SUPPLY AND USE TABLES WITH HYBRID UNITS TO ASSESS ENERGY ENVIRONMENTAL IMPACTS

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(1) Overview

The technique of input-output analysis, introduced by Wassily Leontief, gained widespread application for quantifying the interactions among complex economic systems activities and their productive response to exogenous changes. Among the vast number of extensions generated by this practice, tools for the analysis of the interactions between economy, ecology and energy deserve special attention. The present work will focus on a combination of some of these extensions, namely the application of supply and use tables framework (EUROPEAN COMISSION, 2008) and the measurement of economic flows with both physical and monetary values, through the so-called hybrid units.

(2) Methods

Merging national energy balances with national supply and use tables is a technique under development which utilizes hybrid units to analyze the interaction of energy, ecology and economics (MILLER, R.E.; BLAIR, P.D, 2009, chapters 9 and 10; HANNON, B ., 2010). A first application of this methodology was presented at the 20th International Input-Output Conference, Bratislava, Slovakia, 25- 29 June 2012. (PAIXÃO, P. 2012). In the occasion, the approach was centered on the changes of fuels consumption mix with the patterns of economic development growth. The intention now is to see how those different patterns of growth imply in CO2 equivalent emissions, thus contributing to the analysis of economic growth impacts on the environment in association with alternative energy consumption patterns.

(3) Results

Examples of application will be developed for the Brazilian economy of 2008, adding to the exercise initiated in 2012 mentioned above. Figure 1 exemplifies the sort of results then obtained, showing the impact in the fuel mix consumption accruing from the same monetary amount of final demand for goods and services impact, corresponding to 0,1% of the Brazilian GDP of 2008, when alternatively applied to the sectors indicated in the table headings. Extensions of this sort of tabulation will now be obtained, showing the CO2 equivalent emissions for different hypotheses of both economic growth structure and fuels consumption mix.

	Agriculture	Metallurgy	Other industry	Pirivate services	Transp
Oil and Gas	144	196	134	36	630
Other primary	16	82	26	5	65
Biomass and hydropower	67	297	111	25	157
Oil products	117	132	79	29	648
Biomass products, coke and gas	10	223	34	7	147
Utilities Electricity	32	113	43	15	11
Distributed electricity and other fuels	69	106	116	15	45
Agriculture	2.803	22	57	33	21
Other mining	23	184	39	3	8
Cement	5	4	22	2	6
Metallurgy	42	3.156	359	24	63
Other chemical	660	302	386	91	251
Food and beverages	273	20	37	75	23
Textiles	11	7	17	15	18
Paper and pulp	13	19	44	13	11
Other industry	53	125	2.891	114	221
Pirivate services	371	552	666	3.092	670
Public services	0	0	0	0	0
Transports	127	216	153	80	2.827
Primary fuels (1000toe)	**227**	**574**	**271**	**66**	**852**
Secondary fuels (1000toe)	**227**	**574**	**271**	**66**	**852**
Rest of the economy (MMR$)	**4.381**	**4.608**	**4.671**	**3.541**	**4.120**

Fig. 1: Impact of the addition of 0,1% of GDP in the final demand of some sectors, Brazil 2008

(4) Conclusions

The methodology helps in assessing the feasibility of achieving the same economic growth rate targets by means of alternative fuel mixes associated with alternative structures of growth, quantifying the different environmental impacts corresponding to each of them, as far as CO2 equivalent emissions are involved.

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