EJSIT
European Journal of Science, Innovation and Technology
ISSN: 2786-4936
www.ejsit-journal.com
Volume 3 | Number 5 | 2023

Sustainability Thought 183: How Would the Structure of a Bipolar World Where Developing Countries Have Dwarf Green Markets and Developed Countries Have Green Markets Look Like? Which World Would Collapse First in an Open System Environment?

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ABSTRACT

We know that dwarf green markets and green markets work in opposite ways; and we know that we have been avoiding to shift from the perfect traditional market way of thinking to the perfect green market way of thinking since 2012 Rio + 20 Conference when we had a chance to orderly transition from the environmentally dirty economy to the environmentally clean economy, but we missed it. We missed the opportunity to go beyond business as always as the Brundtland Commission asked the world to do. Imagine that suddenly developed countries decide to go full the green market way as they have the economic resources needed to invest in closing the renewable energy technology gap to transition green markets towards environmentally clean economies, where environmental pollution reduction is now a good profit making opportunity. On the other hand, imagine that developing countries have no choice, but to stay within dwarf green markets as they do not have the economic resources to close their renewable energy technology gaps to transition to environmentally clean world. How would countries behave in a closed system environment in this bipolar world? How would they behave in an open system environment in this bipolar world? And this raises important questions such as: How would the structure of a bipolar world where developing countries have dwarf green markets and developed countries have green markets look like? Which world would collapse under an open system environment? What are the implications of this? Among the goals of this paper is to provide answers to the questions above.

Key words: traditional market, environmental pollution production market, green market, environmental pollution reduction market, dwarf green market, environmental pollution management market, clean market, environmentally clean market, environmental pollution-less market, environmental pollution problem, developing country, developed country, traditional market price, green market price, dwarf green market price

INTRODUCTION

a) The traditional market and its environmental pollution problem

i) The pollution production market

It has been pointed out recently (Muñoz, 2023a) that the traditional market (TM) is an environmental pollution production market (EPOPM), in the short term environmental pollution generation is minimal, but in the very long term the environmental pollution generated accumulates creating an environmental pollution problem (EPO) affecting the sustainability of the traditional market (TM), a situation summarized in Figure 1 below:

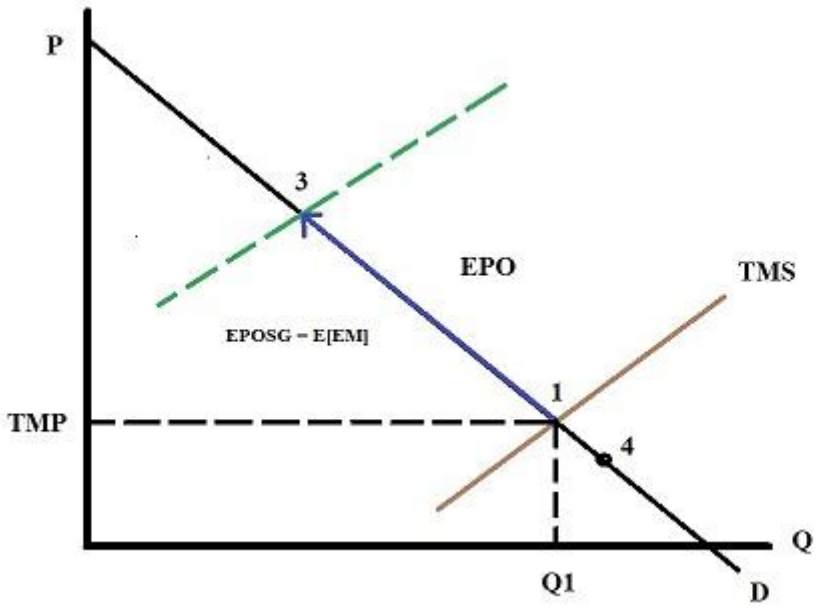

Figure 1. The environmental pollution problem (EPO) associated with the traditional market (TM) of Adam Smith's model and its expansion

We have a traditional market (TM) at point 1, where the traditional market price (TMP) clears the market and the traditional quantity produced and the traditional quantity consumed is Q1, the point where the traditional supply (TMS) meets the demand (D). The blue arrow going from point 1 to point 3 represent the environmental pollution problem (EPO) that the traditional market (TM) has currently accumulated. Notice that if the traditional market (TM) expands by shifting the traditional market supply (TMS) to the right from point 1 to point 4, then more traditional production and consumption takes place so that Q > Q1 at this lower traditional market price (TMP), expanding the environmental pollution problem (EPO) by the distance from point 1 to point 4 as indicated by the expanded arrow, which is what makes the traditional market an environmental pollution production market (EPOPM); and hence, TM = EPOPM. Notice too that as environmental cost is being externalized (E[EM]) an environmental pollution sustainability gap (EPOSG) is created affecting the sustainability of the traditional market (TM) so that EPOSG = E[EM], which is the distance from point 1 to point 3.

ii) The structure of the pollution production market price

As the traditional market (TM) produces at economic cost (ECM) plus profits(i), then the structure of the pollution production market price (EPOPMP) is the same as the structure of the traditional market price (TMP = P = ECM + i) so that:

$$TMP = EPOPMP = P = ECM + i$$

Notice that the traditional market price (TMP) and therefore, the environmental pollution production market price (EPOPMP) does not reflect environmental concerns as it does not reflect the environmental costs associated with business activity.

iii) The environmental pollution sustainability gap (EPOSG)

The environmental pollution sustainability gap (EPOSG) is the gap created by externalizing the environmental cost margin (E[EM]), a process that allows the traditional market (TM) to be able to operate at the lowest traditional market price possible reflected by traditional market price (TMP) at point 1 in Figure 1 above. Hence, the distance from point 1 to point 3 is the environmental pollution sustainability gap (EPOSG) affecting the working of the traditional market (TM), which is equal to the environmental cost margin (EM) being externalized so that EPOSG = E[EM]. Notice too in Figure 1 above that since both the

environmental pollution sustainability gap (EPOSG) and the environmental pollution problem (EPO) are the distance from point 1 to point 3 in Figure 1 above then they are equal so that EPOSG = EPO = E[EM].

b) The two solutions to the environmental pollution problem

The perfect and imperfect solutions to the environmental pollution problem (EPO) created by expanding traditional markets (TM) because they do not account for the environmental cost associated with business activity as the environmental margin (EM) is externalized (E[EM]); and hence, not reflected in their traditional pricing mechanism have been recently pointed out (Muñoz, 2023b) as being the green market solution (GM) and the dwarf green markets solution (DGM) respectively, and they can be summarized as indicated in Figure 2 below:

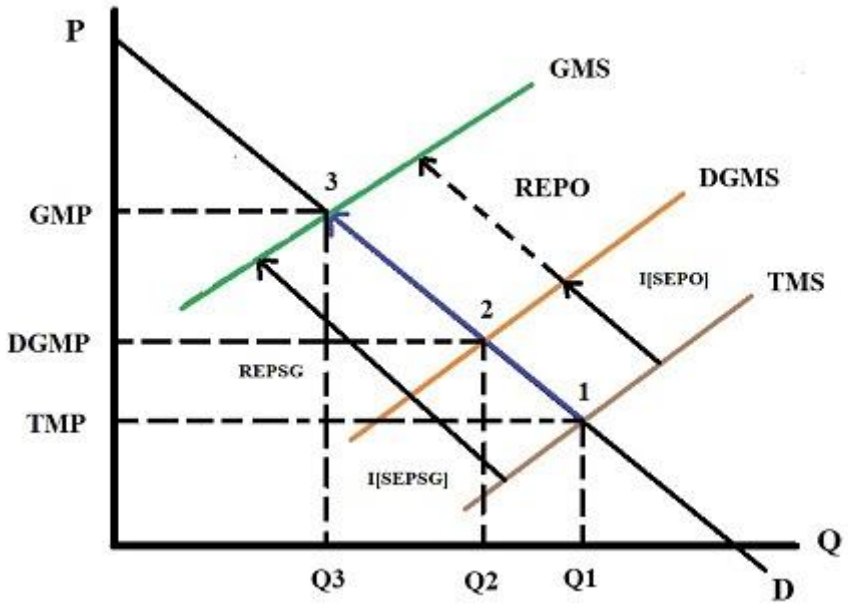

Figure 2. The dwarf green market solution (DGM) and the perfect green market (GM) solution to the environmental pollution problem associated with the traditional market (TM)

Figure 2 above shows the two market solutions to the environmental pollution problem (EPO) created by environmental pollution production markets (EPOPM) such as the traditional market (TM), one is the dwarf green market solution (DGM) found at point 2, where dwarf green market supply (DGMS) meets demand (D); and the other is the green market solution (GM) indicated at point 3, where the green market supply (GMS) meets demand (D), solutions that are described in detail one by one below:

i) The imperfect market solution

1) The dwarf green market solution

When environmental pollution management markets (EPOMM) are taken as the solution we create dwarf green markets (DGM) such as the one at point 2 in Figure 2 above where the dwarf green market price (DGMP) clears the market; and the dwarf green quantity produced and consumed is Q2. Notice that when only a portion of the environmental cost associated with the business is accounted for (DEM) to correct the traditional market model (TM) then the traditional market supply TMS shifts from point 1 to point 2. Hence, at point 2 we have the structure of the imperfect dwarf green market (DGM), a market that requires ongoing government intervention. Notice that at point 2 in Figure 2 above still there is a remaining environmental pollution problem (REPO) as still some environmental costs

associated with business activity are being externalized in dwarf green markets (DGM) or environmental pollution management markets (EPOMM) as indicated by the broken arrow going from point 2 to point 3, which affects the sustainability of the dwarf green market (DGM). In other words when only some of the environmental pollution problem (SEPO) is addressed and internalized (I[SEPO]) in the traditional market model(TM), then only some environmental pollution costs or dwarf environmental margins (DEM) are accounted for too in the traditional market pricing mechanism, which reflects the gap from point 1 to point 2 in Figure 2 above; and when this is done, then the traditional market supply (TMS) contracts from point 1 to point 2 and takes the form of the dwarf green market supply (DGMS) as it is now an environmental pollution management market supply (EPOMMS), which is affected by the remaining environmental production problem (REPO); and hence the remaining environmental pollution sustainability gap (REPOSG), the distance from point 2 to point 3. See that consumption in dwarf green markets is less than consumption in traditional markets since Q2 < Q1 as the dwarf green market price is higher than the traditional market price (DGMP > TMP); and therefore, producing and consuming less in dwarf green markets means polluting less.

2) The structure of the dwarf green market price

As the dwarf green market price (DGMP) is an environmental pollution management market price (EPOMMP) that comes along when adding a dwarf green margin (DEM) to the traditional market price mechanism (TMP = P = ECM + i) as a pollution management cost to reflect some environmental concerns as per the environmental pollution manager, then the price structure is:

DGMP = EPOMMP = TMP + DEM = P + DEM = ECM + i + DEM

Notice that the dwarf green market price (DGMP) and therefore, the environmental pollution management market price (EPOMMP) does reflect some environmental concerns, which are addressed by managing some environmental pollution (DEM) in a way delinked from the actual environmental pollution sustainability gap (EPOSG); and that means in this world environmental pollution is here to stay.

3) Understanding the shift from a pollution production market to a pollution management market

When you add a pollution management cost or dwarf environmental margin (DEM) in the pricing mechanism of environmental pollution production markets (EPOPM) such as the traditional market (TM) you are internalizing some environmental problem (I[SEPO]), which shifts the traditional market (TM) towards dwarf green markets, a shift that is summarized as indicated below:

I[SEPO] = DEM

EPOPMP = TMP = ECM + i ----------→ EPOMMP = DGMP = ECM + i + DEM

Therefore, we see in the formula above that the internalization of some of the environmental problem by adding a dwarf green margin (I[SEPO] = DEM) transforms environmental pollution production markets (EPOPM) or traditional markets (TM) into environmental pollution management markets (EPOMM) or dwarf green markets (DGM).

4) The remaining environmental pollution sustainability gap (REPOSG)

The remaining environmental pollution sustainability gap (REPOSG) is the gap that separates the dwarf green market (DGM) from the green market (GM) in Figure 2 above as indicated by the broken arrow, the distance from point 2 to point 3, which reflects the part of the environmental pollution cost still being externalized as the pollution process still continues to take place while environmental pollution management takes place. In other words, when some of the environmental pollution problem (SEPO) is addressed by setting the dwarf green margin (I[SEPO] = DEM) as the environmental cost to be passed to consumers

to reduce production and consumption from point 1 to point 2 in Figure 2 above, then the remaining environmental pollution sustainability gap (REPOSG) is created, which affects the sustainability of the dwarf green market (DGM).

Notice that if we compare Figure 1 and Figure 2 above we can see that i) The remaining environmental problem (REPO) in dwarf green markets in Figure 2 above can be found by subtracting the accounting of some environmental problem (SEPO) from the environmental problem (EPO) in Figure 1 above so that REPO = EPO – SEPO, ii) The remaining environmental pollution sustainability gap (REPOSG) can be found by subtracting from the environmental pollution sustainability gap (EPOSG = E[EM]) affecting traditional markets (TM) in Figure 1 above the dwarf green market (DEM) associated with addressing some environmental problem (I[SEPO]) so that the REPOSG = EPOSG – I[SEPO] = E[EM] – DEM; and since EPOSG > I[SEPO] and E[EM] > DEM, then we have an active remaining environmental sustainability gap fed by remaining environmental cost externalization (E[EM] – DEM) problem that will affect the sustainability of environmental pollution management markets like dwarf green markets (DGM); and hence, iii) The remaining environmental pollution sustainability gap (REPOSG) is equal to the remaining environmental problem (REPO) so that REPOSG = REPO, the distance from point 2 to point 3 in Figure 2 above. Finally, notice that addressing some environmental problem I[SEPO] means we are closing some of the environmental pollution sustainability gap (I[SEPOSG]) so that the remaining environmental pollution sustainability gap (REPOSG) can also be seen as REPOSG = EPOSG – I[SEPOSG] = E[EM] – DEM as I[SEPO] = I[SEPOSG].

ii) The perfect market solution

1) The green market solution

When environmental cost internalization (I{E[EM]} = EM) is taken as the solution we create green markets (GM) such as the one at point 3 in Figure 2 above where the green market price (GMP) clears the market; and the green quantity produced and consumed is Q3. Notice that now when all the environmental cost associated with the business activity is internalized (I{E[EM]} = EM), the traditional market supply TMS shifts from point 1 to point 3. Therefore, at point 3 we have the structure of a perfect green market (GM). See that at point 3 there is no longer a remaining environmental pollution problem (REPO = 0) as no environmental costs are now externalized (E[EM] = 0) as indicated by the continuous black arrow that goes from point 1 to point 3.

2) The structure of the green market price

As the green market price (GMP) is an environmental pollution reduction market price (EPORMP) that comes along when adding an environmental margin or green margin (EM) to the traditional market price mechanism (TMP = P = ECM + i) as a pollution reduction cost to reflect that now the environmental problem (EPO) is an internal problem as now the environmental cost of doing business is internalized (I{E[EM] = EM}), then the price structure is:

$$\mathbf{GMP = EPORMP = TMP + EM = P + EM = ECM + i + EM}$$

Notice that the green market price (GMP); and therefore, the environmental pollution reduction market price (EPORMP) does reflects all environmental concerns, which are addressed by internalizing the environmental pollution problem in a way linked to the actual environmental pollution sustainability gap (EPOSG); and that means this world is moving away from environmental pollution as it goes beyond business as usual in a way that can be transitioned towards environmentally clean economies in the long term.

3) Understanding the shift from a pollution production market to a perfect green market

When you add the environmental pollution cost or green margin (EM) in the pricing mechanism of environmental pollution production markets (EPOPM) such as the traditional

market (TM) you are internalizing the environmental problem (I[EPO] = I{E[EM]} = EM), which shifts the traditional market (TM) towards perfect green markets (GM), a shift that is summarized as indicated below:

I[EPO] = I{E[EM]} = EM

EPOPMP = TMP = ECM + i ----------→ EPORMP = GMP = ECM + i + EM

Therefore, we see in the formula above that the internalization of the environmental problem by adding a green margin (I[EPO] = I{E[EM]} = EM) transforms environmental pollution production markets (EPOPM) or traditional markets (TM) into environmental pollution reduction markets (EPORM) or green markets (GM), where in the long term as the environmental cost of green production decreases and decreases you can produce at lower and lower green market prices, making this way pollution reduction a profitable business opportunity, which will provide the incentive that businesses need to drive to produce at the lowest green market price possible.

c) The structure of the dwarf green market and green market in a bipolar world

If we think about a bipolar world where there are green markets (GM) and dwarf green markets (DGM) coexisting, then we can see a situation as the one indicated in Figure 3 below:

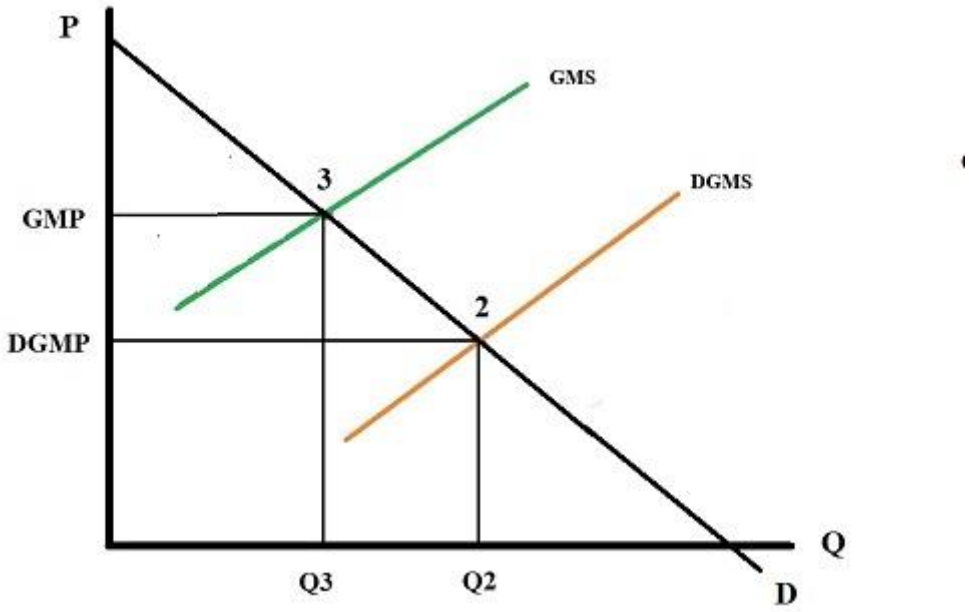

Figure 3. The setting up of green markets and dwarf green markets

There is a dwarf green market (DGM) at point 2 in Figure 3 above producing at the dwarf green market price (DGMP) and consuming Q2; and there is a green market (GM) at point 3 producing at the green market price (GMP) and consuming Q3. Notice that consumption in dwarf green markets (DGM) is higher than consumption in green markets (GM) as Q2 > Q3.

d) The working of dwarf green markets and green markets in the bipolar world in the long term

Production and consumption behavior in each market is affected by the way they work in the long term; and in the long term they work in opposite ways (Muñoz, 2019) as one markets works on expansions while the other market works on contractions as indicated in Figure 4 below:

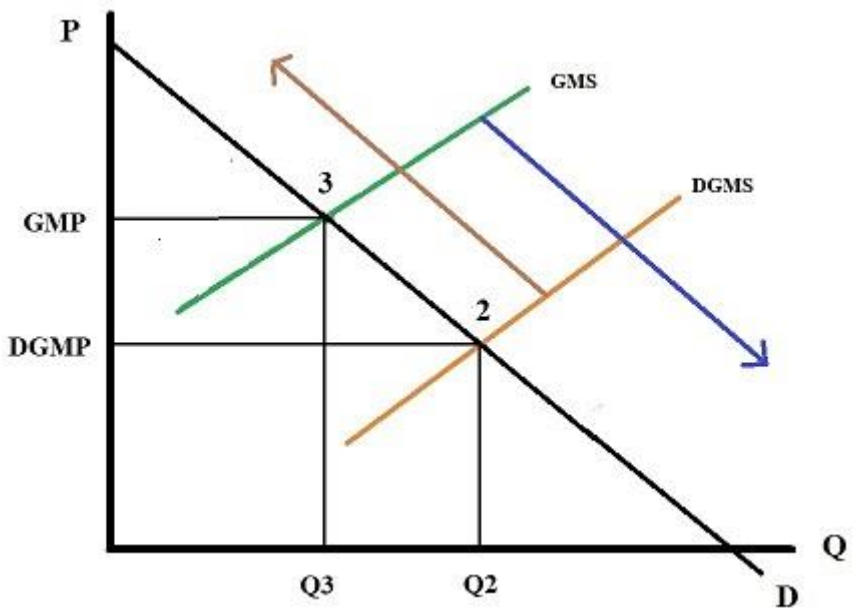

Figure 4. The working of dwarf green markets and green markets

We can appreciate in Figure 4 above that since green markets (GM) tend to produce at the lowest green market price possible they expand from left to right leading to production and consumption of increasingly cheaper and less pollution based goods and services as indicated by the blue line. On the other hand, we can see in Figure 4 above that since dwarf green markets (DGM) produce at the dwarf green market margin DEM set up by the pollution manager they contract from right to left as the environmental manager decides to increase the size of the environmental margin to be charged to consumers to decrease pollution by decreasing production and consumption. In other words, in the long term green consumers will have an increasing supply of cheaper and less pollution based goods and services as the green market expands as indicated by the blue arrow going from left to right while dwarf green consumers will have a contracting supply of more expensive and still pollution based goods and services as the dwarf green market contracts as indicating by the brown arrow going from right to left. Hence, the behavior of green consumers and of dwarf green consumers as rational decision makers in this bipolar world in Figure 4 above will depend on whether the bipolar world is a close system or is an open system, and whether in each case we are considering the short and the long term.

e) Imaging a bipolar world where developing countries operate under dwarf green market thinking and the developed world works under perfect green market thinking; and how markets would behave under closed and open system thinking in the short term and in the long term.

As indicated above we know that dwarf green markets and green markets work in opposite ways; and we know that we have been avoiding to shift from the perfect traditional market way of thinking to the perfect green market way of thinking since 2012 Rio + 20 Conference (UNCSD, 2012a; 2012b) when we had a chance to orderly transition from the environmentally dirty economy to the environmentally clean economy, but we missed it. We missed the opportunity to go beyond business as always as the Brundtland Commission asked the world to do in 1987 (WCED, 1987) to address the environmental issues embedding in traditional market thinking (Smith, 1776), and therefore, the needed transition road from environmentally dirty economies to environmentally clean economies was never built then (Muñoz, 2022). Imagine that suddenly developed countries decide to go full the green market way as they have the economic resources to invest in closing the renewable energy

technology gap to transition green markets towards environmentally clean economies, where environmental pollution reduction is now a good profit making opportunity. On the other hand, imagine that developing countries have no choice, but to stay within dwarf green markets as they do not have the economic resources to close their renewable energy technology gaps to transition to environmentally clean world. How would countries behave in a closed system environment in this bipolar world? How would they behave in an open system environment in this bipolar world? And this raises important questions such as: How would the structure of a bipolar world where developing countries have dwarf green markets and developed countries have green markets look like? Which world would collapse under an open system environment? What are the implications of this? Among the goals of this paper is to provide answers to the questions above.

GOALS OF THIS PAPER

a) To highlight the structure of a bipolar world in the short terms after developing countries going dwarf green markets and developed countries go the way of green markets; b) To point out the long term structure of a bipolar world where development countries go dwarf green markets and developed countries go green markets; c) To stress the short term and long term implications of market contractions in developing countries; and of green market expansions in developed countries needed to address the environmental pollution problem in a closed bipolar system; d) To indicate the short term and long term implications of market contractions in developing countries and of green market expansions in developed countries needed to address the environmental pollution problem in an open bipolar system; and e) To use the implications of the discussion above to exalt which countries would fall first and why in an open bipolar system.

METHODOLOGY

First, the terminology used in this paper and some operational concepts and models are shared. Second, the structure of the bipolar world developing country dwarf green market and developed country green market in the short term is listed. Third, the short term structure above is used to expand the contractions of developing country dwarf green markets and expand the expansions of developing county green markets that are expected to take place in the long term. Fourth, the long term structure above is used to point out the implications of developing country dwarf green market contractions and developed country green market expansions when in a closed bipolar system. Fifth, the long term structure above is used too to point out the implications of developing country dwarf green market contractions and developed country green market expansions when in an opened bipolar system. And finally, sixth, which countries fall first when coexisting in an open system and why is highlighted.

Terminology

P = Price Q = Quantity
TM = The traditional market GM = The green market
EDM = The environmentally dirty market PO = Pollution
EPO = Environmental pollution E[C] = Environmental cost externalization
I[c] = Environmental cost internalization CLM = The clean market
EPORM = Environmental pollution reduction market DM = The dirty market
EPOPM = Environmental pollution production market EM = Environmental margin
DEM = Dwarf environmental margin E[EM] = Environmental margin externalization
GM = Green market DGM = Dwarf green market
LDCDGM = Developing country dwarf green markets GM = Green market
I{E[EM]} = Internalization of the externality DGM = Dwarf green market

DCGM = Developed country green markets GMP = Green market price
EPOMM = Environmental pollution management market DGMP = Dwarf green market price
EPOLM = Environmental pollution-less market ECLM = The environmental clean market
DCGM = Developed country green market TMP = Traditional market price
LDCDGMP = Developing country dwarf green market price GMS = Green market supply
LDCDGM = Developing country dwarf green market DGMS = Dwarf green market supply
DCGMP = Developed country green market price TMS = Traditional market supply
LDCDGMP = Developing country dwarf green market price E[M] = Externality "M"

Operational Concepts, Model Structures; and Internalization, Externalization and Sustainability Gap Opening and Closing Rules

A) Operational concepts

Some of the concepts relevant to this paper are:

1) Sustainability, *the world where the interplay of sustainability theory and sustainability practice is aimed at fixing or correcting embedded externality problems.*

2) Sustainable development, *the world where the interplay of sustainable development theory and sustainable development practice is aimed at patching or managing embedded externality problems.*

3) Golden paradigm, *one that does not creates abnormalities.*

4) Flawed paradigm, *one that creates abnormalities.*

5) Kuhn's loop, *the science based mechanism that leads to paradigm shift through abnormality correction.*

6) The perfect traditional market, *the market cleared by the traditional market price (TMP = P), an economy only market at the heart of raw capitalism.*

7) The perfect green market, *the market cleared by the green market price (GMP = P + EM), an environment and economy market at the heart of green capitalism.*

8) The perfect sustainability market, *the market cleared by the sustainability market price (SMP = P + SM + EM), a society and environment and economy market at the heart of yellow capitalism.*

9) The dwarf green market, *the market cleared by the dwarf green market price (DGMP = P + DEM), a patched green market at the heart of dwarf green market based capitalism.*

10) The dwarf sustainability market, *the market cleared by the dwarf sustainability market price (DSP = P + DSM + DEM), a patched sustainability market at the heart of dwarf yellow capitalism.*

11) The dwarf environmental margin, *the cost that reflects the assigned social cost of production (DEM) in the environmental externality management based market.*

12) The dwarf sustainability margin, *the cost that reflects the assigned social (DSM) and environmental (DEM) cost of production in the socio-environmental externality management based market.*

13) Environmental pollution problem, *the problem created by pollution production markets when externalizing the environmental cost associated with production.*

B) Flawed paradigm structures

If we have a dominant paradigm R and it is a flawed paradigm FLM, then it produces "n" externalities or abnormalities A so as A1, A2,….

i) FLM = R(A1, A2,….An)

As it can be appreciated in expression i) above the flawed model FLM generates "n" abnormalities.

C) The Thomas Kuhn's transformation loop (TKTL) under academic integrity when dealing with flawed paradigms

If we subject a flawed paradigm FLM = **R (A1, A2,….An)** to the Thomas Kuhn's transformation loop(TKTL), the loop process will be active until all abnormalities are corrected and a golden paradigm GOM arises

ii) TKTL (FLM) = TKTL[R(A1, A2,….An) -------→R = GOM

The expression ii) above indicates that the TKTL loop process transforms flawed dominant paradigms FLM in the end into golden paradigms GOM by correcting the abnormalities A1…..An affecting them and shifting them in the process.

D) 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 paradigm

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 as a flawed paradigm 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 as a flawed paradigm 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 as a flawed paradigm 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 green market under as golden paradigm

v) GM = BC

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

6) The green market as a flawed paradigm under social abnormalities (a)

vi) GM = aBC

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

E) Abnormality externalization and internalization rules

If k is an abnormalities and K is the corrected variables and if E[ ] = externalization and I[ ] = internalization, then the following holds true:

a) E[K] = k b) I[k] = K c) I[E[K]] = K d) E[I[k]] = k

F) Sustainability gap creation and closing rules

If k is the abnormality that creates a sustainability gap (SG) and K is the corrected variables and if E[ ] = externalization and I[ ] = internalization, then the following holds true:

a) $E[K] = SG_K$ b) $I[SG_K] = K$

G) Remaining sustainability gaps

If we have two dominant components K and L and we have a cost margin $CM_K = E[K] = SG_K$ and $CM_L = E[L] = SG_L$ plus we have a dwarf cost margin $DCM_K = T_K$ and $DCM_L = T_L$, where $CM_K > DCM_K$, $CM_L > DCM_L$ and hence, $E[K] > T_K$ and $E[L] > T_L$, then the remaining sustainability gap RSG for each variable comes as follows:

a) $RSG_K = CM_K – DCM_K = E[K] –T_K = SG_K – T_K$

b) $RSG_L = CM_L – DCM_L = E[L] –T_L = SG_L – T_L$

H) Patching of sustainability gaps

If we have two dominant components K and L and we have a cost margin $CM_K = E[K] = SG_K$ and $CM_L = E[L] = SG_L$; and we have dwarf market patches T_K and T_L, then the patching(F) of sustainability gaps SG leading to dwarf sustainability gaps DSG works as follows:

a) $F(CM_K) = F(E[K]) = F(SG_K) = DSG_K = T_K$

b) $F(CM_L) = F(E[L]) = F(SG_L) = DSG_L = T_L$

E) Internalizing patched sustainability gap to close them

If we have a two dominant components K and L and we have patched cost margins such that $F(CM_K) = F(E[K]) = F(SG_K) = DSG_K = T_K$ or $F(CM_{KL}) = F(E[KL]) = F(SG_{KL}) = DSG_{KL} = T_{KL}$, then the dwarf cost internalization process to shift markets to dwarf markets works as follows:

a) $I[F(CM_K)] = I[F(E[K])] = I[F(SG_K)] = I[DSG_K] = I[T_K] = T_K$

b) $I[F(CM_{KL})] = I[F(E[KL])] = I[F(SG_{KL})] = I[DSG_{KL}] = I[T_{KL}] = T_{KL}$

F) More information about operational concepts, model structures; and internalization, externalization and sustainability gap opening and closing rules consistent with the ones shared here can be found papers with the same line of thinking such as Muñoz (2022).

The Structure of the Bipolar World Developing Country Dwarf Green Market and Developed Country Green Market When Set Up

We can use the structure in Figure 4 above and transform it into the bipolar world developing country dwarf green markets (LDCDGM) and developed country green markets (DCGM) by making the GM = DCGM and DGM = LDCDGM, where the GMP = DCGMP, the DGMP = LDCDGMP, the GMS = DCGMS, and the DGMS = LDCDGMS, as shown in Figure 5 below under the assumption that developed countries go green markets (GM) because they can afford the cost of closing the renewable energy gap to transform pollution reduction into a profit making activity towards a transition to an environmentally clean economy; and the assumption that developing countries go dwarf green markets because they cannot afford to do that so their governments can only go the way of dwarf green markets (DGM):

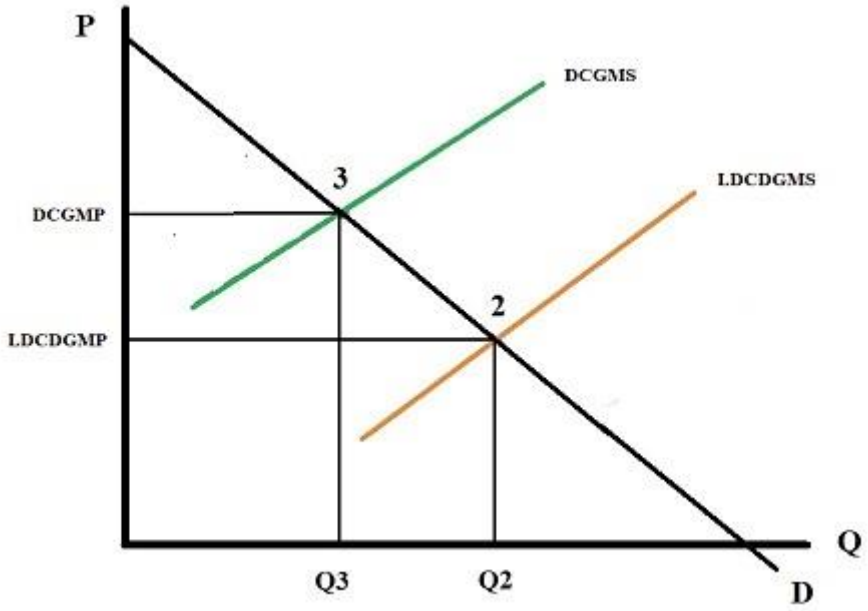

Figure 5. A bipolar world when there is a developing country dwarf green market at point 2 and there is a developed country green market at point 3

Figure 5 above described the bipolar world where rich countries and poor countries interact, where at point 2 we have a developing country dwarf green market (LDCDGM) and the point where developing country dwarf green market supply (LDCDGMS) meets the demand (D); and at point 3 we have a developed country green market (DCGM), point where the developed country supply (DCGMS) cuts its demand (D). Therefore, the quantity consumed and produced in dwarf green markets (DGM) is Q2 as this market is cleared by the dwarf green market price (LDCDGMP) while the quantity produced and consumed in green markets (DCGM) is Q3 as this market is cleared by the green market price (DCGMP). Notice that consumption in dwarf green markets (LDCDGM) is greater than the consumption in green markets (DCGM) so Q2 > Q3 because prices in green markets (DCGM) are higher than prices in dwarf green markets (LDCDGM) so that DCGMP > LDCDGMP.

The Structure of the Bipolar World Developing Country Dwarf Green Market and Developed Country Green Market When They Contract and Expand Respectively in the Long Term

As indicated in the introduction, in the long term dwarf green markets (LDCDGM) will contract to reflect the pollution reduction priorities of the environmental pollution manager (driven by government policy); and the green market (DCGM) will expand as the environmental cost of production (EM) decreases in order to produce at the lowest green market price (DCGMP) possible and maximize green profits (driven by profit maximization), a situation highlighted in Figure 6 below:

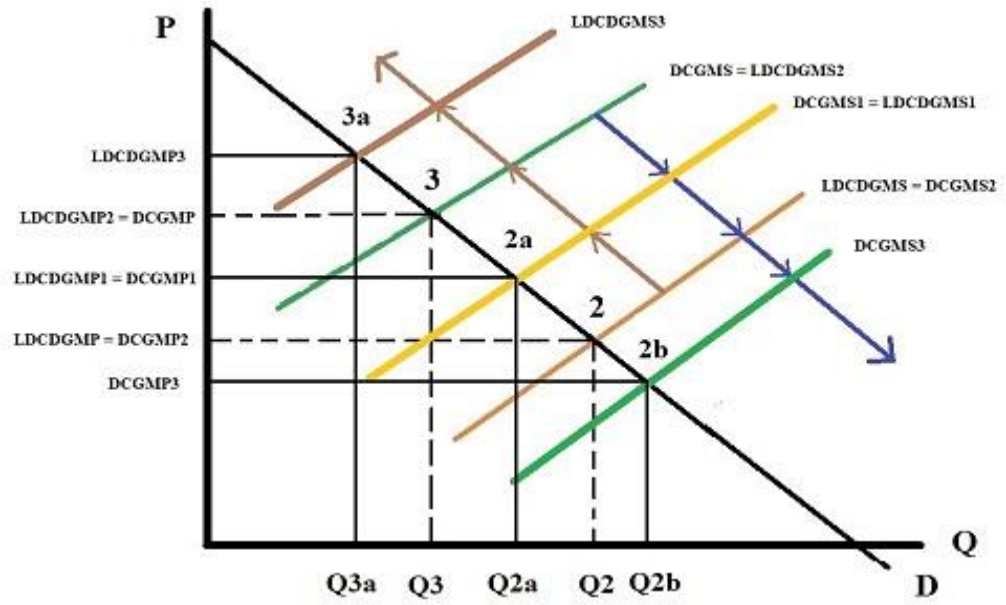

Figure 6. The bipolar world showing less development country dwarf green market (LDCDGM) contractions and developed country green market (DCGM) expansions, which are moving in opposite directions

The brown arrow going from point 2 to the left in Figure 6 above indicates that as the pollution manager increases the environmental pollution management cost (DEM) the dwarf green market price (LDCDGMP) will increase contracting production; and therefore reducing pollution by contracting to point 2a, to point 3, and to point 3a since as the dwarf green market price increases less is produced and consumed and more pollution is reduced. The blue arrow going from point 3 to the right in Figure 6 above indicates that green producers in developed countries will increase production of green goods and green services as the environmental cost of producing (EM) green good and services decreases, as green producers are making more money while reducing environmental pollution and producing more, they will tend to produce at the lowest green market price (DCGMP) possible to maximize profits, expanding production from point 3 to point 2a, to point 2, and to point 2b since as the green market price decreases more is produced and consumed and more pollution is reduced while maximizing green profits.

The bipolar world in Figure 6 above has short term and long term implication for both developed and developing countries when interacting in a closed bipolar system environment and when interacting in an open bipolar system environment, and this situation is addressed in detail below.

The Case of a Closed Bipolar System for Developing Countries

The governments of developing countries set up dwarf green markets (LDCDGM) as indicated in Figure 6 above:

i) The case of developing countries dwarf green market contractions in a closed system

The expected behavior in the short term in developing countries in a closed system environment is to consume at point 2, the dwarf green market (LDCDGM) set up by the government with the initial pollution management cost of DEM, where the dwarf green market price (LDCDGMP) clears the market; and leads to production and consumption levels of Q2. The adding of the dwarf green margin DEM to the environmental pollution production market's pricing mechanism known as the traditional market (TM) contracts production, consumption, and pollution to point 2.

ii) The case of developing countries market contractions in the long term in a closed system

The expected behavior in the in the long term in developing countries in a closed system is to produce and consume according to the pollution reduction schedule determined by the environmental pollution manager such as the one where DEM < DEM1 < DEM2 < DEM3 behind the price increases LDCDGMP < LDCDGMP1 < LDCDGMP2 < LDCDGMP3 driving the series of market contractions along the brown arrow going from point 2 to the left going from point 2 to point 2a to point 3 to point 3a respectively. The higher the dwarf green market price (LDCDGMP) gets the higher the dwarf green margin (DEM) added the more extreme the dwarf green market contraction is.

iii) Implications

In isolation and in a closed system in the short term the dwarf green consumer has no choice and consumes at point 2, and in isolation and in an open system the dwarf green consumer has no choice, but to consume along the production contraction route indicated by the brown arrow decided by the environmental pollution manager. As time passes the dwarf green consumer consume less and less at a higher price, but still consuming goods and services with high pollution content as at the beginning as in dwarf green markets pollution continues to take place and its cost continues to be externalized as environmental pollution management takes place. Dwarf green producers see no profit incentive to deviate from the pollution management schedule set up by the environmental pollution manager.

The Case of a Closed Bipolar System for Developed Countries

The governments of developed countries and developed country producers set up green markets (DCGM) as indicated in Figure 6 above:

i) The case of developed countries green market in the short term in a closed system

The expected behavior in the short term in developed countries in a closed system is to consume at point 3, the green market (DCGM) set up with the initial environmental margin or environmental pollution cost of EM, where the green market price (DCGMP) clears the market; and leads to production and consumption levels of Q3. The adding of the green margin EM to the environmental pollution production market's pricing mechanism known as the traditional market (TM) shifts production, consumption, and pollution to point 3.

ii) The case of developed countries market expansion in the long term in a closed system

The expected behavior in the in the long term in developed countries in a closed system is to produce and consume according to production expansion schedule decided by the free green market's green producers as the one where EM > EM1 > EM2 > EM3 behind the price decreases DCGMP > DCGMP1 > DCGMP2 > DCGMP3 driving the series of market expansions along the blue arrow going from point 3 to the right; and hence, going from point 3 to point 2a to point 2 to point 2b respectively. The lower the green market price (DCDGMP) gets the lower the green margin (EM) added leading to more green market expansion and green profits.

iii) Implications

In isolation and in a closed system in the short term the green consumer has no choice but to consume at point 3, and in isolation and in an open system the green consumer has the choice to consume more and more at lower and lower green market prices consistent with the production expansion schedule determined by free green producer and free green consumers represented by the blue arrow going from point 3 to the right in Figure 6 above. As time passes the green consumers will consume more and more at lower and lower green market prices, consuming each time more and more environmentally clean goods and services at

lower green market prices; and this is possible because the environmental pollution problem is internalized and addressed while making money. Hence, green producers see a profit incentive to produce at the lowest green market price possible as the way to maximize green profits.

The Case of an Open Bipolar System

In an open system we should expect green producers and green consumers and dwarf green consumers and dwarf green producers to be rational decision makers; and make decisions based on market price signals as green consumers can always afford green consumption and they consume only green products and services while dwarf green consumers will consume what their income can buy, they will buy dwarf green market goods and services for sure as long as they are cheaper than green good and services available in the open environment, a situation addressed below:

i) The case of developing countries and developed countries in the short term in an open system

The expected behavior of developing country dwarf green consumers in the short term in an open bipolar system is to consume at the dwarf green market price (LDCDGMP) at point 2 and the expected behavior of developed country green consumers is to consume at the green market price (DCGMP) at point 3 in Figure 6 above, where dwarf green consumers consume more at an initial lower dwarf green market price and green consumer consume less at a higher initial green market price so that Q2 > Q3 as LDCDGMP < DCGMP.

ii) The case of developing countries and developed countries in the long term in an open system

The expected behavior of developing country dwarf green consumers in the long term in an open system is to consume less and less as the dwarf green market price increases; and the expected behavior of developed country green consumers is to consume more and more as the green market price decreases. As green consumers are benefiting from consuming more and more of cleaner and cleaner goods and services at lower green prices they will continue to expand consumption. However, the green market expansion affects the rational choices available to dwarf green consumers in an open system while the dwarf green market contractions do not affect expected green consumer's behavior

1) The case where developed country green markets stay at point 3 and the developing country dwarf green market contracts

As developed countries consumers can afford green consumption they consume at point 3 at the green market price (DCGMP) while investment in green technologies and green innovations are geared to reducing the renewable energy technology gap. In this case dwarf green consumers will be fine with consuming dwarf green products and services for sure as long as the dwarf green market price (LDCDGMP) is less that the green market price (DCGMP) so that DLCDGMP < DCGMP, a situation found just below point 3.

Notice that if the dwarf green market contraction ends at point 3, then dwarf green consumers will be indifferent to consuming dwarf green products or consuming green products as they have the same price LDCDGMP2 = DCGMP, but we should expect that given the choice dwarf green consumers who tend to be environmentally friendly will choose to consume green products, which will undermine the supply of dwarf green products at point 3 and plant the seeds of collapse. And see that dwarf green consumers will not tolerate a dwarf green market contractions past point 3 such as point 3a as then the dwarf green market price (LDCDGMP3) is greater than the green market price (DCGMP), and in this case all dwarf green consumers will shift to consuming green products, leading to the dwarf green market full collapse.

2) The case where developed country green markets expand from point 3 to point 2a and the developing country dwarf green market contracts

As developed country consumers begin to benefit from decreasing green market prices due to the reduction of the environmental cost of production from using investment in green technology and green innovations to close the renewable energy technology gap they expand consumption to point 2a. In this case dwarf green consumers will be fine with consuming dwarf green products and services for sure as long as the dwarf green market price (LDCDGMP) is less that the green market price (DCGMP) so that DLCDGMP < DCGMP, a situation found just below point 2a.

See that that if the dwarf green market contraction ends at point 2a, then dwarf green consumers will be indifferent to consuming dwarf green products or consuming green products as they have the same price LDCDGMP1 = DCGMP1, but we should expect that given the choice dwarf green consumers who tend to be environmentally friendly will choose to consume green products, which will undermine the supply of dwarf green products at point 2a and plant the seeds of collapse. And notice that dwarf green consumers will not tolerate dwarf green market contractions past point 2a such as point 3 as then the dwarf green market price (LDCDGMP2) is greater than the green market price (DCGMP1), and in this case all dwarf green consumers will shift to consuming green products, leading again to the dwarf green market full collapse.

3) The case where developed country green markets expand from point 3 to point 2 and the developing country dwarf green market is still at point 2

As developed country consumers continue to benefit from decreasing green market prices due to the additional reduction of the environmental cost of production from using investment in green technology and green innovations to close the renewable energy technology gap they expand consumption to point 2. In this case dwarf green consumers are captive of the green market expansion that matches the dwarf green market price as now the developing country market price at point 2 is equal to the green market price at point 2 since LDCDGMP = DCGMP2. Now dwarf green market contractions are not possible as if the dwarf green market contracts for example to point 2a it will collapse as the dwarf green market price then would be higher than the green market price at that point since LDCDGMP1 > DCGMP2.

Since dwarf green producers can not deviate from the environmental margin DEM set by the environmental pollution manager in order to produce at price less than the LDCDGMP, they will continue to produce at point 2 and face competition. Hence, dwarf green consumers can not have access to dwarf green goods at dwarf green prices above or below the dwarf green market price at point 2, which is LDCDGMP in this case, they only have access to dwarf green products with the same price as green products as LDCDGMP = DCGMP2, and as indicated above when facing the same price dwarf green consumers will be indifferent to consuming dwarf green products or consuming green products, but we should expect that given the choice dwarf green consumers who tend to be environmentally conscious will choose to consume green products, which will undermine the supply of dwarf green products at point 2a and tend towards collapse. And notice that if the green market expands from to point 2b in Figure 6 above, the dwarf green market would fully collapse as then the dwarf green market price would be higher than the green market price as then LDCDGMP > DCGMP3.

iii) Implications

In summary we can say the following about the implications of the information in Figure 6 above: a) when the developing country dwarf green market price is less than the green market price so that LDCDGMP < DCGMP dwarf green consumers will consume only dwarf green good and services; b) when the developing country dwarf green market price is

equal than the green market price only the environmentally conscious dwarf green consumers should be expected to consume green products instead of dwarf green products, which will undermine the dwarf green market supply, and tend towards collapse; c) when the developing country dwarf green market price is higher than the developed country green market price so that LDCDGMP > DCGMP, then the dwarf green market will fully collapse; d) Green consumers will always consume green products regardless of the dwarf green market price as they can afford green consumption and they prefer green products; e) When the green market supply is above the dwarf green market supply, green consumers will consume green goods and dwarf green consumers will consume dwarf green goods; and f) When the dwarf green market supply is above the green market supply, the dwarf green market will fully collapse as dwarf green consumers would not be willing to pay more for pollution based goods than for green goods; and they would now as rational decision makers shift consumption to green goods, which are cleaner and at lower price than the dwarf green products available to them.

The Fall of Developing Countries Dwarf Green Markets

Green producers in developed countries have an incentive to produce at the lowest green market price possible to maximize green profits so they have an incentive to close the renewable energy technology gap as soon as possible to speed up the decrease in the environmental cost of production so as to speed up the decrease in green market prices and speed up the green market expansion, and consistent with the information in Figure 6 above, at any time the green market expansion surpasses the dwarf green market contraction, the dwarf green market will collapse, a situation highlighted in Figure 7 below:

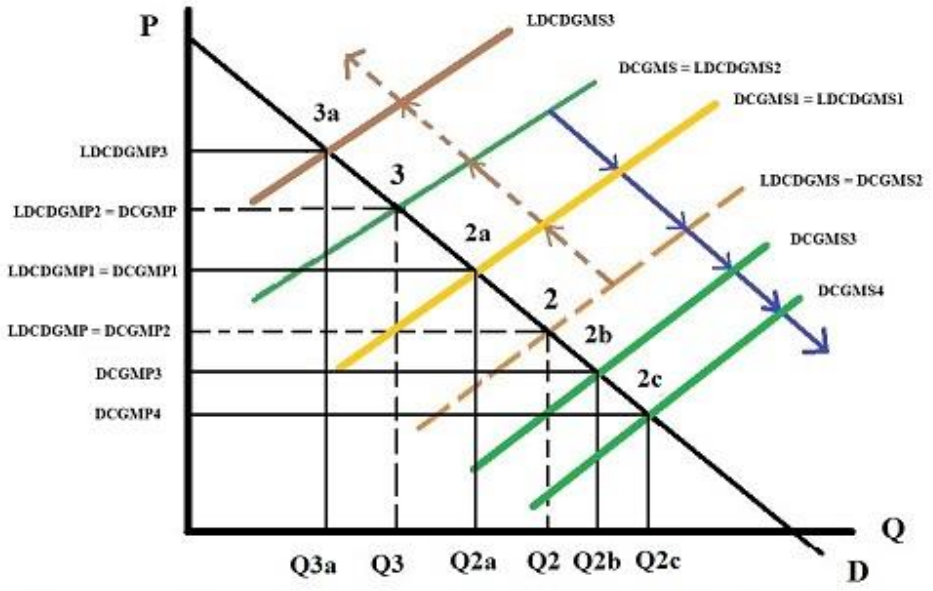

Figure 7. The collapse of the developing country dwarf green market (LDCDGM) as the green market price (GMP) expands equal or below the developing country dwarf green market price (LDCDGMP) and the extra expansion of the developed country green market supply from DCGMS3 to DCGMS4

Figure 7 above summarizes the situation where the drive to maximize green profits leads to the fall of the dwarf green market each time the green market expansion undercuts the dwarf green market price.

i) The why developing countries dwarf green markets fall

We can appreciate the why dwarf green markets fall in an open environment when facing green market expansions driven by the drive of green producers to produce at the

lowest green market price possible in order to maximize green profits can be appreciated in the following examples: a) if the dwarf green market contraction is at point 3 and the green market expands from point 3 to point 2a, the dwarf green market will fall as the dwarf green market price at point 3 is higher than the green market price at point 2a (LDCDGMP2 > DCGMP1); b) If the dwarf green market contraction is at point 2a and the green market expands from point 2a to point 2, the dwarf green market will fall as the dwarf green market price at point 2a is higher than the green market price at point 2 (LDCDGMP2 > DCGMP2; and c) if the dwarf green market contraction is at point 2 and the green market expands from point 2 to point 2b, the dwarf green market will fall as the dwarf green market price at point 2 is higher than the green market price at point 2b (LDCDGMP > DCGMP3).

Hence, every time the developed country green market price "i" goes below the developing country dwarf green market price "j" so that DCGMPi < LDCGMPj in Figure 7 above, the dwarf green market fully collapses as dwarf green consumers can now consume green goods instead of consuming dwarf green goods at lower market prices.

ii) The expected developed country market expansion to meet developed countries demand for green good and services after collapse.

At any point where the dwarf green market falls because the green market price undercuts the dwarf green market price, the supply of green products needs to increase to meet or accommodate now the demand of all consumers, green consumers and dwarf green consumers, an expansion of green production shown in Figure 7 above as the green market expansion that goes from point 2b to point 2c, where the green market is cleared by a lower green market price DCGMP4 and all consumers are consuming now Q2c. Hence, the fall of the dwarf green markets leads to a further expansion of the green markets in order to meet the new world demand in this bipolar world under an open system.

Food for Thoughts

1) Do dwarf green markets tend to produce at the lowest dwarf green market cost possible? I think No, what do you think?; 2) Do you need government intervention in free green markets if there is no green market failure? I think No, what do you think?; 3) Is dwarf green growth green growth? I think No, what do you think?; and 4) would you expect rich consumers with a preference for green consumption to buy the goods and services they need from a green company instead of a dwarf green company? I think Yes, what do you think?

CONCLUSIONS

First, it was shown that the bipolar framework developing country dwarf green markets and developed country green market can be useful to highlight the rational behavior of the different consumers in those two different markets when facing contractions and expansions. Second, it was pointed out that in a closed system dwarf green consumers will consume both in the short term and in the long term along the dwarf green market contraction brown arrow, consuming less and less of pollution based goods and services as the dwarf green margin (DEM) increases to decrease pollution through decreasing dwarf green production. Third, it was stressed that in a closed system green consumers will consume both in the short term and in the long term along the green market expansion blue arrow, consuming more and more of less and less pollution based goods and services as the green margin (EM) decreases as pollution reduction take place increasing green production. Fourth, it was indicated that in an open system in the short term dwarf green consumers will consume at the developing country dwarf green market price and green consumers will consume at the developed country green market price, but in the long term the consumption behavior of dwarf green consumers is affected by the expansion of the developed country green market. Fifth, it was mentioned that in the long term and in an open bipolar system environment dwarf green consumers will

continue to consume dwarf green market products to the point where the dwarf green market price is less that the green market price so that DGMP < GMP, but when the point where the green market price (GMP) goes below the dwarf green market price (DGMP) is reached so that GMP < DGMP then dwarf green consumer will start preferring to consume green goods and services at a lower price than dwarf green goods and services. Sixth, it was stated that in the long term and in an open bipolar system environment that when green market expansion goes way over dwarf green market contraction then the dwarf green market will collapse as dwarf consumers can now afford to consume green good and services at a lower price that those produced in dwarf green markets and this are less pollution base ones. And seventh, it was said that when the developing country dwarf green market collapses, the demand for green good and services now needs to meet both the developing country and the developed country demands at the same time so there will be an expansion of green production.

In general, it can be said a) that in a closed system both in the short and in the long term dwarf green producers and green producers consume following the contraction line and the expansion line respectively; b) that in an open system in the short term dwarf consumers will consume at the dwarf green market price and green consumers will consume at the green market price; and c) that when the green market expands to a point where the green market price is equal to that the dwarf green market price, then the dwarf green market will start to collapse, and the tendency of the green market to produce at the lowest green market price possible will lead to the full collapse of the dwarf green market when the green market price becomes lower than the dwarf green market price; and therefore, to an expansion of green production to meet the new world green demand.

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