Sustainability thoughts 126: Are environmental externality management based production and consumption bundles inconsistent with green pareto efficiency and with pareto efficiency principles at the same time? If yes, why?

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Abstract

Pareto optimality in perfect traditional markets can be affected by cost internalization and by government intervention. For example, environmental cost internalization shifts pareto optimality in perfect traditional markets towards green pareto optimality in perfect green markets while government intervention in environmental markets transforms pareto optimality in traditional markets into environmental externality management markets, which are not perfect markets. Pareto optimality and green pareto optimality are linked by an environmental sustainability gap, which can be seen as an environmental externality management market zone as government intervention can create an environmental externality market at any point within that gap. If we analyze an environmental externality management point in that gap, we can see that it falls outside the green production frontier and it falls below the pareto optimal consumption and production point; therefore, it is a less preferred bundle, but production and consumption takes place there anyway. Hence, there is a link between green pareto optimality, pareto optimality, and environmental externality management markets and its structure through the environmental sustainability gap, but to my knowledge nothing is written about how the environmental sustainability gap is linked to optimal and non-optimal markets such as pareto optimal markets, green pareto optimal markets and environmental externality management based markets. Therefore, there is a need to understand the nature of this environmental externality link so as to be able to address questions such as Are environmental externality management based production and consumption bundles inconsistent with green pareto efficiency and with pareto efficiency principles at the same time? If yes, why? What is the structure of the environmental externality management market? Among the goals of this paper is to provide answers to these questions.

Key words

Pareto optimality, green pareto optimality, environmental externality based markets, pareto inefficient, green pareto inefficient, pareto improvement, green pareto improvement, free market, non-free markets, environmental sustainability gap

Introduction

a) The structure of green pareto efficiency and of pareto efficiency

Pareto optimality in perfect traditional markets can be affected by cost internalization and by government intervention. For example, environmental cost internalization shifts pareto optimality in perfect traditional markets towards green pareto optimality in perfect green markets while government intervention in environmental markets transforms pareto optimality in traditional markets into environmental externality management markets, which are not perfect markets. The impact of implementing environmental cost internalization in the traditional market and its pareto optimality point is to shift them to green markets and its green pareto optimality point as it has been recently highlighted(Muñoz 2020), leading to the situation shared as in Figure 1 below.

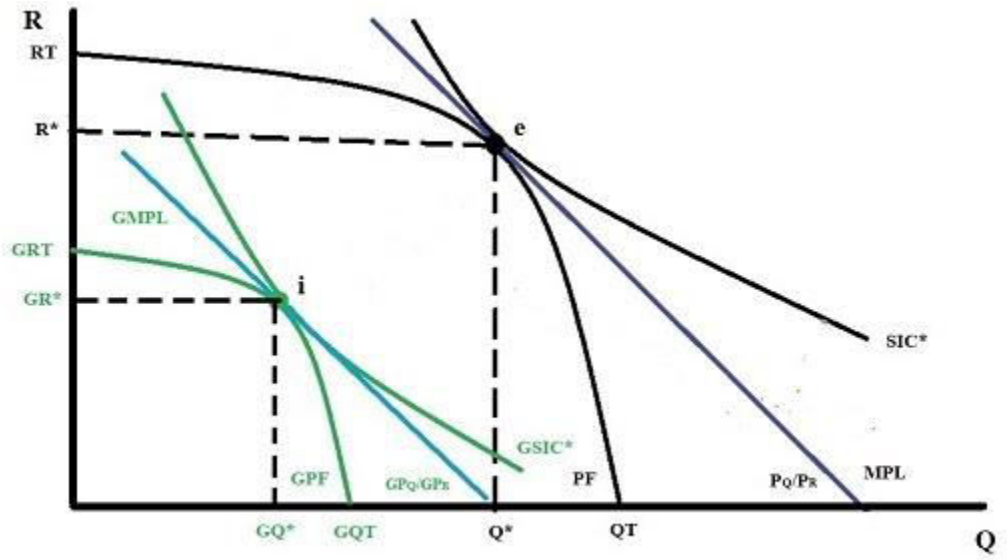

Figure 1 The structure of green pareto optimality(i) and of pareto optimality(e)

Figure 1 above shows two optimal points; 1) the traditional pareto optimality point at point "e"; and 2) the green pareto optimality point at point "i". The traditional pareto optimality point "e" is where the traditional production frontier(PF), the optimal social indifference curve(SIC*), and the market price line(MPL) meet and have the same slope. It is also at this point "e" that optimal production and consumption of product Q* and product R* is found. On the other hand, the green pareto optimality point "i" is where the green production frontier(GPF),

the optimal green social indifference curve(GSIC*), and the green market price line(GMPL) meet and have the same slope. It is also at this point "i" that optimal green production and green consumption of green product Q* and green product R* is found. We can see in Figure 1 above that if environmental costs are fully externalized because of the environmental externality neutrality assumption then traditional pareto optimality at point "e" holds, which means economic efficiency holds, but if environmental costs are fully internalized because environmental costs are real and relevant; and therefore, there is no externality neutrality assumption, then green pareto optimality at point "i" holds, and this means that eco-economic efficiency holds. When we fully internalize the environmental cost of production in the pricing mechanism of the traditional market we shift it to green markets(Muñoz 2016; Muñoz 2019), and when doing this pareto optimality at point "e" in Figure 1 above shift to green pareto optimality at point "i"

b) The sustainability gap between green pareto efficiency and pareto efficiency

The discussion above suggest that pareto optimality and green pareto optimality are linked by an environmental sustainability gap(ESG) as shown in Figure 2 below:

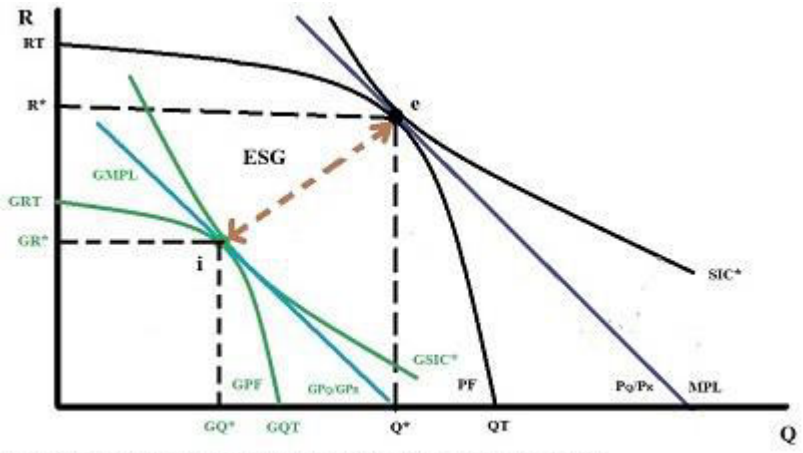

Figure 2 The pareto inefficient gap between green pareto optimality and pareto optimality

We can see in Figure 2 above that pareto optimality and green pareto optimality are linked by an environmental sustainability gap(ESG) that goes from point "e" to point "i" and it is between the two production frontiers. This environmental sustainability gap can be seen as an environmental externality management market zone as government intervention seeking to manage environmental externalities instead of setting up green markets can create an environmental externality management market at any point within that gap. For example, an environmental externality management market point can be set up between point "e" and point "i" or anywhere within those two production frontiers GPF and PF, and such point would look or looks like an outlier that does not fit green pareto thinking and traditional pareto thinking at the same time. In other words, if we analyze an environmental externality management point in that

gap between the two production frontiers, we can see that it falls outside the green production frontier and it falls below the pareto optimal consumption and production point "e"; therefore, it is a less preferred bundle than point "e", but production and consumption takes place or would take place there at the outlier point anyway as it is or it would be an externally set bundle under environmental externality management market forces. The existence of this environmental sustainability gap affecting the sustainability of the traditional market and the need to fix it(Muñoz 2020b), not to patch it(Muñoz 2020c) has been pointed out recently.

c) The need to understand how the environmental sustainability gaps are linked to optimal and non-optimal markets

Hence, there is a link between green pareto optimality, pareto optimality, and environmental externality management markets and its structure through the environmental sustainability gap(ESG), but to my knowledge nothing is written yet about how the environmental sustainability gap is linked to optimal and non-optimal markets, such as pareto optimal markets, green pareto optimal markets and environmental externality management based markets. The Brundtland Commission(WCED 1987) focused on sustainable development ways to address the environmental sustainability gap while the 2012 Rio + 20 conference(UNCSD 2012a; UNCSD 2012b) placed its attention on green market, green economy and green growth thinking in general, not on the need to find pareto optimal ways of dealing with the environmental issue. And therefore, there is a need to understand the nature of this environmental externality or environmental sustainability link so as to be able to address questions such as Are environmental externality management based production and consumption bundles inconsistent with green pareto efficiency and with pareto efficiency principles at the same time? If yes, why? What is the structure of the environmental externality management market? Among the goals of this paper is to provide answers to these questions.

Goals of this paper

1) To link the environmental sustainability gap to environmental cost internalization and the shift from traditional pareto optimality to green pareto optimality; 2) To link the environmental sustainability gap to environmental cost externalization and the impossibility of green market thinking under those conditions and the normal life in traditional markets and traditional pareto optimality; 3) To link the environmental sustainability gap to the idea of environmental externality management market zones; 4) To place an externality management market point inside the environmental externality management market zone to highlight its inconsistency with optimality; and 5) To introduce the structure of the environmental externality management market.

Methodology

1) The terminology used in this paper is given; 2) Operational concepts are shared; 3) How environmental sustainability gaps are linked to the shift to green pareto optimality is highlighted; 4) How environmental sustainability gaps are linked to traditional pareto optimality is stressed; 5) How environmental sustainability gaps are linked to environmental externality management market zones is pointed out; 6) Why environmental externality management bundles do not fit green pareto thinking and traditional pareto thinking is indicated; 7) How the structure of environmental externality management markets looks like is shown; and 8) Some food for thoughts and relevant conclusions are provided.

Terminology

RT = Total production of product R R* = Optimal production and consumption of product R

QT = Total production of product Q R = Product R

Q* = Optimal production and consumption of product Q Q = Product Q

GR = Green product R GRT = Total production of green product R

GQ = Green product Q GQT = Total production of green product Q

MPL = Traditional market price line GMPL = Green market price line

SIC = Social indifference curve GSIC = Green social indifference curve

SIC* = Optimal social indifference curve PF = Production frontier

GSIC* = Optimal green social indifference curve GPF = Green production frontier

e = Pareto optimal point i = Green pareto optimal point

GR* = Optimal green production and green consumption of green product R

GQ* = Optimal green production and green consumption of green product Q

DPF = The dwarf production frontier DSIC = The dwarf social indifference curve

DMPL = The dwarf market price line DQ = The dwarf quantity Q

DR = The dwarf quantify R DP = Dwarf market price

Tc = The environmental tax RESG = Remaining environmental sustainability gap

DQT = Total dwarf quantity Q DRT = Total dwarf quantity R

J = The environmental externality management bundle

Operational concepts

1) Traditional market, *the economy only market*

2) Green market, *the environmentally friendly market*

3) Traditional market price, the *general market economic only price or the price that covers the*
cost of production at profit(TMP = ECM + i = P) or zero profit(TMP = ECM = P).

4) Green market price, *the price that reflects both the economic and the environmental cost of production or the price that covers the cost of environmentally friendly production.*

5) Cost externalization, *the leaving out of the pricing mechanism of the market relevant costs associated with production.*

6) Social cost externalization, *the leaving out of the pricing mechanism of the market the social costs associated with production.*

7) Environmental cost externalization, *the leaving out of the pricing mechanism of the market the environmental costs associated with production.*

8) Cost externalization assumption neutrality, *the assumption that production has minimal or no cost impact on external factors to a market model.*

9) Full costing, *the reflecting in the pricing mechanism of the market all cost associated with production; there are no market distortions.*

10) Partial costing, *not reflecting in the pricing mechanism of the market all cost associated with production; there are partial market distortions.*

11) No costing, *not reflecting in the pricing mechanism of the market any costs associated with production; there is full market distortion.*

12) Fully independent development choices, *when we have individual development choices unrelated to each other or pure choices such as society only(A), economy only(B), and environment only(C). In this world only fully independent development choices exist so the set = {A, B, C}. This is the world of the Arrow Impossibility theory and theorem.*

13) Partially codependent development choices, *when we have mixed/paired development choices such as socio-economy(AB), socio-environment(AC), and eco-economy(BC). In this universe only codependent development choices exist so the set = {AB, AC, BC}. This is outside the normal world of the Arrow Impossibility theory and theorem.*

14) Full cost externalization, *all costs associated with production are not reflected in the pricing mechanism of the market.*

15) Partial cost externalization, *some costs associated with production are not reflected in the pricing mechanism of the market.*

16) No cost externalization, *all costs associated with production are reflected in the pricing mechanism of the market.*

17) Full cost internalization, *all costs associated with production are reflected in the pricing mechanism of the market.*

18) Partial cost internalization, *some costs associated with production are reflected in the pricing mechanism of the market.*

19) No cost internalization, *all costs associated with production are not reflected in the pricing mechanism of the market.*

20) Externalities, *factors assumed exogenous to a model*

21) Full externality assumption, *only one component is the endogenous factor in the model; the others are exogenous factors.*

22) Partial externality assumption, *not all factors are endogenous factors at the same time in the model.*

23) No externality assumption, *all factors are endogenous factors at the same time in the model.*

24) Economic externality, *the economic costs associated with production not reflected in the pricing mechanism of the market.*

25) Social externality, *the social cost associated with production not reflected in the pricing mechanism of the market.*

26) Environmental externality, *the environmental cost associated with production not reflected in the pricing mechanism of the market.*

27) Green or environmental margin, *to cover the extra cost of making the business environmentally friendly*.

28) Social margin, *to cover the extra cost of making the business socially friendly.*

29) Economic margin, *to cover only the economic cost of production*

30) Profit, *the incentive to encourage economic activity*

31) Full cost price, *a price that reflects all costs associated with production.*

32) Some cost price, *a price that reflects only some costs associated with production.*

33) No cost price, *a price that does not reflect any cost associated with production.*

34) Circular market illusion, *the idea that production activity can take place without producing relevant externalities.*

35) Circular traditional economy illusion, *the idea that production activity can take place without producing relevant social and/or environmental externalities.*

36) Circular dwarf green economy, *the idea that market prices can be manipulated externally to generate revenue to cover the cost of dealing with the externality they create to close the non-free market cycle production-consumption-environmental externality.*

37) Circular green economy, *the idea that market prices reflect the cost of making business environmentally friendly in order to cover the cost of dealing with the environmental externalities they create to close the free market cycle production-consumption-environmental externality.*

38) Circular environmental externality management based market illusion, *the idea that you can solve an environmental externality problem by dealing with the consequences of that problem, not the cause.*

39) Circular green economy illusion, *the idea that green production and green consumption can take place without having social impacts(E(A) = 0).*

40) Pareto optimal, *the levels of production and consumption determined by the traditional market price.*

41) Green pareto optimal, *the levels of green production and green consumption determined by the green market price.*

42)Dwarf market, *it looks like a known market but it is not*

43) Dwarf market price, *the traditional market price plus the dwarf margin*

44) Dwarf margin, *the tax in externality management markets*

45) Dwarf green market, *the environmental externality management market*

46) Dwarf green market price, *the traditional price plus the dwarf green margin*

47) Dwarf green margin, *the environmental tax in environmental externality management markets.*

Environmental cost internalization and paradigm shift from pareto optimality conditions to green Pareto optimality conditions

Environmental cost internalization is nothing more than the closing of the environmental sustainability gap affecting the sustainability of the traditional market shown in Figure 2 above to shift it to green markets, shifting pareto optimality to green pareto optimality as shown in Figure 3 below:

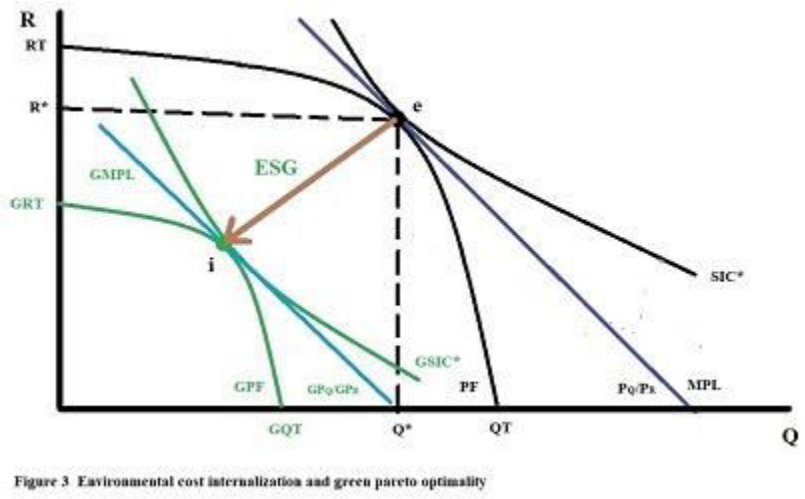

Figure 3 Environmental cost internalization and green pareto optimality

Figure 3 above shows that environmental cost internalization in traditional markets to make them environmentally friendly shift traditional pareto optimality at point "e" to green pareto optimality at point "i" as indicated by the green arrow from point "e" to point "i". Notice that at point "e", economic efficiency matters, but at point "i" eco-economic efficiency matters. In other words, environmental cost internalization fixes economic efficiency transforming it into eco-economic efficiency.

Environmental cost externalization and paradigm shift from green pareto optimality conditions to pareto optimality conditions

Environmental cost externalization is nothing more than the opening of the environmental sustainability gap affecting the sustainability of the traditional market shown in Figure 2 above to maintain the status quo in traditional markets, keeping pareto optimality as we know it as indicated in Figure 4 below:

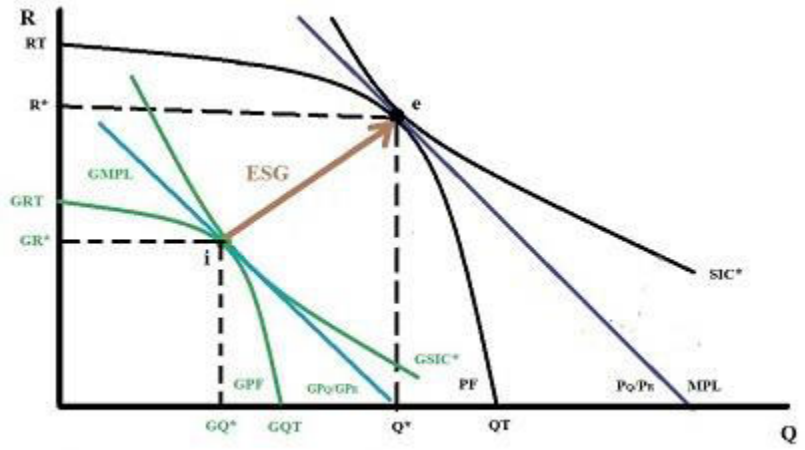

Figure 4 Environmental cost externalization and pareto optimality

Figure 4 above indicates that environmental cost externalization in traditional markets to make them environmentally unfriendly leads to traditional pareto optimality at point "e" leaving the idea of green markets behind as indicated by the arrow from point "i" to point "e". Notice that at point "i", eco-economic efficiency is the rule, but at point "e" economic efficiency matters. In other words, environmental cost externalization distorts the pricing mechanism in favor of economic efficiency as pareto optimality bundles like "e" have lower price than green pareto optimality bundles like "i" simply because it assumes that environmental costs do not matter. Hence, prices in green markets and its green pareto optimality point are higher than in traditional markets because of environmental cost internalization; and prices in traditional markets and its pareto optimality point are lower because of environmental cost externalization. So if environmental cost does not matter, then all bundles within green markets would be pareto inefficient as environmental cost can be externalized, and then pareto improvement forces would drive them towards point "e" as environmental costs do not matter. But if environmental cost do matter, then all bundles within traditional markets would not be available in green markets as they are not eco-economic efficient bundles.

The environmental externality management market zone

The environmental sustainability gap(ESG) pointed out in Figure 2 above can be seen as an environmental externality management market production and consumption (EEMMPC) zone as the environmental sustainability gap(ESG) is an environmental externality gap, a situation summarized in Figure 5 below:

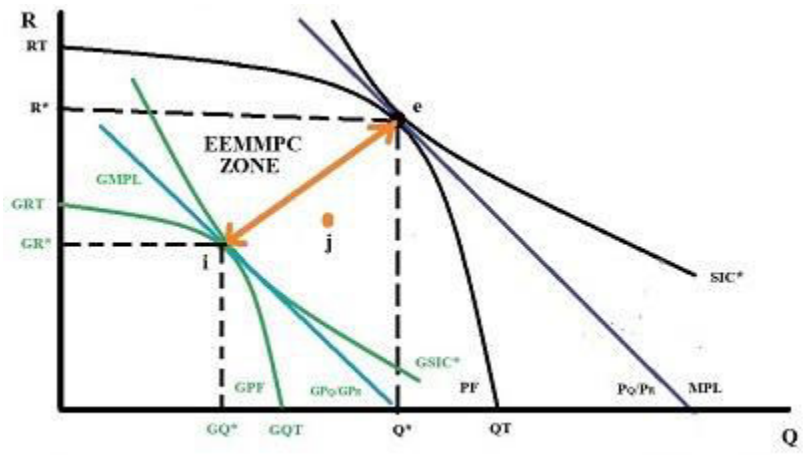

Figure 5 The environmental externality management market production and consumption zone(EEMMPC ZONE)

Figure 5 above helps us see that external actors such as the government can set up environmental externality management markets(EEMM) at any point between the green production frontier(GPF) at point "i" and the traditional production frontier(PF) at point "e" that makes up the environmental externality management market production and consumption zone(EEMMPC Zone) if the government, due to green market paradigm shifts knowledge gaps or willful academic blindness decide to manage the environmental externality during the paradigm shift instead of internalizing the environmental costs in the pricing mechanism of the traditional market.

For example, the government could decide to set up an environmental externality management market at point "j" in Figure 5 above to manage that level of externality, so that production and consumption at point "j" is less than pareto optimal production and consumption at point "e" and more that green pareto optimal consumption and production at point "i", and reduce some production and consumption related pollution that way. But notice that bundle "j" falls outside the green production frontier so it is not a green bundle and therefore, it would not be available in green markets; and it also falls below the pareto optimal point "e" making it a pareto inefficient point from the pareto optimality point of view, but production and consumption takes place at point "j" anyway as it is an externally set market. See that both the green market and the traditional market are perfect, free markets while environmental externality based markets are non-perfect, non-free markets as perfect free markets do not need government intervention unless there is market failure while environmental externality markets cannot exist without permanent ongoing government intervention. Therefore, environmental externality management based production and consumption bundles are inconsistent with green pareto efficiency and with pareto efficiency principles at the same time because they are non-free, non-perfect markets set up by external actors to manage the environmental sustainability gap affecting the traditional market up to levels such as point "j".

The non-optimal nature of environmental externality management market based consumption and production bundles

The non-optimal nature of these productions and consumption bundles can be extracted from the placing a production bundle "j" between the green pareto optimality point and the traditional pareto optimality representing an environmental externality management bundle that is brought by an environmental tax Tc imposed by the government on goods being produced and consumed to reduce that way pollution from production and consumption; and manage that way a portion of the environmental sustainability gap(ESG) shown in Figure 2 and being closed in Figure 3 above, a situation summarized in Figure 6 below:

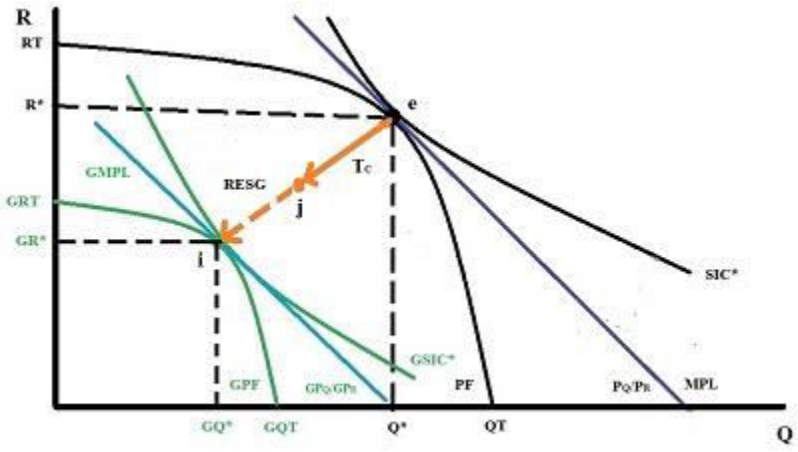

Figure 6 A green pareto inefficient and pareto inefficient environmental externality management based bundle "j"

We can see in Figure 6 above the following: 1) The environmental tax Tc on goods consumed and produced shift production and consumption from point "e" to point "j" as indicated by the arrow from point "e" to point "j", where this environmental externality management market(EEMM) is placed; and 2) the environmental externality market at point "j" operates under a remaining environmental sustainability gap(RESG = ESG - Tc) as pollution still is taking place as indicated by the broken arrow from point "j" to point "i" as only a portion of the environmental sustainability gap(ESG) affecting the traditional market shown in Figure 2 above is being accounted for by the tax. And ongoing government intervention is needed to keep production and consumption at point "j", which makes this point "j" a clearly non-optimal, non-free, non-perfect production and consumption bundle. Notice that in order to increase pollution reduction under environmental externality management based markets(EEMM) to the left of point "j" the environmental tax Tc needs to increase so pollution reduction from less production and less consumption takes place; and therefore, in environmental externality base markets pollution reduction is not a driver of profit making as long as producers can pass the tax to consumers or as long as consumers can pay the dwarf green price to consume there they are fine producing and consuming at point "j" while the remaining environmental sustainability gap(RESG) is still active as pollution continues.

Notice that in traditional markets the more cost externalization the lower the price so you can produce and consume at a lower price; and traditional producers aim at producing at the lowest price possible so pollution behavior and lower prices are linked as more production and consumption means more pollution; and at point "e' we have the lowest market price and the highest polluting point in Figure 6 above. See that in green markets the lowest the environmental cost of production the lowest the green price so more can be produced and consumed as the green price decreases because the environmental cost decreases; and hence in green markets at point "i", pollution reduction is linked to green profit making. In other words, in perfect markets like traditional markets and green markets, producers and consumers when the production frontier expands as prices decrease, produce and consume more, more traditional goods in traditional markets and more green products in green markets, but in environmental externality management markets price increases due to environmental tax increases drive the market towards lower pollution by inducing less production and less consumption. And this is the reason why a market at point "j" requires on going for ever government intervention to exist while markets like traditional markets at point "e" or green markets at point "i" require no government intervention unless there is market failure.

Finally, we can see in Figure 6 above that economic activity in both the traditional market and in green markets moves from left to right driven by decreasing prices so they expand to the right while in environmental externality management based markets economic activity contracts from right to left as prices increase due to increasing environmental taxes. This is because consumers and producers in traditional markets and in green markets are price setters as prices are determined by supply and demand; and producers and consumers in environmental externality based markers are price takers as prices are not determined by supply and demand, but by external intervention. Because prices in environmental externality management markets(EEMM) are not determined by supply and demand, they are non-free markets which the author calls "dwarf green markets".

The structure of the environmental externality management market

The structure of the environmental externality management market(EEMM) is made up by a dwarf production frontier(DPF), a dwarf social indifference curve(DSIC), and a dwarf market price line(DMPL), as indicated in Figure "7" below:

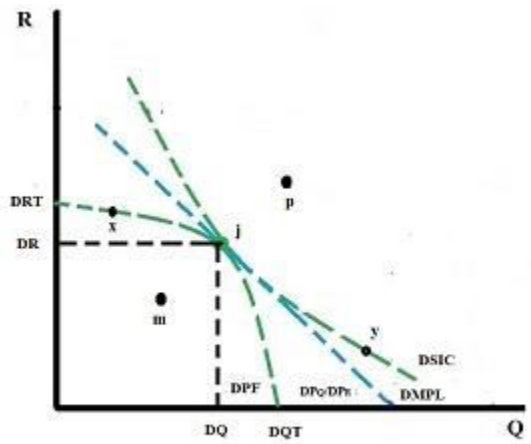

Figure 7 The structure of the environmental externality management market(EEMM)

We can see in Figure 7 above that that the production frontier(DPF), the social indifference curve(DSIC), and the market price line(DMPL) associated with the environmental externality management market point j" are broken because environmental externality management markets(EEMM) are not cleared by supply and demand, and hence they are dwarf markets as they are not free markets since producers and consumers in this market are price takers. In environmental externality management markets the dwarf price(DP = P + Tc) clears the market making production and consumption of DQ and DR not an optimal production and consumption bundle. In other words, a broken production frontier means there are no free choice production bundles, a broken social indifference curve means there are no free choice consumption bundles, and a broken market price line means there is no market price determination as the price is externally set through environmental taxes.

We can see the following in Figure 7 above about environmental externality management markets(EEMM): 1) Producers and consumers have no choice but to produce and consume at point "j" where the externally set price line or dwarf market price line(DMPL) meets the only production and consumption bundle possible at point "j" given the environmental tax leading to producing and consuming DQ and DR; 2) Producers and consumers could produce and consume at point "m" if they had a choice with the same environmental tax and reduce pollution even more than in traditional markets, but by producing at point "j" producers can make more money and by consuming there consumers can save some money so rational expectations tells us they will choose to make more money if producing and to same money if consuming; 3) Producers and consumers would prefer an environmental externality management based market at point "p" instead of at point "j", yet they have no choice but to stay at point "j". Hence, production at point "x" and consumption at point "y" are not possible given the environmental tax, only the bundle at point "j" is possible as; and 4) at the non-optimal point "j" we have that the absolute value of the ratios of dwarf marginal costs, of the dwarf marginal utilities and of the dwarf market prices are equal($DMC_Q/DMC_R = DMU_Q/DMU_R = DP_Q/DP_R$ so that $DMC_Q = DMU_Q = DP_Q$ and $DMC_R = DMU_R = DP_R$). Hence, consumers take whatever utility bundle "J" gives

them at that dwarf price; and producers will pass the tax to consumers by producing bundle "j" where the dwarf marginal costs meet the dwarf market price.

Hence, consistent with Figure 7 above, an environmental tax increase could shift production and consumption from point "j" to point "m" reducing pollution that way, and producers would produce and sell less at a higher price and make less money, and consumers would be consuming non-green products at higher prices. On the other hand, an environmental tax decrease would shift production and consumption from point "j" to point "p" helping producers to produce more and make more money at lower prices, and help consumers to consume more and save more money at lower prices, behavior that would increase pollution from production and consumption as compared to point "j" as pollution is expected to increase as production and consumption increases.

Food for thoughts

1) Is cost externalization directly related to model unsustainability? I think yes, what do you think?; 2) Is cost internalization directly related to increasing model responsibility? I think, yes what do you think?; 3) Does cost externalization creates pareto improvement situations that lead to development races towards pareto efficient bottoms? I think yes, what do you think?; and 4) Does cost internalization eliminates pareto improvements situations that lead to development races away from pareto efficient bottoms? I think yes, what do you think?

Conclusions

1) It was pointed out that environmental externality management based markets can be set up by the government anywhere within the environmental externality management market production and consumption zone; 2) It was stressed that any environmental externality management bundle is found between green pareto optimality and traditional pareto optimality points and since they are not free markets production and consumption in those markets are not optimal; 3) It was highlighted that as prices in environmental externality management based markets are not determined by supply and demand, they are called by the author dwarf green markets; 4) It was indicated that as a dwarf market, the environmental externality management market has broken dwarf production frontier, broken social indifference curves and broken market price lines reflecting its market structure; 5) It was exalted that production and consumption in perfect markets such as the green market or the traditional market expands from left to right as prices decrease while production and consumption in environmental externality management markets contracts from right to left as environmental taxes increase; and 6) it was shown graphically and analytically that environmental externality management based production and consumption bundles are inconsistent with green pareto efficiency and with pareto efficiency

principles at the same time because i) they are not perfect green bundles nor they are perfect traditional economic bundles as they are not determined by supply and demand and driven by perfect market prices; and hence ii) they are not optimal, not free, and not-perfect market bundles that require ongoing government intervention to exist as market prices in these markets are set externally.

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