University of Rome Tor Vergata

School of Economics

Master of Science in European Economy and Business Law

Final Dissertation in

Environmental Economics

"Using the SAM to study the impact of Bioenergy oriented projects in Italy: What if Universities adopt wood-waste cogeneration plants"

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EXECUTIVE SUMMARY

For the last 50 years policy makers have been challenged with new questions related to the issues of climate change, natural resource depletion, population growth and environmental degradation. In response to these challenges the European Union (EU) has taken a pro-active role in areas related to greenhouse gases (GHG) emissions reductions, renewable energy useage and the greening of its agricultural policy by issuing in 2012, a policy strategy paper (European Commission, 2012b, p.3). The paper was released by the European Commission (EC) and introduces the concept of the bioeconomy as a sustainable model of growth to reconcile the goals of continued wealth generation and employment with bio-based sustainable resource usage. Nevertheless the topic is relatively new and the definition of bioconomy provided by the EC, which is a of an economy that "encompasses the production of renewable biological resources and the conversion of these resources and waste streams into value added products, such as food, feed, bio-based products and bioenergy" (European Commission, 2012B, p.3), is not universly shared.

Italy, as a Member State of the European Union, has to comply with the communitary goals expressed in the Horizon 2020 programme and respect the commitment made at international level on environmental and energy subjects.

Given the blurred boundaries of bioeconomic sectors and the relatively poor data availability for disaggregated bio-based activities, there are not many economy-wide quantitative assessments covering the full diversity of this sector.

This work tries to address the abovementioned problem by constructing a social accounting matrix (SAM) for Italy encompassing a highly disaggregated treatment of traditional and non-traditional bio-based sectors. The disaggregation of commodities/activities account follows the EXIOBASE 2 database, a global, detailed Multi-regional Environmentally Extended Supply and Use / Input Output (MR EE SUT/IOT) database released in 2014 and basedyear at 2007. The resulting SAM gives a complete snapshot of the national economy and, thanks to the high level of sector decomposition; it is possible to use it as a basis to perform simulations in order to evaluate the impact of bioeconomic policies and projects. From the analysis of the multipliers it results that bioeconomic sectors have high Backward Linkages and low Forward linages. High BL imply that the corresponding sectors have an important role in the activation of

the economy while low FL imply a scarce participation in the economy meaning a low dependence from the internal demand. This is an interesting property when it comes to productive sectors since it denote a preminent role of external demand. Consequentially it is possible to say that in Italy biosectors would not be vulnerable to national economic fluctuation or to European asymmetric shocks that could negatively affect the national economy.

Additionally this work offers a simulation study on the implication of an investment in bioenergy, hypthized thorugh an extension of the project elaborated by the University of Rome Tor Vergata in 2007, for the construction of a co-generation plant (5MWe and 7MWe) that uses as burning input the residual of tree pruning of all the gardens and boulevards of the city and province of Rome supplying the amount of electricity necessary to the University to be independent. Since the small entity of the described project, it has been decided to extend it to other nine universities in Italy, appropriately chosen according to the number of students enrolled in 2007. The total investment passes thus from 15 million euros to almost 125 million. To evaluate the implication of such project on the national economy it is necessary to distinguish two phases.

- The first one is the so-called *construction period,* during which the plants are put in place. The costs of the plants are distributed in several sectors that correspond to those activated in the SAM. The alternative scenario, when the project is not enabled, is depicted according to the national capital formation path that is detectable from the SAM.
- The second one is the *period of full operation,* which allows the analysis of the long-term impact. In this work the assumption of a structural change in the source of electricity production in the country is made. The change implies a doubling in electricity by biomass and waste and an equivalent decrease in electricity by petroleum and other oild derivatives. Also the composition of the input vector of electrivity by biomass and waste is modified to be more dependent on wood waste, less dependent on forestry and to eliminate the import from the RoW.

Overall results in the construction period are very positive both at institutional and production level, with a small but yet positive increase of the GDP. In the period of full

operation there is positive annual income effect, measured by the value added, generated by the doubling in biomass electricity consumption.

The dissertation is organized as follow: in the first chapter the SAM framework, content and structure are analysed, in the second chapter the state of Bioeconomy in Europe and Italy is described, with relative references to the legal framework; finally in the third chapter the methodology for the construction of the disaggregated SAM is explained, the backward and forward linkages analysis is performed, and the results relative to the two simulation impact are described.