INTRODUCTION TO MINERAL ECONOMICS (MIN 3059)

2017

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TOPICS

► **Basic economic concepts:** Microeconomics and Macroeconomics

The study of microeconomics and macroeconomics in relation to mineral economics

► **The role of firms and markets in the micro-economy**

How business firms fit into the microeconomics picture. The emergence of entrepreneurship. Structure of contemporary business enterprise. The firm and the market place. The concept of the market. The firm and its corporate strategy

TOPICS

► **The theory of supply and demand**

Factors affecting demand. Elasticities of demand
Factors affecting supply

► **How markets function**

The model of perfect competition. The model of monopolistic competition. The many models of oligopoly. The case of monopoly. Analysing the strength of competition. Evaluating competition and market performance.

TOPICS

► **The firm and Technological change**

The concept of production. Production activity. Transforming inputs into outputs. Basic types of production activity. The production function. The impact of technological advance on production functions. The consequences of technological change for production processes. Characteristics of technological progress. R&D spending and firm size. The motivation and pressures for innovation.

TOPICS

► **Production analysis**

Fixed and variable inputs. Short run and the long run. Short run production functions

► **Cost functions and economies of scale**

The concept of costs. The many aspects of cost. Cost output relationships. Cost-output relationships in the short run. Cost output relationships in the long-run. Cost behaviour and firm size.

TOPICS

► **Production analysis**

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TOPICS

► **The firm and its goals**

The ambiguous meaning of profit. Theories of profit. Do business firms seek to maximize profits? Alternatives to profit maximization. Satisficing behaviour. Revenue maximization. Market share goals. Long-run survival goals. The goal of social responsibility. Security, autonomy, and growth. Growth and expansion goals

TOPICS

Mining policy

* Objectives and structure of mineral policies

Mineral taxation

Minerals and economic development

Environmental economics

GRADING

►   Assignments: 10%
►   Research paper   5%
►   Tests: 15%
►   Final examination: 70%

TEXTS/REFERENCES

1)   Ahuja, H.I , (2004), "Macroeconomics", S. Chand & company, ISBN 81-219-0335-1.
2)   Ahuja, H.I , (2004), "Principles of microeconomics" S. Chand & Company.
3)   Class notes hand-outs

BASIC ECONOMIC CONCEPTS

WHAT IS ECONOMICS?

► *Definition*

► *Key issues in the study of economics*

► *Branches of economics*

SOME DEFINITIONS

- *Economics asks what goods are produced, how these goods are produced, and for whom they are produced.*

- *Economics analyses movements in the overall economy – trends in prices, output, unemployment, and foreign trade. Once such trends are understood, economics helps develop the policies by which governments can improve the performance of the economy*

- *Economics is the study of commerce among nations. It helps explain why nations export some goods and import others, and analyses the effects of putting economic barriers at national frontiers.*

SOME DEFINITIONS

- *Economics is the science of choice. It studies how people choose to use scarce or limited productive resources (labour, equipment, technical knowledge), to produce various commodities (such as mineral resources, missiles, and concerts).*

- *Economics is the study of money, banking, capital, and wealth.*

- ***In a nutshell, "economics is the study of how societies use scarce Resources to produce valuable commodities and distribute them among different people".***

BRANCHES OF ECONOMICS

Economics normally studied under two branches:

➡️ *MACROECONOMICS*

➡️ *MICROECONOMICS*

INTRODUCTION

Mineral Economics defined

Mineral Economics is the academic discipline that investigates and promotes understanding of Economic and policy issues associated with the production and use of mineral commodities.

It focusses on improving the understanding of economic, social, environmental and political implications of natural resources.

INTRODUCTION

Mineral economics is the academic discipline that investigates and promotes understanding of economic and policy issues associated with the production and use of mineral commodities. While its origins can be traced back at least 200 years to the writings of David Ricardo and other early Classical economists, it emerged as a separate academic field only after World War II and then primarily in the United States. As a separate academic discipline, its roots are found in mining schools that needed to consider the milieu in which minerals are sold.

Mineral economics is the academic discipline that examines the economic and policy issues associated with the discovery, extraction, processing, use, recycling, and disposal of mineral commodities. As Robinson (1989) shows, its roots can be traced back to the early development of economics as a formal discipline. Chapter III of Ricardo's *Principles* is "On the Rent of Mines." Malthus's fears about resources are a still-recalled preliminary to the resource pessimism of subsequent years

INTRODUCTION

Mining may well have been the second of humankind's earliest endeavors —granted that agriculture was the first. The two industries ranked together as the primary or basic industries of early civilization. Little has changed in the importance of these industries since the beginning of civilization. If we consider fishing and lumbering as part of agriculture and oil and gas production as part of mining, then agriculture and mining continue to supply all the basic resources used by modern civilization.

From prehistoric times to the present, mining has played an important part in human existence (Madigan, 1981).

INTRODUCTION

The history of mining is fascinating. It parallels the history of civilization, with many important cultural eras associated with and identified by various minerals or their derivatives: *The Stone Age* (prior to 4000), *the Bronze Age* (4000 to 5000), *the Iron Age* (1500 B.C.E. to 1780 B.C.E), *the Steel Age* (1780 to 1945), and *the Nuclear Age* (1945 to the present). Many milestones in human history — Marco Polo's journey to China, Vasco da Gama's voyages to Africa and India, Columbus's discovery of the New World, and the modern gold rushes that led to the settlement of California, Alaska ,South Africa, Australia ,and the Canadian Klondike — were achieved with minerals providing a major incentive (Rickard,1932).

The uniqueness of minerals as economic products accounts for the complexity of mineral economics and the business of mining (Vogely, 1985; Strauss ,1986). Minerals are unevenly distributed and, unlike agricultural or forest products, cannot reproduce or be replaced. A mineral deposit may therefore be considered a depleting asset whose production is restricted to the area in which it occurs.

INTRODUCTION

These factors impose limitations on a mining company in the areas of business practices, financing, and production practices. Because its mineral assets are constantly being depleted, a mining company must discover additional reserves or acquire them by purchase to stay in the mining business.

Other peculiar features of the mineral industries are associated with operations. Production costs tend to increase with depth and declining grade. Thus, low-cost operations are mined first, followed by the harder-to-mine deposits. In addition, commodity prices are subject to market price swings in response to supply and demand, which can make the financial risk of a long-term minerals project quite risky.

INTRODUCTION

A change in mining or processing technology can also drastically alter the economic landscape. The pattern of usage, in terms of intensity of use (lb/capita or kg/capita) and total consumption of metals on the world market for the nonferrous metals, shows that the intensity of usage of many of these metals continues to go down while overall consumption goes up (Crowson,1998). Any swing in intensity of use due to substitution or recycling can greatly affect the market price of a metal.

Mining companies must therefore keep their prices low by further improvements in productivity, or market price drops can easily create great economic hardships. Some minerals, such as precious metals, iron, and most of the base metals, can be recycled economically, thereby affecting the markets for freshly mined metal. This is good practice and favorable for the future of humankind, but it can create economic problems if the market price is adversely affected.

What is Macroeconomics?

Studies the functioning of the economy as a whole – examining the economy through a wide-angle lens. Macroeconomics examines how the level of growth of output are determined, analyses inflation and unemployment, asks about the total money supply and investigates why some nations thrive while others stagnate.

Macroeconomics

To evaluate the success of an economy's overall performance, economists look at four areas:

►   Output measured by the Gross Domestic Product (GDP)

►   Employment (level of unemployment)

►   Price stability

►   International trade

GOALS AND INSTRUMENTS OF MACROECONOMIC POLICY

Objectives (Major goals of macroeconomic policies – wish list)	Instruments (Tools available to accomplish the wish list)
Output (as measured by the GDP): High level of output Rapid growth rate of output	**Fiscal policy:** Government expenditure Taxation
Employment: High level of employment Low involuntary unemployment	Monetary policy: Control of money supply affecting interest rates
Price level stability with free markets	Foreign economics: Trade policies Exchange-rate Intervention
International trade: Export and import equilibrium (preferably the existence of trade surplus) Exchange-rate stability (not too strong or too weak)	Income policies: From voluntary guidelines to mandatory controls

HOW DOES MACRO-ECONOMICS AFFECT THE MINERAL SECTOR?

At macro level, government sets sectoral policies (in this case the national mineral policy) which may affect the sector (positively or negatively depending on its structure and promotional aspects).
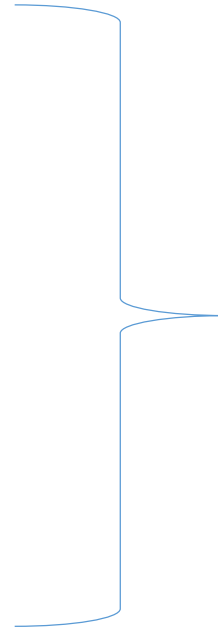
Taxation

Employment regulations

Environmental, safety and health regulations

Ownership, etc

The basic structural make up of global national mineral policies will be discussed later in the course.

Examples of other national (government) policies

- Mining policy
- Education policy
- Agricultural policy
- Health policy
- Environment management policy
- Gender policy
- Housing policy
- etc…….

NATIONAL ECONOMIC
&
SOCIAL POLICY

HOW DOES MACRO-ECONOMICS AFFECT THE MINERAL SECTOR?

- Trade policies may affect the manner in which mineral products are traded. Do mine owners retain all the forex? Do they market through government agencies? No limitations on externalization of profits?

- How is the forex rate fixed? Free floating or government controlled? Exchange rate mechanisms affect trade.

- Do employment policies restrict expatriate workers?

- Interest rates have a bearing on the cost of capital and hence affect investment in the sector.

- Do foreign investors have access to local borrowing?

MICRO-ECONOMICS

What is Micro-economics?

Word "micro" comes from Greek word "Mikros" which means millions of parts.

Microeconomics is the study of particular markets, and segments of the economy. It looks at issues such as consumer behaviour, individual labour markets, and the theory of the firms.

Analyses the behaviour of individual components of the economy like industries, firms and households. The focus is on trees not the forest. The study is about among other things, how individual prices are set, consider what determines the price of land, labour and enquire into the strengths and weaknesses of the market mechanism. Microeconomics is economics through the microscope.

MICRO-ECONOMICS

In reviewing the subject of microeconomics, we examine the mining firm and the market place.

► *The concept of the market place*
► *How a market functions*
► *The firm and its corporate strategy*
► *The firm and technological change*
► *Cost functions and economies of scale:*
  Cost-output relationships in short-run
  Cost-output relationships in long-run

MICRO-ECONOMICS

THE MINING FIRM AND THE MARKET PLACE

Conventional economic theory instructs that the firm and its business are governed by forces in the market place. The firm is depicted as reacting and responding to market supply and demand conditions – conditions that are beyond its purview to control. The market, not the firm is held to be hub of economic activity and the focus of analytical concern.

MINERAL INVESTMENT PROCESS STARTS WITH THE SEARCH AND DISCOVERY OF A MINERAL DEPOSIT - EXPLORATION.
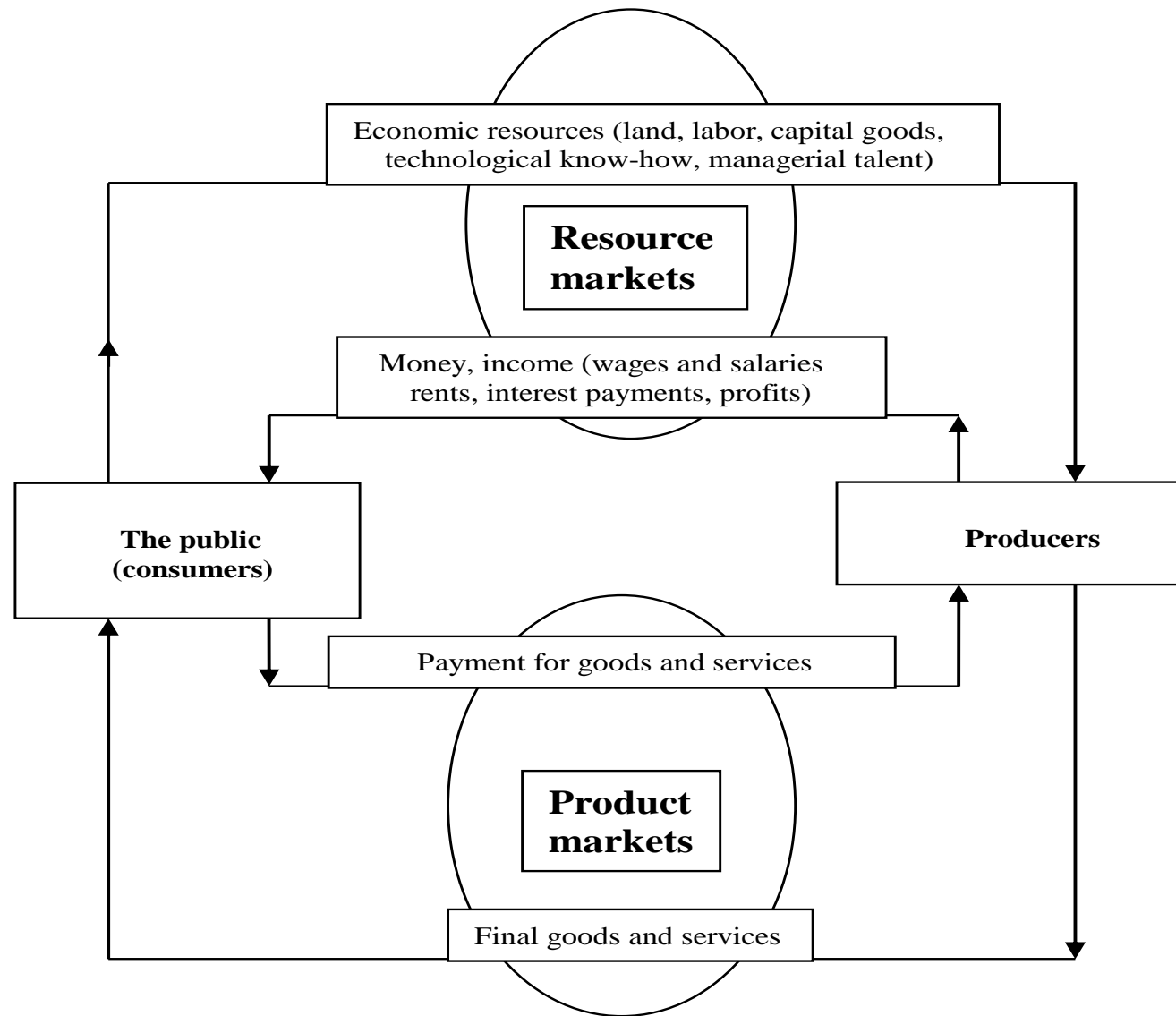
Barefoot Geologists seeking copper outcrops in Mumbwa

The concept of the market

In a competitive enterprise system, "the market" is held to be the supreme over all other economic units. Its importance is like that of the sun in the solar system – all economic activity revolves around the market. The market is where buyers and sellers conduct business. Therefore the market is two sided: it reflects both demand and supply conditions and does so simultaneously.

A market is seldom a single, precisely defined geographical place. Think of e-commerce!

The Role of firms in markets in the micro-economy

To develop some perspective for a study of microeconomics, it is helps to begin with a feeling for what an economic system is and how it works. The basic economic activities that take place in a modern economy are summarized as:

Economic resources (land, labor, capital goods, technological know-how, managerial talent)

Resource markets

Money, income (wages and salaries rents, interest payments, profits)

The public (consumers)

Producers

Payment for goods and services

Product markets

Final goods and services

The public, as owners of economic resources, sell their resources to producers in resource markets. From a viewpoint of the public, the sale of these resources generates money income; from the viewpoint of producers, the purchase of economic resources represents costs of production. Producers utilize the resources they purchase to make goods and services, which, in turn, are sold to the public through product markets.

The public's source of income to make these purchases is of course, the money income obtained as resource suppliers. From the public's view point, the purchases of goods and services are expenditures; from the producer's viewpoint these same dollar flows are revenues. Bothe the clockwise flow of economic resources and final goods and services and the counter clockwise flow of money incomes and dollar expenditures for final goods and services are simultaneous and repetitive.

Various countries have elected to us different economic systems both in organising resources in the production process and in distributing the resultant goods and services.

Three Basic Economic Systems

A traditional economic system

Relying on custom, habit, social mores, and tried and true methods of achieving economic goals; technology is primitive, changes are slow and production is undertaken in the same way as last year and year before. Tradition and status quo are perpetuated. Examples are abound in most rural areas (life among the Kombai tribe in Papua New Guinea, Pigmies in Congo forests)

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Kombai tribe – Papua New Guinea

Kombai tribe – Papua New Guinea

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Pigmies in Central African rain forests

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Bushmen of Kalahari - Desert Botswana

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Bushmen in Namibia

Bushmen making fire

Three basic economic systems

A Command Economy System

Relies upon public ownership and centralized control of the basic means of production; severe limitations are placed upon individual choice when such choices conflict with government determined economic priorities. Economic plans and activities are under the control of government. Heavy use is made of governmental directives, the assumption being that the government is in the best position to decide what economic choices and policies are beneficial for the economy and its component parts. Both socialistic and communistic nations are examples of command economies.

Three basic economic systems

A Capitalistic or Market (free market) Economic System

Emphasizes private ownership, individual economic freedom, competition, the profit motive, and the price system in the achievement of economic goals. Each economic unit decides what choices and policies are best for it, the thesis being that in encouraging the drive for individual economic self-interest, the outcome proves also to be in the overall best interests of society because of the *strong incentives for efficiency, productivity, and satisfaction of consumers*.

HOW A MARKET FUNCTIONS
(*The market mechanism*)

The Law of Supply and Demand

The prime movers in our perfect market model are the forces of supply and demand. The interaction of these market forces determine the price of the mineral commodity and the quantity exchanged.

What is 'Perfect Competition'

Perfect competition is a market structure in which the following five criteria are met:

1) All firms sell an identical product;
2) All firms are price takers - they cannot control the market price of their product;
3) All firms have a relatively small market share;
4) Buyers have complete information about the product being sold and the prices charged by each firm; and
5) The industry is characterized by freedom of entry and exit. Perfect competition is sometimes referred to as "pure competition".

BREAKING DOWN 'Perfect Competition'

Perfect competition is a theoretical market structure. It is primarily used as a benchmark against which other, real-life market structures are compared. The industry that most closely resembles perfect competition in real life is agriculture.

Perfect competition is the opposite of a monopoly, in which only a single firm supplies a particular good or service, and that firm can charge whatever price it wants because consumers have no alternatives and it is difficult for would-be competitors to enter the marketplace.

Under perfect competition, there are many buyers and sellers, and prices reflect supply and demand. Also, consumers have many substitutes if the good or service they wish to buy becomes too expensive or its quality begins to fall short. New firms can easily enter the market, generating additional competition. Companies earn just enough profit to stay in business and no more, because if they were to earn excess profits, other companies would enter the market and drive profits back down to the bare minimum.

Real-world competition differs from the textbook model of perfect competition in many ways. Real companies try to make their products different from those of their competitors. They advertise to try to gain market share. They cut prices to try to take customers away from other firms. They raise prices in the hope of increasing profits. And some firms are large enough to affect market prices. But the perfect competition model is not an ideal that we should try to achieve in the real world.

The demand side of the Market:

The following figure represents the demand curve DD.

Fig. 1 Demand curve

Demand curve

- Reflects the intensity with which buyers want and are willing to pay for the product in question.

- Represented by a curve showing the various quantities which buyers are willing to purchase at each of various quantities which buyers are willing to purchase at each of various possible prices, all things being equal.

- Conceptually, the curve slopes downward because typically buyers are willing to purchase less at higher prices than lower prices.

- Events such as rising income, changes in the prices of substitute products and shifts in preferences and life styles can and do shift the shape and position of the curve.

What factors affect demand for a mineral?

Determinants of demand can generally be represented by the function:

$$Q_d = f(P, P_r, T, I, E, R, N, O)$$

Where, Q_d = quantity demanded of a particular mineral product
           P = market price of the mineral product
           P_r = price of related products
           T = consumer tast*es* and preferences

What factors affect demand for a product (mineral)?

I = Level of consumer incomes (or purchasing power)

E = consumer expectations about future prices, incomes and product availability

R = range of products available to consumers

N = number of potential consumers (market size)

O = all other factors which may influence Q_d

Factors affecting demand

Market price of the mineral product

The interrelationship between the product price and quantities demanded with all factors remaining constant is as shown in Fig. 1 above. Generally more quantities are demanded at lower prices and vice versa.

Factors affecting demand

Price of related (mineral) products:

This is an important demand variable because of interrelationshionships that exist among mineral products. Two types of relatiionships may exist;

     i)   **Substitutes**

              A substitute material must functionally replace the product.

              Examples:

- Aluminum has been used to replace copper when the price is high in electrical application.
- Synthetic gemstones and imitations have been used in place of natural ones (emerald, tanzanite, spinel, quartz, diamonds, ruby, etc.)
- Plastics have replaced pipings, car radiators, etc.

Factors affecting demand

ii)   **Complimentary**

In the case of complimentary products, the products are demanded jointly.

Examples

- The demand for steel alloys will increase the demand for iron.
- The demand for chrome will increase with demand for chrome alloys
- The demand for jewellerly will increase the demand for gemstones.
- Demand for butter increases with demand for bread.

Factors affecting demand

Consumer Tastes and Preferences

When consumer perceptions of a good or service become less favourable, market demand for the item lessens and vice versa. Consumer taste and preference patterns undergo continuous review and are subject to change, sometimes gradual and sometimes rapid., over time. The emergence of new and better products, changing values and life styles, new information about health and safety features of products, business cycles, rising standards of living, higher levels of affluence, and advertising, to mention a few, all exert a pervasive influence upon consumer tastes and preferences

Factors affecting demand

Consumer Income

Willingness to buy is in itself insufficient; consumers must be able to pay for the commodities they want. Typically, the greater is consumer income the greater will be demand for goods in general and for some items in particular. Only in the case of inferior goods is rising income accompanied by a weakening demand.

Factors affecting demand

Consumer Expectations

Expectations with respect to future prices, income levels, product availability can have an effect on the demand for a mineral commodity.

Factors affecting demand

All other factors that may affect demand

- Is a good a luxury or necessity? This is largely a function a function of life styles and value judgements

- Degree of market saturation for a product

- Discretionary income – This is the residual amount of income remaining after subtracting necessary living expenses and fixed payment charges from disposable personal income. Demand for some goods depends on discretionary income.

- Disasters

- Changing safety, health and environmental concerns (use of asbestos roofing)

- Recycling

Fig. 2 Demand curve – change in demand

Demand function

In the demand function, with all other factors held constant, the quantities demanded may relate to its market price as indicated in Figure 2. A reduction in the price from P_{x1} *to* P_{x2} results in an increase in the quantity demanded. There is a change in quantity demanded.

Shift in demand may also happen if there is a change in one of the determinants of demand. In this case the entire demand curve may shift outward or inward depending on the causating factor. For instance, if all other factors are held constant and the income level increases, the demand curve may shift outward and vice versa as shown in the figure 3 below.
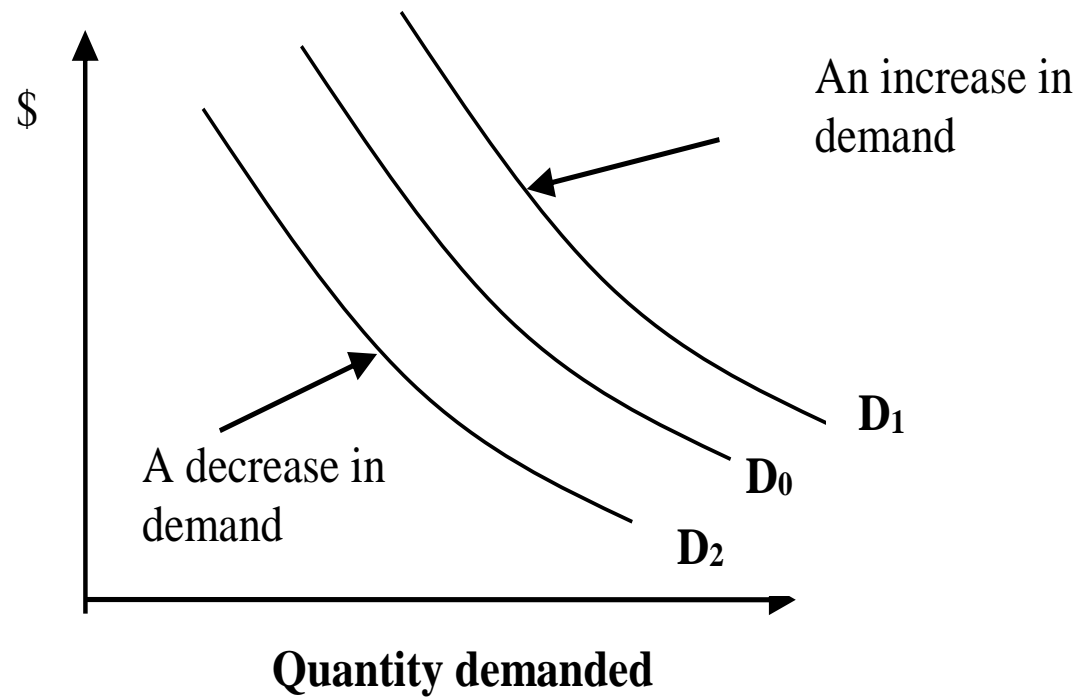
Fig. 3 Demand curve – shifts in demand

Elasticity of demand

The concept of elasticity of demand is one of the most important aspects of demand analysis. In general terms, elasticity of demand measures the magnitude of the responsiveness or sensitivity of the quantity demanded of a commodity to a change in some demand determinant. More specifically, elasticity concerns the extent to which a percentage change in one demand variable causes a percentage change in the quantity demanded.

$$\varepsilon = \frac{\%\ \text{change in quantity demanded}}{\%\ \text{change in any demand determinant}}$$

Elasticity of demand

There are as many kinds of elasticity of demand as there are numbers of demand determinants for a commodity (price elasticity, income elasticity, etc).

Price elasticity of demand

The relation of a commodity price to sales volume is of major interest to business firms as a basis for pricing policy, sales strategy, and achievement of profit and market share objectives.

Price elasticity of demand can be defined as:

$$\varepsilon = \frac{\%\ \text{change in quantity demanded}}{\%\ \text{change in price}}$$

Elasticity of demand

The coefficient of price of elasticity is always negative. This is because the price and quantity demanded are inversely related.

Two methods of calculating price elasticity exist – the arc elasticity method and the point elasticity method.

Arc method: This is a measure of the responsiveness of the quantity demanded between two seperate points on the demand curve.

Example:

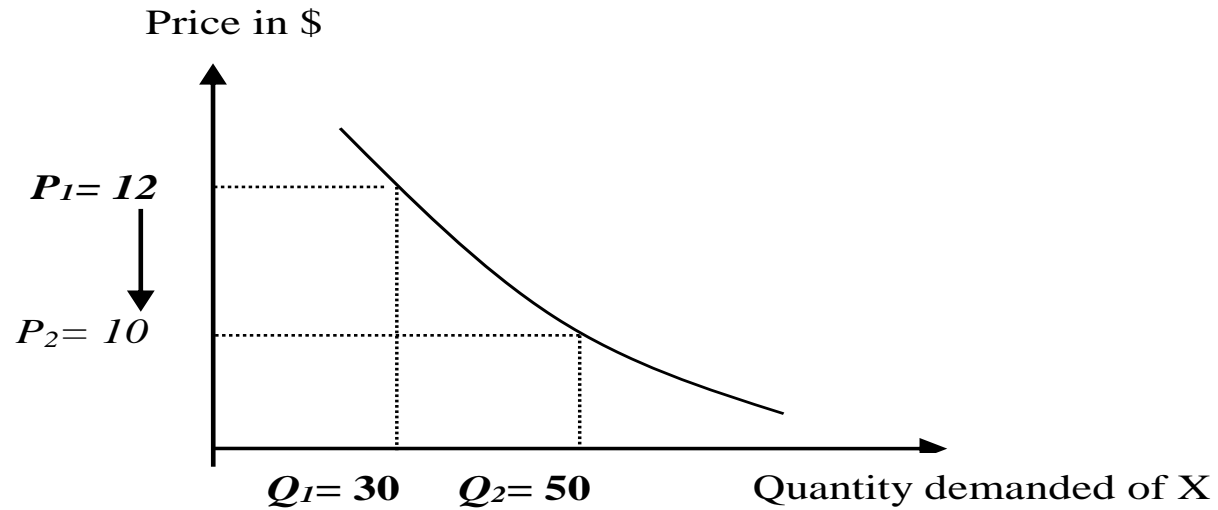Determine the degree of responsivess of the quantity demanded to a decrease in price from $12 to $10.

Price in $

Fig. 4 Elasticity of demand

$$\varepsilon_p = \frac{\% \text{ change in quantity demanded}}{\% \text{ change in price}}$$

$$= \frac{[(Q_2 - Q_1)/Q_1] \times 100}{[(P_2 - P_1)/P_2] \times 100}$$

Where the pairs *(Q1, P1) and (Q2, P2)* represent respectively, the quantity and price values before and after their change.

Substituting the appropriate values into the formula gives:

$$\varepsilon_p \ = \ \frac{[(Q_2 - Q_1)/Q_1] \ x \ 100}{[(P_2 - P_1)/P_2] \ x \ 100} \ = \ \frac{(50 - 30)/30}{(10 - 12)/12} \ - \ \text{- 4.0}$$

However, if we compute the sensitivity of the quantity demanded to an increase in price from \$10 to \$12 (equivalent to moving up the demand curve), the coefficient of price elasticity is

$$\varepsilon_p = \frac{[(Q_2 - Q_1)/Q_1] \; x \; 100}{[(P_2 - P_1)/P_2] \; x \; 100} = \frac{(30 - 50)/50}{(12 - 10)/10} \quad - \quad - \, 2.0$$

Price elasticity of demand

The discrepancy in the two elasticiy coefficients arises because the percentage changes going from $12 to $10 are not the same as those from moving from $10 to $12. This is a troublesome matter but not without a remedy. The ambiquity of arbitrarily using one of the two points as the original or base values for calculating the percentage changes can be partially overcome by using averages of the quantity values as the base for calculating the percentage change in Q and the average of the two prices as the base for calculating the percenatge change in P. Making this adjustment gives the more satisfactory formula

$$\varepsilon_p = \cfrac{\cfrac{Q_2 - Q_1}{\left[\cfrac{Q_1 + Q_2}{2}\right]}}{\cfrac{P_2 - P_1}{\left(\cfrac{P_1 + P_2}{2}\right)}}$$

In terms of our previous example, the coefficient of price elasticity for a decline in price from \$12 to \$10 becomes;

$$\varepsilon_p = \cfrac{\cfrac{50 - 30}{\left[\cfrac{30 + 50}{2}\right]}}{\cfrac{10 - 12}{\left(\cfrac{12 + 10}{2}\right)}} = -2.75$$

Price elasticity

A price elasticity of –2.75 should be interpreted as meaning that over the indicated range of prices and quantities, a 1% change in price will be followed by approximately a 2.75% change in quantity demanded in the opposite direction (verify that the same coefficient is obtained by moving from $10 to $12).

Price elasticity

In general, the further apart the two points between which arc elasticity is computed, the greater is the discrepancy between the price elasticity coefficients obtained from the two-point arc formula.

Since the sign of the price elasticity of demand is always negative (in accordance with the law of demand), it is the size of the coefficient itself which is most relevant. By convention if:

$\varepsilon_p > 1$ demand is elastic (quantity demanded is sensitive to price changes)

$\varepsilon_p = 1$ demand is unitary or of unitary elasticity

$\varepsilon_p < 1$ demand is inelastic (quantity demanded is relatively unresponsive or insensitive to price changes.

Point Elasticity: Measuring elasticity at a point eliminates the imprecision of the arc elasticity concept. Point elasticity refers to the responsiveness of quantity demanded to very small price changes from a given point.

$$\varepsilon_p = \frac{\Delta Q/Q}{\Delta P/P} = \frac{\Delta Q}{Q} \cdot \frac{P}{\Delta P} = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q}$$

As the changes in price get smaller and smaller and actually approach zero, the ratio of $\Delta Q/\Delta P$ becomes equivalent to the derivative of the demand function with respect to price.

$$\underset{\Delta P \to 0}{Lim} \frac{\Delta Q}{\Delta P} = \frac{dQ}{dP}$$

Therefore the formula for point elasticity becomes

$$\varepsilon_p = \frac{dQ}{dP} \cdot \frac{P}{Q}$$

Similarly, the income elasticity may be derived as

$$\varepsilon_I = \frac{dQ}{dI} \cdot \frac{I}{Q}$$

Cross elasiticity of demand

Cross elasiticity of demand : Mineral commodities can be treated in three ways in as far as their demand is concerned:

i).   They may be ***competing products or substitutes***. In this case an increase in the purchase of one is at the expense of the other. Consider plastics substituting metals in motor vehicles and construction.

ii).   They may be ***complimentary products***, in which case an increase of one causes a rise in the purchase of another. Complimentary means that commodities are consumed together. Consider the demand for gemstones and gold in demand for jewellery.

iii).   Commodities may be ***independent*** implying that the purchase of one mineral commodity has no direct bearing on the demand of another. In this case the commodities are neither consumed together nor in place of one another.

Cross elasticity of demand is a measure for interpreting the relationship between products. For two products X and Y, cross elasticity measures the percentatge change in the quantity demanded of product Y in response to a percentage change in the price of product X.

$$\varepsilon_{y\,x} = \frac{\%\ \text{change in quantity of Y}}{\%\ \text{change in price of X}}$$

Where $\varepsilon_{y\,x}$ is the coefficient of cross elasticity between X and Y. Again there are two ways of calculating the coefficient of cross elasticity of demand.

The arc formula is:

$$\varepsilon_{yx} = \frac{\dfrac{Q_{y2} - Q_{y1}}{\left[\dfrac{Q_{y1} + Q_{y2}}{2}\right]}}{\dfrac{P_{x2} - P_{x1}}{\left(\dfrac{P_{x1} + P_{x2}}{2}\right)}}$$

The point elasticity formula is

$$\varepsilon_{yx} = \frac{dQ_y}{dP_x} \cdot \frac{P_x}{O_v}$$

The cross elasticity coefficient may be either positive or negative. Note that when

$\varepsilon_{yx} > 0$ Commodities are substitutes
$\varepsilon_{yx} < 0$ Commodities are complimentary
$\varepsilon_{yx} = 0$ Commodities are independent

Partial Elasticities of Demand:

A more rigorous Concept of Demand Elasticity

In its most general form, the demand function for a good can be expressed as

$$Q_1 = f(P_1, P_2, \ldots P_n, T, I, E, R, N, O)$$

Where,
- Q_1 = quantity demanded of good 1
- P_1 = market price of the good
- $P_2, \ldots P_n$ = prices of other goods
- T = consumer tastes and preferences
- I = Level of consumer incomes (or purchasing power)
- E = consumer expectations about future prices, incomes and product availability
- R = range of products available to consumers
- N = number of potential consumers (market size)
- O = all other factors which may influence Q_d

The elasticity of demand with respect to any demand determinant refers to the degree of responsivess of the quantity demanded relative to some percentage change in that demand determinant *when the values of all other demand determinants are held fixed.*

FACTORS AFFECTING SUPPLY

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Determinants of Supply

Price in $
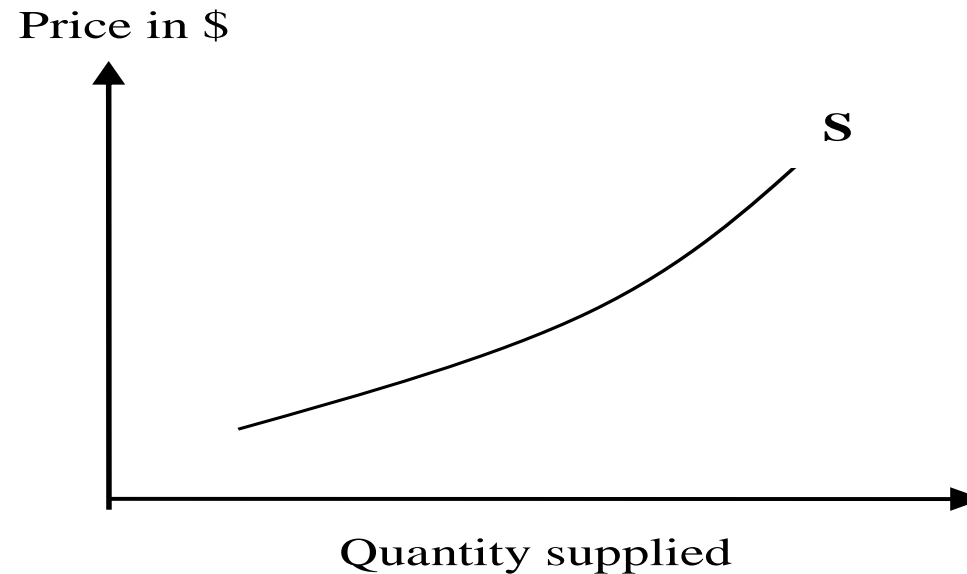
S

Quantity supplied

Fig. 5 Supply curve

The supply curve (S) in Fig. 5 represents the marginal cost curve for the industry supplying a particular mineral commodity. Conceptually, supply increases with increase in the market price of the commodity. This is expected because with an increase in the market price, some of the marginal deposits become viable and contribute to the expansion of supply. If the price falls on the market, some marginal mines will become unprofitable and forced to close down thereby reducing the overall supply. Thus the market mechanism regulates supply.

Factors affecting the supply of mineral commodities in the long term are:

- Major new discoveries (e.g., oil in Ghana, oil in Uganda, oil in Angola, oil in Congo Brazzaville, copper in Zambia, etc)
- Depletion (coal in UK, coal and iron in Germany, etc).
- Advance in processing technology (that has made it possible to process low grade ores or enhancement methods used in the treatment of low grade ores, e.g., Lumwana Cu; gemstones, oil tar sands in Canada, etc.)
- Recycling (secondary supply)
- Enviromental controls (progressive increase in regulations have rendered mining of some deposits uneconomic).
- Development of substitutes (e.g., plastics in place of metals).
- Development of new product markets (e.g., use of Cu as insulator and not electricity conductor).

Metal Recycling

Metals are essential, versatile and can be used in a number of ways. Metals can be used for industrial purposes such as manufacture of trucks, cars, airplanes, ships, and railways. They can also be used to manufacture domestic items such as cutlery, crockery and even in packaging. The good thing about metal recycling is that, metal can be recycled over and over without altering its properties. The most common recyclable metals include aluminum and steel. The other metals for example silver, copper, brass and gold are so valuable that they are rarely thrown away to be collected for recycling. Therefore, they do not create a waste disposal crisis or problem.

Updated January 27, 2016.

The United States recycles 150 million metric tons of scrap materials annually, including 85 million tons of iron and steel, 5.5 million tons of aluminum, 1.8 million tons of copper, 2 million tons of stainless steel, 1.2 million tons of lead and 420,000 tons of zinc, according to the Institute of Scrap Recycling Industries (ISRI). Other metals such as chrome, brass, bronze, magnesium and tin are recycled as well.

U.S. Exports Recycled Metal

In 2008, the scrap recycling industry generated $86 billion and supported 85,000 jobs. The recycled materials that the industry processes into raw material feedstock every year are used for industrial manufacturing around the world. ***For example, 25% of the steel used in production car panels (doors, hood, etc.) is obtained from recycled materials.*** For copper, used in the home building industry for electric wires and plumbing pipes, that proportion surpasses 50%.

Each year, the United States exports staggering amounts of scrap metals - called scrap commodities - contributing significantly to U.S. trade balances. For example, in 2012 the U.S. exported $3 billion worth of aluminum, $4 billion of copper, and $7.5 billion of iron and steel.

[Metal Recycling](#) Saves Energy and Natural Resources

Recycling scrap metal reduces the substantial amounts of greenhouse gas emissions produced during the various smelting and processing operations used when making metal from virgin ore. At the same time, the amount of energy used is also much smaller. Energy savings using various recycled metals compared to virgin ore is up to:

-- 92 percent for aluminum
-- 90 percent for copper
-- 56 percent for steel

These savings are significant, especially when scaled up to large production capacities. Indeed, according to the U.S.Geological Survey, 60% of steel production comes directly from recycled iron and steel scrap. *For copper, the proportion coming from recycled materials reaches 50%.* Recycled copper is [almost as valuable as new copper](#), making it a common target for scrap metal thieves.

In the short-term, supply may be affected by

- Labour strikes
- Changes in producer and consumer inventories
- Mine production cut-backs
- Government stockpiles
- Business cycles

In addition to changes in along the supply curve, there could be shifts in the supply curve.
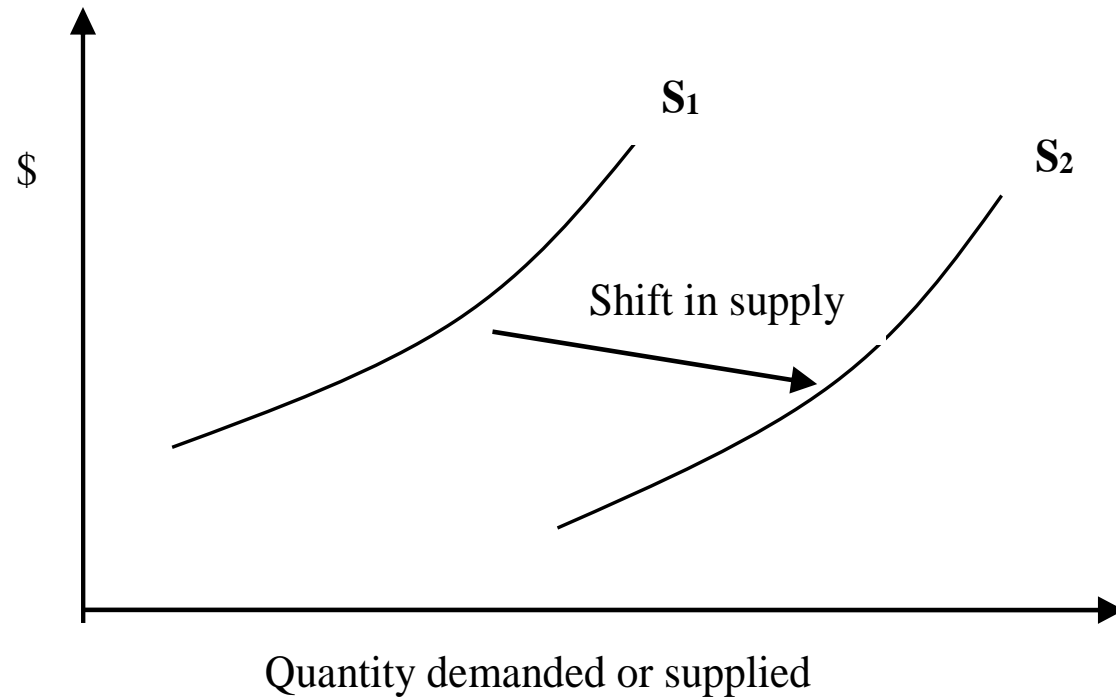

Fig. 6 Supply curve – shifts in supply

MINERAL MARKETS

We have already defined a market as a collection of individual decision making units, some of which desire to buy (demand) and some of which desire to sell (supply) a particular good or service.

In analysing the structure and functioning of markets, we shall first deal with a special kind of theoretical market model. It is a market that is both perfect and competitive.

Perfect Market:

Assumes that buyers and sellers have complete knowledge of market conditions, that any change in market conditions will be immediately known and acted on.

Competitive Market:

- The concept of a competitive market, like that of a perfect market, is an abstraction. The most important characteristic of a competitive market is that no single participant has power to affect the market outcome in an significant way. All participants are price takers and not price makers

- The second characteristic of a competitive market is that there is no obstruction or restriction placed on supply (that is, no barriers to entry), demand or the level of price.

- The final characteristic of a competitive market is that only one homogeneous commodity is sold in any given market.

- The prime movers in our model are the forces of supply and demand. They determine the price of the good and the quantity exchanged in any given market.
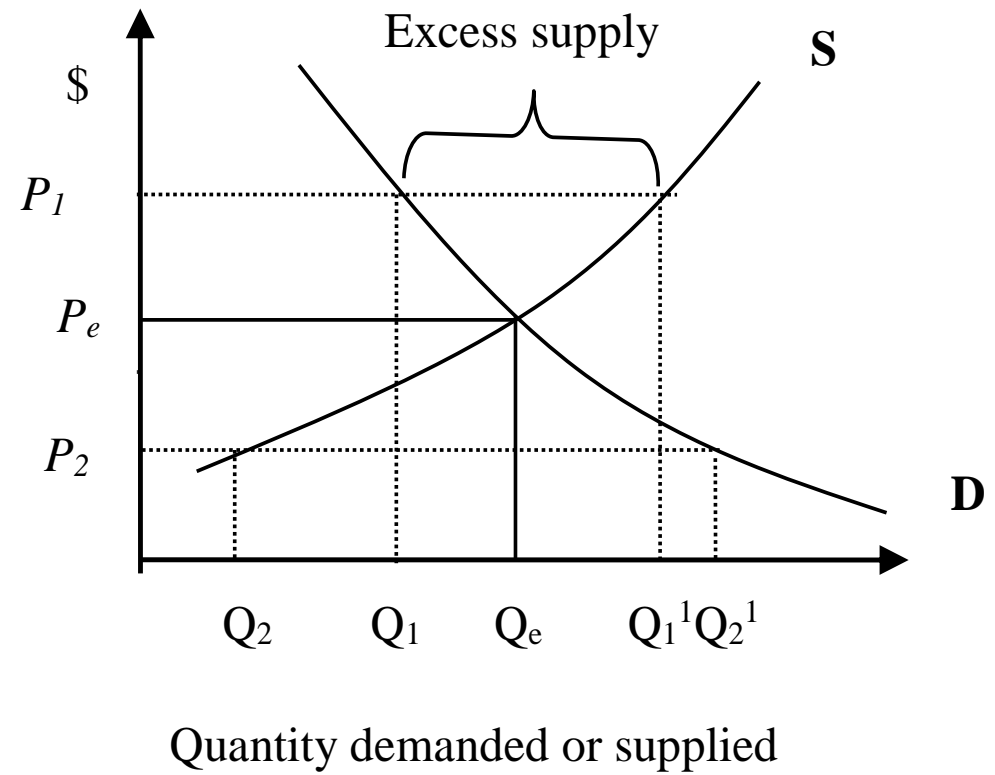
Figure 7: Excess Supply condition

At price P_1, the quantity supplied (Q_1^1) is greater than the quantity demanded (Q_1) by the market. Therefore there is excess supply that will result in forcing the price down because competitive price bidding by sellers will continue. Excess supply is ($Q_1^1 - Q_1$). Such a situation is a *buyers' market*. Similarly at a price P_2, the quantity demanded (Q_2^1) is greater than the quantity being supplied on the market. There is excess demand, a situation that will eventually force the price to move up because there will be competitive bidding by demanders. Buyers are the ones now scrambling and in the process force the price up – a situation which is favourable to sellers. Excess demand is ($Q_2^1 - Q_2$).

At both prices (P_1 and P_2), the market is not in equilibrium. At a price P_e, the quantity supplied is equal to the quantity demanded by the market. The market is said to be *equilibrium*. The price P_e is the market equilibrium price. What conditions would facilitate the emergence of a black market?

However, all these changes affecting the demand and supply conditions are superiposed. All we actually see is the overall result.

TYPES OF MARKET POWER

There are three basic kinds of market power. Two of them deal with control over the supply or demand of a product. The third deals with control over its price.

Monopoly and Monopsony Power

To control the supply or demand of a good or service is to possess market power. Free markets are rigged and the market system obstructed when either or both of these forces are controlled. Those who control *supply*, who determine how much of a good or service is to be brought into the market, possess *monopoly power*. Those who control *demand*, who determine how much of a good or service will be taken off the market, possess *monopsony power.*

Market Structure and Market Power

In principle market structures range from an ideal case of perfect competitive market to a pure monopoly with intermediate market structures called oligopoly and monopolistic competition. Monopoly and Monopsony Power result from a particular kind of market structure. ***The existence of either monopoly and Monopsony implies the absence of competition***.

Competitive markets, we have seen, have a unique set of conditions. There are so many independent buyers and sellers that no one can affect the price, commodity exchanged is homogeneous, and no barriers to entry.

Monopolistic Competition

In most real world markets, the products of firms are not homogeneous. Ordinarily, the product of each firm is in some way *differentiated* from the product of every other firm. In fact, most enterprises devote considerable time and effort to engineering special features into their products and to making their products unique through advertising, packaging, brand names, terms of credit, service , etc.

Monopolistic competition implies a market environment comprising many firms selling products that are very close (but not perfect) substitutes for each other (cell phones, consumer electronics, cars, etc)
Three factors combine to set monopolistic competition apart:

- Product differention
- presence of large numbers of sellers
- non price competition

Many Models of Oligopoly

Oligopoly is synonymous with competition among the few. Markets are said to be oligopolistic whenever a small number of firms supply the dominant share of an industry's output.

If the firms produce a standardized product, the industry is called a pure oligopoly. Most common examples of virtually uniform products marketed under oligopoly include steel, aluminun, lead, copper, cement, explosives, fuel oil.

If a few firms dominate the market for a differentiated product, the industry is called a differentiated oligopoly. Examples include the production of cars, TV sets, mobile phones, cigarettes, computers, soft drinks, etc. Entry into an oligopolistic industry is typically formidable. The most pervasive barrier to entry is the presence of substantial economies of scale.

Price leadership Models

Two major forms of price leadership stand out: *dominant firm leadership and barometric firm leadership.*

Dominant Firm Price leadership: A dominant firm establishes its own preferred price as the going market price and allows the competitive fringe firms to sell all they wish at that price.

Barometric Price leadership: Exists when there are several principal firms (surrounded or not, as the case may be, by a competitive fringe of small firms) and one of the large firms is not powerful enough to impose its will upon the other consistently. In copper, price leadership has been exercised by all the big three – Anaconda, Kennecott, and Phelps Dodge. US Steel, Bethlehem have exercised price leadership in steel.

Cartel Theory of Oligopoly

A cartel is an organisation established whose purpose is manipulate the price by controlling supply or demand. So there can be producer cartels and consumer cartels.

Cartels tend to arise in markets where there are few firms and each firm has significant share of the market. Cartels are illegal in US. Internationally there are no restrictions on cartel formation.

By working together, the cartel behaves like a monopolist.

Examples of very successful producer cartels include:

OPEC – the Organization of Petroleum Exporting Countries comprising 12 countries is largely concentrated in the middle east.

In accordance with its Statute, the mission of the Organization of the Petroleum Exporting Countries (OPEC) is to coordinate and unify the petroleum policies of its Member Countries and ensure the stabilization of oil markets in order to secure an efficient, economic and regular supply of petroleum to consumers, a steady income to producers and a fair return on capital for those investing in the petroleum industry

The Organization of the Petroleum Exporting Countries (OPEC) was founded in Baghdad, Iraq, with the signing of an agreement in September 1960 by five countries namely Islamic Republic of Iran, Iraq, Kuwait, Saudi Arabia and Venezuela. They were to become the Founder Members of the Organization.

These countries were later joined by Qatar (1961), Indonesia (1962), Libya (1962), the United Arab Emirates (1967), Algeria (1969), Nigeria (1971), Ecuador (1973), Gabon (1975) and Angola (2007).

From December 1992 until October 2007, Ecuador suspended its membership. Gabon terminated its membership in 1995. Indonesia suspended its membership effective January 2009.

Currently, the Organization has a total of 12 Member Countries.

The OPEC Statute distinguishes between the Founder Members and Full Members - those countries whose applications for membership have been accepted by the Conference.

The Statute stipulates that "any country with a substantial net export of crude petroleum, which has fundamentally similar interests to those of Member Countries, may become a Full Member of the Organization, if accepted by a majority of three-fourths of Full Members, including the concurring votes of all Founder Members."

The Statute further provides for Associate Members which are those countries that do not qualify for full membership, but are nevertheless admitted under such special conditions as may be prescribed by the Conference.

CIPEC

The Intergovernmental Council of Countries Exporters of Copper (CIPEC) (French Conseil intergovernmental des pays exportateurs de cuivre) was created in 1967 in Lusaka with the objective of coordinating policies of the country members looking for growth in the revenues coming from copper.

Composition

It was initially constituted with four members, Chile, Peru, Zaire and Zambia. A further four were added to the cartel in 1975 - Australia, Indonesia, Papua New Guinea and Yugoslavia.

CIPEC represented around 30% of the world's refined copper, and more than 50% of the proven reserves of copper. The intent of the members to secure higher prices failed, particularly of increasing the price during the crisis of 1975-1976, and the subsequent change of behavior of Chile finally finished the cartel (1967-1988).

Many experts consider that the market power of this cartel was negligible, because the residual demand that it faced was elastic (much higher than OPEC, for example). The inability of coordinating output cutbacks during the extensive period of life of CIPEC seems to validate this hypothesis. It was dissolved during the 1990s.

CIPEC stages

There were three stages of the CIPEC that economists recognize:

Nationalization stage (1967–1973)
Unilateral Action stage (1973–1976)
Reflux stage (1976–1988)

Copper cartels

Since 1870, there have been several formal attempts to restrict the copper output and raise, in this form, its price.

This is a list of copper cartels in the 20th century:

- Copper Export Association, CEA, 1918–1923
- Copper Exporters, Inc., CEI, 1926–1932
- International Copper Cartel, ICC, 1935-1939 (Also called World Copper Agreement)
- Intergovernmental Council of Copper Exporting Countries, CIPEC, 1967–1988

A Diamond Market No Longer Controlled By De Beers

Thursday June 06, 2013 10:44

Historically the diamond industry was structurally flawed -the De Beers monopoly controlled prices. But, with peak market share reaching almost 90% in the late 1980's, a series of events over the next 25 years led to the erosion of the De Beers monopoly. Today, De Beers no longer has control of the diamond industry, and for the first time in a century, market supply and demand dynamics, not the De Beers monopoly, drives diamond prices.

In the late 19th century a massive diamond discovery in South Africa prompted a diamond rush. Businessman Cecil Rhodes bought as many diamond-mining claims as he could, and his accumulation of properties eventually became De Beers Consolidated Mines Limited. De Beers maintained a hold on what was a relatively small industry at the time by expanding from mining into every facet of the diamond industry, with a focus on monopolizing distribution. De Beers successfully influenced just about all of the world's rough suppliers to sell production through the De Beers channel, gaining control of global supply. This gave De Beers the power to influence diamond supply and thus diamond prices.
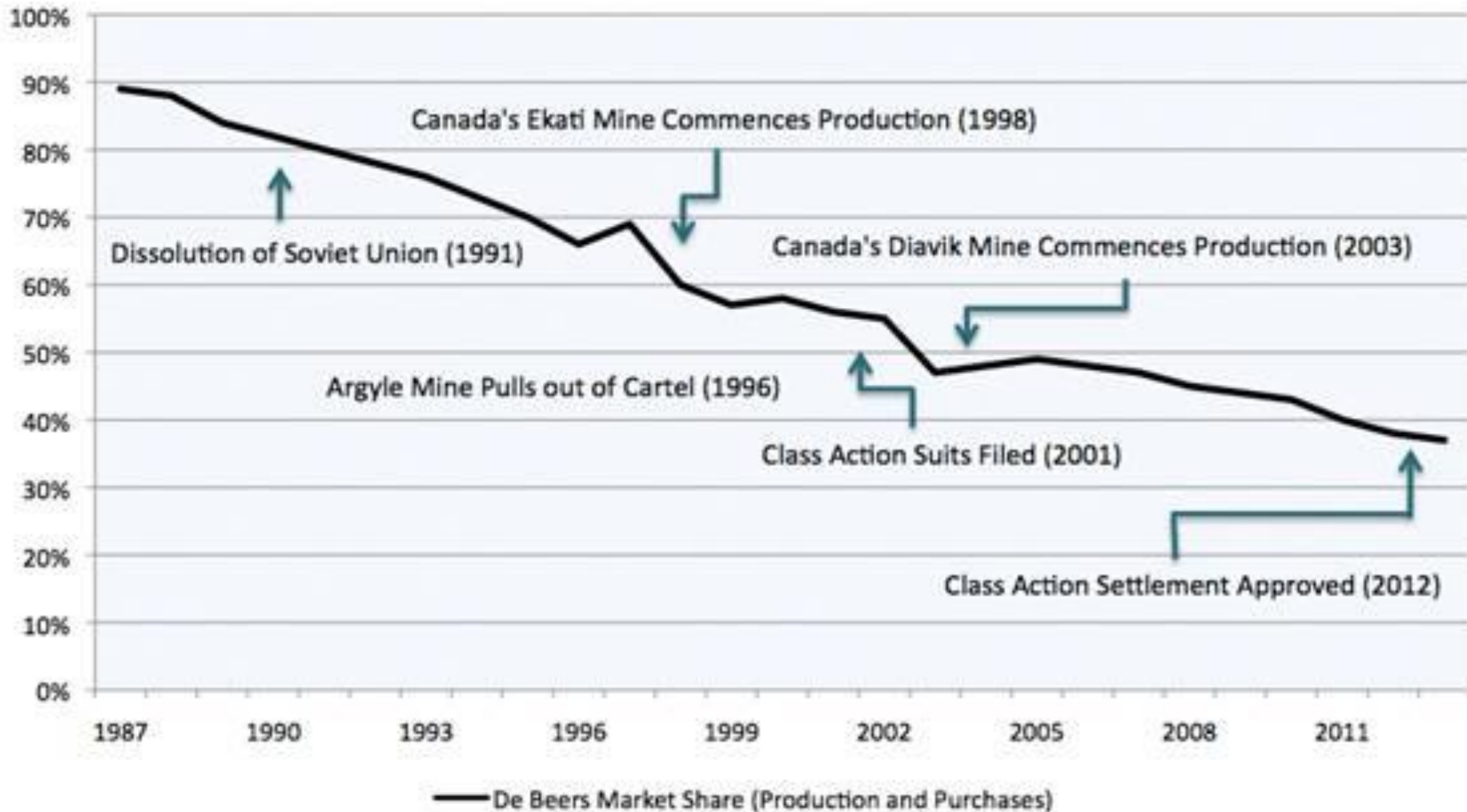
The De Beers distribution channel, operating under the unassuming moniker Diamond Trading Co. (DTC), was a system put in place that gave De Beers complete control and discretion to distribute the majority of the world's diamonds. Only buyers or "Sight holders" authorized by De Beers could participate in the non-negotiable DTC sales.

In order to maintain a stable but rising diamond price, De Beers had the power to stockpile inventory in a weak market or raise the prices charged to Sight holders, and then in an excessively strong price environment (with the potential to damage demand), De Beers had the excess supply on hand to release to the market when needed, repressing disorderly price increases.

To keep the DTC system intact, it was necessary for De Beers to maintain control of the worlds rough diamond supply.   However, in the second half of the 20th century, as new world-class mines were discovered in Russia, Australia, and Canada, it became increasingly difficult for De Beers to control global supply. The biggest risk to the survival of the De Beers cartel was for these new world-class mines to begin selling directly to the market, bypassing De Beers.

Russia began producing diamonds in the 1950's. At first, the Russians agreed to sell production to De Beers keeping the cartel intact. However, the arrangement was weakened in 1963 when Anti-Apartheid legislation restrained the Soviet Union from dealing with a South African company. Further pressure came during the Soviet Union collapse in the 1990's, when political chaos and a weak rubble further separated Russia's production from De Beers. The De Beers market share began to fall from a peak of almost 90% (See Figure 1.1).

De Beers Market Share

Dissolution of Soviet Union (1991)

Canada's Ekati Mine Commences Production (1998)

Canada's Diavik Mine Commences Production (2003)

Argyle Mine Pulls out of Cartel (1996)

Class Action Suits Filed (2001)

Class Action Settlement Approved (2012)

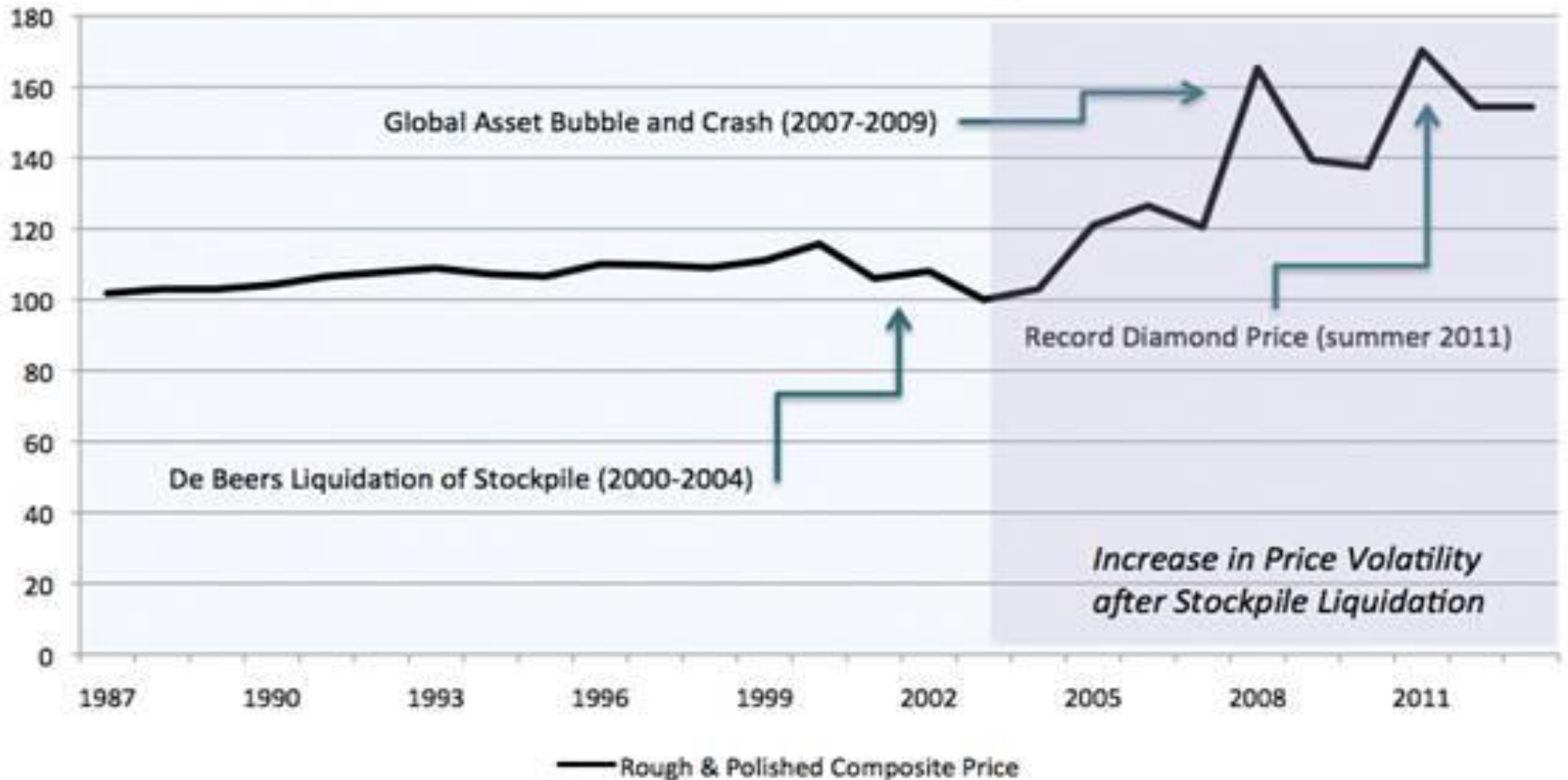De Beers Market Share (Production and Purchases)

Shortly after losing control of the Russian supply, the Argyle Mine in Australia (at the time the largest diamond producing mine in the world by volume) broke away from De Beers because of the cartel's inflexibility. Over the next few years, other mines followed suit, as new world-class mines in Canada chose to sell their supply independent of De Beers.

In an effort to maintain control of supply, De Beers began buying diamonds in the secondary market at a premium, but the strategy was short lived as the cost was prohibitive. By the end of the 1990's, De Beers' market share had fallen from as high as 90% in the 1980's to less than 60%. In 2000, De Beers announced a shift in strategic initiative focused on independent marketing of the De Beers brand, implying that they no longer had control of the market.

In 2001, several law suits were filed in U.S. courts alleging that De Beers "unlawfully monopolized the supply of diamonds, conspired to fix, raise, and control diamond prices, and issued false and misleading advertising." After multiple appeals, in 2012 the U.S. Supreme Court denied final petition for review, and a settlement in the amount of $295 Million with an agreement to "refrain from engaging in certain conduct that violates federal and state antitrust laws" was finalized.

Diamond Price History

De Beers Liquidation of Stockpile (2000-2004)

Global Asset Bubble and Crash (2007-2009)

Record Diamond Price (summer 2011)

Increase in Price Volatility after Stockpile Liquidation

Rough & Polished Composite Price

The way that De Beers did business, revolving around the central concept of controlling market supply, was simply not viable in a more competitive environment. With the company restructuring underway, De Beers liquidated their stock pile from 2000 to 2004, resulting in a modest decline in diamond prices as the liquidation supply more than offset new demand coming out of Asia (see figure 1.2). By 2005, the inventory overhang had been exhausted allowing market forces to drive diamond prices for the first time in a century, resulting in unprecedented price volatility.

 Diamond prices made a new high in 2007, followed by a violent sell off in 2008 and 2009 before rebounding to another new high in the summer of 2011. As of June 2013, diamond prices are approximately 15% off the 2011 highs, but remain firm as lower than expected mine output has subdued supply supporting prices.

Why Cartels Fail:

Once established, cartels are difficult to maintain. Problem is that cartel members will be tempted to cheat on agreed limit production. By producing more output than it has agreed to produce, a cartel member can increase its share of cartel's profit. Hence there is a built-in incentive for each cartel member to cheat. OPEC and the now dead CIPEC cartels have suffered this problem.

- Mineral dependent economies. Pressure of financing Development in DCs. Over 20 nations dangerously vulnerable to resource curse. Over 75% of all mineral-dependent countries are now low and medium income countries. *Mineral-dependent countries defined as countries dependent for at least 25% of their tangible exports.*

- Different production costs favours low cost producers who may not face low price pressure and hence not fully committed to cartel's ideals.

Leonardo DiCaprio's 2006 movie "Blood Diamond" shed light on the sometimes dubious origins of luxury goods.

The movie highlighted increasing concern about human rights violations in the supply chain and the diamond industry has been put under pressure to eliminate minerals of unknown or dubious sources.

Now, attention is shifting to metals and other commodities that are mined using child or slave labor, or in dangerous conditions.

Apple under fire

Cobalt is an insignificant-looking grey metal that risk consultant Verisk Maplecroft says may be the next so-called conflict mineral. It is used to make the rechargeable batteries found in cell phones, laptops, electric vehicles, aircraft and power tools. The metal is predominately mined in the Democratic Republic of Congo (DRC), where critics say children as young as seven-years-old labor in horrendous conditions.

"The glamourous shop displays and marketing of state-of -the art technologies are a stark contrast to the children carrying bags of rocks and miners in narrow manmade tunnels risking permanent lung damage," Mark Dummett, a researcher at human rights charity Amnesty International, said in a report on cobalt mining in the DRC in January.
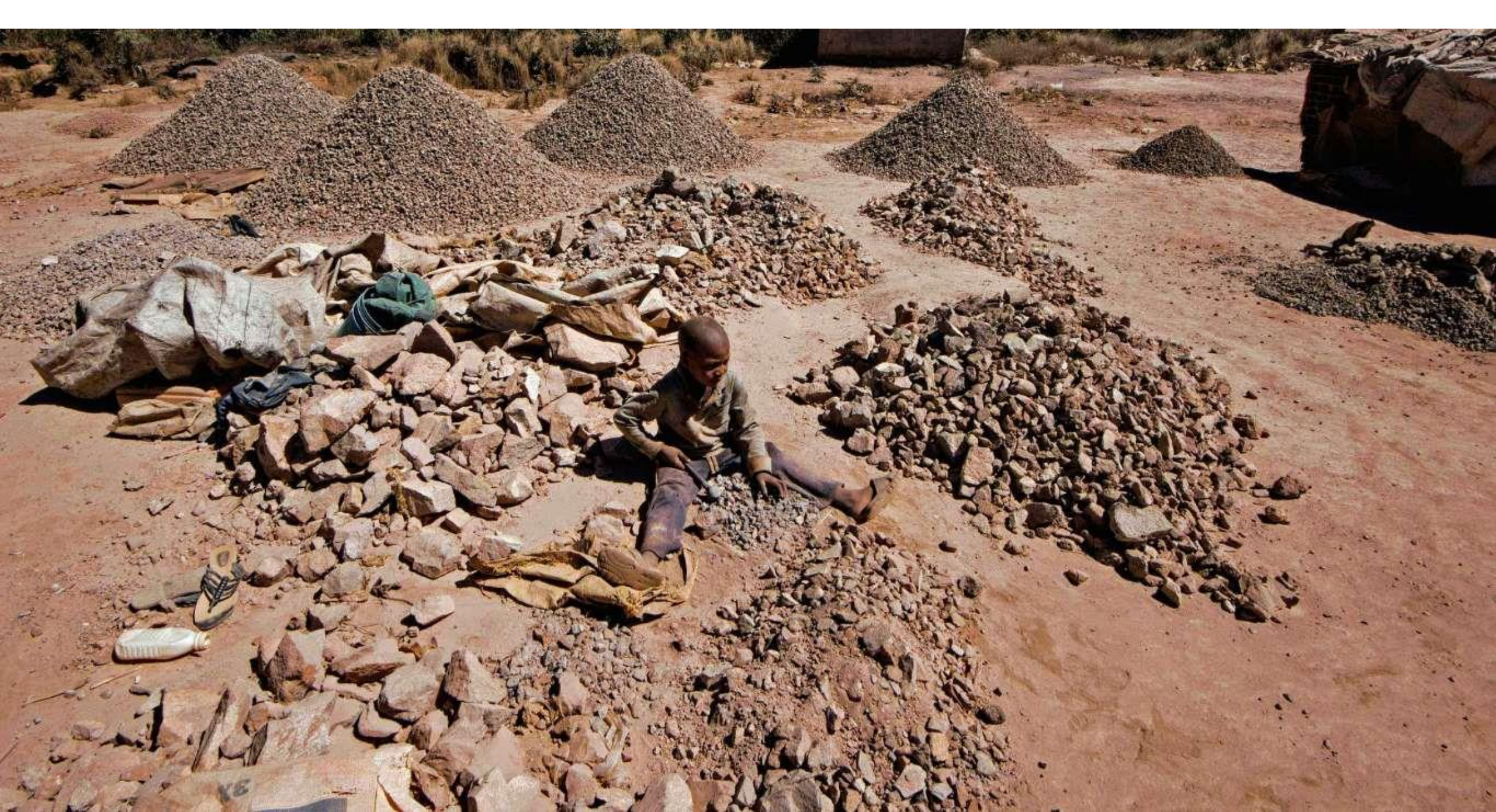
The term "conflict mineral" carries a lot of legal ramifications. U.S. Securities and Exchange Commission rules mean public companies must track the source of commodities designated conflict minerals in their supply chains in an effort to combat the financing of militia in countries like the commodities-rich DRC.

At present there are only four legally designated conflict minerals **– tantalum, tin, gold, and tungsten** – of which the first three are commonly mined in the DRC. Some analysts and human rights bodies say cobalt should be added to the list of minerals for which companies have to conduct heighted supply chain scrutiny.

These calls increased after Amnesty International's report, which alleged that a subsidiary of Chinese mineral giant Zhejiang Huayou Cobalt bought cobalt from mines in the DRC where child labor was rife. Amnesty said Huayou Cobalt sold the processed metal onto battery component manufacturers in China and South Korea, who claimed to supply 16 multinational consumer brands, including Apple.

Complex supply chains spanning several continents present challenges for companies who are required to determine where every commodity and component in their products come from. In response to Amnesty's report, Apple said it was evaluating if the cobalt in its products came from the DRC and if so, whether it was via Huayou Cobalt.

The U.S. company added that it did not tolerate underage labor and that when it had conducted an audit in 2014, 16 underage workers were discovered out of a workforce of 1.6 million. These cases were "successfully addressed," Apple said. Huayou Cobalt said it was unaware that any of its "legitimate suppliers" employed children at their mining sites or operated in unsafe conditions.

Verisk Maplecroft has warned that workers of all ages in the DRC are at "extreme of risk" of exposure to forced labor or trafficking.

The consultancy said this type of modern-day slavery was common across many poorer countries – not just in Africa – and that the goods and components produced might find their way on to shop shelves in Europe and the U.S.
"Companies are heavily reliant on goods and raw materials from India and China. However, sourcing from these countries can come with a substantial risk of association with forced labor," Verisk Maplecroft said in a report.
"The risk is endemic in India's agricultural sector and is prevalent in parts of its garment sector. The exploitation of children in the mining of minerals is also common. Forced labor, including the exploitation of young apprentices, occurs across multiple sectors in China, including electronics production, mining and agriculture," it added.

Making sure
Under-pressure multinationals are turning to outside consultancies to help them understand their own supply chains. One is RCS Global, whose tag line is "making sure" and has bases in Colombia, Rwanda, South Africa, China the U.S. and the U.K.

"If you look at the issue of slave labor or forced labor, I think where there are extremely unregulated supply chains, in countries of weak governance, you are sure to find this issue and that goes for any material," Harrison Mitchell, director of responsible supply chains at RCS Global, told CNBC.
He said companies were typically ignorant of exactly where they sourced their materials, rather than indifferent.
"There is quite a bit of movement on this issue in terms of companies taking the issue seriously," Mitchell told CNBC.

DECISION-MAKING THEORY OF A MINING FIRM

Decision-making theory of a mining firm revolves around three key components:

- Profit
- Survival
- Growth

THE MINING FIRM AND ITS CORPORATE STRATEGY

A firm has to pose and seek answers to a number of questions:

► What products will the firm offer for sell?

► Who will be the firm's customers?

► Why will they buy the firm's products?

► What should the concept of the firm's business be – now and in the future?

► What should the firm continue to do, and what should it abandon?

► How should the firm try to compete against its market rivals?

► How does the firm's economic mission mesh with market and competitive realities?

A firm's answers to these questions comprise what is meant by corporate strategy and constitute its directional signals and its master plan – **COMPANY'S STRATEGIC PLAN**

Profit: ► Basic objective of the firm and thus, is an important determinant of investment decisions. Investments will not take place if this objective is not met.

Survival: ► Is the most critical decision-making component for most mining firms because of the problems associated with mine replacement. The mining firm cannot survive within the context of its currently producing mines. To survive it must successfully participate in the uncertain exploration environment (also to survive, the company must have sustainable positive cash flows).

Growth: ► A mining firm has three growth direction alternatives

First stage: Horizontal integration

If a firm is to survive and grow, it must be successful in discovering other deposits. Success results in a horizontally integrated mining firm.

Second stage: **Forward vertical integration**

As a firm grows, three changes usually occur: exploration uncertainty decreases, market uncertainty increases and output of individual mineral products increases. These changes encourage forward vertical integration.

Vertical integration may only be effected gradually, in a number of stages over a period of time. The production of individual mineral commodities must be sufficient to support forward processing functions. Time is required within the firm to build the necessary marketing skills and processing technology. Financial resources are required to develop the forward processing plant. Realization of these basic requirements renders forward vertical integration feasible.

In spite of increasing incentives for vertical integration, the mining firm is not likely to abandon its horizontal integration strategy. The depletion of existing mines will provide a continuing need for the discovery of new deposits.

However, at some stage of growth, the mining firm will begin to develop forward processing facilities. The firm becomes its own customer between the integrated functions. Vertical integration transfers the market problem in the direction of the manufactured product. In pursuing such a strategy, the firm develops market skills and a technological base. Integration continues until a limit of profitable forward growth has been reached. A fully integrated mining firm embraces:

Mining ▶ **Milling** ▶ **Smelting** ▶ **Refining** ▶ **Fabrication**

Third stage: Diversification

As the mining firm's direction of growth shifts forward, the market skills and technological base become increasingly important. These are the requisite characteristics for diversification. Whether such a strategy will be pursued depends on a number of factors. Diversification will be encouraged when:

►   Growth rates and profit expectations in other sectors are greater than within the mineral industry.

►   Market uncertainties for mineral products are high and it is desirable to spread the market uncertainty of the firm as a whole.

►   Sufficient opportunities are not available within the mineral industry to sufficiently utilize the firm's resources.

MICRO-ECONOMIC ANALYSIS OF PRODUCTION

Production: Any activity that creates value is production. It is a series of activities by which resource inputs (raw materials, labour, capital, land utilization and managerial talents) are transformed over time into outputs of goods and services.

This relationship can be expressed symbolically as:

$$Q = f(X_a, X_b, X_c, \ldots X_n)$$

Where,

$X_a, X_b, X_c, \ldots X_n$ = Quantities of different types of inputs

Q = Quantity of output per period of time

Fixed and Variable inputs

Fixed input:

Definition

An item [required](#) to [produce](#) [goods and services](#) that do not [demonstrate](#) [short term](#) [variations](#). For example, a fixed input for a [manufacturing](#) [business](#) might be its factory, [production](#) machinery, key managerial personnel or other large [assets](#) that are consistently used to produce its [finished goods](#).

Variable input:

Definition

Usage rate can be altered easily in desire to lower or increase volume of output (electric power, labour, most raw materials).

Short-run – Time period so short that the firm is constrained from varying the quantity of its fixed inputs.

Long-run – Time period sufficiently long to allow all inputs to be varied – no inputs are fixed including technology

Short-run production function

$$Q = f (Xa, Xb, \ / Xc,…….. Xn)$$

Variable   fixed inputs

Cost functions – in short-run

Variable costs: costs vary with level of production (e.g., labour, materials).

Fixed costs: (also referred to as overhead costs) remain relatively constant regardless of the level of production activity. They tend to be proportional to time and independent of the number of units produced (e.g rent, licence fees, R&D, insurance).

$$TC = TFC + TVC$$

Where,   TC = Total cost

TFC = Total fixed cost

TVC = Total variable cost

$$TFC = \sum_{i=1}^{n} pi.Qi$$

Where,   pi = price of a specified fixed input

Qi = quantity of the specified fixed input

n = number of various fixed inputs

$$TVC = \sum_{j=1}^{n} pj.Qj$$

Where,   pj = price of a specified variable input

              Qj = quantity of the specified variable input

              n = number of various variable inputs

Therefore,   TC = $\sum_{i=1}^{n} pi . Qi$ + $\sum_{j=1}^{n} pj . Qj$

DEFINITIONS:

- **Totals:** Total (costs, revenues, profits) as a function of output

- **Averages:** (costs, revenues, profits) at a given level of output.

- **Marginals:** Amount of (cost, revenue, profit) added to the total amount by each additional unit of output, at a given level of output.

Cost behavior with increasing and decreasing returns to variable input in short-run
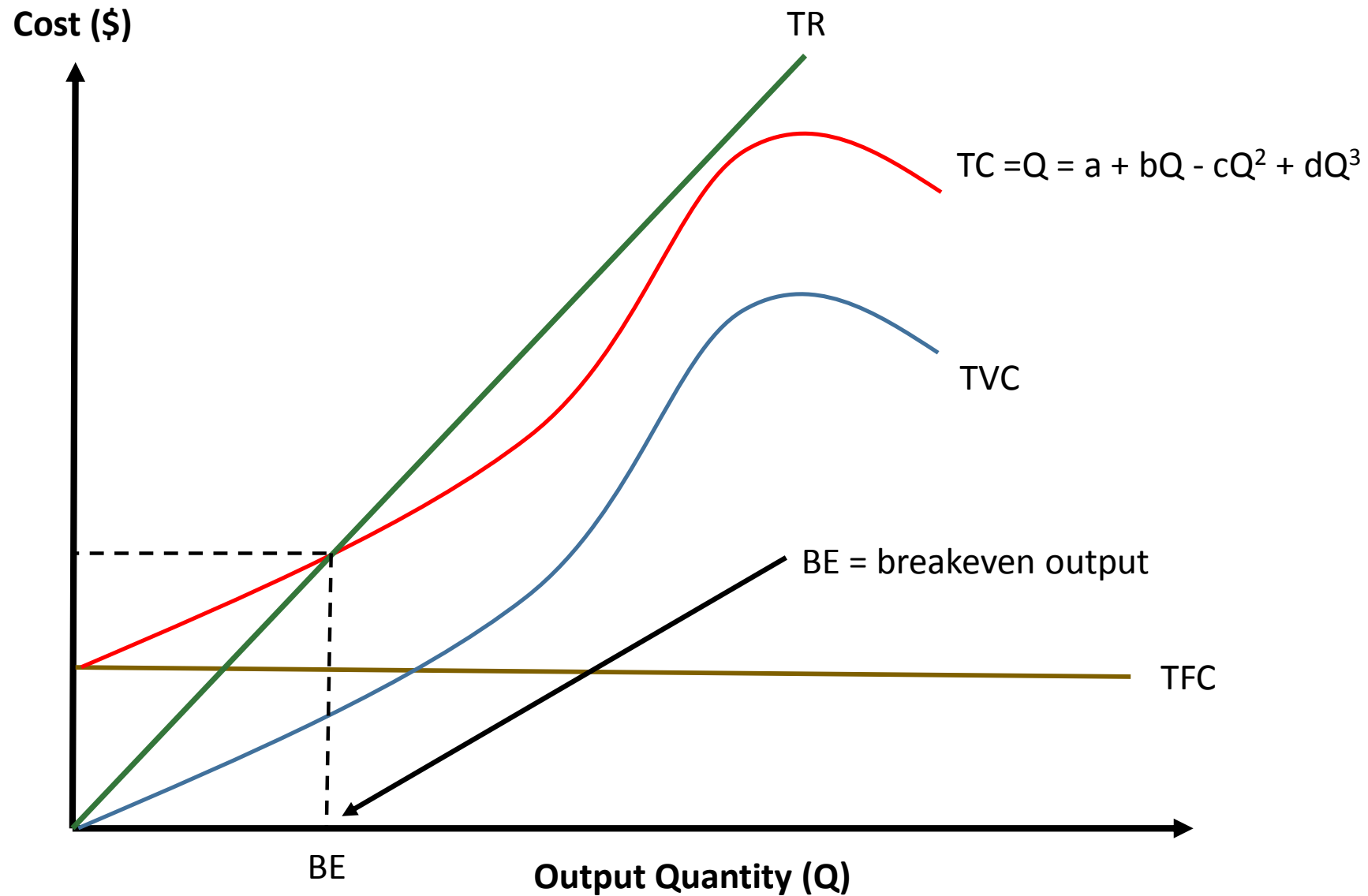
General equation

$$Q = a + bx - cx^2 + dx^3$$

Figure: Cost functions curves – short-run
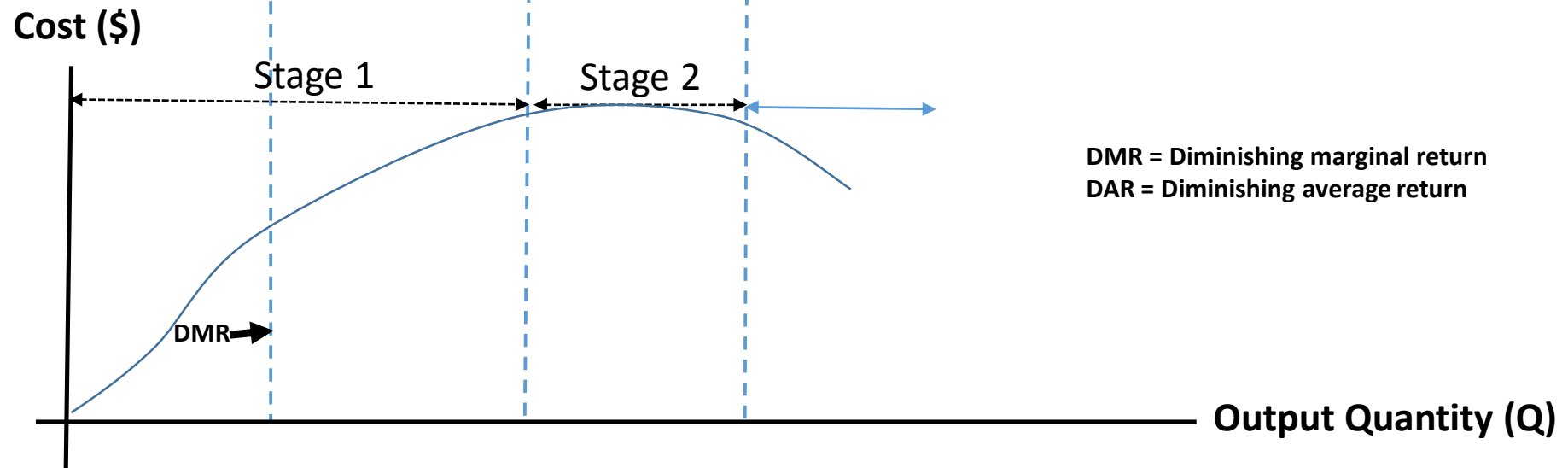
MIN 3059 INTRODUCTION TO MINERAL ECONOMICS

$TVC = bQ - cQ^2 + dQ^3$
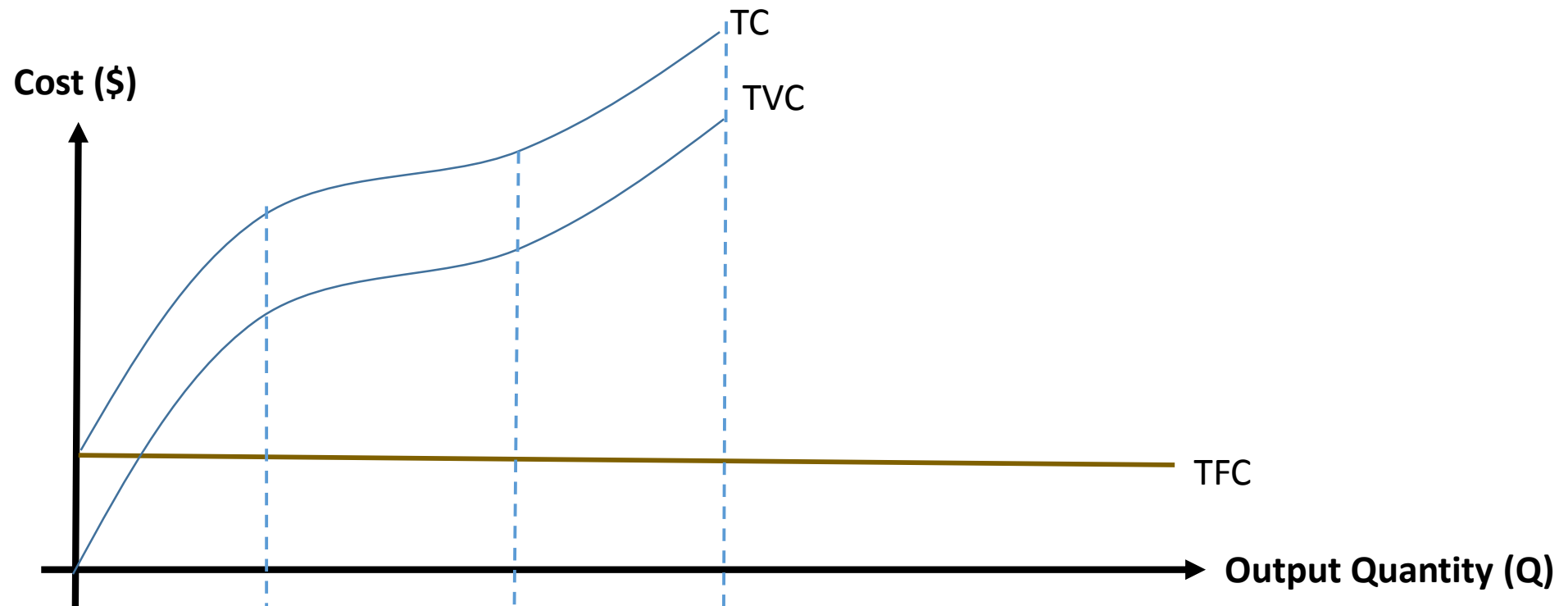
$TC = a + bQ - cQ^2 + dQ^3$

$dTc/dQ = MC = b - 2cQ + 3dQ^2$

$ATC = a/Q + b - cQ + dQ^2$

$ATC = b - cQ + dQ^2$

$AFC = a/Q$

Cost ($)

TC

TVC

TFC

Output Quantity (Q)

Cost ($)

Stage 1   Stage 2

DMR = Diminishing marginal return
DAR = Diminishing average return

DMR

Output Quantity (Q)

Why do diminishing returns occur?

In the short run, the law of **diminishing returns** states that as we add more units of a variable input to fixed amounts of land and capital, the change in total output will at first rise and then fall. **Diminishing returns** to labour **occurs** when **marginal** product of labour starts to fall.

For example, a Small-scale mine (SSM) has 30 employees. And every day the SSM produces 300 tonnes of ore. When there are 10 employees, 120 tonnes of ore is produced. When you add 10 more employees, the output is increased to 220. And an additional 10 employees increases the output by 80 making the output 300.

This is because of the law of diminishing marginal returns. As the employees increase in number, the marginal (additional) output decreases.

Given that 30 employees is the maximum amount of employees the factory needs, additional employees, given the law of diminishing marginal returns, will decrease the level of output.

Some of the reasons for these may be the limited number of machines or equipment in the factory. Too many employees may cause overcrowding in these machines and decrease the level of output due to lack of space and a chaotic overcrowded workplace. Or it may be that too many employees cause other employees to slack off and talk to the other employees which will divide their attention and decrease output. These are just some examples that can explain the law of diminishing marginal returns.

Totals	**Averages**	**Marginals**
TC = f(Q)	AC = TC/Q	MC = dTc/dQ
TR = f(Q)	AR = TR/Q	MR = dTR/dQ
TP = TR-TC	AP = TP/Q	MR = dTR/dQ

Where,   Q = output

Break-even occurs when TR = TC

When,   dTC/dQ = 0, we have minimum cost

Long –run cost-output relationships

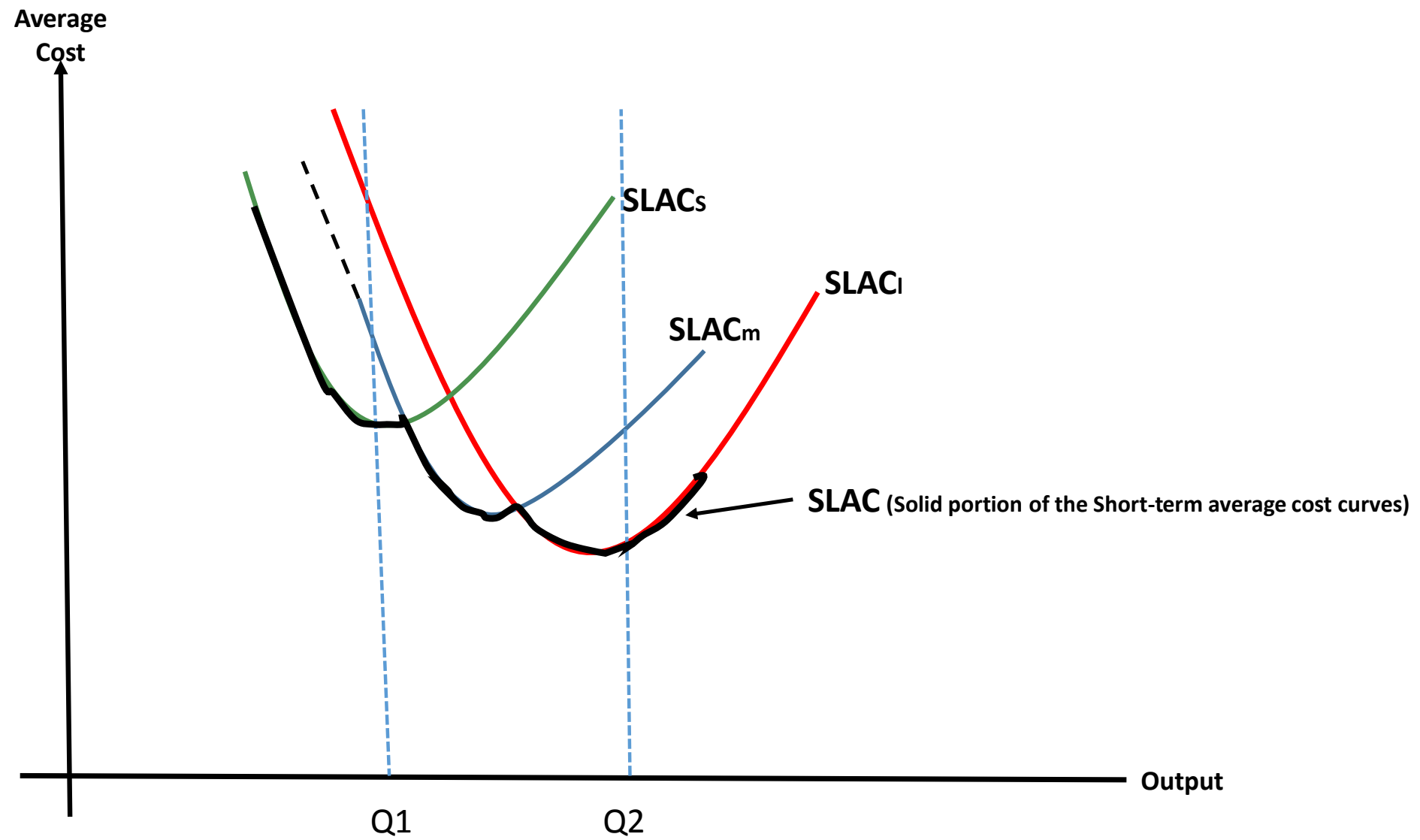In the LR, all resource inputs are variable.

A firm can alter its usage of major capital equipment, change top management, build new plant capacity, close down obsolete facilities, update its use of technology, or in any other way modify its production process and use of resources per period of time.

Generally, the firm's LR cost objective is to be in a position to produce the desired output at the lowest possible cost.
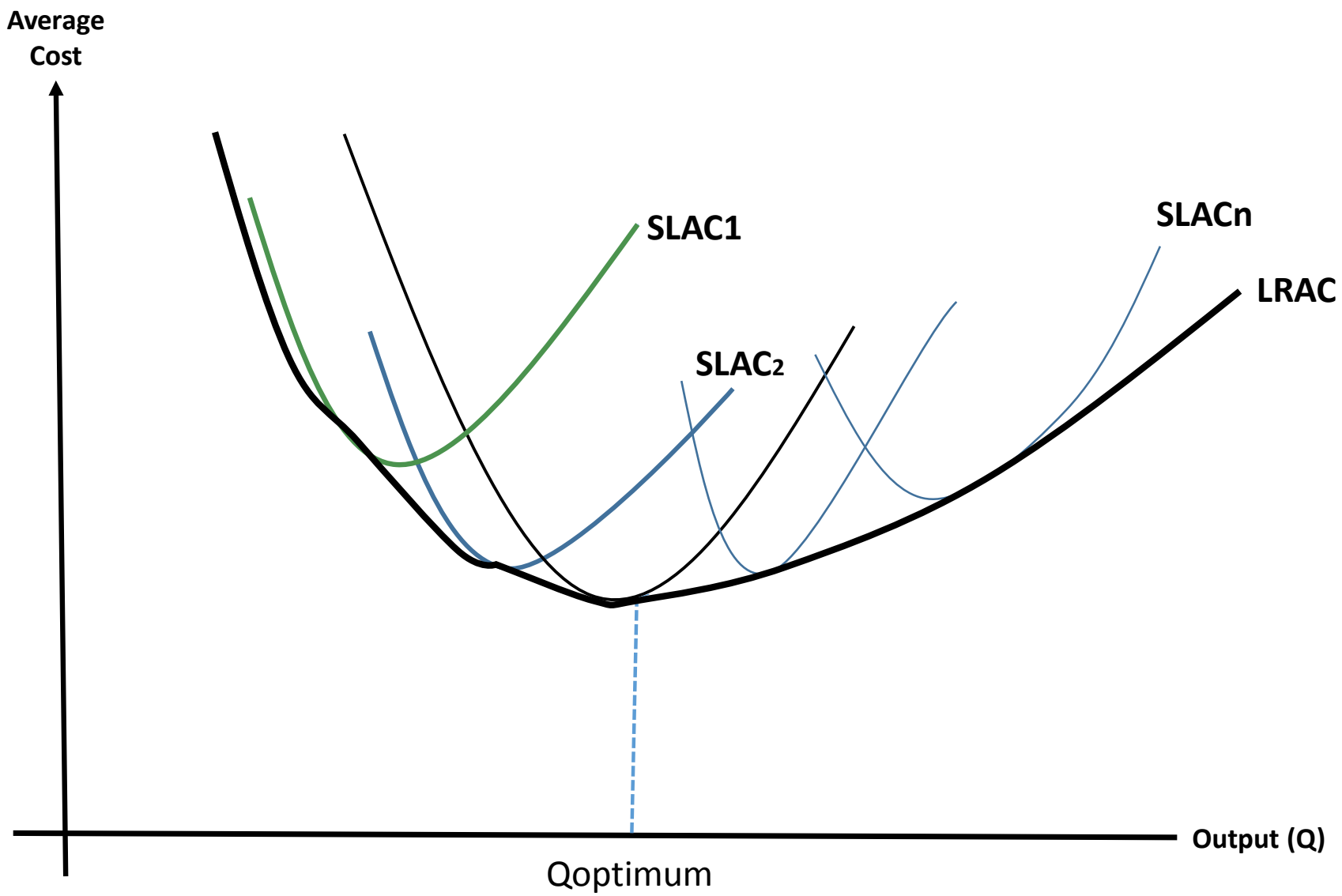
This means adjusting its scale of production so as to be the RIGHT SIZE.

- Sometimes economies can be attained by dividing the production process into smaller production units

- On other occasions, lower unit costs can be achieved by enlarging the scale of production

- In examining how efficiency and costs are affected by scale of production, it is important to distinguish between PLANT and FIRMS because the cost efficiency advantage of each are different.

Usually, s firm will have more than just 3 plant sizes to choose from. When the number of alternative plant sizes approaches infinity, the LRAC is an envelope of the short-run curves that is tangent to each of the short-run curves.

Average Cost

SLAC$_s$

SLAC$_l$

SLAC$_m$

SLAC (Solid portion of the Short-term average cost curves)
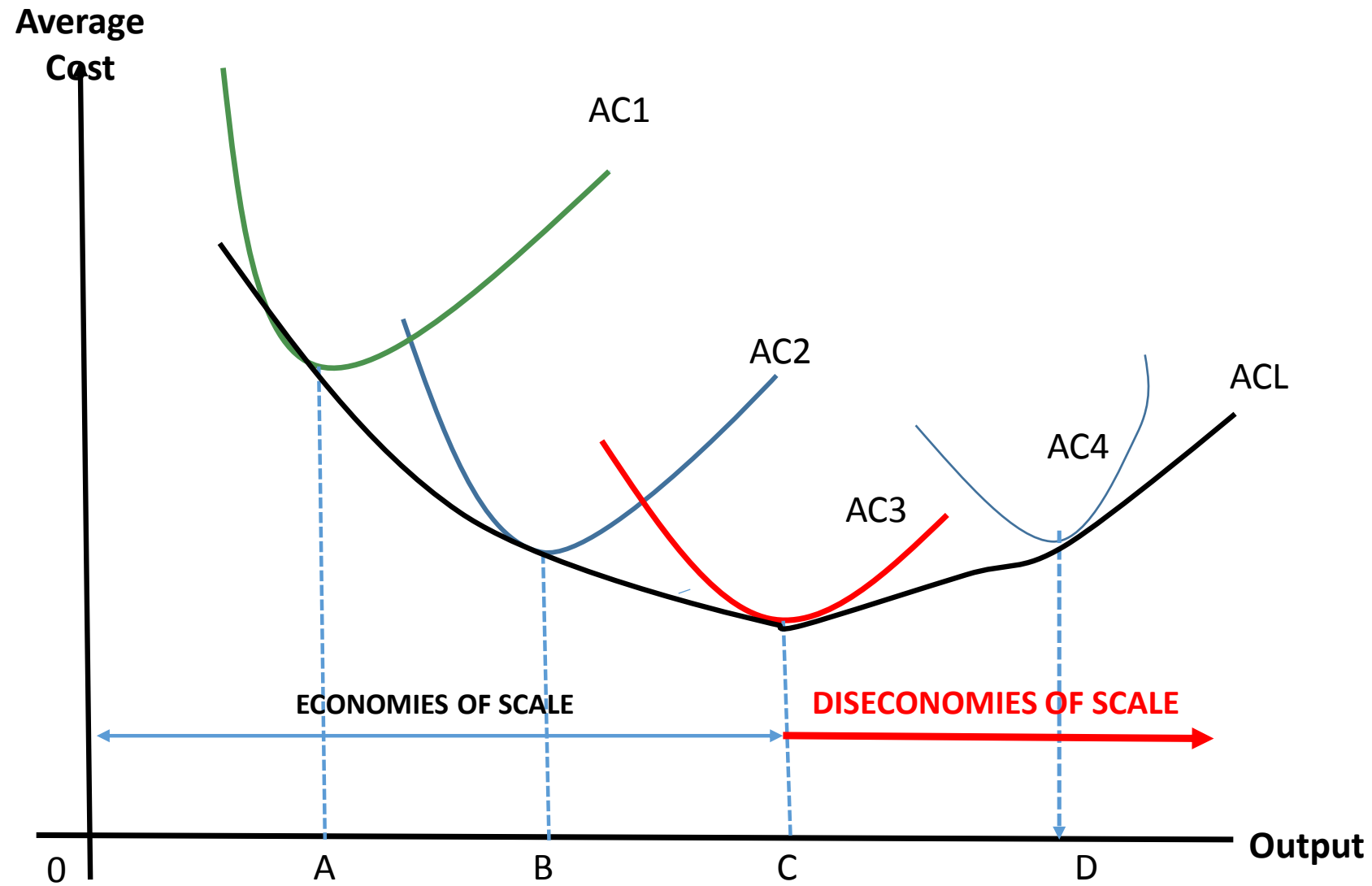
Output

Q1   Q2

- Here again, the LRAC curve should be interpreted as representing the least unit cost attainable for a given output rate when the firm has time to change the rate of usage of any and all inputs.

- Of all the possible plant sizes, the one which is most efficient all is the one whose SRAC curve is tangent to the LRAC curve at the minimum point of the LRAC curve (Qoptimum). The plant capable of producing the product at the lowest unit cost of all the other plants is termed the OPTIMUM PLANT SIZE.

ECONOMIES OF SCALE

- Sometimes called "economies of large-scale".
- Occurs when average costs of the firm decrease as it grows larger

- The firm produces at lowest with output A1
- AC1 - average cost of producing different outputs when size of the firm does not change.
- AC2, AC3 AND AC4 are additional fixed plant size average cost curves.
- B, C and D – are firm's average costs at sizes B, C and D.
- Economies of scale A to C. After C, diseconomies set it

REASONS FOR ECONOMIES OF SCALE AT PLANT LEVEL

- Up to a point, larger operations allow greater subdivision of the production process and specialization in the use of resource inputs (capital, labour, supervision, etc). Almost invariably, specialization along functional or task-specific lines, maximizes the efficiency gains and cost savings to be had from the "learning curve" or "experience".

- Greater volume of production and more intensive utilization of such facilities, the lower are the unit fixed costs because fixed investment costs of capital intensive techniques are being spread over a large number of units of output.

- Centralizing and integrating manufacturing stages into a single continuous process offers another avenue for achieving scale of economies at plant level. For instance, steel firms have found it advantageous to have pig iron, raw steel, and semi-finished steel products produced in one continuous operation in order to economize on reheating materials between phases of the production process.

- Also the larger a plant, the greater the opportunities for taking advantage of and utilizing by-products which add revenues to apply against production costs associated with the primary product.

- Large-scale plants are in a position to take advantage of quantity discounts on their purchase of raw materials (inputs) and utility services. Similarly, larger plants can realize transportation savings by instituting their own shipping.

- Eventually, of course plants can be enlarged to a point where all economies of scale are exploited and bring no additional savings in unit costs. It is here that the minimum level of the LRAC curve for plants is reached.

REASONS FOR DISECONOMIES OF SCALE AT PLANT LEVEL.

- The more space over which a plant is spread, the greater the bottlenecks and costs of getting labour, materials and semi-finished goods from one place in the plant to another.
- The larger the plant, the more likely that needed raw materials will have to be shipped from more distant suppliers, thereby driving up transportation costs of incoming materials.
- The larger the plant output, the further distances outputs may have to be shipped to reach potential buyers thereby raising the costs of transporting the product from manufacturer to the final consumer.
- Growing difficulties of maintaining efficient supervision and coordination.

COST BEHAVIOUR AND FIRM SIZE

Even after plants have been expanded to their most efficient size, and all economies of plant size taken advantage of, there may arise additional cost-efficiency gains from putting a number of plants under common management. These separate units of a multi-plant enterprise may perform the same kind of operation and thus horizontally integrated. Or plants may be vertically integrated to perform successive phases of the same overall production process. Or they may involve the production of a number f unrelated commodities as with conglomerate enterprises. In all three situations, opportunities for realizing scale of economies may exist.

REASONS FOR ECONOMIES OF SCALE AT FIRM LEVEL

- Putting several plants under one management economizes on top-management costs. Spreading the salaries of key executives and administrative staff over five million units of output a year instead of one million units lowers average cost.

- Multiproduct firms may derive a number of economic advantages from specializing in serving the full range of needs of a particular customer segment or market, or from using the same distribution channel to market their outputs, or from using common technology to produce a number of different products.
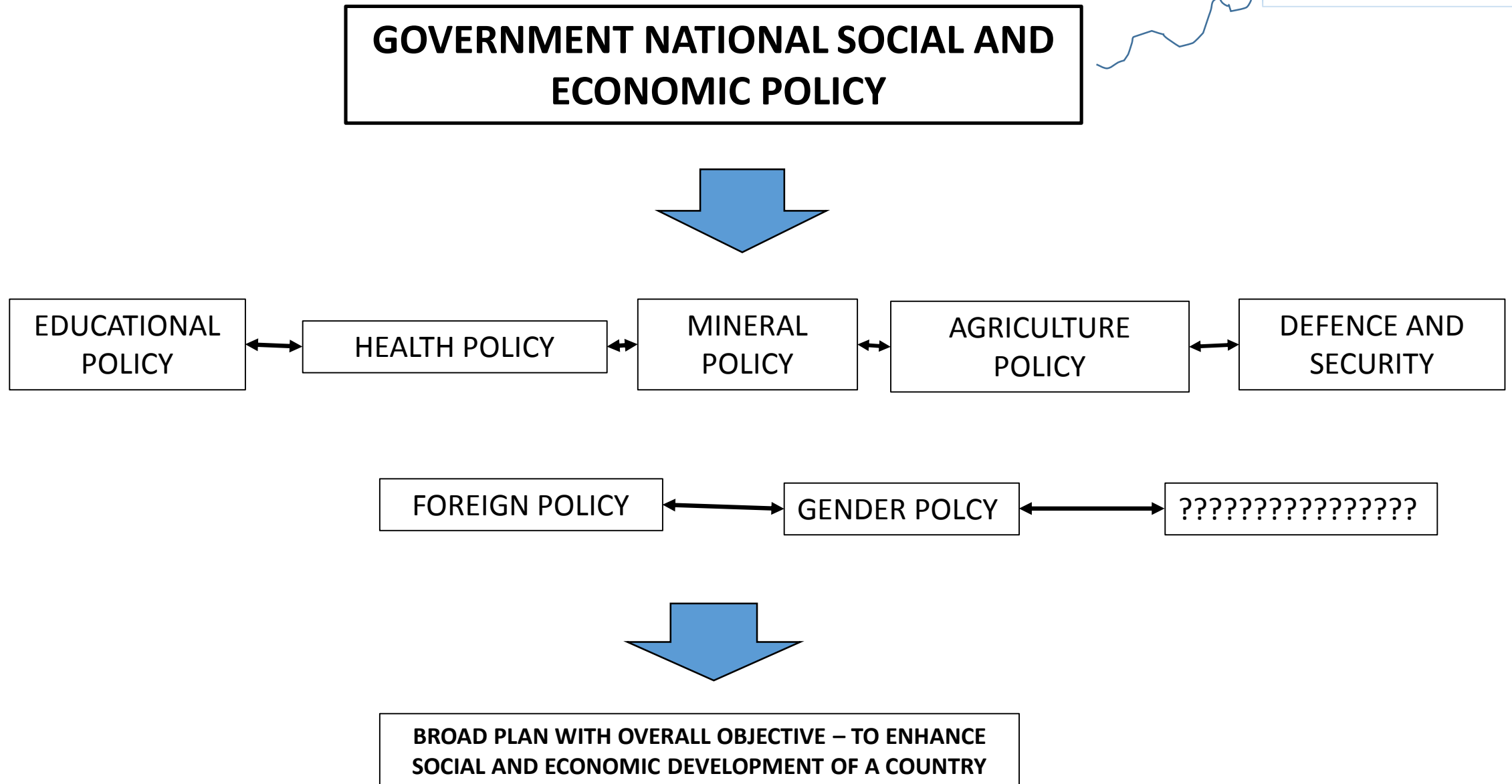
MINERAL POLICIES

Definition

A **policy** is a [deliberate](#) [system](#) of [principles](#) to guide decisions and achieve rational outcomes. A policy is a statement of intent, and is implemented as a procedure or protocol.

Policy cycle

In [political science](#), the **policy cycle** is a tool used for the analyzing of the development of a policy item. It can also be referred to as a "stragist approach", "stages heuristic" or "stages approach". It is thus a rule of thumb rather than the actual reality of how policy is created, but has been influential in how [political scientists](#) looked at policy in general. It was developed as a theory from [Harold Lasswell](#)'s work.

GOVERNMENT NATIONAL SOCIAL AND ECONOMIC POLICY

Party Manifestos

EDUCATIONAL POLICY

HEALTH POLICY

MINERAL POLICY

AGRICULTURE POLICY

DEFENCE AND SECURITY

FOREIGN POLICY

GENDER POLCY

??????????????

BROAD PLAN WITH OVERALL OBJECTIVE – TO ENHANCE SOCIAL AND ECONOMIC DEVELOPMENT OF A COUNTRY

Generally the principle objectives of an economic development policy can be summarized as follows (Samuelson and Nordhaus):

- To maintain a high and sustainable economic growth resulting in increasing GNP per capita.

- An equitable distribution of income among the population, and an equitable rate of development among the regions.

- Maintenance of satisfactory balance of payments positions.

- To maintain high employment among the population and minimization of unemployment.

- Stabilization of price levels, with prices and wages determined by supply and demand and free markets

One version has the following stages:

1.Agenda setting (Problem identification) - The recognition of certain subject as a problem demanding further government attention.

2.Policy Formulation - Involves exploring a variation of options or alternative courses of action available for addressing the problem. (appraisal, dialogue, formulation, and consolidation).

3.Decision-making - Government decides on an ultimate course of action, whether to perpetuate the policy status quo or alter it. (Decision could be 'positive', 'negative', or 'no-action')

4.Implementation - The ultimate decision made earlier will be put into practice.

5.Evaluation - Assesses the effectiveness of a public policy in terms of its perceived intentions and results. Policy actors attempt to determine whether the course of action is a success or failure by examining its impact and outcomes.

An eight step policy cycle is developed in detail in *The Australian Policy Handbook* by Peter Bridgman and Glyn Davis: (now with Catherine Althaus in its 4th and 5th editions):

1.Issue identification

2.Policy analysis

3.Consultation (which permeates the entire process)

4.Policy instrument development

5.Building coordination and coalitions

6.Program Design: Decision making

7.Policy Implementation

8.Policy Evaluation

Content

Policies are typically [promulgated](#) through official written documents. Policy documents often come with the endorsement or signature of the executive powers within an organization to legitimize the policy and demonstrate that it is considered in force. Such documents often have standard formats that are particular to the organization issuing the policy. While such formats differ in form, policy documents usually contain certain standard components including.

- A **purpose statement**, outlining why the organization is issuing the policy, and what its desired effect or outcome of the policy should be.

- An **applicability and scope** statement, describing who the policy affects and which actions are impacted by the policy. The applicability and scope may expressly exclude certain people, organizations, or actions from the policy requirements. Applicability and scope is used to focus the policy on only the desired targets, and avoid unintended consequences where possible.

- An **effective date** which indicates when the policy comes into force. [Retroactive policies](#) are rare, but can be found.

- A **responsibilities** section, indicating which parties and organizations are responsible for carrying out individual policy statements. Many policies may require the establishment of some ongoing function or action. For example, a purchasing policy might specify that a purchasing office be created to process purchase requests, and that this office would be responsible for ongoing actions. Responsibilities often include identification of any relevant [oversight](#) and/or [governance](#) structures.

- **Policy statements** indicating the specific regulations, requirements, or modifications to organizational behavior that the policy is creating. Policy statements are extremely diverse depending on the organization and intent, and may take almost any form.

Some policies may contain additional sections, including:

- **Background**, indicating any reasons, history, and intent that led to the creation of the policy, which may be listed as **motivating factors**. This information is often quite valuable when policies must be evaluated or used in ambiguous situations, just as the intent of a law can be useful to a court when deciding a case that involves that law.

- **Definitions**, providing clear and unambiguous definitions for terms and concepts found in the policy document.

MRP Purpose and Structure

A mineral resource policy (MRP) may generally be defined as a broad plan of action adopted by a government to ensure that mineral resources development provides its maximum contribution in meeting national and economic development objectives.

Structurally a MRP comprises of long term plans or strategies as they are sometimes referred to, as well as short term plans which specify the actions to be taken to implement the policy and which are of tactical nature.

The structure of a MRP is of fundamental importance in meeting the expectations of mineral resource development in the economy. It must structurally be comprehensive to deal with all aspects of mineral resource development (e.g identifying the structural differences between small scale and large scale mining and hence approaches in providing support).

Economic policies and objectives vary among different countries and so do details of MRP objectives. For most developing countries, typical MRP objectives include the following:

Maximization of government revenues - from taxes, royalties and dividends/profits where it holds shares.

Foreign exchange earnings – exploitation and export of minerals is seen as a source of export earnings. Most DCs are mineral dependent economies.

Diversification objective – it has been the desire of most mineral economies (more than 20% of export earnings) to achieve some level of diversification for two main reasons:

- *To diversify production in order to lessen dependence on individual mineral commodity exports exploit other minerals).*

- *Encourage industrialization by developing other sectors of the economy by diverting revenues from existing production to finance diversification programs.*

Further Domestic Processing *– the objective is add value to minerals prior to exportation, to contribute to industrialization and help generate employment locally. Multinational mining companies have often resisted downward further processing due to already established marketing arrangements. This is manifested by the lack of integration of mining activities in many DCs with the rest of the economy, resulting in mineral investments operating as enclaves.*

Strategy here lies in identifying the space in the international value chain arrangements

Regional Development objectives *– mineral resource development in rural areas can be seen as a vehicle for improving regional infrastructure and the creation of jobs outside industrial centers.*

Other Objectives may include:

- **Mineral conservation from** destructive exploitation such as high-grading, improper mining methods or premature abandonment.

- **Import substitution to conserve forex**. Local sourcing to lessen foreign dependence and enhance security of supply.

- **Objectives concerning** the transfer of technology, employment and training of nationals, and reduction in the country's dependence on foreign expertise (indigenization).

Elements of a MRP

Typically, a comprehensive MRP contains the following elements:

Legal framework

The development of mineral resources depends on the establishment of a sound and stable legal framework environment. This is probably the overall most important aspect of a MRP. The legal framework includes mining laws and other related regulations that are designed to guide mineral investment activities in a country.

Financing

The overall strategy from a policy point of view should be such that investing in the mining sector is made possible and attractive.

Taxation

Basically a tax system can be viewed as a mechanism for determining how the net operating cash flow is to be divided between the investor and the state. Taxation constitutes the single most important MRP instrument available to the governments to encourage or discourage mineral investment. Many taxes present a critical cost element that affects the profitability and hence rate of return of a mineral investment. Consequently, taxes have a significant effect on mineral investment decisions.

Generally, a poor MRP leads to process which occurs in three consecutive stages:

- *The first stage is identified by the loss of the ability to attract capital for entirely new ventures*

- *Secondly, the loss of the ability to attract capital for expanding existing operations; and*

- *Lastly, the loss of the ability to maintain facilities.*

- Environmental protection
- Institutional framework support
- Infrastructural development
- Further domestic processing
- SSM promotion, where such activities are significant

Legal Framework

Development of mineral resources depend on sound and stable legal framework environment. This is probably the overall most important aspect of a MRP. It includes mining laws and other related regulations that are designed to guide mineral investment activities in a country. Important are:

- *Mineral rights*
- *Foreign investment in the sector*
- *Environmental regulations*
- *Marketing of mineral products*
- *Sector taxation,etc*

Financing

How is the sector going to be financed? MRP must facilitate this process of attracting investment

Taxation

MRP must address peculiar issues associated with mineral investment such as high capital costs, long gestation periods, non-renewable assets, site bound investments, etc.

Environmental Protection

A balanced MRP must not discourage mineral resource development while maintaining acceptable environmental standards. Unless there is a uniform application of controls, those exempted from controls will have a competitive advantage from uninternalized environmental costs.

Institutional Framework Support

A MRP is defective without provisions for an effective institutional support to supervise its implementation. Usually Mines ministries play this role.

Infrastructure Development:

Can be costly and prevent investment in very rural areas without government intervention.

Domestic Processing

Further domestic processing is meant to add value to mineral products prior to exportation and to contribute to industrialization by forming linkages with other sector of the economy.

Backward linkages – associated with domestic production of inputs for the mining sector such as mining machinery, explosives and transportation facilities

Forward linkages – associated with further domestic processing of the mineral product such as iron ore into steel and steel products.

Final Demand linkages – associated with the production of consumer goods and services for those deriving income from the mineral sector

MINERAL POLICY OBJECTIVES

Generally, a Mineral Policy seeks to address the challenges of the mineral sector of a given country. As such, a responsible Government strives to attract and enable the private sector to take the lead in exploration, mining, mineral beneficiation and marketing. Its purpose is to increase the mineral sector's contribution to the GDP and alleviate poverty by integrating the mining industry with the rest of the economy.

COUNTRY EXAMPLES

TANZANIA MINERAL POLICY OBJECTIVES

MINERAL POLICY OBJECTIVES

The Mineral Policy of 2009 seeks to address the challenges of the mineral sector mentioned in the introduction. The Government will continue to attract and enable the private sector to take the lead in exploration, mining, mineral beneficiation and marketing. Its purpose is to increase the mineral sector's contribution to the GDP and alleviate poverty by integrating the mining industry with the rest of the economy. Other objectives include:-

(a) To improve the economic environment in order to attract and sustain local and international private investment in the mineral sector;

(b) To promote economic integration between the mineral sector and other sectors of the economy, so as to maximize the contribution of the mineral sector to the economy;

(c) To strengthen the legal and regulatory framework for the mineral sector and enhance the capacity for monitoring and enforcement;

(d) To strengthen the institutional capacity for effective administration and monitoring of the mineral sector;

(e) To participate strategically in viable mining projects and establish an enabling environment for Tanzanians to participate in ownership of medium and large scale mines;

(f) To support and promote development of small scale mining so as to increase its contribution to the economy;

(g) To facilitate, support and promote increased participation of Tanzanians in gemstone mining;

(h) To establish transparent and adequate land compensation, relocation and re-settlement schemes in mining operations;

(i) To strengthen involvement and participation of local communities in mining projects and encourage mining companies to increase corporate social responsibilities;

(j) To promote and develop a marketing system of minerals to ensure that miners get right values of minerals traded in formal markets;

(k) To promote and facilitate value addition activities within the country to increase income and employment opportunities;

(l) To promote research development and training required in the mineral sector and encourage its utilization;

(m) To develop a local base for technical capacity;

(n) To improve communication on the mineral sector to the public through education.

NAMIBIA MINERAL POLICY

Mineral policy

- ***Private sector driven***
- ***Promotion of small-scale mining***
- ***Promoting efficient technology***
- ***Promotion of SHE***
- ***Promotion of marine mining***
- ***Promotion of technical capacity through research***

Mineral policy

Government will further explore opportunities for the promotion of value addition.

Government will encourage and facilitate local manufacturing under the concept of "Mined and Manufactured in Namibia"

Mineral policy

Government will create a capacity that is properly resourced to undertake mineral promotion and marketing activities

Mineral policy

The Namibian Government recognises its commitment to the Southern African Development Community (SADC) region. The member States of the SADC agreed through a treaty to formulate common approaches to policies, strategies and programmes. Currently Regional programmes are being developed for the benefit of all member States. The Government is committed to the SADC Treaty and the SADC Mining Protocol.

The Objectives of the Minerals Policy

- ***Promote and stimulate investment in exploration and mining so as to discover new ore deposits that will lead to the development of new mines and also to maintain the existing ones;***

- ***Promote a conducive environment for the mineral sector that encourages and facilitates the active participation of all stakeholders;***

- ***Promote and encourage local participation in exploration and mining;***

- ***Promote and encourage maximum local beneficiation of mineral products to ensure that as many of the economic benefits as possible are retained in Namibia for the benefit of all its citizens;***

The Objectives of the Minerals Policy

- *Regularize and improve artisan and small-scale mining so that it becomes part of the formal mining sector;*

- *Promote research and development for improving technology in exploration, mining and mineral processing operations;*

- *Ensure the establishment of appropriate educational and training facilities for human resources development to meet the manpower requirements of the minerals industry;*

The Objectives of the Minerals Policy

- *Promote and facilitate marketing arrangements to increase the economic benefits of the sector;*

- *Ensure the adherence to the principle of socio-economic upliftment through appropriate measures;*

The Objectives of the Minerals Policy

- **Ensure compliance with national environmental policy and other relevant policies to develop a sustainable mining industry.**

- **Review on a regular basis the legal, economic, social and political aspects of the Minerals Policy, to ensure that it remains internationally competitive, that it adequately addresses the mining industry's volatility and that it serves the**

    common good of Namibians; and

MINE MANAGEMENT PRINCIPLES

The Objectives of the Minerals Policy

Ensure mining operations are conducted With due regard to the safety and health of all concerned.

Mineral Policy

The Mining Rights and Mineral resources division in the Directorate of Mining is usually the first contact for investors, as it handles all applications for and allocation of mineral rights in Namibia.

SADC PROTOCOL ON MINING

FRAMEWORK FOR HARMONISATION OF MINING POLICIES, STANDARDS, LEGISLATIVE, AND REGULATORY IN SOUTHERN AFRICA

Mining is an *industry of strategic importance in Southern Africa. Roughly half of the world's vanadium, platinum, and diamonds originate in the region, along with 36% of gold and 20% of cobalt. These minerals contribute greatly to several Southern African Development Community (SADC) [Member State] gross national product and employment, and many of them depend on mineral exports for their foreign exchange earnings.*

Recognising the significance of the mineral industry within the region, SADC launched the [Protocol on Mining] in September 1997 which came into effect in February 2000, and has come to form the basis for SADC's work programme on mining. This protocol aims to develop the region's mineral resources through international collaboration, in turn improving the living standards of the people engaged with the mining industry.

The Protocol on Mining

As part of the Protocol on Mining, Member States of SADC have been engaged to harmonise their policies and procedures for mineral extraction, cooperating on improving technical capacity and sharing knowledge. With a goal to grow the mineral industry in Southern Africa, SADC Member States also agree to encourage private sector developments, including small-scale projects that promote economic empowerment of those who have been historically disadvantaged in the mining sector. Because mining can be a hazardous undertaking, the Protocol on Mining also requires that Member States observe internationally-recognised health and safety and environmental protection standards.

In order to facilitate these goals, the Protocol on Mining also calls for an organisational structure consisting of a Committee of Mining Ministers, a Technical Committee of Officials, and a Mining Coordinating Unit to oversee mining operations and ensure that applicable standards are upheld.

Introduction

The Protocol's main areas of focus

- Harmonisation of national policies to the objectives of regional integration
- Improving the availability of economic information to the private sector
- Promoting private sector participation in the regional mining.
- Facilitating the development of human and technological capacities
- Promoting responsible small scale mining
- Observing internationally acceptable standards of health, safety and environment.

Mineral Policies

- Mineral policy stability, making allowance for adjustments from time to time;
- Consistency and transparency;
- Stakeholder dialogue in policy formulation;
- Management of stakeholder expectations;
- Transferability and tradability of mining rights; and,
- Environmental protection, integrated land use (multi-sector based), social and post mining development plans.

Mineral Policies cont.

- Mineral policy stability, making allowance for adjustments from time to time;
- Consistency and transparency;
- Stakeholder dialogue in policy formulation;
- Management of stakeholder expectations;
- Transferability and tradability of mining rights; and,
- Environmental protection, integrated land use (multi-sector based), social and post mining development plans.

Minerals Policy Template for SADC

- **Business Climate and Mineral Development**
- **Participation in Ownership and Management**
- **People Issues**
- **Environment Management**
- **Regional Co-operation**
- **Governance**

Political, Economic and Social Environment

- HIV/AIDS
- Employment
- Foreign Direct Investment
- Macroeconomic convergence

General Investment Regulations

- **Local equity stakes;**
- **Exchange controls**
- **Dividends**.

Mining Fiscal Environment

- **SADC Tax Memorandum of Understanding**
- **SADC Finance and Investment Protocol**
- **Principles of mining taxation**

Fiscal Framework

- **International Tax Issues**
- **National Tax Issues**
- **Local Government/Regional Tax**
- **Issues**

International Tax Issues

- Double taxation
- Withholding taxes
- Import duties
- Export duties
- Transfer-pricing

National Tax Issues

- Tax stability agreements
- Effective tax burden to be competitive;
- Rent distribution at high commodity prices
- Tax holidays
- Accelerated amortization and depreciation
- Mining tax ring fencing
- Loss carry forward or the cost amount
- Realized capital gains
- Mine rehabilitation on closure, contributions to a mining
- rehabilitation trust fund - tax deductible,
- Build up and disbursement - tax free except for the surplus; and
- Environmental expenditures - allowable deduction for income tax purposes; and
- Social expenditures - allowable deduction for income tax purpose

Local Government/Regional Tax Issues

- Local communities benefits
- Directly levied local taxes

Mineral Administration and Development Systems

- One-stop mineral administration system
- Application for an exploration licence
- Term of exploration licences
- Information in a standardized format
- Integrate geological regional information management system
- Automatic progression from exploration to mining
- Mining rights duration conform to business plan -
- Internationally competitive mineral-specific royalties;
- Fee structure that encourages exploration;
- Surface rental fees by the property market;
- Incentives with specific policy

Mineral Beneficiation

- Enabling environment for manufacturing
- Beneficiation projects on a regional scale;
- Infrastructure (transport, energy and water),
- Technology, skills and other inputs for value addition; and
- Producer associations - barriers to value

Mineral Clusters

- **Research and Development in the area of cluster development**

Minerals Marketing

- Free market
- Assistance in marketing – A & SSM
- Niche markets
- Database of tariff and non-tariff barriers

Social Responsibility

- **Social obligations -**
- **Skills training - , numeracy and literacy**

Environmental Management

- Environmental Impact Assessments –
- International principles of integrated environmental management
- Pre-mining and post closure rehabilitation of mining areas and compensate for adverse impacts on community livelihoods;
- Multiple land use planning and post mining uses of land
- Environmental Rehabilitation - environmental disasters and social decline

Governance

- Sustainable development objectives into mineral law;
- Security and continuity of tenure
- Participation of nationals and skills transfer
- National consultative bodies

Artisan and Small-Scale Mining

- **Policies and legislation - alleviate poverty.**
- **Access to land, financing, marketing, technology and skills development,**
- **Health, safety and environmental guidelines for the sector;**
- **Integrated into rural community development programmes.**

Research and Development

- Fundamental research
- Regional centres of excellence
- Existing centres
- Reward for research outcomes
- Technological innovation
- Fabrication for local markets
- Simplified geological information management framework

Human Resources and Skills Development

- **Incentives to encourage skills development programmes;**
- **Active database on skills**
- **Standardization of qualifications**
- **Social and labour plans – alternative skills**
- **Regional approach to skills**

Gender

- Gender equality and equity enforcement and develop targeted policies
- The SADC and AU 50/50 gender equality principle
- Education programmes to increase women's access,
- Communication and sensitization programmes

Monitoring and Evaluation

- **Process for harmonization is gradual Standardization and Alignment**
- **Milestones benchmarked into SADC**
- **RISDP timeframes;**
- ✓ **immediate,**
- ✓ **short term and**
- ✓ **long-term**

Issues for Standardization

- Technical and Engineering requirements
- Geology
- Health and safety
- Skills, training and Qualifications
- Environmental Regulations
- Social Obligations and Regulations
- Mineral Valuation standards

Issues for Alignment in the Southern African Minerals Industry

- Exploration and Mining licensing
- Land rights and tenure
- Mining Fiscal regime
- Minerals Marketing
- Minerals Processing and Value Addition
- Minerals Cluster Development
- Environmental Requirements
- Social Obligations and Regulations
- Institutional Framework
- Infrastructure for minerals development (energy, transport, water)
- Artisan Mining
- Small Scale Mining
- Gender Parity
- Labour Policies
- Cross-border movement of minerals skills
- Cross-border movement of capital, minerals, goods and services
- Investment Regulations
- Economic and Political Framework
- Customs and tariffs Harmonisation
- Product security

Format for Reporting on Performance of the Mining Industry in Member States

- **Geology**
- **Mining Development**
- **Mineral Processing And Production**
- **Environmental Protection**
- **Sector Administration**
- **Small Scale Mining Support**
- **HRD and Research and Development Institutions**
- **General Overview**
- **Recommendations**