True sustainability thinking 101: Why is Pareto efficient in traditional markets outside sustainability based Pareto efficiency in sustainability markets? What is the structure of sustainability based Pareto optimality? What are the implications of this?

By

Lucio Muñoz*

* Independent qualitative comparative researcher/consultant, Vancouver, BC, Canada. Email: munoz@interchange.ubc.ca

Abstract

At the heart of perfect market thinking is Pareto efficiency thinking, in consumption and in production, where Pareto efficiency in production and consumption is found at the market equilibrium point. In 1987 the Brundtland Commission challenged us to go beyond business as usual by internalizing social issues or environmental issues or socio-environmental issues affecting negatively the working of traditional market thinking as it was leading to the critical social and/or environmental problems they documented. However, instead of going full externality cost internalization as required by sustainability market thinking, the Brundtland Commission went the way of partial cost internalization a la sustainable development thinking, leaving us still under a world of distorted sustainable development markets, be it socially friendly sustainable development markets or environmentally friendly sustainable development markets or socio-environmentally friendly sustainable development markets. Had the Brundtland Commission gone the way of full cost internalization, they could have opened the possibility to a world under red markets if solving the social sustainability issue was the priority or to a world under green markets if solving the environmental sustainability issue was the priority or to a world under true sustainability markets if addressing the socio-environmental sustainability problem was the priority. Hence, the Brundtland Commission could have opened the door to ideas such red Pareto optimality, green Pareto optimality, and sustainability based Pareto optimality, all of which leave behind traditional Pareto optimality thinking. This papers is about Sustainability market based Pareto optimality and how this thinking works and transforms the economic component specific based Pareto optimality concept into a conjunctural system specific concept that would have applied if the Brundtland Commission would have make the priority to fully address the socio-environmental sustainability problem in 1987. A shift to sustainability market thinking means that traditional Pareto efficiency thinking is left behind as when internalizing socio-environmental costs in the pricing mechanism of the traditional market we shift the production frontier, the social indifference curve, and the market price line of the traditional market towards the sustainability market based production frontier, the sustainability market based social indifference curve, and the market price line of sustainability markets, and therefore, it is a shift towards sustainability market based pareto optimality, giving birth that way to the idea of sustainability market based Pareto efficiency thinking. This is because at the heart

of sustainability market thinking is the concept of sustainability market based Pareto efficiency, in sustainability based consumption and in sustainability based production, where sustainability based Pareto efficiency in production and consumption is found at the true sustainability market equilibrium point. In other words, a shift from traditional perfect market thinking to perfect sustainability market thinking indicates a shift from traditional Pareto efficiency and optimality to sustainability market based Pareto efficiency and optimality, yet to my knowledge nothing is written about this. And this raises questions such as why is Pareto efficient in traditional markets outside sustainability market based Pareto efficiency in true sustainability markets? What is the structure of sustainability market based Pareto optimality? What are the implications of this?

Key words

Pareto efficient, pareto inefficient, pareto improvement, pareto optimal, sustainability based pareto efficient, sustainability based pareto inefficient, sustainability based pareto improvement, sustainability based pareto optimal, paradigm shift, traditional market, true sustainability market

Introduction

a) The nature of pareto efficiency thinking

The nature of pareto efficiency thinking can be extracted with the use of three components, the production frontier(PF), the social indifference curve(SIC), and the market price line(MPL) in relation to production and consumption bundles of product Q and product R , as indicated in Figure 1 below:
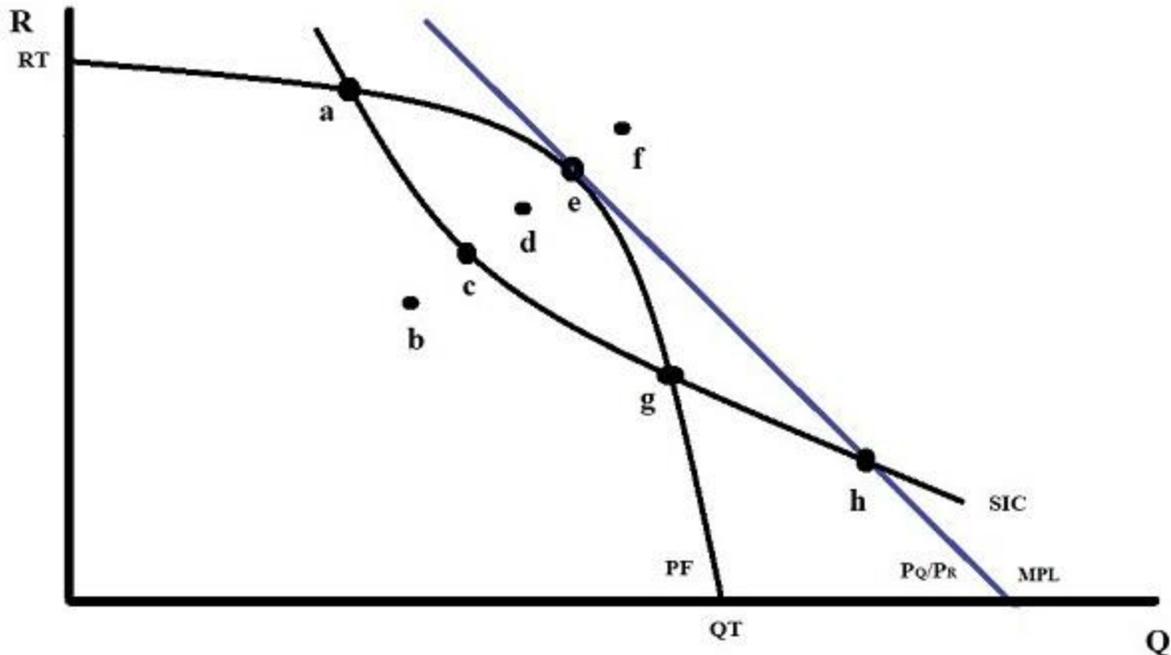
Figure 1 The thinking behind pareto efficient, pareto inneficient, pareto improvement and pareto optimal

Figure 1 above shows a constellations of points that are used below to point out the thinking behind pareto efficient, pareto inefficient, pareto improvement, and pareto optimal as they relate to the production frontier(PF), the social indifference curve(SIC) and the market price line(MPL), as described in detail below:

1) The thinking behind the production frontier(PF)

We can see in Figure 1 above that there is a production frontier PF, where all production bundles on it like points "a", "e", and "g" are pareto efficient in production because at those points no pareto improvements in production exist. Points "b", "c" and "d" are pareto inefficient in production as pareto improvements in production exist. Points "f" and "h" are production points that falls outside the production frontier so producing at that level is not possible. Producing at point "d' for example is preferred than producing at point "b". Notice that here the idea of more production is better prevails in the analysis.

2) The thinking behind the social indifference curve(SIC)

We can see in Figure 1 in above that there is a social indifference curve SIC, where all consumption bundles on it like points "a", "c", "g" are pareto inefficient in consumption because at those points pareto improvements in consumption exist, and notice that point "h" is a consumption point on the social indifference curve (SIC) that falls outside the production frontier (PF); and therefore, that consumption bundle is not available. Point "b' is the pareto inefficient consumption bundle less preferred and point "f" is the consumption bundle more preferred as it

is on a higher indifference curve, but it is not available. Notice that here the idea of more consumption is better prevails in the analysis.

3) *The thinking behind the market price line(MPL)*

We can see in Figure 1 above that there is a market price line(MPL), with points like point "e" and "h", where at point "e" there is pareto efficient production and pricing that is optimal as the market line is tangent to the pareto efficient point "e"; and at point "h" there is pricing of a consumption bundle on the indifference curve that falls outside the production frontier, and therefore, it is not available. Notice that here the idea that the market price line when tangent determines optimal production and consumption levels prevail in the analysis.

b) The transition towards pareto optimality

As long as there are pareto improvement moves in consumption such as the ones indicated in Figure 1 above we should expect the social indifferent curve(SIC) to move up towards no pareto improvements in consumption since more consumption is better until it reaches its optimal consumption point at point "e" as indicated in Figure 2 below:
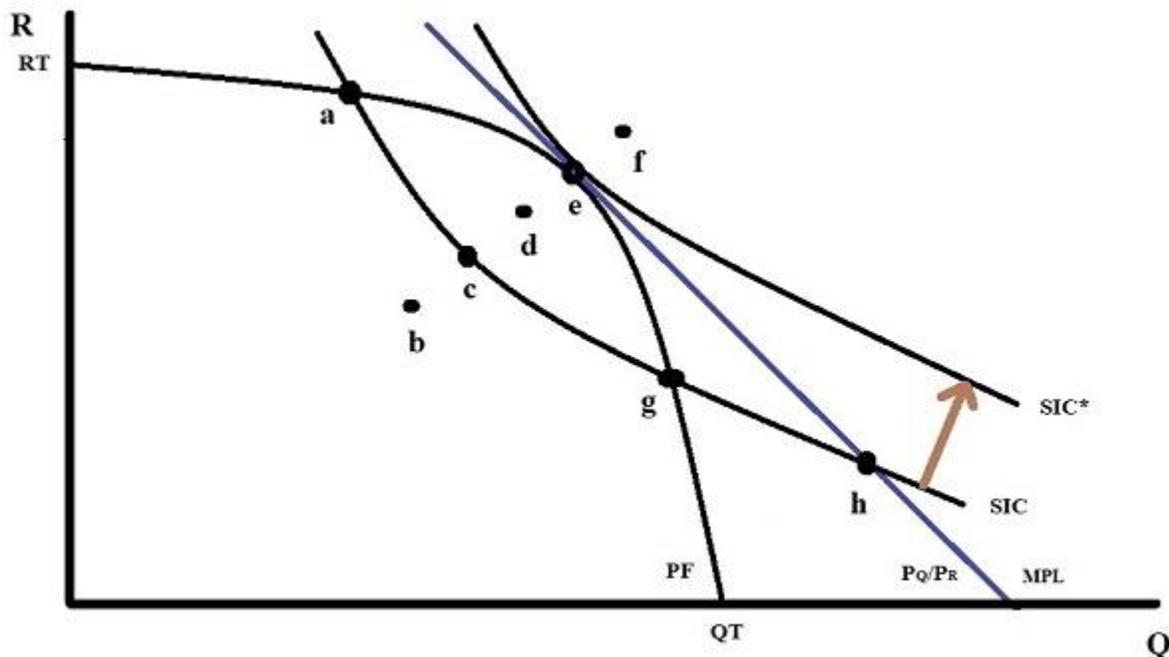

Figure 2 The move from non-optimal social indifference curves(SIC) to the optimal social indifference curve(SIC*)

We can see in Figure 2 above that since consuming more is better the social indifference curve (SIC) will shift up from point "c" all the way to point "e" as there we have the optimal level of consumption and the maximum that can be consumed; and therefore, at that point "e" the social indifference curve (SIC) takes the form of an optimal social indifference curve (SIC*), where optimal pareto efficiency in consumption exists. In other words, pareto improvements in consumption can be made from point "c" and up, and these possible pareto improvements will

stop when the social indifference curve(SIC) reaches point "e", the optimal point in production and consumption and pareto efficient. Notice that consumption at point "f" is preferred to point "e", but it is not available, so the best and optimal consumption point is point "e". Therefore, at point "e" we have optimal production, optimal consumption and optimal pricing, and therefore, point "e" is both pareto efficient and pareto optimal.

c) The structure of pareto optimality

Consistent with the above discussion, at the heart of perfect market thinking is Pareto efficiency thinking, in consumption and in production, where Pareto efficiency in production and consumption is found at the market equilibrium point, a situation pointed out in Figure 3 below:
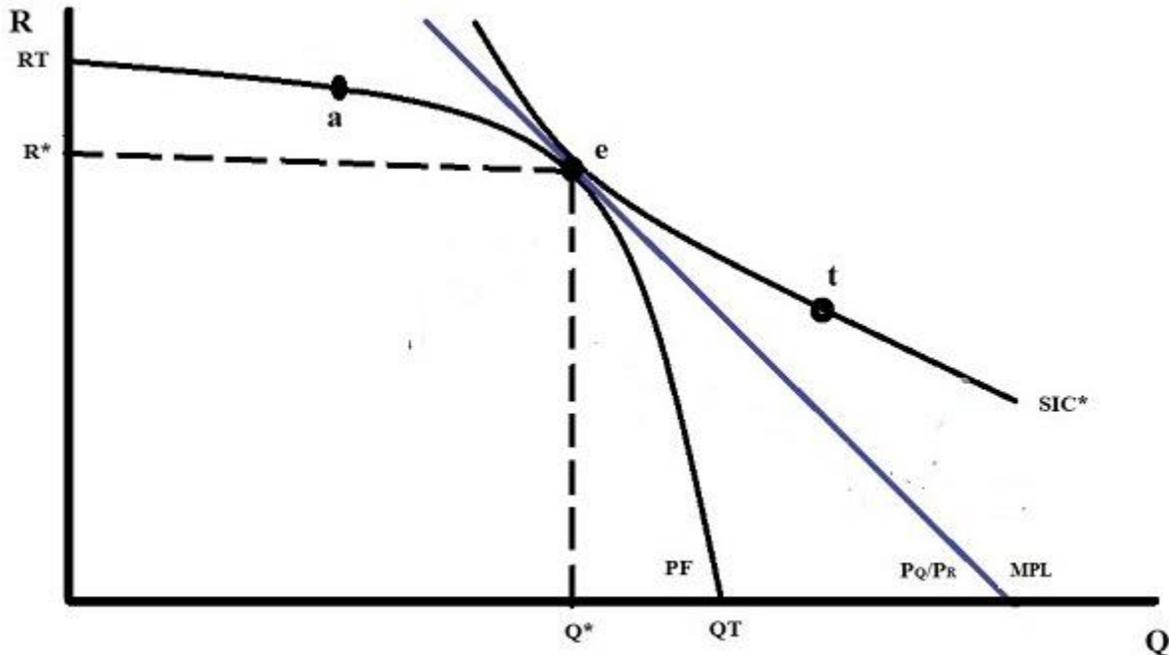

Figure 3 The structure of traditional pareto optimality

We can see in Figure 3 above that point "e" is the optimal point, 1) the point where we have optimal pareto efficiency in production and optimal pareto efficiency in consumption at the same time; and 2) the point where the traditional market price line determines the optimal quantities to be produced and consumed so it is a point of optimal pricing. We can see also in Figure 3 above also the following 1) that any point on the production frontier(PF) that is not "e" such as point "a" is pareto efficient in production, but it is not optimal; 2) that any point of the social indifference curve(SIC*) that is not "e" such as point "t" is pareto efficient in consumption, but it is not optimal; and therefore, 3) only point "e" is pareto efficient and optimal at the same time, in production and in consumption and in pricing.

Notice that since at point "e" the slopes of the production frontier(PF), of the social indifference curve(SIC) and of the traditional market price line(TML) are the same, then the following is true:

1) $\left|\text{Slope of PF}\right| = \left|\text{Slop of SIC}\right| = \left|\text{Slop of TML}\right|$

2) $MC_Q/MC_R = MU_Q/MU_R = P_Q/P_R$

3) $MC_Q = MU_Q = P_Q$

4) $MC_R = MU_R = P_R$

And therefore, point "e' meets all the pareto optimality conditions in production, in consumption and in pricing at the same time, which is the reason why it summarizes the structure of pareto optimality. Notice that pareto optimality is possible only because of the externality neutrality assumption, which allow for the externalization of costs associated with production like social costs and environmental costs.

d) The nature of sustainability based Pareto efficiency thinking

In 1987 the Brundtland Commission (WCED 1987) challenged us to go beyond business as usual by internalizing social issues or environmental issues or socio-environmental issues affecting negatively the working of traditional market thinking as it was leading to the critical social and/or environmental problems they documented. However, instead of going full externality cost internalization as required by sustainability market thinking, the Brundtland Commission went the way of partial cost internalization a la sustainable development thinking without any specific social and/or environmental problem solving priority (Muñoz 2024), leaving us still under a world of distorted sustainable development markets, be it socially friendly sustainable development markets or environmentally friendly sustainable development markets or socio-environmentally friendly sustainable development markets. Had the Brundtland Commission gone the way of full cost internalization, they could have opened the possibility to a world under red markets if solving the social sustainability issue was the priority or to a world under green markets if solving the environmental sustainability issue was the priority or to a world under true sustainability markets if addressing the socio-environmental sustainability problem was the priority. Hence, the Brundtland Commission could have opened the door to ideas such red Pareto optimality, green Pareto optimality, and sustainability based Pareto optimality, all of which leave behind traditional Pareto optimality thinking. The idea of green Pareto optimality (Muñoz 2020) and the structure of perfect green markets (Muñoz 2016a) and how they work under perfect green market completion (Muñoz 2019a) has been recently shared. This papers is about Sustainability market based Pareto optimality and how this thinking works and transforms the economic component specific based Pareto optimality concept into a conjunctural system specific concept that would have applied if the Brundtland Commission would have make the priority to fully address the socio-environmental sustainability problem in

1987. A shift to sustainability market thinking means that traditional Pareto efficiency thinking is left behind as when internalizing socio-environmental costs in the pricing mechanism of the traditional market we shift the production frontier, the social indifference curve, and the market price line of the traditional market towards the sustainability market based production frontier, the sustainability market based social indifference curve, and the market price line of sustainability markets, and therefore, it is a shift towards sustainability market based pareto optimality, giving birth that way to the idea of sustainability market based Pareto efficiency thinking. This is because at the heart of sustainability market thinking is the concept of sustainability market based Pareto efficiency, in sustainability based consumption and in sustainability based production, where sustainability based Pareto efficiency in production and consumption is found at the true sustainability market equilibrium point. In other words, a shift from traditional perfect market thinking to perfect sustainability market thinking indicates a shift from traditional Pareto efficiency and optimality to sustainability market based Pareto efficiency and optimality, yet to my knowledge nothing is written about this. The idea that paradigm shifts have unintended consequences such as leaving the knowledge base and anything supported on that old knowledge base behind (Muñoz 2016b) as well as how the perfect sustainability market structure looks like (Muñoz 2016c) and it is expected to work under perfect sustainability market competition (Muñoz 2019b) has been recently point out. And this raises questions such as why is Pareto efficient in traditional markets outside sustainability market based Pareto efficiency in true sustainability markets? What is the structure of sustainability market based Pareto optimality? What are the implications of this?

Goals of this paper

a) To point out that internalizing socio-environmental costs in the traditional market shifts the pareto optimal point to the sustainability based pareto optimal point; b) To stress that in the new market even the pareto efficient point is not desirable to sustainability based stakeholders as all production and consumption points of the traditional market fall outside the sustainability based pareto production and sustainability based consumption functions so they are not available in true sustainability markets; and c) To state the structure of sustainability based pareto optimality both analytically and graphically.

Methodology

1) The terminology used to support the ideas in this paper are shared; 2) The process behind the shift from pareto efficiency to sustainability based pareto efficiency when socio-environmental costs are internalized is indicated; 3) The nature of sustainability based pareto efficiency thinking is pointed out in detail; 4) The pareto efficiency world is compared to the sustainability based pareto efficiency world to stress that all consumption points and production

points in the traditional market and traditional pareto optimality thinking including the pareto optimal point fall outside the true sustainability based production frontier; and therefore, they are not possible choices in true sustainability markets; 5) The migration of sustainability based social indifference curves towards sustainability based optimality is described as driven by moves from sustainability based pareto inefficient points to a sustainability based pareto efficient point; 6) The structure of sustainability based pareto optimality is highlighted graphically and analytically; and 7) 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

TSR = True sustainability product R

TSRT = Total production of sustainability based product R

TSQ = True sustainability based product Q

TSQT = Total production of true sustainability based product Q

MPL = Traditional market price line   TSMPL = True sustainability market price line

SIC = Social indifference curve

TSSIC = True sustainability based social indifference curve

SIC* = Optimal social indifference curve   PF = Production frontier

TSSIC* = Optimal true sustainability based social indifference curve

TSPF = True sustainability based production frontier

e = Pareto optimal point   i = True sustainability based Pareto optimal point

TSR* = Optimal true sustainability based production of product R

TSQ* = Optimal true sustainability based production of product Q

TSMP = TSP True sustainability market price   TSU = True sustainability marginal utility

TSMC = TSC True sustainability marginal cost   U = Marginal utility

MC = Marginal cost   P = TMP = MP = Traditional market price

TSU = True sustainability marginal utility

TSP_Q = True sustainability marginal price for commodity Q

TSP_R = True sustainability marginal price for commodity R

P_Q = Marginal price for commodity Q P_R = Marginal price for commodity R

Operational concepts

1) Traditional market, *the economy only market*

2) Sustainability market, *the social and 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) Sustainability market price, *the price that reflects both the economic and the socio-environmental cost of production or the price that covers the cost of social and environmentally friendly production.*

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

6) Socio-environmental cost externalization, *the leaving out of the pricing mechanism of the market the socio-environmental cost associated with production.*

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

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

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

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

11) 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.

12) 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.*

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

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

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

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

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

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

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

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

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

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

23) Economic externality, *the economic costs associated with production not reflected in the pricing mechanism of the market.*
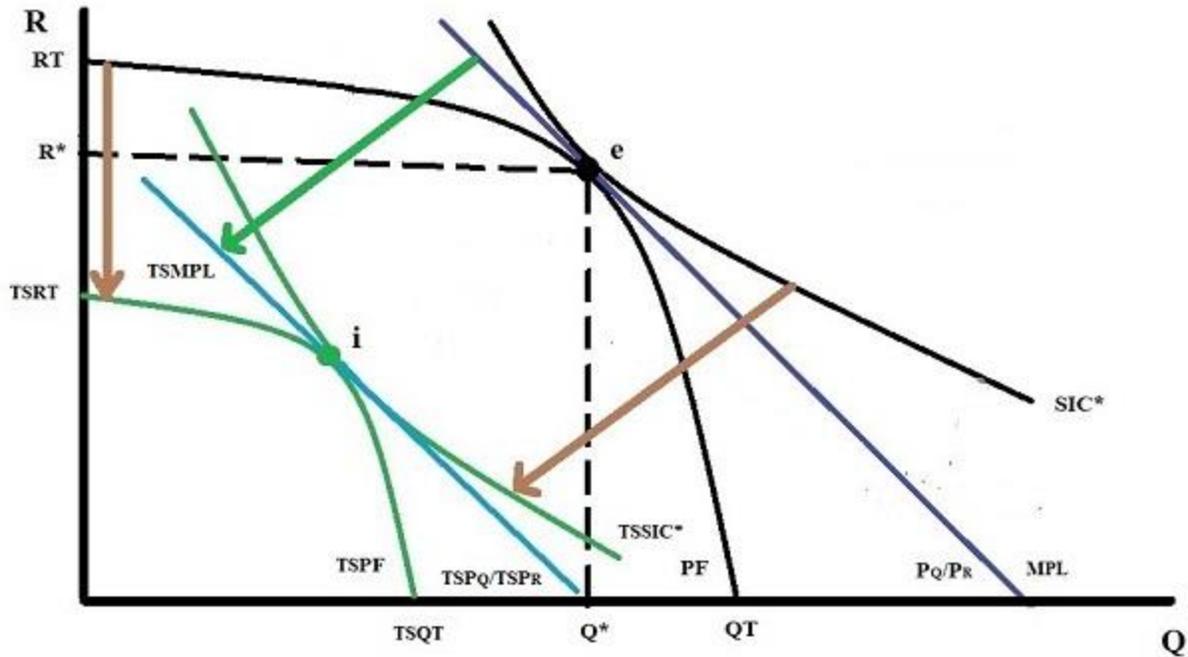
24) Socio-environmental externality, *the social and environmental cost associated with production not reflected in the pricing mechanism of the market.*

25) Socio-environmental margin, *to cover the extra cost of making the business socially and environmentally friendly.*

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

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

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

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

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

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

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

33) Circular dwarf sustainability 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-socioenvironmental externality.*

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

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

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

37) Sustainability based Pareto optimal, *the levels of sustainability based production and sustainability based consumption determined by the true sustainability market price.*

The shift from Pareto efficiency to sustainability based Pareto efficiency

When the socio- environmental cost of doing business is internalized in the pricing mechanism of the traditional market the whole Pareto optimal structure in Figure 3 above shifts towards the sustainability based Pareto optimal structure as indicated in Figure 4 below:

Figure 4 The shift from traditional Pareto optimality at point "e" to sustainability based Pareto optimality at point "i"

Figure 4 helps see the following consequences of socio-environmental cost internalization in the traditional market producing commodities Q and R: 1) The traditional production frontiers(PF) shifts and takes the form of the true sustainability based production frontier(TSPF) as indicated by arrow going from RT to TSRT; 2) the traditional optimal social indifference curve(SIC*) shifts and takes the form of the true sustainability based optimal social indifference curve(TSSIC*) as indicated by the arrow going from SIC* to TSSIC*; and 3) The traditional market price line(MPL) shifts and takes the form of the true sustainability based market price line(TSMPL) as shown by arrow going from MPL to TSMPL. Hence, Figure 4 above helps us appreciate that the internalization of socio-environmental costs shifts the traditional Pareto optimal point at point "e' to the sustainability based pareto optimal point at point "i".

The nature of true sustainability based Pareto efficiency thinking

The nature of true sustainability based pareto efficiency thinking then can be extracted with the use of three components, the true sustainability based production frontier (TSPF), the true sustainability based social indifference curve (TSSIC), and the true sustainability based market price line (TSMPL) in relation to sustainability based production and sustainability based consumption bundles of product Q and product R, as indicated in Figure 5 below:
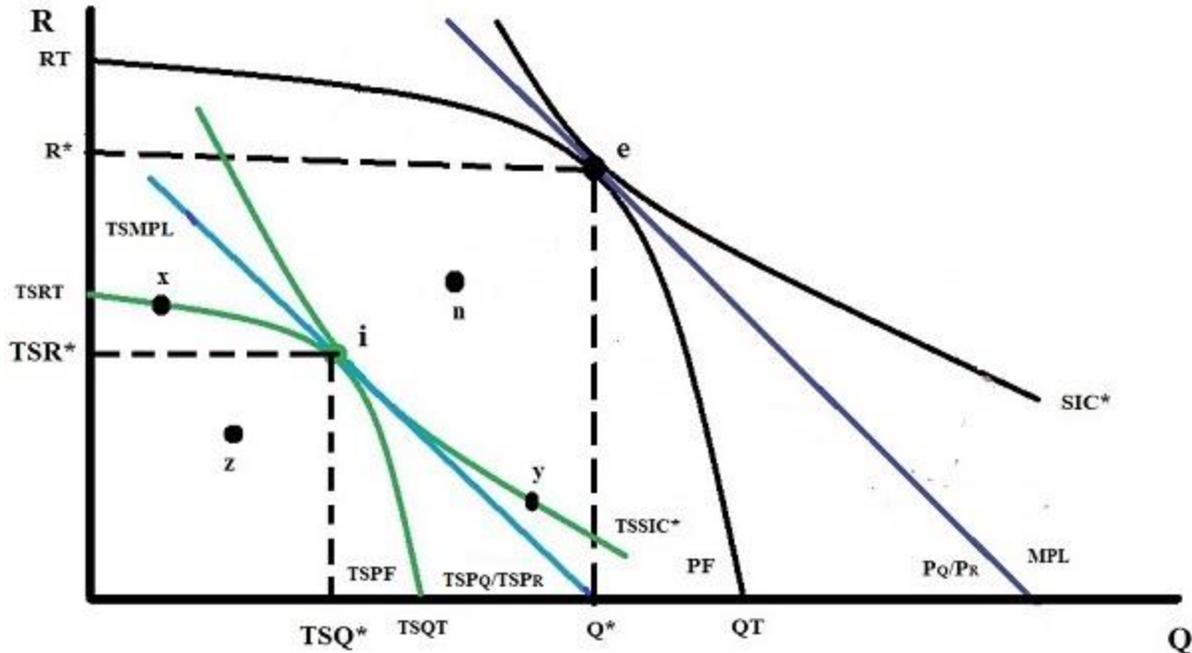
Figure 5 Contrasting the sustainability based Pareto optimality at point "i" with traditional Pareto optimality at point "e"

Figure 5 above shows a constellations of points that are used below to highlight the thinking behind sustainability based pareto efficient, sustainability based pareto inefficient, sustainability based pareto improvement, and sustainability based pareto optimal as they relate to the sustainability based production frontier (TSPF), the true sustainability based social indifference curve (TSSIC) and the true sustainability based market price line (TSMPL), as described in detail below:

1) The thinking behind the true sustainability based production frontier (TSPF)

We can see in Figure 5 above that there is a sustainability based production frontier TSPF, where all production bundles on it like points "x" and "i" are sustainability based Pareto efficient in production because at those points no sustainability based Pareto improvements in sustainability based production exist. Points "z" is sustainability based Pareto inefficient in production as sustainability based Pareto improvements in sustainability based production exist. Point "n" is a production point that is preferred to "z" but falls outside the sustainability based production frontier so producing at that level is not possible. Notice that here the idea of more sustainability based production is better prevails in the analysis.

2) The thinking behind the sustainability based social indifference curve (TSSIC)

We can see in Figure 5 in above that there is a social indifference curve TSSIC, where all consumption bundles on it like points "y" and "i" are sustainability based pareto efficient in consumption because at those points sustainability based pareto improvements in consumption

do not exist, but notice that since point "y" falls outside the sustainability based production frontier (TSPF) that sustainability based consumption bundle is not available. Point "z' is the sustainability based Pareto inefficient consumption bundle less preferred and point "n" is the sustainability based consumption bundle more preferred, but it is not available. Notice that here the idea of more sustainability based consumption is better prevails in the analysis.

3) The thinking behind the true sustainability based market price line (TSMPL)

We can see in Figure 5 above that there is a sustainability based market price line (TSMPL) going through point "i" tangent to the sustainability based production frontier (TSPF) and to the sustainability based social indifference curve (TSSIC*) at the same time; and this means that at point "i" there is sustainability based Pareto efficiency in production, sustainability based Pareto efficiency in consumption and pricing that is optimal.   See that point "x" is sustainability based Pareto efficient in production, but it is not optimal and point "i" is sustainability based Pareto efficient in production and it is optimal. Point "y" on the other hand, if it existed, it would be sustainability based Pareto efficient in sustainability based consumption, but it is not optimal while point "i" is sustainability based Pareto efficient in consumption and it is optimal. Notice that here the idea that the sustainability based market price line (TSMPL) when tangent determines optimal sustainability based production and sustainability based consumption levels prevail in the analysis.

### Comparing the world of Pareto efficiency with that of sustainability based Pareto efficiency

When comparing the structure of pareto optimality at point "e" with sustainability based pareto optimality at point "i" in Figure 5 above we can see the following: 1) Traditional optimal pareto production and consumption is higher than optimal sustainability based pareto production and consumption($Q^* > TSQ^*$; $R^* > TSR^*$); 2) if we were living in a true sustainability market based world and we suddenly externalize all socio-environmental costs, then sustainability markets would become traditional markets operating at point "e"; and 3) if we are living in a world of perfect traditional markets and we suddenly internalize all socio-environmental costs, then traditional markets would become true sustainability markets operating at point "i". By comparing point "e" and point "i" in Figure 5 above we can state that 1) pareto optimality is not sustainability based pareto optimality; and therefore, 2) even pareto efficient and optimal points like point "e" would not be available under true sustainability markets as they fall outside the sustainability market production frontier.   In other words, we can see clearly in Figure 5 above that pareto efficient in traditional markets falls outside sustainability based pareto efficiency in true sustainability markets as even the pareto optimal point falls outside the sustainability based production frontier (TSPF) so traditional market choices would not be available in true sustainability markets.

The migration of sustainability based social indifference curves towards true sustainability based optimality

As long as there are sustainability based pareto improvement moves in sustainability based consumption possible such as point "z" in Figure 5 above we should expect the sustainability based social indifferent curve (TSSIC) to move up towards no sustainability based pareto improvements in sustainability based consumption since more sustainability based consumption is better until it reaches its optimal true sustainability based consumption point at point "i". In other words, we can see in Figure 5 above that since consuming more is better the sustainability based social indifference curve (TSSIC) will shift up from point "z" all the way to point "i" as there we have the optimal level of sustainability based consumption and the maximum that can be consumed; and therefore, at that point "i" the true sustainability based social indifference curve (TSSIC) takes the form of an optimal sustainability based social indifference curve (TSSIC*), where optimal true sustainability based pareto efficiency in sustainability based consumption exists. Notice that sustainability based consumption at point "n" is preferred to point "i", but it is not available, so the best and optimal sustainability based consumption point is point "i". And this means that at point "i" we have optimal sustainability based production, optimal sustainability based consumption and optimal sustainability based pricing at the same time, and therefore, point "i" is both sustainability based pareto efficient and sustainability based pareto optimal.

The structure of sustainability based Pareto optimality

At the heart of perfect sustainability market thinking as pointed out above is sustainability based pareto efficiency thinking, in sustainability based consumption and in sustainability based production, where sustainability based pareto efficiency in sustainability based production and sustainability based consumption is found at the true sustainability market equilibrium point, a situation indicated in Figure 6 below:
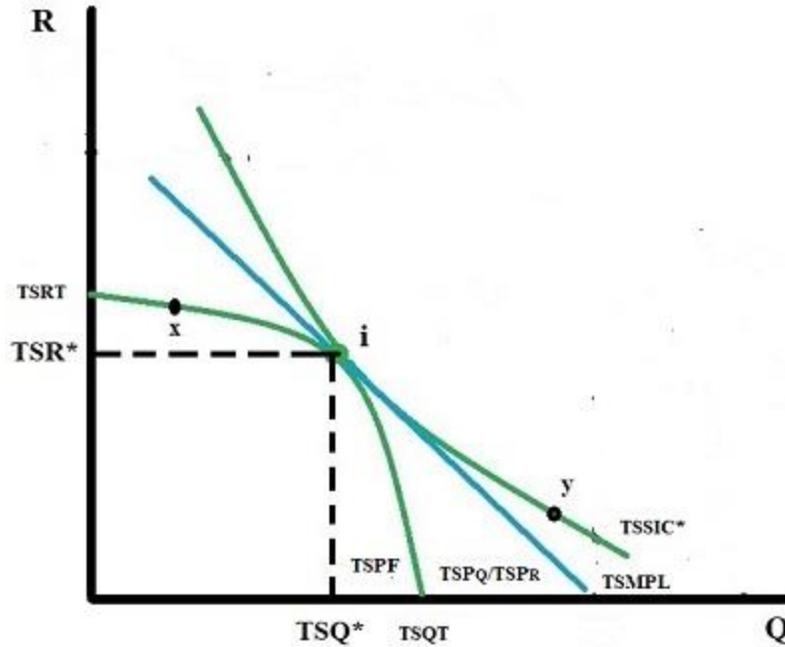
Figure 6   The structure of sustainability based Pareto optimality

We can see in Figure 6 above that point "i" is the optimal true sustainability point, 1) where we have optimal sustainability based pareto efficiency in production and optimal sustainability based pareto efficiency in consumption at the same time; and 2) the point where the sustainability based market price line (TSMPL) determines the optimal true sustainability based quantities to be produced and consumed so it is a point of optimal true sustainability market pricing. We can see also in Figure 6 above also the following 1) that any point on the true sustainability based production frontier(TSPF) that is not "i" such as point "x" is sustainability based pareto efficient in production, but it is not optimal; 2) that any point on the sustainability based social indifference curve(TSSIC*) that is not "i" such as point "y" is sustainability based pareto efficient in consumption, but it is not optimal and it is not available; and therefore, 3) only point "i" is sustainability based pareto efficient and optimal at the same time, in sustainability based production and in sustainability based consumption and in sustainability based pricing.

Notice that since at point "i" the slopes of the sustainability based production frontier (TSPF), of the sustainability based social indifference curve(TSSIC) and of the sustainability based market price line(TSMPL) are the same, then the following is true:

1) $|$ Slope of TSPF $|$ = $|$ Slop of TSSIC $|$ = $|$ Slop of TSMPL $|$

2) $TSMC_Q/TSMC_R = TSMU_Q/TSMU_R = TSP_Q/TSP_R$

3) $TSMC_Q = TSMU_Q = TSP_Q$

4) $TSMC_R = TSMU_R = TSP_R$

And therefore, point "i' meets all the sustainability based pareto optimality conditions in sustainability based production, in sustainability based consumption and in sustainability based pricing at the same time, which is the reason why it summarizes the structure of true sustainability based pareto optimality. Notice that true sustainability based Pareto optimality is possible only because there is no socio-environmental externality neutrality assumption here in true sustainability markets as both the economic and socio-environmental costs of production are reflected in the sustainability market price.

Food for thoughts

1) Do paradigm shifts from traditional markets to sustainability markets means that the knowledge base of the traditional market does not work in the new paradigm? I think yes, what do you think?; 2) Can sustainability based Pareto optimality be seen as a fix of traditional Pareto optimality to make it socio-environmentally friendly? I think yes, what do you think?; 3) Can we think of the gap between sustainability based Pareto optimality and traditional Pareto optimality as a socio-environmental externality management market zone? I think yes, what do you think?.

Conclusions

1) The internalization of socio-environmental costs in the pricing mechanism of the traditional market shifts the pareto optimal structure to the sustainability based pareto optimal structure; 2) The nature of sustainability based pareto efficiency thinking can be taken as a correction of pareto optimality thinking to make it socio-environmentally friendly; 3) Once in true sustainability markets, traditional pareto efficiency thinking does not work as now all traditional pareto efficiency choices, included the optimal choice falls outside the sustainability based production frontier and so they are not available in sustainability markets; 4) Sustainability based social indifference curves migrate just like traditional social indifference curves, but now the driver is the presence of sustainability based pareto improvements; and 5) The structure of sustainability based pareto optimality shows that if socio-environmental concerns are fully internalized, then we leave the world of traditional pareto optimality behind as now we are in the world of true sustainability markets.

References

Muñoz, Lucio, 2016a. **Beyond Traditional Market Thinking: What is the Structure of the Perfect Green market?,** In: *International Journal of Science Social Studies Humanities and Management (IJSSSHM),* Vol. 2, No. 5., May, Ed. Dr. Maya Pant, India.

Muñoz, Lucio, 2016b. **The Unintended Consequences of Paradigm Death and Shift: Was the Arrow Impossibility Theorem Left Behind?,** *Weber Economics & Finance (ISSN:2449-1662),* **Vol. 2 (3) 2016, Article ID wef_170, 547-555.**

Muñoz, Lucio, 2016c. Beyond Green Market Thinking: What would be the Structure of the Perfect Sustainability Market?, *In: International Journal of Science Social Studies Humanities and Management (IJSSSHM),* **Vol. 2, No. 5, May, Ed. Dr. Maya Pant, India.**

Muñoz, Lucio, 2019a. **From Traditional Markets to Green Markets: A Look at Markets Under Perfect Green Market Competition,** *Weber Economics & Finance (ISSN:2449-1662),* Vol. 7 (1) 2019, Article ID wef_253, 1147-1156

Muñoz, Lucio, 2019b. **From Traditional Markets to Sustainability Markets: A Look at Markets Under Perfect Sustainability Market Competition**, **In:** *International Journal of Management Studies and Social Science Research(IJMSSSR*), Volume 1, Issue 1, January-February, Ed. Dr.Vishal Muvel, India.

Muñoz, Lucio, 2020. **Sustainability thoughts 125: Why is Pareto efficient in traditional markets outside green Pareto efficiency in green markets? What is the structure of green Pareto optimality? What are the implications of this?,** In: *International Journal of Management studies and Social Science Research(IJMSSSR),* Vol. 2, Issue 6, November-December, Pp 108-117, ISSN: 2582-0265, India.

 Muñoz, Lucio, 2024. **Sustainability thoughts 194: How can we show that the sustainable development solutions to the socio-environmental sustainability problem created by traditional market thinking by 1987 are both partial and without clear priority solutions?,** In: *International Journal of Education Humanities and Social Science(IJEHSS),* ISSN: 2582-0745, May-June, Vol. 7, Issue 3, Pp. 6-17, India.

World Commission on Environment and Development (WECD), 1987. ***Our Common Future***. London, Oxford University Press, UK.