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WHY SHOULD THE CARBON TAX BE FLOATING? A TOBIN'S Q MODEL APPLIED TO GREEN INVESTMENT

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Abstract

The carbon market reform is controversial because the modalities of carbon pricing foreseen risk reducing the performance of companies and negatively affecting the economy. The objective of this paper is to show that the carbon tax can be floating and adapt to the economic situation while maintaining its ecological efficiency. Herein, Tobin's Q model, which has become a standard in the literature for explaining the investment decision, is applied to the green investment decision. A carbon tax is introduced into the firm's maximization program to see how carbon pricing changes the outcome of the traditional model. The model shows that green investment depends on the sum of the stock price and the carbon price, which suggests the possibility of modulating this amount according to the upward or downward trend of the stock price to avoid permanently penalizing the competitiveness of firms. The study also demonstrates how the financial market is likely to value green investments and that such investments will likely generate shareholder value through several channels. Indeed, green investments impact the firm's turnover and the minimum income required by the shareholder. Such a modulation of the carbon tax according to the economic cycle would make reconciling ecological and economic efficiency possible.

Keywords stock market price, greenhouse gas emissions, green investment, Tobin's Q, carbon tax

JEL Classification C02, C61, D21, E22, H20

INTRODUCTION

The European carbon market reform accelerates the reduction of free allowances offered to force the industries involved to decrease their emissions accordingly. In addition, the market reform will gradually be extended to the maritime sector and emissions from intra-European flights. The gradual decrease in the distribution of free allowances is likely to provoke controversy among industrialists since this tightening of the rules increases production costs. The abolition of the distribution of free allowances means that industrialists will pay a carbon tax based on their emissions if they have exhausted their stock of allowances to pollute.

One theoretical problem spurred by the carbon tax is that, although a permanently high carbon tax will reduce CO_2 emissions, it also reduces economic activity and can cause a severe recession. The climate emergency means that public authorities must take effective measures. Nevertheless, it is possible to show that theoretical models justifying the reinforcement of carbon pricing fail to consider all the determinants of firms' investment decisions.

This study aims to show whether, from a theoretical point of view, it is possible to implement a floating carbon tax without affecting its ecological efficiency. The paper identifies how the introduction of ecological taxation interacts with the other determinants of investment. This analysis method justifies the introduction of an alternative mechanism to encourage firms to invest in the ecological transition. However, a comparable ecological efficiency can be maintained by considering the stock market valuation of green investments for carbon pricing. In this way, it is possible to implement a floating or flexible carbon price that adapts to the stock market trend.

1. THEORETICAL BASIS

The modification of Tobin's Q model is first introduced with a literature review aiming to show that reform of the European carbon market is influenced by macroeconomic models highlighting the need for a much higher carbon price than at present, but that such a price would lead to a great risk of slowing down economic activity. In the second step, Tobin's Q model applied to green investment shows that the carbon tax could be floating in reality.

The decision to strengthen carbon pricing in Europe follows the theoretical recommendations of several models. They claim that to avoid devastating climate change, it is necessary to implement a very high carbon price to incentivize firms to introduce green investments and thus reduce the volume of carbon emissions. For example, Bovari et al. (2018) show that with a very high carbon price in the short term, the temperature anomaly can be limited to +2.07C. The model of Jackson and Victor (2019) agrees with the findings of Bovari et al. (2018) and shows that significant reductions in carbon emissions are possible if an appropriate carbon tax level is set. Without a high carbon tax, Dafermos et al. (2017) maintain that emission reductions would occur owing to severe economic crises. Naqvi's (2015) theoretical model describes the macroeconomic effects of implementing a CO_2 emissions charge: firms pass on the burden of the charge to the price of goods purchased by households, thus decreasing their real income. In turn, firms' production and revenues decrease, leading to reduced emissions. Lin and Jia (2018) also find that a high carbon tax can effectively reduce emissions, but the impact on the GDP is necessarily very negative. For Böhringer et al. (2017), the effects of a high carbon tax are so deleterious that they consider alternative climate policy modes, leading them to test their macroeconomic effects in a computable general equilibrium model.

Most researchers in this field agree that a high carbon tax is necessary, but its effects are particularly harmful to economic activity. One exception to this diagnosis is to be noted: Piluso and Le Heron (2022) have constructed a Keynesian model in which the introduction of a carbon tax that, under certain conditions, can have expansive effects.

Fagnard and Germain (2014) have constructed a canonical AS AD model (with flexible prices) by introducing a climate policy in the form of a carbon tax or rights to pollute. Introducing such a levy for environmental purposes leads to a negative supply shock: any increase in output requires a larger price increase. A direct consequence would be a weakening of the impact of Keynesian-type stimulus policies. Nevertheless, the diagnosis of the need for a high carbon tax ignores the role of financial markets in determining green investment. The role of markets can be highlighted with Tobin's Q model (Bolton et al., 2011; Epaulard, 1993; Lin et al., 2018; Reiffers, 1995; Tobin, 1969).

The approach considered here consists of taking Tobin's (1969) investment determination model and applying it to green investment decisions. This modified model introduces a CO_2 emissions price to encourage firms to reduce their emissions. The method of reducing emissions is based on the assumption that the realization of green investments will allow the type of energy used to be modified, thus improving the carbon impact of the production process. Green investment can be profitable in the long term because it increases the productivity of industrial processes and opens up new markets by attracting consumers sensitive to the environmental impact of their consumption. The study is based on the presentation of Tobin's Q model made by Epaulard (1993) and its resolution mode.

A firm determines the level of green investment I_t^v, by maximizing its net worth V_0, as given in equation (1):

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$$V_0 = \int_0^{\infty} [\pi_t - I_t^v P_{it}] e^{-it}. \quad (1)$$

This maximization is achieved under a green capital accumulation constraint, which is expressed by:

$$\ddot{K}_v = I_t^v - \partial K_v, \quad (2)$$

where π_t is the profit in period t; P_{it} is the acquisition price of the green investment goods that reduce greenhouse gas emissions in period t; i is the discount rate. K_v represents the accumulation of green capital and ∂K_v is the depreciation of green capital.

A firm is subject to a carbon tax to encourage it to make green investments. This tax is applied to the firm's greenhouse gas emissions. The emissions depend on the production volume given by the production function F(K_t, K_t^v, N_t). It is assumed that emissions are proportional to the production volume. Below, the proportionality coefficient is denoted by z, a parameter representing the carbon intensity of the production. Nevertheless, a firm can cancel a certain amount of CO_2 emissions due to the implementation of green investments. The volume of emissions canceled depends on the volume of green investments I_t^v and their ecological efficiency, measured by a parameter v. Thus, the carbon tax T that is applied to net CO_2 emissions is equal to:

$$zF\left(K_t, K_t^v, N_t\right) - vI_t^v. \quad (3)$$

In each period t, the firm's profit is equal to:

$$\pi_t = P_t F\left(K_t, K_t^v, N_t\right) - W_t N_t - \\ -\varphi\left(I_t^v{}_t, K_t^v\right) P_{it} - \left(zF\left(K_t, K_t^v, N_t\right) - vI_t\right)T, \quad (4)$$

where P_t is the price of the goods produced by the firm in period t; F(K_t, K_t^v, N_t) is the production function that gives a certain level of production for each combination of factors; $W_t N_t$ is the wage cost related to the volume of employment N_t; $\phi(I_t^v$, $K_{t,}{}^v)$ is a maintenance cost function – which is assumed to be homogeneous of degree 1 – for the capital stock K_t and the green capital stock K_t^v.

The Hamiltonian of the firm is written as follows:

$$H\left(N_t, I_t, K_t, \rho_t\right) = \Big[P_t F\left(K_t, K_t^v, N_t\right) - \\ -W_t N_t - \varphi\left(I_t^v, K_t^v\right) P_{it} - \\ \left(zF\left(K_t, K_t^v, N_t\right) - vI_t\right)T - \\ -I_t^v P_{it} + \rho_t\left(I_t^v - \partial K^v\right)\Big] \cdot e^{it}. \quad (5)$$

The green capital installation and maintenance cost function is assumed to be:

$$\varphi\left(I_t^v, K_t^v\right) = \frac{1}{2}\frac{\beta}{K_v}\left(I_t^v - \partial K^v\right)^2. \quad (6)$$

The first-order conditions are then:

$$F'_N = \frac{W}{P}, \quad (7)$$

$$\frac{\partial H}{\partial I_t} = 0 ==> -P_i - \varphi'\left(I_t^v{}_t, K_t^v\right) P_i + \\ +VT + \rho = 0, \quad (8)$$

$$-\frac{\partial H}{\partial K} = \frac{d\rho e^{-it}}{dt}. \quad (9)$$

Finally, the transversality condition is:

$$\lim_{t \to \infty}\left(\rho_t e^{-it}\right) = 0, \quad (10)$$

which gives:

$$\dot{\rho} = i\ddot{\rho} + \rho\delta - P_t F'\left(K_t, K_t^v, N_t\right) + \varphi^{'(I_t, K_t) P_{it}} - \\ +\left(zF'\left(K_t, K_t^v, N_t\right)\right)T, \quad (11)$$

$$\frac{\partial H}{\partial I} = 0 - \varphi'\left(I_t^v{}_t, K_t^v\right) P_{it} - P_{it} - vT + \rho_t = 0. \quad (12)$$

Condition (8) can be rewritten as follows:

$$-P_i - \frac{\beta}{K_v}(I_t^v - \partial K^v) P_i + VT + \rho = 0. \quad (13)$$

Rearranging the terms yields:

$$\frac{I^v}{K^v} = \frac{VT + \rho}{P_i \beta} + \left(\partial - \frac{1}{\beta}\right), \quad (14)$$

which can be rewritten as:

$$\frac{I^v}{K^v} = \frac{\frac{VT + \rho}{P_i \beta} + \left(\partial - \frac{1}{\beta}\right) P_i \beta}{P_i \beta}. \quad (15)$$

In the traditional Tobin's Q model, the investment/capital ratio is as follows:

$$\frac{I}{K}=\frac{1}{\beta}\frac{\rho}{P_i}+\left(\partial-\frac{1}{\beta}\right). \quad (16)$$

If the transversality condition is satisfied, and the cost function of installing and maintaining capital is homogeneous to degree 1 (as assumed here), then the coefficient (ρ / P_i) is equivalent to the ratio between the firm's market valuation V_0 and the acquisition cost of capital P_iK. In other words, the ratio between the investment and the capital stock I/K is an increasing function of the stock price.

2. RESULTS

In this model enhanced by a carbon tax, a similar result is obtained if a firm makes only green investments: the volume of green investment grows with the ratio between the stock price and the cost of acquiring green capital, as represented by the ratio (ρ / P_i). Nevertheless, investment is also an increasing function of the carbon tax T and the efficiency of green investments. In the model, the carbon tax acts as a booster of green investment, playing a role identical to the stock price.

In the traditional Tobin's Q model, a firm is assumed to invest when the ratio of the stock price to the acquisition price of capital is greater than 1. If a firm wishes to acquire capital to produce more or improve productivity, it will need to compare:

- the acquisition price of capital already existing in competing firms, which it can achieve by buying stock shares;
- the acquisition price of new capital assets.

$$\text{Tobin's Q}=\frac{\text{stock market price}}{\text{replacement cost of capital}}. \quad (17)$$

If the price of shares is higher than the price of capital goods, a firm will invest, i.e., buy new production goods. If the price of shares is lower than the price of capital goods, a firm chooses to enter the capital of competing firms to acquire existing production equipment.

In the enriched model, a firm will invest if the ratio of the sum of the stock price and carbon pricing to the acquisition price of capital is greater than 1.

$$\text{Tobin's Q with carbon tax}=\frac{\left(\begin{matrix}\text{stock market}\\ \text{price}\end{matrix}\right)+\left(\begin{matrix}\text{carbon price x ecologic}\\ \text{efficiency of green capital}\end{matrix}\right)}{\text{replacement cost of capital}}. \quad (18)$$

As the stock price fluctuates, it is possible to modulate the carbon tax according to the level of the stock price: when the stock price highly values the realization of green investments, the carbon tax can decrease because the value of the stock price is sufficient to encourage companies to make the necessary investments. However, when the stock price falls for one reason or another, the carbon tax rate must be raised to maintain a high level of investment. As first pointed out by Keynes (1936), the decision to invest strongly depends on the marginal efficiency of capital. Keynes (1936) indicates that a variation in the stock market price is equivalent to a variation in the marginal efficiency of capital, a stipulation with which Tobin (1969) agrees. However, when stock prices are persistently low, it is complicated to stimulate investment with an expansionary monetary policy. In this carbon tax model, raising the tax is an effective method for restoring the level of investment: firms will be forced to make ecological investments to prevent the carbon tax having too great impact on profits that the economic crisis has already eroded. To the extent that carbon pricing becomes a direct determinant of green investment, it can be less volatile.

The model also shows that if the ecological efficiency of green investments is assumed to increase over time, the carbon tax can decrease over time because the modified Tobin's Q depends positively on the product of the carbon tax T and the ecological efficiency of the green investment represented by the parameter v.

3. DISCUSSION

This study shows that the carbon tax should be floating, adapting to the economic context and the dynamics of the stock market. But is this thesis realistic? To demonstrate this, it is necessary to go back to the logic of stock market dynamics and

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the question of why green investments are valuable on the financial market. After addressing these aspects, it is possible to place these results in relation to the literature on the double dividend of ecological taxation.

According to Keynes (1936), the stock exchange (i.e., the financial markets) assesses the value of investments made daily. Thus, Keynes (1936) asserts that the average expectation governs certain investment classes, reflected in stock prices and formed by operators on the stock exchange, much more than by the genuine expectations of professional entrepreneurs. This "calculation" is a pure convention based on the assumption that the current state of affairs will continue indefinitely unless there are well-founded reasons to anticipate its modification. In Keynes' (1936) words, the formation of this valuation convention is the result of the mass psychology of many ignorant individuals. In the end, the valuation of markets is based on beliefs that can be changeable and that it is prey to waves of optimism or pessimism that are sometimes exaggerated.

Thus, in the growth phase, the beliefs of entrepreneurs and stock market valuation professionals are overly optimistic, stimulated by encouraging returns on investment and effective demand that remains at a high level, fed by multiplier effects. Nevertheless, the economic growth phase is accompanied by an increase in the price of goods (returns are assumed to be decreasing) and a rising interest rate (the demand for money for transactions and precautionary reasons, a function of the income level, increases). Production costs rise accordingly, as does the price of capital goods. Blinded by their enthusiasm, entrepreneurs do not immediately perceive this cost rise. It is only when the actual returns fall below those expected that the morale of stock market valuers and entrepreneurs falls.

The fall in stock prices, equivalent to a decline in the marginal efficiency of capital, is then violent: the financial markets, as Keynes (1936) notes, are influenced by "buyers who are largely unaware of what they are buying and speculators who are more concerned with the anticipation of the next change in market opinion than with the rational estimation of future returns on assets." Uncertainty about future returns, the economic downturn, and rising unemployment increase the liquidity preference and reduce the marginal propensity to consume (and thus effective demand), which accentuates the rise in the interest rate and the fall in investment, with a multiplier effect leading to a contraction in domestic growth product. Central bank intervention to reduce the interest rate is necessary for recovery. However, it is not sufficient in a context where the marginal efficiency of capital continues to fall.

According to Keynes (1936), it is necessary to wait a certain amount of time (at least three years) for confidence to be fully restored for the marginal efficiency of capital to start increasing again to initiate new economic growth. Tobin's Q model with a carbon tax shows in precise terms that floating carbon pricing can correct this problem by forcing firms to make green investments in periods of low economic activity.

The economic literature indicates that climate change is likely to cause adverse supply shocks. These shocks are modeled with climate damage functions that can take various forms, such as damage functions only affecting the output (Dietz & Stern, 2015), damage functions affecting both capital and output (Dafermos et al., 2017), or damage functions affecting labor and capital productivity (Burke et al., 2015). These damages lead to the assertion that climate change destroys part of the output firms generate and therefore destroys part of their revenue. Moreover, Daumas (2023) and Lagoarde-Segot et al. (2023) show that climate change will likely amplify financial instability. However, by limiting climate change, green investments limit firms' revenue losses and may even open up new markets. It is logical that by limiting negative random shocks on the supply side, green investments can create shareholder value and thus increase stock prices.

The creation of shareholder value (economic value added [EVA]) is equal to the difference between the profit (net of financial charges) and the minimum acceptable income for the shareholder. The formula for creating EVA is as follows:

$$EVA = (\pi - rD) - r_e FP, \quad (19)$$

where π is the profit made by the firm, $r_e FP$ is the cost of the equity contribution, FP is the book value of capital, and D is the amount of debt. The minimum shareholder return is given by the fundamental Capital Asset Pricing Model equation:

$$r_e = r + \beta\left(E\left(r_M\right) - r\right), \tag{20}$$

where β is the non-diversifiable risk of the firm, $E(r_M)$ is the expected return on the risk capital market, and r is the rate of return on risk-free assets. The return demanded by shareholders is therefore equal to the return on risk-free assets plus a risk premium. This process has two components: (1) the aggregate risk price, that is, the difference between the expected return on the market portfolio and the return on the risk-free asset; and (2) the sensitivity to this risk of the security in question, measured by β. The latter is, by definition, equal to:

$$\beta = \frac{\operatorname{cov}(r_i, r_M)}{\sigma^2_{r_M}}, \tag{21}$$

where $\operatorname{cov}(r_i, r_M)$ is the covariance between the rate of return on the assets of firm i and the rate of return on the market portfolio, and σ^2_{rM} is the variance of the market portfolio.

Green investments can help create shareholder value through two channels:

- Increasing revenues and profits (denoted as π) by limiting climate damage and possibly opening up new markets.
- Limiting random negative supply shocks and reducing the firm's contribution to market risk (its covariance and, hence, its beta).

If the overall market risk measured by σ^2_{rM} decreases as a result of all firms making green investments, an individual firm will have an even greater incentive to make green investments in order to lower its covariance and, therefore, its beta. At the macroeconomic level, green investments increase the beta by limiting the market risk. This constitutes an incentive for firms, on a microeconomic scale, to do better than the market and lower their covariance and, therefore, their beta.

This brief analysis demonstrates (1) that green investments can doubly stimulate the stock market price (because this stimulation goes through two channels that reinforce each other), and (2) that shareholders' search for value creation establishes a competition between firms to reduce their contribution to the market risk via green investments.

Contrary to this study, economists advocate rigid carbon pricing to the extent that they use simple green investment functions in their models that depend only on the interest rate, relative input prices, and/or expected demand (Piluso & Le Heron, 2022). The result of this study is explained by the fact that a key determinant of investment, the stock price, is taken into account. This consideration is based on the teachings of Keynes and Tobin.

The result obtained from this analysis enriches the literature on the double dividend of ecological taxation.

The double dividend refers to the idea that an environmental tax is likely to produce both an ecological and an economic benefit with unchanged budgetary revenues (budget neutrality hypothesis). Ekins (1997) draws up a typology of the economic benefits that can arise from ecological taxation: an employment dividend when it reduces unemployment, an efficiency dividend when it reduces tax distortions (Goulder, 1994), or a social dividend when the redistribution process improves equity within the community of economic agents. Generally speaking, the theoretical and empirical literature on the double dividend is limited to analyzing these three types of benefits (Chiroleu-Assouline, 2001). Goulder (1994) adds three versions of the double dividend linked to the degree of the benefit provided by the environmental tax: a weak version (the ecological tax makes it possible to reduce the gross costs of taxation), an intermediate version (the ecological tax makes the costs of taxation disappear), and a strong version (the ecological tax makes the gross costs of taxation negative).

The first models to study the occurrence of a double dividend from environmental tax policy were based on general equilibrium theory, assuming close-to-perfect competition. Examples

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of such models are given by Chiroleu-Assouline (2001), Fullerton (1997), Bovenberg and Mooij (1994), Bovenberg and van der Ploeg (1996), Parry (1995), and Goulder (1995). Their results show that an environmental tax solves an environmental externality problem but increases tax distortions to the extent that such a tax can only be justified if the environmental benefit is large.

Moreover, from an initial level of environmental taxation, any public decision to increase it leads to decreased employment and production. By reducing the purchasing power of workers, an environmental tax reduces the labor supply. As Chiroleu-Assouline (2001) points out, "the key role played in the results by the elasticity of labor supply to the purchasing power of wages emphasizes key assumptions of the general equilibrium analysis conducted by Bovenberg and de Mooij (1994, p. 13), namely pure and perfect competition and labor market equilibrium." Kaltenrieder (2005) constructed a general equilibrium model applied to Switzerland based on assumptions of perfect competition. He confirms the analysis given above, showing there is no double dividend from ecological taxation in terms of employment. Similarly, Al Amin et al. (2009) presented a computable general equilibrium model that does not support such a double dividend.

The possibility of a double dividend appears when moving to an imperfect competition framework. This is the case, for example, if it is assumed that unemployment is generated when the real wage remains fixed at an excessive level. As Bovenberg and van der Ploeg (1996) demonstrated, introducing an ecological tax on "energy" production leads to a substitution of labor for energy if labor is a better substitute for energy than capital.

In a model of competition without price fixing, such a tax leads to a decrease in output instead of an increase in the demand for labor. In a model with an endogenous efficiency real wage (Schneider, 1997), ecological taxation favors employment if, in return, it reduces social charges on labor. In that way, it allows firms to reduce the wage offered without loss of effort and productivity on the part of workers, increasing the level of employment. In models where the real wage is the result of wage negotiations (Brunello, 1996), ecological taxation worsens the purchasing power of both employees and the unemployed, but employees benefit from a reduction in social security charges on their wages, which improves employment levels. The double dividend, in this case, results from a transfer of the tax burden from workers to the unemployed.

Marsiliani and Renstron (2000) and Holmlund and Kolm (2000) show that the more important the economic dividend, the less competitive the market. Similarly, Boitier et al. (2015, p. 4) argue that "labor market flexibility thus appears crucial for the intra-population sharing of the effects of an energy price increase and for the efficiency of recycling the amounts of a potential energy tax." The first empirical estimates of neo-Keynesian models confirmed the idea of a double employment dividend of eco-taxes when they are used to reduce the cost of labor (Godard & Beaumais, 1994; DGII-CEC, 1992; Barker et al., 1993).

More recently, Collonnec et al. (2012) evaluated the impact of the carbon tax in a neo-Keynesian model characterized by price stickiness and quantity adjustment, concluding that there is an improvement in the macroeconomic situation (growth, employment and public deficit) linked to ecological taxation. The same conclusion is given by Chiroleu-Assouline and Fodha (2011). Hourcade and Ghersi (2000) developed a computable general equilibrium model involving underemployment that shows a double dividend of modest importance based on employment and consumption. Finally, Crassous et al. (2009) use a static general equilibrium model with imperfect competition, notably in the labor market, to test the macroeconomic effect of implementing a carbon tax under various recycling conditions. The macroeconomic gain appears to be maximal (in terms of economic growth) in the case of a substitution of social security contributions by wages.

It is important to remember that, in the classic literature, carbon taxation can generate a double dividend only if the analytical framework involves imperfect competition. If competition is perfect, the reduction in ecological externalities (the positive effect) is offset by increased economic disadvantages (deterioration in employment or the rate of economic growth). In this study of Tobin's Q model with a carbon tax, there is no need to introduce elements of imperfect competition to demonstrate the cumulative positive effects of a carbon tax. By taking into account the most critical determinants of investment, the present model shows that a floating carbon tax system will allow:

- a reduction in greenhouse gas emissions by encouraging green investments (green effect);
- an increase and stabilization of the investment effort over time (double economic effect).

In this context, the floating carbon tax theoretically allows a triple dividend: one ecological benefit and two economic benefits.

This analytical framework can inspire future carbon pricing reforms within companies. Future research could integrate such a result into a broader macroeconomic model (of the consistent stock-flow type, for example) to estimate the appropriate level of carbon pricing to be implemented according to the phases of the economic cycle and, therefore, according to the economic situation.

CONCLUSION

The objective of this study is to show that the current pricing arrangements for carbon ignore the role played by the stock market price in the decision to invest. Both Keynes (1936) and Tobin (1969) have highlighted such a role.

In Tobin's Q model applied to the green investment decision in which carbon pricing is introduced, it is possible to show that green investment is an increasing function of both the carbon tax and the stock price. The main result of the model presented here is that these two signals play a complementary role in the decision of entrepreneurs. Thus, the carbon tax can be diminished when the stock price is high to avoid any negative supply shock.

The conclusion drawn from this study is that it is necessary to adapt carbon pricing to the economic situation to maintain the competitiveness of firms and avoid a negative effect on the level of economic activity.

AUTHOR CONTRIBUTIONS

Conceptualization: Nicolas Piluso.
Formal analysis: Nicolas Piluso.
Investigation: Nicolas Piluso.
Methodology: Nicolas Piluso.
Resources: Nicolas Piluso.
Writing – original draft: Nicolas Piluso.
Writing – review & editing: Nicolas Piluso.

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