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Personal background

Date and place of birth: 7 july, Barcelona, Spain.
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Doctoral Thesis

Multisectorial Models Applied to the Environment: An Analysis for Catalonia

Thesis advisor: Professor Dr. Maria Llop Llop

References

Maria Llop Llop

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Degrees

- MsC in Industrial Organization by Rovira i Virgili University, Reus, 2007.
- Degree in Economics by Rovira i Virgili University, Reus, 2005.
- Degree in Business Administration by Rovira i Virgili University, Reus 2005.

Research Interests

Multisectorial Models of General Equilibrium, Economic Impact Analysis, Economics and Environmental Accounts, Ecological Economics, Energy Economics, Multilevel Model, Technological progress.

Professional Experience

2010-2011 Part-time Teaching Fellow, Department of Applied Economics, Universitat Autònoma de Barcelona, Bellaterra, (Spain)

2009-2010 Part-time Teaching Fellow, Department of Applied Economics, Universitat Autònoma de Barcelona, Bellaterra, (Spain).

2009-2010 Part-time Teaching Fellow, Department of Economics, Rovira i Virgily University, Reus (Spain)

2007-2009 Pre-doctoral Research Felow, Rovira i Virgili University.

2005-2007 Teaching Felow, Rovira i Virgili University

Publications

International Journals:

"Input-output analysis of alternative policies implemented on the energy activities: An application for Catalonia", *Energy Policy*, 36 (5), 1642-1648, 2008 (with M. Llop).

"Relationship between technological progress, capital elasticity and emissions of industrial pollutants for the production sectors in Catalonia", *Energy Policy*, 37, 214-218, 2009 (with M. Saez).

"Decomposition of emission multipliers in a NAMEA: The case of Catalonia", *Journal of Industrial Ecology*, forthcoming (with M. Llop, URV), 2009.

Book Chapters:

"Modelling a reduction in greenhouse gas emissions in the Catalan economy: The NAMEA approach", in Vasser, C. P. (editor): *The Kyoto protocol: Economic assessments, implementation mechanisms and policy implications*, Nova Publishers, 2009 (with M. Llop, URV).

Research Papers

- "Exogenous Income Determination in a SAM Model: The Catalan Economy towards the "20-20-20 European Directive"", (with M. Llop, URV), 2011.
- Multisectorial effects of environmental policies: Price and quantity approaches for Catalonia", (with M. Llop, URV), 2011.
- "Desigualdades ambientales y salud en Cataluña" (with M. Saez, UdG), 2011.
- "Homogeneization in a Leontief (o Leontief-Sraffa)" (amb X.L. Quinoá), 2011.
- "Topologías en espacios de matrices y Sistemas Leontief y Leontief-Sraffa" (amb X.L. Quinoá), 2011.

Teaching Experience

2010-2011 Introduction to economics and ecological economics, Lecturer, Universitat Autònoma de Barcelona, (undergraduate).

2010-2011 Political Economy, Lecturer, Universitat Autònoma de Barcelona, (undergraduate).

2009-2010 Economic Policy, Lecturer, Universitat Autònoma de Barcelona, (undergraduate).

2009-2010 Political Economy, Lecturer, Universitat Autònoma de Barcelona, (undergraduate).

2009-2010 Introductory stadistic, Teaching Assistant, Rovira i Virgili University, (undergraduate).

2009-2010 Econometrics I, Teaching Assistant, Rovira i Virgili University, (undergraduate).

2009-2010 Stadistics II, Lecturer, Rovira i Virgili University, (undergraduate).

2009-2010 Estadística i tècniques d'anàlisis de l'activitat turística, Teaching Assistant, Rovira i Virgili University, (undergraduate).

2008-2009 Economics and new tecnologies, Lecturer (with M. Ferrer), Rovira i Virgili University, (undergraduate).

2007-2008 Economics of the turism, Teaching Assistant, Rovira i Virgili University, (undergraduate).

2006-2007 Economics and new tecnologies, Lecturer (with J. Gutierrez), Rovira i Virgili University, (undergraduate).

2005-2006 Macroeconomics I, Teaching Assistant, Rovira i Virgili University (undergraduate).

2005-2006 Economics, Teaching Assistant, Rovira i Virgili University, (undergraduate).

Participations in Research Projects

Public Projects:

- "Turismo, medioambiente y política". Spanish Ministry of Science and Innovation ECO2010-18158, 2010-2013.

- "Quantitative, urban and regional economics", Catalan Government (SGR2009-322), 2009-2013.
- "Mercado laboral, vivienda e inmigración: un análisis empírico para el mercado español", Spanish Ministry of Science and Education (SEJ2007-66318), 2007-2010.

Other Projects:

- "Impacto económico de las centrales nucleares de Vandellòs II, Ascó I y Ascó II, ANAV (Asociación Nuclear Ascó y Vandellós), 2009-2010.
- "Estudio Tarifario", Remolcadores de Barcelona S.A. and Sociedad Anónima de Remolcadores, 2007.

Conference

Conference Presentations:

2010 Llop, M. and Pié, L.: "Modelling a reduction of greenhouse gases emissions in the Catalan economy: the NAMEA approach, International conference on economic modeling (ecomod 2010), Istanbul.

2010 Llop, M. and Pié, L.: "Exogenous income determination in a SAM model: the Catalan economy towards the "20-20-20 European directive", International conference on economic modeling (ecomod 2010), Istanbul.

2009 Llop, M. and Pié, L.: "Analysis of accounting multipliers in a NAMEA: An application to the case of Catalonia", III Jornadas Españolas de Análisis Input-output, Albacete (Spain).

2007 Llop, M. and Pié, L.: "Economic impact of alternative policy measures implemented on the energy activities of the Catalan production system: an input-output analysis", II Jornadas Españolas de Análisis Input-output, Zaragoza (Spain).

2007 Llop, M. and Pié, L.: "Economic impact of alternative policy measures implemented on the energy activities of the Catalan production system: an input-output analysis", EcoMod Conference on Energy and Environmental Modeling, Moscow (Russian Federation).

Assistence to workshop:

2008 Workshop in "Expert Workshop on Consumption and Climate Change", Regional Activity Centre for Cleaner Production, Barcelona (Spain).

2005 Workshop on "Firm Demography and Industrial Location", Rovira i Virgily University, Reus (Spain).

Assistence to other conferences:

2010   Congress in "2a conferencia internacional de viticultura ecologica, sostenible i canvi climatic "ecososteniblewine"", Vilafranca del penedés (Spain).

2008   Congress in "First Mediterranean Roundtable on Sustainable Consumption and Production", Regional Activity Centre for Cleaner Production, Barcelona (Spain).

2008   Conference in "International Input-Output Meeting on Managing Environment", Pablo Olavide University, Sevilla (Spain).

Fellowships

- Research prize, issued by *"Mútua Catalana Private Foundation",* on account of a research project titled "Analysis of linear multipliers in a NAMEA: An application to the case of Catalonia" (2009).
- Research Scholarship, issued by the Department of Economics, Rovira i Virgili University (2005-2009).
- Research prize, issued by *"Ignasi Vilallonga Foundation"*, on account of a research project titled "Implicacions econòmiques de les diferents mesures implementades sobre el sector de l'energia en el sistema productiu català" (2004).

Academic Research Stays

Research visit at the Groningen Input-Output Research Group in the Research School of the Faculty of Economics and Business, University of Groningen, 2009.

Research visit at the department of Quantitative Economics of the Faculty of Economics and Business, University of Santiago de Compostela, 2011.

Research visit at the Scholar at Rutgers, The State University of New Jersey, 2011.

Professional Memberships

Since 2007   Research member, Quantitive Urban and regional Economics (QURE) research group, Rovira i Virgili University, Reus, Spain.

Since 2005   Member of Sociedad Hispano Americana de Análisis Input-Output (SHAIO)

Skills

Languages: Catalan (native), Spanish (native), English (good), French (basic)

Computer Skills: Matlab, Gauss, Stata, R, Eviews2005, SPSS

Thesis synopsis

The objective of my doctoral thesis is to apply different multisectorial models available to analyse the impact that would had on the Catalan economy as a result of the introduction of policies designed to reduce emissions of greenhouse effect gases and save energy, and also at the same time to improve the environmental competitiveness of both individual companies and the economy as a whole. For the purposes of this thesis I have analysed the six greenhouse gases that are regulated by the Kyoto Protocol: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulphur hexafluoride (SF_6), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs). The range of exercises that I put into practice in this thesis enables us to examine the usefulness of the models applied, and allow to analyse questions that are of great importance for the future environmental and economic conditions of Catalan society.

The chapter one contains a brief introduction to computable general equilibrium models, describing the different phases that make up the construction of any applied general equilibrium model, and the advantages and limitations of this type of models. I also give an introduction to the subject of computable general equilibrium models applied to the environment. In the chapter two I construct a social and environmental accounting matrix for Catalonia in the year 2001 (referred to below as NAMEACAT01), which will be used as the numerical basis for all subsequent analyses. A NAMEA (National Accounting Matrix using Environmental Accounts) is simply a double-entry table in which the rows contain the origins of the economic resources and the columns show the uses that economic agents give to the resources concerned.

In the next chapter, I define a linear model of emission multipliers using the NAMEA for the Catalan economy. Like income multipliers, emission multipliers can be divided into own effects, open effects and circular effects. This decomposition shows the various channels of income generation and how they affect regional greenhouse pollution.

The chapter four I analyse the economic impact of alternative policies implemented on the energy activities of the Catalan production system. Specifically, I analyse the effects of a tax on intermediate energy uses, a reduction in intermediate energy demand, and a tax on intermediate uses combined with a reduction in intermediate energy demand. The methodology involves two versions of the input-output price model: a competitive price formulation and a mark-up price formulation.

In chapter five, I use the model proposed by Roland-Holst and Sancho (1995) to assess the economic and social impact of the implementation of different policies to reduce CO_2 emissions and improve, at the same time, the environmental competitiveness of enterprises and the private real income in Catalonia. Alternativelly, I also apply a second model, which is an extension of the exogenous determination of production in the input-output quantity model (Miller and Blair, 1985) to a SAM database. Finally, chapter six summarises the conclusions and future research of this study.

Input–output analysis of alternative policies implemented on the energy activities: An application for Catalonia

The aim of this paper is to analyze the economic impact of alternative policies implemented on the energy activities of the Catalan production system. Specifically, we analyze the effects of a tax on intermediate energy uses, a reduction in intermediate energy demand, and a tax on intermediate uses combined with a reduction in intermediate energy demand. The methodology involves two versions of the input–output price model: a competitive price formulation and a mark-up price formulation. The input–output price framework will make it possible to evaluate how the alternative measures modify production prices, consumption prices, private real income, and intermediate energy uses. The empirical application is for the Catalan economy and uses economic data for the year 2001. The combination of a tax on energy uses and an improvement in the energy efficiency of the production system is a measure that accomplishes both economic and environmental goals, since it has no effects on prices, it has a positive effect on private real income and, finally, energy consumption is considerably reduced.

Relationship between technological progress, capital elasticity and emissions of industrial pollutants for the production sectors in Catalonia

As is known, the Kyoto protocol proposes to reinforce national policies for emission reduction and, furthermore, to cooperate with other contracting parties. In this context, it would be necessary to assess these emissions, both in general and specifically, by pollutants and/or among productive sectors. The objective of this paper is precisely to estimate the polluting emissions of industrial origin in Catalonia in the year 2001, in a multivariate context that explicitly allows a distinction to be made between the polluter and/or the productive sector causing this emission.

Six pollutants are considered, four directly related to greenhouse effect. A multi-level model, with two levels, pollutants and productive sectors, was specified. Both technological progress and elasticity of capital were introduced as random effects. Hence, it has been permitted that these coefficients vary according to one or the other level. The most important finding in this paper is that elasticity of capital has been estimated as very non-elastic, with a range that varies between 0.162 (the paper industry) and 0.556 (commerce). In fact, and generally speaking, greater the capital in the sector, lower the elasticity of capital estimated.

Decomposition of emission multipliers in a NAMEA: The case of Catalonia

This study defines a linear model of emission multipliers through the use of a National Accounting Matrix including Environmental Accounts (NAMEA) for the Catalan economy that integrates the regional economic information with the greenhouse emissions. As in the model of income multipliers, the emission multipliers can be divided into own effects, open effects and circular effects. This decomposition shows the different channels of income generation and its effects on regional greenhouse pollution. The results reveal significant differences between the three gases analysed and they also show important asymmetries at a sectorial level.

Exogenous income determination in a SAM model: The Catalan economy towards the "20-20-20 European Directive"

At the end of 2008, the European Union (EU) signed the "20-20-20 European Directive", which is a climate change agreement that pledges to reduce the Union's greenhouse gas emissions by 20% before 2020. Additionally, this agreement also stipulates that 20% of the energy used in Europe has to come from renewable sources, and that energy efficiency has to be improved by 20%. The objective of this paper is to quantify the economic impact of an adaptation of the Catalan emissions to the European regulation through the use of a multisectorial model based on a social accounting matrix (SAM) database. Specifically, we extend the exogenous determination of input-output production to a SAM framework to show the reduction in the level of endogenous income of the model needed to reduce emissions by 20%. With this analysis we quantify the degree of adjustments in the economic agents if the emissions levels are reduced to the level established by the EU policy. Our results suggest that the reduction in the income of those more polluting agents, would succeed in reducing total CO_2 equivalent emissions. This would enable us to comply with the agreement signed by the European Union. However, despite these positive effects to the atmosphere, the economic impacts would be very distorting and very asymmetric individually on the different agents involved.

Homogenization in a Leontief (or Leontief - Sraffa) type System

With a Leontief´s (or Leontief - Sraffa) type system given, it is proven that it can be turned into another *structurally equivalent one* that we will call *homogenized system* in which the technological matrix A as well as Leontief's inverse have the mathematical relevant properties related to the maximum eigenvalue $\bar{a}$ of A. Matrix $I - (1+\Pi)A$, $\quad 0 \leq \Pi < \dfrac{1}{\bar{a}} - 1$ have columns dominant diagonal.

It is necessary condition for a homogenized system that the relative prices in the sense Sraffa remain invariant when modifying the kind of benefit, that the direct labour coefficients are equal. In like manner for this type of systems, the ratio between the sum of the goods that compose the surplus and the sum of the goods used as production means, fits with the maximum rate of benefit $\widetilde{\Pi} = \dfrac{1}{\overline{a}} - 1$, is what Sraffa called "*pattern reason*" (global) in his Pattern System.