports, and indeed all non-traditional exports, is mainly the longstanding structural supply impediments rather than due to real exchange rate misalignment or critically, from an incoherent macroeconomic stance. Adam and Simpasa (2009) argue that among other factors, infrastructural deficiencies and inflexibility in labor markets continue to constraint the competitiveness of the non-traditional exports sector. The poor results may also be due to the short-sample period. Therefore, as more data becomes available, these findings may need to be updated and revalidated.

4. The Natural Resource "Curse" and economic growth

The "natural resource curse" is a hypothesis which states that countries with a large endowment of natural resources tend to have lower growth rates. In this section, we will examine empirically this hypothesis and see that Chile is a counterexample; moreover, the "curse hypothesis" is not statistically valid for Zambia.

Several studies suggest that on average, countries that have relatively high levels of NR (natural resources) have had lower economic growth than those with low levels of NR; in addition, countries with higher growth tend (in general) to have a low level of NR. Initially, several studies found that there was a negative relationship between economic growth rates and the ratio of NR exports to GDP for a set of 80 developing countries (for example, Sachs and Warner, 1995). All of these studies were carried out in the seventies, eighties and early nineties (Auty and Mikesell, 1998).[7]

It is counterintuitive that a country with several natural resources should tend to be poorer in the long term. The empirical support for the "natural resource course" was accentuated by observing the high growth rates of East Asian countries (Korea, Taiwan, Hong Kong and Singapore), which are poor in natural resources, and low growth in Latin America and Africa (Nigeria, Sierra Leone, Angola, Saudi Arabia and Venezuela), which are much richer countries in terms of natural resources.

Several studies have revised the estimations made by Sachs and Warner (1995) and have found various econometric problems that challenge the negative association between growth and NR level (see Manzano and Rigobón, 2001; Lederman and Maloney, 2001; World Bank, 2001).

New evidence shows that when resource abundance (stocks of natural resources as a measure of wealth) is used instead of resource dependence, the effect of natural resources on growth is reversed (Wright and Czelusta, 2004; Maloney, 2002; Stijns, 2003). The criticism also stems from methodological perspective. For instance, Maloney (2002) argues that there is little evidence to suggest that natural resources caused a growth slowdown. Instead, they have been an integral part in the success of many successfully industrialized countries. Nonetheless, Maloney's (2002) argument applies to industrialized countries, whose economic structures and institutions are deemed superior to those obtaining in less developed resource-rich countries.

[7] See also the graphical analysis in Larraín et al. (1999).

In the particular case of Chile and Zambia, the most serious problem with the natural resource curse hypothesis is the conclusion that have been suggested (see for Chile Larraín et al., 1999): If there exists the "curse of the NR" then the optimal solution to the problem for Chile and Zambia would be to leave the copper in the ground. However, would this really have a positive effect on economic growth path? Moreover, would a boom in technological innovation be spontaneously generated? In reality, the argument of why large copper production inhibits technological innovation and growth is not clear (Meller, 2002).

There are various explanations that have been used to justify the existence of the "curse" (Meller, 1996; Auty and Mikesell, 1998, World Bank, 2001; Meller, 2002): (i) The Prebisch hypothesis about the deterioration in the terms of trade of NR: According to Prebisch, it requires an increasingly greater amount of NR to buy the same quantity of industrial products. However, the empirical evidence for this hypothesis is scarce. It is sufficient to look at the price of computers, which has seen a real drop of over 10% annually for 30 consecutive years; i.e. one ton of copper today can buy many more computers than it could in 1980.[8] (ii) The NR sector tends to have large Ricardian rents.

The existence of these large Ricardian rents can induce "rentier" behavior by producers, reducing the level of investment in other activities that would be more profitable for growth; the existence of rents creates incentives for corrupt actions in the government, which could provide privileged access to certain firms (or individuals) for the exploitation of these NRs. Obviously, the existence of Ricardian rents is neither a necessary nor a sufficient condition for there to be corrupt governments and / or "rentier" producers; (iii) The high volatility in international NR prices generates macroeconomic imbalances that affect the pace of economic growth. Empirical evidence supports the fact that the terms of trade of NR exporting countries are more volatile than the rest.

However, the effect on the growth rate is not obvious, since (in general) the link between the productive NR export sector and the rest of the economy is weak; (iv) Dutch disease syndrome is another explanation. As mentioned above, a boom in NR exports generates a large influx in currency which induces an appreciation in the exchange rate, and this currency appreciation exposes the rest of the sectors producing tradable goods. The lower export

[8] By way of an example, in 1980 2 tons of copper were necessary to acquire a PC ("personal computer"); in 2000, one ton of copper allowed the acquisition of 2 PCs. By 2008, one ton of copper could be exchanged for 5 PCs.

competitiveness in industry and agriculture would have negative implications if these sectors generated more knowledge through "learning by doing" (Sachs and Warner 1995, Torvik 2001); (v) finally, it has been argued that the NR producing sector, given its relative productivity, draws human capital, entrepreneurial ability, etc. from other economic sectors, affecting their growth. Given the relatively low labor intensity in mining, this does not seem to be a relevant argument for copper.

However, the emergence of countries rich in natural resources that have also experienced significant long-term economic growth has generated a literature that questions the assumptions of the curse.[9] The key countries in this literature have been Norway and Botswana. Norway is a country with large oil resources that was the poorest in Europe in the early 20th century. Currently, thanks to oil, it is one of the richest in the world. Many have claimed that the proper management of petroleum resources has been a major reason for its success. In another region, Botswana has had the greatest economic success in Africa. As described by Acemoglu et al (2003), Botswana was one of the world's poorest countries. But, between 1965 and 2000 it had one of the highest growth rates in the world, growing at a rate of 7.7% per year over that period. Given that the low growth of African countries is usually explained by the natural resource curse, it is a contradiction that Botswana has done so well, since a fundamental part of its income is from diamond mining. As Acemoglu et al (2003) wonder, what has made natural resources a curse for almost every African country but a blessing for Botswana?

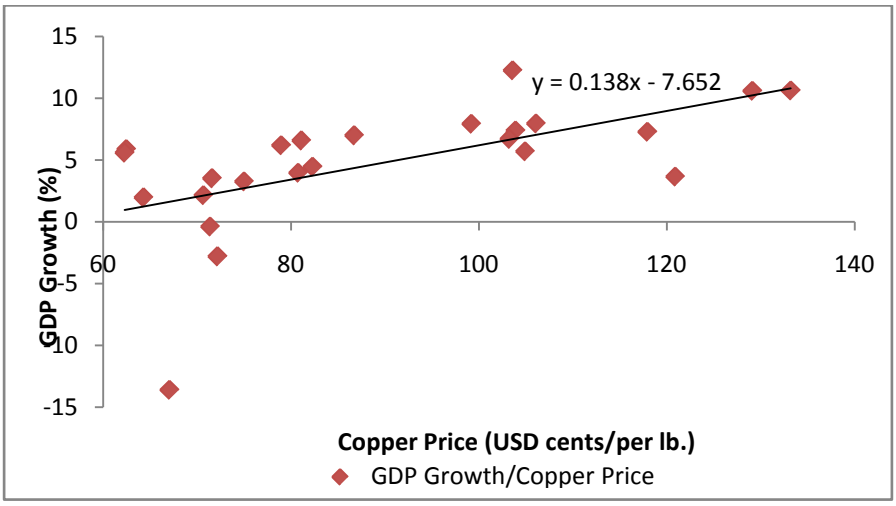
As a result, the question has changed from whether there is a natural resource curse, to why natural resources are a curse in some countries and a blessing in others. In general, the literature states that this dual behavior is determined by the quality of institutions, since they determine the final use of the resources. Acemoglu et al (2003) point out that the difference between Botswana and other African countries is that Botswana, due to a number of factors, has an adequate institutionalization of "private property"[10] which allows the positive use and saving of resources generated from diamonds. In a similar vein, Robinson et al (2006) provided a model for relating political institutions with the natural resource curse. According to these authors, countries with institutions that allow arbitrary management of the resources, in which there is no accountability or transparency, are more likely to suffer misuse of natural resources, and

[9] For a more extensive and deeper criticism of the "curse", see World Bank (2001) and Maloney (2002).
[10] Principally linked to the existence of impediments to opportunist behavior

therefore, a commodity boom generates lower economic efficiency. For example, Mehlum et al (2006)[11] initially estimated the impact of natural resources on GDP, finding that higher levels of natural resources produced lower growth. However, they then added other independent factors such as the quality of the institutions and the interaction with the abundance of resources. In this case, they found that abundance still had a negative effect on growth, but the term of interaction between the resources and institutions had a positive coefficient. This means that with lower institutional quality, natural resources are effectively a curse, but on the contrary, with high institutional quality, they increase growth and will, therefore, be a blessing.

We will now empirically examine the effect that the copper price can have on the growth of GDP. It is possible for the high price volatility of a commodity to provoke great economic volatility, generating marked economic cycles. The key issue is related to the relationship between the price of copper and economic growth at a country level. The price of copper in Chile has traditionally been linked to growth. In short, copper abundance and its price increase is considered a blessing. As a result, the predictions for the pattern of Chilean economic growth have used a very simple model: if the price of copper is relatively high (low), the forecast would be that the annual GDP growth would be relatively high (low). In order to examine this approach, Figure II.12 shows the relationship between copper prices and Chilean economic growth for the period (1980-2003) prior to the current commodity boom. As can be observed there is a positive correlation between copper price and growth.

Figure II. 12: GDP Growth and Copper Price in Chile 1980-2003



Source: COCHILCO and Central Bank of Chile.

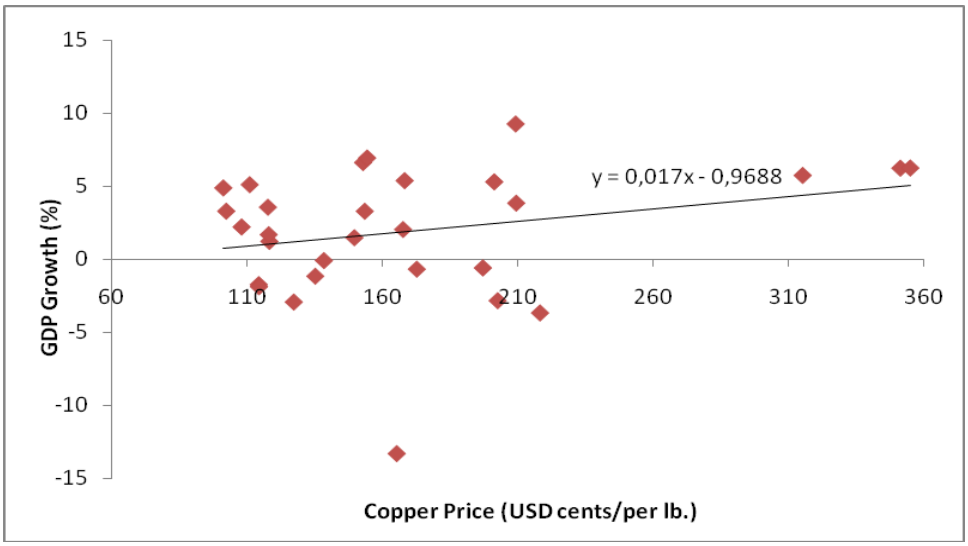
[11] The authors analyze the period 1965-1990 for 42 countries.

However, something different has occurred during the current boom. This is in part a result of macroeconomic institutions and rules for fiscal expenditure that aim to smooth the economic cycles. Considering that copper prices peaked at 4 times the value observed in 2003, high growth rates could have been expected for the Chilean economy. Nonetheless, this is not what happened. In summary, in the current boom period economic growth has not responded to the copper price, which could be an indicator of the extent to which the Chilean economy has become immunized (see De Gregorio, 2006). There are two different interpretations, a positive and a negative one. The positive one would point out that Chilean economy has been successful in isolating the economy from the copper cycle. On the other hand, why is it that Chile has been unable to take advantage of the present boom situation to expand investment and growth?[12] In order to make explicit which are the mechanisms through which copper has a positive interrelationship with the level of GDP, see Morandé & Quiroz (1997).

A positive relationship between copper prices and growth rates can also be detected in Zambia's case. Here it is valid for the entire period spanning 1980-2008 (Figure II.13). What happened during the recent boom is particularly interesting. After a prolonged period of economic stagnation, the Zambian economy has shown signs of recovery with real GDP growth averaging above 5 % from 2000 to 2008 and per capita income has grown at an average of 2.6 % over the same period. Part of this economic recovery is credited to the rebound in mining which stimulated economic activity in many other sectors of the economy.

[12] De Gregorio (2006) analyzes these issues.

Figure II. 13: GDP Growth and Copper Price in Zambia 1980-2008



Source: World Economic Outlook and COCHILCO.

Below we will engage in an econometric assessment of the direct relationship between economic growth rates and copper prices in Chile and Zambia. To this end we will make analogous use of the aforementioned cases in a simple model where the dependent variable is the natural logarithm of GDP. The variables on the right side are similar to those of previous regressions. The results are presented below (*GDP* corresponds to Gross Domestic Product in billions of dollars; annual data 1981-2008; test t in parenthesis)

$$Ln(GDP_t) = \underset{(2.68)}{-0.5929} + \underset{(1.9)}{0.7332 \cdot b} + \underset{(3.28)}{0.1265 \cdot Ln(P_t)} - \underset{(2.04)}{0.1473 \cdot b \cdot Ln(P_t)} + \underset{(62.66)}{1.0093 \cdot Ln(GDP_{t-1})} \quad \text{(Chile)}$$

$$Ln(GDP_t) = \underset{(1.29)}{0.3283} - \underset{(0.56)}{0.2530 \cdot b} - \underset{(0.7)}{0.0306 \cdot Ln(P_t)} + \underset{(0.76)}{0.0641 \cdot b \cdot Ln(P_t)} + \underset{(18.96)}{0.9313 \cdot Ln(GDP_{t-1})} \quad \text{(Zambia)}$$

An Augmented Dickey-Fuller test for unit root does not reject the null hypothesis that GDP in Chile or Zambia follows a unit root process. See Appendix for more details. The estimators obtained indicate that the relationship between copper prices and GDP is positive in Chile, which means that higher copper prices generate greater growth. This relationship is statistically significant, at 1%. In addition, it should be noted that the boom does play an important part here. In fact, in Chile the boom had positive linear effects, but they were counteracted by the lesser effects of copper prices on growth. In Zambia's case, none of the coefficients was statistically significant. This means that the null hypothesis that copper prices do

not affect Zambian economic growth cannot be refuted. Thus, in both countries econometric estimators would tend to refute the curse of natural resources.

5. Summary of Results

Copper is not the only mechanism for Chile and Zambia to obtain foreign currency. In Chile's case copper exports are equivalent to 50% of total foreign currency inflows (non-copper inflows). In fact, during the recent boom in prices investment inflows (capital and financial) were equivalent to the amount of copper exports. Copper plays a more important role in generating foreign currency in Zambia's case. During the recent boom the foreign currency generated (in Zambia) by copper was four times greater than investment inflows (capital and financial).

Empirical evidence refutes the existence of the "Dutch disease" phenomenon in Chile and Zambia. First, increase in copper prices caused the real exchange rate to depreciate in Chile (though it is only statistically significant at 10%), while in Zambia one can see that rising copper prices did not cause the real exchange rate to appreciate. Second, copper prices would have a positive effect on Chilean and Zambian manufacturing exports, though that effect is not statistically valid.

Lastly, the econometric estimators show a positive relationship between copper prices and economic growth in both Chile as well as in Zambia. Briefly put, there is no copper "curse" in neither country.

III. Role of Copper in Chilean & Zambian Development

Foreign investors play a crucial role in developing countries with abundant natural resources. Foreign companies are the ones exploring for, discovering and mining copper deposits. This was the case in the early 20th century in both Chile as well as Zambia.

Copper became very important to local economies over time and for diverse reasons. Local agents began to question the magnitude and speed with which investments were being made in the sector, as well as the way that copper revenues were being distributed. This gave rise to repeated situations of tension and conflict between foreign investors and local governments.

Both countries, Chile and Zambia expropriated and nationalized copper mining in the early 1970s. The timing is no coincidence: in the early 1960s state participation in world copper production (non-socialist states) was only 2.5%, but by 1970 state participation had increased to over 40% (Radetzki, 2009).

In this section we will see how nationalization of copper was followed by diametrically opposed trends in each country. While in Chile copper production had more than doubled 20 years later, in Zambia it was cut in half.

In the 1990s and the first decade of the 21st century foreign investment once again began playing an important role in both countries. However, there is an interesting difference between the two countries. While Zambia only has private copper mining, in Chile state companies coexist with private ones.

A. Copper and the Role of Foreign Investment during the XX Century

1. A short Chilean overview on the role of foreign investment- Phase 1

Since the end of the 19th Century, nitrate and copper have played an important role in the Chilean economy. The discovery of rich and large copper mines at the beginning of the 20th century was the main attraction for foreign investors seeking to gain a foothold in Chile's natural resource exploitation. The first investors to start exploration and exploitation of Chile's mineral reserves were from the United States and opened up some of the largest copper mines in the world. The first, El Teniente (the largest underground copper mine in the world) was opened in 1904, while Chuquicamata, which until recently was the world's largest open pit mine, opened in 1911.[13] At the time of their discovery, both El Teniente and Chuquicamata were projected to contain copper reserves lasting up to 100 years. Current estimates indicate that their mine life to be approximately 50 years.

Given Chile's level of underdevelopment at the time of mineral discovery, the mining industry suffered from lack of local entrepreneurship and qualified workers to set up Chilean firms to exploit large scale mining operations. Even today, local capacity to develop large scale mining is still a major obstacle. Therefore, the discovery of mineral reserves and the arrival of

[13] La Escondida, discovered by foreign investors in the 1980s, near Chuquicamata, has become the largest open copper pit.

US investors were the initial mechanisms to kick-start Chile's entry into the world economy. Chile now boasts large scale mining, dominated by the state-owned CODELCO and the country is the largest copper producer in the world.

In short, NRs (and their plentiful availability) were the first mechanism possible to link Chile to the world economy.

2. A short overview of the role of foreign investment in Zambia- Phase I

Since the discovery of copper deposits more than a century ago, the Zambian mining industry has undergone different investment and development regimes. The initial period from the late 1880s through to independence in 1964 reflects colonial interests, beginning with the aggressive acquisition of mineral rights by the British South African Company (BSAC) in 1889. Prior to the arrival of European settlers, there was evidence of small scale mining of copper by the indigenous people within the Copperbelt region (see Bostock and Harvey, 1972). However, it was the arrival of Cecil Rhodes and his BSAC which marked the beginning of modern day mining.

In 1922, the BSAC granted exclusive prospecting licenses to financially sound companies over a specific period of time. The two large companies to have actively participated in developing Zambia's mining industry were the Rhodesian Selection Trust (RST) owned by American Metal Climax Inc. (Amax) and South Africa's Anglo American Corporation (AAC). The investment by RST and AAC led to the commissioning of the Roan Antelope as the first mine in 1931. In 1933, two other mines opened at Nkana and Mufulira. More exploratory activities resulted in other new mines opening up within the Copperbelt region and in North Western Zambia. Throughout the 1950s, the Zambian mining sector experienced a remarkable increase in production, triggered mainly by high international copper prices and rising global demand due to rapid industrialization in the post-war period.

The second phase of copper mining began after Zambia's independence in 1964, which saw the drastic change in the ownership structure following the nationalization of the mining industry in 1970. The boom which started in the 1950s continued through the period leading to Zambia's independence and the years that followed. By 1969, Zambia had emerged as one of the leading producers and exporters of copper accounting for more than 12% of global output (Bostock and Harvey, 1972).

B. Nationalization

1. Chile: Conflicts with Large Copper Mining Property

During 1910-1970, Large Copper Mining belonged to US firms. After 1945 the external world environment was characterized by small international private capital; in other words, Chile faced restrictions of foreign financial inflows. Foreign exchange is required to finance the imports of capital goods and machinery. Then scarce foreign exchange becomes a bottleneck for development.

Successive Chilean governments pressured foreign companies to increase copper production, which obviously required significantly increasing investment. The technical argument was centered on Chilean participation in global copper production. Given the fact that Chile had important comparative advantages for copper production, it ought to increase its participation in global production. However, the opposite took place in the period spanning 1945-1965. Foreign companies feared future expropriation, which was a disincentive to investment. But this situation itself provided a powerful argument in favor of nationalization. The foreign investors' apprehension ended up becoming a self-fulfilled prophecy.

The political economy outcome of the above situation was summarized by President Allende: "copper is the crossbeam of Chilean development". Then, in order to increase economic growth, Chile needs all the foreign exchange generated by copper production. Then given the above situation, the solution was obvious: nationalization of Large Copper Mining. This happened in 1971 with the full support of Congress (including all political parties). But President Allende and his Unidad Popular Government went further: to increase economic growth the State had to control all main enterprises (foreign and national) and the main economic sectors (for a deeper analysis see Meller, 1996).

2. Copper Nationalization in Zambia

A similar type of argument was used in Zambia. Given the fact that the copper mines remained under foreign ownership even after independence in 1964, this meant that investment and production decisions were undertaken to serve the interests of the foreign companies. To reverse this situation, the government acquired a 51% stake in the mines in order to secure a high proportion of mineral revenues accruing to the state in the spirit of ensuring that the Zambian people fully exercised sovereignty over their mineral resources. Upon nationalizing the mines,

two state companies were formed from AAC and RST. The Nchanga Consolidated Copper Mines (NCCM) was born out of AAC while Roan Copper Mines (RCM) arose from the operations of RST. The government subsequently increased its equity stake in the mines to 60% in 1979 and in 1982 the two mining companies – NCCM and RCM – were merged to form a single state – owned mining conglomerate, Zambia Consolidated Copper Mines (ZCCM). The state further increased its equity to 60.3 % in ZCCM while the remaining 39.7 % was owned by the Zambia Copper Investments (ZCI) Limited, which was majority owned by AAC. The shares of ZCCM were listed on the London and New York stock exchanges, and ZCCM also operated an office in London.

The ZCCM was responsible for producing copper while another company – Metal Marketing Company of Zambia (MEMACO) limited also with offices in London – was established to market Zambia's copper. Other auxiliary companies were also established, headquartered in London, to represent many of ZCCM's interests, including procurement. For example, Techpro, a company responsible for procuring all of ZCCM's engineering equipment had its lavish offices in London with top class engineers and other specialists.

The distribution of mineral rents to other parts of the economy was limited by the economic, institutional and political strength created by the Copperbelt region and the need to sustain this economic powerbase. The Copperbelt province emerged as a prosperous region with a well educated, well-paid urbanized labor force which also enjoyed highly generous welfare support from the mining companies. It was a network of towns with a cluster of heavy industry supporting the needs of the mines and represented the economic heartland of the country.

Zambia's relatively healthy macroeconomic environment in immediate post-independence era has been credited to the high mineral rents, which lifted real GDP growth and supported government fiscal revenues. Between 1964 and 1974, Zambia enjoyed respectable average GDP growth of 6.1 % per annum. With population growth averaging only 2.5%, high economic growth translated into positive real GDP per capita growth, even surpassing that of South Korea.

Due to growing urban demands, and with copper the only major source of foreign exchange, the state used the bulk of ZCCM's generated foreign exchange to support other activities, with little remaining for ZCCM's own use. Auty (2008) argues that on formation of ZCCM, the state resorted to regulatory rent by compelling ZCCM to support party related functions and other activities such that the distinction between the state and the party became

blurred. This resulted in ZCCM's recorded huge losses. The imposition of new mineral taxes further curtailed ZCCM's ability to accumulate any cash surpluses (ZCCM Annual Report, 1990). As ZCCM could not secure any of its rapidly vanishing revenues, it incurred a huge tax liability. By 1987, total loss in mineral tax payable amounted to US$321.3 million.

Table III. 1: ZCCM – Consolidated Financial Position (US$ million)

	Sales	Cost of sales	Net Profit/Loss
1990	915.58	711.76	82.06
1991	881.11	663.66	80.53
1992	560.12	532.95	23.83
1993	666.95	554.67	91.72
1994	583.51	851.62	(108.66)
1995	692.20	1,165.61	3.98
1996	1,322.21	1,223.83	(24.91)
1997	1,149.46	1,188.15	(151.80)
1998	699.12	825.61	(251.39)

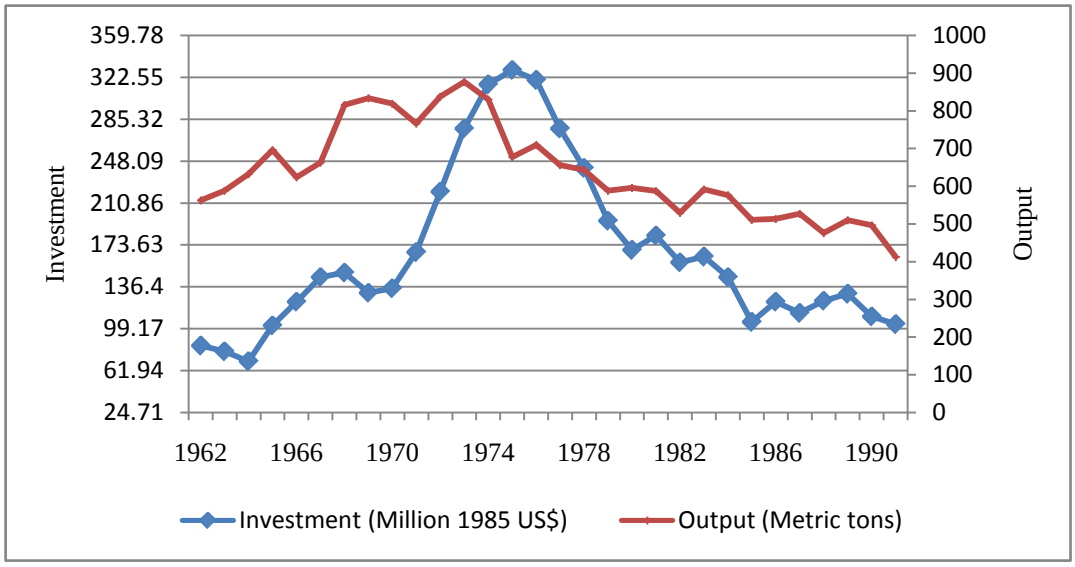
Source: ZCCM Financial Statements (Various)

The dominant role of the political class in the Zambian economy was mostly evident in its influence on ZCCM. The state extracted rent from mining through political and governmental institutions. For instance, by appointing the chairman and chief executive of ZCCM as a member of the ruling party's supreme law making body – the Central Committee – the government ensured that its interests in ZCCM were secure and could use this leverage to appropriate the resource rent. Therefore, most decisions were influenced by political motives, completely overshadowing any technical advice provided by the experts. Furthermore, at the initiative of the state, ZCCM was also compelled to go beyond its core-mining mandate by investing in socially and economically unviable activities, including using its resources to maintain the President's state run luxury holiday resorts. In the late 1980s, the government ordered ZCCM to build a commuter railway line in Lusaka but the viability of this project proved unsustainable.

Thus, through the appointment of the ZCCM's chief executive and members of its board, the government was able to direct and influence the formulation of important company policies. The engagement of ZCCM in non-core activities led to an expanded workforce, which stoked a rise in labor related fixed costs against a background of dilapidated infrastructure and shrinking revenues. Although mining production costs increased globally in general, ZCCM's expansion into non-core mining activities coupled with the state's capture of the mineral rent severely constrained the company's ability to retain any surplus for reinvestment in exploration to replenish dwindling ore quality and improvement of equipment to increase productivity at

existing mines. The operating environment was becoming increasingly dire for the mines with a number of production units facing closure due to poor equipment performance. By the beginning of the 1990 decade, the financial condition of ZCCM had deteriorated. Figure III.1 below shows the declining trend in capital investment in the mining sector. In 1993, total investment was one third of its peak in 1975, depicting the severity of contraction in mine capitalization and the deleterious effect this had on production.

Figure III. 1: Mining investment and Copper production (1963-1993)



After nationalization of the mines, the government increased its capital spending in mining while at the same time production throughout was enhanced to take advantage of high metal prices. However, both investment and output decelerated at a rapid pace from 1976 onwards. The decline in mining investment drastically undermined exploration activities for development of new mines and processing of finished copper suffered due to capacity constraints. For a country so heavily dependent on copper[14], the consequences were disastrous.

In short, in the late 1960s and early 1970s, copper generated far greater wealth to the country than other sectors of the economy. However, throughout the 1980s and early 1990s, the copper industry suffered a severe contraction in output and its contribution to national welfare declined substantially. The decline in mining activity largely arose from lack of capital investment and mismanagement. Thus, between 1980 and 1990, copper contributed an average

[14] The mineral dependence index was estimated at 46 in 1976, well above those for other copper producing countries such as 33 for Chile and Peru's 21, (Auty, 1991).

of only 5.1% to total fiscal revenues compared with 40% in the period following independence. By 1994, the share of copper revenues to total revenues had shrunk precipitously to less than 2%, underlining the severity of difficulties the mining sector was experiencing. The reduction in mineral rent accruing to government mirrored the fall in export earnings. As copper exports fell drastically, so was the revenue accruing to the state in terms of taxes and direct payments in form of dividends.

The decline in mining sector fortunes cannot be attributed exclusively to the process of nationalization. From the late 1960s the Zambian government adopted populist socialist economic development policies weaved around the import industrialization strategy (ISI) strategy and applied state intervention in many areas of the economy to redress the imbalances of the colonial past. Therefore, state ownership of the mining assets was used as a tool to increase the government's capture of mineral rent for development of other sectors of the economy. However, increased deployment of distortionary statist policies gravely damaged the economy and marked the beginning of the country's three decades' long economic stagnation. Hence, when copper prices started a long and sustained decline from 1975, the Zambian economy was already suffering from structural imbalances. Accordingly, due to poor public policy response to the terms of trade shock of 1975, the economy experienced a prolonged recession.

Therefore, the collapse of the Zambian economy and the mining sector in particular was a combination of egregious policies reflected in poorly designed structural, fiscal and other macroeconomic policies in the 1970s and 1980s, and government's direct involvement in the core activities of the economy, including mining. These policy distortions were so severe and only magnified the effects of the prolonged decline in global copper prices thereby preventing the state from securing a sensible allocation of resources from the mining sector.

C. Privatization and Foreign Investment Phase II

1. The Zambian Experience

The government's announcement to privatize ZCCM in 1995 came at the very bottom of the Zambian mining industry – highly depressed global metal prices, rising production costs and mounting losses and aging equipment which hampered efficient response to changing structural

conditions. Therefore, the announced sale of ZCCM was not met with great fervor. The reluctance to the sale of ZCCM was largely driven by the totemic position of the mining industry in the Zambian economy and the close attachment many Zambians felt with the mining industry. Thus, it was feared that ceding Zambia's most prized natural assets to foreigners would rob the citizens of their sovereignty and national identity. Nonetheless, given the depressed domestic and external environment and continued dilapidation of ZCCM assets, the government proceeded with the program, ending years of contemplation. A new era in Zambia's copper mining industry had dawned.

In 1997 the government started the process of privatizing the mining industry. This process was concluded in 2000 with the mines reverting to foreign private ownership, thereby ending the period of state dominance in the Zambian mining sector and the economy in general.

Then, the third and last story of Zambia's sector begins from 2001 after the completion of the privatization program. This period saw an unprecedented recovery in the price of copper, beginning in 2003 and ending in mid-2008 following the close up of the world economy. However, the boom did not translate into any fiscal benefit largely because of the poor design of the Developments Agreements (DAs).

Cognizant of the magnitude of deterioration in mining infrastructure, the government was more concerned by attracting investors with technical and financial capability to invest in the mines. Therefore, the privatization of ZCCM was driven by two major objectives. The first was to stem the operating losses that were borne by the public budget and crowding out already low public expenditure. Secondly, the government sought to reverse more than 30 years of underinvestment by attracting private sector financing in order to recapitalize the mines and infuse efficiency of operations whilst providing incentives for exploration and development of new mines. These factors dictated the pace and strategy of privatizing ZCCM.

The privatization of ZCCM was initially placed under the ambit of ZPA and ZCCM itself with specific mandate to conclude the sale process by end of June 1997. However, within a short period, ZPA's involvement in the privatization process was curtailed when the president decided to appoint a special committee – the ZCCM Negotiating Team – to oversee the negotiations under the chairmanship of Mr. Francis Kaunda, former Chairman and Chief Executive Officer (CEO) of ZCCM.

The privatization of ZCCM became a very complicated and protracted exercise, taking more than three years to complete. To attract investors, the company was unbundled into separate packages denoted A through J with the less attractive units packaged with relatively more lucrative assets in order to improve the overall asset value (Kaunda, 2002). Ultimately, the components were sold one-by-one through an opaque process using bilateral negotiations with pre-selected preferred bidders (see Appendix I for sale details and payments).

Whilst the sale of smaller units proceeded without difficulty, the crunch of the privatization program rested with the final disposal of a block of core assets comprising Konkola (together with Konkola Deep Mining Project, KDMP), Nchanga (packaged with Nampundwe), Nkana and Mufulira Divisions, which accounted for more than two thirds of ZCCM output. Despite initial interest from many investors, only one bid was received from the Kafue Consortium.[15] Suspecting collusion, the negotiating team rejected the bid as too low, as it did with a revised offer in June 1997. The Consortium withdrew its revised offer citing unfavorable market conditions and low international copper price and in its place submitted an even lower one with request for greater tax concessions, but this too was rejected in June 1998. Consequently, the Consortium disbanded, effectively ending the negotiations.

In August 1998, Anglo American Corporation (AAC) was invited to bid for the core assets, resulting in another protracted negotiation process. The AAC finally acquired a controlling stake in the Nchanga, Konkola and Konkola Deep mining divisions in March 2000. The company created was renamed Konkola Copper Mines, KCM. The mine assets of Mufulira and Nkana divisions were acquired by a Swiss-Canadian consortium of First Quantum and Glencore AG and formed Mopani Copper Mines (MCM).[16] The final settlement of the assets negotiated by Anglo American and First Quantum/Glencore embodied generous tax and other concessions in excess of what the Kafue Consortium had initially requested two years earlier.

[15] This was a group of investors comprising Avmin, Noranda Mining and Exploration Incorporated, Phelps Dodge and the Commonwealth Development Corporation (CDC) of the United Kingdom

[16] The Anglo American ownership of KCM was indirect and was one element in a complex ownership structure. KCM was owned 65% by ZCI (in which Anglo American held a 51% share), 7.5% by the International Finance Corporation of the World Bank, 7.5% by the Commonwealth Development Corporation and 20% by ZCCM-IH, the residual investment holding company 87% owned by the Government of Zambia. Anglo American held the management contract for KCM.

In each of the disposed assets, government retained an indirect minority equity share in the mining sector through its majority ownership of ZCCM Investment Holdings (ZCCM-IH), an investment company charged with the management of legacies arising from former ZCCM operations including debt consolidation, pension fund obligations and the environmental legacies.

a) The exit of Anglo and its implications on the Zambian mining landscape

Less than two years after acquiring a majority stake in KCM, Anglo decided to pull out of the Zambian mining industry in January 2002. Anglo's main interest in KCM was the viability of the KDMP and the prospects it presented to the future of the Zambian mining industry. However, after failing to secure long-term funding to develop the KDMP and AAC's own projections that copper prices would remain depressed in the medium to long-term, Anglo opted to relinquish its planned investment in the KDMP despite the project's life expectancy of 22 years and high-grade ore deposits of 4% of copper.

After the departure of Anglo, the World Bank, which had been championing the privatization of ZCCM pledged to assist the country during a 'very difficult time'. On its part, Anglo offered the Zambian government US$30.0 million cash in compensation and a loan of US$26.5 million to keep KCM operational while new equity partners were being sought. To forestall mining closure and protect jobs, the government assumed control of KCM, increasing its equity ownership, through ZCCM-IH back to 42%.[17] In 2004 Vedanta Resources plc, an Indian mining company listed in London, acquired a controlling stake in KCM, taking up 51 % of the mining assets and ZCCM-IH reverted to its initial holding of 20.6% while Zambian Copper Investment (ZCI) retained 28.4%. Vendata also held a call option over the full amount of the ZCI equity valued at US$213.15 million, which was dully exercised in April 2008, raising the company's holding in KCM to 79.4%. The remaining 20.6% is held by ZCCM-IH, reflecting government's largest stake in the privatized mines.

b) The design of Development Agreements (DAs)

The enormity of losses and the dilapidation of ZCCM infrastructure put the Zambian government at a great disadvantage. Since many of the potential purchasers had ample information on the financial condition of ZCCM assets based on their own due diligence, it was

[17] A number of options were proposed to save KCM (see IMF, 2002 for details).

in the interest of the government to sell the assets for a positive cash price. Therefore, the government caved in and made numerous concessions, providing several tax incentives to "sweeten" the sale of the mines.

Individual development agreements were drafted for each of the units sold. However, these DAs were shrouded in a veil of secrecy. Although the sale of each component of ZCCM was conducted on a bilateral basis and embodied specific conditions, each of the development contracts contained broadly similar tax considerations. The all-encompassing tax regime took the following form:

- Corporate tax was set at 25% compared with 35% paid by other sectors of the economy.
- The royalty rate was capped at 3% on gross copper proceeds (this compares with the global average of 2-5% for other countries and the IMF estimate of 5-10% for developing countries. In practice, all new mining companies paid the royalty rate of only 0.6%, after Anglo had negotiated for a reduced rate.
- Exemption of import duties for all mining companies to accommodate capital and other imports
- Interest on loans and repatriation of proceeds (dividends) were tax-deductible.
- New mine owners were allowed 100% deduction of capital expenditure in the year in which it was incurred
- Loss carry-forward provisions extended for up to 15-20 years

The most controversial clause in the DAs was the length of the 'stability period' of between 15 and 20 years during which time the agreed terms and conditions were not to be varied.

c) Mining recapitalization

The acquisition of ZCCM assets by private foreign investors achieved two major objectives, firstly curbing escalation in losses that became a drain on the fiscal budget and secondly, recapitalizing the mines after a prolonged period of underinvestment. Stemming losses and mining recapitalization were both critical to reviving production and putting the Zambian mining industry on a path to profitability and long-term sustainability. The government also sought to encourage exploration in order to open up new mines so as to replenish the depletion of existing ores.

Although there have been operational difficulties encountered by some of the privatized mines, notably the closures experienced at the Roan Antelope Mining Company (RAMCOZ), renamed Luanshya mine, there have been new capital investment flows in most of the privatized mines. The government estimates that 80% of total capital inflows in the Zambian economy went to the mining sector (GRZ, 2009a). By far, the increase in the level of investment reflects the long-term view held by the mining companies about the potential of Zambian mines. For this reason, the bulk of the investment went to rehabilitate the existing mines and smelting operations. Substantial amounts of investments have also been committed in the new mines, notably for the development of KCM's KDMP and Lumwana mine near Solwezi by Equinox Minerals Limited, a consortium between Australian and Canadian mining operators. Lumwana mine is touted to be Africa's largest copper mine and the world's largest new open pit copper mine. A low cost copper producer, Lumwana mine made an estimated pre-production capital investment of US$762 million.

d) Post privatization copper production

Increased investment and recapitalization of the mines and opening up of new ones has led to high copper output. In 1998, total copper output stood at 315 metric tons. By 2004 copper output was above 400 metric tons and at the end of 2008, it had reached well over 600 metric tons. The bulk of the increase came from output at KCM and MCM, the sector's two largest producers and the commencement of production at the new Lumwana mine. The increase in copper production saw Zambia's market share rise from less than 2% of the world market in 2000 to 3.5% in 2008. When at full capacity, output at Lumwana is projected to average 172 metric tons over its 37-year life cycle, accounting for 25% of total Zambian copper production.

In large measure, the rise in copper production has been incentivized by increased capacity and high rate of recovery of refined copper from tailings owing to better technology and containment of production costs.

Although the privatization of the mines infused some level of optimism, the poor design of resource contracts completely weakened the state's capacity to capture a substantial share of rent from copper. Even when copper prices rose significantly during the boom period, the government forego a substantial amount of mineral revenue through the generous fiscal incentives accorded to the mining companies. It was not until the mineral fiscal reforms of 2008

that the government improved its mineral revenue take, albeit of significantly low level relative to total revenues accruing to the mines.

2. The Chilean Experience

a) Chilean Foreign Investment Code[18]

The history of Chile's investment code dates back to the 1970s, when foreign investment policy was radically modified (after the 1973 military coup) by substituting the restrictive regime for one based on non-discrimination and limitations on the discretionary powers of the administrative authorities. The new scheme gave foreign investors capital inflows, greater guarantees and incentives through Decree Law (DL) 600 or the Statute of Foreign Investment (*Estatuto de la Inversión Extranjera*), the original text of which was drawn up in August 1974. The original DL 600 text was ratified by National Congress in March 1993 with minor modifications. The permanence of this regulatory body over time shows how important it has been for Chile to have a stable foreign investment policy over the long term.

Therefore, the strong presence of foreign investment in Chile's copper mining industry owes much to the generous investment climate and in particular to the provisions enshrined in the new constitutional framework for mining that was implemented in 1982 (Vivanco, 1986; Bande and Ffrench-Davis, 1989). This framework introduced the concept of full concessions and granting of property rights in mining. Concession is guaranteed by the Chilean state and in the case of eventual expropriation, foreign firms have the right to compensation to the extent of the net present value of the proven reserves. Non-discrimination between foreign and national investment, the remittance of capital after three years (possibility eliminated in 1998) and the option of a fixed tax rate of 42% of the profits for twenty years are fully protected by Law in that they guarantee judicial certainty and stability. In addition, the law provides for accelerated depreciation and transfer of loss to the future and the possibility of establishing offshore accounts for maintaining the deposits of foreign exchange abroad as well as a minimum requirement for financial assets of 25% of total investment.

[18] This section has been extracted from the official information provided by the Committee for Foreign Investment website (www.cinver.cl), valid in November 2009.

b) Foreign Investment Contract

In order to facilitate foreign investment in Chile, prospecting foreign investors sign a foreign investment contract with the State. The contract establishes rights and obligations and may not be modified or rescinded unilaterally by either party. The Foreign Investment Committee may prescribe a minimum amount for applications for foreign investment contracts, which in August 2008 was US$5.0 million if the investment is in foreign currency and US$2.5 million for other forms of investment. The investor also has full guaranteed access to the formal exchange market, both in order to liquidate the foreign exchange constituting capital contribution and to acquire foreign exchange to remit by way of capital or profits.

The investor has the right to remit capital a year free of charge but up to the amount of materialized investment. The objective of this is to stimulate investment in the productive sectors and services. This remittance is free from any contribution, tax or charge, up to the total amount of the materialized investment. By fulfilling the existing legal norms, investors may develop all types of economic activity.

Article 9 of DL 600 establishes the principle of non-discrimination, guaranteeing the foreign investor subject to this body of law that in the exercise of their commercial activity, the same laws and rules will be applied to them as to a local investor in the same productive activity.

c) General Tax Regime

Regarding taxes, it is considered that any person domiciled in Chile will pay taxes on their income from any source. Non-residents are subject to tax on their income from Chilean sources. Therefore, all Chilean companies have to pay a corporate tax of 17% without exception. However, foreign investors are also subject to an additional tax on profit remittances. In addition to the profit remittance tax, foreign investors pay 35% from which the 17% corporate income tax is deducted. An investor may not pay taxes exceeding 35%. The investor can also opt for a tax invariability regime, in which case the additional tax rate to profit remittance is 42%, a rate that remains fixed for 10 years. This invariance may be waived at any time, once only, leaving the investor subject to the common regime applicable at the time of remittance, which is 35%.

d) Tax Regime in Mining

With regard to mining, there is a specific tax contained in Law N° 20.026 of the Ministry of Finance which establishes a specific tax on mining activities. The act amends DL 600,

incorporating a new article. This establishes the tax invariability regime for foreign investors that sign new contracts in mining projects that have a value of no less than US$50 million. To qualify for this special scheme, investors with existing foreign investment contracts should not be covered by invariance schemes established in DL 600, or should give them up when they apply for this special scheme.

e) Coexistence of the State and Private Producing Copper Firms

The coexistence of state and private firms has been a subject of ideological debate. In the light of evidence and with the experience of several decades of coexistence in Chile, it is possible to analyze some views that have characterized this ideological debate (Meller, 2002).

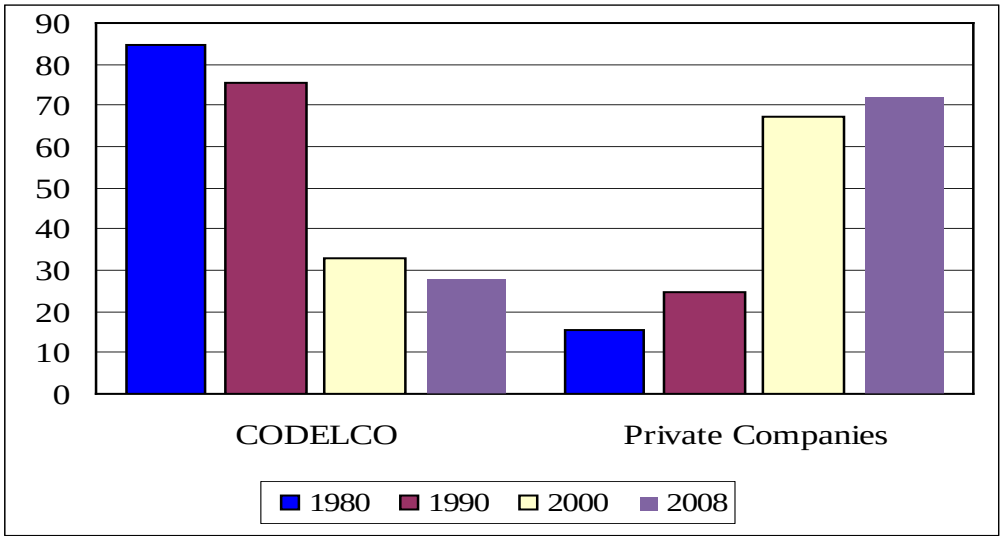
The main policy question is whether or not state participation in a company is a disincentive for private investment in the sector. This question comes from the perspective that there may be unfair competition from state companies. For a country producing a commodity whose market is global, such disincentives for private investment may seem irrelevant because neither firm enjoys market power. Therefore, for Chile's CODELCO, which is a well-known and important company, there is the possibility of an eventual public audit, which creates opportunities for transparency and public scrutiny to check the excesses of the company. This has considerable effects on the operations and procurement decisions of companies and/or the exploration of new deposits since CODELCO's participation in tenders has a limiting effect on risk-taking for offer- and decision-making. In the context of an oligopoly market, with asymmetric information, private companies can more easily absorb the "winner's curse" that tends to be present in such bidding.

The thesis that the presence of a state company in the mining sector discourages investment does not hold up in light of historical evidence. In previous sections it was argued that even when Chile nationalized and "Chileanized" copper, foreign investment continued to flow in the mines because the state established a code for coexistence. For example, during the 1980s, the level of foreign investment in mining was around US$200 million per annum. This increased to US$ 1.3 billion annually in the 1990s, equivalent to 4-5% of total FDI[19] in the country and between 5-6% of the country's GDP. This figure reached US$ 24 billion in 2008

[19] Foreign Direct Investment.

(39% of the total FDI in the country and 14% of GDP). While the state accounted for 90% of Chilean copper production in 1960 private sector copper production has today become the most important source of Chilean copper production, representing nearly three quarters of the sector's total output in 2008 (see Figure III.2 below).

Figure III. 2: Chilean Production Share - CODELCO and Private Companies (%)



Source: COCHILCO

A second argument against the presence of the state in productive activities is that these can be carried out more efficiently by the private sector. The classic response to this question is that the presence of a state copper company implies that the state, and hence all of its citizens, receive existing Ricardian rents from the exploitation of deposits. However, the coexistence of private and public companies is a fact of life in current Chilean public opinion and does not generate conflict or debate.

Moreover, the coexistence of state and private copper companies can have certain advantages. The state company has a benchmark with regard to production efficiency to maintain minimum levels of competitiveness. In general, CODELCO belongs to the first quartile of lower costs in the world. From the perspective of minimizing costs, CODELCO is efficient and this efficiency has been assured by tight monitoring and audit mechanisms to ensure CODELCO conforms with international best industry practices.

Another advantage of coexistence between state and private copper companies is the possibility of comparison of tax revenues collected by the government for each type of company. This led to an open debate in 2001 about royalties for private mining firms.

Let us recall that in 1971 the largest copper mines (owned by US firms) were nationalized; during the seventies more than 85% of Chilean copper was produced by CODELCO (the state enterprise). However, state share of copper generated rents diminished from 1990 on. This is due to the large amounts of foreign private investment in the copper industry which has led to a reduction in CODELCO's share to 30% in recent years from 75% in 1990 and today it is less than 30%.

IV. Long Term Rules

The recent boom in commodity prices made Sovereign Funds (SF) fashionable. Does an ideal model of SF exist? Could any country implement such an ideal SF? We believe that the answer to both questions is no. Implementing a SF that plays a satisfactory role requires "state capacity." This means that the country has adequately resolved certain preconditions and has managed to create (and abide by) certain long-term rules.

First, macroeconomic stability. The existence of macro-imbalances concentrates all attention and energy on resolving these disequilibria. A central objective to attaining macroeconomic stability is bringing inflation under control. For this to happen, government spending has to be related to revenues (in general terms, "not spending more than you have"). A special component is the evolution of public spending and, in our case, preventing fluctuations in copper prices from having an effect.

Second, copper mining investments take a long time to reach maturity and require long-term rules so they can be stimulated. The tax on copper profits is a central element to this and stable rules of the game are vital. However, when an unexpected event like the recent boom in copper prices occurs and generates very high Ricardian rents, it inevitably arouses doubts regarding the distribution and appropriation of those rents, which in turn increases pressure to establish a royalty for the copper sector.

A third issue has to do with the local government's rules for the use of windfall profits from the boom. This will determine which social groups will benefit, how copper revenues will be distributed internally. This is the role that SFs play.

A. Macroeconomic Stability

This subject reveals the vast differences between the two countries. While Zambia is still having difficulties resolving macro-imbalances, Chile did so a couple of decades ago.

1. The Zambian Experience

a) Government's macroeconomic policy response to the crisis

The policy response to Zambia's windfall resource revenues of the 2003-2008 was markedly different to that of the early 1970s. During the 1970s, the government captured the resource revenue and expanded government consumption using copper generated rent. This reflected the difficulties many developing countries face with the fiscal management of resource booms. In contrast, although the mining companies received the full scale of the 2003-2008 resource windfall revenues, the effect of the boom fell squarely on the monetary authorities, highlighting the challenges of conducting monetary policy under conditions of surging foreign exchange inflows. During the period of the boom, Zambia also received substantial debt relief and was attracting significant amounts of private capital inflows into the domestic debt market (Muhanga and Soteli, 2009). These inflows and debt relief reinforced the effect of the boom on the demand for money and were responsible for the observed appreciation in the nominal exchange rate.

The effect of the fall in the price of copper could have been averted had the government responded by undertaking necessary adjustment measures. Although structural imbalances were already evident even before the terms of trade shock, these problems were veiled by seemingly bountiful mineral resources and positive economic growth rates in the prosperous years. As a result, the government mistook the sharp fall in the copper price of the mid-1970s as a temporary shock or a cycle with the expectation that it will revert to pre-crisis high levels within a short period (Auty, 1991; McPherson, 1995; Gulhati, 1989). Instead, the price decline took a long trend lasting many years and the initial fall in terms of trade became more complicated and long

lasting, eventually leading to a deep balance of payments crisis and macroeconomic disequilibrium.

Early attempts at economic adjustments were made in 1978 and 1983 under the IMF auspices but neither program was successful due to loss of reform momentum (Bigsten & Kayizzi-Mugerwa, 2000). Due to continued deterioration in economic conditions, the government annulled the IMF funded program on 1st May 1987 and in its place adopted a new economic reform program (ERP), dubbed *'Growth from Own Resources'*. Under the ERP, price controls and food subsidies were reinstated and the government reverted to a fixed exchange rate system. External debt service payments were also restricted to only 10% of export earnings. During the life of the ERP copper prices recovered temporarily resulting in positive terms of trade. However, due to its short-spell, the recovery in metal prices was insufficient to reconcile the program's fundamental macroeconomic incompatibility and failed to halt the slide in economic conditions as open and disguised unemployment grew rapidly. With rents from the mining sector exhausted, any remaining political support for the ERP and its principle sponsor, President Kaunda, dissolved.

The year 1990 was a turning point in Zambia's economic and political history because social agitation brought about by severe economic hardships prompted the government to repeal the constitution, paving way for multi party elections in 1991. Frederick Chiluba of the Movement for Multiparty Democracy (MMD) party overwhelmingly won the elections and a new government was formed, ending decades of Kaunda's political and economic domination. In summary, therefore, delays in economic adjustment proved very costly in the long-term and given the state's failure to save when copper prices were temporarily high and realign its spending during the downside, Zambia had lost more than two decades of promising economic prosperity. The average annual economic growth rate in 1978-1990 was 0.9%. This means that per capita income fell 34.5% over that period. In addition, foreign debt was 200% GDP in 1990.

b) Economic reforms and outcomes in post-1990 period

The change of government in 1991 breathed fresh air into the economic and political system in Zambia. On assuming office in 1991, the MMD government ended Zambia's record of populist policies, transforming the economy from one with *dirigiste* policies in the 1980s to one of the most liberalized economic systems.

The reforms undertaken by the MMD government received broad-based support from social partners and this helped in implementing some of the most difficult policies, including the privatization of the mines. Most importantly, the government recorded some important gains and managed to stabilize the macroeconomic environment. However, the steely commitment exhibited in the first decade of the reforms was beginning to falter as early as 1996 when allegations of corruption within the ruling elite emerged. Weaknesses in governance created discontent among the donors resulting in suspension of aid. Given that aid inflows financed a large proportion of the domestic budget, the withdrawal of donor support adversely affected fiscal performance. With domestic revenues already depressed, the government relied on seignorage to finance the fiscal deficit. Between 1990 and 1994, domestic revenue as share of GDP was 19.6% per annum, but by end of the decade this figure had fallen to an annual average of 18.8%.

External debt service payments also created another macroeconomic difficulty for the government as high interest payments exerted more pressure on domestic borrowing to liquidate the debt (IMF, 2006). Debt service repayments exceeded 50% of total revenue, reflecting the country's huge external resource outflow.

The macro-results for the 1990s were poor. The economy's average annual growth rate was 1.2% (1991-2000); there were two years (1992 and 1993) in which inflation was around 200% and by the end of the decade (year 2000) it was 30%. The poverty rate (head count) was over 60%.

The copper price boom and the external debt preferential treatment were highly important to change the dire economic situation; i.e., conditions improved dramatically from 2003 onwards. In April 2005 Zambia qualified for the HIPC debt relief which saw a significant reduction in the country's external debt stock. Although the debt relief eased the government fiscal pressures, failure to partake in the copper price boom blighted the country's ability to increase its social spending and reverse the deterioration in social and economic conditions. However, the general improvement in macroeconomic situation brought about by the HIPC debt relief increased investor confidence. This led to a surge in foreign exchange inflows, both as a result of the boom and private capital inflows into the domestic debt market (Muhanga and Soteli, 2009). As we said before, these inflows and debt relief produced an appreciation of the nominal exchange rate.

The beneficial impact of the appreciation in the exchange rate was immediately felt on the inflation front. Given the pre-occupation to contain the rate of inflation to a single digit, the central bank initially refrained from intervening in the foreign exchange market to sterilize the inflows and accommodate the demand for domestic money, which had resulted from the portfolio shift by the private sector. Instead, the Bank of Zambia opted to stick to the tight monetary conditions and aided by lower world oil prices, this resulted in a strong deceleration in the rate of inflation from 24.3% at the start of the boom in 2003 to 9.4% in April 2006.

2. Chilean Macro Policies Framework

A summary of the set of macroeconomic policies will be presented in this section.

a) Monetary Policy:

Monetary policy has been a very important mechanism for the good macroeconomic results seen in Chile and the handling of possible inflationary bursts due to commodity booms. Monetary policy is based on three principles:

i. Autonomy of the Central Bank: the institutional reform of the Central Bank was established in 1989.[20] The inflation rate has dropped significantly since 1989 and, moreover, there has been a recognized reduction in its volatility. Numerous Chilean analysts link this result to the independence of the Central Bank.

ii. Forecasts and Inflation Targets: In 1990, with an annual inflation of almost 30%, the Central Bank decided to reduce the inflation rate gradually. To this end, it used yearly inflation rate targets to guide the expectations of price variations. The rate of interest was the tool used to "induce" economic agents to believing that the targets will be met. The Chilean Central Bank was the first in Latin America to use inflation targets.[21]

iii. Credibility of the Central Bank: The fact that effective inflation was almost always within the range predicted has increased the credibility of the Central Bank. In brief, the Central Bank has for almost a decade demonstrated a good capacity for meeting the

[20] To have an independent Central Bank it requires: i) The Central Bank cannot provide loans to the Government; ii) the Central Bank cannot print money to pay for Government debts; iii) in order to assure the independence of the Central Bank, its authorities should stay in the Board for a fix (years) period that is not related to the Government length mandate, Moreover, Central Bank Board members should have the agreement of different country powers, i.e., the Executive and the Legislative powers. See King (2005).

[21] To see the effect that the control of inflation has produced on the use of inflationary objectives in Chile, see Schmidth-Hebbel & Tapia (2002) and Céspedes & Soto (2007). For an analysis focused on developing countries, see Mishkin (2000).

expected inflation predictions. Thanks to this, the Chilean Central Bank now has a highly credible reputation.

When the inflation rate reached an annual level of 2.3% in 1999, i.e. when Chilean inflation was convergent with that of developed countries, the Central Bank decided to explicitly implement (from December 2000) a monetary policy associated with an **inflation target**. This **inflation target** established an annual range (of inflation rate) of between 2%-4%, centred on 3%, for a horizon of 12 to 24 months. The Central Bank uses the monetary policy (i.e. variations in the interest rate) when the effective inflation rate is outside of the expected target range.

In this way, the Central Bank has rendered the monetary policy transparent and provided a medium- and long-term horizon. The implicit idea is that the annual inflation target of **2 to 4%** be a **permanent anchor** for the monetary policy. As part of this strategy, the Central Bank had already previously established (in September 1999) a free-floating exchange regime.

In conclusion, the combination of fiscal policies independent of the copper price (that will be reviewed in next sub-section) and the clear inflationary targets of the Central Bank have meant a slow and gradual reduction in inflation rates. Chile has gone from inflation levels of around 20% between 1980 and 1990 to a continual decrease during the nineties, reaching an inflation level of less than 4% since 2000. This demonstrates the success that the various policies have had in generating low levels of inflation. It should be pointed out that Chile had had inflation problems for one hundred years (1890-1990). Prior to 1990 the inflation rate was double digits most of the time fluctuated in the range of 20% to 30% per year.

The Chilean Government has established a Structural Surplus Rule, according to which the Treasury has to generate a surplus using the long-term copper price as a reference for the revenues. This rule has precisely the objective of making the evolution of public expenditure independent from the short-term copper price. The logic behind this rule is that a small country integrated into the global economy is exposed to frequent external shocks. A negative external shock implies a drop in the production level and growth; this generates unemployment, loss of revenue and a reduction of fiscal revenue.

During a crisis special programs are needed to smooth the reduction of consumption by most agents, especially of the lower income groups. The availability of a fiscal surplus facilitates policies of emergency employment and avoids the need to reduce or suspend social programs. In

brief, the Government can apply macro countercyclical policies to face the crisis without generating inflationary pressures.

It is worth noting that the Ministry of Finance established the structural fiscal surplus of 1% in 2001, due to the fact that the Chilean State was facing various risks associated with future Government commitments that influenced future fiscal sustainability (see Engel et al (2007) and Rodríguez et al (2007)): (i) Operating deficit and Central Bank (financial) debt[22]. (ii) High level of pension liabilities[23]. (iii) Liabilities associated to a Public Highways Concessions System[24]. (iv) Control of Exchange Risk[25]. (v) Other liabilities[26]

All of the above justifies an accumulation of funds through the 1% surplus. However, after 6 years of operating this surplus target the Chilean treasury had sufficient reserves to control the above risks. The fiscal surplus target was therefore reduced to 0.5% (GDP) in 2008 and it should tend towards 0% in the long term.

The use of the fiscal surplus rule did not have legal backing in its beginnings, depending on the discretion of the authority in office. However, in 2006 a Fiscal Responsibility Law was passed, creating an institution whereby the authority in office must respect certain parameters of structural balance, such as the calculation and description of how such policies will affect this balance[27].

B. Government Expenditure in Chile and Zambia

Given that copper price affects government income, this has repercussions for government expenditure. This sections seeks to investigate if Chile and Zambia adopted appropriate policy responses aimed at better management of copper resources, in order to avoid adverse repercussions.

[22] These were principally due to the financial rescue package of the Chilean Banks bankruptcy in 1982; in addition, the exchange policy in the nineties (support of a given level of exchange rate) generated losses to the Central Bank.
[23] Due to the state guarantees of minimum pensions and welfare as well as the recognition of contributions for low income pensioners that were transferred to the AFP (Private Social Security System) system in 1981.
[24] Chile implemented a public works concessions system in 1996. Many of these works have a guaranteed future income for the concessionaire. In the case that the concessionaire obtains less income than agreed, the State complements his income.
[25] In a developing country such as Chile, almost all of its external debt is in dollars. This implies an exchange risk in the case of a sudden appreciation of the dollar, and therefore, an increase in the value of the external debt.
[26] State guarantees for university credits and other demands where the Chilean government acts as guarantor.
[27] For more detail see DIPRES (2006).

The relationship between the copper price and government expenditure is due to the fact that a greater income relaxes the fiscal liquidity restrictions that developing countries traditionally face. The shock in fiscal expenditure can operate through three mechanisms (Davis et al, 2001; Gelb, 1988): (i) Direct use of the resources generated by the commodity. In this case, the government directly uses the additional resources to expand government expenditure; this is very attractive to public opinion. Obviously, once the boom ends, it is necessary to constrain expenditure, but there tends to be rigidity, inflexibility, and political opposition to do it. (ii) Indirect use of the resources from the commodity. The government destines one part to government savings (deposits or sovereign funds). However, at the same time, it uses these savings as collateral for borrowing and can therefore spend more. Thus the commodity boom enables the government to generate a debt that it could not previously obtain. This mechanism, of simultaneous saving and debt generation, means that at the end of the boom (of the commodities), the countries are highly indebted and unable to meet their obligations[28]. (iii) Relaxation of tax policy. In this case the government reduces taxes so that its fiscal revenue depends more heavily on the commodity boom. Once the boom is over, the Treasury can no longer sustain the previous level of expenditure since the tax revenue is insufficient, which creates pressure for a reduction in expenditure, since a tax increase is always unpopular.

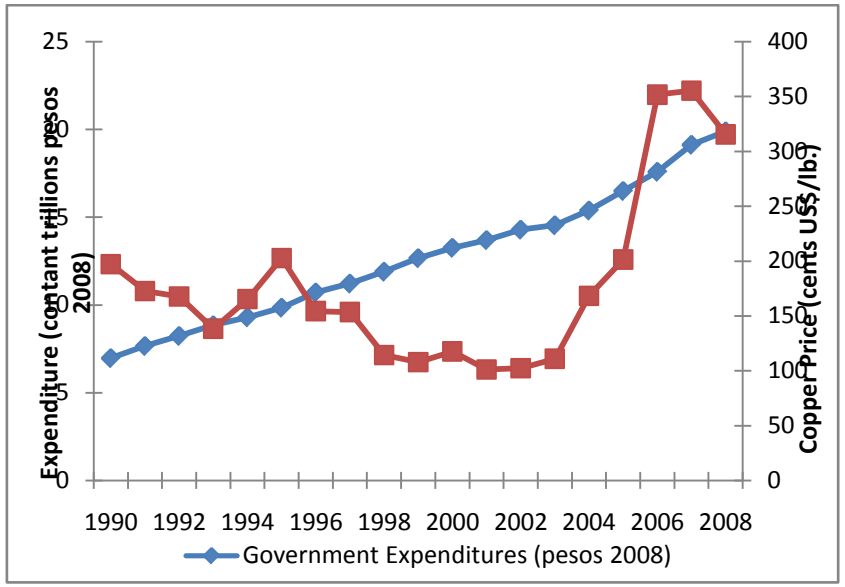
One of the main consequences of having a high correlation between the commodity (copper) price and government expenditure is that projects that were started at the height of high copper prices had to be stopped due to the subsequent reduction in price and hence diminution of cash flows. In this context, Chile and Zambia have acted very differently.

Figure IV.1 shows how Chilean government expenditure (in constant domestic currency) has evolved with respect to the copper price. It can be seen that since 1990, expenditure has constantly increased without being particularly affected by the booms or bursts in copper prices. In other words, copper price volatility has not affected the handling of fiscal resources. In contrast, Zambia has followed the opposite course. Figure IV.2 shows that the Zambian government expenditure (in constant domestic currency) followed the evolution of copper prices

[28] Moreover, this situation is more difficult for public opinion to diagnose, since the authority in power can use the savings generated during the boom as evidence of its responsible management. Once the commodity boom is over, there is a considerable reduction in expenditure, because it is no longer sustainable and, moreover, there is the need to repay debts.

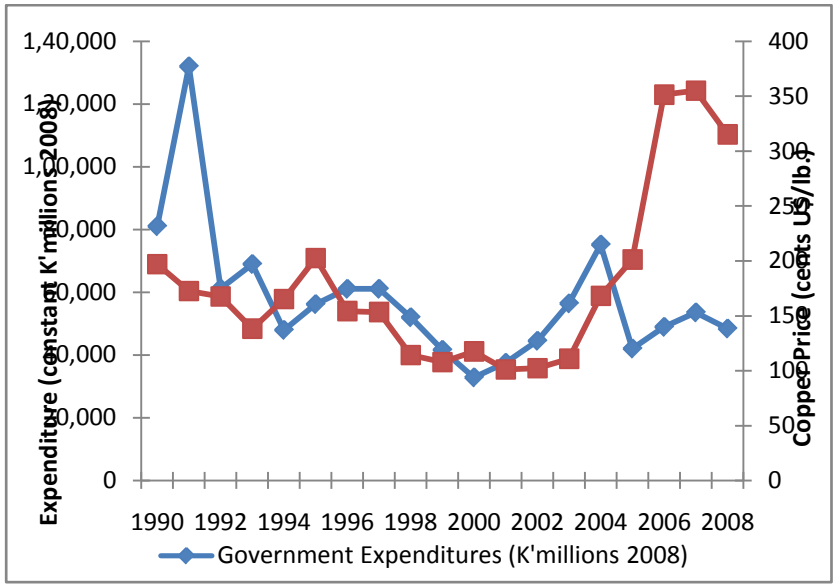
quite closely up to 2004. Only during the recent price boom, Zambian government expenditure (in constant domestic currency) decreased with respect to the peak in 2004; as the price of copper rises, Zambian Government expenditure has returned to the level it was at in 2003.

Figure IV. 1: Chile - Government Expenditure (US$) and Copper Price



Source: Ministry of Finance and COCHILCO.

Figure IV. 2: Zambia – Government Expenditure (K'millions) and Copper Price

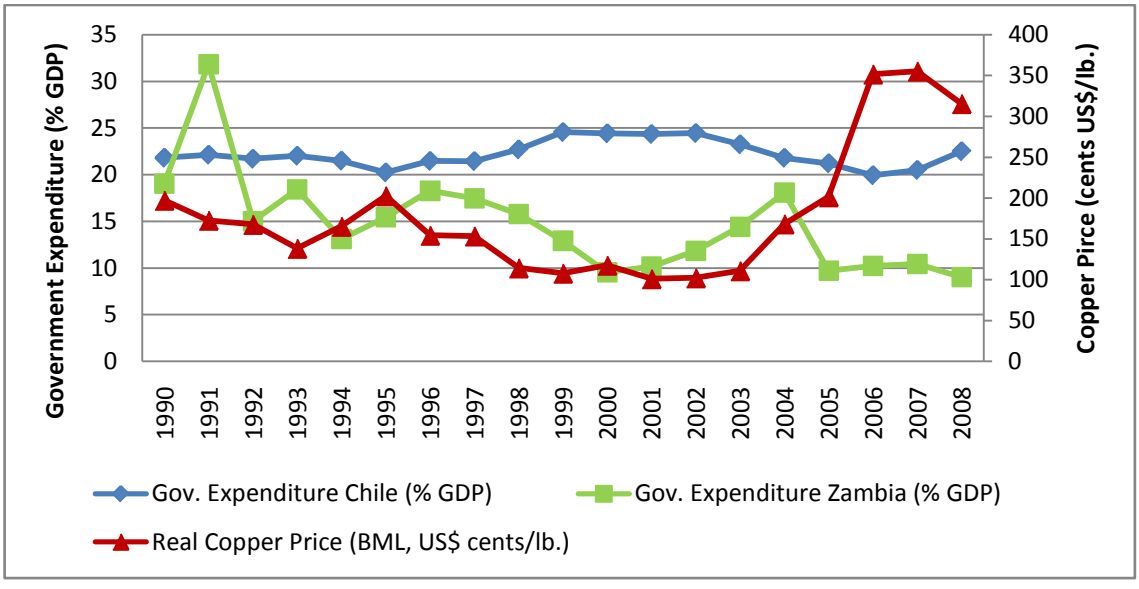


Source: World Bank (WDI); IMF (WEO) and Ministry of Finance and National Planning.

The evolution of Government expenditure is related to the type of fiscal policy that is being used. As we have seen, fiscal revenue is highly influenced by the fluctuations in the price of copper. Higher fiscal revenues will provide incentives to increase Government expenditure. Once public expenditures increase, it is very difficult from a political point of view to reverse them when there is a drop in the price of copper that reduces fiscal revenues. Therefore, it is fundamental to avoid the dependence of fiscal expenditure on (fluctuations of) copper prices.[29] Moreover, it is highly convenient to implement anti-cyclical expenditure policies with respect to cyclical changes in the copper price.

As we explained earlier, Chile has established a rule of fiscal structural surplus. This economic policy has been effective in generating greater independence of fiscal expenditure from the short-term fluctuations in copper prices; the Chilean Government has achieved credibility because it has been able to maintain a stable public expenditure (Figure IV.3). In Zambia, the fiscal rule observed is established based on the IMF program. Over the past decade, the rule has been that consistent with growth projections, overall fiscal deficit should be restricted to 1.3% of GDP. In practice however, the deficit has deviated from this rule, either due to expenditure overruns or revenue shortfalls or a combination of both.

Figure IV. 3: Chile and Zambia - Government Expenditure (% GDP) and Copper Price



Source: Ministry of Finance Chile; COCHILCO; World Bank (WDI); IMF (WEO); Ministry of Finance and National Planning Zambia.

[29] To succeed in this, a country may require a tax policy that keeps up with Government Expenditure, independently from commodity prices.

Although in Chile fiscal income depends highly on the copper price, expenditure, as a percentage of GDP, shows an anti-cyclical behavior. This is a clear effect of the structural surplus rule described above, since when the copper price is higher, the contingent surplus is calculated on the basis of a lower price. On the contrary, when the copper price is low, the price used for the surplus is greater. This helps to isolate the level of internal prices with regard to copper revenues and generates greater stability in fiscal expenditure. Thus the Chilean government avoided expansive spending policies during a copper boom, not committing itself to expenditure that would not be sustainable after the boom. Similarly, it has avoided the temptation of becoming over-indebted, as is typical during commodity booms due to the greater availability of external credits, and which leads to debts that cannot be sustained at the end of the boom.

In the case of Zambia, in the period prior to the recent price boom (1990-2003) Government expenditure followed the cyclical evolution of price of copper quite closely; this feature could be observed in both Figures IV.2 and IV.3. Only since 2004 has Zambian fiscal policy attitude changed to establish government expenditure independently of the behavior of copper prices.

We will analyze the impact of copper prices on government spending in both countries using the same econometric specification as in Section II. This means estimating the effect on government spending of a (logarithm of) copper prices, a dummy variable associated with the boom (in copper prices), and their interaction with copper prices and the lag value of the dependent variable. First, let's look at the results using Government spending measured in constant local currency (G^{LC}) as the relevant variable:

$$\underset{}{Ln(G^{LC}{}_t)} = \underset{(3.42)}{1.8934} - \underset{(1.54)}{0.2904}\cdot b - \underset{(1.24)}{0.0342}\cdot Ln(P_t) + \underset{(1.72)}{0.0658}\cdot b\cdot Ln(P_t) + \underset{(33.04)}{0.8967}\cdot Ln(G^{LC}{}_{t-1}) \qquad \text{(Chile)}$$

$$\underset{}{Ln(G^{LC}{}_t)} = \underset{(2.19)}{5.3095} + \underset{(1.21)}{4.2141}\cdot b + \underset{(1.5)}{0.6626}\cdot Ln(P_t) - \underset{(1.27)}{0.8399}\cdot b\cdot Ln(P_t) + \underset{(0.78)}{0.2143}\cdot Ln(G^{LC}{}_{t-1}) \qquad \text{(Zambia)}$$

In Chile the estimator on the effect of copper prices on public spending can be observed to have a negative coefficient, as does the dummy estimator associated with the boom. This implies that higher (lower) copper prices reduce (increase) public spending. However, neither

estimator is statistically significant. On the contrary, post-boom copper prices have a positive effect on government spending, but the copper price coefficient under normal circumstances has to be subtracted from this effect. An Augmented Dickey-Fuller test for unit root does not reject the null hypothesis that Government Expenditure, measured in local currency, in Chile or Zambia follows a unit root process. See Appendix for more details.

Meanwhile, in Zambia the coefficients on the effect of copper prices and the boom are both high-value and positive. Nevertheless, once again the interaction between the boom and copper prices has an opposite negative sign. But none of the estimators are statistically significant. In other words, one cannot reject the null hypothesis that there is no relationship between the evolution of public spending and copper prices.

Another analytic perspective is to use Government Spending as a percentage of GDP ($G^{\%GDP}$) as the dependent variable. This allows a better evaluation of the relationship between public spending and the cycle of copper prices. The econometric regressions are provided below:

$$\underset{}{Ln(G^{\%GDP}{}_t)} = \underset{(4.3)}{41.0445} - \underset{(2.9)}{21.2830}\cdot b - \underset{(3.86)}{4.7386}\cdot Ln(P_t) + \underset{(3.01)}{4.1712}\cdot b\cdot Ln(P_t) + \underset{(1.12)}{0.2154}\cdot Ln(G^{\%GDP}{}_{t-1}) \quad \text{(Chile)}$$

$$\underset{}{Ln(G^{\%GDP}{}_t)} = \underset{(1.49)}{-48.0251} + \underset{(1.79)}{103.0457}\cdot b + \underset{(1.87)}{13.0599}\cdot Ln(P_t) - \underset{(1.89)}{20.8009}\cdot b\cdot Ln(P_t) - \underset{(0.09)}{0.0244}\cdot Ln(G^{\%GDP}{}_{t-1}) \quad \text{(Zambia)}$$

As can be seen, there are statistically significant negative coefficients in Chile, both for the price of copper as well as for the (copper price) boom dummy, which is likely to be evidence of the countercyclical policy that Chile has generally implemented by not increasing public spending when copper prices go up. However, this behavior is apparently reversed during the boom; the interaction between the recent boom and copper prices produces a positive and statistically significant coefficient of a similar magnitude to the one involving copper prices without interaction. An Augmented Dickey-Fuller test for unit root does not reject the null hypothesis that Government Expenditure, as a percentage of GDP, in Chile follows a unit root process. However, it does reject that hypothesis in the case of Zambia. See Appendix for more details. Given that the pre- and post-boom estimators are of similar magnitudes but opposing

signs (and both statistically significant), one could infer that the boom in copper prices did not affect government spending as a percentage of GDP.

In contrast, the opposite results are obtained in Zambia. In this case copper prices and the boom dummy have positive (and statistically significant) effects on public spending. However, the interaction produces a negative coefficient, meaning that no direct relationship between copper prices and government spending as a percentage of GDP would be observed during the boom. Given the relative magnitudes of the estimators on the dummy variable and the interaction term between copper price and the boom dummy, we can argue that there was no increase in government spending over the boom period. The net effect of the effect of the copper price on government spending can be obtained by differentiating $Ln\left(G_t^{LC}\right)$ with respect to $Ln\left(P_t\right)$. Although the magnitude of this effect is large at 16.2%, it was nonetheless insignificant in statistical terms.[30]

C. Royalty –Tax on Profits

The most traditional tools of the state to capture some of the Ricardian rents associated with mineral extraction are the Royalties and Taxes on Profits. However, these taxes are not easily implemented, as they imply dealing with interested groups and maybe interpreted by some people as a "change of the rules". Nevertheless, both Zambia and Chile have revised these taxes during the boom.

1. The Zambian Experience

a) Copper price boom without fiscal benefit

The closure of the sale of ZCCM core assets to Anglo came at the bottom of the market when global economic conditions dictated a cutback in investment in base metals. In 2002, the price of copper was US$2,270 per ton compared with US$3,406 per ton in 1997. After Anglo's exit, the outlook for the global copper market changed drastically, heralding an unprecedented 5-year long copper price boom, much in line with Cashin et al. (2002) estimated half-life of commodity booms. The recovery in prices was largely driven by global demand fuelled by the investment boom in China and India. In 2003, China overtook the U.S. as the world's largest

[30] The true effect is calculated as (exp(0.663-0.84)-1)*100, see Wooldridge, J.M (2009), *Introductory Econometrics: A Modern Approach* , South Western Cengage Learning, Mason, USA

copper consumer and by 2004, it was consuming 46% more copper than the U.S. and accounted for 20% of global demand (Dyer, 2006).

Between 2002 and the top of the recovery during 2008, copper prices quadrupled in real terms, rising to an average of US$9,000 per ton. Even adjusting for the initial weakening and subsequent strengthening of the U.S. dollar in late 2008, this price boom dwarfed both the post-War boom and the boom of the late 1960s and early 1970s (Adam and Simpasa, 2009).

Nonetheless, over the period of the boom, copper export earnings in constant US dollars rose from US$826 million in 2002 to US$3,684 million in 2008. The increase in copper export earnings even surpassed the growth in aid inflows. Copper exports were also more than four times higher than total foreign investment inflows in 2008 and one and half larger than official development assistance (ODA) in nominal terms. Clearly in gross revenue terms, the copper windfall gain was substantial.

Adam and Simpasa (2009) have estimated the scale of the mineral resource windfall of 60 - 80 % of pre-boom GDP, the vast bulk of which was accounted for by the increase in the copper price boom.[31] The boom in cobalt contributed around 8 % of baseline GDP. Based on a discount rate of 8%, the authors show that the boom led to an increase in permanent income by around 5.4 % of pre-boom GDP. Although the relative contribution of the windfall gain to permanent income appears modest it was nonetheless not trivial. In terms of savings, the rebound in resource rents yielded an estimate of the net present value of total windfall savings of approximately K6.5 trillion at 2002 prices out of total windfall income of K10.9 trillion.

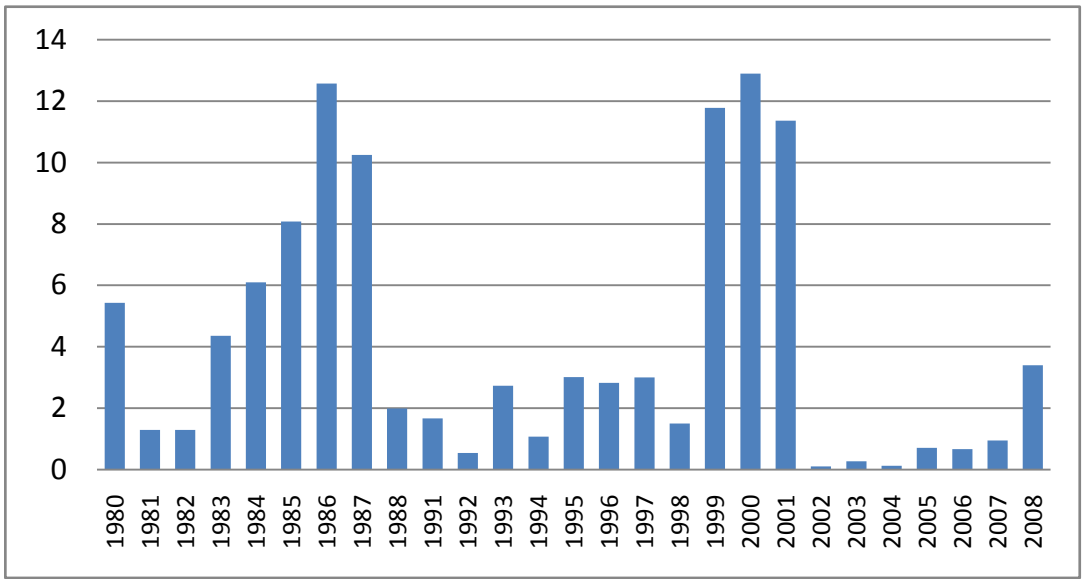
Undoubtedly, this resource windfall was the biggest opportunity for Zambia's transformative development. However, given the ownership structure of the mines, a substantial share of the windfall income accrued to the foreign private owners of the Zambian mines. Given the tilted tax regime, a substantial proportion of the measured foreign asset accumulation was in fact repatriated as profits and payment of dividends by Zambian-based mining houses to their foreign shareholders. This amount was estimated to be about 75 % of total net capital outflows (Adam and Simpasa, 2009).

Figure IV.10 highlight the extent to which the copper boom was completely absent from fiscal revenue. Despite the boom, tax revenue remained almost unchanged at 18 % of GDP throughout the duration of the boom, depicting the government's inability to capture the rent.

[31]See Adam and Simpasa (2009) for the approach used and assumptions underlying these computations.

Out of this amount, corporate tax accounted for 2 % of GDP. The largest source of income was employee based pay as you earn (PAYE). Note also from Annex Table 27 that mineral royalty generated less than 1 % of GDP, indicating that there was virtually no rent accruing directly from the mining sector. The government's failure to benefit from the copper boom reflected the twin effects of the large loss carry-forward provisions granted to the mining companies and the incentives for full expensing of investment expenditure. The net tax liability effect of these measures on government revenue was therefore zero.

Figure IV. 4: Copper Revenue as share of Fiscal Revenue (%)



b) The Zambian 2008 fiscal reforms

The apparent failure of government to extract any substantial revenue from the copper boom increased the pressure on government to re-define its relationship with the mining industry. Discussions to re-negotiate the DAs started in early 2007 and initially the government was cautious not to temper with investment in exploration and exploitation in the mining sector.

Since the DAs were created on a bilateral basis, government's initial approach was to establish a revised code for new mining investment by re-negotiating the existing agreements one-by-one. However, due to a multiplicity of the agreements, a coordinated and transparent re-negotiation of all the existing dozen resource contracts proved onerous. As a compromise, the authorities opted for a more direct legislative approach which led to the cancellation of pre-existing DAs and establishment of a new fiscal regime for the mining sector.

The details of the new mineral fiscal regime were announced in the 2008 Budget but consisted of two main elements (GRZ, 2008). The first was to shift the tax code decisively in favor of generating a larger revenue flow to government, principally through an adjustment to the royalty rate. This saw the royalty rate shifted upwards from 0.6 % to 3 % of gross revenue on copper. The second key element was the most drastic policy shift in the management of mineral revenues. In order to capture a sizable amount of rent, the government introduced a degree of progressivity into the tax code through two main channels:

i. A variable profit tax rate under which the marginal tax rate would rise from 30% to 45 % when taxable profits exceed 8 % of gross revenue.
ii. A graduated windfall tax levied at a rate of 25 % on gross proceeds when the copper price exceeds US$2.50/pound (US$5,600 per ton); at a rate of 50% when the copper price exceeds US$3.00/pound (US$6,720 per ton); and 75% in excess of $3.50/pound (US$7,840 per ton).

At prevailing international prices, revenue from mining under the new fiscal regime was projected to increase from US$20 million generated in 2007 to approximately US$400 million in 2008. This was equivalent to a tax yield of about 10 % of gross mining proceeds estimated at US$3.8 billion. The projected increase stemmed largely from the removal of tax incentives previously enjoyed by the mining companies and the substantial increase in output given the expansion in mining activity after completion of rehabilitation works and commencement of production at some new mining units.

The tax measures were not without dispute from the mining enterprises, who argued that the government had reneged on its commitment to respect the legal provisions of the DAs. This was true although from the perspective of government direct negotiation left it exposed to potentially collusive behavior on the part of the mining companies and to a range of other hold-up problems. The legislative route on the other hand had the advantage of being transparent - redressing one of the key criticisms of the DAs - and arguably shifted the burden of coordination costs on the mining companies by facing them with a take-it-or-leave it option. However, the main force of the criticism levied at the government was the genuine concern that the new regime radically increased both the marginal burden of tax and the degree of price distortion. Specifically, the mining companies contested the introduction of the graduated windfall tax which was perceived to be punitive especially for high cost producers. The consequence of the windfall tax and all other new tax instruments pushed the effective tax rate from 31% to 47%,

making Zambia one of the highest mineral tax zones in developing countries. However, in view of the prevailing level of investment in mining and the accumulated losses carried forward, the actual tax yield was probably lower. It should also be recalled that the envisaged rapid increase in fiscal revenue from copper following the reforms did not materialise as the global financial meltdown brought commodity prices crushing resulting in lower than projected copper export earnings. The IMF had estimated that mining taxes after the reforms would account for 3.2% of GDP in 2008, rising to almost 5% in 2009. However, as we observed earlier (IMF, 2008), the outturn was only 0.6% of GDP in 2008 on account of the effects of the global recession and the resulting cutback in mineral exports.

The other contest was over the introduction of the export duty which was aimed at encouraging domestic value-added through smelting. However, given the constraints on capacity and the highly import intensive nature of smelting, the contribution to value added was deemed limited.

The government quickly clarified that when the graduated windfall tax was operative, the variable profit tax would not be applicable. In addition, it removed the top two bands of the graduate tax in July 2008 leaving only the single-step rate while the windfall tax was completely withdrawn in the 2009 Budget (GRZ, 2009b). This adjustment removed the most distortionary and contentious element of the 2008 fiscal reforms. Government did not, however, cede ground on the basic royalty rate or on any of the other elements of the 2008 mineral fiscal reforms.

In retrospect, the 2008 reforms highlight many of the difficulties in implementing mining tax regimes that are capable of generating revenue for government but also limit incentive effects on mining companies. The mineral fiscal reforms were far from being smooth and this explains why government was challenged at each turn. Nevertheless, it was very realistic of government to cede the more egregious distortions created by the graduated windfall tax. In this regard, mining analysts lauded the Zambian government noting that “Zambia has a history of mining, and understands the risks involved. Even with new regulations on taxations and royalties, these will only take it to the similar levels of other African countries. Even then, the government is prepared to negotiate and discuss.” (Fraser Institute, 2008).

Although some foreign mine owners continue to resist compliance on the remaining components of the reforms; the suspension of the windfall tax appears to have defused much of the tension. In all likelihood, the 3% royalty and the variable profit tax regime are expected to remain in force. With the recent uptake in international copper prices, the mining sector may

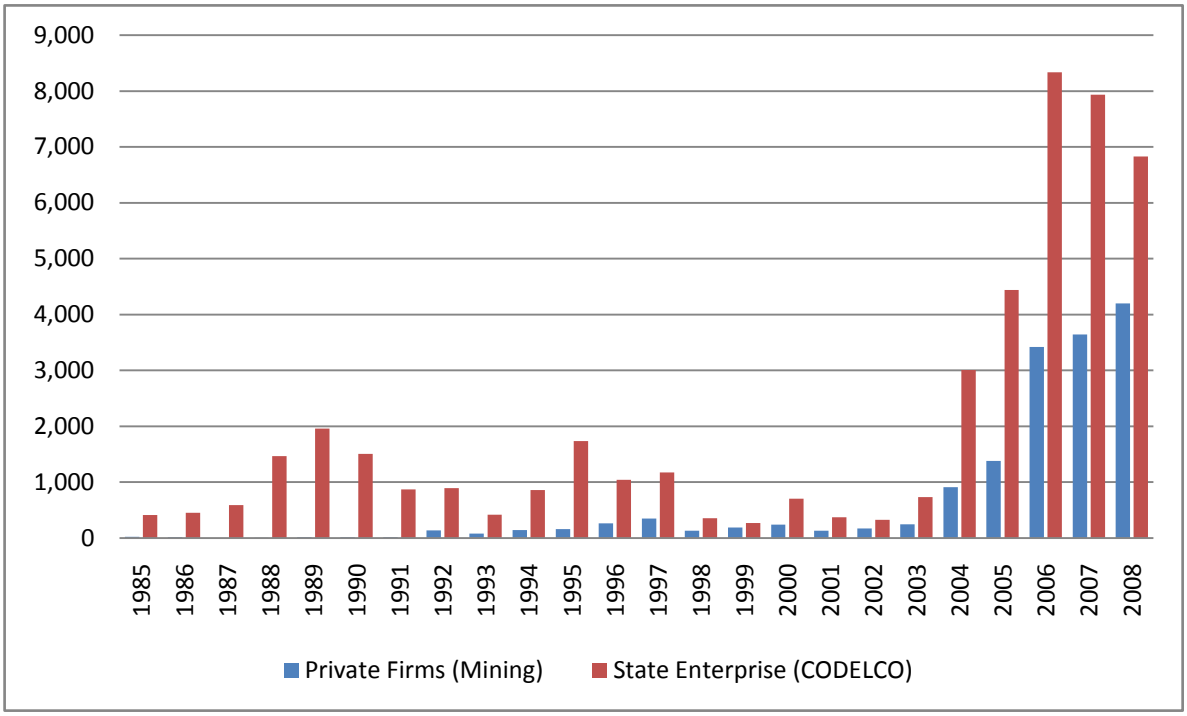
return to profitability, provided the cost structure is rationalized and, as front-loading of investment expenditure tapers off, loss carry-forward and investment offsets against taxable profits will decline in the medium to long-term thereby ensuring that the conventional profit tax will begin to yield some revenue to government. This environment may also provide scope for government to revisit its windfall tax regime.

2. The Chilean Experience

In Chile there was a long debate (the last decade) over the royalty that ended with Law N° 20,026, which established a specific tax to mining activity. In 2001 a special Law on Tax Evasion and Tax Avoidance was enacted and it was mainly focused on mining firms. Public opinion was making the traditional historical complaint: how is it possible that after the massive foreign investment in copper and the significant expansion of copper exports of the 1990s, mining firms are not paying taxes? Figure IV.5 shows that up to year 2002, private mining firms were practically paying almost no taxes; this fact was due to the incentive related to accelerated capital amortization rules. Private mining firms argued that they were not evading taxes, but they were using existing legislation to avoid paying taxes. For most Chileans it was very difficult to understand the difference between tax evasion and tax avoidance. In short, there was an increasing public pressure to point out to mining firms that they had to increase their contribution to Chile.

Figure IV. 5: Fiscal Revenue from Copper, separated by State and Private Firms

Chile, 1999-2008 (Millions US$)



Source: COCHILCO

Moreover, the specific case of the mining copper firm La Disputada (foreign-owned) increased the pressure. This firm had not paid any tax for twenty years, because the company accounting books showed losses all the time. There must be something wrong with the Foreign Investment Code and the Tax system if it allows a large firm not to pay taxes for twenty years. Furthermore, this firm was sold for US$1.2 billion in 2003; why would a rational agent pay such an amount for a firm that has not made any profit for twenty years?

There are different mechanisms that multinational mining firms have used to generate losses in an affiliate: (i) Transfer pricing, where the affiliate sells copper to multinational headquarters below world international prices; (ii) high interest payments charged by the headquarters to the affiliates for credit provided for financing host country investments; (iii) high consultant fees paid by the affiliate to headquarters experts; (iv) future market operations where the losses are transferred to the affiliate.

A report by the Internal Revenue Service in 2002 pointed out that large private mining companies had earned US$400 millions of profits, and that they had not paid any taxes. The explanation provided was related to the intensive use of the accelerated depreciation allowances.

The Minister of Finance said that the procedure used by the mining companies was “legal but not reasonable”.

A Chilean business leader’s counterargument was that “eventually (and in the short term) the tax benefits related to the accelerated depreciation framework were going to run out and then they were going to pay the taxes that they owed.” But there is obviously a difference between asking for a loan and paying a given amount after a year and paying the same amount over 10 years (without interest). Saving the amount lent generates the necessary profits in those 10 years to pay the loan and to earn significant profits.

The debate on the implementation of a royalty on mining activities found positions in favor (government and public opinion) and against (mainly businesspeople in general and in particular the mining sector).

(a) Arguments used in favor of the royalty: (i) nonrenewable mining resources belong to all Chileans, both current as well as future generations, meaning that the extraction of these resources is related to a payment associated with the right of all Chileans as represented by the Chilean State; (ii) the Chilean tax policy was “excessively complacent” with foreign mining companies, which used legal tools to pay low or no taxes on their activities; (iii) from a technical perspective, the Ricardian rents associated with the extraction of nonrenewable resources suggested the implementation of a Royalty. A price boom generates unexpected “extraordinary” profits that are not associated with increases in productivity that might have been anticipated.

(b) Arguments used against the royalty: (i) The introduction of a royalty on preexisting investments is to “change the rules of the game,” which would affect Chile’s current credibility and pose a disincentive for future investments; (ii) Chile uses the principle of general rules and nondiscrimination (positive or negative) against economic sectors. The royalty discriminates against mining. If you implement a mining royalty, one will later be applies to other activities that exploit renewable resources; (iii) small and medium producers might not be in a condition to pay a royalty and it could lead them to bankruptcy; (iv) lastly, it was argued that the time was not right (given the economic situation) to apply a royalty at that moment

In brief, in the Chilean case, where there was a consensus on general rules and no exemptions were allowed, introducing a specific tax for a specific sector required a good rational justification. Public opinion polls (large majority support) and the empirical evidence on the use

of royalty taxes in other countries (even in the developed countries where the owners of the foreign investors came from) provided the required rationalization. Table IV. 1 gives a comparison of prevailing mining tax and royalty regimes in selected leading copper producing countries and regions.

Table IV. 1: Types of Copper mining royalties applied in selected countries

Country/Region		Law	Royalty Tax	Basis
Zambia		National Law	2%	ad valorem on net residual value (RNF)
Australia	Nueva Gales del Sur	National Law	4%	ad valorem less deductibles
	North Territory	National Law	18%	on residual product less production costs
	Queensland	National Law	2.7%	variable taxi f the Price is over reference value
	Western Australia	National Law	5%	Concentrate: 5% of value Metal: 2.5% of value
Peru		National Law	1-3%	Mobile scale based anual sales
USA	Arizona	State Law	2%	2% mínimum; an expert sets up the market price
	Michigan	State Law	2-7%	Adjusted sales value
	Nevada	State Law	5%	On net product (over US$4 millions per year)
Canada	Brittish Columbia	State Law	2-13%	13% on net income 2% on net product
	NorthWest	National Law	5-14%	Value of production
	Ontario	State Law	10%	Profits
	Saskatchewan	State Law	5-10%	5% net profits (increasing to 10% according to output levels)

Source: Otto et al, 2007.

In 2004 the Government submitted a special project establishing a royalty for NR activities. President Lagos gave a speech to get public support for the royalty law. In spite of that the project was rejected by Parliament, because it was not a specific one for the mining sector. Chile is exporting other NR where the royalty could be applied; in fact some congressmen were in favor of this general feature. Then the Government sent a second bill specifically aimed at the copper mining sector. Also, different royalty tax percentages were applied according to the size of the company (copper output). On May 2005 the Law 20,026 setting a specific royalty tax on mining was approved.

This law states that mining firms (defined in this law) will pay a royalty on taxable income that ranges from 0.5% to 4.5% for annual production levels of 12,000 to 50,000 Tm; the royalty tax will be 5% for production levels over 50,000 Tm per year. Table IV.2 provides the relationship between the royalty tax and production levels.

Table IV. 2: Specific tax on mining activities-Chile

Production range	Production Unit	Royalty tax
12,000 to 15,000	Metric Tons of copper per year	0.5%
15,000 to 20,000		1.0%
20,000 to 25,000		1.5%
25,000 to 30,000		2.0%
30,000 to 35,000		2.5%
35,000 to 40,000		3.0%
40,000 to 50,000		4.5%
More than 50,000		5.0%

Source: Ley 20,026. Biblioteca Congreso Nacional.

In synthesis, large mining enterprises produce more than 50,000 Tm per year; therefore, more than 80% of Chilean copper has to pay a royalty of 5%.

D. Analysis of Sovereign Funds

One of the political economy tools to deal with natural resources rents in a copper price boom are the Sovereign Funds. While Chile has an explicitly defined sovereign fund institutional mechanism, Zambia has none yet. Regardless, there are three fundamental reasons for creating them (Asafaha, 2007; Davis, et al, 2001):

- To isolate government expenditure from the volatility of the commodity price. As it has been mentioned repeatedly, if a country's revenue is highly dependent on the price of a commodity, public spending can show the same volatility as the commodity. Thus, a sovereign fund can help to immunize public expenditure against the commodity price. This is due to the fact that extraordinary funds go to the sovereign fund and, at the same time, restrictions will be established for the use of the fund resources. This was the first type of NR funds created which were called Stabilization Funds.
- To establish intertemporal revenue distribution of NR rents: It is not certain whether there will be access to the natural resource in the future, it may be necessary to keep resources for future needs or generations. In this case, a sovereign fund can be an adequate mechanism, but it requires restrictions and rules on the use of the resources, so they can be used by future generations or be used to finance future debts.
- To prevent a "Dutch disease": A sovereign fund can be highly useful as it allows extraordinary fiscal revenue (in foreign exchange) to be kept either abroad or in a special account at the (autonomous) Central Bank.

Of these three objectives, the one that has been most studied is that of attaining greater revenue stability. Davis, et al (2001) studied the relationship between the existence of sovereign funds and (commodity) price-expenditure elasticity in different countries. Their results show that countries with sovereign funds tend to have public expenditures sterilized against commodity price. However, in a finer analysis, they determined that countries with sovereign funds had already shown public spending isolation with respect to commodity price in periods prior to the existence of the funds. Thus, the lower (commodity) price-expenditure elasticity is due to a better economic management per se in these countries and not to the establishment of sovereign funds. In a similar vein, Fasano (2000) realized an analysis of the experience on the use of commodity sovereign funds in various countries (Norway, Chile, Venezuela, Alaska, Kuwait and Oman), and found that while in the majority of these cases, funds had enabled a better macroeconomic management, in others it had not made much difference (Venezuela and Oman). It is definitely clear that these funds are not a substitute for good economic policy and tend to only benefit countries that have previously established a good macroeconomic framework and reliable and stable long-term rules and strong institutional structure.

Perhaps the best example of the importance of rules and law and its relationship with sovereign funds is the contrast between Norway and Chad. Both countries are strong exporters of oil; both established sovereign funds to save extraordinary revenue. However, while in Norway the sovereign fund was highly successful, allowing the financing of better pensions and a countercyclical fiscal policy, in Chad it was a failure because the country's governments changed the rules for the funds and used the resources inefficiently. For many, the role of the sovereign fund is to enable strict regulation related to the use of the resources. However, there are examples of when this has not been effective, since Norway's fund rules allowed a highly flexible use of the resources, resulting in success, whilst in Chad, the fund rules were highly restricted but did not achieve good results.

Moreover, it is important to ask how necessary sovereign funds are for achieving the aforementioned objectives. An authority with the correct incentives could easily use deposits abroad for the same ends (expenditure stability, intertemporal redistribution and prevention of "Dutch disease"). For this reason it is important to analyze other outcomes of sovereign funds that may make them necessary for developing countries. Humphreys and Sandbu (2007) propose that the principal role should be realigning the incentives of political players, which would imply an improvement in the law in general. In order to achieve this, it would be necessary to have clear rules regarding the withdrawal of resources, for the fund to function with transparency and for decisions to be made in such a way as to represent the whole of society (Humphreys and Sandbu, 2007; Asafaha, 2007). All of this may eventually lead to a balance, whereby the citizens are aware of the good use of sovereign funds.

Next, we will review the Zambian and Chilean experience in this respect.

1. The Zambian Experience

The changes to the mineral tax regime in 2008 were estimated to bring in additional revenues amounting to US$ 415 million in 2008, up from the US$ 20 million recorded the previous year (GRZ, 2008). This amount was expected to increase to between US$ 600 million and US$ 800 million in 2009, subject to copper prices remaining high. In the long-term, copper revenues attributed to the new taxes were projected to be as high as US$1.0 billion depending on long-run prices of copper. However, these additional resources, equivalent to a tax yield of 10% of gross mining proceeds, were overly optimistic and fell below the actual revenue outturn by a

very wide margin due to a precipitous decline in the price of copper during the second half of 2008.

Table IV. 3: Central Government Revenue, 2001-2008 (% GDP)

	2001	2002	2003	2004	2005	2006	2007	2008
Total Revenue and Grants	**24.90**	**0.26**	**0.25**	**0.24**	**0.24**	**0.22**	**0.23**	**0.22**
Tax Revenue	**19.1**	**17.9**	**18.0**	**18.3**	**17.2**	**17.2**	**18.4**	**18.2**
Tax on incomes and profits	7.2	7.6	7.2	7.8	7.4	7.5	8.1	7.8
Individuals	5.7	5.9	5.6	6.5	6.0	5.7	5.5	5.4
Corporations	1.5	1.7	1.6	1.3	1.4	1.8	2.6	2.4
of which Mining Company Tax	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Taxes on goods and services	4.9	4.7	4.3	4.1	4.2	3.6	2.7	1.8
Of which Mining License	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mineral Royalty	0.1	0.0	0.0	0.0	0.1	0.1	0.2	0.4
Taxes on international trade	6.5	5.2	5.1	5.6	5.1	5.1	6.7	7.5
Other revenue	0.5	0.3	1.4	0.8	0.4	0.9	0.7	0.7
Grants	5.7	8.3	7.0	5.5	6.4	4.4	4.5	3.7
Direct taxation on mining								
Mining Taxes (US$ m)	1.90	0.69	1.86	1.15	8.90	10.19	20.84	69.01
A share of total revenue (%)	0.27	0.10	0.24	0.12	0.71	0.67	0.95	3.41
As share of GDP (%)	0.05	0.02	0.04	0.02	0.12	0.11	0.18	0.62

Source: Ministry of Finance and National Planning Fiscal Tables

Although revenues from direct mineral taxation increased substantially to US$ 69.1 million (3.4% of total revenue and 0.6% of GDP) from US$ 21 million (1.0% of revenue and 0.6% of GDP), see Table IV.3 above, they were not particularly transformative to meet Zambia's numerous economic and social challenges. The benefit from the windfall gains was limited by the scale of the drop in the price of copper and reflected the cost of government's belated policy response to the boom and the consequences of the lock-in effect due to poor design of the DAs. Nonetheless, the government was hopeful that it could reign in the high poverty levels by taking advantage of the boom.

A major consideration of the tax reforms was to ensure long-term sustainability and predictability of mineral revenues given that copper is a dwindling asset. Therefore, the authorities sought to balance the economic revenues accrued from copper exploitation with policy credibility of attracting private investors and ensuring that these outcomes were mutually efficient. This required establishing a stable fiscal framework that, under conditions of uncertainty of mineral revenues, would yield a high share of mineral rent for the country and simultaneously assure a positive return commensurate with the risk for private mining investment.

Recognizing the volatility of resource revenues, the government decided against including the projected windfall revenues in the 2008 Budget. In the interim, a team of technocrats from the Ministry of Finance was tasked with the mandate to explore possible options of an appropriate institutional structure of managing the funds in the context of the pressing spending needs. Since the scale of revenue flows was projected to be modest, variable and possibly short-lived, there appeared to have been no strong case for the creation of a stabilization fund along the lines of Norway.[32] After broad-based consultations, it was decided that the revenues accrued from the reforms would be ring-fenced in a special mineral revenue account (MRA) at the central bank. The MRA resembled a stabilization fund for smoothing expenditures over time taking into account macroeconomic conditions and absorptive capacity in the economy (IMF, 2008).

Subsequently, the funds from the MRA, including all other revenue streams, were to be channeled through the medium-term expenditure framework (MTEF). The MTEF is a coherent public spending strategy designed to inform medium-term broad macroeconomic policy. In order to avoid mistakes of the past, the government decided to use the funds to finance high investment projects in priority sectors identified in the Fifth National Development Plan (FNDP) and the Vision 2030, a blueprint aimed at making Zambia a middle-income country by the year 2030. Of particular interest in these strategy documents is the greater emphasis placed on diversifying the economy away from the copper sector into the growth of non-traditional exports. The documents also identified major growth constraints and deficiencies in the domestic and regional transport system, the provision of communications and information technology, capacity constraints in power generation and long-established weaknesses in skills and training.

Whereas the 2008 budget did not articulate the actual use of the additional resource revenues, it was anticipated that the 2009 budget would directly reflect these priorities. The main driving factor for the Zambian economy remained that of economic diversification, but the planned implementation of some of the identified spending programs was constrained by revenue shortfalls caused by the shrinkage in copper receipts due to a drop in copper prices. Despite this,

[32] In the 1960s, Zambia experimented with a stabilization fund at the recommendation of the United Nations. However, the life of the fund suffered from shrinking mineral revenue and the subsequent draw-down on the funds and given the absence of strong institutional and political support, it was abandoned in 1972 (Auty, 1990). Bell (1983) also argued that if the recession is prolonged, the revenue stabilization may not produce the intended results of smoothing fiscal revenues.

public expenditure on key social and infrastructure programs received special attention through a realignment of resources toward the development of agriculture, tourism, education, health and national infrastructure (GRZ, 2009a). Total expenditure related to these programs was estimated to be almost half of the budget and 16% of GDP in 2009.

In retrospect, the government's handling of the boom was exemplary. The policy announcements surrounding the use of the windfall revenues for public savings and investment depicted deliberate government policy to escape the resource curse and chart the way toward future sustainable economic development. Faced with enormous political pressures to expand the resources from the windfall on consumption related spending, the government appeared to approach the issue with caution and avoided repeating the mistakes of the 1970s. Of course the uptake from the boom was limited, but credibility in policy response and steadfastness in the face of threats from the mining sector marked the maturity with which the government handled the tax reforms and the accompanying resistance to the tax changes. Given the secret environment under which the resource contracts were negotiated, there was a strong case for the government to renegotiate the DAs, especially considering that the fundamentals had drastically shifted in favor of such a fiscal reform. As Collier and Goderis (2007) have argued, there is no basis in international practice compelling governments to remain locked into highly disadvantageous tax regimes that are the product of corruption and ignorance.

2. The Chilean Experience

Booms in commodity prices have the potential to generate significant surpluses for the government, depending on who receives the Ricardian rents. When the rents from the resources are received by the private sector, the boom will not lead to a surplus, as occurred in Zambia with the boom of 2003. However, the situation in Chile is different since the state collects a significant portion of the copper resources. Hence, with the aim of neutralizing the impact of a commodity boom, Chile has used mechanisms such as sovereign funds which we will detail below.

Chile has a structural surplus rule which sterilizes the country's spending levels against fluctuations in copper. This generates a significant accumulation of wealth during the years when copper prices are high. A second relevant question is therefore how to administer the

accumulated resources. Chile has created sovereign funds abroad to administer them. These sovereign funds are investments abroad made by the country.

The sovereign funds have been successful in Chile's case. Chile has two main sovereign funds[33]:

- Economic and Social Stability Fund (FEES): This fund is specifically designed to smooth government expenditure. Its objective is to be an instrument for saving resources generated by effective surpluses from to the existence of a structural surplus target and to finance public expenditure in periods of effective deficit. Its value in September 2009 was around US$ 13.709 billion.
- Pension Reserve Fund (FRP): This fund is destined to finance future pension obligations generated from the pension reforms enacted by President Michelle Bachelet. This reform includes the guarantee of a (minimum) solidarity retirement allowance and an increase in the minimum pension amounts, for which it is necessary to transfer the copper resources inter-temporally to meet new future commitments. By September 2009 this fund had reached a value of US$ 3.457 billion.

As has been seen, these funds have accumulated considerable sums. In particular in the case of the FEES, this allowed a strong fiscal stimulus to be given to the financial crisis which begun in 2008. In fact, from this fund US$ 6,937 million were withdrawn between January and September 2009. However, it is important to mention that this fund has been highly successful thanks to the establishment of the structural surplus target. As a result, a rule of expenditure management, rather than one of fund contributions, has been crucial. This result fits with Asafaha's (2007) suggestion that the funds should function in line with an expenditure rule instead of a rule of fund contributions. Similarly, the FRP has been successful since the necessary funds for future pensions have been saved (and allocated) there.

Moreover, it is worth pointing out some special components of the functioning of Chilean funds. First, it is necessary to note that the contributions and withdrawals are regulated by the Fiscal Responsibility Law for which there is an institutional structure that establishes the level of the flows. Second, these funds are some of the best-functioning funds in the world. For example, the FEES ranks 8th with regard to its functioning according to a ranking of sovereign funds by

[33] Based on the Ministry of Finance (2009)

the Peterson Institute for International Economics (2008). In particular, these results reward the active pro-transparency measures by the Chilean Ministry of Finance regarding how the funds are managed. Finally, it is necessary to stress the good results (rate of return) of the investment policy Chile has pursued. This is based on the participation of several agents, including the Ministry of Finance, the Central Bank and international banks. Similarly, there is a Financial Committee, with experts of different ideological beliefs, who advise the Ministry of Finance with regard to the investment strategies used with the funds. The results of the investments on 2008, after the financial crisis, can be seen in Table IV.3. It can be appreciated that Chile's conservative investment strategy has had excellent results, especially compared with the rate of return of funds from other countries.

Table IV. 4: Composition and return of investments of different sovereign funds

Fund	Composition of investments				Return[(b)]	
	Money market instruments	Fixed income	Equity shares	Other investments[(a)]	2008	Since beginning (annualized)
Norway		50	50		-23.3	2.9
Ireland	10	22	58	10	-29.5	0.6
New Zealand		19	53	28	-26.2	4
Alaska		31	47	22	-24.7	2.5[(c)]
Australia	46	17	28	9	-8.5	-4.1
Chile	30	70			7.6	9.5

(a): Includes private equity, hedge funds, commodities and real estate.

(b): The return is presented in the currency chosen by each fund to measure their performance. Norway uses a basket of currencies; Ireland uses euro; New Zealand uses the New Zealand dollar, Australia uses the Australian dollar, meanwhile, Alaska and Chile use the US dollar.

(c) In the last five years.

Source: Ministry of Finance (2009).

On the other hand, a new fund was created (2008) after the extraordinary copper boom, which has significantly increased fiscal revenues. Given the existence of a structural surplus rule, these revenues have been translated into fiscal savings. Chile has decided to invest a significant part of the boom resources on training highly advanced human capital.

The Chilean Government allocated US$ 6 billion in windfall savings to the *Fondo para la Beca Chilena Bicentenaria para el Desarrollo del Capital Humano* (Chilean Bicentenary Scholarship Fund for the Development of Human Capital) with the goal of increasing the number of PhDs per capita. The returns of this fund will be used to give scholarships to Chileans who enroll into top world universities, which will imply a steep increase in the number of Chileans

studying in foreign countries. Thanks to that the number of Chilean students abroad has increased. While there were only 172 Chilean students abroad in 2005, it raised to 500 in 2007, 1,000 in 2008 and 2,500 in 2009. It is expected to increase by over 20 times, to 3,500 per year in 2015.

V. Final Remarks

Natural Resources (NR) have been treated by economic literature as a negative factor for countries. In particular, there is the "curse of NR", which states that countries that are rich in NR are condemned to low GDP growth rates, and the "Dutch disease" hypothesis, which predicts that NR abundance would imply an appreciation of the exchange rate and, therefore, an under-development of learning by doing sectors.

Not only have the "curse of NR" and "Dutch disease" hypotheses oversimplified things, they are also misleading caricatures. It is not the case that a country's economic growth and exchange rate depend exclusively on what happens with its main export commodity. Furthermore, as we have seen, empirical evidence from Chile and Zambia refutes the central ideas underlying these hypotheses.

The basic assumption of the "Dutch disease" hypothesis is that the exchange rate is essentially a microeconomic variable and that its determinant factor is the international price of commodities. The following has been observed in both Chile as well as Zambia: (i) There are other foreign currency inflows that should have an influence on the exchange rate. The relative importance of these inflows (with regard to copper) increases as the country develops. (ii) The exchange rate is mainly a macro variable. That is, its fundamental determinants depend on fiscal and monetary policies and other fundamentals, including changes in key macroeconomic variables, in addition to the exchange rate regime that the country has adopted. It is therefore no coincidence that we are unable to find a statistically significant relationship between the real exchange rate and copper prices. (iii) Chilean and Zambian manufacturing exports have steadily increased, regardless of what happens to international copper prices. In sum, "Dutch disease" is not generally a relevant hypothesis for Chile and Zambia.

These findings may also apply to other countries as well. To the extent that there is sufficiently strong adjustment mechanism to relative price changes, variations in the price of copper may not necessarily induce a Dutch disease, particularly if the economy if adequately diversified.

With regard to the "curse of NR" and its (negative) influence on economic growth, there is an easy way to eliminate the "curse": you just have to close down all copper mines and leave the mineral in the ground. Would that increase growth? What would be the mechanism in question? It could be said that Zambia apparently did this by cutting copper production by half between 1970 and 1990, and not only did it not experience higher growth, it experienced negative growth during those 20 years instead. Meanwhile, empirical evidence shows a generally positive relationship between copper prices and economic growth rates in both Chile and Zambia. Briefly put, the hypothesis of the "curse of NR" is irrelevant as a factor to explain economic growth in these two countries. Where evidence of the NR hypothesis has been established, this has relied on narrow definitions of the concept, ignoring other important factors at play. Indeed, as new empirical evidence has shown when stocks of natural assets are used as a measure of a country's wealth rather than rely on narrow measures such as commodity exports, the recourse curse hypothesis is unambiguously rejected. Therefore, the findings on Chile and Zambia, while also relying on narrow measures of natural resource wealth yield some important observations regarding the resource curse. They show that the NR hypothesis does not always hold, and any conclusions drawn must be interpreted with great caution. Most importantly, the findings posit that a country that suffers from immense structural constraints in the face of natural resource abundance may be seen as retarding due to inappropriate utilisation of resource rents. Yet, at the root of the problem lies the inflexibility in many sectors of the economy, including labour and price rigidities, as was the case in Zambia at the height of the economic downturn prior to economic reforms and privatisation of the mines.

There is an ideological prejudice that state companies are intrinsically inefficient and that their mismanagement sows chaos. The nationalization experience (which took place simultaneously) in Chile and Zambia shows diverging results: while Chile more than doubled copper production at the state-owned company, Zambia's fell to half. One can therefore not come to a universally valid conclusion that "state-owned companies are synonymous with inefficient management." Furthermore, what happens with these state companies depends on the set of macro- and structural policies that a country has implemented. In addition, in Chile's case one can see that the state copper company CODELCO's contribution to fiscal revenues is

considerably higher than that of the private foreign copper companies whose production is higher.

Both Chile as well as Zambia increased taxes paid by foreign companies during the boom (of commodity prices). This obviously breaks the rules of the game that were in force when the foreign investment in the copper sector was stimulated. On the other hand, isn't an extremely low level of taxes paid by these companies relative to their profit levels an incentive for the host country to break the rules? Even developed countries have special royalties for the copper sector. Thus, an extension of the Law of One Price in a globalized world would suggest similar royalty rates in all countries.

The use of the Sovereign Fund is a good mechanism to avoid opportunistic behavior on the part of the politicians in power and also to ensure the inter-generational distribution of the wealth generated by copper. However, it s not a good idea for Zambia to imitate and implement Chile's Sovereign Fund: countries need to fulfil certain preconditions. These are: macro-stability, a state and institutions with adequate accountability conditions, and transparency to oversee and guarantee that the rules of the Sovereign Fund are complied with.

Bibliographical References

Acemoglu, D., S. Johnson and J. Robinson (2003): "An African Success Story: Botswana, in Dani Rodrik", ed. in *Search of Prosperity: Analytical Narrative on Economic Growth*, Princeton, NJ: Princeton University Press.

Adam C and A.M. Simpasa (2009): "Harnessing Resource. Revenues for Prosperity in Zambia", Revised draft report of the OxCarre Project for the Revenue Watch Institute, University of Oxford, UK

Arellano, J. P. (2008): "La Importancia de Chile para el Desarrollo de Chile", Presentación Seminario CESCO, Santiago.

Aron, J., and I. Elbadawi (1992, May): "Parallel Markets, the foreign exchange auction and exchnage rate unification in Zambia". *Research Policy Working Paper (WPS) No.909*, World Bank.

Asafaha, S. (2007): "National Revenue Funds. Their efficacy for fiscal stability and intergenerational equity", International Institute for Sustainable Development, Canada.

Auty, R. (1991): "Mismanagement mineral dependence: Zambia 1970-1990l". *Resources Policy*, 170-183.

Auty, R. (2008). "Political Economy of African Mineral Revenue Deployment: Angola, Botswana, Nigeria and Zambia Compared", WP 28/2008,

Auty, R.M. y R.F. Mikesell (1998): "Sustainable Development in Mineral Economies", Claredon Press, Oxford.

Bande, J. and R. Ffrench-Davis (1989): "Copper policies and the Chilean economy: 1973-88", *Notas Técnicas Nº 132*, CIEPLAN, Santiago.

Bates, R., and P. Collier (1995): "The politics and economics of policy reform in Zambia", *Journal of African Economies*, 4 (1), 115-143.

Bigsten, A., and S. Kayizzi-Mugerwa (2000): "The political economy of policy failure in Zambia", *Working Papers in Economics n° 23*, Department of Economics, Göteborg University.

Bostock, M. and C. Harvey (1972): "Economic Independence and Zambian Copper. A Case Study of Foreign Investment". New York: Praeger Publishers.

Cashin, P. and J.C.McDermott (2002) 'The long run behavior of commodity prices; small trends and big volatility' *IMF Staff Papers* vol 49(2) pp 175-199.

CNE (2009): “Estadísticas Sectoriales”. Comisión Nacional de Energía, Santiago.

COCHILCO (2008): “Claves del cobre en un año de crisis, Recopilación de Estudios”, Comisión Chilena del Cobre, 2008.

COCHILCO (2009): “El Futuro de la Minería en Chile”, Presentación Escuela de Ingeniería en Minas, Universidad de Chile, Santiago.

Collier, P and B. Goderis (2007), “Prospects for Commodity Exporters: Hunky Dory or Humpty Dumpty?”, *World Economics*, 8 (2): 1-15

Daniel, P. (1992). “Economic Policy in Mineral Exporting Countries: What have we learned?”. In J. Tilton (Ed.), *Mineral Wealth and Economic Development*. Washington, DC: Resources for the Future.

Davis, J., R. Ossowski, J. Daniel and S. Barnett (2001): “Stabilization and Savings Funds for Nonrenewable Resources”. *IMF Occasional Paper 205*. International Monetary Fund. Washington. 2001.

De Gregorio, J. (2006): “Bonanza del Cobre: Impacto Macroeconómico y Desafíos de Política”, *Estudios Públicos*, N° 103, pp. 17-42, invierno.

Dinh, T.H., A. Adugna and B. Myers (2002): “The Impact of Cash Budgets on Poverty Reduction in Zambia: A Case Study of the Conflict between Well-Intentioned Macroeconomic Policy and Service Delivery to the Poor”, *World Bank Policy Research Working Paper 2914*, Washington DC.

Dyer, G (2006): “China: Feeding a growing appetite”. *The Financial Times*, 9 May 2006.

Engel, E., M. Marcel and P. Meller (2007): “Meta de Superávit Estructural: Elementos para su Análisis”, report prepared for the Ministry of Finance of Chile, Santiago.

Fasano, U. (2000): “Review of the experience with oil stabilization and savings funds in selected countries”. *IMF Working papers, WP/00/112*. International Monetary Fund. Washington. June 2000.

Fraser Institute. (2008). *Fraser Institute Annual: Survey of Mining Companies (2007/2008).* Fraser Institute . Vancouver: Fraser Institute.

Gelb, Alan and Associates (1988): Oil Windfalls: Blessing or Curse? World Bank: Oxford University Press.

GRZ (2008): “Budget Speech” Ministry of Finance and National Planning, Government of the Republic of Zambia, Lusaka.

GRZ (2009a): “Foreign Private Investments and Investor Perceptions in Zambia 2007/2007”, *Report of Survey Conducted by the Bank of Zambia*, Central Statistical Office and the Zambia Development Agency, Lusaka.

GRZ (2009b): “Budget Speech” Ministry of Finance and National Planning, Government of the Republic of Zambia, Lusaka.

Gulhati, R (1989): “Impasse in Zambia: the economics and politics of reform”, *World Bank Economic Development Institute Development Policy Case Studies No.2*.

Harchaoui, Tarek M. and P. Lasserre (2001): “Testing the Option Value Theory of Irreversible Investment”, *International Economic Review* 42 (1): 141-166

Heimlich, E. (2008): “China, Desarrollo Económico y Consumo de Cobre”. Santiago: COCHILCO.

Humphreys, M., and M.E. Sandbu. (2007): “The political economy of natural resource funds”. In M. Humphreys, J.D. Sachs, and J.E. Stiglitz (Eds.), *Escaping the resource curse*. New York: Columbia University Press.

IMF (2006), “Zambia: Selected Issues and Statistical Appendix”, *Country Report No. 06/118,* Washington DC.

IMF (2008): “Zambia: request for three-year agreement under PRGF”; *staff assessment IMF Country Report 08/187*.

Kaunda, F (2002) Selling the Family Silver: The Zambian Copper Mines Story (Interpak Books, Kwa-Zulu Natal).

King, M. (2005): “Monetary Theory: Practice ahead of Theory”. *Mais Lecture*, London.

Kydd, J. (1988), “Coffee after Copper? Structural Adjustment, Liberalization, and Agriculture in Zambia”, *The Journal of Modern African Studies*, 16 (2): 227-251

Larraín, F., J. Sachs, and A. Warner (1999): “A structural analysis of Chile´s long term growth: history, prospects and policy implications”, mimeo, Min. de Hacienda, Chile, September.

Lederman D. and W. Maloney (2001): “Open questions about the link between natural resources and economic growth: Sachs and Warner revisited”, mimeo, World Bank, Washington D.C.

Maloney, W. (2002): “Missed Opportunities: Innovation, Natural Resources and Growth in Latin America.” *Economia*, 3(1): 111-150.

Manzano, O. and R. Rigobón (2001): “Resource curse or debt overhang”, NBER *Working Paper No. 8390*, July.

McPherson, M. F. (1995): “The sequencing of economic reforms: lessons from Zambia”. Special Programme of Assistance for Africa. Paris.

Mehlum, H., K. Moene and R. Torvik (2006): “Institutions and the Resource Curse”. *Economic Journal*, 116, 1 –20.

Meller, P. (1996): “La “maldición” de los recursos naturales”, *Archivos del Presente*, Año 2, No. 6, Buenos Aires, (195-211).

Meller, P. (2002): “Dilemas y Debates en Torno al Cobre”. Santiago: Dolmen Ediciones.

Mining Review. (2007): “Zambia: Lumwana, copper in 2008. Uranium and more copper later”. *Mining Review Africa Issues*, 10-13.

Ministry of Finance (2009): “Informe Anual Fondos Soberanos 2008”. Disponible en http://www.minhda.cl/fondos_soberanos/informes_anual_fondos_soberanos.php. Santiago.

Morandé, F. and J. Quiroz (1996): “The copper boom in the Chilean economy: What should we expect?”, *Dirección de Estudios DE/16/96*, COCHILCO, Santiago.

Muhanga, I. and K. Soteli (2009): “Foreign Portfolio investors in Africa: the Case of Zambia,” In *Measuring Financial Innovation and its Impact*, IFS Bulletin No 31, Proceedings of the IFC Conference, Bank for International Settlements (BIS), Basel, 26 – 27 August 2008.

Musonda, A (2008), “Real Exchange rate Volatility and Non-Traditional exports performance: Zambia, 1965-1999, AERC Research Paper 185, African Economic Research Consortium (AERC), Nairobi.

Mwanawina, I. and J. Mulungushi (2008): “Zambia” in Ndulu, B., S.O’Connell, J-P Azam, R.H.Bates, A.K.Fosu, J-W Gunning and D.Njinkeu (eds) *The Political Economy of Economic Growth in Africa 1960-2000* (Cambridge, Cambridge University Press).

Peterson Institute for International Economics (2008): “A Scoreboard for Sovereign Wealth Funds”, Washington. 2008.

Pimentel, S. (2008): “Consumo de Energía y Emisiones de Gases de Efecto Invernadero de la Minería del Cobre de Chile”. Year 2008. Santiago: COCHILCO.

Potts, D. (2005). “Counter-Urbanization on the Zambian Copperbelt? Interpretations and Implications”. *Urban Studies*, 42 (4), 583-609.

Radetski, M. (2008): “A Handbook of Primary Commodities in the Global Economy”. Cambridge, Cambridge University Press.

Robinson, J., R. Torvik and T. Verdier, (2006): “The Political Foundations of the Resource Curse”, *Journal of Development Economics*, 79 (2006), 447-468.

Rodríguez, J., C. Tokman and A. Vega (2007): "Structural balance policy in Chile, OECD", *Journal of Budgeting*, vol. 7(2), pp. 59-92.

Sachs, J.D., A. Warner, (1995): "Natural resource abundance and economic growth". *NBER Working paper no. 5398*.

Soros. (2007): Foreword in M. Humphreys, J.D. Sachs, and J.E. Stiglitz (Eds.), *Escaping the resource curse*. New York: Columbia University Press.

Spilimbergo, A., (1999): "Copper and the Chilean economy, 1960-98", *IMF Working Paper*, Washington D.C., April.

Stijns, J., (2003): "An Empirical Test of the Dutch Disease Hypothesis using a Gravity Model of Trade", mimeo, UC Berkley.

Torvik, R., (2001): "Learning by doing and the Dutch disease". *European Economic Review* 45, 285– 306.

Vivanco, J. M. (1986): "Propiedad y concesión en la ley minera", in Ernesto Tironi, ed. *Desarrollo Minero: Evolución y Desafíos para Chile*, CED-Ed. Universitaria, Santiago, (125-154).

World Bank. (1996): "Zambia: Economic Recovery and Investment Promotion". Washington DC: World Bank.

World Bank. (1996): "Zambia: Prospects for sustainable growth,1995-2005". Washington: World Bank.

World Bank (2001): "From Natural Resources to the Knowledge Economy", World Bank Latin American and Caribbean Studies, Washington D.C.

World Bank. (2002, December): "Zambia: Privatization Review, Facts, Assessment and Lessons". Report prepared at the request of the Minister of Finance and National Planning .

Wright, G. and J. Czelusta (2004): "The myth of the resource curse." *Challenge* 47(2): 6-38.

Appendix

Appendix 1: Privatization Packages

Table A1 summarizes the transactions composing the privatization of ZCCM. The table reports the units sold and amounts paid, including ZCCM equity stake in the new privatized companies and the investment commitments made by the purchasers at the time of purchase. The following notes provide more detail on all packages except the major mining assets (packages A and C). See text for details.

Chibuluma (Package A1) [separated from Package A]

Chibuluma mine was originally packaged with Nchanga and Nkana mines. However, given the complexity of the larger two mines it was sold as a separate unit to Metorex Consortium, a South African company forming Chibuluma Mines plc. The actual terms of payment were an outright cash payment of US$17.5 million and US$7.6 million payable later, subject to the improvement in copper and cobalt prices. A total of US$34.0 million was pledged as investment commitment to develop Chibuluma South.

Luanshya/Baluba mine (Package B)

Luanshya division was sold to the Binani Group of India in October 1997, being renamed the Roan Antelope Mining Company of Zambia (RAMCOZ). Luanshya division comprised of the mine and a metallurgical complex. The Binani Group's lack of mining experience resulted in severe operational problems, culminating in serious liquidity problems. The mine incurred huge losses and it became increasingly difficult to procure basic materials, including paying for power supply to the mine. The Copperbelt Energy Company (CEC) which was the main supplier of electricity to RAMCOZ eventually disconnected power supply for non-payment of bills, paralyzing RAMCOZ's mining and metallurgical operations, bringing production to a complete halt and RAMCOZ was placed under receivership and eventually went into liquidation.

The mine was subsequently sold to J &W Investment of Switzerland for US$8.0 million (for an 85% equity share) and an investment commitment of US$28.0 million to refurbish Baluba mine. The company was Luanshya Copper Mines (LCM).

Chambishi mine (Package D)

The first offer of Chambishi mine was made to a Canadian firm, Ivanhoe Capital Corporation. The package comprised of the cobalt and acid plants and Nkana slag dumps. However during the course of the discussions, copper prices dipped, prompting Ivanhoe to withdraw its bid of US$ 100 million. After some delays on finding a new buyer, the mine was subsequently sold to China Non-Ferrous Metals (CNFM) in September 1998 for US$ 20 million.

Kansanshi Copper Mine (Package E)

The sale of Kansanshi Copper Mine in North-Western Zambia was concluded on 14 March 1997 with Cyprus Amax forming Cyprus Amax Kansanshi PLC, a subsidiary of the Phelps Dodge Corporation of the US. Since the mine was non-functional, the deal involved specific requirements to redevelop it and undertake further explorations for new ores. In 2001, Phelps Dodge sold its 80% interest in Cyprus Amax PLC to First Quantum Minerals Ltd for US $50,000.

Chambishi cobalt and acid plant (Package G)

The Chambishi cobalt and acid plant was sold to Avmin of South Africa in August 1998 for US$50 million in cash plus US$90 million in committed investment. The initial bid was from the Kafue Consortium, but this fell through following the disbanding of the Consortium.

Ndola Precious Metals Plant (Package H)

Initially only one bid was received from First Quantum of Canada. This was rejected by the Negotiation Team and the plant was sold to the Binani Group for US$ 0.35 million cash and investment commitment of US$1.4 million. Binani's problems at RAMCOZ extended to Minerva as management was continuously embroiled in labour disputes related to deterioration in working conditions. Minerva was sold to J&W Investments along with RAMCOZ (package B).

Konkola North (Special Package I)

The sale of Konkola North was conducted as part of a special package, resulting from the split of Konkola Mine into two sections. Konkola North, the second of the two emerging components of Konkola Mine had no operating mine but comprised a shaft which had been disused since 1956. Through competitive tendering process, Avmin purchased Konkola North while ZCCM-1H retained 15-20% interest. Under the terms of the agreement Avmin committed to fund an extensive drilling program and to conduct a pre-feasibility study on the development of the deposit. If AVMIN was unable to develop the project within five years the rights over the concession and the drilling results were to revert in full to ZCCM-IH.

Power Division (Package J)

The ZCCM Power Division distributed electrical power from the National Grid to the operating divisions of ZCCM and also provided ancillary services such as civil and electrical construction and the movement of materials to support production across other ZCCM mine divisions. This package received the most bids and was sold in November 1997 to the National Grid of the UK. The company was renamed the Copperbelt Energy Corporation (CEC).

Annex Table 1: Major unbundled privatized ZCCM units

A1	Chibuluma (originally part of **A**)	Meterox (South Africa)	Oct-97	Chibuluma Mines plc	15 percent	US$17.5 million	-	US$7.6 million	US$34.0 million	15 years
B	Luanshya Division	Binani Industries (India) [1]	Jun-97	Roan Antelope Mining Company (RAMCOZ) plc	15 percent	US$35.0 million	-	-	US$69.0 million	15 years
C	Mufulira Division and Nkana	Glencore and First Quantum (Canada)	Mar-00	Mopani Copper Mines	10 percent	US$20.0 million	US$23.0 million	US422.0 million	US$159.0 million	20 years
D	Chambishi Copper Mine	China Non-Ferrous Metal Industries (China)	Jun-98	NFC Africa Mining plc	15 percent	US$20.0 million			US$70.0 million	
E	Kansanshi Copper Mine	Cyprus Amax Minerals (US)	Jan-97	Cyprus Amax Kansanshi plc	15 percent	US$3.0 million			US$30.0 million	15 years
G	Chambeshi Cobalt and Acid Plant	Avmin Ltd (South Africa)	Sep-98	Chambishi Metals plc	10 percent	US$50.0 million		US$45.0 million	US$70.0 million	15 years
H	Ndola Precious Metals Plant	Binani Industries (India) [1]	Jun-97	Minerva	15 percent	US$0.35million			US$1.4 million	15 years
I	Konkola North (special package)	Avmin Ltd (South Africa) [2]	Sep-98		20 percent	US$8.5million			US$12 million	
J	Power Division	Midland Power and National Grid (UK)	Nov-97	Copperbelt Energy Company (CEC)	20 percent	US$50.0 million	US$73.0m in debt	US$7.5 million	US$25.5 million	

Source: Mining Journal, 2000; Craig, 2001

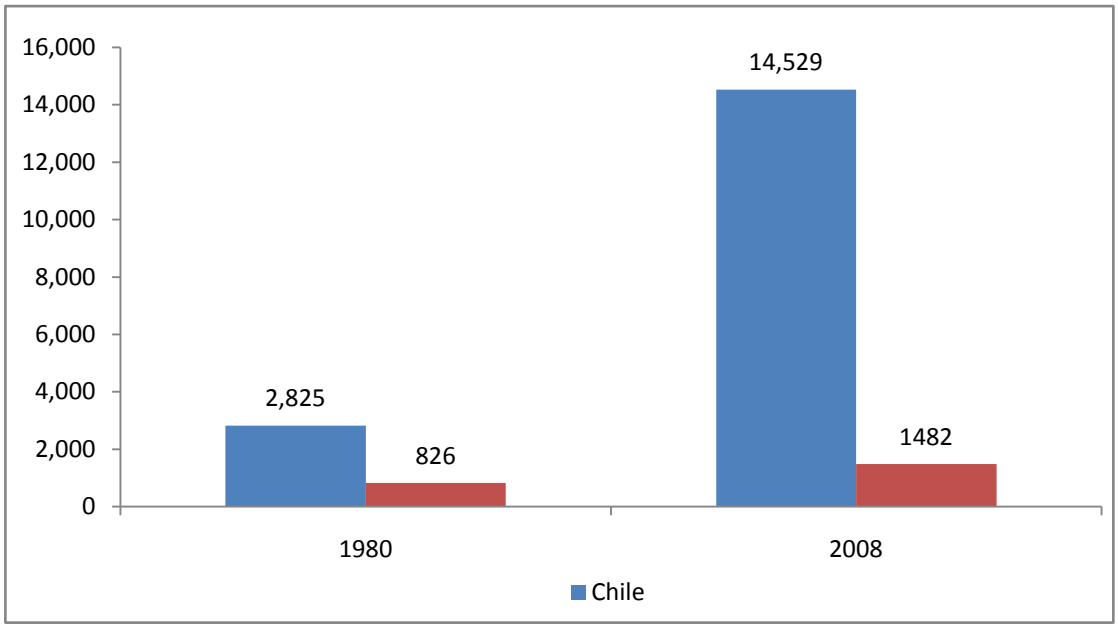
Notes: [1] RAMCOZ and Minerva experienced severe financial and operation problems in its first year of operation and was put into receivership in 1997

The company was sold to J&W Investments of Switzerland in 1998 for US$8million and an investment commitment of US$28m. The mine was renamed Luanshya Copper Mines plc.

[2] The Konkola North mine has been closed (and flooded) since 1956. This was an exploration concession. As of 2008, a major investment by Teal of Canada is under consideration

Growth in Chile and Zambia

Figure 1: GDP per capital (PPP, Current U$) in 1980 and 2008 for Chile and Zambia



Source: World Economic Outlook.

Annex Table 1: World copper: Production, Exports, Reserves and main country producers shares- 1980-2008

	World production kMT Copper Content	Global Copper Exports kMT Copper Content	Chile (Share of World)			Zambia (Share of World)			USA (Share of World)			Australia (Share of World)			Peru (Share of World)		
			Production	Exports	Reserves	Production	Exports	Reserves	Production	Exports	Reserves	Production	Exports	Reserves	Production	Exports	Reserves
1980	7713.9		14%														
1981	8157.9		13%														
1982	8038.4		15%														
1983	8101.0		16%														
1984	8257.6		16%														
1985	8404.5		16%														
1986	8393.2		17%			6%			14%			3%			5%		
1987	8746.5		16%			5%			14%			3%			5%		
1988	8686.7		17%			5%			16%			3%			4%		
1989	9025.3		18%			5%			17%			3%			4%		
1990	8956.5		18%			5%			18%			4%			4%		
1991	9099.4		20%			4%			18%			4%			4%		
1992	9458.1	6588.8	20%	29%		5%			19%			4%			4%		
1993	9474.4	6868.2	22%	29%		4%			19%			4%			4%		
1994	9574.9	6907.6	23%	30%	28.4%	4%		3.9%	19%		14.5%	4%		2.3%	4%		2.3%
1995	10181.4	8008.5	24%	30%	28.4%	3%		3.9%	18%		14.5%	4%		2.3%	4%		2.3%
1996	11110.7	9025.5	28%	33%	27.5%	3%		3.8%	17%		14.1%	5%		2.2%	4%		2.2%
1997	11478.8	9368.5	30%	35%	25.9%	3%		3.5%	17%		13.2%	5%		2.1%	4%		5.6%
1998	12272.7	10050.2	30%	36%	25.9%	3%		3.5%	15%		13.2%	5%		2.1%	4%		5.6%
1999	12749.4	10856.4	34%	39%	25.9%	2%	2%	3.5%	13%	1%	13.2%	6%	5%	2.1%	4%	5%	5.6%
2000	13246.5	11522.7	35%	39%	25.9%	2%	2%	3.5%	11%	3%	13.2%	6%	5%	2.1%	4%	4%	5.6%
2001	13756.7	12311.7	34%	38%	33.3%	2%	3%	4.0%	10%	1%	7.3%	6%	6%	5.0%	5%	5%	7.3%
2002	13565.4	11788.9	34%	38%	31.9%	2%	3%	4.0%	8%	1%	7.4%	7%	6%	5.1%	6%	7%	6.4%
2003	13696.1	11842.3	36%	40%	31.9%	3%	3%	4.0%	8%	1%	7.4%	6%	6%	5.1%	6%	6%	6.4%
2004	14721.1	12383.8	37%	44%	31.9%	3%	3%	4.0%	8%	2%	7.4%	6%	5%	5.1%	7%	7%	6.4%

2005	15188.3	13361.5	35%	40%	31.3%	3%	3%	4.0%	8%	2%	7.3%	6%	5%	5.0%	7%	8%	6.3%
2006	15210.4	13530.1	35%	39%	30.6%	3%	4%	3.9%	8%	4%	7.1%	6%	5%	4.9%	7%	7%	6.1%
2007	15649.9	14039.4	36%	40%	29.1%	3%	4%	3.5%	7%	3%	6.4%	6%	5%	4.4%	8%	8%	10.9%
2008	15588.6	13824.1	34%	39%	36.0%		4%			3%			6%			9%	

Source: Central Bank of Chile, COCHILCO, Ministry of Finance of Chile, U.S. Geological Survey.

Annex Table 2: Chilean copper production, reserves, exports, fiscal revenue, GDP share and employment.- 1980-2008

	Production	Reserves	Exports	Fiscal Income			Copper	
	kMT Copper Content	kMT Copper Content	Million USD, current dollars	Total Fiscal Revenue (Millions US$)	Fiscal Revenue from copper (Millions US$)	Share of Fiscal Revenue (%)	share/GDP (%)	Copper Mining Employment Share (%)
1980	1068		2153					
1981	1081		1713					
1982	1242		1670					
1983	1258		1850					
1984	1291		1570					
1985	1356		1760	4360	436	10%		
1986	1401		1750	4718	472	10%		
1987	1418		2227	5925	592	10%		
1988	1451		3477	7013	1473	21%		
1989	1609		3945	7922	1981	25%		1.0%
1990	1588		3850	7619	1524	20%		1.0%
1991	1814		3603	8494	886	10%		1.0%
1992	1933		3910	10338	1030	10%		1.0%
1993	2055		3266	10771	496	5%		0.8%
1994	2220	88000	4485	12137	1003	8%		0.8%
1995	2489	88000	6392	15502	1898	12%		0.8%
1996	3116	88000	5839	16513	1308	8%	6%	0.8%
1997	3392	88000	6851	17874	1520	9%	6%	0.7%
1998	3687	88000	5324	16735	488	3%	6%	0.6%
1999	4391	88000	6164	14880	456	3%	7%	0.6%
2000	4602	88000	7286	16272	941	6%	7%	0.6%
2001	4739	160000	6526	14909	499.6	3%	7%	0.6%
2002	4581	150000	6279	14187	499.2	4%	7%	0.6%

2003	4904	140000	7553	15311	979.5	6%	7%	0.6%
2004	5413	140000	14530	21053	3917.7	19%	7%	0.6%
2005	5321	150000	17763	28132	5822.3	21%	6%	0.6%
2006	5361	150000	33351	37830	11756.4	31%	6%	0.6%
2007	5557	160000	37913	45043	11578.7	26%	6%	0.7%
2008	5328		36550	44746	11029	25%	5%	0.7%

Source: Central Bank of Chile, COCHILCO, Ministry of Finance of Chile, U.S. Geological Survey.

Annex Table 3: Main Copper Import Countries.- 2000-2008

	2000	2002	2004	2006	2008(p)
China	11.4	16.0	17.6	14.4	23.6
Japan	14.4	12.3	11.8	11.2	11.5
Germany	8.2	6.7	7.6	9.6	9.0
USA	11.1	12.7	7.6	9.9	7.2
South Korea	7.0	7.4	7.5	6.6	6.7
Italy	5.6	5.7	6.0	6.1	4.9
Taiwan	5.8	5.8	6.0	5.1	4.7
France	5.4	5.1	5.1	4.0	3.5
India	1.2	1.6	2.0	4.9	3.3
Brazil	2.6	1.9	2.5	2.5	3.0
Spain	2.6	2.7	2.3	2.7	2.9
Turkey	1.8	1.7	2.1	1.4	2.6
Thailand	1.4	1.7	1.9	2.1	2.1
Belgium	2.3	2.2	2.7	2.3	2.1
Other countries	16.3	14.3	14.1	14.0	11.1
Total imports(1) (kMT Copper Content)	**10,927.9**	**11,254.9**	**11,598.0**	**12,644.9**	**12,549.5**

(1) Includes global imports of copper concentrates and blister and refined copper.

(p) Estimated.

Source: World Metal Statistics April 2009 and Yearbook 2008.

Annex Table 4: Chilean copper exports.- 1980-2008

	Copper share in the export basket	Copper export/GDP (%)
1980	46%	8%
1981	44%	5%
1982	46%	7%
1983	48%	9%
1984	43%	8%
1985	46%	11%
1986	42%	10%
1987	43%	11%
1988	49%	14%
1989	49%	14%
1990	46%	12%
1991	40%	10%
1992	39%	9%
1993	35%	7%
1994	38%	8%
1995	39%	9%
1996	38%	8%
1997	41%	8%
1998	35%	7%
1999	38%	8%
2000	38%	10%
2001	36%	10%
2002	34%	9%
2003	35%	10%
2004	45%	15%
2005	45%	15%
2006	56%	23%
2007	56%	23%
2008	52%	22%

Source: COCHILCO, Central Bank of Chile.

Annex Table 5: Template Table Chile, 1980-2008

Year	Real Copper Price (BML, USD cents/lb.)	Real Exchange Rate (2000=100)	Inflation	GDP Growth (%)	Government Final Consumption Expenditure			Net Trade Balance (US$)
					US$	% GDP	Growth (%)	
1980	209.4	154.23	35.14	7.95	6,391,282,454	12.45	-8.10	-1,084,000,000
1981	152.7	183.06	19.69	6.21	6,227,561,584	13.15	-2.56	-3,285,000,000
1982	127.1	163.90	9.94	-13.59	6,112,752,446	15.32	-1.84	-411,000,000
1983	135.1	134.98	27.26	-2.80	5,968,691,599	14.19	-2.36	547,000,000
1984	114.2	133.51	19.86	5.89	6,163,469,010	14.47	3.26	-181,000,000
1985	118.1	105.82	30.70	1.97	6,147,102,461	13.42	-0.27	495,720,000
1986	117.9	90.50	19.48	5.60	6,213,810,218	12.58	1.09	627,760,000
1987	149.6	83.21	19.88	6.58	6,053,772,851	10.95	-2.58	854,900,000
1988	209.2	77.99	14.68	7.29	6,271,185,677	10.49	3.59	1,519,300,000
1989	218.2	79.99	17.03	10.61	6,506,987,144	10.27	3.76	1,022,540,000
1990	197.1	79.84	26.04	3.67	6,560,910,561	9.99	0.83	1,055,290,000
1991	172.6	83.22	21.79	7.97	6,795,585,488	9.96	3.58	1,518,700,000
1992	167.6	87.99	15.43	12.28	7,175,649,918	10.03	5.59	546,000,000
1993	138.3	89.79	12.73	7.00	7,485,063,475	10.47	4.31	-1,215,700,000
1994	165.2	92.91	11.44	5.71	7,630,149,831	10.44	1.94	581,000,000
1995	202.5	98.48	8.23	10.63	7,948,678,230	10.38	4.17	1,056,900,000
1996	154.3	100.45	7.36	7.40	8,191,601,095	10.97	3.06	-1,072,625,133
1997	153.4	107.80	6.13	6.71	8,664,317,750	11.12	5.77	-1,563,380,808
1998	114.3	105.82	5.11	3.27	8,859,241,731	11.49	2.25	-2,492,077,323
1999	107.8	100.81	3.34	-0.37	9,099,068,163	12.40	2.71	1,689,973,427
2000	117.6	100.00	3.84	4.46	9,367,849,265	12.46	2.95	1,400,054,678
2001	101.1	90.35	3.57	3.53	9,642,674,744	12.59	2.93	999,286,551
2002	102.2	87.35	2.49	2.16	9,939,415,870	12.83	3.08	1,684,100,883
2003	110.8	82.04	2.81	3.97	10,181,489,816	12.01	2.44	3,104,950,480
2004	168.2	86.96	1.06	6.04	10,797,958,958	11.42	6.05	8,839,293,613
2005	201.3	91.87	3.05	5.56	11,435,553,309	11.05	5.90	10,153,017,979
2006	351.5	96.66	3.39	4.59	12,101,853,321	10.43	5.83	22,148,921,951
2007	355.1	95.20	4.41	4.68	12,809,095,460	10.48	5.84	22,660,160,640
2008	315.3	97.32	8.72	3.16				8,199,617,849

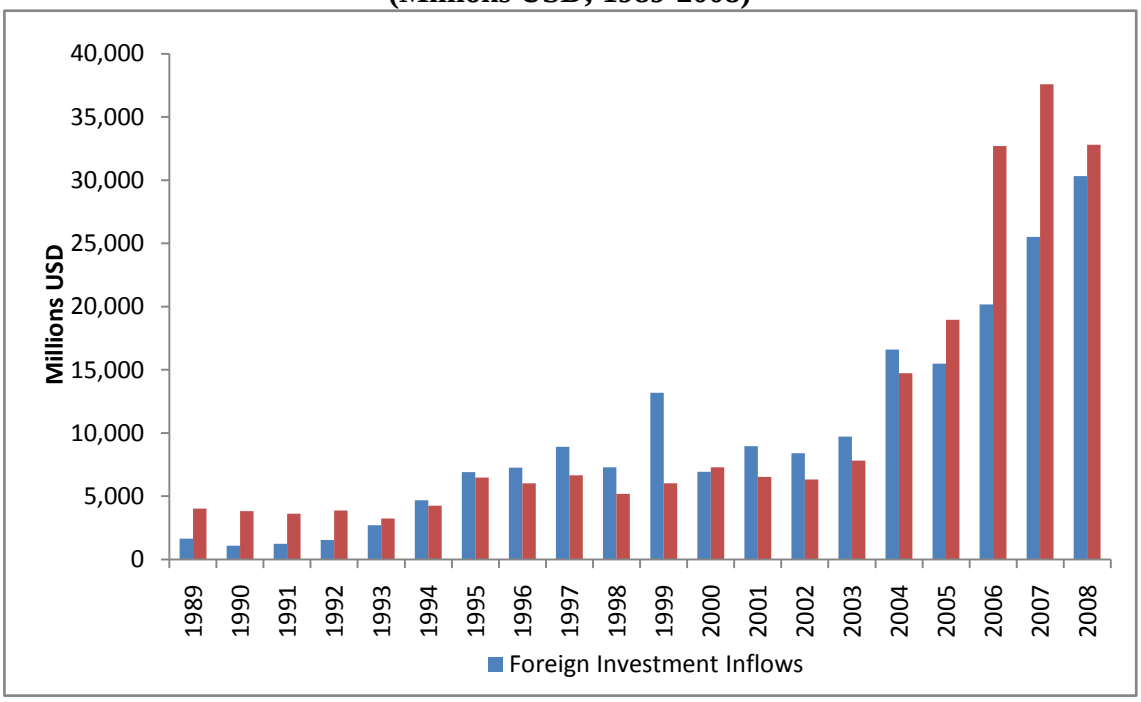
Sources: Cochilco, World Development Indicators, World Economic Outlook

Annex Table 6: Template Table Zambia, 1980-2008

Year	Real Copper Price (BML, USD cents/lb.)	Real Exchange Rate (2000=100)	Inflation	GDP Growth (%)	Government Final Consumption Expenditure			Net Trade Balance (US$)
					US$	% GDP	Growth (%)	
1980	209.4	110.61	11.73	3.85	806,731,463	25.51	12.23	-156,500,000
1981	152.7	108.49	14.00	6.63	928,204,276	28.29	15.06	-500,800,000
1982	127.1	147.32	12.50	-2.91	822,218,908	27.70	-11.42	-348,400,000
1983	135.1	117.45	19.69	-1.15	690,269,082	24.13	-16.05	-23,400,000
1984	114.2	109.76	20.02	-1.72	734,606,955	25.15	6.42	65,500,000
1985	118.1	103.96	37.43	1.24	698,620,625	23.85	-4.90	39,200,000
1986	117.9	51.37	54.80	1.70	705,149,488	26.85	0.93	22,900,000
1987	149.6	55.27	47.03	1.49	573,351,660	20.40	-18.69	91,500,000
1988	209.2	87.55	54.04	9.27	503,049,430	14.87	-12.26	271,300,000
1989	218.2	113.66	128.29	-3.66	631,203,105	13.73	25.48	207,800,000
1990	197.1	87.57	109.56	-0.58	747,361,437	19.03	18.40	-536,800,000
1991	172.6	83.22	97.70	-0.67	1,010,805,596	31.82	35.25	140,100,000
1992	167.6	79.80	165.73	2.05	910,286,809	15.01	-9.94	-91,500,000
1993	138.3	90.61	183.26	-0.08	436,027,409	18.43	-52.10	73,400,000
1994	165.2	87.14	54.61	-13.29	450,967,809	13.11	3.43	205,200,000
1995	202.5	83.43	34.91	-2.82	528,375,241	15.44	17.16	222,600,000
1996	154.3	90.05	43.10	6.95	574,271,053	18.27	8.69	45,000,000
1997	153.4	104.26	24.41	3.30	574,207,787	17.47	-0.01	-115,400,000
1998	114.3	98.68	24.46	-1.86	488,952,121	15.78	-14.85	-332,200,000
1999	107.8	99.14	26.79	2.22	394,050,731	12.91	-19.41	-297,200,000
2000	117.6	100.00	26.10	3.58	308,730,868	9.54	-21.65	-440,346,600
2001	101.1	112.02	21.70	4.89	353,427,725	10.16	14.48	-564,731,600
2002	102.2	110.93	22.20	3.30	419,474,641	11.84	18.69	-474,321,000
2003	110.8	101.78	21.40	5.12	545,270,954	14.40	29.99	-544,413,000
2004	168.2	108.21	17.97	5.40	708,852,240	18.07	30.00	-97,934,000
2005	201.3	136.45	18.33	5.31	873,933,574	9.70	23.29	-111,411,100
2006	351.5	179.96	9.02	6.25	1,096,710,344	10.23	25.49	934,323,000
2007	355.1	153.94	10.66	6.26	1,394,930,083	10.43	27.19	347,872,000
2008	315.3	145.65	12.45	5.75	1,764,488,966	9.03	26.49	322,900,000

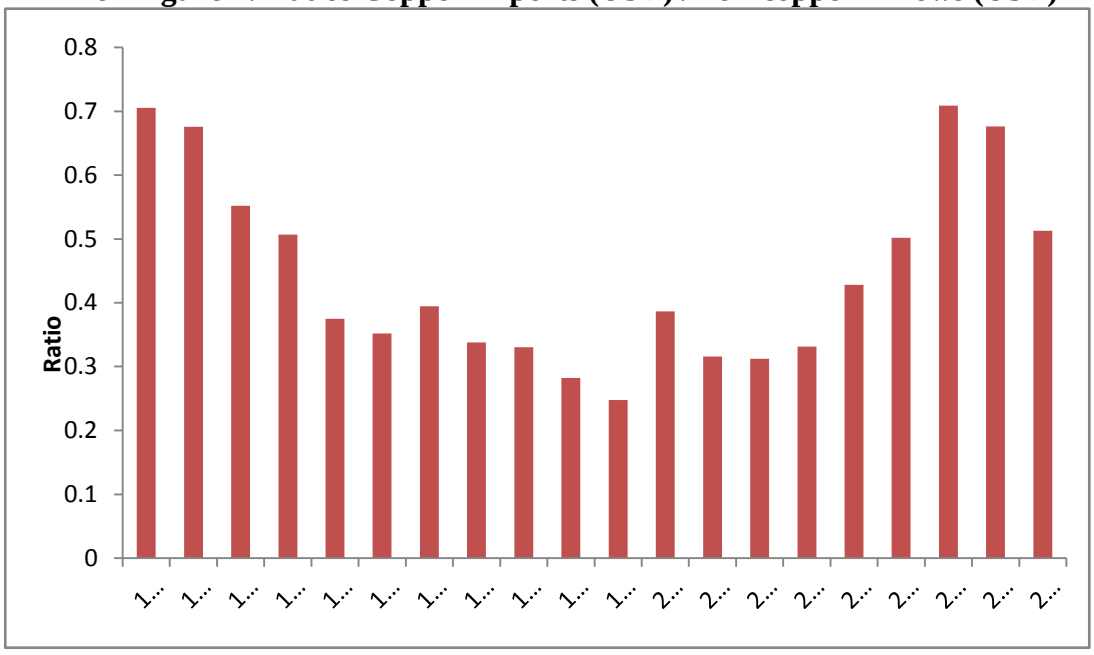
Sources: Cochilco, World Development Indicators, World Economic Outlook

Annex Figure 1: Foreign Investment Inflows and Copper Exports (Millions USD; 1989-2008)



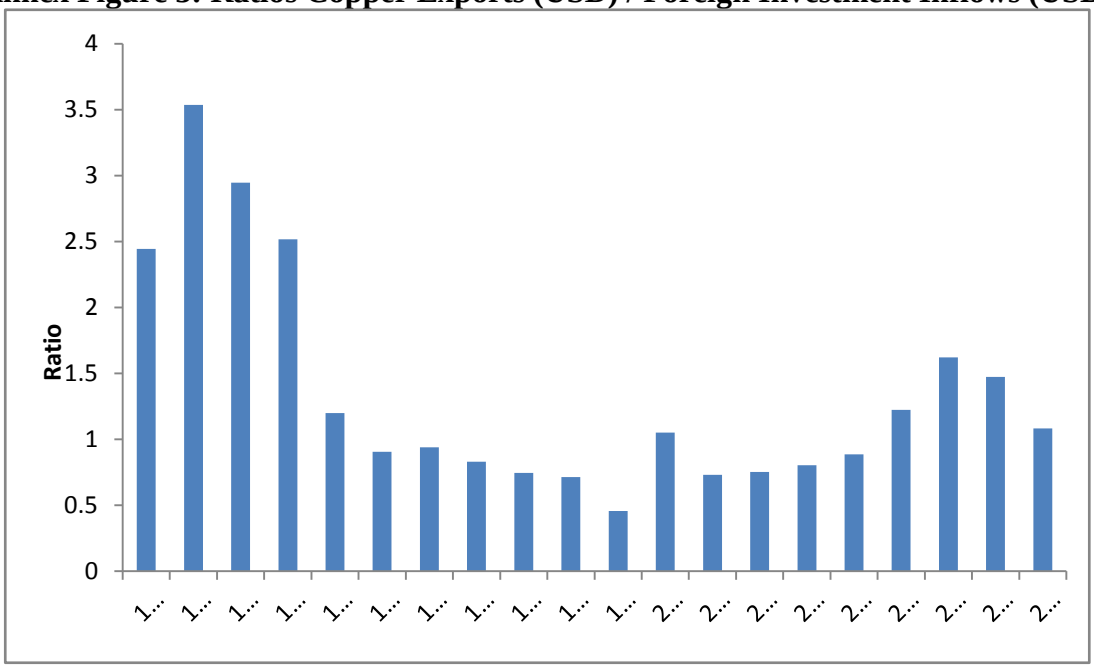
Source: Central Bank of Chile

Annex Figure 2: Ratios Copper Exports (USD) / non-copper Inflows (USD)



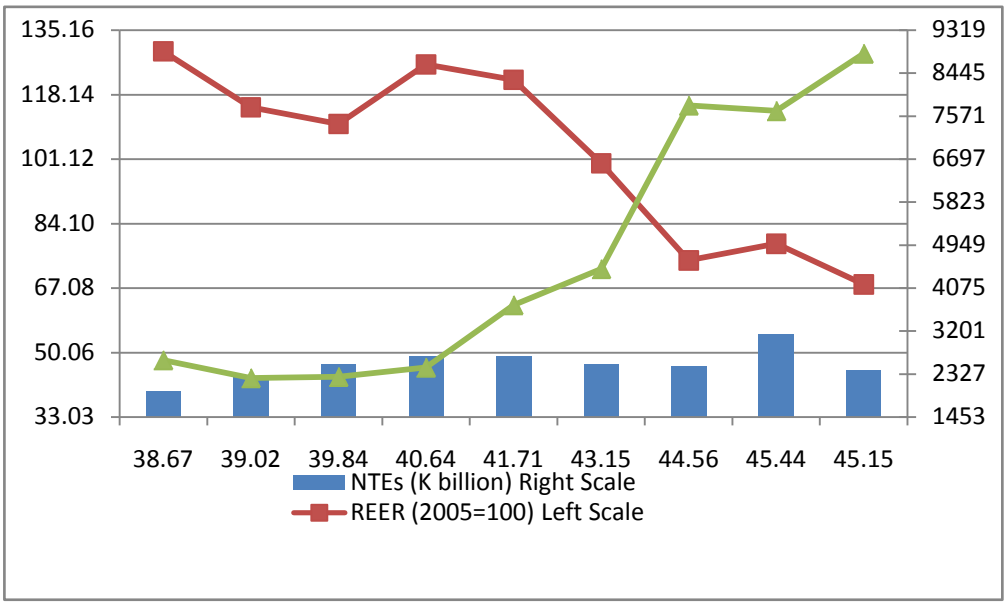
Source: Central Bank of Chile

Annex Figure 3: Ratios Copper Exports (USD) / Foreign Investment Inflows (USD)

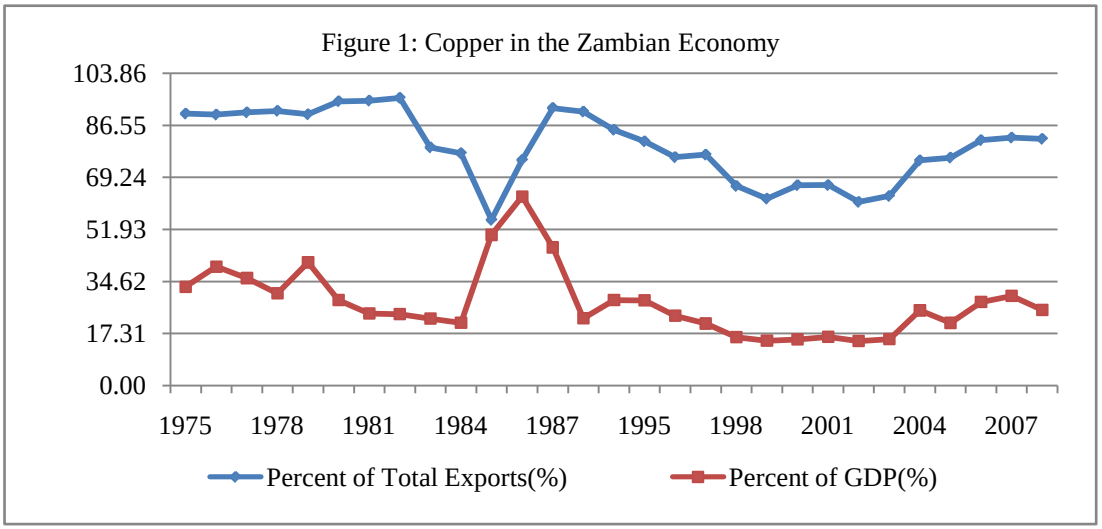


Source: Central Bank of Chile

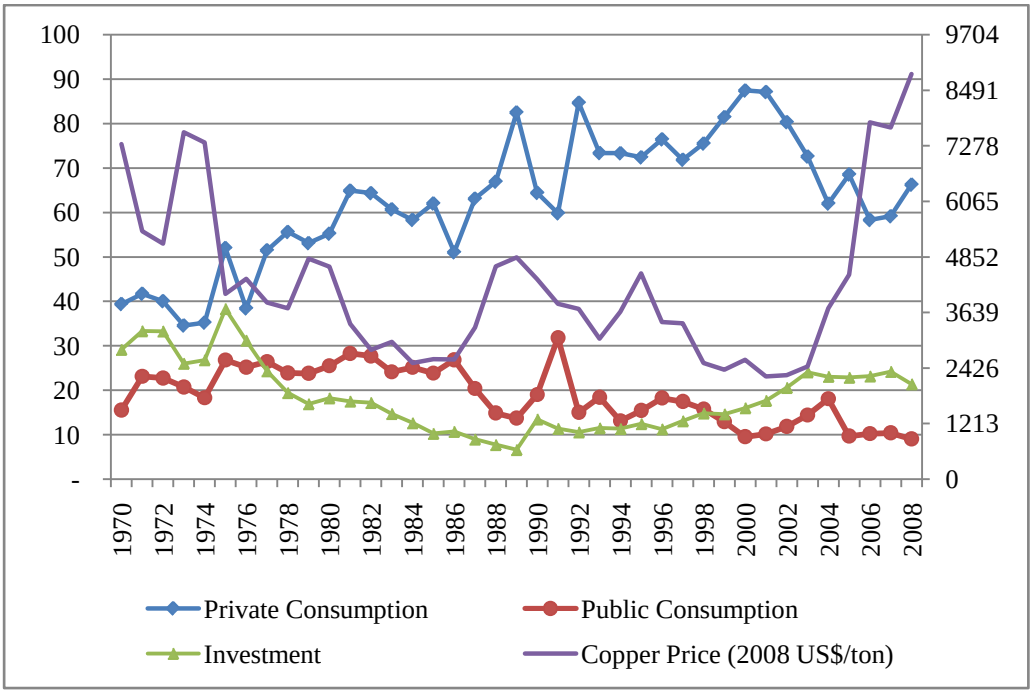
Annex Figure 4: Zambia - Copper Boom and Non-Traditional Exports



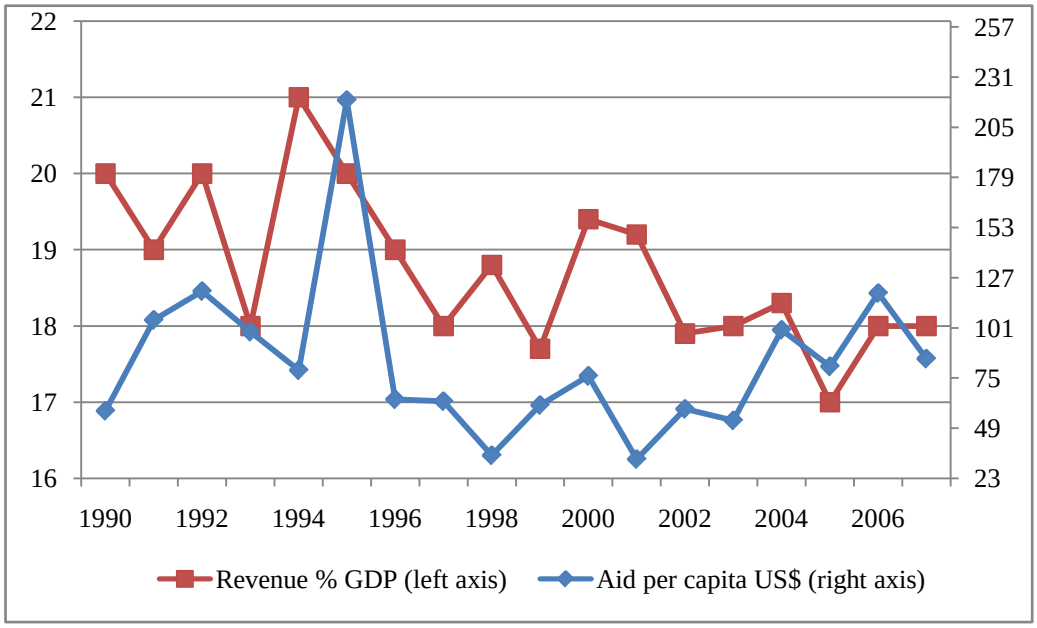
Annex Figure 5: Copper in the Zambian Economy



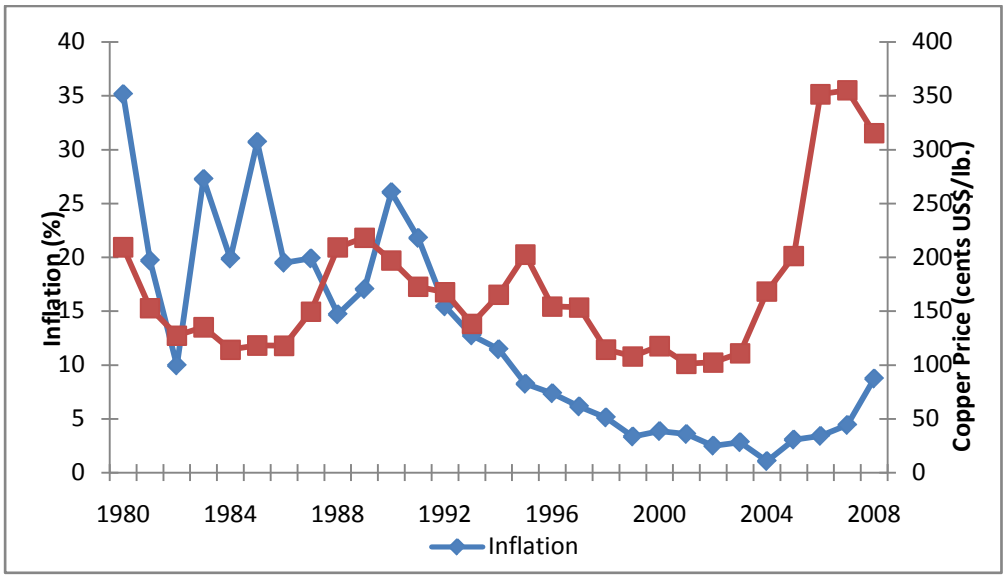
Annex Figure 6: Copper Price and Components of Domestic Absorption



Annex Figure 7: Domestic revenue and aid per capita

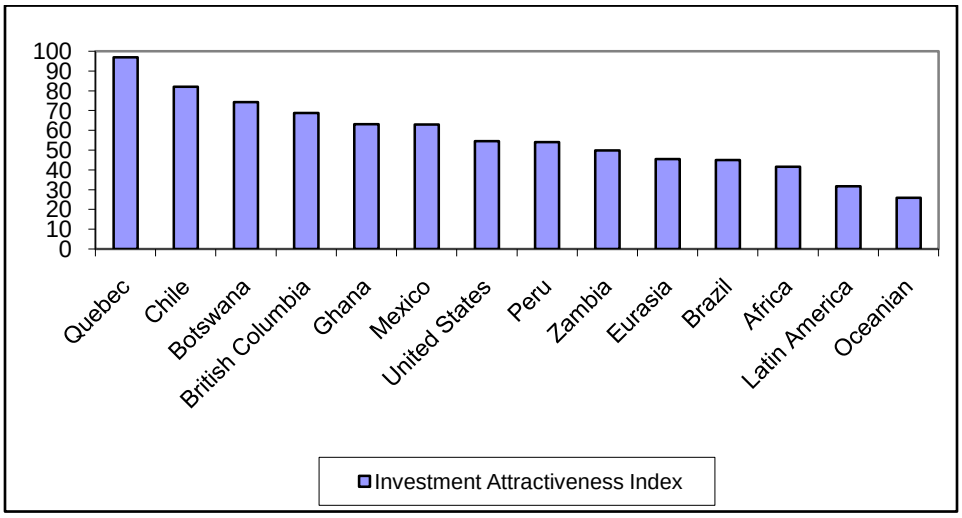


Annex Figure 8: Chile – Inflation and Copper Price



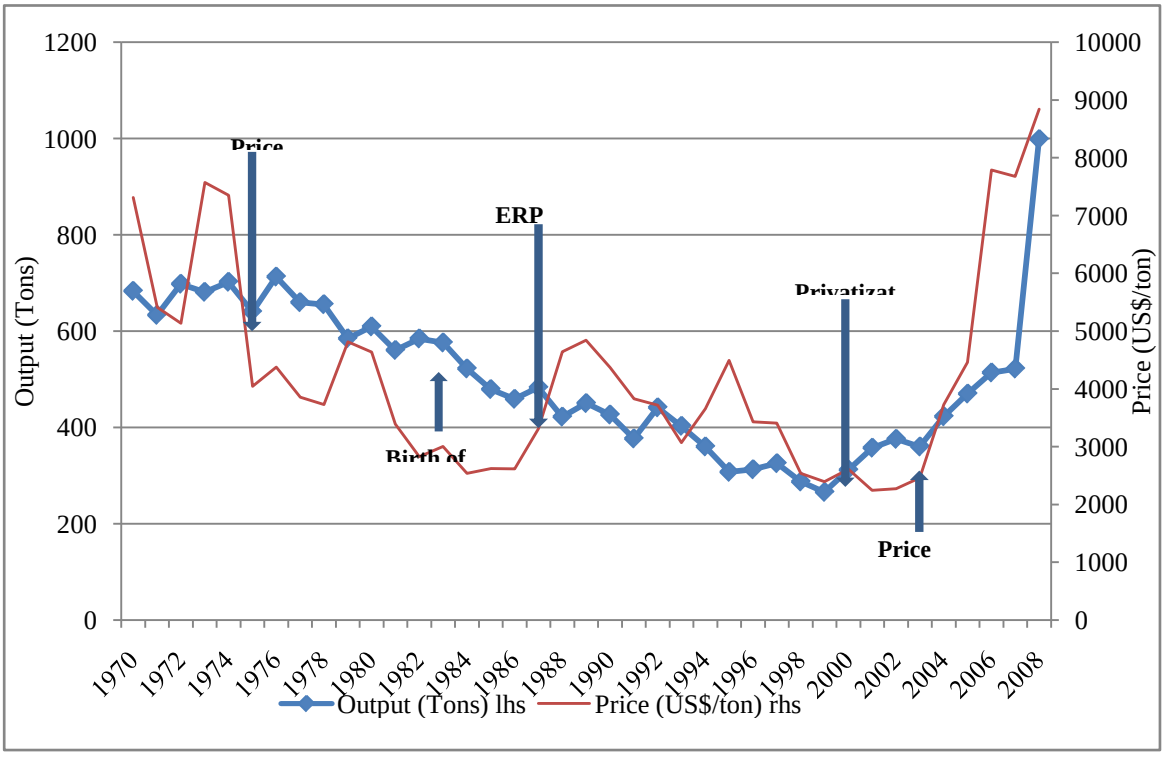
Source: Central Bank of Chile and COCHILCO.

Annex Figure 9: Investment Attractiveness of Mining Index - 2008

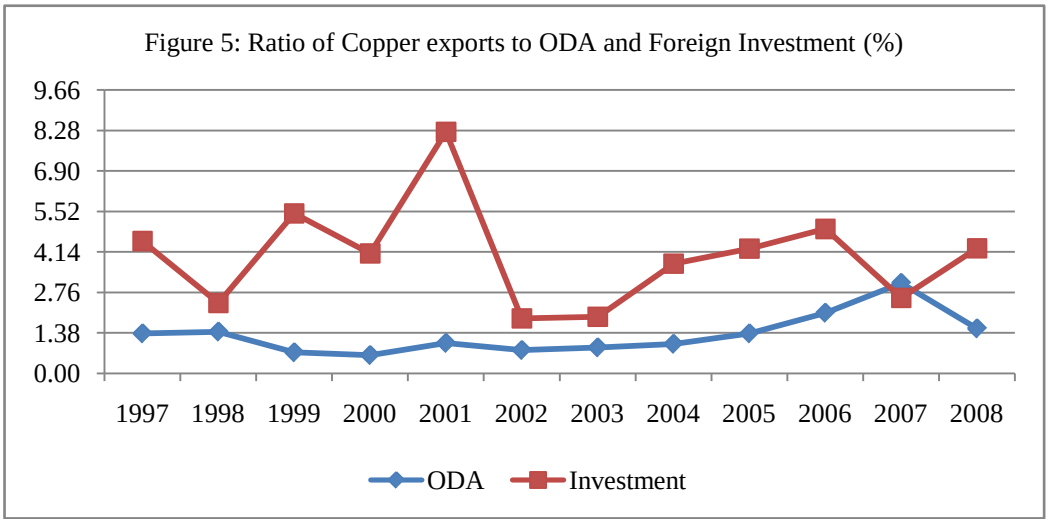


Source: The Fraser Institute. World Mines Ministries, Forum 2008.

Annex Figure 10: Zambia Copper Story, Output vs. Constant Price

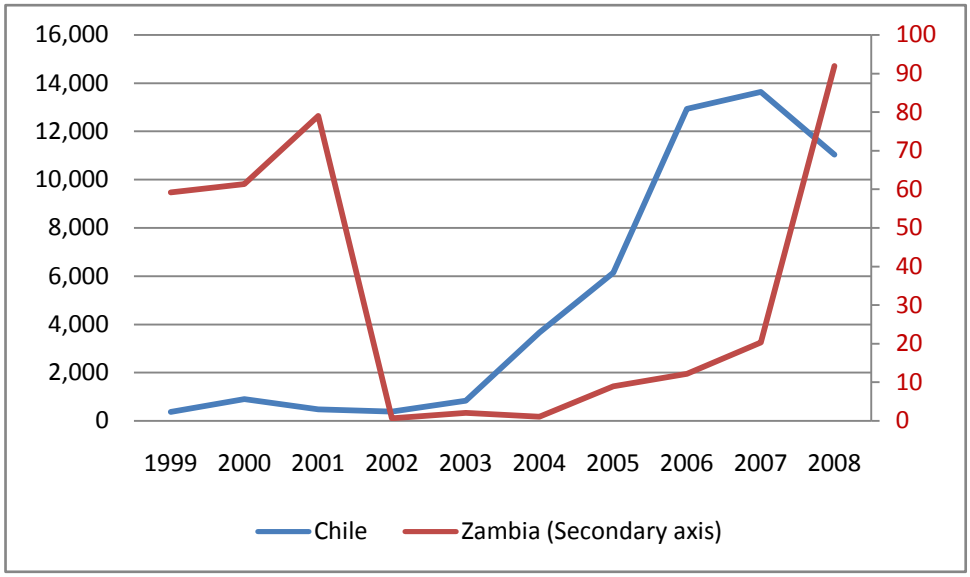


Annex Figure 11: Ratio of Copper exports to ODA and Foreign Investment (%)



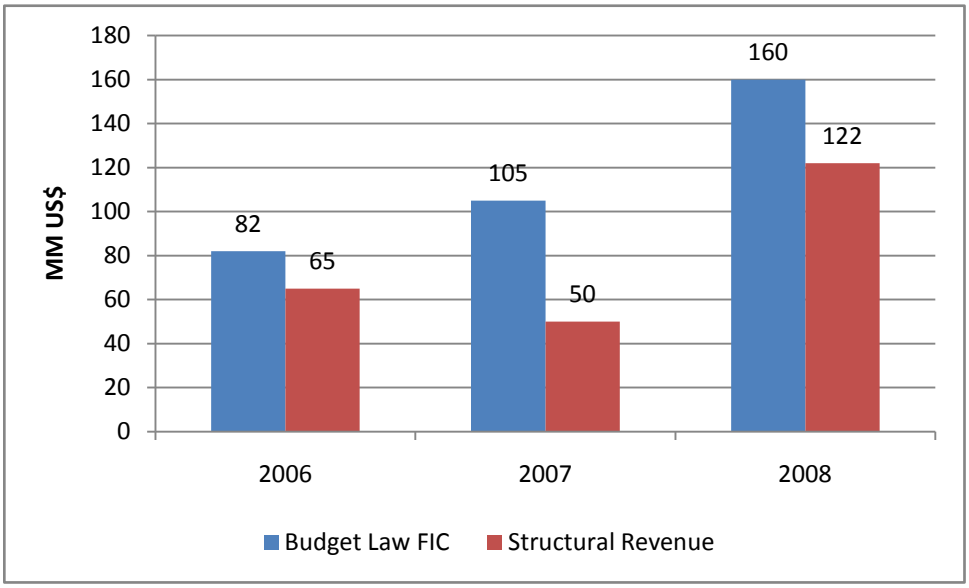
Source: DAC (OECD); United Nations; Bank of Zambia

Annex Figure 12: Total Fiscal Revenue (Millions US$)



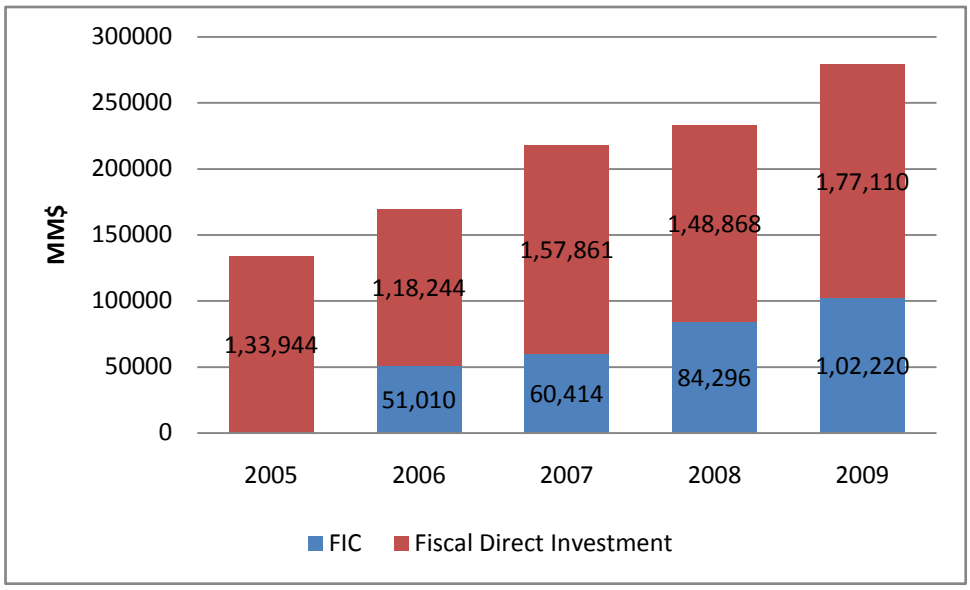
Source: COCHILCO, CSO - Monthly Bulletin of Statistics, Ministry of Finance and National Planning

Annex Figure 13: Royalty Structural Revenues and FIC Revenues.



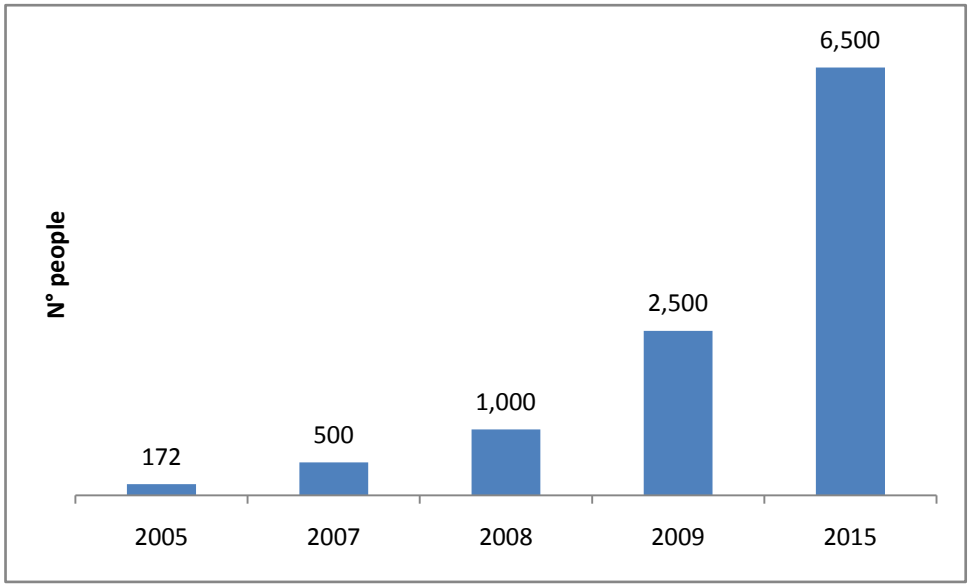
Source: Ministry of Economy.

Annex Figure 14: Public Investment in Innovation (pesos 2009)



Source: DIPRES.

Annex Figure 15: Projection of the number of people studying outside of Chile (not undergraduate)



Source: Ministry of Finance.

Annex Table 7: USD Flows to Chile (Millions USD)

Año	Foreign Investment Inflows	Copper Exports	Total exports	Non-copper Exports	Ratio Copper Exports/ Foreign Investment Inflows	Ratio Copper Exports/Non-copper Inflows
1989	1,644.6	4,021.40	8,078.4	4,057.0	2.45	0.71
1990	1,077.1	3,810.20	8,372.7	4,562.5	3.54	0.68
1991	1,228.1	3,617.30	8,941.5	5,324.2	2.95	0.55
1992	1,544.4	3,886.00	10,007.4	6,121.4	2.52	0.51
1993	2,711	3,247.80	9,198.7	5,950.9	1.20	0.37
1994	4,686	4,242.00	11,604.1	7,362.1	0.91	0.35
1995	6,899.6	6,487.10	16,024.2	9,537.1	0.94	0.39
1996	7,255.0	6,028.60	16,626.8	10,598.2	0.83	0.34
1997	8,910.8	6,646.60	17,870.2	11,223.6	0.75	0.33
1998	7,284.2	5,197.40	16,322.8	11,125.4	0.71	0.28
1999	13,193.5	6,026.37	17,162.3	11,135.9	0.46	0.25
2000	6,931.7	7,284.48	19,210.2	11,925.8	1.05	0.39
2001	8,951.5	6,536.54	18,271.8	11,735.2	0.73	0.32
2002	8,394.6	6,323.22	18,179.8	11,856.6	0.75	0.31
2003	9,726.3	7,815.48	21,664.2	13,848.7	0.80	0.33
2004	16,603.8	14,722.72	32,520.3	17,797.6	0.89	0.43
2005	15,504.0	18,965.23	41,266.9	22,301.7	1.22	0.50
2006	20,186.3	32,710.21	58,680.1	25,969.9	1.62	0.71
2007	25,514.2	37,582.74	67,665.8	30,083.0	1.47	0.68
2008	30,339.8	32,807.50	66,455.5	33,648.0	1.08	0.51

Source: Central Bank of Chile and COCHILCO.

Annex Table 8: USD Flows to Chile (Millions USD)

Año	Foreign Investment Inflows	Copper Exports	Total exports	Non-copper Exports	Ratio Copper Exports/ Foreign Investment Inflows	Ratio Copper Exports/Non-copper Inflows
1989	1,644.6	4,021.40	8,078.4	4,057.0	2.45	0.71
1990	1,077.1	3,810.20	8,372.7	4,562.5	3.54	0.68
1991	1,228.1	3,617.30	8,941.5	5,324.2	2.95	0.55
1992	1,544.4	3,886.00	10,007.4	6,121.4	2.52	0.51
1993	2,711	3,247.80	9,198.7	5,950.9	1.20	0.37
1994	4,686	4,242.00	11,604.1	7,362.1	0.91	0.35
1995	6,899.6	6,487.10	16,024.2	9,537.1	0.94	0.39
1996	7,255.0	6,028.60	16,626.8	10,598.2	0.83	0.34
1997	8,910.8	6,646.60	17,870.2	11,223.6	0.75	0.33
1998	7,284.2	5,197.40	16,322.8	11,125.4	0.71	0.28
1999	13,193.5	6,026.37	17,162.3	11,135.9	0.46	0.25
2000	6,931.7	7,284.48	19,210.2	11,925.8	1.05	0.39
2001	8,951.5	6,536.54	18,271.8	11,735.2	0.73	0.32
2002	8,394.6	6,323.22	18,179.8	11,856.6	0.75	0.31
2003	9,726.3	7,815.48	21,664.2	13,848.7	0.80	0.33
2004	16,603.8	14,722.72	32,520.3	17,797.6	0.89	0.43
2005	15,504.0	18,965.23	41,266.9	22,301.7	1.22	0.50
2006	20,186.3	32,710.21	58,680.1	25,969.9	1.62	0.71
2007	25,514.2	37,582.74	67,665.8	30,083.0	1.47	0.68
2008	30,339.8	32,807.50	66,455.5	33,648.0	1.08	0.51

Source: Central Bank of Chile and COCHILCO.

Annex Table 9: General Government Expenditure Chile

Año	General Government Expenditure % GDP	General Government Expenditure (millions of pesos 2008)	Central Government Balance (% GDP)
1990	21.8	6,967,728	3.0
1991	22.1	7,655,673	2.4
1992	21.7	8,229,738	2.8
1993	22.0	8,839,463	2.1
1994	21.5	9,291,699	2.1
1995	20.2	9,838,646	3.7
1996	21.5	10,706,483	3.0
1997	21.4	11,211,538	2.8
1998	22.7	11,888,088	1.0
1999	24.6	12,658,962	-1.3
2000	24.4	13,246,678	0.4
2001	24.3	13,686,691	0.1
2002	24.4	14,277,726	-0.6
2003	23.2	14,531,747	0.0
2004	21.8	15,370,958	2.4
2005	21.2	16,480,475	4.7
2006	19.9	17,572,973	7.5
2007	20.5	19,111,246	8.7
2008	22.5	19,877,873	5.0

Source: DIPRES.

Annex Table 10: Government Expenditure in Zambia

Año	General Government Expenditure % GDP	General Government Expenditure (K'millions of 2008 prices)	Central Government Balance (% GDP)
1970	15.54	90,776.91	5.27
1971	23.12	117,732.40	-18.67
1972	22.73	124,787.15	-14.68
1973	20.72	126,849.85	-20.99
1974	18.31	122,343.68	7.29
1975	26.79	136,350.08	-23.10
1976	25.17	131,947.83	-14.33
1977	26.43	119,488.98	-13.19
1978	23.89	105,180.16	-9.03
1979	23.79	112,891.46	-11.35
1980	25.51	124,760.12	-18.52
1981	28.29	138,062.13	-12.90
1982	27.70	123,960.05	-18.59
1983	24.13	104,907.09	-7.83
1984	25.15	107,449.76	-8.39
1985	23.85	106,342.27	-15.17
1986	26.85	141,783.64	-21.38
1987	20.40	121,856.81	-12.89
1988	14.87	82,404.17	-11.25
1989	13.73	59,662.78	-10.43
1990	19.03	81,062.29	-8.32
1991	31.82	132,052.38	-6.96
1992	15.01	61,174.10	-2.47
1993	18.43	68,995.90	-5.60
1994	13.11	47,966.80	-4.64
1995	15.44	56,197.07	-3.83
1996	18.27	61,068.48	-0.53
1997	17.47	61,084.15	-0.19
1998	15.78	52,006.96	-5.19
1999	12.91	41,623.87	-3.66
2000	9.54	32,832.48	-5.90
2001	10.16	37,489.71	-7.23
2002	11.84	44,499.00	-5.09

2003	14.40	56,437.62	-6.02
2004	18.07	75,189.22	-2.87
2005	9.70	42,024.99	-2.72
2006	10.23	48,938.04	19.82
2007	10.43	53,557.83	-1.28
2008	9.03	48,410.00	-1.47

Source: World Bank (WDI); IMF (WEO) and Ministry of Finance and National Planning.

Annex Table 11: Manufactured Exports: Chile, 1980-2007

Año	Manufactured Exports (current US$)
1980	427,762,353
1981	295,826,687
1982	269,729,535
1983	257,767,434
1984	268,384,947
1985	261,190,182
1986	362,296,527
1987	466,982,421
1988	644,408,159
1989	837,058,511
1990	942,011,590
1991	1,195,386,211
1992	1,361,547,323
1993	1,521,523,722
1994	1,956,496,472
1995	1,877,315,134
1996	2,193,460,281
1997	2,572,280,373
1998	2,640,072,230
1999	2,710,449,112
2000	2,949,264,957
2001	3,105,537,071
2002	2,949,161,403
2003	3,378,069,253
2004	4,180,351,307
2005	5,496,887,792
2006	6,282,547,845
2007	6,839,310,352

Source: World Bank

Annex Table 12: Mining Investment in Chile (Millions of Current US$)

	State companies (1)	Private firms (2)	TOTAL
1974	n.d.	1.8	n.d.
1975	n.d.	11.8	n.d.
1976	111.0	2.2	113.2
1977	100.0	2.6	102.6
1978	164.0	214.9	378.9
1979	178.0	132.9	310.9
1980	278.6	155.6	434.2
1981	315.7	161.3	477.0
1982	236.8	144.4	381.2
1983	207.6	75.5	283.1
1984	277.8	90.6	368.4
1985	377.4	81.4	458.8
1986	388.4	107.3	495.7
1987	353.7	127.1	480.8
1988	355.4	398.1	753.5
1989	467.4	691.0	1,158.4
1990	386.0	762.3	1,148.3
1991	372.8	440.2	813.0
1992	461.8	561.8	1,023.6
1993	424.6	883.3	1,307.9
1994	370.2	1,752.6	2,122.8
1995	409.2	1,706.8	2,116.0
1996	775.5	1,015.8	1,791.3
1997	946.5	1,710.6	2,657.1
1998	713.0	2,469.2	3,182.2
1999	369.3	1,336.9	1,706.2
2000	495.9	233.7	729.6
2001	603.8	1,136.3	1,740.1
2002	850.6	2,003.0	2,853.6
2003	896.4	392.2	1,288.6
2004	900.2	349.6	1,249.8
2005	1,852.3	588.7	2,441.0
2006	1,233.4	1,126.2	2,359.6

2007	1,630.2	304.3	1,934.5
2008	2,021.2	2,366.2	4,387.4

Note: Public investment in 2005 includes Codelco's US$393-million Ventanas Smelter & Refinery acquisition.
(1) Includes CODELCO and ENAMI.
(2) Foreing direct investment (FDI) DL600
Source: -CODELCO y ENAMI.
-Foreign Investment Committee.

Annex Table 13: Copper Cathodes – Unit Production Cost[(1)] – (US$ cents/lb.) US$ 2007[(3)]

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008[(2)]
Chile	**89.3**	**87.5**	**83.1**	**84.9**	**81.0**	**74.0**	**78.0**	**105.1**	**102.1**	**105.4**
Africa	134.6	117.8	122.1	121.1	113.6	143.9	137.7	166.0	162.9	160.6
Asia	68.2	87.7	62.0	55.6	48.0	81.0	77.3	138.4	91.0	138.2
CIS Former East Bloc	97.9	85.9	89.9	88.1	85.9	88.5	107.7	119.6	124.0	121.6
Latin America	91.4	89.2	84.6	83.9	79.8	71.6	72.9	99.8	92.7	96.5
North America	107.3	102.5	118.0	122.3	98.7	96.1	74.1	108.7	141.4	139.7
Oceania	109.9	92.1	86.2	96.8	97.9	106.5	116.9	149.1	159.1	153.9
Western Europe	112.9	109.6	92.5	95.7	99.4	98.4	106.2	112.5	125.7	112.7
Total	**96.7**	**92.5**	**89.9**	**89.4**	**83.1**	**83.6**	**84.7**	**114.0**	**111.5**	**117.6**

(1) Per Brook Hunt's Composite Total Cost (C3), which includes Direct Cash Costs, Depreciation, Interest and Indirect Costs. For mines where more than 65 percent of revenues come from copper, this includes a credit deduction for copper byproduct sales. In all other cases, copper and copper byproduct costs are prorated per share of revenue. Based on the profile of local mining, this is equivalent to Chile's Net Cathode Cost.
(2) 2008 costs are estimates noted in 2007 currency.
(3) Deflator: U.S. Producer Price Index (PPI, All Commodities)
Source: Brook Hunt Ltd.

Annex Table 14: Price/Cost Relationship - Chile

Year	Chilean Gross Cost (CGC)	African Gross Cost (AGC)	Copper Price (CP)	Ratio CCP/GC	Ratio ACP/GC
1992	73.8		103.6	1.4	
1993	77.1		86.7	1.1	
1994	75		104.9	1.4	
1995	74.4		133.2	1.8	
1996	68.8		103.9	1.5	
1997	70.2		103.2	1.5	
1998	62.3		75	1.2	
1999	56.6	135	71.4	1.3	1.9
2000	57.8	118	82.3	1.4	1.4
2001	54.6	122	71.6	1.3	1.7
2002	54	121	70.6	1.3	1.7
2003	56.3	114	80.7	1.4	1.4
2004	66.2	144	130.1	2.0	1.1
2005	88.9	138	167.1	1.9	0.8
2006	107.6	166	305.3	2.8	0.5
2007	114.1	163	323.2	2.8	0.5
2008	124.8	161	315.3	2.5	0.5

Source: COCHILCO (2008).

Annex Table 15: Template Zambia, 1980 - 2008

	kMT Copper Content	Million USD, current dollars	Total Fiscal Revenue (Millions US$)	Fiscal Revenue from copper (US$)	Copper Share of Fiscal Revenue (%)	Copper Revenue/GDP (%)	Copper Mining Employment Share (%)
1980	595.80	1227.15	952.21	51.74	5.43	1.36	16.62
1981	587.40	1022.44	914.25	11.76	1.29	0.30	16.31
1982	529.60	979.85	903.52	11.62	1.29	0.30	16.39
1983	591.30	662.32	670.84	29.27	4.36	1.06	15.66
1984	576.00	503.89	495.52	30.21	6.10	1.35	15.89
1985	510.80	235.55	272.83	22.04	8.08	0.98	15.75
1986	512.90	387.87	236.10	29.68	12.57	1.78	16.34
1987	527.00	930.27	537.50	55.09	10.25	2.43	15.57
1988	476.10	911.87	510.00	10.15	1.99	0.27	15.45
1989	510.20	763.20	457.38				15.05
1990	496.00	801.90	549.90				15.12
1991	412.40	692.00	465.92	59.79	1.67	1.07	16.39
1992	432.60	442.10	318.08	24.97	0.54	0.78	16.91
1993	431.50	568.20	327.63	14.00	2.73	0.43	16.81
1994	373.20	892.00	660.41	7.08	1.07	0.23	15.63
1995	316.00	875.80	626.93	18.89	3.01	0.64	10.77
1996	334.00	760.92	646.48	18.21	2.82	0.57	9.95
1997	352.90	979.33	726.89	21.80	3.00	0.60	8.94
1998	315.00	569.60	492.15	7.40	1.50	0.29	8.39
1999	280.00	468.10	502.24	59.18	11.78	2.10	8.07
2000	249.10	497.37	475.27	61.33	12.90	2.77	7.36
2001	312.00	589.57	695.67	79.02	11.36	0.05	7.36
2002	330.00	559.62	675.40	0.70	0.10	0.02	8.67
2003	330.00	669.23	777.35	2.11	0.27	0.04	11.66
2004	427.00	1359.13	993.51	1.15	0.12	0.02	11.07
2005	436.00	1515.62	1260.85	8.99	0.71	0.12	7.36
2006	540.00	3029.33	1833.11	12.20	0.67	0.11	18,38
2007	523.44	3406.54	2129.38	20.31	0.95	0.18	
2008	569.9	4001.0	2694.0	91.9	3.4	0.62	

Source: CSO - Monthly Bulletin of Statistics, Ministry of Finance and National Planning

Annex Table 16: Zambian copper exports, 1980 - 2008

	Copper exports Share of Total Exports(%)	Copper exports Share of GDP(%)
1980	94.542	28.473
1981	94.758	23.977
1982	95.689	23.794
1983	79.225	22.251
1984	77.283	20.913
1985	30.045	50.124
1986	75.023	62.857
1987	92.319	45.997
1988	91.108	22.400
1989	89.778	16.741
1990	87.649	14.885
1991	88.775	21.771
1992	81.553	31.225
1993	82.074	26.785
1994	85.074	28.446
1995	81.220	28.340
1996	75.961	23.232
1997	76.802	20.624
1998	66.387	16.058
1999	62.165	14.914
2000	66.650	15.362
2001	66.687	16.197
2002	61.075	14.823
2003	63.051	15.470
2004	74.898	24.986
2005	75.803	20.843
2006	81.615	27.811
2007	82.449	29.853
2008	82.036	25.144

Source: CSO - Monthly Bulletin of Statistics; Bank of Zambia and Ministry of Finance and National Planning

Annex Table 17: Copper Mine Production – Main countries (kMT Copper Content)

	1991	2008
Chile	1,814	5,330
USA	1,634	1,340
Peru	375	1,268
Australia	320	885
Russia	840	785
Indonesia	220	650
Canada	811	607
Zambia	391	528

Source: -World Metal Statistics March 2009 and Yearbook 2008
- Chile data: Chilean Copper Commission.

Annex Table 18: Composition of exports (period average) in Zambia

	1986-1989	1990-2000	2001-2007	**2008**
Total Exports (US$'mn)	839.90	1014.66	2198.10	**4876.80**
Metal Exports (US$'mn)	748.30	821.53	1657.31	**4000.80**
NTEs (US$'mn)	95.61	200.31	524.67	**876.00**
Metal Exports (% of total)	89.09	80.97	75.40	**82.04**
NTEs (% of total)	11.38	19.74	24.60	**17.96**
NTEs (% of metal)[1]	12.78	24.38	31.66	**21.90**

1/Export diversification index

Source: Bank of Zambia and author's own estimates

Annex Table 19: Chilean Production Share – CODELCO and Private Companies

	CODELCO	Private Companies
1980	84.7	15.3
1990	75.3	24.7
2000	32.9	67.1
2008	28	72

Source: COCHILCO

Annex Table 20: Production by type of companies

	Large companies	Mid size Companies	Small Companies
1960	90	4.7	5.3
1980	84.7	5.7	9.6
2000	92.4	5.6	1.9
2008	87	7	6

Source: COCHILCO

Annex Table 21: Fiscal Revenue from Copper, separated by State and Private Firms (Millions US$)

	Private Firms (Mining)	State Enterprise (CODELCO)	Total
1985	25	411	436
1986	17	455	472
1987	0	592	592
1988	6	1467	1473
1989	20	1961	1981
1990	19	1505	1524
1991	16	870	886
1992	139	891	1030
1993	78	418	496
1994	145	858	1003
1995	163	1735	1898
1996	264	1044	1308
1997	347	1173	1520
1998	133	355	488
1999	187	269	456
2000	239	702	941
2001	129.6	370	499.6
2002	173.2	326	499.2
2003	244.5	735	979.5
2004	908.7	3009	3917.7
2005	1380.3	4442	5822.3
2006	3422.4	8334	11756.4
2007	3645.7	7933	11578.7
2008	4200	6829	11029

Source: COCHILCO, Consejo Minero.

Annex Table 22: Copper Production – Chile and Zambia (kTM)

	Chile	Zambia
1960	532	568
1965	585	696
1970	692	819
1971	708	766
1972	717	838
1973	735	877
1974	902	830
1975	828	677
1976	1,005	709
1977	1,054	656
1978	1,034	643
1979	1,063	588
1980	1,068	596
1981	1,081	587
1982	1,242	530
1983	1,258	591
1984	1,291	576
1985	1,356	511
1986	1,401	513
1987	1,418	527
1988	1,451	476
1989	1,609	510
1990	1,588	496
1991	1,814	412
1992	1,933	433
1993	2,055	432
1994	2,220	373
1995	2,489	316
1996	3,116	334
1997	3,392	353
1998	3,687	315
1999	4,391	280
2000	4,602	249

2001	4,739	312
2002	4,581	330
2003	4,904	330
2004	5,413	427
2005	5,321	436
2006	5,361	540
2007	5,557	523
2008	5,328	570

Source: COCHILCO, CSO - Monthly Bulletin of Statistics; Bank of Zambia and Ministry of Finance and National Planning

Annex Table 23: Zambia: Selected Macroeconomic Indicators (2000-2008)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	**Average**
Real GDP (%)	3.52	4.89	3.32	5.13	5.40	5.34	6.23	6.17	6.00	**5.11**
Real Per Capita GDP growth (%)	0.94	2.38	0.39	3.34	3.11	2.81	3.72	3.66	3.43	**2.64**
Investment (% GDP)	16.00	17.65	20.56	24.07	23.07	22.86	23.14	24.18	21.38	**21.44**
Public Consumption (% GDP)	9.54	10.16	11.84	14.40	18.07	9.70	10.23	10.43	9.03	**11.49**
Fiscal Deficit (% GDP)	-5.90	-7.23	-5.09	-6.02	-2.87	-2.72	19.82	-1.28	-1.47	**-1.42**
Inflation (%)	30.10	18.70	26.70	17.20	17.50	15.90	5.60	7.90	12.45	**16.89**
Official Exchange Rate (ZMK/US$)	3,110.84	3,610.94	4,398.60	4,733.27	4,778.88	4,463.50	3,603.07	4,002.52	3,745.66	**4,049.70**
External Debt (US$'bn)	6.33	7.29	6.94	6.04	7.11	5.06	1.77	2.13	2.11	**4.98**
Copper Price (US$/ton)	1,822.70	1,734.49	1,544.52	1,689.02	2,614.03	3,371.24	6,160.49	6,938.80	6,280.55	**3,572.87**
Copper Exports (% Total Exports)	66.65	66.69	61.08	63.05	74.90	75.80	81.62	82.45	82.04	**72.70**
Current Account Balance (% GDP)	-18.26	-19.07	-14.70	-14.68	-7.73	-8.38	1.20	-4.43	-5.50	**-10.17**
Official Reserves (Months of Imports)	1.96	1.24	3.63	1.51	1.58	2.07	1.96	2.20	4.80	**2.33**

Source: MoFNP, Bank of Zambia, IMF (WEO) and World Bank (WDI, online), United Nations

Annex Table 24: Percent Change in Copper Production – Zambia vs. Major Competitors (1913-2008)

	Zambia	Chile	USA	USSR/RUSSIA	World	Others
1913-1950	148.02	71.94	10.47	246.22	39.05	-19.44
1950-1964	100.62	18.49	30.79	181.53	68.25	173.42
1964-1974	70.38	45.74	40.79	106.07	67.85	90.86
1975-1985	-20.58	59.18	-3.11	17.77	29.59	68.43
1985-1990	-16.56	31.72	4.59	-8.41	9.74	14.82
1990-2002	-29.47	112.39	25.20	-39.31	27.87	20.15
2002-2008	20.91	66.30	-30.42	15.85	30.00	31.43

Annex Table 25: Zambia – Selected macroeconomic indicators, 1978-1990

	1978-1982	1983-1986	1987-1990	**1978-1990**
GDP growth (% per annum)	0.80	0.09	1.87	**0.91**
Per capita GDP growth (% per annum)	-2.40	-3.00	-1.00	**-2.15**
Copper prices (US$/pound)	0.79	0.65	1.12	**0.85**
Foreign Exchange Reserves (US$'mn)	64.74	94.78	138.03	**96.53**
Current account balance (% of GDP)	-10.68	-12.94	-10.56	**-11.34**
External debt (% of Gross National Income)	96.20	229.25	238.00	**180.77**
Domestic balance, excluding grants (% of GDP)	-14.68	-13.18	-10.92	**-13.06**

Sources: World Bank-World Development Indicators (online version) and World Tables (1994);
IMF: International Financial Statistics (online version)

Annex Table 26: Selected macroeconomic indicators for Zambia, 1991-2000

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	**Average**
Real GDP growth (% per annum)	-0.1	0.1	-3.4	4.2	-2.3	6.6	3.4	-2.0	2.0	3.6	**1.2**
Current account (% GDP)	-15.2	-22.5	-14.4	-11.9	-13.4	-13.0	-13.0	-17.8	-15.5	-17.1	**-15.4**
Inflation (% per annum)	92.6	197.0	189.0	52.3	46.0	35.2	18.6	30.6	20.6	30.1	**71.2**
Real lending rate	-55.6	-106.4	66.7	11.2	10.5	10.7	20.1	1.2	19.8	9.0	**-1.3**
Interest rate spread	12.3	14.4	36.7	25.2	20.7	24.8	21.7	24.4	30.0	28.7	**23.9**
Domestic budget (% of GDP)	-45.1	-6.6	-7.8	-1.2	-4.6	-2.4	-9.5	-5.5	-3.7	2.2	**-8.4**
Investment (% of GDP)	11.0	11.9	15.0	8.2	5.9	12.8	14.6	16.4	17.9	18.3	**13.2**

Sources: International Financial Statistics (various issues), Bank of Zambia and Central Statistical Office various issues, draft Public Expenditure Review (PER) 1995-2000

Annex Table 27: Selected Poverty and Social Indicators for Zambia, 1991 - 2006

	1991	1993	1996	1998	2004	2006
Incidence of Poverty (head count)	69.7	73.8	69.2	73.0	68.0	64.0
Extremely Poor	58.2	60.6	53.2	58.0	53.0	51.0
Infant Mortality Rate (per 1000 births)	99	107	108	105	103	79
Under-5 Mortality Rate (per 1000 births)	163	178	178	174	170	124
Gini Coefficient	0.59	0.51	0.50	0.66	0.51	-

Source: Central Statistical Office (Living Conditions Monitoring Surveys (1998-2006) and World Bank - World Development Indicators (Online version)

Annex Figure 16: Results of Augmented Dickey-Fuller test for unit root, 1980-2008

	Chile		Zambia	
Variable	**p-value**	**Result**	**p-value**	**Result**
GDP	0.8667	Stationary	0.9791	Stationary
RER	0.8638	Stationary	0.3555	Stationary
Manufactured Exports	0.1872	Stationary	0.3438	Stationary
Government Expenditure LC	0.2288	Stationary	0.2236	Stationary
Government Expenditure %GDP	0.8235	Stationary	0.0186	Non-stationary

Source: Elaborated with annual data from IMF, World Bank.