



The effect of natural resources on a sustainable development policy: The approach of non-sustainable externalities

Markus Schilling^{a,*}, Lichun Chiang^b

^a Graduate Institute of Political Economics, National Cheng Kung University, University Road 1, Tainan, Taiwan, ROC

^b Department of Political Science, National Cheng Kung University, Taiwan, ROC

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ABSTRACT

The debate about the importance of non-renewable resources for economic development between optimists and pessimists shows that the extensive depletion of non-renewable resources, particularly oil, along with a higher level of consumption could have a significant impact on the economic development of future generations. Based on this debate, this paper proposes criteria under which the depletion of non-renewable resources would create excess costs for future generations. Therefore, this paper aims to answer the question “What will be the impact of the depletion of non-renewable resources on sustainable economic development?” Accordingly, a sustainable development policy appears feasible by minimizing non-sustainable externalities which derive from future externalities that weigh the benefits from a previous employment of natural resources. The research based on qualitative analysis clarifies the reasons for and the extents of taking sustainability into account as well as points to difficulties of implementing policies to time the transition towards a sustainable economic development. Finally, the research shows the implications of this approach for environmental degradation, the depletion of non-renewable resources and energy production.

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1. Introduction

The fluctuations of the oil price in the past demonstrate the influence of non-renewable resources on global economic growth. Not only are consumers highly concerned about the price of oil, most companies consider any rise as a major threat to their profitability. Many scholars, such as Simmons (2005) and Watkins (2006), have discussed the impact of the depletion of natural resources on economic growth and their prognosis for the future falls into two basic camps. Pessimists, such as Meadows (1992), Deffeyes (2001) or Simmons (2005), argue that growth is limited by the finite nature of resources—the rising price of oil indicates a near term exhaustion of this resource, and as a consequence, the decline or impossibility of economic growth. On the other hand, Simon (1996), Radetzki (2002) and Watkins (2006) take an optimistic perspective and argue that growth is unlimited. They look at the price of oil from the viewpoint of price mechanisms for the aggregate supply of goods and their substitutes. Both perspectives, as will be subsequently explained, have merits as well as flaws in their argumentation. Yet they provide essential insights for a better understanding of the depletion of natural resources for sustainable development.

* Corresponding author.

E-mail address: shimake25@gmail.com (M. Schilling).

For the purpose of this paper it is worthwhile to look at the meaning of economic growth from a broader perspective. Although people have traditionally been more concerned about economic development during their life time, but as the example of global warming shows, people became more and more aware of the long-term impact of their economic life style during the last decades. In order to grasp the meaning of sustainability for development properly, it is necessary to set the time horizon further away. The approach of non-sustainable externalities proposes conditions, under which governments would have to choose between higher present consumption of non-renewable resources and future development. Currently, governments generally consider the immediate interests of their citizens and hence tend to disregard its impact on subsequent generations. The high public debts of many developed countries illustrate the choice governments have to make between redistributing resources to people and investing in their countries' long-term future economic competitiveness. When analyzing global sustainable development, this pattern is an obstacle in the shift from the depletion of non-renewable resources towards the employment of renewable substitutes. Bazhanov (2006) analyzes possible transition paths for a gradual substitution of non-renewable resources, but concludes that technical restrictions do not allow for a smooth transition to a sustainable resource employment. Past economic development has been characterized by the depletion of resources and resulted in the pollution of the environment, and most scholars agree that we cannot continue

forever in this manner, because pollution and depletion will result in serious consequences for future development (Homer-Dixon, 2001).

This paper proposes to give an overview of the arguments of the two schools of thought regarding the use of natural resources for economic development and will further expand this discourse by applying the concept of sustainability in order to suggest the approach of non-sustainable externalities. This paper aims to answer the questions “What will be the impact of the depletion of non-renewable resources on sustainable economic development?” and “Under what conditions will current efforts of employing renewable resources create negative or positive externalities for future generations?” Furthermore, this paper points to the difficulties of implementing policies to time the transition towards a sustainable use of resources. Finally, the paper considers limitations of this approach for a policy for sustainable development.

In the following, Section 1 will clarify the meaning of sustainable development in terms of natural resources. Section 2 will review the arguments of both optimists and pessimists on future development. Section 3 will suggest a framework for the depletion of non-renewable resources under the condition of sustainability by applying the concept of externalities. Finally, Section 4 will point out the implications of policy approaches for a sustainable development policy.

2. Research background: natural resources and sustainability

This section defines the meaning of natural resources and sustainability and shows their interdependence. In general, the criteria of sustainability for both renewable and non-renewable resources emphasize that the stock of a resource remains the same over time. Therefore, sustainability requires that the rate of recovery at least equals the rate of destruction (Asafu-Adjaye, 2005). Examples of non-sustainable development can be found in environmental degradation, resource depletion, increasing income disparity, poverty and marginalization (Raskin, 2000).

Furthermore, it is important to distinguish between renewable and non-renewable resources. Fossil fuels, for example oil, are non-renewable resources because they are consumed at a higher rate than their rate of reproduction (Conrad, 1999; Richards, 2006). However, there are reasons why a final depletion of oil is unlikely to occur—the rate of depletion might decrease dramatically, for example, due to the adoption of oils from vegetable sources (Harris, 2007:265f), an increased price of the good, decreased prices of substitutes, or a more efficient use. Furthermore, relatively costly resources create incentives for the exploration of new deposits. For example, the production of food has been controlled and increased to satisfy its demand.

One condition of sustainability for natural resources is fulfilled when the rate of consumption is equal to or less than the rate of recovery. Accordingly, the World Commission on Environment and Development defines sustainable development as “... development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED (World Commission on Environment and Development), (1987): 43). The goal to preserve the inter-generational capacity for development implicates barriers for the depletion of non-renewable resources. Without a change in the current input rate of non-renewable resources into economic processes, non-renewable resources will approach exhaustion sooner or later. Bartelmus (1994: 45–52) argued that two factors are important when taking the depletion of non-renewable resources into account: The life expectancy of the resource and the discount rate caused by its depletion. For instance, oil could be considered a renewable resource if it were produced artificially from renewable resources at a higher rate than current consumption. This would be feasible if

the retail price in terms of sustainability would include the future costs of maintaining its stock. In addition, the substitution of fossil fuels by biofuels based on agricultural commodities is of questionable benefit as it causes rising prices on the agricultural market FAO (Food and Agriculture Organization of the United Nations) (2008). The conditions for a sustainable input of natural resources appear relatively clear-cut, but it remains uncertain whose transition path towards a sustainable development should be favoured.

The shift of paying now for long-term future costs of replacement will not be the only major challenge for the global economy. Still another will be the obstacle of providing enough energy at this increased cost for all economic processes. In this context, Barbier (2005) stressed that a “free deployability” of non-renewable resources by no means contributes to economic development, but may even hinder it. At present non-renewable resources are an important factor in many economic models, but they are likely to lose their importance in the long-run as their depletion progresses. Yet there are other ways of providing energy: for example, technological progress has made the employment of solar cells successively cheaper. Furthermore, as Simon (1996) pointed out, the pattern of invention and substitution is likely to be continued in the future. Hence, uncertainty about our future dependence on non-renewable resources in the long-run complicates the determination of an optimum transition towards sustainable development.

The above mentioned discussion of the underlying mechanisms points towards the next section. Having noted the importance of resource time-lines on depletion, the following part will review the arguments of both the pessimists and the optimists.

3. Literature review

The first debate: the British classical economists

In 1798, Malthus (1798) suggested that neither technological progress nor the human ingenuity would be sufficient to overcome obstacles of population growth. He criticized the prevailing idea that nature would never limit growth. This view had already been expressed by the French philosopher Nicolas de Condorcet in 1794 (Malthus, 1798). The British classical economists likewise argued that in principle nature could limit future growth, but such natural constraint would not be reached in any meaningful time frame. The most famous scholar who took this stance was John Stuart Mill (1862). In 1862 he argued that social institutions and increases in social welfare would slow down population growth. Therefore, the first debate was primarily concerned with the threat of an overpopulation in the future for economic growth.

The second debate: The US Conservation Movement (1890–1920) and the Studies by Hotelling, Barnett and Morse

Since the 1890s the debate increasingly considered the depletion of non-renewable resources as a major obstacle for future growth. In this context, the former US President Roosevelt (1908) promoted the conservation movement. Research was deepened by Hotelling in 1931 and Barnett and Morse in 1963, who took an optimistic view. Barnett and Morse (1963) assumed that technological development would produce substitutes for scarce resources, reduce the relative prices of these goods and expand the total amount of economic reserves. Even so, they considered how the depletion of non-renewable resources could impede future economic growth and what the optimal rate of depletion would be. Although they allowed for the possibility of scarce natural resources, scarcity was an idea only considered validity in theory. In fact most companies chose a higher rate of depletion, because

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