

Personal Problem

15.879 Class – Spring 2025

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What is the effect of an entrepreneurial ecosystem on global warming?

Entrepreneurial ecosystems exhibit dual climate impacts, fostering low-carbon innovation (renewables, circular economy) while potentially harming the environment through unchecked growth. The net effect could hinge on policy alignment—climate focus versus growth focus.

The model's principal elements consist of the ecosystem's economic capital, defined as the total economic value produced within a specific timeframe, and energy consumption, defined as the energy consumed per unit of economic capital. Key sources of inertia that influence this balance include direct emissions from ecosystem actors and indirect emissions from newly generated startups. By categorizing startups (green vs. brown) and analyzing policy impacts on resource allocation, the model can identify conditions that lead to a net-positive environmental outcome.

Modeling Steps:

- Consider a regional ecosystem with a given number of mature firms contributing to the regional economic capital by the average mature firm's factor. The economic capital is the sum of all the economic activity of the regional ecosystem. The life cycle of new startups influences the growth of economic capital. Two archetypes of startups are considered for the scope of this model: green and brown startups. Both the Startup types have their own death rate, average economic capital contribution, and time to scale up.
- After the scale-up time, the startups contribute to the growth of the economic capital through the average additional economic capital factor. Green and brown startups have their own additional economic capital factor. Both green and brown startups, after scaled-up, began mature firms. The mature firms' stock has a proper death rate governed by the average lifetime of the firms. When a firm dies, the economic capital decreases by the average mature firm's economic capital contribution.
- A part of the regional economic capital is reinvested in entrepreneurial activity that generates new startups. The allocation of the fractional economic capital to the two startup typologies is for the moment, arbitrary.
- The energy intensity of the ecosystem could now be introduced, accounting for the energy consumption for a unit of economic capital. Green and brown startups have their own average energy intensity. The mature firms have an initial energy intensity that is influenced by the energy intensity of the scaled-up startup and by the dying of big firms. The energy intensity of the green and brown startup and the mature firm determine the average energy intensity of the ecosystem. The green startup's energy intensity also influences the mature firms' energy intensity for an imitation effect. For example, green innovation introduced by green startups is imitated by big firms.

- The assumption of a fixed fraction for green entrepreneurial activity can be released, assuming that the increasing energy consumption influenced the perceived global warming problem that changes dynamically the fraction of entrepreneurial activity destined for green startups. Moreover also the return on the capital invested in green vs brown startup influence the fractional of the entrepreneurial activity destined for green startups.

Additional complexity:

- Two additional typologies of startups for both green and brown startups: Schumpeter Startups and Market Creation Startups. The first scale-up with breakthrough technology replaces existing mature firms, and the latter satisfies new needs without directly competing with existing firms
- The energy intensity of both green and brown startups changes dynamically with the R&D expenditure in innovation and green innovation.

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