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Sustainability thought 179: Can we transition from the environmentally dirty economy to the environmental clean economy with the use of green markets? If Yes, why?

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Abstract

There is an environmental pollution problem separating the environmentally dirty economy from the environmentally clean economy; and this is because the environmentally dirty economy operates through the use of environmental pollution production markets. Since 2012 Rio +20, the world has been using dwarf green markets to manage pollution generation; and this is because the dwarf green economy works through the use of environmental pollution management markets, markets that are apparently delinked from the idea of the need to transition as soon as possible from the environmentally dirty economy to the environmentally clean economy, a permanent climate change friendly move. Now imagine the world would have gone the way of environmental pollution reduction markets a la green markets instead of dwarf green markets since 2012 when facing environmental pollution, things could be different. And this raises the question: Can we transition from the environmentally dirty economy to the environmental clean economy with the use of green markets? If Yes, why? What are the implications of this? Among the goals of this paper is to provide answers to all those questions.

Key concepts

Traditional market, Green market, dwarf green market, dirty markets, clean markets, environmental pollution problem, environmental pollution production market, environmental pollution reduction market, environmental pollution management market, environmentally dirty economy, environmentally clean economy, paradigm transition, paradigm shift

Introduction

a) The problem separating environmentally dirty markets from environmentally clean markets

i) The environmental pollution problem(EPO) in simple terms

The ideal of environmental pollution problem(EPO) separating the environmentally dirty economy(EDM) from the environmentally clean economy(ECLM) has been pointed out recently in simple terms(Muñoz 2022) as indicated in Figure 1 below:

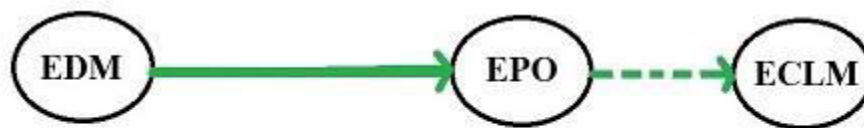


Figure 1 There is an environmental pollution problem(EPO) that separates the environmentally dirty market(EDM) and the environmentally clean market(ECLM)

Figure 1 above tells us that there is an environmental pollution problem(EPO) separating the environmentally dirty economy(EDM) from the environmentally clean economy(ECLM); and therefore, to live under an environmentally clean market(ECLM) we need to get rid of the pollution production markets(PPM) like the environmentally dirty market(EDM). In other words, Figure 1 above indicates that we need to eliminate the environmental pollution problem(EPO) generated by the environmentally dirty market(EDM) fully to transform it into the environmentally clean market(ECLM), which means that the most climate change friendly action humanity can take is to transition to an environmental pollution free world under environmentally clean markets(ECLM).

ii) The environmental pollution problem(EPO) graphically

We can transform the information in Figure 1 into graphical information in terms of supply and demand of the environmentally dirty market(EDM) as summarized in Figure 2 below:

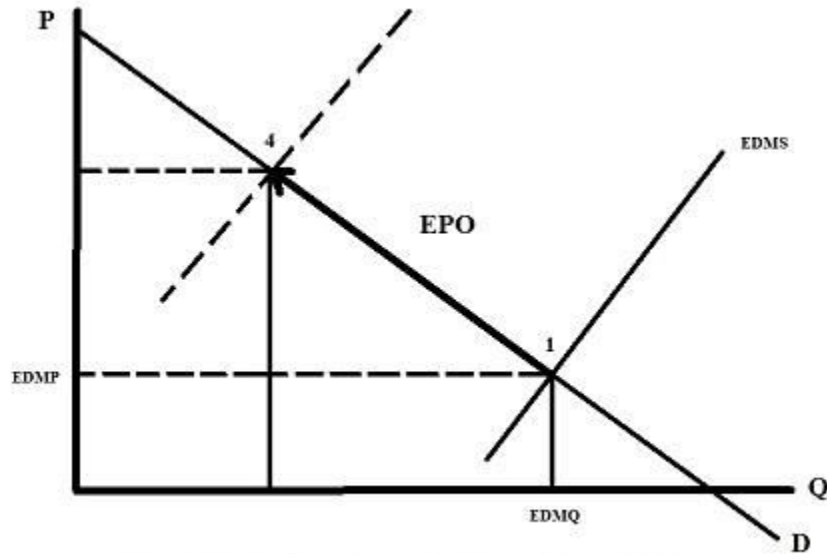


Figure 2 A look at the environmental pollution problem graphically

Figure 2 above tells us the following: i) that there is an environmentally dirty market (EDM) at point 1 where the environmentally dirty supply (EDMS) meets the environmentally dirty demand D, determining the environmentally dirty market quantity (EDMQ) to be produced and consumed at the environmentally dirty market price EDMP; ii) that this market generates environmental pollution EPO going from point 1 to point 4; and iii) that as long as this pollution generation problem (EPO) exists, there will be no environmentally clean markets (ECLM). Hence, the best climate change friendly policy based on Figure 2 above is to eliminate the environmental pollution problem (EPO) generated by the environmentally dirty market (EDM) at point 1 to transition it towards the environmentally clean economy (ECLM).

iii) The expansion of the environmental pollution (EPO) generation problem

If the environmentally dirty market expands from EDM to EDM1 because there is a decrease in the environmentally dirty market price from EDMP to EDMP1, then the environmentally dirty market supply will shift from EDMS to EDMS1, expanding pollution levels as indicated in Figure 3 below:

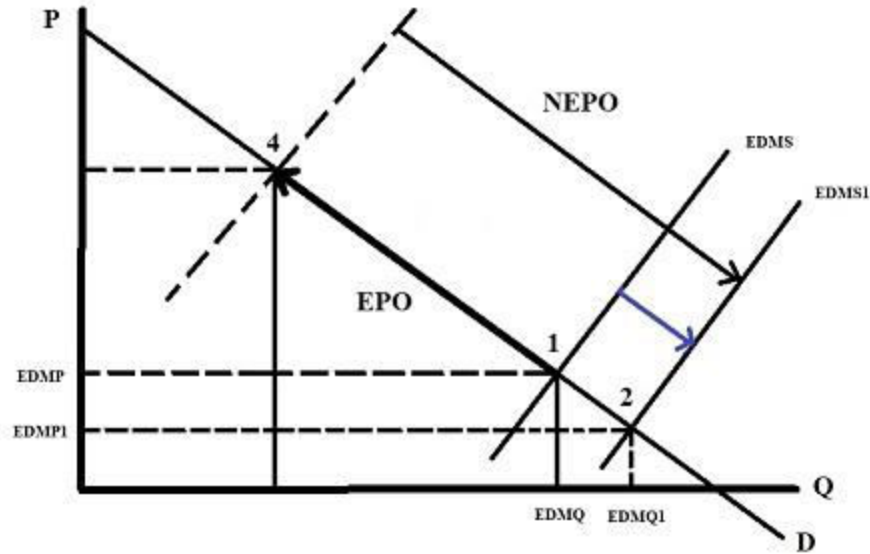


Figure 3 The expansion of the environmental pollution problem

We can see in Figure 3 above that when the environmentally dirty market expands from point 1 to point 2 the pollution problem(EPO) expands from point 4 to point 1 to point 4 to point 2 as the new environmental pollution problem(NEPO) is greater than the original environmental pollution problem(EPO) so that $NEPO > EPO$ by the distance from point 1 to point 2 represented by the blue arrow. In other words, as the environmentally dirty market(EDM) expands more environmental pollution(EPO) is generated.

b) Ways of dealing with the environmental pollution(EPO) problem

There are two possible ways of addressing the environmental pollution problem(EPO), one is through setting up environmental pollution management markets(EPOMM) if we just want to patch the pollution generation problem and live permanently under them; and the other one is setting up environmental pollution reduction markets(EPORM) if we want to fully fix the pollution problem and transitioning it to the environmentally clean economy(ECLM), which are summarized in Figure 4 below:

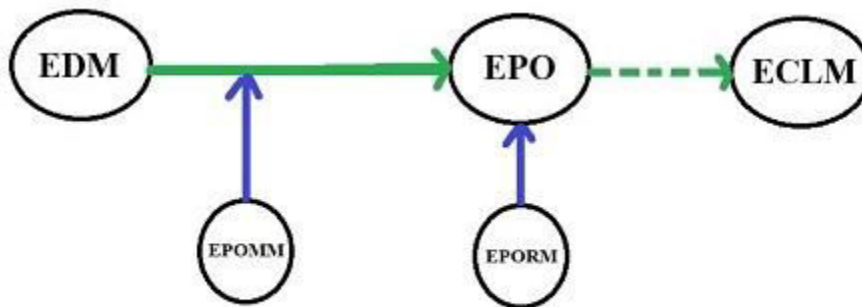


Figure 4 The environmental pollution management market solution(EPOMM) and the environmental pollution reduction market reduction marke solution(EPORM) to the environmental pollution problem(EPO)

We can see in Figure 4 above that environmental pollution management markets(EPOMM) deal with a portion of the pollution generation problem(EPO) created by the environmentally dirty market(EDM) while environmental pollution reduction markets(EPORM) deal with the whole of the environmental pollution problem(EPO) through problem internalization. In other words, environmental pollution management markets(EPOMM) addresses the environmental pollution generation problem(EPO) through pollution management theory where, once markets are in place, pollution reduction is not a profitable business incentive as pollution management costs are set externally while environmental pollution reduction markets(EPORM) deal with the environmentally pollution problem through perfect pollution reduction market theory where, once markets are in place, pollution reduction is an excellent business opportunity as it leads to producing at the lowest pollution reduction market price possible.

c) Dealing with the environmental pollution problem though the use of green markets

As pointed out recently(Muñoz 2023) since the 2012 Rio + 20 conference(UNCSD 2012a; UNCSD 2012b) the environmental pollution issue(EPO) has been dealt with the use of dwarf green markets(DGM) as environmental pollution management markets(EPOMM), where the environmental pollution problem(EPO) generated by the environmentally dirty market(EDM) is being patched with the use of dwarf green markets leaving them permanently delinked from any hope to transition towards environmentally clean markets. Had the world not avoided fixing the environmental pollution problem(EPO) since 2012 Rio +20 and they would use green markets(GM) from the beginning the structure of the green market solution to the environmental problem would have looked like the one summarized in Figure 5 below:

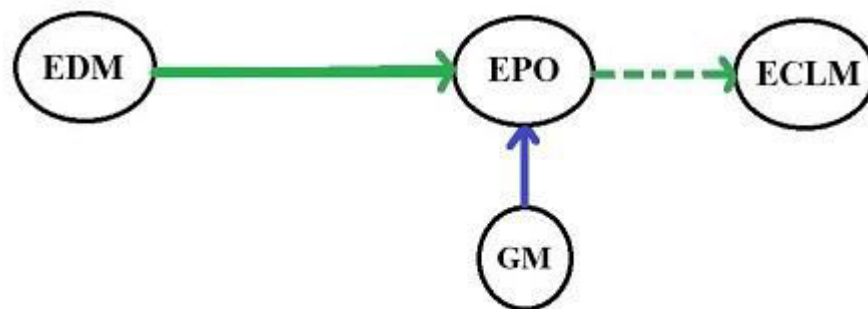


Figure 5 The green market solution(GM) to the environmental pollution problem(EPO)

Figure 5 above simply states how green markets(GM) can be used to address the environmental pollution problem(EPO) separating the environmentally dirty economy(EDM) from the environmentally clean economy(ECLM). In other words, Figure 5 above indicates that green markets(GM) can be used to fix the environmental problem(EPO) generated by the environmentally dirty market(EDM) by addressing it head on. Notice that the structure of the environmentally dirty market(EDM) in Figure 5 above is similar to the market structure of the environmentally dirty traditional market(ETM) of Adam Smith(Smith 1776) when under social

externality neutrality assumptions so that $EDM = ETM$, which means that there is an environmental pollution problem(EPO) separating the environmentally dirty traditional market(ETM) from the environmentally clean market(ECLM), and this means too that the environmentally dirty traditional market(ETM) can also be fixed using perfect green market thinking and theory(GM).

d) The need to understand whether or not we can transition to the environmentally clean economy through the use of green markets

In summary, based on the discussion above there is an environmental pollution problem separating the environmentally dirty economy from the environmentally clean economy; and this is because the environmentally dirty economy operates through the use of environmental pollution production markets. Since 2012 Rio +20(UNCSD 2012a; UNCSD 2012b), the world has been using dwarf green markets to manage the environmental pollution generation problem highlighted in 1987 by the Brundtland Commission(WCED 1987); and this is because the dwarf green economy works through the use of environmental pollution management markets, markets that are apparently delinked from the idea of the need to transition as soon as possible from the environmentally dirty economy to the environmentally clean economy and just focused on managing and bearing the problem(UNFCCC 2022), and which work in opposite ways as perfect green markets do(Muñoz 2016; Muñoz 2019). It has recently been pointed out that we cannot transition from the environmentally dirty economy to the environmentally clean economy using dwarf green markets because their use leaves a remaining environmental pollution problem active(Muñoz 2023), which keeps them permanently away from the world of environmentally clean markets. Now imagine the world would have gone the way of environmental pollution reduction markets a la green markets instead of dwarf green markets since 2012 when facing environmental pollution, things could be different. And this raises the question: Can we transition from the environmentally dirty economy to the environmental clean economy with the use of green markets? If Yes, why?. What are the implications of this? Among the goals of this paper is to provide answers to all those questions.

Goals of this paper

a) To highlight how green markets work in framework form and graphically; b) To point out how the expansion of green markets works analytically and graphically; c) To stress the structure of environmentally clean markets once the green markets expansions end both analytically and graphically; d) To indicate how the expansion of environmentally clean markets works analytically and graphically; e) To show the two natural development periods that would have followed had Adam Smith stated the theory of the perfect green markets in 1776 both analytically and graphically; f) To share the structure of the world of climate change under pollution reduction markets like green markets both analytically and graphically; and g) To

describe the structure of the world under environmentally clean markets, and hence, under climate change friendly environmentally clean market expansions both analytically and graphically.

Methodology

First the terminology used in this paper is shared. Second, how green markets work in framework form and graphically is pointed out. Third, how the expansion of green markets works analytically and graphically is highlighted. Fourth, the structure of environmentally clean markets once the green markets expansions end both analytically and graphically is indicated. Fifth, how the expansion of environmentally clean markets works analytically and graphically is stressed. Sixth, the two natural development periods that would have followed had Adam Smith stated the theory of the perfect green markets in 1776 both analytically and graphically are shared. Seventh, the structure of the world of climate change under pollution reduction markets like green markets both analytically and graphically is shown. Eight, the structure of the world under environmentally clean markets, and hence, under climate change friendly environmentally clean market expansions both analytically and graphically is described. And finally, some food for thoughts and relevant conclusions are listed.

Terminology

TM = The traditional market

GM = The green market

EDM = The environmentally dirty market

PO = Pollution problem

EPO = Environmental pollution problem

E[C] = Environmental cost externalization

I[c] = Environmental cost internalization

CLM = The clean market

EPORM = Environmental pollution reduction market

DM = The dirty market

ECLM = Environmentally clean market

DGM = Dwarf green market

POPM = Pollution production markets

EPOPM = Environmental pollution production market

PORM = Pollution reduction markets

EPORM = Environmental pollution reduction markets

RPO = Remaining pollution problem

REPO = Remaining environmental pollution problem

NEPO = New environmental problem

DGMP = Dwarf green market price

GMP = Green market price

EM = Environmental margin

TMP = Traditional market price

EDMP = Environmentally dirty market price

I[EPO] = Environmental pollution internalization

RETG = Renewable energy technology gap

Operational concepts, relevant market structures and externalization and internalization rules

A) Operational concepts

- 1) **Science**, *the world based on the scientific truth, this world falls if invalidated.*
- 2) **Ideology**, *the world based on the non-scientific truth, this world will tend to persist even if invalidated.*
- 3) **The theory-practice general consistency principle**, *the world where the theory of the model must match the practice.*
- 4) **The different model general inconsistency principle**, *the world where the theory and practice of different models are inconsistent with each other.*
- 5) **Academic facts**, *the science based truth.*
- 6) **Alternative academic facts**, *the non-science based truth.*
- 7) **Academic blindness**, *the inability to see academic facts due to the existence of knowledge gaps, paradigm shift based or otherwise.*
- 8) **Willful academic blindness**, *the willingness to ignore academic facts and consensus.*
- 9) **Sustainability**, *the world where the interplay of sustainability theory and sustainability practice is aimed at fixing or correcting embedded externality problems.*
- 10) **Sustainable development**, *the world where the interplay of sustainable development theory and sustainable development practice is aimed at patching or managing embedded externality problems.*
- 11) **Academic integrity**, *the duty to respect and defend academic facts and consensus.*
- 12) **Golden paradigm**, *one that does not creates abnormalities.*
- 13) **Flawed paradigm**, *one that creates abnormalities.*

- 14) **Kuhn's loop**, *the science based mechanism that leads to paradigm shift through abnormality correction.*
- 15) **Dirty economy**, *a pollution based economy.*
- 16) **Clean economy**, *a pollution less based economy.*
- 17) **Red Marxism**, *capitalism need to be replaced as it is destroying societies.*
- 18) **Green Marxism**, *dwarf green capitalism must be replaced as it is destroying nature.*
- 19) **The red socialism market**, *the social justice and equality based market.*
- 20) **The green socialism market**, *the environmental justice and equality based market.*
- 21) **Green capitalism**, *capitalism supported by green markets.*
- 22) **Dwarf green capitalism**, *capitalism supported by dwarf green markets.*
- 23) **Traditional market**, *the market cleared by the traditional market price.*
- 24) **Green market**, *the market cleared by the green market price.*
- 25) **Red market**, *the market cleared by the red market price.*
- 26) **Pollution production market**, *a market operating under distorted market pricing.*
- 27) **Environmental pollution production market**, *a market operating under environmentally distorted market pricing*
- 26) **Pollution reduction market**, *a market operating under a corrected distorted market price.*
- 27) **Environmental pollution reduction market**, *a market operating under an environmentally corrected distorted market price.*
- 28) **Pollution management market**, *a market operating at a pollution management cost led market price.*
- 29) **Environmental pollution management market**, *a market operating at an environmental pollution cost led market price.*
- 30) **Sustainability market**, *the one cleared by the sustainability market price.*
- 31) **Dwarf green market**, *the market cleared by the dwarf green market price.*
- 32) **Clean market**, *a market operation at zero pollution cost.*
- 33) **Environmentally clean market**, *a market operating at zero environmental pollution cost.*

B) Relevant market structures

If we have the following: a = social abnormality, c = environmental abnormality, A = dominant society, C = dominant environment, and B = the dominant economy, then the structure of relevant markets can be stated as indicated below:

1) The traditional market as a golden model

i) TM = B

Under externality neutrality assumptions the traditional market TM in section i) above is a golden paradigm, it produces no abnormalities.

2) The traditional market under social abnormalities(a)

ii) TM = aB

Under no social externality neutrality assumptions, the traditional market TM in section ii) above produces social abnormalities “a”. It is a flawed paradigm as it has social abnormalities to correct.

3) The traditional market under environmental abnormalities(c)

iii) TM = Bc

Under no environmental externality neutrality assumptions, the traditional market TM in section iii) above produces environmental abnormalities “c”. It is a flawed paradigm as it has environmental externalities to correct.

4) The traditional market under socio-environmental abnormalities(ac)

iv) TM = aBc

Under no socio-environmental externality neutrality assumptions, the traditional market TM in section iv) above produces socio-environmental abnormalities “ac”. It is a flawed paradigm as it has social and environmental externalities to correct.

5) The red market under environmental abnormalities(c)

v) RM = ABc

Under no environmental externality assumptions, the red market RM in section v) above produces environmental abnormalities. It is a flawed paradigm as it has environmental externalities to correct. Notice that in the red market RM, both society(A) and economy(B) are in dominant form.

6) The green market under social abnormalities(a)

vi) GM = aBC

Under no social externality assumptions, the green market GM in section vi) above produces social abnormalities. It is a flawed paradigm as it has social externalities to correct. Notice that in the green market GM, both the economy(B) and the environment(C) are in dominant form.

7) *The sustainability market has no abnormalities*

vii) SM = ABC

The sustainability market SM in section vii) above produces no abnormalities as all components are in dominant form since all components are now endogenous to the model. It is a golden paradigm as it has no abnormalities to correct.

C) Abnormality externalization and internalization rules

If y, x, z are three abnormalities and Y, X, Z are the corrected variables and if $E[] =$ externalization and $I[] =$ internalization, then the following holds true:

- | | | |
|------------------|------------------|-----------------|
| a) $E[Y] = y$ | b) $E[X] = x$ | c) $E[Z] = z$ |
| d) $I[y] = Y$ | e) $I[x] = X$ | f) $I[z] = Z$ |
| g) $I[E[Y]] = Y$ | h) $E[I[y]] = y$ | i) $E[YX] = yx$ |

The working of the green market solution to the environmental pollution problem in simple terms

If we insert the green market solutions(GM) in Figure 5 above between the environmentally dirty market(EDM) and the environmentally clean market(ECLM), we can see that it internalizes the pollution problem($I[EPO]$) created by the environmentally dirty market generating a new market, the green market(GM), that can be transition towards the environmentally clean economy as in green markets(GM) pollution reduction is a profit making opportunity, a transition framework that has been recently shared(Muñoz 2022); and which is summarized in Figure 6 below:

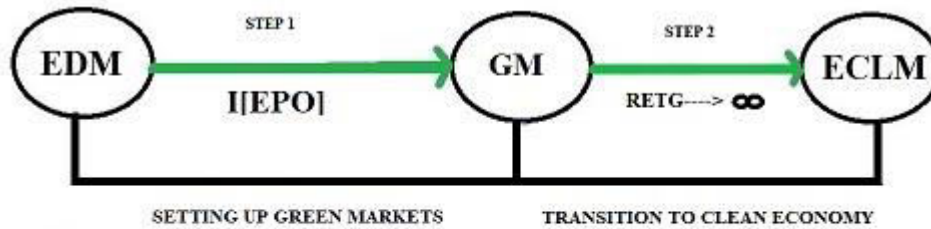


Figure 6 The green market(GM) solution has two steps: i) The internalization of the environmental problem(I[EPO]) to shift the environmentally dirty market(EDM) to the green market(GM); and ii) the transition of the green market(GM) towards the environmentally clean market(ECLM) through the closing of the renewable energy technology gap($RETG \rightarrow \infty$) to be able to produce at the lowest green market price through the lowest environmental cost possible.

Figure 6 above summarizes how the green market solution(GM) first internalizes the environmental pollution problem(I[EPO]) affecting the environmentally dirty market(EDM), shifting the environmentally dirty market(EDM) to the green market(GM) as indicated by the green arrow from EDM to GM; and then the green market(GM) can be transitioned towards the environmentally clean economy(ECLM) as indicated by the green arrow from GM to ECLM until the point where the environmental cost of production in the green market is zero($EM = 0$), point at which the green market becomes an environmentally clean market($GM = ECLM$) as when $EM = 0$, then the green market price equals the environmentally clean economy market price($GMP = ECLMP$). In other words, Figure 6 above helps us to see the following: i) the green market(GM) internalizes the environmental pollution problem EPO as indicated by the green arrow from EDM to DGM so that there is no remaining environmental pollution problem(REPO) as environmental cost of production are no longer externalized($REPO = 0$) in green markets(GM); ii) environmental cost internalization means(I[EPO]) means that now environmental pollution reduction is a good profit making opportunity as the lowest the environmental cost of production, the lowest the green market price so more business activity takes place, and therefore, there will be a tendency to produce at the lowest green market price possible to maximize profits, meaning more consumption and more production of lower pollution content good and services at lower prices; and iii) And this indicates that a transition from green markets(GM) to environmentally clean markets(ECLM) is possible to the point that when there is a green market price(GMP) where the environmental cost of pollution is zero($EM = 0$), then the green market(GM) becomes an environmentally clean market(ECLM). Therefore, the internalization of the environmental pollution problem(I[EPO]) leaves the environmentally dirty economy(EDM) behind as now the world is ruled by green markets(GM), which have a clear transition path towards a world under fully environmentally clean markets(ECLM) as green markets(GM) will tend to produce at the lowest green market price possible, and this is because they would tend to operate at the lowest environmental cost possible, approaching the environmentally clean economy(ECLM) in an increasingly more and more climate change friendly manner.

The working of the green markets solution to the environmental production problem graphically

We can transform the information in step 1/the setting up green markets(GM); and in step 2/the transition towards environmentally clean markets(ECLM) shown in Figure 6 above into graphical information step by step as it is indicated below:

a) The setting up of green markets / step 1

When we internalized the environmental pollution problem(I[EPO]) we shift the structure of the environmentally dirty market(EDM) to the structure of the green market(GM), a situation point out in Figure 7 below:

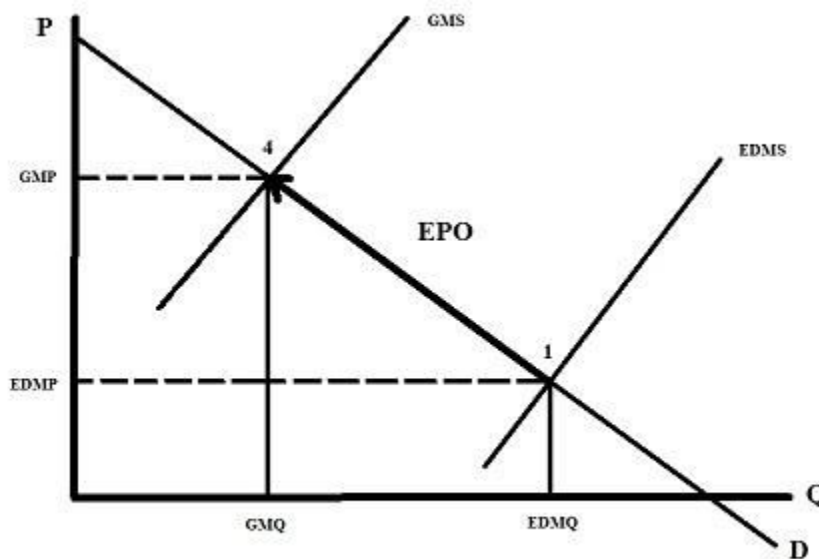


Figure 7 Setting up green markets(GM) by internalizing the environmental problem(EPO) making now environmental pollution reduction a nice business or profit making opportunity

We can extract the following relevant information from Figure 7 above: i) At point 1 we have environmentally dirty market(EDM) where the environmentally dirty supply EDMS meets the demand D at the environmentally dirty market price EDMP; ii) At point 1 we have the environmental problem(EPO) generated by the environmentally dirty market(EDM) as indicated by the black arrow that goes from point 1 to point 4; iii) At point 4 we have the green market(GM) where the green market supply GMS meets the demand D at the green market price GMP; iv) At point 4 the environmental pollution problem(EPO) is internalized so there is no remaining environmental pollution(REPO) being externalized; iv) If the environmentally dirty market(EDM) is placed under green markets(GM) then no environmental pollution cost is being externalized, a situation taking place at point 4; and v) hence the setting up of green markets(GM) reduces pollution by internalizing the pollution problem; and it creates the tool to transition towards environmentally clean markets(ECLM).

The working of perfect green markets as pollution reduction markets

If we expand the green market(GM) consistent with the situation in Figure 7 above, then when the environmental pollution cost(EM) associated with the green market decreases, this leads to lower green market prices(GMP), which increases green production and green consumption and green profits while decreasing environmental pollution(EPO) at the same time shifting supplies from left to right, as summarized in Figure 8 below:

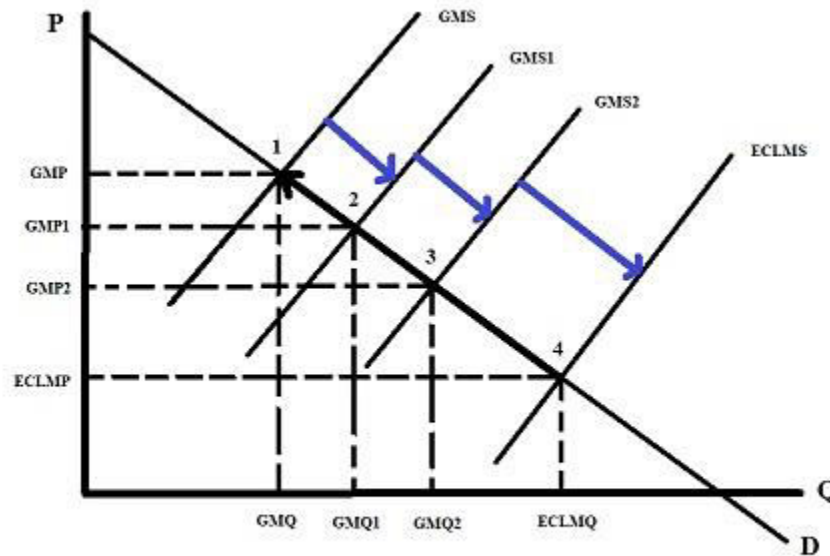


Figure 8 Green markets(GM) expand from left to right as the environmental cost of production decreases the green market price decreases and production and consumption of lower pollution content goods and services increases too

The blue arrows in Figure 8 above indicate the direction that green markets(GM) follow when they expand tending to produce and consume at the lowest green market price(GMP) possible in response to producing at the lowest environmental cost(EM) possible while making money and reducing pollution at the same time. Also notice that as the environmental cost of production(EM) decreases the green market price(GMP) decreases from GMP to GMP1 from GMP1 to GMP2 from GMP2 to ECLMP shifting supplies accordingly, which explains why production and consumption of lower pollution content good and services takes place as the environmental cost decreases so that $ECLMQ > GMQ2 > GMQ1 > GMQ$.

In particular we can appreciate based on Figure 8 above the following: i) that when we expand the green market(GM) from point 1 to point 2, from point 2 to point 3, and from point 3 to point 4 a result of constantly decreasing environmental pollution costs from point to point($EM1 > EM2 > EM3 > EM4$) we are reducing environmental pollution while making money and we are getting closer and closer to the environmentally clean economy(ECLM) at the same time; ii) there is no remaining pollution problem(REPO) in the green market(GM) since here the environmental pollution problem is internalized(I[EPO]); and therefore, iii) Green

markets(GM) provide a profitable way to reduce environmental pollution as we transition towards the environmentally clean market(ECLM).

Implication:

Setting up green markets reduces pollution through environmental externality internalization while creating a market tool that will tend towards the environmental clean economy as environmental pollution reduction behaviors supports profitable business behavior since producing at the lowest environmental cost possible leads to market expansion and profit making opportunities that are climate change friendly.

The end of the transition to the environmentally clean market

As the environmental pollution cost(EM) associated with business activity decreases the green market price($GMP = P + EM$) decreases leading to green market expansions left to right until the environmental pollution cost becomes zero($EM = 0$), where the green market price equals the environmentally clean market price $GMP = ECLMP$ and therefore, the green market becomes an environmentally clean market. In other words, when the environmental cost of production is zero($EM = 0$) green market supply GMS becomes the environmentally clean market supply ECLMS ending the transition from green markets to environmentally clean markets as indicated in Figure 9 below:

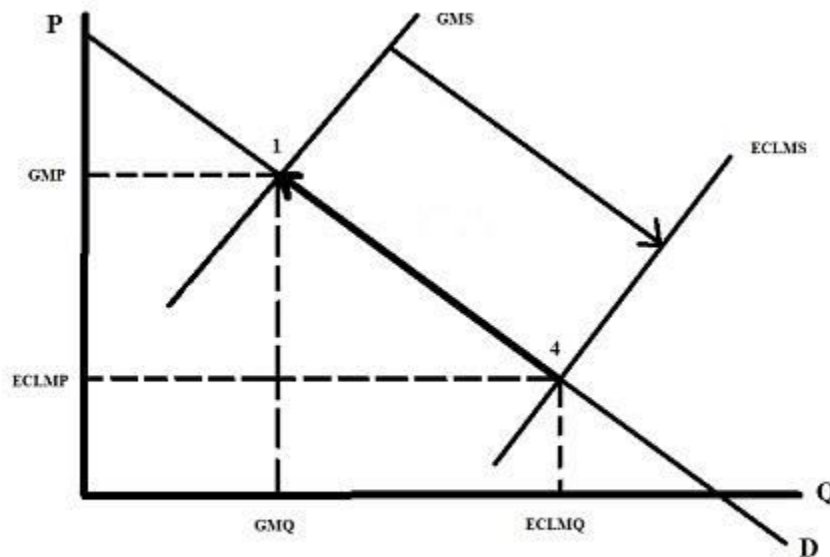


Figure 9 The transition from the green market(GM) towards the environmentally clean economy(ECLM) through the closing of the renewable energy technology gaps ends when the environmental cost associated with economic activity is zero($EM = 0$).

We can highlight the following aspects about environmentally clean markets based on Figure 9 above: i) The transition from the environmentally dirty economy(EDM) through green markets(GM) begins at point 1 and ends at point 4, where we have an environmentally clean

market cleared by the environmentally clean market price (ECLMP) and producing and consuming ECLMQ; ii) Environmental pollution cost at point 4 is zero ($EM_4 = 0$) so at this point the green market price $GMP = P + EM_4$ is equal to the environmentally clean market price $ECLMP = P$ as $EM_4 = 0$; and iii) Production and consumption in environmentally clean markets is greater than production and consumption in green markets $ECLMQ > GMQ$, which means that we are producing and consuming cleaner goods and services at lower prices, a climate change friendly characteristic. Moreover, we can use figure 9 above to point out the existence of two periods when dealing with the environmental pollution problem head on: i) The transition expansion period which starts soon after setting up green markets (GM) at point 1 and which ends at point 4 when green markets become clean markets; and ii) The environmentally clean markets expansion periods that starts at point 4 and moves to the right as environmentally clean markets will tend to produce at the lowest environmentally clean market price possible.

The way the expansion of environmentally clean markets work

As the environmentally clean market price decreases (ECLMP) the environmentally clean market supply ECLMS will shift to the right as more environmentally clean products and services are going to be produced and consumed then, a situation summarized in Figure 10 below:

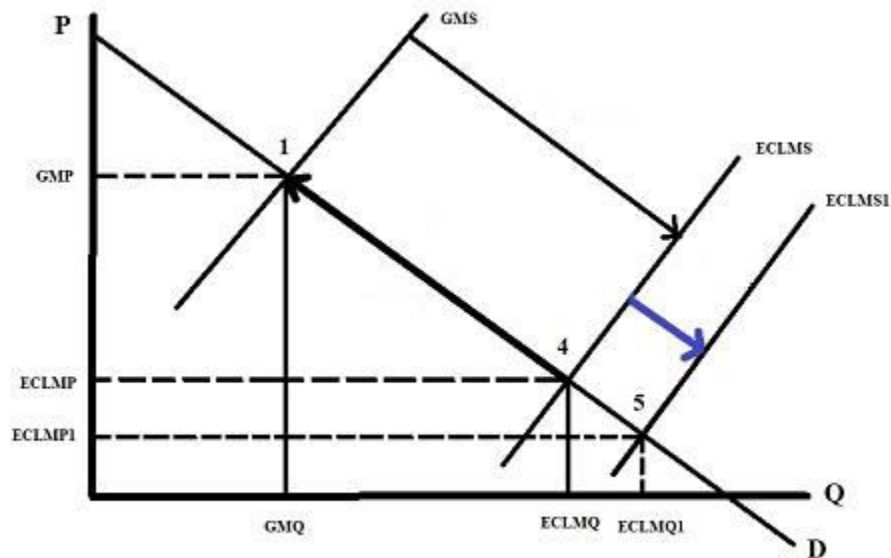


Figure 10 The working of the expansion of environmentally clean markets once in place (ECLM)

The blue arrow in Figure 10 above indicates that in response of a clean market cost decrease there is a decrease in clean market prices from ECLMP to ECLMP1 which leads to an increased on production and consumption of environmentally clean goods and services from ECLMQ TO ECLMQ1. In other words, the decrease in environmentally clean market prices leads to a shift in environmentally clean market supply from ECLMS to ECLMS1 that goes from

point 4 to point 5. These expansions are pollution less expansions as in environmentally clean markets there is not environmental pollution associated with production.

The working of markets had Adam Smith giving us the theory of the perfect traditional green market

Imagine that instead of the theory of the perfect traditional market, a pollution production market, Adam Smith (Smith 1776) would have given us the theory of the perfect green market, a pollution reduction market, where the pollution cost of production ($EM > 0$) is positive and endogenous and its market price is $GMP = P + EM$, then we would have had the market situation shown in Figure 11 below:

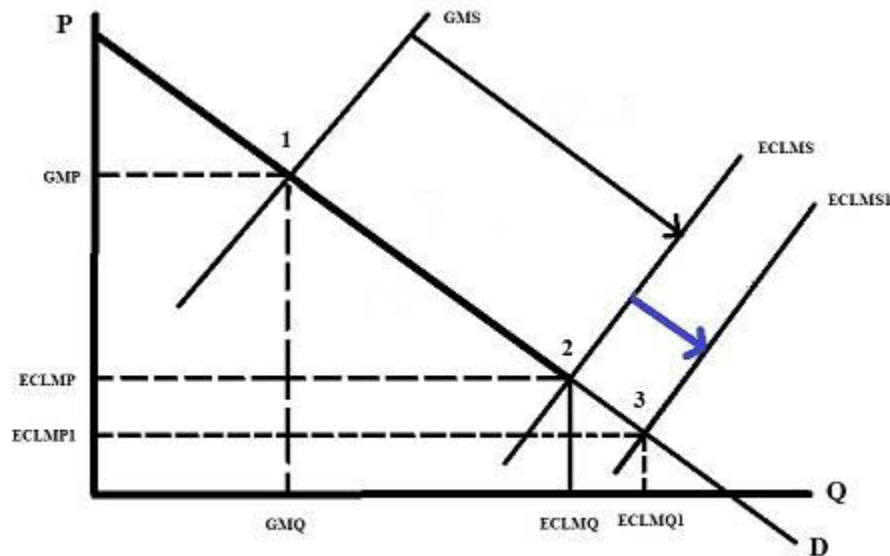


Figure 11 The working of markets had Adam Smith giving us the theory of the perfect green market in 1776

At point 1 in Figure 11 above there would have been a green market (GM), a market cleared by the green market price ($GMP = P + EM$) and where production and consumption is GMQ . At point 2 in Figure 11 above there would have been an environmentally clean market (ECLM), a market cleared by the environmentally clean market price ($ECLMP = P$, since $EM = 0$) and where production and consumption is $ECLMQ$. As producing towards point 2 is more profitable for green producers, then green production will expand to the right of point 1 towards point 2, and at point 2 green production and clean production are one and the same. Therefore, we can appreciate two periods that would have taken place had Adam Smith led us to set up green markets from the beginning: i) The green market expansion period, that goes from point 1 to point 2 as indicated by the black arrow from GMS to $ECLMS$; and ii) the environmentally clean market expansion period that goes from point 2 to the right as indicated by the blue arrow from point 2 to point 3.

Addressing climate change head on in 2012 would have taken two steps

The two steps required to addressing climate change head on since 2012 Rio + 20 or even earlier since 1987 WCED “Our Common Future” are: to set up green markets to internalized the environmental problem, and then transition the green markets towards environmentally clean markets through step by step closing renewable energy technology gaps to continue producing at the lowest pollution cost possible with the very long term goal of zero pollution production costs.

i) Setting up green markets, the first climate change friendly move

The world structure after setting up green markets is summarized in Figure 12 below:

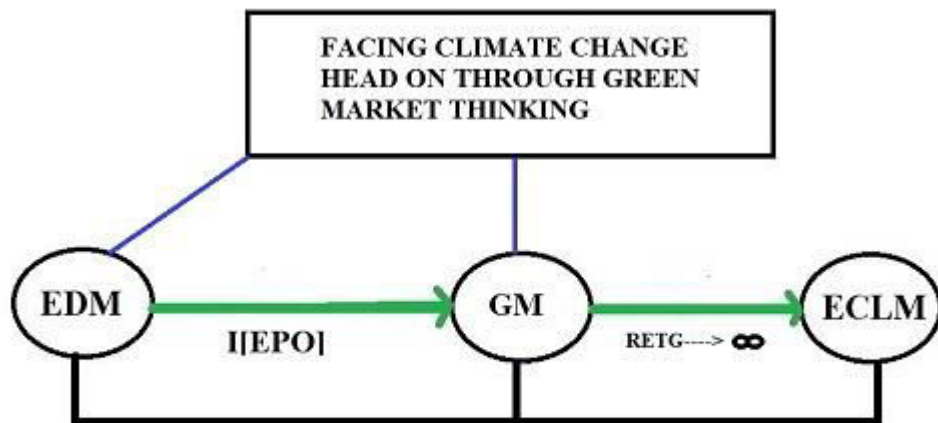


Figure 12 Addressing the environmental pollution problem(EPO) of the environmentally dirty market(EDM) directly through environmental cost internalization(I[EPO]) leads to pollution reduction markets like the green market(GM)

Figure 12 above tells us that when we internalized the environmental cost of production(I[EPO]) in the environmentally dirty market(EDM) it shifts towards green markets(GM) as indicated by the green arrow from EDM to GM, which means we are dealing with the environmental pollution problem and climate change then head on.

ii) Transitioning green markets towards environmentally clean markets, the second climate change friendly move

When green markets(GM) are in place, the old environmentally dirty market(EDM) and its knowledge base is left behind, and now we have a market tool, green markets(GM), that can be transitioned towards the environmentally clean economy by constantly aiming at producing at the lowest pollution cost possible until there is no pollution cost, a situation highlighted in Figure 13 below:

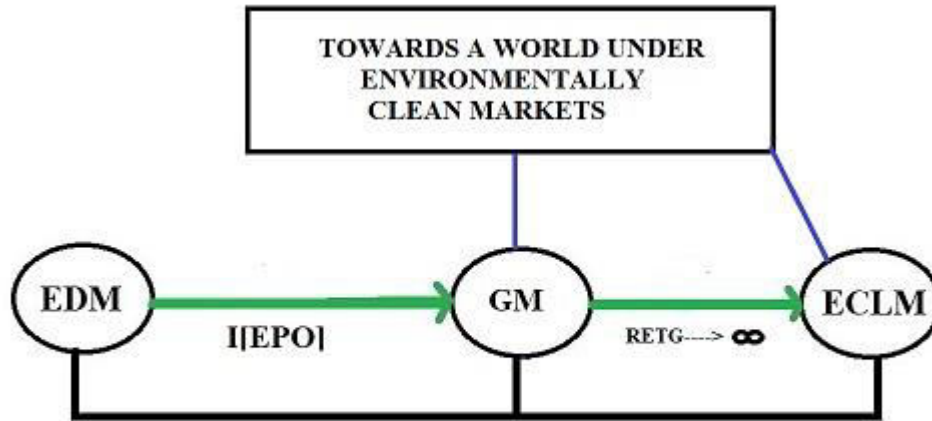


Figure 13 The transition from the green economy(GM) to the environmentally clean economy(ECLM) ends with a world under environmentally clean market(ECLM) expansions without environmental pollution generation; and hence, very climate change friendly market expansions.

Figure 13 above highlights that when green markets(GM) are in place then a link to transition green market(GM) expansions toward environmentally clean market(ECLM) expansions is now in place too, which leads toward economic expansions of increasing climate change friendliness as the environmental pollution costs goes lower and lower with each expansion.

Food for thoughts

a) In the world of dwarf green markets, are dwarf green producers and dwarf green consumers leaders in development? I think No, what do you think?; b) In the world of perfect green markets, are green producers and green consumers followers in development? I think No, what do you think?; and c) In the world of perfect traditional markets, are traditional producers and traditional consumers followers in development? I think No, what do you think?

Conclusions

First, it was pointed out that the green market solution to the environmental problem created by the environmentally dirty economy has two steps, the setting up of green markets, and then transitioning the green market towards the environmentally clean market. Second, it was stressed that when you create environmental dirty markets you create an environmental pollution problems, that when you internalized the pollution problem you shift dirty markets into green markets, and that when you create green markets you have a tool to transition towards environmentally clean markets. Third, it was highlighted that when green markets are in place, they expand to the right as they tend to produce at the lowest green market price as it is producing at the lowest environmental pollution cost possible. Fourth, it was indicated that the

transition from the green market to the environmental clean market ends when the environmental pollution cost becomes zero. Fifth, it was mentioned that when the environmental clean market cost margin decreases the environmentally clean market price decreases too shifting the clean market supply to the right as more clean good and services are produced and consumed. Sixth, I was said that if Adam Smith would have given us the perfect green market theory in 1776 we would have seen two types of expansions: a green market expansion towards environmentally clean markets; and an expansion of environmentally clean markets, two climate change friendly types of economic expansions. And finally, it was shown that setting up green markets and transitioning those markets to environmentally clean markets would have been the correct way for addressing the environmental pollution problem head on through climate change friendly ways since 2012 Rio + 20.

In general, it was shown that green markets can be used to transition towards the environmentally clean economy leaving behind the old environmentally dirty world once and for all; and this is because once green markets are in place they will tend to produce at the lowest environmental cost possible as by doing so it makes more money; and as the environmental cost of production continues to decrease green markets expand towards environmentally clean markets, and when their environmentally cost of production becomes zero, then green markets become environmentally clean markets.

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