Mini Review
Volume 12:2, 2021

Business and Economics Journal

ISSN: 2151-6219 Open Access

A Systematic Review of Knowledge Spillovers from Renewable Energy Technologies (Rets) in Cameroon

Henri Kouam*

Department of Policy Institute, Face College Jesus Marie,Yaounde, Cameroon

Abstract

Increases in the atmospheric concentration of carbon have significant adverse environmental and socio-economic implications, more so for developing with little climate-centric infrastructure. This paper investigates the salience of renewable energy in addressing climate risks and forming the basis of an innovation-centric growth model. It analyses the prevalence of knowledge spillovers in Cameroon using patents as a proxy for innovation and drawing from a broad-based international literature spanning. The study finds a propensity for knowledge spillovers, which occur from renewable energy to innovation due to learning-by-doing. Additionally, spatial distributions of knowledge clusters are found to result from tacit circulation of technological information within and across industries. The paper finds the need for policymakers to prioritize climate-centric infrastructure to lessen environmental externalities and redress socio-economic and regional imbalances. Meanwhile, second-round effects will incite cross-industry applications from Renewable energy technologies (Rets) and achieve broader development and socio-economic objectives ranging from poverty reduction, innovation and sustainable economic growth.

Keywords: Renewable energy • Spillovers • Regional imbalances • Innovation

About the Study

The energy sector is a cornerstone for economic development, improvements in standards of living, and broad-based economic growth in developing economies. Whilst information and communication technologies (ICT) are seen as foundations for economic growth, their prevalence and competitiveness are contingent on access to energy for manufacturing, transport, tourism, and higher value-added sectors that form the basis for sustainable growth Mueller. Indeed, such a process is symptomatic of energy-dependent economic activity; several studies detail the adverse environmental effects of increases in the atmospheric concentration of carbon, driven by polluting activities that support economic growth and prosperity and Saidi and Hammami. This is especially so for commodity exporters, a majority of whom have not met the precondition for technology-driven economic development.

Furthermore, renewable energy supports economic growth by limiting energy imports and find renewable energy such as wind, solar, biofuels, hydroelectricity, and associated technologies to generate health and environmental benefits along with the facilitation of energy access for industries and households. Several studies spanning the Johnstone, find renewable energy to have positive impacts on employment, sustainable economic growth with positive spillovers into industries spanning manufacturing to higher value-added products and services [1].

Advances in technology are a 'force majeure' in facilitating the transition away from fossil fuels as they lower energy cost, support nascent industries and cause greater market penetration of renewable energy and associated technologies. Consequently, technological advancements in renewable energy will accelerate the energy transition. Cheaper and more accessible renewable energy technologies (Rets) will become more efficient and adopted across various industries. Additionally, the rapid adoption and diffusion of renewable energy will become increasingly apparent across the industrial and manufacturing sector, facilitating the emergence and development of higher value-added products set to drive long-term competitiveness across for consumer and non-consumer products, auto manufacturing, ICT components, and industrial chemicals. This is particularly salient for developing economies like Cameroon, with raw materials accounting for 65.0% of total exports, intermediate goods at 13.0%, and capital goods at 1.58%.

An increase in the renewable share of the energy mix will boost productivity by lessening the adverse effects of power outages on economic growth, whilst the transmissions from renewable energy and relevant technologies will reduce carbon emissions and expedite higher value-added exports to drive sustainable and inclusive economic growth. Moreover, the creation of an "innovation milieu"

***Address to correspondence:** Henri Kouam, Department Policy Institute, Face College Jesus Marie, Yaounde, Cameroon,Tel:+237693538157; E-mail: kouamhenri@hotmail.com

Received: February 12, 2021; **Accepted**: February 26, 2021; **Published**: March 05, 2021

triggered by the transmissions of renewable energy into innovation is consistent with findings of knowledge diffusion from innovation. By employing a qualitative approach, this study examines the extent of knowledge spillovers from RETs as innovative ideas spill over into firms and sectors, generating what can be otherwise termed as "positive externalities". As such, New posits that innovation improves costs and efficiency, although it shows that innovation enables the integration of existing and emerging renewable technologies. Regardless of whether early-stage renewable technologies become available, their ability to increase energy efficiency and distribution suggests bi-directionality from innovation to renewable energy and vice versa.

Indeed, international experience suggests a less than the marginal impact of renewable energy and associated technologies to innovation and Nordhaus. However, renewable energy will facilitate sustainable economic growth, generate technology spillovers via learning-by-doing, and drive broader competitiveness. The rationale for the energy transition away from fossil fuels is justified and the economic benefits provide credence to the persistence of a relationship between renewable energy and technological advancements[2-5].

Literature Review

The environment-growth-nexus suggest heterogeneity in the transmission mechanisms from renewable energy such as solar, wind, marine, hydropower, geothermal, waste, and biomass energy technologies and the knowledge from storage technologies to innovation and growth. Whilst a great deal of the literature details the anthropogenic causes of climate change authors such as Nordhaus posits that increases in the atmospheric concentration of carbon have caused negative externalities to accrue to climate outcomes. The environmental, economic, and social impact can be attenuated with the adoption of renewable energy, while the transmissions from RETs into innovation will have more persistent effects on standards of living, economic growth, and carbon emissions. A plethora of studies such as Brusco investigate the transmissions and knowledge spillovers from storage technology, solar, biomass, and hydropower, marine and waste energy and associated technologies. Rather than reflect lower energy cost, the spillovers are much more broad-based across renewable energy as storage technologies determine rates of adoption as well as management of the grids.

Dechezleprêtre finds that innovations in clean energy generate spillovers from production, automobiles, fuel, and lighting. Their findings show patented inventions receive 43% more citations than dirty inventions, thus supporting the view that stronger public support for clean R&D is warranted. Meanwhile, Nemet finds that valuable advances in energy technology suggest that knowledge acquired from external sources has a positive effect impact on energy inventions.

Noailly & Shestalova investigate intra-technology spillovers of knowledge flows within similar technological sectors, technologies in power generation termed inter-technology spillovers, and external technology spillovers using citation data of patents in renewable technologies at 17 European countries over the 1978-2006 periods. The results show heterogeneity across various renewable energies, solar energy and storage technologies find applications in sectors other than power generation, suggesting higher spill over into the real economy. Conversely, the technological advancements in wind energy are constrained to the power sector. This work chimes with findings from Dekker.

Over the years, two main strands of literature investigate the knowledge spillovers from energy technologies. The first strand of the innovation spillover literature estimates knowledge spillovers based on the effects on the current or available stock of knowledge on renewable energy technologies and current innovation outcomes. By investigating patents in eleven different categories of energy technologies, Popp finds evidence of significant intra-technology spillovers in solar and wind technologies to be statistically significant across the studied categories of technology. The results align with evidence from Johnstone whose findings of inter-technology knowledge spillovers show that knowledge stock, which accrues to storage technologies, has a net positive impact on innovation in renewable and clean technologies, more so for intermittent technologies. This article fits into the first category of the literature, using data on patents and renewable energy generation to investigate the extent of spillovers from renewable energy and associated technologies into innovation such as Dechezlepretre [6].

Learning By Doing (LBD) as transmission mechanisms from innovation

Other studies suggest two competing effects. On one hand, there is the added value to near-term technology investment due to LBD, as just mentioned. On the other hand, LBD also leads to lower costs of future abatement, which implies that abatement should be delayed. The net result of the two opposing effects may be theoretically ambiguous, but numerical simulations by Ek and Söderholm suggest that the slope of the abatement curve over time actually may be steeper with LBD included, contrary to previous findings, such as those of Grübler and Messner. In the R&D model, there are two effects of induced innovation on optimal abatement: it reduces marginal abatement costs, which increases the optimal amount of abatement. But it also increases the cost of abatement today relative to the future as marginal utility effects set in. Conversely, Dechezleprêtre, posits such outcomes appear probable because of lower abatement costs in the future are driven by cost and productivity efficiencies.

Discussion and Conclusion

This article investigates the impact of the adoption of renewable energy and associated technologies on innovation in Cameroon. Rather than proxy innovation by investigating the effects of wind and solar-powered grids on patents and renewables, the literature is a synthesis of empirical and qualitative studies that investigate the relationship between RETs and innovation, learning by doing, and the emergence of an innovation milieu. The latter benefiting from inter and intra-industry spillovers. The literature posits a pass-through from renewable energy and associated technology to innovation. This occurs via learning-by-doing that leads to the creation of knowledge clusters. As such, public policy should attempt to reduce structural impediments posed by a semi-skilled workforce, with learning-by-doing prioritized to ensure the workforce is sufficiently digitized to facilitate increased rates of adoption.

This paper attempts to answer two questions. Does renewable energy boost innovation via knowledge spillovers, Can learning-by-doing facilitate cross-industry spillovers that at once redress climate vulnerabilities and achieve broader socio-economic objectives? By investigating an international literature on renewable energy and knowledge spillovers, the study finds statistically significant relationships for the said relationship amongst a global sample. It investigates the prevalence of said trends in Cameroon by analyzing renewable energy projects and changes in registered and administered patents. Whilst the absence of granular data suggest less specific findings, the creation of "innovation milieus".

The findings suggest a positive effect from RETs and innovation, with implications for industrial competition. Using a mixed approach, the findings advocate targeted policies that enable public and private sector companies to leverage machine learning to forecast and supply energy production and distribution, robotics to monitor the grid and facilitate the transition of renewable energy spanning wind, solar, biofuels, and hydroelectric power. All these will be driven by the pursuit of learning-by-doing, which facilitates the adoption of RETs across other sectors. Such an approach will reduce the adverse impact of climate change, increase the positive net spillovers across manufacturing, green technology, health care, and the service sector where value-added is linked to energy access. Furthermore, increased internet access will increase rates of digitization ensuring the emergence of innovation milieus that fully benefits from improved energy security. While the economic case for the energy transition remains unchallenged by most, it must occur against a backdrop of an increasingly skilled labor force to leverage technological advances effectively; hence the need to ensure targeted policies to reduce the employment shocks from event-driven shocks. Increased adoption of renewable energy will spillover to non-energy sectors and the transmissions to industry will achieve broader macroeconomic objectives via knowledge clusters.

References

1. Lametschwandtner, Alios, and P Simonsberger. "Light and Scanning Microcopial Studies of the Hypothalamo-Adenohypophysial Portal Vessels of the Toad Bufo bufo (L.)." *Cell Tissue Res.* 162 (1975): 131-139.
2. Bergland, RM, and RB Page. "Can the Pituitary Secrete Directly to the Brain? (Affirmative anatomical evidence)." *Endocrinology.* 102 (1978): 1325-1338.
3. Gross, PM, MG Joneja, JJ Pang, and TM Polischuk, et al. "Topography of Short Portal Vessels in the Rat Pituitary Gland: A Scanning Electron-Microscopic and Morphometric Study of Corrosion Cast Replicas." *Cell Tissue Res.* 272 (1993): 79-88.
4. Carretero, A, H Ditrich, M Navarro and J Ruberte. "Afferent Portal Venous System in the Mesonephros and Metanephros of Chick Embryos: Development and Degeneration." *Anat Rec.* 247 (1997): 63-70.
5. Ohtani, O, and I Naito. "Renal Microcirculation in the Bullfrog, Rana Catesbeiana. A Scanning Electron Microscope Study of Vascular Casts." *Arch Histol Japn.* 43 (1980): 319-330.
6. Ohtani, O, T Ushiki, H Kanazawa and T Fujita. "Microcirculation of the Pancreas in the Rat and Rabbit with Special Reference to the Insulo-Acinar Portal System and Emissary Vein of the Islet." *Arch Histol Japn.* 49 (1986): 45-60.

How to cite this article: Kouam, Henri "A Systematic Review of KnowledgeSpillovers from Renewable Energy Technologies (Rets) in Cameroon." *Bus Econ J* 12 (2021): 355