Structural Adjustment Programs and the Environment: An Empirical Analysis of Transitional Economies

Anna Gueorguieva *

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ABSTRACT

The paper analyzes the effects of structural adjustment programs on the quality of the natural environment. Structural adjustment programs (SAPs) are designed to reform economies to become more liberalized and export-oriented, while reducing the role of governments. The effects of these programs on the environment have been studied quantitatively primarily in cross-country regression and computable general equilibrium models, which have endogeneity of program implementation and form specification limitations. The proposed research will correct for problems of adverse self-selection and will differentiate the impacts of SAPs from underlying economic

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and social developments. The effects of these policies on emissions and industry structure will be estimated for transitional economies. The findings of the paper will have implications for minimizing the adverse environmental effects of development policies and institutional change.

1 Introduction

Structural adjustment programs (SAPs) are designed to reform economies to become more liberalized and export-oriented, while reducing the role of governments that have become inefficient bureaucracies. They remove market distortions thus easing the response of the private sector to market signals. The main instruments are price reforms, trade liberalization and currency devaluation, reduced government expenditures as well as removal of institutional obstructions (Sebastian and Alicbusan, 1989). We will focus on structural adjustment lending (SAL) programs of the World Bank as identifiable set of policies with clear program objective and, to a varying degree, backed up with commitment by the government. These lending programs, started in the aftermath of the oil shocks and viewed as part of the 1980s, have recently come into spotlight with the onset of the East Asian, Russian and Brazilian balance of payment crises during 1997-9 and with renewed attacks by environmentalists for a lack of concern for the environment, mismanagement of natural resources, and ecological damage at the anti-globalization protests.

This paper will analyze the impacts of these World Bank programs on the quality of the environment for transitional economies. We will briefly discuss

the nature of the process of adjustment and derive the conceptual linkages between SAL instruments and the environment. The next section will review the research on the subject to date. Section 3 will propose a methodoly for analyzing the problem. Section 4 will discuss the preliminary statistics.

The effects of SAPs on the resource base and environmental quality of the economy are very complex. Two basic SAP-environment linkages are identifiable: (i)scale effects; and (ii) structure effects. The former occurs when SAPs have improved economic performance and this has in turn increased emissions and resource use. The latter refers to changes in the economy's structure and institutions that bias production to cleaner or dirtier industries.

The scale and structure impacts on the environment are brought about through market signals and through institutional change. For instance, removing subsidies on energy, which will be a market signal effect, will reduce energy consumption and will improve energy conservation measures. Setting up an energy commission can provide more efficient use by managing supply and influencing demand. In agriculture, the environmental impacts are primarily a result of substitution effects in crop production, restructuring of land tenure rights and credit availability. For the urban environment, the main concerns for the effects of SAP are the uncontrolled flood of migrants from the rural areas, the advocated reduction in public expenditure causing insufficient urban services such as water purification and waste hauling, and increased urban pollution. Trade liberalization is associated with migration of "dirty" industries to low-income countries because of difference in costs of

pollution abatement and looser environmental standards.

2 Literature Review

Most of the studies of the effects of structural adjustment programs are not quantitative and often have not applied rigorous statistical methods. Panayotou *et al.* (1996) breaks down the research approaches employed in the literature into several categories: (a) historical (discussion of events, consequences, and intervening factors); (b) analytical (implying that quantitative models or calculations were used, but the method is unspecified); (c) case studies (integration of site-specific research projects); and (d) computable general equilibrium (CGE) and partial equilibrium sectoral models. The most rigorous statistical methods employed are cross-country econometric analysis of trade liberalization and CGE analysis of policy prescriptions for particular countries.

Comparisons between various evaluation methods are hampered due to differences in context, sector focus and stage of the adjustment process. The results of the inquiry on the effects of adjustment policies are strongly influenced by what is examined, at which sectoral level and at what stage of the adjustment process. Adjustment programs are considered to have negative as well as positive effects - depending on the focus of the analysis. There are difficulties in differentiating the effects of SAPs from underlying economic and social developments. In addition, Eastern Europe, and Southeast Europe in particular, have not been studied sufficiently on these issues: in an

extensive literature review of over 50 studies, only one paper on Poland's energy sector was done for the region (Gueorguieva, forthcoming).

Due to the diversity of impacts on the environment from SAPs, most authors are unable to draw firm conclusions on their overall success or failure, but instead pinpoint the more common impacts and the most likely scenarios. However, the available studies and reviews more often than not point to negative environmental impacts of SAPs (Kessler *et al* 1998).

3 Methodology

The econometrics methodology developed to analyze effectiveness of programs is usually referred to as treatment or program analysis and answers questions such as "What is the impact of the program on the treatment group?". It specifically addresses problems that arise if standard econometric techniques are used in such contexts. The first problem is self-selection. For instance countries with poorer environmental record are likely to seek assistance from international corporations thus making it appear as though the program is correlated with environmental degradation. The second is of differentiation between the effects of the program and the underlying developments. E.g. when a program helps recover an industry, which used to be a major polluter, this pushes up emissions. However, if economic recovery was on the way regardless of the program, the responsibility for the environmental damage is questionable.

Program placement is usually analyzed in the following framework:

$P*$ is an index function explained by observable characteristics W.

$$P* = \gamma' W + v \tag{1}$$

If $P* > 0$ then the program is implemented. W are observable covariates such as economic performance and v are unobservable characteristics which might influence the placement such as political influence of the country's leaders to obtain a loan.

The environmental quality follows equation (2)

$$y = \beta' X + \delta P + u \tag{2}$$

where y is an indicator of environmental quality, X are variables which influence this indicator such as level of economic activity (GDP), environmental regulations, level of technology in the sector. The variable P takes the value of 0 if the program was not implemented and 1 if it was and u is an unobservable shock.

We assume that the disturbance terms follow a bivariate normal distribution

$$(u, v) \sim N(0, 0, \sigma_u = 1, \sigma_v = \rho)$$

The expected value of the environmental impacts is:

$$E(y|X_i, P_i = 1) = \beta' X + \delta + \rho\sigma_u \frac{\varphi(-\gamma' W)}{1 - \Phi(\gamma' W)} \tag{3}$$

and

$$E(y|X_i, P_i = 0) = \beta' X - \rho\sigma_u \frac{\varphi(\gamma' W)}{\Phi(\gamma' W)} \tag{4}$$

where ϕ and Φ are the standard normal probability density and cumulative functions.

The estimation is then conducted in a two-step Heckman procedure: a probit estimation of equation(1) and a regression of equations (3) and (4).

Note that a before-and-after analysis of the form:

$$E(y_i|P_i = 0, \text{before})$$

and

$$E(y_i|P_i = 1, \text{after})$$

does not remove the effect of underlying behavior. This case can be used as a benchmark for the later more sophisticated results.

Our estimation will therefore be done for a cross-section, time-series data. We will first check for random assignment of the program since some might argue that there are random factors making a government more proactive in obtaining a loan. Next, we will estimated the selection based on observables and non-observables. Since we will be looking at several countries in South-east Europe, we can use a country with no program in a particular year as our control group.

4 Summary Statistics

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