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ANALYSIS

Computable general equilibrium model analysis of economywide cross effects of social and environmental policies in Chile

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Abstract

The analysis of the linkages between development policies and social and environmental variables is a neglected area within the development literature. This paper focuses on the key interrelations among the economic, social and environmental elements of the sustainable development triangle. A thorough review is undertaken of both social and environmental policies in Chile, underlining important economic growth and reforms. Using the static CGE model ECOGEM-Chile, the economywide impacts of several environmental, social and combined policies are simulated for the Chilean economy. Six different policies are simulated—three environmental policies that impose different taxes on PM10, SO_2 and NO_2 emissions, respectively; the same tax on PM10 in a context of high unemployment; one social policy that increases government transfers to households; and a mixed social-environmental policy package where the environmental tax on PM10 and the social transfer policy are simulated simultaneously. The results show that environmental tax policies may have negative social effects, using real disposable income by quintiles as proxy. The impacts depend on the use of the new revenues and the status of employment. Taxing PM10 emission yields better environmental results than taxing SO_2 and NO_2. Social policies do not show negative environmental impacts. Combined environmental and social policies improve results. Thus, specific compensating social policies would improve environmental policy acceptance, while also reducing poverty or strong income distribution disparities. The evidence suggests that environmental policies may have social impacts, but not vice versa. The results show that the ECOGEM-Chile model is useful for analyzing systematically and holistically, different economywide policies and their impact on the Chilean economy. Winners and losers may be identified, as well as the potential magnitude of gains and losses. The results obtained are not all straightforward, due to indirect effects.

Keywords: PM10; Social transfer policy; ECOGEM-Chile model

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1. Introduction

In the 21st century, the concept of sustainable development is receiving increasing attention from world decision makers, in their search for new solutions to many critical problems including traditional development issues (such as economic stagnation, persistent poverty, hunger, malnutrition and illness), as well as newer challenges (like, worsening environmental degradation and accelerating globalisation). Governments have taken the responsibility to promote sustainable development—in response to Agenda 21 adopted unanimously at the 1992 United Nations Conference on Environment and Development (*UNCED*) in Rio 1992 and followed up at the 2002 World Summit on Sustainable Development (WSSD) in Johannesburg.

While no universally acceptable practical definition of sustainable development exists, the concept has evolved to encompass three major points of view—economic, social and environmental (Munasinghe, 1992). For our purposes, sustainable development may be defined as a process for improving the range of opportunities that will enable individual human beings and communities to meet their needs, as well as to achieve their aspirations and full potential, over a sustained period of time, while maintaining the resilience of economic, social and environmental systems (Munasinghe, 1994). This wider perspective on human well-being has encouraged researchers to look beyond traditional development goals like maximizing economic output, and pay more attention to environmental and social effects.

In this paper, we analyze the interrelation among environmental and social policies and their cross effects as well as the impacts on the key macroeconomic and sectoral variables, within a general equilibrium macroeconomic modeling framework applied to Chile. Thus, our work is the natural extension of a major trend in the literature, which has sought to examine countrywide or economywide policies (both macroeconomic and sectoral) and their powerful and pervasive impacts on environmental and social issues (see, for example, Munasinghe and Cruz, 1994; Reed, 1996; Munasinghe, 2002).

In the remainder of this section, we summarize the computable general equilibrium (CGE) modelling framework that is used, and then review the relevant literature. Section 2 describes the main economic, social and environmental issues and policies in Chile. The ECOGEM-Chile model is applied to explore alternative environmental and social policies, and simulation results are discussed in Section 3. Finally, Section 4 summarizes the main conclusions.

1.1. Computable general equilibrium (CGE) approach

A general equilibrium approach will capture complex inter-linkages among economic, environmental and social variables, better than partial equilibrium methods. It is often difficult to integrate these three major domains (and associated systems). The economic domain is geared mainly towards improving human welfare, primarily through increases in the consumption of goods and services. The environmental domain focuses on protection of the integrity and resilience of environmental systems. The social domain emphasizes the enrichment of human relationships and achievement of individual and group aspirations, including equity.

Since the precise definition of sustainable development remains an elusive (and perhaps unreachable) goal, it is more promising to pursue a less ambitious strategy that merely seeks to 'make development more sustainable' (Munasinghe, 1994). Thus, our study focuses on beneficial (or adverse) changes in selected economic, environmental and social variables. Such an incremental (or gradient-based) method is more practical, because they help to identify and eliminate many unsustainable activities—often avoiding sudden catastrophic ('cliff edge') outcomes. The practical goal is an approach that will (inter alia) permit continuing improvements in the present quality of life at a lower intensity of resource use and reduced environmental degradation, thereby leaving behind for future generations an undiminished stock of productive assets (i.e., manufactured, natural and social capital) that will enhance opportunities for improving their quality of life.

Macroeconomic policies and strategies have widespread effects—typically, they range from exchange rate, interest rate and wage policies, to trade liberalization, privatization and similar programs. They are usually coupled with various sectoral measures, including pricing in key sectors like energy or