

## Economic structure and Greenhouse gases emission Key sectors analysis for Uruguay

Topic: Environmental IO models 5

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### Abstract

IOA extended to the environmental dimension allows full understanding of the relationship between the economy and material flows, which is essential for fully understanding environmental problems and policy design to solve them (Hoekstra, 2005). Hirschman (1958) suggested its use for the identification of key sectors in the economy, measuring the structural interdependence through the backward and forward inter-sectoral linkages proposed by Rasmussen (1956), arguing that economic development and structural change is driven through sectors with above average linkages. Thus, a relatively small number of sectors whose first impulse may produce small changes ultimately affect the economy as a whole.

Sectors with greater linkages generate greater externalities, meriting government intervention (Jones, 1976). Thus, key sectors analysis extended to the environmental dimension enables to allocate responsibility, both directly and indirectly, of the sectors in reference to resource depletion and environmental degradation. Solution to these problems must be addressed both, from a technical and economic standpoint. Key sectors analysis is useful to get deep in some of this problem, particularly which kind of policies can be carried out, which sectors will be involved, and what are their relations with other sectors (Alcantara, 2007).

This paper main objective is to identify Greenhouse Gases polluters (GHGs) key sectors of the Uruguayan economy in 2005, and decompose their linkages between direct and indirect effects. The secondary objective is to organize detailed data for four environment indicators related with productive activities and related it with National Accounts structure, approaching to a proposal of environmental accounts for Uruguay.

There had been large debate around the key sectors concept, since Rasmussen/Hirschman's traditional approach, which still evolves today. It was further elaborated by Sonis et al. (2000) based in a minimum information approach, while other advances in order to avoid multipliers biases have been done. Among them, through the elements of the dominant eigenvectors of the matrix A (Dietzenbacher, 1992), the hypothetical extraction method (Paelinck et al., 1965 and Strassert, 1968), graph theory application (Guerrero and Ordaz, 1995), the fuzzy clustering analysis (Diaz et al., 2005), or the make and use tables (Rueda-Cantuche and Amores, 2010). Alternative perspectives on economic interdependence should not be regarded as exclusive, but as complementing each other (Sonis et al., 2000). In this stage, this paper explores the traditional Rasmussen/Hirschman's approach. It is expected in a future step to develop key sector analysis through other methodologies, and comparing their results.

Key sectors analysis can be generalized to any vector of sectoral coefficients. Alcántra (2007b) applies it to identify key sectors, through forward and backward linkages, in reference to SO<sub>x</sub> emissions in Catalonia, Spain, Lenzen (2003) on energy consumption, land disturbance, water use and emissions of greenhouse gases (NO<sub>x</sub> and SO<sub>2</sub>) in Australia. Also it has been extended regarding CO<sub>2</sub> emissions and energy consumption in Spain (Alcántara, 2007a and Alcántara et al., 2010), CO<sub>2</sub> emission in Denmark (Rueda-Cantuche and Amores, 2010) and in Brazil (Imori and Guilhoto, 2010).

This paper applies IOA to study the relation of the productive structure and its link with environment in a country where agricultural food industry and services plays an important role. It is expected to precisely determine the key sectors of the Uruguayan economy in reference to GHG emissions. In this way, this project seeks to guide the mitigation policies design for the reduction in atmospheric pollutants. Further analysis of the relationship between the Uruguayan productive structure and environment will be allowed, in order to give guidelines about specific policy design and government

intervention for each problem, according to the role of each of the sectors. Sectors with different level and kind of linkages deserve different kind of policies. In this way, the present project will help to properly design policies to reduce the environmental impact and pressure of the Uruguayan economy. Different key sectors methodologies are computed for result comparing.