



# Environmental consciousness, economic growth, and macroeconomic instability<sup>☆</sup>



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## ABSTRACT

This paper develops an endogenous growth model to examine the linkages between environmental consciousness and economic growth. It is found that macroeconomic instability can arise in a simple AK-type growth model when the pollution externality is present only in the agent's utility function. It is also found that the impact of environmental consciousness on the economic growth rate is ambiguous. The economic systems (a decentralized versus centralized economy) and the ecological evolution (the specific pollution growth rate) are two crucial factors that determine the relationship between environmental consciousness and economic growth.

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## 1. Introduction

The conventional wisdom usually believes that environmental consciousness has an adverse effect on economic growth. This belief builds upon the viewpoint that, as environmental consciousness increases, the public usually expends more resources to maintain environmental quality, leading to fewer resources being used on productive activities, hence deterring economic growth. However, existing studies reveal mixed conclusions regarding the relationship between environmental consciousness and economic growth that are based on a variety of analytical frameworks.

Basically, three major lines of argument regarding the linkage between environmental consciousness and economic growth in the literature should be distinguished. The first line involves the intertemporal substitution elasticity. For example, Ligthart and van der Ploeg (1994), den Butter and Hofkes (1995) and Nielsen, Pedersen, and Sørensen (1995) assume that consumption and pollution are set to be time separable in a household's utility, so that a negative linkage between environmental consciousness and the economic growth rate is established. Running counter to the preceding viewpoint, some studies, e.g., Elbasha and Roe (1996), Huang and Cai (1994), Shieh, Lai, and Chen (2001), Itaya (2008), Chen, Shieh, Chang, and Lai (2009) and Chu and Lai (2014) also include pollution as a disutility in a multiplicative utility function of economic agents to capture the amenity effect of a clean environment. They find

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that the intertemporal elasticity of substitution plays an important role in determining the relationship between environmental consciousness and economic growth.

The second line of argument has to do with the pollution growth rate. There are three competing and conflicting strands of the modeling strategy in the literature on the pollution growth rate. The first strand of the literature including [Huang and Cai \(1994\)](#), [Ligthart and van der Ploeg \(1994\)](#), [Michel and Rotillon \(1995\)](#) and [Itaya \(2008\)](#) specifies that pollution grows over time, while the second strand of the literature, such as [Bovenberg and Smulders \(1995\)](#), [Elbasha and Roe \(1996\)](#), [Bovenberg and de Mooij \(1997\)](#), [Chen, Shieh, Chang, and Lai \(2009\)](#) and [Acemoglu, Aghion, Bursztyjn, and Hemous \(2012\)](#), proposes that environmental quality cannot be too low in order to support the life system. Hence the pollution growth rate is necessarily zero to avoid the excessive degeneration of environmental quality. The third strand of the literature, for example, [Xepapadeas \(2005, p. 1228\)](#), indicates that pollution may exhibit a negative growth rate if cleaner production technology is used as the economy grows. This implies that environmental pollution can be eventually eliminated. As is evident, the types of the evolution of pollution serve as a potential role in governing the influence of environmental consciousness on economic growth.

The third line of argument concerns the economic system. It is widely accepted that pollution is an externality. As a result, the typical household is not willing to expend any resources on pollution abatement in a decentralized economy since it feels that its activities are too insignificant to affect pollution. On the other hand, in a centralized economy resources for abatement are chosen by the social planner from the viewpoint of grand optimization. The social planner thus has an incentive to allocate some resources for abatement purposes so as to achieve the socially optimal level of pollution.

This paper is written with two objectives in mind. The first objective is to provide a concise summary of different viewpoints that have frequently been adopted in the recent environmental economics literature. Following an approach already adopted in existing studies, this paper first develops an endogenous growth model in which pollution is able to exhibit both positive and negative sustained growth rates. Then, we use the model to show that both economic systems (the decentralized economy versus the centralized economy) and ecological evolution (the specific pollution growth rate) play a crucial role in determining the relationship between environmental consciousness and economic growth.<sup>1</sup>

The second purpose of this paper is to examine the role of environmental consciousness in governing the dynamic properties (determinacy vs. indeterminacy or macroeconomic stability vs. macroeconomic instability) of an economic system. The topic of local indeterminacy or macroeconomic instability has recently received a great deal of attention in the real business cycle literature. In general, the rationale for the occurrence of macroeconomic instability can be explained intuitively as follows. The household's optimistic expectations of a higher future return on its holdings of one specific asset lead to an actual increase in the return on that asset, implying that the household's initial optimistic expectations become self-fulfilling. To reflect the characteristic that business cycles are generated by the household's belief and the result that household's expectations tend to be self-fulfilling, macroeconomic instability is also referred to as "belief-driven business cycles" and "self-fulfilling expectations".<sup>2</sup>

There has been extensive discussion on dynamic general equilibrium models that display macroeconomic instability.<sup>3</sup> For example, [Benhabib and Farmer \(1994\)](#) and [Farmer and Guo \(1994\)](#) propose that macroeconomic instability arises in economies that exhibit a sufficiently high degree of labor externalities in production. Surprisingly, in the environmental economics literature few studies have focused on whether the presence of pollution externalities will govern the possibility of the emergence of macroeconomic instability. In their recent papers, [Itaya \(2008\)](#) and [Chen, Shieh, Chang, and Lai \(2009\)](#) respectively develop a dynamic general equilibrium model with pollution externalities, and find that the degree of environmental consciousness, the pollution-generating function, and the extent of the environmental production externality are crucial for the emergence of macroeconomic instability. However, a common feature in [Itaya \(2008\)](#) and [Chen, Shieh, Chang, and Lai \(2009\)](#) is that they stress the *supply-side* factors (i.e., the endogenous labor-leisure choice) for the emergence of macroeconomic instability. In departing from these existing studies, by setting up a simple *AK*-type growth model this paper instead emphasizes that the *demand-side* factors (i.e., the pollution externality in the agent's utility function) are crucial for the likelihood of macroeconomic instability.<sup>4</sup>

The organization of the remainder of this paper is as follows. Decentralized and centralized economic models are outlined in [Sections 2 and 3](#), respectively. The main focus in these two sections is to discuss how the dynamic properties and the economic growth rate are related to environmental consciousness. Finally, some concluding remarks are presented in [Section 4](#).

## 2. The decentralized economy

Consider an economy consisting of a representative household and a government. The household produces a single composite commodity, which can be consumed or accumulated as capital. The government collects its tax revenue and provides public abatement to lessen pollution damage.

<sup>1</sup> One might argue that pollution has an adverse effect on private production. Under such a specification, an additional positive channel with regard to the relationship between environmental consciousness and economic growth is present. Since the negative production role of pollution is quite intuitive and well known in the literature, we henceforth ignore this channel.

<sup>2</sup> For an intuitive explanation regarding the emergence of macroeconomic instability, see [Harrison \(2001\)](#) and [Harrison and Weder \(2002\)](#). The empirical studies of [Matsusaka and Sbordone \(1995\)](#) and [Harrison \(2005\)](#) support the view that the household's expectations are a driving force behind business cycle fluctuations. In particular, [Matsusaka and Sbordone \(1995\)](#) find that between 13% and 26% of GNP innovations can be attributed to innovations in the consumer's belief system. This empirical finding reveals that the consumer's belief system is an important source of economic fluctuations.

<sup>3</sup> See [Benhabib and Farmer \(1999\)](#) for a comprehensive survey.

<sup>4</sup> In their previous studies that do not involve environmental issues, [Alonso-Carrera, Cabellé, and Raurich \(2005\)](#) and [Park \(2013\)](#) show that an alternative demand side factor (i.e., habit persistence in preferences) is a plausible source for the emergence of macroeconomic instability.

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