

The environmental goods and services sector is the keystone of net zero: Let's subsidize it!*



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To reach net zero emissions, worldwide firms will critically depend on the relative cost of decarbonising their production lines. However, the environmental goods and services sector -the sector providing climate change mitigation goods- is under-developed. Our analysis shows that governments can play a critical role in helping this sector to grow, by providing them with subsidies, financed by a carbon tax. Such a policy would (i) help firms to overcome the high initial costs and risks associated with entering this market and (ii) thus reduce the cost of the net zero transition by saving \$2.9 trillion in world GDP each year until 2060.

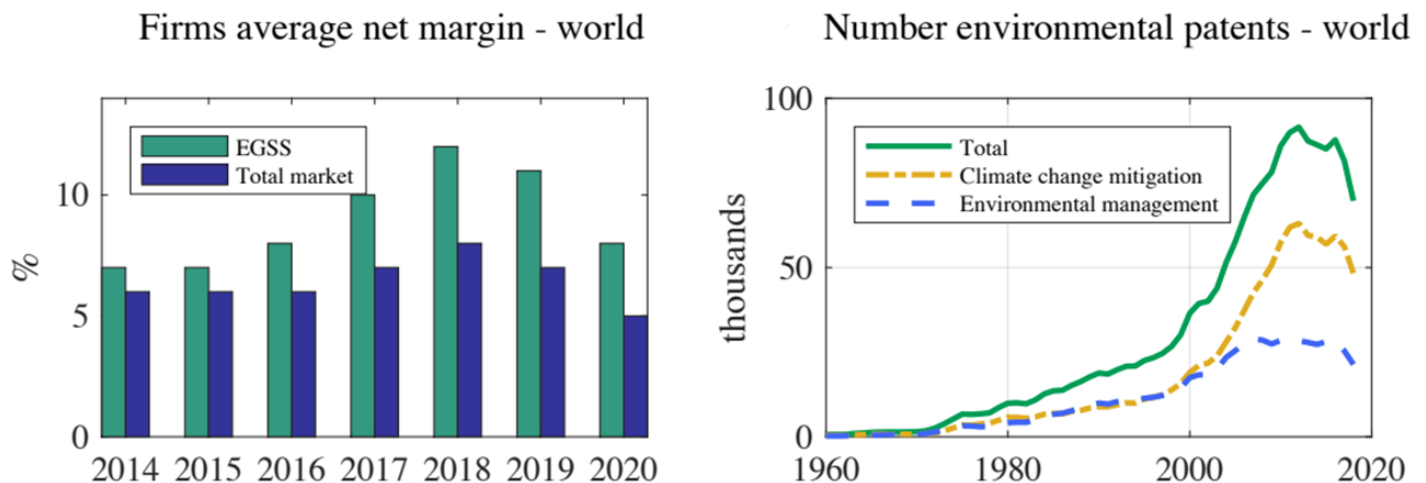
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Introduction

Energy transition requires a profound change in production processes by substituting polluting inputs for low-emission ones. Without any particular expertise on creating low pollution products, firms must critically rely on the environmental goods and services sector (EGSS) to lower their carbon footprint. However, EGSS is still underdeveloped. For instance, in the European Union with a well-established EGSS, the latter represents no more than 5.5% of GDP and 2.3% of total employment, but should reach 11% of GDP to reach net zero (Barrage and Nordhaus, 2023). Furthermore, EGSS is a highly concentrated sector (Ecorys, 2009), with net margins well above the average for all industries (Figure 1, left panel). Such a concentration results from high barriers to entry that prevent potential competitors from challenging incumbent firms. Last, the number of world environment-related patents has decreased since 2012 (Figure 1, right panel). This means that an EGSS that is too small and insufficiently competitive will increase transition cost through a higher price for environment-related products and thus threaten the achievement of the Paris Agreement.

Motivated by these observations, in Jondeau et al. (2023), we investigate how public subsidies can mitigate transition cost in promoting the development of EGSS. To this end, we develop a nonlinear macro-climate model for the world economy featuring an endogenous market structure for the abatement good sector (or equivalently EGSS), with a clear distinction between changes in the production of existing goods (intensive margins) and changes in the variety of available goods supplied by new firms (extensive margins). By relying on explicit microfoundations and forward-looking agents, our model appropriately controls for the effects of policy measures through expectations, notably those related to climate change, which may imply permanent shifts in macroeconomic time series. We then estimate this macro-climate model using full information methods, which allow us to describe the joint fluctuations of five world's macroeconomic and climate-related time series from 1961 to 2018. A nonlinear estimation is indeed deemed necessary to account for unbalanced growth dynamics originating from climate change.

Figure 1: Competition in the environmental goods and services sector (EGSS)



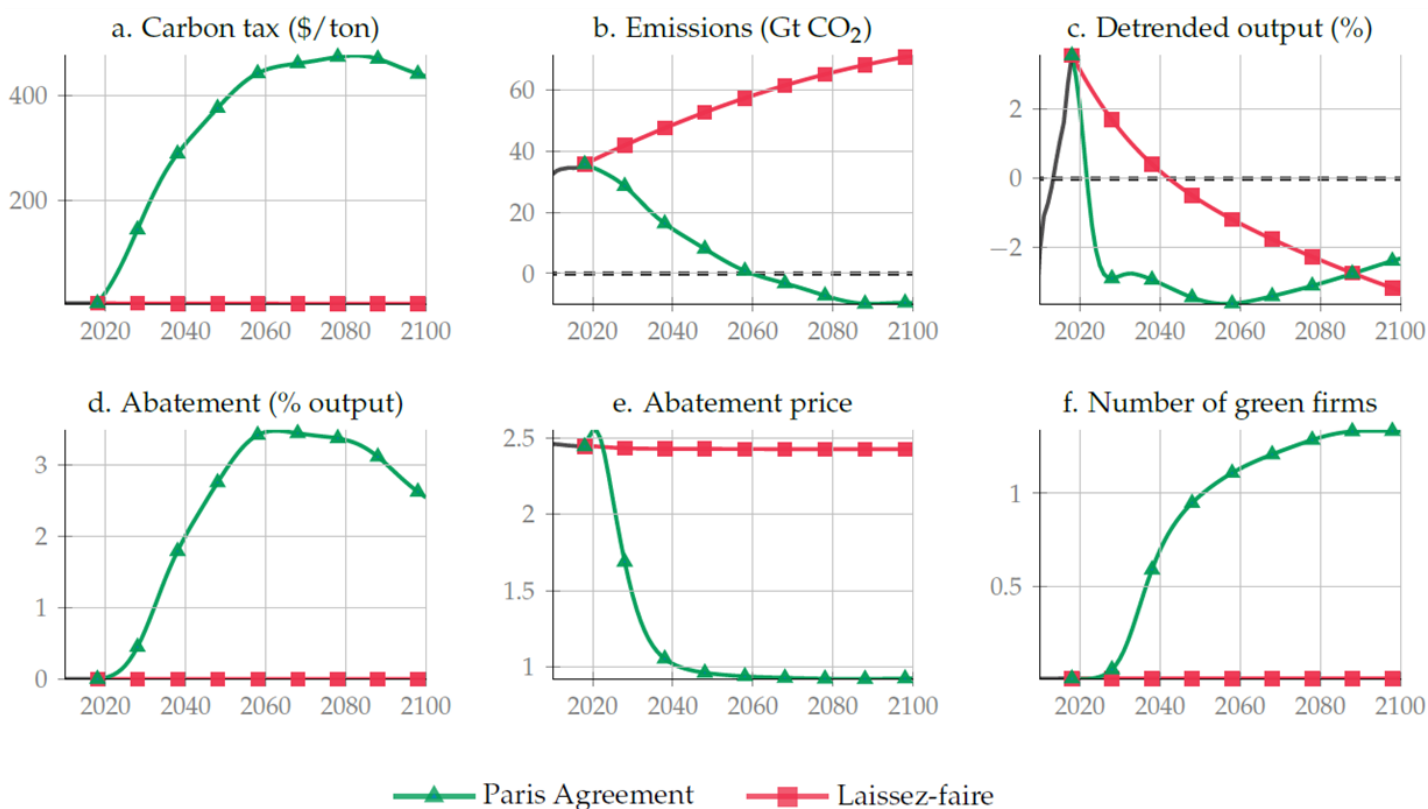
Note: Left panel reports the average net margin (i.e., the net income on the total revenue) computed from a panel of 600 firms worldwide for EGSS (represented by “Green and Renewable Energy” and “Environmental and Waste Services”) and 46,500 firms for the total market. Right panel displays the annual number of environment-related patents by category. Source: Eurostat, OECD, Bloomberg, Morningstar, Capital IQ, and Compustat.

The macroeconomic cost of the transition to a low-carbon economy

We use the model to generate projections to the end of the 21st century. We consider two alternative climate scenarios in line with the Intergovernmental Panel on Climate Change (IPCC, 2021). The first scenario assumes that there are no environmental policies, resulting in a continuous increase in carbon emissions (“laissez-faire scenario”). The second scenario assumes that carbon neutrality is reached in 2060 thanks to the introduction of a carbon tax (“Paris Agreement scenario”).

Following the introduction of a carbon tax aiming at fulfilling the Paris Agreement, producing firms seek to reduce their emissions by purchasing abatement goods (Figure 2). The prospect of future high profits in the abatement good sector boosts firms’ market value and, through free-entry conditions, incentivizes prospective entrants to create startups. The number of firms increases, and the resulting competition pushes prices down. However, the carbon tax and the transfer of resources from the production sector to the abatement goods sector are expected to have a recessive impact on the economy. It notably diverts a fraction of resources from consumption to investment.

Figure 2: The cost of the transition

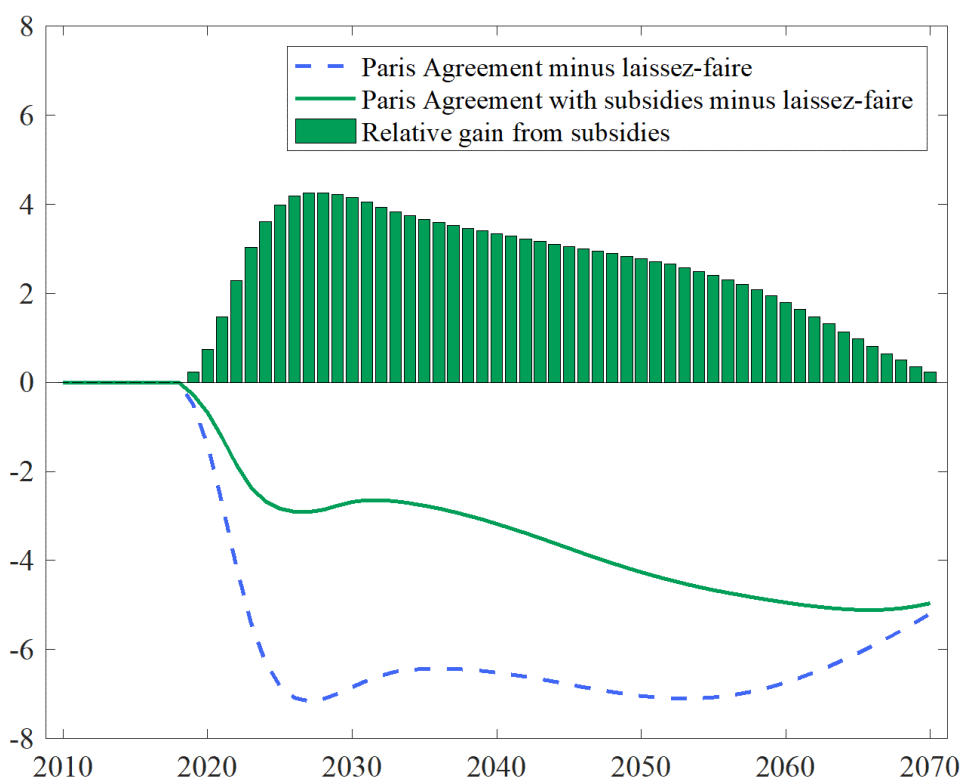


Note: This figure displays the projections of the main variables of the macro-climate model under two scenarios, corresponding to temperature increases of +4°C (laissez-faire) and below +2°C (Paris Agreement) relative to preindustrial levels.

Recycling the carbon tax revenues to EGSS

How could government use the fiscal space offered by the carbon tax? Standard analysis such as Barrage and Nordhaus (2023) impose that carbon tax revenues are lump-sum transferred to households, with no real effects on economic decisions. In contrast, we propose to use those carbon tax revenues to incentivize the production sector to go greener. We explore two subsidy experiments designed to mitigate the cost of the transition: (i) a subsidy to existing firms in the abatement good sector and (ii) a subsidy that is optimally shared between existing firms and startups in a way that maximizes social welfare. As suggested by Figure 3, we find that the Paris Agreement scenario would lead to a cumulative world GDP loss of \$266 trillion from 2019 to 2060 relative to the laissez-faire scenario (i.e., an average annual loss of \$6.3 trillion, or equivalently 6% of 2022 world GDP). Public subsidies, fully financed by the carbon tax, can reduce this loss substantially by fostering competition and lowering the selling price of abatement goods. A subsidy policy targeting startups is particularly efficient as it quickly lowers the cost of adopting green production technologies.

Figure 3: World GDP loss during the transition (in trillion of \$)



Following the optimal allocation scheme, i.e. with 60% of carbon tax revenues allocated to startups and 40% to existing firms, the cumulative loss of GDP would fall to \$145 trillion between 2019 and 2060. Hence, the optimal subsidy would reduce the GDP loss by \$121 trillion, or equivalently \$2.9 trillion each year. Note that in this scenario, the carbon tax would increase to \$150 per ton of CO₂ by 2040 and \$400 by 2060, the abatement price would be divided by more than 2.5, and the numbers of firms/varieties in the abatement good sector would substantially increase.

Interestingly, the largest gains are made during the first 10 to 20 years of the policy, as the subsidies allow the abatement good price to be drastically reduced and encourage the entry of new firms into the abatement good sector. Therefore, by accelerating the development of the abatement good sector and by reducing the costs associated with the net-zero emissions objective by 2060, the subsidy policy has a double benefit, which substantially mitigates climate transition costs.

Conclusion

Subsidizing the environmental goods and services sector would have two main effects on the economy. First, in the transition phase, it would almost halve the distorting effect of the carbon tax compared to the carbon tax policy only. Second, by reducing labor costs for both entrants and incumbents operating in EGSS, it would accelerate its development and offer a large reduction in the selling price of abatement technologies. Eventually, the GDP loss would be reduced from \$266 trillion between 2019 and 2060 to \$145 trillion. Importantly, reducing entry costs in EGSS would accelerate the transition and reduce the GDP loss mainly at the beginning of the transition. ■

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