Brazilian Journal of Political Economy, vol. 43, nº 2, pp. 380-397, April-June/2023

Green economy and green jobs*:* a multisectoral analysis by means of Spain's social accounting matrix

Economia verde e empregos verdes: uma análise multissetorial por meio da matriz de contabilidade social da Espanha

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RESUMO: Durante as últimas décadas a economia verde tem sido proposta por diversos organismos internacionais como um modelo econômico para o século XXI que gravita em torno do respeito ao meio ambiente. Este artigo tenta identificar, com critérios de eficiência econômica (alto impacto econômico) e eficiência social (alto impacto na geração de empregos, empregos verdes), os "setores potencialmente verdes" que podem ser estimulados por uma estratégia nacional para desenvolver uma economia verde na Espanha. Para isso, utilizaremos a Matriz de Contabilidade Social da Espanha 2010, identificando, por meio dos coeficientes de absorção e difusão normalizados e por meio de multiplicadores de emprego, os setores-chave, impulsionadores e com maior capacidade de criação de emprego de um grupo de dez setores que identificamos como "setores potencialmente verdes".
PALAVRAS-CHAVE: Economia verde; empregos verdes; modelo SAM; economia espanhola; política econômica.

ABSTRACT: During the last decades the green economy has been proposed from different international organizations as an economic model for the 21st century that gravitates around respecting the environment. This paper tries to identify, with criteria of economic efficiency (high economic impact) and social efficiency (high impact on job creation, *green jobs*), the "potentially green sectors" that can be stimulated by a national strategy to develop a green economy in Spain. For this, we will use the Social Accounting Matrix of Spain 2010, identifying, by means of the normalized absorption and diffusion coefficients and by means of employment multipliers, the key, drivers and with greater capacity for job creation sectors from a group of ten sectors that we have identified as "potentially green sectors".
KEYWORDS: Green economy; green jobs; SAM model; Spanish economy; economic policy.
JEL Classification: B41; C67; J08; Q57.

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1. INTRODUCTION

The links between economy and nature were never a main concern to the economists, except in the early stages of Economy as a science, with the works of the French physiocrats such as *Tableau Économique* (Quesnay, 1758), and with the work *An Essay on the Principle of Population* (Malthus, 1798). It wasn't until the 1970s that the relationship gained prominence once again in this field, with The *Limits to Growth* (Meadows et al., 1972). This document started what we could call the "pessimistic" trend of the relationships between economy and nature, founded under the principle that there are biophysical limits to growth. Opposing this relationship, soon would their antithesis arise, the "optimistic" trend of the relationships between economy and nature. Its first main exponents were the compilation of essays from *The Resourceful Earth* (Simon and Kahn, 1984), under the idea that both the market and technology would allow to easily solve the conflicts among economy and nature. Furthermore, as a synthesis of both currents, the "possibilist" trend would also arise. It is based on the idea that it is possible to implement an economic model which will make the economic growth compatible with the sufficient preservation of nature, in order to allow proper living standards in the future. The document referring to this "possibility" trend was *Our Common Future* (World Commission on Environment and Development, 1987), from which the expression sustainable development became popular. It is within this framework of "possibilist" trend, based on the idea of a sustainable development that we must subscribe to the proposal of a green economy. Matches with UNEP (2011) that defines green economy as enhancing natural capital – that is, stocks of and flows from crops, fisheries, water bodies and forests – and energy and resource efficiency -that is, enabling environmental technology in renewable energy, manufacturing, waste management, buildings, transport, tourism, and cities.

The concept of green economy, coined by Pearce et al. (1989), became popular upon the proposal of the General Assembly of the United Nations to organize a Conference on Sustainable Development in 2012, in Rio de Janeiro (Brazil). Green economy is an economic model which focuses on improving the welfare of human beings and social equality, reducing carbon emissions, increasing earnings, creating jobs, promoting energy efficiency, and using resources and halting the loss of biodiversity and ecosystem services (Herrán, 2012: 2). In this sense, the green economy would be an umbrella concept that would include both the bioeconomy and the circular economy (D'Amato et al., 2017: 726; Pearce and Turner, 1990). This understanding allows the inclusion of green economy within the scope of sustainable development and the eradication of poverty, highlighting its economic, social, and environmental dimensions (Mahnkopf, 2014: 34-35). Therefore, it could be considered as a proposal for sustainable development in the form of weak sustainability, specific to environmental economy. Moreover, as far as the European Union is concerned, green economy is part of the strategy *Europe 2020* (European Commission, 2010), and its reaffirmation into *A Roadmap for Moving to a Competitive Low Carbon Economy in 2050* (European Commission, 2011) and *The European Green*

Deal (European Commission, 2019), where the aim is to achieve a low-carbon economy. As noted by the European Union, the concept of green economy could be understood as a response to the various financial, environmental, climate and social crises that have occurred worldwide leading to question the strength of the traditional economic growth models and the role they play in the development or worsening of such crises, emphasizing that technological advances are the key for a sustainable economic growth (European Network for Rural Development, 2017: 5).

Related to the green economy concept we came across the concept of green jobs. This concept is defined as the work activity that helps to protect the environment and fights against climate change, by saving energy and *commodities*, promoting renewable energy, reducing waste and contamination, and protecting biodiversity and ecosystems. In addition, it involves adequate earnings, acceptable working conditions, appropriate social protection, respecting the rights of workers and their involvement in decisions that will ultimately affect their lives (Jiménez Herrero and Leiva, 2010: 6).

During the last decade, research studies on the green economy labor market have multiplied and yielded mixed results. Some studies consider that environmental regulation hampers competitiveness because it offers low profitability and is detrimental to job creation. For example, in the case of the United Kingdom, in order to reduce greenhouse gas (GHG) emissions by 34% they must sacrifice at least 5% of their GDP, consequently impacting employment because of the elimination of jobs in the affected sectors would not be compensated with the creation of jobs in the sectors benefited from the environmental regulation (Hughes, 2011: 36-37). In the same vein, other authors (Dechezleprêtre and Sato, 2014: 18-19) claim that although the change towards a more sustainable economy generates new jobs, these jobs are fewer than the jobs that have been eliminated. There are also studies claiming that a higher environmental regulation shall lead to companies' off-shoring production to territories with looser environmental legislations, thereby eliminating employment in those countries with higher regulations (Mulatu and Wossink, 2014: 527; Kahn and Mansur, 2013: 111-112). There is no lack of studies claiming the existence of myths related to green jobs, given the fact that most of the employment resulting from the environmental regulation activities will be non-productive bureaucratic jobs (Morris et al., 2009: 95-97).

However, other groups defend the positive effects of the environmental regulation policies on employment. Thus, some studies argue that investing in renewable energies creates more jobs per units of energy produced than investing in energies originating from fossil fuels (Wei et al., 2010: 928-930). Other studies based on the circular economy theory have reached similar conclusions (Loiseau et al., 2013; D'Amato et al., 2017). There are also studies by countries showing that the environmental policies driven by governments have generated positive employment effects, as it has occurred in China (Cai, 2011: 5999-6001), Brazil (Borges and Montibeler, 2014) and the United States (Yi, 2013: 651-652). In other cases, we have encountered studies on regional economies claiming that regional public policies enable the restructure of economy to improve environmental sustainability and has substantial positive outcomes in terms of job creation (Connolly et al., 2016: 358-359; Battaglia et al., 2018: 264-265; Unay-Gailharda and Bojnecb, 2019: 544-547). Other research studies include that environmental regulation must be accompanied by investment in human capital and innovation in order for the creation of green jobs to surpass the elimination of conventional jobs (Cesere and Mazzanti, 2017: 88-92; Consoli et al., 2016: 1055-1056; Chenoweth et al., 2018: 142-143), this last approach is included within the scope of green economic development, focused on promoting investment in research and human capital formation in order to develop a productive sustainable model (Hess et al., 2018: 4). Nevertheless, green economic development could be considered as a variant of sustainable development in the form of environmental economics.

Considering the information states thus far, this study seeks to identify the green economy sectors which stimulus would generate a greater economic impact and a greater social impact (capacity to create green jobs) in the case of Spain. However, considering that the sectors that arise from the International Standard Industrial Classification of All Economic Activities (ISIC) are used in the elaboration of the Social Accounting Matrix (SAM), it is not possible to determine which specific activities of a certain sector or subsector really respond to a logical green economy and which ones are not. In practice, we can only make a sectoral approach to the green economy by identifying those sectors that have "potential" to really be green economy sectors under certain conditions (improving the welfare of human beings and social equality, reducing carbon emissions, increasing earnings, creating jobs, promoting energy efficiency, and using resources and halting the loss of biodiversity and ecosystem services). These "potentially green sectors" would be those related to the bioeconomy and taken into consideration in the preparation of the bio-SAM of Spain as bio-based sector (Mainar et al., 2017a)[1]: crops[2], livestock[3], fishing[4], forestry[5], food industry[6], wood industry[7], textile industry[8], biochemical industry[9],

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[1] The available data does not allow a disaggregated classification of the bioeconomic sectors and neither of the circular economy sectors of the Spanish economy through its SAM; however, we have an approximation to the green economy in Spain thanks to the Spanish bio-SAM prepared by Mainar et al. (2017a).

[2] Cereals (paddy rice, wheat, barley, maize, other cereals); vegetables (tomatoes, potatoes, other vegetables); fruits (grapes, other fruits); oilseeds (rape, sunflower, and soya seeds); oil plants (olives, other oil plants); industrial crops (sugar beet, fiber plants, tobacco); and other crops (live plants, other crops).

[3] Extensive livestock production (live bovine, sheep, goats, horses, asses, mules…); intensive livestock production (live swine, poultry); other live animals and animal products; raw milk.

[4] Fishing.

[5] Forestry, logging, and related service activities, energy crops include.

[6] Animal feed, fodder crops, biodiesel by-product oilcake; red meat (meat of bovine, meat of sheep, goats); white meat (meat of swine, poultry); vegetable oils; dairy; rice, processed; sugar, processed; olive oil; wine; beverages and tobacco; other food products).

[7] Wood products, pellets include.

[8] Textiles, wearing apparel and leather.

[9] Biochemicals.

bioenergy industry[10]. To these sectors we add the circular economy sector par excellence: water and waste[11]. We assume in the document that "potentially green sectors" are the best possible approximation to green economy sectors.

In this regard, we pose the following questions: What are the "potentially green sectors" which stimulus would generate a greater economic impact in Spain (driving areas and key sectors)? What are the "potentially green sectors" which stimulus would generate a greater social impact ("potentially green jobs") in Spain?

Therefore, the goal of this study is to determine the "potentially green sectors" that could be considered as priority to be included by policy makers in an economic stimulus strategy based on their economic and social impact to visualize if the transition of the Spanish economy into the green economy would have a remarkable impact in economic growth and job creation. To determine the potential economic and social impact of promoting green economy we will perform a general equilibrium analysis based on the Spanish economy. We will use the Social Accounting Matrix of bioeconomy, or bio-SAM (Mainar et al., 2017a), which introduces, in detail, the general equilibrium of an economy and captures the underlying connections within production, consumption and distribution (Mei-Mei et al., 2019: 138). The Social Accounting Matrix has been widely used to study the relationships between economy and the environment to create national and regional policy recommendations (Hoekstra, 2010; Chapa and Ortega, 2017; Su and Ang, 2012; Sato, 2014; Campoy, 2017; Fuentes et al., 2017; Yingzhu et al., 2018).

2. MODEL ATTRIBUTES

The SAM model is an extension of the Input-Output table by Leontief (1936: 105-125), developed by the Cambridge Growth Project (Stone, 1962)[12]. A SAM offers in greater detail the income distribution structure, the taxation pattern and the existing transfer system in a country (Casares et al., 2017: 120). In this sense, we find interesting cross-sectional analyzes by Soza and Ramos (2005) based on economic sectors at a European level. The analysis was also done comparing Spanish regions, for example SAM from Andalusia against the SAM from Extremadura (Cardenete et al., 2000). SAM based analysis are considered to be a reliable tool

[10] Bioelectricity; biofuel 1st generation (bioethanol, biodiesel); biofuel 2nd generation (biochemical and thermal technology biofuel).

[11] Water distribution, sewerage, waste management and remediation activities.

[12] A Social Accounting Matrix (SAM) represents the functioning of the economy of a territory for a prolonged period, in which its structure remains stable, and collects the monetary flows of the circuit of transactions among the different economic accounts (García-Remigio et al., 2020). To appreciate the existence of a structural change in an economy using social accounting matrices, it is necessary to resort to the comparison among the matrices of different periods of time (usually 10 years); however, structural change is not the object of study of this research.

for decision making with regards to economic policy by policy makers and to guide the measures to promote wealth and job creation.

In our case, we will use the bio-SAM Model for Spain, 2010 (Mainar et al., 2017a) to identity the characteristics of the "potentially green sectors" and their capacity to generate indirect, direct, and total employment opportunities. The matrix used for this study is based on European research studies about the bio-SAM Model for European countries (Mainar et al., 2017b).

2.1. Sector classification from a Social Accounting Matrix

SAM's countable multipliers represent the full effect over each of their endogenous items from an additional unit impact within their set of exogenous variables. When these multipliers are applied to our research, they could be useful determining which of the so-called "potentially green sectors" is generating the biggest impact in economy and employment by the policy maker stimulus. To calculate these multipliers we must start from the following general expression (1) (Cardenete et al., 2015: 154):

$$y_n = A_n y_n + x = (I - A)\text{-}1x = Max \qquad (1)$$

where y_n is the column vector for the incomes of endogenous accounts, A_n is the matrix of the average propensity consumed by endogenous accounts. Their components (a_{ij}) represent the expenditure performed in the account i by each expenditure unit or usage unit of $_j$, in which x is the column vector accounting for all the income flow received by the endogenous accounts from the exogenous accounts. Matrix Ma is the matrix of countable multipliers, the components (ma_{ij}) represent the impact from an additional exogenous income unit on an endogenous account j, which is finally generated on the income of the endogenous account i.

The sum of the matrix column with countable multipliers (Ma) indicates the full effect from an exogenous shock received by an endogenous account for the economy as a whole. Thus, if the sum of a column from Ma had a very high value, it will indicate the account has a greater influence over the rest of the economy when receiving an exogenous shock (for example, a measure of economic policy). From Ma we can calculate the absorption and diffusion coefficients. Absorption coefficients are calculated by the sum of all the elements on each raw Ma (2):

$$M_{i.} = \sum_{j=1}^{n} m_{ij} \qquad (2)$$

This column (Mi.) indicates the accounts absorbing most of the growth produced for the economy as a whole, because its value is reflected on the income of the account i when an exogenous income unit injection takes place in the economic system. Diffusion coefficients are calculated by the sum of all the elements on each column Ma (3):

$$M_{.j} = \sum_{i=1}^{n} m_{ij} \qquad (3)$$

This raw ($M_{.j}$) indicates the accounts with the highest expansion effect on income for the economy as a whole, because its value is reflected on the income of the total endogenous account when an increase on exogenous income unit occurs in the account *j*.

From Mi. y M.j we can calculate Rasmussen's (1956) absorption and diffusion coefficients, which standardize the absorption and diffusion coefficients by linking them to global absorption and diffusion averages and providing a relative measure of the importance of such effects.

Rasmussen's absorption coefficient, or dispersion responsiveness, (Ui.) would be (4):

$$\text{FL:} \quad Ui. = \frac{\frac{1}{n}\sum_{j=1}^{n} m_{ij}}{\frac{1}{n^2}\sum_{j=1}^{n}\sum_{i=1}^{n} m_{ij}} = \frac{M_{i.}}{\frac{1}{n}\sum_{j=1}^{n}\sum_{i=1}^{n} m_{ij}} \quad (4)$$

and it would represent the absorptive capacity (dispersion responsiveness), in relative terms, from each account receiving an increased income, or their forward linkages (FL). While Rasmussen's diffusion coefficient, or power of dispersion, (U.j) would be (5):

$$\text{BL: U.j} = \frac{\frac{1}{n}\sum_{i=1}^{n} m_{ij}}{\frac{1}{n^2}\sum_{j=1}^{n}\sum_{i=1}^{n} m_{ij}} = \frac{M_{.j}}{\frac{1}{n}\sum_{j=1}^{n}\sum_{i=1}^{n} m_{ij}} \quad (5)$$

and it would represent the diffusing force (power of diffusion), in relative terms, from each account receiving an increased income, or their backward linkages (BL).

This way we can affirm that a sector presents strong forward linkages (FL), if products are obtained from their business activities that will be used in other branches during their production process (absorption or forward expansion); while a sector presents strong backward linkages (BL) if it insists on input from the rest, inducing the development of other activities (López Álvarez, 2015: 12-1). Taking into consideration the forward linkage (FL) and the backward linkage (BL) from each sector we can classify the economic sectors (Table 1).

Table 1: Economic sector classification according to their relationships with other sectors

	Sectoral BL< Average BL Ui. < 1	Sectoral BL> Average BL Ui. > 1
Sectoral FL< Average FL; U.j < 1	Independent sector	Driving sector
Sectoral FL< Average FL; U.j >1	Base sector	Key sector

Source: Prepared by the author based on López Álvarez (2015: 13).

Thus, if the diffusion effect from the sector (FL) is below the median of the diffusion effect for the economy as a whole (U.j < 1) and the absorption effect of that sector (BL) is also below the median of the absorption effect for the economy as a whole (Ui. < 1), it would be treated as an independent sector, island sector or other sector (with very few links to other national sectors). It is common for an independent sector to present substantial backward and forward linkages with the external sector. They tend to have a strong quantitative importance in enclave economies; the textile industry is a good example for those countries where maquiladoras textile enterprises prevail.

If the diffusion effect from the sector (FL) is below the median of the diffusion effect for the economy as a whole (U.j < 1) and the absorption effect of that sector (BL) is above the median of the absorption effect for the economy as a whole (Ui. > 1), it would be treated as a base sector or strategic sector (with substantial links to clients from domestic sectors). The importance of a base sector lies in its capacity to bottleneck the economy, that is, a relative shortage in production or weak growth of a base sector could end up paralyzing other sectors or curbing their expansion. A good example would be the mining industry in areas with highly developed industries dedicated to processing mineral products.

If the diffusion effect from the sector (FL) is above the median of the diffusion effect for the economy as a whole (U.j > 1) and the absorption effect of that sector (BL) is below the median of the absorption effect for the economy as a whole (Ui. < 1), it will be treated as a driving sector or motor sector (with substantial links to their supplying sectors). The importance of a driving sector lies in its capacity to spillover to the supplying sectors, that is, the expansion of a sector will consequently stimulate the production of their supplying sectors and a recession in a driving sector will anticipate a posterior recession in many other sectors. A good example is the construction sector, especially if it is primarily nourished by domestic products.

While if the diffusion effect from the sector (FL) is above the median of the diffusion effect for the economy as a whole (U.j > 1) and the absorption effect of that sector (BL) is also above the median of the absorption effect for the economy as a whole (Ui. > 1), it would be treated as a key sector (with substantial sectoral backwards linkages, domestic suppliers, and forward, with domestic clients). The importance of a key sector lies in its double role as a base sector and driving sector, that is, its simultaneous capacity to bottleneck and simultaneous capacity to spillover. A good example of a key sector is the iron and steel industry, when there is both an important domestic metallic mining sector, as well as an important domestic sector of metallurgical industry.

2.2. Employment multipliers from a Social Accounting Matrix

The employment multipliers of a SAM model provide information about the expansionary impact that final demand shocks have on domestic usage; that is, they show us each sector's responsiveness rate, in terms of employment, to the changes in the demand. This multiplier originates from Pasinetti's (1973) vertically integrated labor vectors. This calculation leads to the implicit assumption that there is a linear relationship between the employment from each sector and the value of their production. The employment multiplier for each sector (6) (Pasinetti, 1986) would be determined by:

$$E_j = \sum_{i=1}^{n} W_{n+1} m_{ij} \qquad (6)$$

mij being the element of matrix Ma obtained from SAM, and

$$W_{n+1} = \frac{Y^{e_i}}{X_i} \qquad (7)$$

where is the employment generated in sector i, and where Xi it is the total output of sector i.

Thus, having the relationship into consideration, we can determine the impact on the employment of a specific economic sector resulting from the changes in production. Therefore, the sectors with the greatest value from the employment multiplier are the ones creating more jobs from receiving an exogenous income injection. By observing the evolution of this indicator, we could verify whether or not the employment sectoral composition will follow the same behavioral dynamic when facing changes to the economic structure.

It is also worth pointing out that the employment generation in an economy resulting from exogenous shock of a specific sector, can be decomposed into a direct effect. This includes the jobs created directly in the affected sector, and into an indirect effect, including the jobs created in the sectors with linkages, especially those sectors with regional suppliers from the sector.

3. MODEL OUTCOMES

The bio-SAM Model for Spain 2010 is comprised by 61 accounts, out of those, 26 represent the branches of activity (referred to the activity in the different productive sectors) These 26 branches of activity appear on Table 2, in which the 12 sectors we considered as “potentially green sectors” have been shaded.

Applying the methodology and analysis previously described to the 61 accounts of the bio-SAM Model for Spain 2010 and considering as endogenous accounts those related to primary factors, the private sector, and branches of activity, we can obtain the countable multiplier matrix with a dimension of 58 x 58. After obtaining the matrix we can differentiate within the different blocks or sub-matrices, based on the accounts incorporated in the set of endogenous accounts, and conduct an interpretation of each of the items.

To classify the “potentially green sectors” in Spain according to their absorption and diffusion capacities and to be able to identify their capacity to generate “potentially green jobs”, we must get the standardized absorption and diffusion coefficients along with their employment multipliers (Cardenete and López, 2015: 13-14).

Table 2: Branches of activity of the bio-SAM Model for Spain, 2010

1. Crops	10. Petroleum industry	19. Electricity and gas
2. Livestock	11. Non-Bio-Chemical industry	20. Water and waste
3. Forestry	12. Bioenergy industry	21. Construction
4. Fishing	13. Biochemical industry	22. Trade, hospitality and catering business
5. Natural resources	14. Mineral products	23. Transport and Communication
6. Food industry	15. Metal products	24. Financial services and insurance
7. Textile industry	16. Transport equipment	25. Other services
8. Wood industry	17. Machinery and equipment	26. Public administration
9. Paper industry	18. Other Manufacturing	

Source: Prepared by the authors from Mainar et al. (2017b). "Potentially green sectors" are shaded.

3.1. Analysis of the "potentially *green* sectors" of the Spanish economy in terms of economic efficiency

First, we have calculated the countable multipliers of the SAM Model for Spain, 2010, in order to determine the absorption and diffusion coefficients of the sector accounts. From there we can obtain Rasmussen's standardized absorption coefficients (dispersion responsiveness) and Rasmussen's standardized diffusion coefficients (power of dispersion) to be able to classify the "potentially green sectors" based on it, as shown in Table 3.

Table 3: Analysis of the "potentially *green* sectors" in the Spanish economy

BRANCHES OF ACTIVITIES	DISPERSION RESPONSIVENESS Standardized absorption coefficients ($U_{i.}$)	POWER OF DISPERSION Standardized diffusion coefficients ($U_{i.}$)	TYPE OF PRODUCTIVE SECTOR
Crops	0.9381	0.4177	Independent
Livestock	1.2277	0.3989	Driver
Forestry	0.9226	0.2551	Independent
Fishing	1.0680	0.2080	Driver
Food industry	1.1843	1.1777	*Key*
Textile industry	1.0610	0.3081	Driver

Wood industry	1.1577	0.3032	Driver
Bioenergy industry	1.0738	0.2058	Driver
Biochemical industry	1.0500	0.2337	Driver
Water and waste	1.0420	0.3539	Driver

Source: Prepared by the authors.

From Table 3 we can deduct that nearly every "potentially green sector", besides crops and forestry, show substantial backwards linkage, and therefore, are the driving sectors of the economy. Consequently, any exogenous stimulus related to them, will have a strong impact on the aggregated internal demand of the Spanish economy. Thus, the "potentially green sectors" susceptible to stimulation by policy makers to generate a green economic development, in descending order by dispersion responsiveness, would be livestock, food industry, wood industry, bioenergy, fishing, textile industry, biochemical industry, and water and waste. Particular consideration should be given to the food industry sector, not only because its absorptive capacity (dispersion responsiveness), given it is a key sector of the Spanish economy with substantial backwards linkages (their suppliers essentially come from crops, livestock and fishing), and forward (not including family consumption and exports, this sector's client is the powerful trade, hospitality and catering business; that is, trade and tourism). In fact, the food industry is the main manufacturing industry in Spain in terms of added value.

In the cases of forestry and crops as independent sectors, a priori, they draw attention due to their low dispersion power even though they are the supplying sectors to the wood industry, first, and to the food industry, second, expecting them to be base sectors. However, the relevancy of their agricultural and forestry exports justifies their independence with respect to the other economic sectors and their dependence to the exterior sector.

3.2. Analysis of the "potentially *green* sectors" in the Spanish economy in terms of economic efficiency

Similarly, we can calculate the Spanish economy employment multipliers, showing us the expansionary impact final demand shocks have on employment; that is, the responsiveness rate to each sector's demand, in terms of employment or, in other words, the amount of jobs Spain could create for every million euros pumped into each sector (López Álvarez, 2015: 43-44). The employment multipliers from the "potentially green sectors" in Spain are shown in Table 4.

Table 4: Employment multipliers of the "potentially *green* sectors" in the Spanish economy

BRANCHES OF ACTIVITIES	DIRECT EMPLOYMENT	INDIRECT EMPLOY-MENT	TOTAL EMPLOYMENT
Crops	11,004	9,769	20,773
Livestock	10,780	16,482	27,262
Forestry	16,816	12,037	28,853
Fishing	5,105	12,776	17,881
Food industry	2,941	13,687	16,628
Textile industry	2,010	10,910	12,920
Wood industry	4,795	15,113	19,908
Bioenergy industry	0,838	13,223	14,061
Biochemical industry	1,434	11,485	12,919
Water and waste	16,612	11,761	28,373

Source: Prepared by the authors.

Taking this data into account, we could group the ten "potentially green sectors" into three groups according to their capacity for employment creation, direct, indirect, and total, when facing demand changes.

The following are the employment generating sectors above the median, out of all the sectors of the Spanish economy (6.023), as a direct consequence from an exogenous stimulus, in descending order of direct effect: forestry, water and waste, crops, and livestock. These are the four sectors with low-capital intensity and limited absorption of new technologies that could increase labor productivity. Therefore, every exogenous stimulus generating an increase in labor productivity in these sectors will result in a considerable job increase in these sectors.

Secondly, we would have the employment generating sectors above the median, out of all the sectors in the Spanish economy (11.098), as an indirect consequence from the exogenous stimulus, showing in descending order of indirect effect: livestock, wood industry, food industry, bioenergy, fishing, forestry, water and waste, and biochemistry. This group includes the "potentially green sectors", except from crops and the textile industry. Most of the employment generating indirect effect from these sectors takes place in the trade, hospitality, and catering business, in transportation and communications, as well as in other services and in public administration. This is due to the fact that the sectors must request proposals for specific services in order for their products to reach the consumers or the foreign importers in the specified conditions. As the services in question are stalled in many cases, they required a greater amount of labor for each final unit produced. Although in the case of the food industry, the importance of the indirect effect by employing crops and livestock as supplying sectors is also highlighted. While in the case of livestock, it also generates an important indirect effect by using crops to generate productive inputs for said sector, as well as a noticeable indirect effect on the food industry.

And the sectors generating a total effect above the median, out of all the sectors of the Spanish economy (17.121), in descending order of total effect are: forestry (28.852), water and waste (28.373), livestock (27.262), crops (20.773), wood industry (19.908), and fishing (17.881). This latest data shows that, for each million euros o exogenous stimulus pumped into the Spanish economy, on average, a little over 17 jobs are created. When this million euros is intended to promote forestry it generates almost 29 new jobs in the economy as a whole. While in the case of the water and waste sector, it would create a little over 28 jobs, a little over 27 in livestock, almost 21 in crops, about 20 in the wood industry, and almost 19 in fishing. If we consider the total effects on employment, on a strategy promoting green jobs priority should be given to external stimulus enforcing economic policy measurements, in descending order of total effect to forestry, water and waste, livestock, crops, wood industry and fishing.

4. CONCLUSION

Given the results from our analysis, we can confirm that the selected ten "potentially green sectors" present similarities in terms of their dispersion responsiveness and their power of dispersion. Regarding the dispersion responsiveness (standardized absorption coefficient) only two of the ten sectors show lower responsiveness to the unit, forestry, and crops. If we analyze the power of dispersion (standardized diffusion rate) we could see how eleven out of the ten selected sectors have lower rates compared to the unit, and only the food industry would be above the unit. Thus, out of the ten "potentially green sectors", only the food industry is a key sector with substantial backward and forward linkages. While the following sectors, livestock, food industry, wood industry, biochemical industry, and water and waste are the driving sectors, with forestry and crops as independent sectors.

Therefore, the "potentially green sectors", in terms of key and driving sectors which stimulus will generate greater economic impact in Spain would be the food industry (key sector), livestock, wood industry, bioenergy, fishing, textile industry, biochemical industry, and water and waste (driving sectors). This way, by meeting the economic efficiency standards, these ten sectors should be stimulated first during a strategy to promote green economy in Spain.

However, when considering social efficiency criteria, such as the capacity to create green jobs, the priority sectors of said strategy should be the ones with a greater capacity to create jobs (total superior effect to the average of all the sectors of the Spanish economy); that is forestry, water and waste, livestock, crops, wood industry, and fishing.

Hence, when the economic efficiency criteria of the stimulus is combined with its social efficiency criteria, the ten "potentially green sectors" selected should be subject to the stimulus by the policy makers during a strategy to promote green economy and green jobs in Spain. Nevertheless, this conclusion has been reached by applying qualitative technical criteria on economic and social efficiency and requires a series of important tweaks.

If the intention is to transform the Spanish productive structure with the economic stimulus policies to make it more green without having to relinquish economic growth, or job creation. The stimulus must have a qualitative nature (targeting the stimulus), and must also correspond to the environmental efficiency criteria, conditioning their reception until compliance with specific requirements.

So, in the case of crops, the stimulus must be targeted to the organic farming sub-sector, which uses less water for irrigation per hectare. In addition, it avoids using agrochemicals and excludes the transgenic varieties of vegetables. Similar criteria should be applied to the livestock stimulus, targeting it into the organic livestock farming sub-sector, which avoids livestock stabling and feeding animals processed food. Moreover, it excludes the transgenic varieties of livestock and requires consumable goods from organic farming to feed livestock. The same should apply to forestry, targeting the stimulus into the ecoforestry sub-sector, which avoids the irrigation and usage of the transgenic varieties of vegetables and exogenous to the land, and it accommodates the tree harvesting rate to the regeneration rate of deforestation. Fishing deserves specific attention because of the nature of the activity, extracting natural resources from the ocean. In this case the stimulus should be targeted into promoting organic aquaculture (following the organic livestock farming methods), instead of promoting fishing (other than in the cases of overcrowded fishing grounds).

With regards to the food industry the stimulus should be conditioned to the industry demanding products from organic farming, livestock and aquaculture and to give up the usage of transgenic products originating from livestock or plants as well as the usage of plastic containers (due to its high environmental impact). In addition, to encourage people to reuse their own containers (glass and metal preferably) by getting them back at the points of sale (in a circular economy strategy). While in the case of the textile industry only those activities using *commodities* originating from organic farming and livestock, and have a textile recycling mechanism (in a circular economy strategy) to turn them into new items for brand new textile products (usually lower quality). Moreover, they avoid using *commodities* originating from oil, hunting or non-organic crops and livestock.

In the case of the wood industry, the stimulus should be conditioned to the use of wood originating from ecoforestry and guarantees its environmental waste is reutilized as items for the bioenergy industry (biomass) (in a circular economy strategy). And in the case of the biochemical industry the stimulus should be targeted into promoting the production of biodegradable containers and packaging (alternating plastic) (also in a circular economy strategy).

With regards to the bioenergy sector, only should be stimulated those activities producing biomass, biodiesel, and bioethanol which supplies originate from waste (tree harvesting or wood industry), also in a circular economy strategy, or from low-utility products for human consumption originating from sustainable resource extraction (such as seaweed), avoiding competition against crops for ground level power supply when generating the supplies for its production. For the water and waste sector (water supply and sanitation), it would be advisable to promote using waste from sewage treatment plants to produce compost and fertilizer (in a circular economy strategy) and to encourage the creation of green domestic and community filters, conditioning the stimulus to these efforts.

Nevertheless, a strategy to promote green economy and green jobs should not only be limited to the "potentially green sectors" identified and studied in this paper but should also go beyond promoting the production of energy originating from renewable sources. The production of electric and solar vehicles, bioconstruction, sustainable tourism, alternative long-haul traffic other than airplanes and ships (for example, the electric railway does not use oil-based fuels), recycling glass and metal, repairing and renting equipment and properties, as well as civil service activities such as environmental administration, environmental education, or preventive health.

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