Energy transition: between economic opportunity and the need for financing?

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Abstract: The energy transition has become the subject of special attention and debate, and its implementation is now a major social issue on an international scale. This paper examines the macroeconomic impacts of the energy transition by analysing its effects on economic growth, public spending and the balance of the trade balance. In addition, the need for cost-benefit arbitrage and various financing vehicles are studied and placed in perspective. Finally, the article concludes with the need to organise and structure the financing circuit of the energy transition.

Keywords: energy transition; financing; renewable energies; climate change; green bonds; crowdfunding; Paris agreements; COP 21; energy mix; fossil fuels; nuclear.


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1 Introduction

Energy played a key role in the industrial revolution and was at the heart of the transformations of the 18th century. Changes in the past two decades have led to fundamental breakthroughs in the way the world economy operates. ‘Clusters of innovation’ exhibit significant intensity, and territories with the strongest resistance are those that develop integrated issues. Energy continues to be at the heart of these evolutions. Indeed, the energy sector seems to be engaged in a transition based on two pillars (Maresca and Dujin, 2014). The first encourages energy sobriety and leverages effects on the way of life to generate energy savings. The second pillar consists of actions whose purpose is to produce alternative energies based on renewable resources.

2 The energy transition: a conceptual work

Deshaies (2014) defines the energy transition as ‘an expression of a policy designed to reduce consumption by improving energy efficiency and substituting renewable energies for fossil fuels’. Deshaies also reports that Krausse et al. (1980) were the first to evoke the concept of energy transition. Smil (2010) and Rifkin (2011) consider that any energy system is based on a triptych. A certain mix of energies ensures production in a given market, and this production is transformed by ‘driving forces’ for final use in a mode of consumption that is invariable in the very short term. The total energy is carried by different but complementary infrastructures, namely the transmission networks for the distribution of electricity as well as all systems of management of energy logistics. Smil (2010) and Rifkin (2011) thus consider that the energy transition occurs when such a complex system evolves over time. This relatively simple definition gives rise to interpretations with ‘variable geometry’ (De Perthuis, 2013). Indeed, in the USA, the energy transition aims above all to reduce dependence on hydrocarbon imports and conventional products via increasingly sophisticated drilling technologies, notably the horizontal drilling of shale gas. In Europe, the options are much more proactive, focusing on reducing greenhouse gas emissions, promoting renewable energies and encouraging energy efficiency. These national strategies remain completely contradictory as ‘in the name of the energy transition, Germany leaves nuclear, the UK seeks to return, Poland to enter it and France organises a great citizen debate’. Although the evolution of the conceptual framework is still valid, research is unanimous on the importance of innovation in this sector. Indeed, this consensus permits action both on devices that encourage energy sobriety and on those that encourage the development of renewable energies. Nevertheless, the technological intensity of the two levers is very different. The perimeter of the former is restricted. Only the construction sector is concerned with innovations whose purpose is to reduce energy consumption through materials that optimise thermal insulation but are also less energy-intensive (OECD Report 2016). By contrast, innovations within the framework of renewable energies are much more massive and intense in innovation. This is largely reflected in the ‘number of patents filed’ indicator. The number of patents filed by building and civil engineering companies related to products and materials that encourage energy sobriety is far below the number of patents filed by companies operating in the renewable energy sector. This quantitative
indicator can be supplemented by a qualitative distinction in the nature of the innovations that have emerged in these two branches. Research and development is of a fundamental nature in the renewable energy industry but is purely applicable in the field of energy sobriety, especially in the building and transport sector.

3 Energy: macroeconomic impacts

3.1 Energy transition: investment versus employment effects

This distinction between fundamental and applied research is not only semantic but also concerns impacts insofar as innovation and technological intensity refer to an investment dimension. Energy is now subject to two contradictory effects: the positive effect of job creation in the renewable energy sector and the destruction of jobs in the coal and nuclear sectors in Germany and France (e.g., the debate on the closure of the nuclear plant in Fessenheim). The two drivers of investment and consumption have a net effect that is difficult to measure and conceptualise. The innovation effect (Uzunidis, 2015) to which we referred earlier is clearly an investment effect. It should be emphasised that the investment effect is much clearer in the case of renewable energies than in the case of investments in energy sobriety. In the former, the creation of new sectors that are fully integrated with public-private financing and encouraged by very large tax incentives is now structuring investment clusters. The impact on GDP growth is often in contradiction to the impact on employment. Several studies have attempted to demonstrate the impact of energy transition on employment.

There is, however, an impact that creates controversy. In fact, PricewaterhouseCoopers (PWC) conducted a study in 2010 for Areva, a major player in the global nuclear industry. This study examined the impact of the energy transition on industrial employment, particularly in the nuclear sector. The study estimates that 240,000 direct and indirect jobs are generated in the nuclear sector. The latter includes more than 170,000 additional jobs considered by the survey as jobs induced by the wages of the direct and indirect employees of the sector. The underlying aim of this study is to demonstrate that the sector plays an important role in the French economy, particularly in terms of jobs. Increasing the threshold for renewable energies would result in a net negative impact on employment in the nuclear sector. This study ignores the creation of jobs generated by the renewable energy sector. Instead of studying the net balance, it prefers to focus on the passive energy transition. The Agency for the Environment and Energy Management (ADEME) conducted a study in two phases. The first phase covered the period 2006–2010, and the second phase encompassed the period 2011–2013. More than 300,000 full-time equivalent jobs were created in 2010 in both renewable energies and energy efficiency, particularly in construction and transport.

ADEME conducted a prospective study for 2050 by comparing two scenarios: a median scenario of setting up an energy transition process and a reference scenario with no major ambitions in terms of energy transition. ADEM concludes that France’s GDP would be 3% higher in the first case, with additional job creation of approximately 800,000. ADEM explains this figure by the fact that the energy transition pathways are labour-intensive but also much less conducive to import competition. The two effects
must therefore be taken into account to consider the net balance, as the job creation induced by the energy transition projects will replace the layoffs caused by the closures of nuclear power stations. This scheme is known in economic theory by the model of the creation of Schumpeter’s structure (De Brant, 1964). The challenge is to gauge the extent of the recessive effects and the expansive effects of the energy transition on GDP in a global way. He draws a parallel with a world ‘degraded’ by another emerging world. The employment stock of the two energies is almost comparable. The two sectors employ nearly the same number of employees but with a production in KWh largely favourable to the conventional sector. The energy transition resulted in a significant increase in industrial employment in the year 2010. A maturity threshold has been reached with a stock employment similar to that of conventional energy. Studies are unanimous on the impact on wage costs. Indeed, the massive unemployment situation experienced by a large majority of European countries, with mobility of production factors for specific types of labour, will maintain wages in the sectors affected by the energy transition at the same level as the average of the wages of the economy. Models of general equilibrium, especially Keynesian equilibrium, speak of a general equilibrium with underemployment of work capacity. The challenge of the energy transition is to participate in a return to full employment without an increase in wages. We have highlighted the impact of energy transition on investment, particularly through intense technological innovation in the affected sectors. We also highlight the impacts on employment, including mitigated impacts, and highlight energy transition scenarios that can absorb the job destruction induced by the energy transition. These two transmutations reflect two components of aggregate demand. What about the others?

3.2 Other components of aggregate demand: public expenditure and the balance of the trade balance

The impact of energy transition on public spending is not as well studied as the impact on employment and investment. However, the energy transition per se constitutes a public policy resulting in the establishment of public financing structures based on a state contribution through an incentive tax policy, even if such a policy is a proactive budgetary policy focused on funding and contracting programs with state entities responsible for the public policy of energy transition (Callonec et al., 2013). The renewable energy component of the energy transition results in a public policy based on the purchase price. Indeed, the cost of producing renewable energy remains very high compared to other, more competitive sources of energy. The players involved in the production of renewable energy can only be profitable if the state guarantees them a purchase price capable of ensuring their profitability. Since energy is a completely homogeneous product, companies that produce renewable energy cannot implement sophisticated or niche strategies that would justify the price differential due to a discrepancy in the structure of the cost of production. Public spending thus plays the role of compensation for the competitiveness of renewable energy. The European budget massively finances projects with a positive environmental impact. This reorientation of public policies at the level of the states but also at the European level reflects a deliberate intention to act via public spending on a sector of activity that was struggling to garner financing, particularly for fundamental research and development. Private financing has
gradually taken over as innovation has moved closer to the market and assumed a much more practical nature. The importance of environmental taxation as an incentive in the energy transition must not be overlooked, including, above all, the positive counter-effects of environmental tax revenues on public budgets. The final component of aggregate demand for the energy transition footprint is the balance of the trade balance. This balance will undergo significant changes in the short, medium and long term. The renewable energy sector represents a major challenge in terms of investment and innovation. Patent filings make it possible for the first innovators to quickly control knowledge and strategic knowledge in the field. Europe is a net exporter of technology used in sectors affected by the energy transition. However, these technologies will rapidly become widespread and democratic (Vernon’s life cycle, 1966). The trade balance of the leading European technology countries, such as Germany, will feel this evolution. The iron arm of China regarding the control of the photovoltaic panel market perfectly illustrates these trends. There is, however, a structural impact on the trade balance. This impact is a long-term impact and involves a trend of decline in the import of conventional energy products. The planned disappearance of coal and oil and their derivatives, even in the long term, will upset the architecture of the trade balance of European countries. These countries will be impacted by these energy changes because they are net importers of these products.

Transition is a ‘transformation process in which one system moves from one equilibrium regime to another’. Can the transformation process to which the energy sector is subject be qualified at this stage of transition? Since the beginning of the 1970s and especially since the two oil shocks, the energy market has evolved under rather equilibrium conditions: the producers act as regulators anxious to keep prices relatively high without invoking the logic of contestable markets. It is important to note, however, that the clean energy market is not a balanced market. The quantities produced do not meet the needs. The current transition shows that developing an efficient and coherent energy policy, whatever the initial equation (resources, location, means), requires a considerable effort of anticipation and a will to print for the long term the choices that will be laid. The reflection must focus not only on innovation to improve the productivity of renewable energy but also (and especially) on the conditions for optimising energy consumption. Acting on behaviours to reduce demand must be a goal of macroeconomic analyses of the energy sector; price signals and tax incentives/disincentives are among the many macroeconomic variables and instruments of action for behaviours (Ouvrard, 2015). The evaluation body of public energy management policy has conducted several missions aimed at addressing the issue of demand and the modalities of reducing energy consumption (Tutenuit, 2012). The long-term trend in electricity demand makes it possible to consider an energy transition under calm conditions. Indeed, the growth in demand for energy on the French market has increased from 8% between 1950 and 1960 to less than 1.1% between 2001 and 2015 (Berghmas, 2017). This trend is due to the acceleration of energy efficiency gains from electricity use, which is both a change in behaviour and an unfavourable economic development.

In addition to the macroeconomic impacts of the energy transition, attention should be paid to the financial dimension of the energy transition and, more precisely, to the necessity of setting up a profit arbitrage. However, much more cutting-edge work is needed because once the cyclical trends are unstable due to the very sharp fluctuations
in the prices of conventional energy products, the ‘balanced growth path’ is broken. Strong tensions in the markets for these products, which are explained by high demand and uncertainties concerning production, have incentive and motivating effects on accelerating the transition to another model of production and consumption of energy.

4 The energy transition or the need for cost-benefit arbitration

The energy transition that we have defined as the abandonment of fossil energies in favour of renewable energies marks the will of the signatory states of agreements on climate (Paris agreement, COP 21) to promote ecological economic development. Specifically, Law No. 2015-992 of 17 August 2015 on the energy transition for specific green growth specifies the need for environmentally friendly economic development in both efficient energy and the consumption of resources and carbon, social inclusion, support for innovation potential, and a guarantee of the competitiveness of enterprises.

What funding resources can be mobilised and developed to finance the energy transition? The Stern Review on the Economics of Climate Change highlights the strong idea that inaction in terms of energy transition would be disastrous and far more costly than the action itself. In other words, the cost of action is much lower than the cost of inaction. Indeed, Nicolas Stern, the former senior vice president of the World Bank, valorises the cost of climate change and thus the cost of inaction to a regular and sustainable loss equivalent to 5 to 20% of world GDP. Conversely, the report values the cost of decarbonising economies to approximately 1% of global GDP each year. Godard (2007) explains the reasons for the estimation of the cost of inaction in the range of 5 to 20% of GDP (Stern report). Godard specifies the central elements taken into consideration in determining this range and thus details the following thresholds. The valuation of the cost of inaction at 5% of GDP takes into account only damage to production and income-generating activities such as exploitation of natural resources. The cost of inaction is valued at 10% of GDP when consequences such as loss of life and technological losses are integrated. The cost of inaction-related damage increases to 14% when more alarmist assumptions are made about climate sensitivity and the growth of imbalances. Finally, the cost of inaction reaches its peak at the 20% threshold when the consequences of climate change for the living conditions of the poorest populations of the least developed countries are considered. Regardless of ethical reasons, the need for a genuine energy transition policy at the global level results from a cost-benefit arbitrage, as highlighted by the Stern report and supported by subsequent work. A World Bank report published on 3 May 2016, and entitled ‘High and Dry: Climate Change, Water and the Economy’ highlights the major political and socio-economic risks in the event that the problems of water scarcity are not taken into consideration. The report states that regions affected by water shortages could see their GDP fall by 6% by 2050, which would exacerbate already existing inequalities. For several years, the financial sector has been interested in issues of climate deregulation and energy transition. In a report from 2015, Citi group assumes global warming of + 2.5° and estimates the losses at 44,000 billion dollars or 1.1% of world GDP. The report also highlights the relationship between the cost of action and the cost of inaction. By 2040, the cost of action is valued at $190.2 billion, whereas the cost of inaction is valued at $192 billion. In spite of the need for significant initial investments, the energy transition should generate positive returns of between 1 and 4% in 2021 and 3 and 10% by 2035.
4.1 Energy transition: promotion of financing by a favourable macro-financial context – the role of institutional investors

Among the most important capital providers are institutional investors, e.g., pension funds and insurance companies. Some of these investors may have short-term investment horizons that are a priori incompatible with the specificities of the investments required by the energy transition, the benefits of which can only be perceived over a long-term horizon. There is therefore a priori an antagonism between the so-called ‘green’ investment horizons and the short-term profitability requirements of certain institutional investors. This assertion does not include the global macroeconomic context, which is now in an unprecedented situation with historically low interest rates. Grandjean and Martini (2016) explain that, given the low yields of the investments in which institutional investors traditionally invest, that is, sovereign debt, these investors are now turning to long-term but more remunerative investments. Institutional investors manage more than $100 trillion in savings globally, and the current macroeconomic environment does not allow them to meet the returns of their investors due to limited investment opportunities and interest rates with very low yields. Grandjean and Martini (2016) highlight the fall in the remuneration of the long-term portfolios of institutional investors and the existence of a mismatch between institutional revenues and their payment obligations and the remuneration of their savers. As a result, the financial profession is calling for investment stimulus policies that would allow investors to invest in safe and remunerative asset classes. Energy transition projects fall into this category of long-term, low-risk, and remunerative investments. It would thus be possible to align the financial interests of investors with the general interest by placing the billions of dollars managed by institutional investors at the service of the energy transition. The financing of the latter seems therefore possible and available, especially since green investment would certainly meet the need for profitability but would also allow investment funds engaged in this type of responsible investment to direct their financial communication sensibly and thus capture new capital. Eco-responsible investment can be seen as a positive signal to stakeholders as it can enhance the value of committed investors (Akerlof, 1970). Moreover, Article 173 of the Energy Transition Law requires institutional investors to communicate ‘the contribution of their investments to CO2 emissions and their reduction’; ‘green’ investment is now becoming a real challenge for financial communication and company valuations. The Network of Directors for Responsible Investment (NDRI), which met in 2014 at the banking and financial conference on energy transition, highlighted the need for pension funds to take into account risks and opportunities ‘related to climate change and energy transition’. Specifically, French pension institutions could, according to the NDRI, contribute up to $300 billion to climate change and finance the energy transition by allocating 5% of their portfolio to dedicated assets.

4.2 What is the role of the state and communities in financing the energy transition?

The energy transition requires a relatively wide range of investments that can be directed towards mitigating climate change, measures to eliminate or reduce greenhouse gas emissions, or investments that minimise the negative impacts of the deregulation climate. These possible investments include investments related to the search for energy
efficiency and the rational use of resources, investments in clean energy and investments in infrastructure. The latter obviously require intervention and support from states and communities to give the necessary impetus to finance the energy transition. Of these investments in infrastructure, 80% will be made in emerging countries. Grandjean and Martini (2016), on the basis of 93 trillion dollars of investment needed to finance the energy transition (2015–2030), evaluate the state share as 80% and the share of private financing as 20%. As a result, states would have to finance 60 trillion dollars over the period 2015–2030. This need for financing of the energy transition by the states is facing strong macroeconomic constraints. Indeed, the question of reducing fiscal deficits is crucial and international. Within the European Union, the fiscal deficit in 2016 was 1.7% of GDP and reflected disparities between states. Indeed, six members states have reached or exceeded the 3% deficit threshold: Spain (4.5%), France (3.4%), Romania (3%) and the UK (3%). The other 24 comply with the Stability Pact. Outside the European Union, the debt problems of states are also very strong and can thus constitute a brake on the financing and development of the energy transition. For example, Japan is indebted for 230% of its GDP, the USA 104%, Eritrea 137%, and Gambia 108%. These levels of indebtedness are not conducive to the responsible investment required by the energy transition. In spite of these constraints, states can intervene in financing in various forms, either by financing the entire project and thus supporting the full cost of the project or by setting up public-private partnerships (PPPs). The latter allow one or more private contractors to be involved in the construction, maintenance and management of a public work intended to promote the energy transition. In particular, public-private partnerships have been set up to promote renovation of public lighting or energy renovation works for public buildings. PPPs have the advantage of either sharing the costs of the initial investment (partnership) or transferring the cost of the investment to a private operator, who can then operate the project in the form of a concession. In addition to full state financing or implementation of public-private partnerships, the state may choose to transfer the financing of the energy transition to the local level, i.e., local and regional authorities. Indeed, local authorities are increasingly being encouraged to borrow to finance the local energy transition, which is expected to reduce their operating costs over time and to generate new territorial resources. For example, French law conditions the level of financial support granted to local authorities and related to public projects in an effort to reduce greenhouse gas emissions. As noted by Grandjean and Martini (2016), the financing of the energy transition remains mainly the responsibility of the states in developing countries, whereas the effects of substitution of public financing by private financing are beginning to be observed in developed countries, where access to private capital is greater.

The states also intervene through loan programs to finance the energy renovation of residential or commercial buildings. Since 2008 in the USA, the PACE program has provided so-called loans ‘attached to the stone’, whereas the Green Deal in the UK provides so-called loans ‘attached to the meter’. The principle is simple: a loan is granted to a condominium or property to allow the implementation of energy renovation of buildings. The loan is then amortised in monthly payments collected at the time of the billing of the energy benefit (loans attached to the meter) or taken at the time of payment of property or property taxes inherent to the property (loans attached to the stone). The French state has set up several financing solutions for energy renovation, such as the granting of loans at a 0-rate or the possibility of benefiting under certain conditions from a tax credit.
4.3 Green bonds and crowdfunding

Green bonds are financial vehicles whose objective is to enable issuers (companies, organisations or states) to finance environmental projects (Knight, 2015). In this sense, they constitute a major instrument for financing the energy transition. In December 2016, Poland became the first state to issue green bonds, which totalled 750 million dollars. Following in its wake was France, which, following the Paris agreements of 2015, intends to play a major role in the development of so-called green finance, particularly by encouraging French financial institutions to participate in the development and financing of environmental projects. Accordingly, on 24 January 2017, France launched a green sovereign bond for an amount of 7 billion euros. The green bond market, although recently created, is experiencing strong growth, and in 2016 represented $170 billion (Standard and Poor’s) compared to $11 billion in 2011. This strong growth is explained by the increased sensitivity of investors to climate change and awareness of the need to adopt eco-responsible investment practices. This rapid development of green bonds was supported by the creation of the Luxembourg Green Exchange in September 2016, the first trading platform for green financial vehicles. At its opening, 114 green bonds were listed from 25 issuers, in an amount of more than 45 billion dollars. The Luxembourg Green Exchange brings together issuers devoting 100% of the funds raised to green investments, and issuers listed on this market must meet a number of criteria. Issuers must state precisely the green nature of the security issued; the funds raised on that market must be used to finance exclusively green projects; and the issuer undertakes to provide an external ‘ex ante’ analysis conducted by an independent expert and an ex post report. In addition to the green bonds market, 2016 saw the rise of green crowdfunding. Crowdfunding is a means of financing by collecting the savings of different actors to service various types of projects. The latter may take the form of grants with or without counterparties, paid or unpaid loans, or equity participation in the project. In recent years, crowdfunding platforms specialising in the energy transition such as Lendosphere, Enerfip and Lumo have appeared. In 2016, the latter experienced a significant increase. Indeed, the data from the first barometer dedicated to the crowdfunding of renewable energies, implemented by GreenUnivers and the Crowdfunding France association, show loan collections of 11.5 million euros in 2016, representing 12% of assets collected by crowdfunding platforms. The growth of these platforms combined with the enthusiasm of investors make them an essential link in the financing chain of the energy transition, and their prospects for development deserve special attention.

4.4 Yieldcos and the green climate fund

Yieldcos, literally yield companies, offer their shareholders stable and high returns and operate mainly in the sector of renewable energy production through long-term contracts with local authorities. These high-yield companies invest primarily in wind farms or solar power plants. In addition to promises of significant dividends, yieldcos can also generate attractive growth prospects for investors as long as they benefit from a ‘pre-emption right’ on the projects of the parent company to which they are attached. The effective acquisition by a yieldco thus reduces the balance sheet of the parent company, which can then reinvest in the construction of new projects. Recent years have witnessed the appearance of many yieldcos, especially in the USA and, later, Europe. However, it is
important to emphasise the limits of this model, as evident from the summer of 2015, when the stock market values of the main yieldcos fell due to fears about the durability of the model, particularly due to regulatory constraints in the USA.

The Green Climate Fund, which was launched in late 2011 and brings together 194 governments, is the financial mechanism of the United Nations Framework Convention on Climate Change. This fund, under the auspices of the African Development Bank, focuses on reducing greenhouse gas emissions but also helps exposed populations in developing countries adapt to climate change. The initial objective was to raise $100 billion by 2020 to finance projects to combat global warming. The Fund provides beneficiary countries with access to finance through national and sub-national implementing entities and intermediaries (NGOs, ministries, national development banks, etc.). Between 2011 and 2015, the African Development Bank declared that it had mobilised $12 billion in ‘climate finance’ to support projects to limit greenhouse gas emissions in Africa.

5 The challenges of financing the energy transition

The elaboration of the available financing resources for the energy transition raises the question of how best to allocate these very diverse funding resources from stakeholders with disparate characteristics. Rüdinger (2015) points out that although the sources of financing for the energy transition have been identified, there is no real strategy for financing the transition in the long term. Thus, he highlights the need for coherence between the sources of financing of the energy transition and the financing strategy of the latter in the long term. Some studies (Boissinot and Waisand, 2012) also highlight the need to avoid obscuring the strong national and international macroeconomic constraints faced by funding actors (Basel 3, Solvency 2) aimed at consolidating their own funds, which would penalise the granting of long-term loans. States are subject to constraints to limit public deficits, such as slowing down the financing of the energy transition. For example, the energy transition is characterised by the replacement of infrastructure with relatively low initial investment costs and higher operating costs as well as infrastructure with higher long-lived initial investments and functioning (Rüdinger, 2015). As a result, it is essential to mobilise capital with long maturity and low cost to ensure economic balance and project viability. The maturity of capital and the cost of capital thus become strategic elements to be taken into consideration. More broadly, Rüdinger describes the stakes of the energy transition around three axes. The first concerns the necessary mobilisation of capital upstream by intermediaries capable of promoting the flow of capital between the actors of financing and the actors of the energy transition and thus limit transaction costs. The second is concerned with the imperative of developing financing tools adapted to the needs of the actors of the energy transition. Projects related to the energy transition have different characteristics depending on whether they concern energy efficiency research and building renovations or whether they are focused on renewable energies. The third element concerns the state intervention required to inform and ensure regulatory stability to enable actors in the energy transitions to calmly consider actions to be taken in the medium and long term. Thus, while available and developing, energy transition funding resources must now be structured to increase their relevance and effectiveness.
6 Conclusion

The energy transition presents itself as a real economic opportunity whose net impact on the macroeconomic fundamentals seems virtuous. The driving effect that can be generated by a process of transformation not only of the economic model of energy production but also of its consumption conditions could be analysed as a leverage effect. The domino financing-investment-employment effect is a Keynesian effect with a measurable multiplier effect. Analysing the financing of the energy transition and drawing a parallel with the leverage effect and significant in the sense that the latter is interested in the notion of committed capital. The scale of the energy transition and the velocity of transformations in the renewable energies and energy sobriety sectors will depend on the size of funding, i.e., its magnitude, and not its nature. Public and private financing, public and private debt, venture capital and crowdfunding are all financing solutions that guarantee the intelligibility of the transition process.

References


