

Sustainable Consumption and Green Production; an Innovative Approach to Firms Competitiveness.

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Abstract: The objective of this paper is to attempt a linkage between sustainable consumption and green production as an opportunity for firms to create competitive advantage and reposition firms for growth and profitability, by supporting innovation and knowledge creation, Change in the way with produce and consume don't just happen but they are drivers to innovation through which a firm can survive as a result of environmental dynamics.

Keywords. Innovation, Knowledge, Diffusion, Environment

1. Introduction

In the last quarter of this century environmental degradation and destruction of natural resources has emerged as the major economic and political problems generated by the process of capital accumulation and this problem has given rise to a series of explanation from both theoretical and ideological perspectives along with various planning instrument that intends to assert an environmental dimension to economic rationality. At the same time public awareness has increasingly focused on environmental questions, including ecological movements that seek to halt the negative effects of industrial growth, the most socially conscious of these movements, have criticized the ways that community production and consumption have destabilized ecosystems, depleted resources, degraded the environment and led to a disintegration of cultural values and ethnic identities within local communities

Nevertheless, this ideological debate has not engendered an adequate conceptualization of how natural processes are inscribed into economic and capital accumulation processes, despite the fact that all economic activity is aimed at satisfying the needs of consumers and it is in the process of doing this that the same social conscious movement has risen up against producers/firms on the need to know the true cost of a product, the basic ingredients in a product, the true benefit of a product etc. This social movement is called consumerism and they have become a pressure group, putting constraints on firms by advocating for a change in consumption pattern and the effect of the environmental impacts on consumption, which had a rebound effect on firms as there is difficulty in identifying an optimally sustainable pattern of consumption and production.

The problem created by this transition to sustainable production and consumption has often led to the demise of many firms, due to the impact of many stringent environmental legislation and different taxes on emission which has eroded the competitiveness of many firms, to

the neo-classical cost base theorist there is the fear that the private cost initiated through environmental policy has impaired competitiveness and productivity.(Palmer, etal,1995). Though there is a doubt about environmental regulation effects on firms competitiveness, however some scholars have argued that environmental regulation has greatly spur innovation for firms through a number of ways,(first mover advantage) created by the development of new environmental technologies and green products in the environment sector, as well as for their uses, thereby creating a win-win situation, through environmental regulation, where by pollution is reduced and production increased, to (Porter & Van der linde, 1995), properly designed environmental regulation can trigger innovation that may partially or more than fully offset the cost of complying with them.

The objective of this paper is to attempt a linkage between sustainable consumption and green production as an opportunity for creating competition and firm's repositioning.

Sustainable consumption can be defined as patterns of consumption which does not compromise the environments capacity to support the needs of future generations, however according to OECD,(2000), is the use of the services and products which fulfill some essential needs which contribute to improve the quality of life, while minimizing the quantities of natural resources and hazardous materials as well as the quantities of waste and pollutants, all over the life cycle of products and services, so that the needs of future generations can be fulfilled, while green production can be defined as a business strategy that focuses on profitability, through environmental friendly-operating processes. The proponents of this management philosophy contend that green production is a sensible course to follow, not only for its benefit on the environment, but also because of its strategic role on firms profitability and competitiveness (Hart.L.S, 1994), through green production.

This paper will be divided into 5 sections, as follows, the introductory chapter will discuss current problems

and linkage between sustainable consumption and green production, as opportunity for creating competitive advantage and firm's re-positioning strategy, section 2 will look at theoretical and empirical studies on environmental regulation and determinants as a basis for business innovation and product development, section 3, will discuss the new econometric model for green production, which reposition the firm for competitiveness, environmental protection, R&D and innovation strategy, while section 4 discusses policy implication for firms and section 5 will be the conclusion.

2. Literature Review

Change is the greatest provider of opportunities for new and different approach to the way things are done and it is the only constant thing in life, it is a never ending process of mutation and adaptation, it therefore referred to as the purveyor to innovation, similarly innovation consists in the purposeful and organized search for change. In the analysis of the opportunities, such changes might offer for innovation, in the words of Drucker, (1985) environmental dynamics such as competitive intensity and technological turbulence having been pushing firms towards innovation as a form of change. Environmental dynamics often leads to innovation, which Klemmer (2006), has defined as techno-economic, organizational, social and institutional changes leading to an improved quality of the environment, in a recent study by Kemp(2006), he opined that environmental improvement, should throughout the lifecycle of innovation result in a reduction of environmental risk, pollution and other negative impacts of resource use compared to relevant alternatives, with respect to technological and environmental innovations, Rennings (2000), opined that a difference is made between integrated and end of pipe production methods, integrated method can be of product or process character, while environmental product innovation leads to new or improved products, the concept also comprehends the introduction of technologies, the use of known technologies for new applications as well as investment in new technology and improvements of existing products, through new materials, however In contrast to conventional product innovation, environmental product innovations contribute to the reduction or avoidance of environmental burdens, and this may be realized by firms with or without the explicit aim of limiting environmental damage, therefore environmental product innovations can combine business strategy, such as cost cutting effort, profitability etc, with environmental benefits. Similarly it needs to be stated that change does not just come up, it has to be driven or determined by certain factors, just like innovation. For a long time the determinants of general innovation activities were separated by supply and demand side components, in view of the supply side, it is assumed that knowledge and existing technological opportunities are

decisive for the innovation activity of each individual firm (technology push), while the demand side (technological pull), market demand is the essential factor for innovation, however in the current evolutionary theory of innovation both sides are seen as important factor for innovation (Nelson & Winter, 1982,1977), however for a general empirical evidence of this assumption Pavit(1984), Kemp (1991) and Strasser (1997), all of them follow the evolutionary approach and stress that results concerning the general determinants of innovation are also relevant for analyzing environmental innovations, as stated above both supply and demand side factors play a role for the development of environmental innovations, similarly most environmental problems can be regarded as negative external effects, so that there is no clear economic incentive for firms to develop new clean products and processes, therefore the general innovation theory has to be enriched with respect to the analysis of the influence of environmental policy as an external stimulus for environmental innovation, Horbach & Renings (2006), Similarly Kemp (2007) takes a wider perspective on the issue and addresses the need for environmental policy to be oriented towards system innovation involving structural change, in a narrow sense, it could be stated that environmental policy is inter-alia restricted to environmental regulations, taxes etc, which has acted as the linkage between environmental regulation and environmental innovation.

3. Methodology

It has often been argued that policies designed to protect the environment may harm economic growth and if introduced, into a country may reduce the competitiveness of its domestic firms, this argument is based on environmental regulatory policies, which is often based on taxes, but three issues need to be raised, tax is not the only policy instrument and is not the most efficient one that can be used to reduce polluting emissions. When a tax policy is implemented, it is important to access the feedback effects induced by recycling the tax revenue and lastly the most important is the role of technological progress which cannot be neglected, therefore there may be a policy mix that provides firms with the correct incentives to adopt energy-saving techniques and investment in environmentally friendly R&D, while the first two issues partly explored both empirical and theoretical literatures, the last issue (role of incentive to technical progress) still lacks adequate quantitative assessment, and this is the reason why a new model (called green production model) was developed by Carlo Carraro, and the model endogenizes technical progress and its effect on the firm growth and competitiveness without damaging the environment as the policies favor all stake holders, including the government.

The main idea behind this green production model is that technological progress cannot be observed but can

be inferred by observing the dynamics of other variables, which can be decomposed into two parts (energy saving or environmentally friendly capital and the energy consuming or polluting part). Each year a new vintage of capital stock becomes operational, in this way, new capital is added to the two components but the characteristics of this new capital depend on a number of economic variables which affects firms decision of installing energy saving capital the ratio between the two types of capital constitutes our indicator of technological progress. Let k_t = the capital stock

k_e = the environmentally friendly
 k_p = the polluting stocks

By definition, this implies

$$(1) \quad g_k = g_p + (g_e - g_p)(k_e/k_t)$$

Where g_k, g_p are the growth rates of the overall, polluting and environmentally friendly capital stocks respectively, suppose that

$$(2) \quad g_e - g_p = f(x)/(k_e/k_t) + \varepsilon$$

Where $f(x)$ is the capital growth rate in the long run, when all technological possibilities to reduce energy consumption have been implemented

I.e. when $K_t = k_e$ and $g_p = 0$; x is a set of explanatory variables

ε = Stochastic error term

The implicit assumption here is that when the stock of polluting capital is high, the rate of growth of the environmentally friendly capital is greater than the rate of growth of the polluting capital however the difference decreases as k_e approaches k_t

Finally the following equation defines the dynamics of the following component of the capital stock i.e

$$(3) \quad g_p = h(w, v)$$

Where,

w = set of explanatory variables

v = stochastic error term

In particular the explanatory variables include R&D spending, output demand, factor prices and the number of imported patents. All things being equal, it is likely that more R&D spending increases the technological possibility of the economic system so that inducing investment in environmentally friendly capital replaces investment in polluting capital, similarly higher energy prices may induce firms to reduce investment in energy consuming technologies.

The amount of R&D carried out by firms is an endogenous variable of the model and this is related to the total output demand (assuming a unitary elasticity in the long run), relative factor prices and policy variables, which include which include environmental taxation (via energy prices) and innovation subsidies (via publicly funded R&D expenditures).

Esq., (1-3) endogenizes R&D expenditure factor prices and output demand define the structure of the latent variable model because g_p and g_e are not observable, they must be estimated by filtering the information

contained in the observable variables, to achieve this

Let's write eqs (1-3) in a state space form as

$$(4) \quad g_k = Hs + \varepsilon$$

$$(5) \quad S = fs(-1) + v$$

Where S = state space vector, which contains the unobservable variable g_p and the parameter vectors β and δ associated with the variable vectors x and W respectively more precisely we have

$$H = [1 \times 0], \quad S = \begin{bmatrix} g_p \\ \beta \\ \delta \end{bmatrix}, \quad F = \begin{bmatrix} m & 0 & \omega \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

In this matrix

H = output matrix

F = Transition matrix of the state space form of the model that contains the parameters which captures the adjustment speed

m = component of the capital stock sector

ω = variable vector

The zeros and ones necessary to re-produce the identities concerning all the time-invariant coefficients

The error terms ε and v are assumed to be normally distributed and serially uncorrelated

The state space form of eqs (4) and (5) has been estimated using the square root Kalman and information filters described by Carraro (1988), the covariance matrix of the error term ε and v has been estimated using the maximum likelihood method. The initial values for the state vector have been estimated using the generalized least square (GLS) procedure proposed by Carraro (1985). The results of the estimates of state space transition matrix F , the output matrix H and the state vector S (in particular, the vector δ) show that the filtering procedure we used to decompose the capital stock yields homogenous results.

What this model means is that for firms which commit to the adoption of best available technologies, we assume that investment in new vintages of the capital stock concerns either new plants or plants that have become obsolete by assuming a net increase in the energy-saving or environmentally friendly capital stock equal to the subsidy, similarly the outcomes of R&D policy with those of the innovation policy, and government spending for increasing firms green production, as a sum that corresponds to 0.5% of GDP, is kept constant to encourage innovation and adoption of best technologies. It against this background that firms which innovates into green production will always reap the benefit, to attain competitive advantage and firm re-positioning.

4. Policy Implication for the Firm

As a result of the linkages between environmental regulation and environmental innovation, it is important for the firm to strategically position itself in a first mover position for new product development, however in recent time knowledge creation has attracted a lot of attention

as driver/determinant of new product development, in a competitive setting, knowledge creation brings firms some advantages including enabling them to create unique, inimitable and valuable intangible resources, (Grant 1997), create successful new products (Madhavan&Grover,1998), renew organization (Dougherty,1992), and in some firms obtain strategic advantage over their competitors, (Nonaka,1994).The current interest in knowledge creation has prompted studies into high-tech firms , as product innovation has been recognized as the essence for their renewal (Dougherty,1992), these firms rely heavily on new product introduction and commercialization to survive as the environment is characterized by rapid product obsolescence and evolving customer needs, therefore it could be stated that high-tech firms pursue growth mainly through new product development which in turn result in unprecedented levels of new product introductions (Varadarajan & Jayachandra,1999).However still firms still face problems, as the evolving market needs make products obsolete quickly and firms face more intensive competition than ever before, similarly competition via new product launches intends to enhance firms performance in their own product endeavors, but has the unintended effect of exposing consumers to newness on a wide scale (Redmond,2002).Due to this exposure consumers are habituated to a continuous flow of new products and services, which they accept more readily than in the past. Product development has become a dynamic capability of the firms because of its ability to alter the resource configuration of the firms (Eisenhardt & Martin ,2000), however the firm still has to face the liability of newness of a product , similarly scholars (Krough,Nonaka,&Abel, 2001,Madhavan & Glover,1998),have shown that knowledge creation is a potential strategy for innovation driven high –tech firms, as it enables them to maintain dynamic innovation capability and come up with evolving market expectations aimed at achieving competitive advantage .

Therefore knowledge creation plays an important role in new product development, similarly strategic innovation also plays an important role, as it converts newly created knowledge to increase firms value, through new product offerings, It could therefore be stated that knowledge is the base of innovation and its diffusion, as a new product is novel and its introduction changes marketing thinking and practice (Wilton &Myers, 1986).

The quality of technical capabilities, drive innovation performance and this is due to increasing similarity in the access to knowledge sources, as firms are starting with the same base of prior related knowledge which thus lead to less differentiation in their absorptive capacity and a firm's ability to recognize new information, assimilate it, and apply it to commercial ends, will increase its competitive advantage, however this is not enough as the firm needs to strategically position the new product into the market, with the necessary market support instrument , in order to attain profitability and growth.

Therefore as innovation value lies not only in the technical superiority of the innovation but also in what the market is willing to perceive as the value of that technical superiority, similarly for the firm to appropriate greater value from her green product innovation, would depend on the firm's ability to make the market perceive the innovation's value and to fully benefit from this value as a business strategy to capture competitiveness and grow profit, in the following ways.

The firm is advised to have complementary assets to support the new product, especially to enhance the value of the new product to the user especially through the provision of spare parts, as it plays a supportive role in increasing the value of the new product to the user.

A new product's value is also enhanced by the first mover advantage whereby a new product to reach the market is the winner, as it will create the race to the market especially in the area of distribution network or existing user base network, which will help the firm to launch the product faster than a competitor, who has a weak market support capability.

The new product should be strategically positioned in the market, according to "Shumpeter's logic" new products by their nature of "creative destruction" are considered to create market imperfections and thus lead to the generation of economic rent. Consider a situation of perfectly competitive markets of similar products, where all products give equal value to the user and thus enjoy no economic profit, however with the introduction of a new product, such an improved version of the product would attract users due to the greater value being delivered by it ,resulting in the perfectly competitive market becoming monopolistic in nature and thus helping the firm to earn economic profit, in this situation the economic profit generated is driven by superior position of the new product in the product hierarchy.

The firm should use the new product to her advantage by making the market imperfect competition, as a product can potentially earn economic rent and all these is generated by the product-market positioning adopted by the firm to enhance bargaining power, vis-a vis , suppliers, customers, substitutes, and new entrants (Porter,1980), in order to gain competitive advantage.

The firm should position the new product in the market space, because in the market for a new product, where the supply is fixed, the demand for the product would determine the product value (price), perceived ease of usage and usefulness of a product have been found to be important in influencing the acceptance or demand for a new product, especially the ease of shift to the new product without facing problems subsequently. The firm should also support the new product with promotion to enhance its value, as promotion and distribution strategies play a crucial role in new products launch to the market .Distribution is very essential in the eventual acceptance and sales of a new product in the market , as it determines the availability of the new product to

customers, distribution decisions is therefore far reaching because changing them is both resource and time demanding, thus firms have to take great care in designing their distribution system during new product launch, it is important to state that the fit between product and the delivery system is the single most important variable, affecting the success of new products.

The firm should develop a promotion strategy that is crucial in new product launch, as it helps to attract customers attention towards the new product in a market clustered with similar products. As market communication becomes important, any promotion strategy employed by the firm, would impact the positioning of a new product in the consumer mind space and this would help the firm capture greater value from the new product.

5. Conclusion

It can therefore be seen from the foregoing that sustainable consumption and green production does not just happen, but are products of environmental dynamics which articulated the need for change in the way firms produce and consume resources in order to satisfy customer demands which have destabilized the eco-system, depleted resources, etc, (and the effect of regulations in the environment) And as a result of the regulations put in place by the environmental dynamics, has led to firms knowledge creation and innovation of new products and technology, to enhance competitiveness and grow profitability and how innovation could be used by the firm to attain business strategy, by seeing innovation from the market side rather than technical side , which means firms should be proactive and develop marketing strategies in line with the new product (green) for acquiring greater profit potential and firm's re-positioning , For new business opportunities , intellectual property, brand differentiation (green products), as well as goodwill and reputation, in order to attract new employees and public recognition for green products.

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