Innovation and Competitiveness: Mechanisms for Surmounting Trade Barriers in Global Market for Natural Resources

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Abstract

This paper examines how innovation and competitiveness can be mechanisms for surmounting trade barriers in global market for natural resources. As trade barriers range from tariffs and non-tariffs, we employ the Cobb-Douglas function that has labour augmented technology. The main finding from this function is that If the resource is managed such that it grows at the same rate as output, then the neoclassical steady-state will be $g = g_A$. *The output growth is equivalent to technology growth. The technology will transform the natural resource into products that are produced at reduced cost per unit. We also utilize the global market model to show the effect of innovation on competitiveness and trade barriers. As innovations make the country or the organisation producing with natural resources to produce at lower cost per unit, it gives them an added advantage to compete in global market and circumvent trade barriers in the natural resource market.*

1. Introduction

Trade barriers are considered impediments to free trade across the globe. Trade barriers take different forms. It could be in the form of tariffs and non-tariffs. The tariffs could be specific amounts or ad-valorem. While the non-tariffs range from quota, ban, to health and sanitary regulations. World Trade organisation (WTO) and regional trade initiatives and or arrangements view trade barriers the greatest obstacles to free and fair trade and maximizing consumer's welfare. As the trade barriers tend to increase the prices of goods and services across the national frontiers consumer's welfare is greatly reduced. As the prices increased preventing access to global market, the production or supply of affected goods and services will eventually be reduced. Besides consumer's welfare reduction, fair or healthy competition among the nations in global market is hampered. Trade in natural resources (e.g. agricultural products, mineral resources etc) are mostly affected by trade barriers especially the non-tariff barriers. What are the policy implications of the trade barriers for resource dependent nations like African countries? First, the countries (most African countries) that depend mostly on revenues from export of natural resources will be forced to cut down the budgets for capital projects.

Thus the projects for rural sector of the economy might be the first to hit. This might aggravate the poverty incidence among the rural population. Second, the natural resources are a fixed factor of production and hence, almost by definition, impose a restriction on economic growth potential. This restriction may – depending on the nature of the production technology – cause a growing labour force and a growing stock of capital to run into diminishing returns. This is the first reason for an adverse effect of natural resources on growth found in the literature. Nordhaus (1992) has shown that the steady-state rate of growth of output per capita in an economy with natural resources is proportional to the rate of technological progress adjusted for a "population growth drag" due to diminishing returns as well as a "natural resource depletion drag" due to declining levels of exhaustible natural resources. The models for natural resources should move beyond the aim of gaining a 'license to operate'. In fact they should be designed to help envision and implement the criteria that can be used to more effectively assess and regulate the legitimacy of business activities.

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The objective of this study is to examine how the innovations and competitiveness can be mechanisms for surmounting trade barriers in the global markets for natural resources. This is very important for developing countries especially African countries that depend mostly on the export proceeds from primary products or natural resources. Price fluctuations in the natural resource markets would affect the export earnings of natural resource dependent countries, their balance of payments and hence their economic growth. How would these countries remain competitiveness in global market with tariffs and non-tariffs in the export markets?

The paper is organised as follows. The next section discusses the natural resources and economic growth. It highlightens how the natural resources affect economic growth. The third section looks at the innovation and competitiveness, while the fourth section discusses the model that incorporates research and development (innovations). The final section gives the conclusion.

2. Natural Resources and Economic growth

Sachs and Warner (1997), have uncovered a strong and robust cross-country relationship between economic growth and the abundance of, or dependence on, natural resources. This was echoed in Jean-Philippe (2001). The five channels through which natural resource dependence seem to influence growth are as follows:

First, countries that are rich in natural resources experience booms and busts, not only due to commodity price fluctuations in world markets but also due to resource discoveries that typically create intermittent upswings in export earnings that cause the national currency to appreciate in real terms to the detriment of other export industries. This phenomenon is known as the "Dutch disease." It is what happened in the Netherlands in the early 1960s following the discovery of large reserves of natural gas within Dutch jurisdiction in the North Sea. The Dutch got over this ailment pretty quickly, so the Dutch disease is a misnomer, but the name stuck. In Iceland for example, exports of goods and services have been stagnant since 1870 hovering around a third of GDP all this time. Iceland's dependence on the export of fish, has kept the real exchange rate of the national currency too high and too volatile for a long time, thus stifling the growth of non-fish – exports.

Second, according to Auty, 2001 and Gelb, 1988, countries that are rich in natural resources tend to be marred by rent seeking on the part of producers who thus divert resources away from more socially fruitful economic activity. The combination of abundant natural resource rents, ill-defined property rights, imperfect or missing markets, and lax legal structures may have quite destructive consequences. In extreme cases, civil wars break out – such as Africa's diamond wars – which not only divert factors of production from socially productive uses but also destroy societal institutions and the rule of law.

In less extreme cases, the struggle for huge resource rents may lead to a concentration of economic and political power in the hands of elites that, once in power, use the rent to placate their political supporters and thus secure their hold on power, with stunted or weakened democracy and slow growth as a result. Rent seeking can also take other, more subtle forms. For example, governments may be tempted to thwart markets by granting favoured enterprises or individuals privileged access to common-property natural resources, or they may offer tariff protection or other favours to producers at public expense, creating competition for such favours among the rent seekers. Extensive rent seeking – that is, seeking to make money from market distortions – can breed corruption in business and government, thus distorting the allocation of resources and reducing both economic efficiency and social equity.

Insofar as natural resource abundance involves public allocation of access to scarce common-property resources to private parties without payment, thereby essentially leaving the resource rent up for grabs, it is only to be expected that resource-rich countries may be more susceptible to corruption than others. Empirical evidence and economic theory suggest that import protection (which is often extended to foreign capital as well as goods and services), cronyism (special treatment and preference given to friends or colleagues, especially in politics), and corruption, tend to impede economic efficiency and growth (Jean-Philippe, 2001).

Third, natural resource abundance may fill people with a false sense of security and lead governments to lose sight of the need for good and growth-friendly economic management, including free trade, bureaucratic efficiency, and institutional quality and sustainable development (Sachs and Warner, 1999; Rodriguez and Sachs, 1999).

Put differently, abundant natural capital may crowd out social capital, in a similar manner as human capital (Woolcock, 1998; Paldam and Svendsen, 2000), by which is meant the infrastructure and institutions of a society in a broad sense, its culture, cohesion, law, system of justice, rules and customs. Incentives to create wealth through good policies and institutions may wane because of the relatively effortless ability to extract wealth from the soil or the sea. Manna from heaven can be a mixed blessing.

Fourth, natural capital may crowd out human capital as well as social capital by hurting education. Specifically, natural resource abundance or intensity may reduce private and public incentives to accumulate human capital. A wash in cash, natural-resource-rich nations may be tempted to underestimate the long-run value of education. Of course, the rent stream from abundant natural resources may enable nations to give a high priority to education – as in Botswana, for instance, where government expenditure on education relative to national income is among the highest in the world. Even so, empirical evidence shows that, across countries, school enrolment at all levels is inversely related to natural resource abundance or intensity as measured by the share of the labour force engaged in primary production (Gylfason, Herbertsson and Zoega, 1999). There is also evidence that, across countries, public expenditures on education relative to national income, expected years of schooling, and school enrolment are all inversely related to natural resource abundance (Gylfason, 2001). This matters because more and better education is good for growth. Without education, innovations may not be possible or be even thought of.

Fifth, natural resource abundance may blunt private and public incentives to save and invest and thereby impede economic growth. Specifically, when the share of output that accrues to the owners of natural resources rises, the demand for capital falls, and this leads to lower real interest rates and less rapid growth. In other words, natural capital may crowd out real capital as well as human and social capital. Moreover, if mature institutions are conducive to an efficient use of resources, including natural resources, and if poorly developed institutions are not, then natural resource abundance may also retard the development of financial institutions in particular and hence discourage saving, investment and economic growth through that channel as well. As in the case of education, it is not solely the volume of investment that counts because quality – i.e., efficiency – is also of great importance. Unproductive investments – white elephants – may seem unproblematic to governments or individuals who are flush with cash thanks to nature's bounty.

Lastly, natural resource abundance may reduce openness by discouraging exports and capital inflows. The Dutch disease manifests itself through reduced incentives to produce non-primary goods and services for export which the overvalued currency of the resource abundant country renders uncompetitive at world market prices and hence the reduction in trade. Rent seeking appears in many guises, including demands by domestic producers for protection against foreign competition, for example in the form of restrictions against foreign direct investment. Natural capital may thus crowd out foreign capital. This is a form of the Dutch disease – from natural resource riches to foreign capital controls. Have the innovations any roles to play in making natural resource abundant countries competitive in the global market?

3. Innovations and Competitiveness

Current market conditions and globalization have modified the business environment and the ways most organisations in natural resources extraction conduct their business. These modifications have caused organisations to adopt more competitive strategies. Prominent among these strategies is the innovation based on enhanced Research and Development. Innovation is the engine that drives economic growth. Innovations define new technological trajectories through which ecological, social, and economic sustainability can be achieved. The capacity for innovation – the creation of new products and processes – will play a dominant and decisive role in meeting that goal. Innovation results from the transformation of scientific knowledge, through engineering research and technology development into products and processes for the marketplace. As cost of production is reduced through innovations; new ways of utilization of the natural resources are found and developed through research and development, the organisations engaged in extractive industry can remain more competitive in the international market.

Innovation is a key to competitiveness – especially in today"s global markets. New knowledge is generated not only through research and technology but also through new marketing and management solutions e.g. advertising on pizza boxes, improving the tracing of electrical waste, finding new ways to monitor consumer behavior or organising the way you do business more efficiently.

Competition is the critical driver of performance and innovation. It benefits everyone by enabling us to choose from an array of excellent products at affordable prices. Competition encourages the adoption of innovation as companies evolve and offer new ideas in order to flourish in the marketplace (C-Net News, 2005). Products should compete on their own merits, and consumers everywhere should have the ability to easily choose the best products available for purchase. Fair and open competition dictates that the best product wins, and market forces prevail. Innovation fuels economic growth in the global economy. It creates an evergreen environment of new markets - allowing us to reach new customers with existing products – and to serve today's customers with new products and services.

Consumers stand the most to gain from greater competition in the natural resources market. Fair and open competition means lower prices and greater choice. Limiting customers' freedom of choice is harm to innovation. Harm to innovation is a setback for anyone who wants tomorrow's computers – or any technology – to be better than they are, today. Market conditions that permit a single company to become the sole judge of price and quality set a dangerous precedent. Fair and open competition in the market enables vendors and manufacturers to deliver a greater variety of competitive products to their customers around the world. This often results in lower prices and high performance. When competition allows market forces to prevail, leading technology companies can offer the best products to the widest audiences.

4. Effect of Innovations and Competitiveness on Trade barriers

In above two sections (2 and 3) we have numerated the effects of natural resources on economic growth. Also mentioned is the inversely relationship between education and natural resources, it crowds human and social capitals that are vital for innovations and technology advancements. Innovations lower the cost of production and introduce new products and find new ways of resource utilization. This presupposes that country with innovation that transforms scientific knowledge through research and technology development into products and process for marketplace will remain competitive and surmount the trade barriers. China, for example, circumvents most world trade barriers through its innovations and technology development. China produces most of its products at lower costs using its abundant natural resources- human capital- in combination with innovations and technology. In other words, China beats the imagination of the developed nations through innovations and technology development, to the extent that China's products permeate the world market.

Gylfason, Herbertsson and Zoega (1999) derive the effect of the Dutch disease on economic growth in a two-sector model with tradable and non-tradable goods. An appreciation of the domestic currency in real terms lowers the price of tradable output and reduces investment, learning and growth. Increased volatility of the real exchange rate has the same effect. In a recent paper, Gylfason and Zoega, (2003) develop a model of rent-seeking behaviour that also produces an adverse effect of natural resources on growth. In this case it assumed that learning mainly occurs in manufacturing and not in the primary sector. It follows that if the riches of nature tempt workers away from manufacturing and into the primary sector, there will be fewer hands left to work in manufacturing, hence less learning and lower rates of growth. Thus, the model indicates that the growth of output per capita is then an increasing function of the scale and scope of the manufacturing sector and a decreasing function of the natural resource rent.

In this paper, we will explore the effect of innovations or technology development on competitiveness or trade barriers in natural resources market. Following Nordhaus (1992) and Gylfason and Zoega (2005) we assume that output is produced by labour L, natural resources N and capital K and the production function to be of the Cobb-Douglas variety with constant returns to scale:

$$Y = AL^{a}N^{b}K^{1-a-b} \qquad (1)$$

where A represents overall efficiency, including technology and quality. This gives a production function that generates smooth and differentiable isoquants in $L-N-K$ space. We can rewrite equation (1) in per capita terms:

$$y = An^{b}k^{1-a-b}, \qquad (2)$$

where $y = Y/L$, $n = N/L$ and $k = K/L$. Equation (1) encapsulates a technology where natural resources can be bundled together with either labour or capital in the production process (Bruno, 1984).

An economy that has twice as many workers, twice as extensive natural resources and twice as much capital is also going to produce twice as much output. With added technology or innovations it is assumed that output may be quadrupled. The cost of production will be highly reduced giving an economy with abundant natural resources advantage in global natural resource markets.

We distinguish between the intensity and abundance of natural resources as Gylfason and Zoega (2005). By intensity, or dependence, we mean the importance of natural resources to the national economy while abundance refers to the supply (per capita) of the natural resources. Within the Cobb-Douglas framework, the exponents in the aggregate production function (1) denote factor shares while the factor inputs are absolute quantities. An increase in the parameter (b) thus means that the economy now relies more heavily on natural resources in producing output – independently of its supply – while an increase in (N) implies that the supply has increased. The distinction between dependence and abundance allows us to distinguish between the effect of a change in the factor share (b) on growth, on the one hand, and a change in the abundance of the natural resource (N) on the other.

A class of capitalists owns the stock of capital and individuals also own the natural resources. The total stock of natural resources is given and hence also the supply of their services. We take these services to be fixed and exogenous so that no opportunities for intertemporal allocation of these resources arise. We assume a perfectly competitive market for the services of natural resources. In equilibrium, supply of and demand for natural resources are equalized and the marginal product is equal to their real price. Similarly, there is perfect competition in the market for labour and the marginal product of labour is equal to the real wage. Finally, we have a market for capital where the owners of capital sell its services to firms.

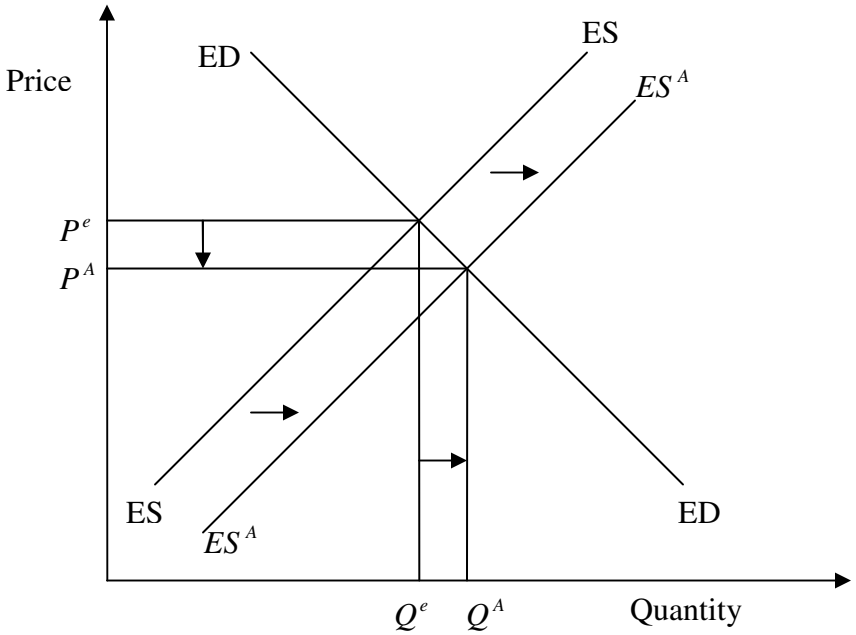
Assuming a constant capital/output ratio K/Y – a reasonable assumption in steady state – we can rewrite equation (1) in terms of logarithms and then derive the following expression for the rate of growth of output per capita g:

$$g = \left(\frac{1}{a+b}\right) g_A - \left(\frac{b}{a+b}\right)(g_L - g_N) \qquad (3)$$

where g_A, g_L and g_N are the rates of growth of technology, the labour force and the natural resource. If the resource is renewable and constant, g_N disappears from the equation. If the resource is non-renewable and a fraction u of the remaining stock of the resource is used up every year, then the term $g_L - g_N$ can be replaced by $g_L + u$ in equation (3). This sum represents the two drags discussed by Nordhaus (1992) and also in Gylfasona and Zoega (2005). If the resource is managed such that it grows at the same rate as output, equation (3) simplifies to the neoclassical steady-state solution, $g = g_A$.

There is a conflict between the advance of technology that increases output per capita over time and the diminishing returns due to the fixed or declining supply of the natural resource. The drag on growth is greater, if the value of (b) is higher– that is, the greater is the dependence on natural resources, the higher are the rates of population growth g_L and resource depletion u. This effect is uncontroversial. The inability to augment one factor of production is bound to introduce diminishing returns to the remaining factors. Clearly if production is heavily dependent on the natural resource – that is, if the value of the parameter (b) is high – the drag becomes more severe. The available way to curtail resource depletion u is to introduce more innovations in terms of utilization and development of new products from natural resources. That is if the resource is managed such that it grows at the same rate as output, then the neoclassical steady-state will be $g = g_A$. The output growth is equivalent to technology growth. The technology will transform the natural resource into products that are produced at reduced cost per unit. This gives an economy with abundant resource a competitive advantage at global markets.

The effect of innovations on competitiveness and trade barriers is depicted in the figure below. This figure represents the global market for natural resources.



Global Market Model for natural resources

The assumptions are that the country or the organisation extracting natural resources is the big one and its action can affect the market. The ED, ES and P^e are excess demand, excess supply and equilibrium price or world market price before the introduction of technology or the organisation embark on innovations. That market clears at P^e and quantity Q^e. As new technology or innovations are introduced, and the products are produced at lower cost per unit, there is a shift in excess supply to right ES^A due to technology or innovations embarked by organization. This causes a downward shift in price from P^e to P^A. The P^A due to innovations is lower than the equilibrium price P^e. The quantity that clears the market is Q^A. The consumers will purchase the quantity at the prevailing world price and maximize their welfare, even if their country imposes restrictions on the import of the products.

5. Conclusion

With innovations and technology development, an economy with abundant natural resources will be sure to have competitive advantage in the global market, simply due to cost advantage of the products from natural resources. As consumers want to maximize their welfare, they will prefer to purchase the products from the lower cost countries to higher cost countries. If the countries impose trade barriers, it will not have much significant effect, even if there is, it will be small.

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