

True Sustainability Thinking 106: Placing the Independent Choice Impossibility Theorem and the Fully Conjunctural Possibility Theorem under the Degree of Conjunctural Framework: Revealing the Structural Continuum from Independent to Codependent Choice Aggregation

By

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Abstract

The degree of conjunctural framework treats choice aggregation as a structural continuum ranging from fully independent decision making to fully codependent decision making. Within this continuum, Arrow's impossibility theorem occupies the limiting case of homogeneous independent choice. As the degree of conjunctural increases, the structural assumptions under which Arrow's theorem is admissible are progressively relaxed. Consequently, the theorem loses structural admissibility outside the fully independent endpoint, creating the structural conditions under which conjunctural possibility emerges. If we make the degree of conjunctural the independent variable that drives the structural falsification theorem, then the following situations come to exist: i) the arrow impossibility theorem is admissible under a fully independent decision-making structure, ii) the partial conjunctural theorem under sustainability gaps is admissible under partial viability or partially codependent decision-making, and iii) the fully conjunctural possibility theorem is admissible under full conjunctural conditions, which means that under full conjunctural conditions the arrow impossibility theorem is fully falsified. And this raises important questions such as how to place the Independent Choice Impossibility Theorem and the Fully Conjunctural Possibility Theorem under the Degree of Conjunctural Framework? How can this framework be used to highlight the Structural Continuum from Independent to Codependent Choice Aggregation?

Objectives

a) To place the Independent Choice Impossibility Theorem and the Fully Conjunctural Possibility Theorem within the Degree of Conjunctural Framework; b) To characterize the structural continuum linking independent, partially codependent, and fully codependent choice aggregation; and c) To show that structural admissibility shifts systematically along this continuum, thereby identifying the domains in which each theorem is valid.

Methodology

First, the terminology used in this paper is shared. Second, the two ways mapping of degree of conjuncturality is introduced. Third, the degree of conjuncturality framework is linked to the degree of decision making. Fourth, the degree of conjuncturality framework is linked to the degree of structurality. Fifth, the degrees of conjuncturality framework is linked to the degree of sustainability; Sixth, the degrees of conjuncturality framework is linked to the degree of preference aggregation, Seventh, the independent choice Arrow's impossibility theorem, the bounded possibility theorem, and the full conjuncturality possibility theorem are placed within the degrees of conjuncturality framework. Eighth, some general implications, a summary of comparisons, and a Summary of specific degree of conjuncturality implications are shared. And finally, ninth, some relevance conclusions are listed.

Terminology

DC = Degree of conjuncturality	FNC = Full non-conjuncturality
PC = Partial conjuncturality	FC = Full conjuncturality
DCO = Degree of codependence	FNCO = Full non-codependence
PCO = Partial codependence	FCO = Full codependence
DDM = Degree of decision-making	FIDM = Fully independent decision-making
PCDM = Partial codependent decision-making	
FCDM = Full codependence decision-making	
DSC = Degrees of structural consistency	FSI = Full structural inconsistency
PSC = Partial structural consistency	FSC = Full structural consistency
DSU = Degree of sustainability	FUN = Full unsustainability
PSU = Partial sustainability	FSU = Full sustainability

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TSU = True sustainability

DPA = Degree of preference aggregation

IPA = Impossible preference aggregation PPA = Partially possible preference aggregation

FPA = Fully possible preference aggregation

SC = Structural consistency

SG = Sustainability gap

CRT = Critical threshold

AIT = Arrow's impossibility theorem

FICIT = Fully independence choice impossibility theorem

FNCIT = Fully non-conjunctural impossibility theorem

PCPT = Partial conjunctural possibility theorem

FCPT = Full conjunctural possibility theorem

The two ways mapping of degrees of conjuncturality

Conjuncturality can be seen as going from full non-conjuncturality (FNC) to partial conjuncturality (PC) to full conjuncturality (FC) so there are different degrees of conjuncturality (DC) that comes along as the degree of separability (DSE) changes as shown below:

DC

↕

FNC

↕

PC

↕

FC

Notice that as the degree of conjuncturality (DC) increases, then the degree of separability (DSE) decreases.

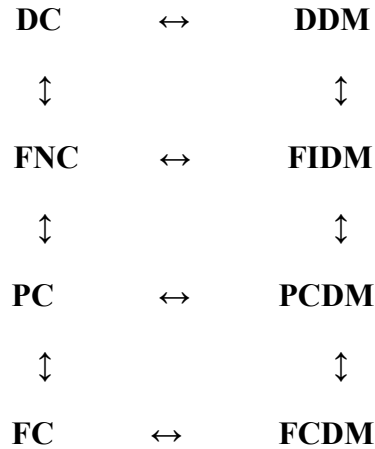
Vertical implication:

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There is an inverse relationship between the degree of conjuncturality (DC) and the degree of separability (DSE)

Linking degrees of conjuncturality to the degree of decision making

Full non-conjuncturality (FNC) requires full independent decision making (FIDM) as full non-conjuncturality implies fully additive thinking; partial conjuncturality (PC) needs partially codependent decision making systems (PCDM) as partial conjuncturality indicates partially codependent thinking (PCO); and full conjuncturality (FC) necessitate full codependent decision making (FCDM) as full conjuncturality points to full codependent thinking (FCO), as expressed below:



Notice that as the degree of conjuncturality (DC) increases, then the complexity of the degree of decision-making (DDM) increases.

Vertical implication:

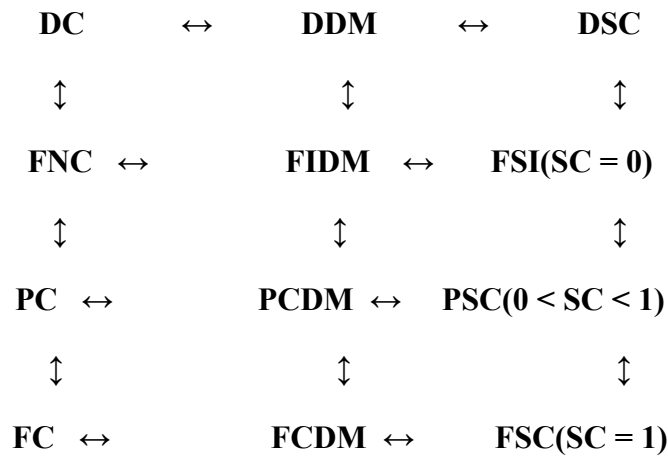
There is a one to one relationship between the changes in the degree of conjuncturality (DC) and the changes in the complexity of the degree of decision-making (DDM)

Horizontal implication

There is horizontal consistency between degrees of conjuncturality (DC), degrees of separability (DSE) and degrees of decision making (DDM).

Linking degree of conjuncturality and degree of structural consistency

Full non-conjuncturality (FNC) means full structural inconsistency (FSI) exists so that structural consistency (SC) does not exist ($SC = 0$); partial conjuncturality (PC) indicates partial structural consistency (PSC) as the structure is partially viable in reality or by assumption so that $0 < SC < 1$; and full conjuncturality (FC) says that there is full structural consistency ($SC = 1$) as shown below:



Notice that as the degree of conjuncturality (DC) increases, then the degree of structural consistency (DSC) increases.

Vertical implication:

There is a one to one relationship between changes in the degree of conjuncturality (DC) and changes in the degree of structural consistency (DSC).

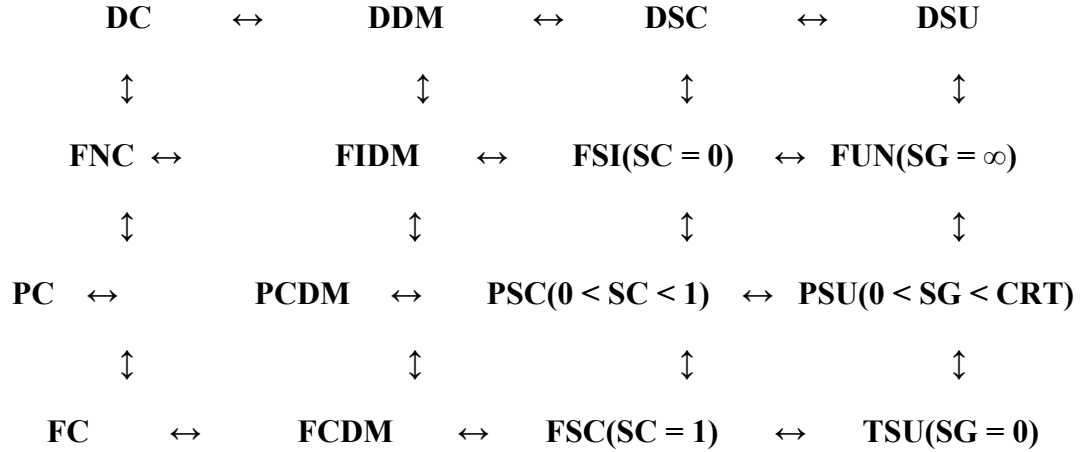
Horizontal implication

There is horizontal consistency between degrees of conjuncturality (DC), degrees of separability (DSE), degrees of decision making (DDM), and degrees of structural consistency (DSC).

Linking degree of conjuncturality and degree of sustainability

Full non-conjuncturality (FNC) reflects the conditions for full unsustainability (FUN) as it full of sustainability gaps (SG) so that $SG = \infty$; partial conjuncturality (PC) indicates the conditions for partial sustainability (PSU) to exist in reality or by assumption so that $0 < SG < CRT$; and full conjuncturality (FC) means that there is true sustainability (TSU) so that $SG = 0$ since there is full structural consistency ($SC = 1$) as pointed out below:

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Notice that as the degree of conjuncturality (DC) increases, then the degree of sustainability (DSU) increases.

Vertical implication:

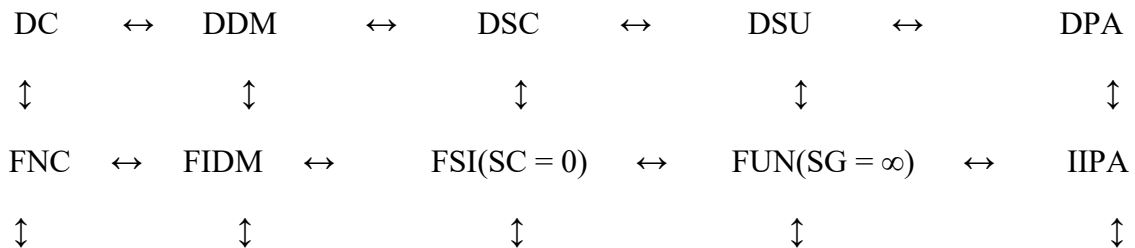
There is a one to one relationship between changes in the degree of conjuncturality (DC) and changes in the degree of sustainability (DSU).

Horizontal implication:

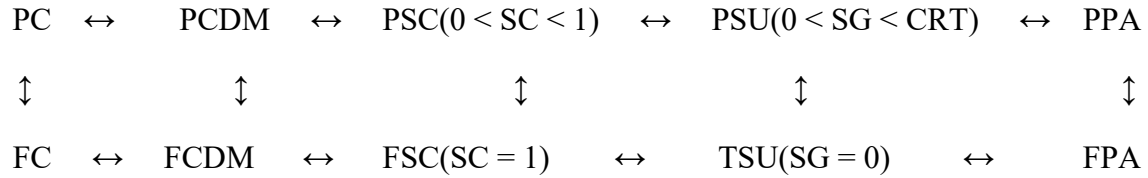
There is horizontal consistency between degrees of conjuncturality (DC), degrees of separability (DSE), degrees of decision making (DDM), degrees of structural consistency (DSC) and degrees of separability.

Linking degrees of conjuncturality with degrees of preference aggregation

Full non-conjuncturality (FNC) indicates impossibility of independence preference aggregation (IIPA); partial conjuncturality (PC) shows that the conditions for partial preference aggregation (PPA) exist in reality or by assumption; and full conjuncturality (FC) means that full preference aggregation (FPA) is possible as represented below:



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Notice that as the degree of conjuncturality (DC) increases the degree of preference aggregation (DPA) increases.

Vertical implication:

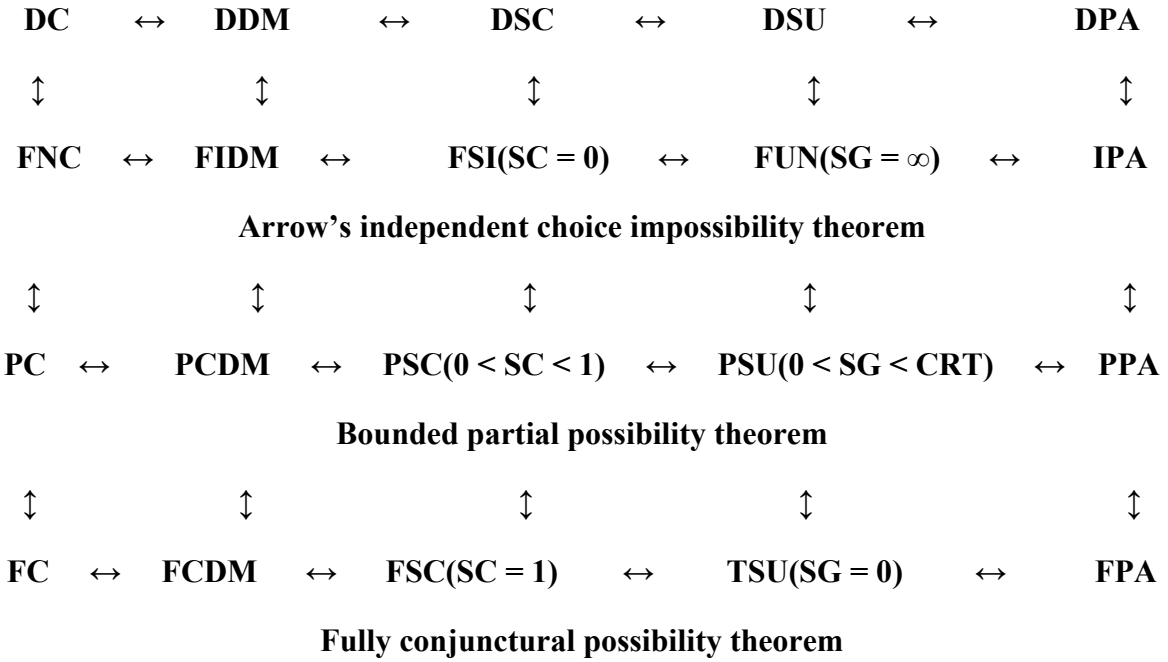
There is a one to one relationship between changes in the degree of conjuncturality (DC) and changes in the degree of preference aggregation (DPA).

Horizontal implication

There is horizontal consistency between degrees of conjuncturality (DC), degrees of separability (DSE), degrees of decision making (DDM), degrees of structural consistency (DSC), degrees of separability and degrees of preference aggregation (DPA).

Placing the arrow's independent choice impossibility theorem and the full conjunctural possibility theorem inside the full mapping of degrees of conjuncturality

Since the Arrow's independent choice impossibility theorem works on the assumptions of homogenous fully independent and fully separable components then it is supported by a fully independent decision-making process as it has a fully non-conjunctural nature, reflecting an impossibility point. If the degree of conjuncturality increases from fully independent and fully separable components to partially independent and partially non-separable components, then we have a bounded system or partial possibility point, which it relies on a partially codependent decision-making process and it has a partially conjunctural nature. If the degree of conjuncturality increases from fully independent and fully separable components to full non-independent and fully non-separable components, then a higher level system appears, which is supported by a fully non-independent decision-making process and it has a full conjunctural nature, creating a conjunctural possibility point; and when we reach the full conjuncturality point, then the arrow's impossibility theorem reaches invalidity and it is no longer admissible; and hence at this highest point then the fully conjunctural possibility theorem becomes valid and admissible, a situation summarized below by placing the arrow's independent choice impossibility point theorem, the partially conjunctural possibility point theorem and the full conjunctural possibility point theorem within the degrees of conjuncturality framework as pointed out below:



The degree of conjuncturality framework above tell us the following things: 1) at the horizontal level of full non-conjuncturality the arrow impossibility theorem is valid and admissible, which means that the arrow impossibility theorem is in essence a Full non-conjunctural impossibility theorem; 2) at the horizontal level of partial conjuncturality the partial conjunctural possibility theorem becomes the valid and admissible theorem; 3) at the horizontal level of full conjuncturality the full conjunctural possibility theorem becomes then the valid and admissible theorem; 4) As the level of conjuncturality increases, the fully independent arrow's impossibility theorem ceases to work and in the end it becomes fully invalid; 5) When the arrow impossibility theorem becomes fully invalid, then the full conjunctural possibility theorem becomes the valid and admissible theorem; 6) The arrow impossibility theorem has the seeds of full unsustainability embedded in its original structure; and as the accumulation of sustainability gap pressures become binding in the long term it will need consistent structural replacement: Long term **fully non-conjunctural impossibility theorem** → **requires full conjunctural structural replacement or long-term Arrow's independent choice impossibility theorem** → **Requires a fully consistent paradigm replacement** ; 7) Since the partial conjunctural possibility theorem exist within active structural or active sustainability gaps (SG) when the pressures coming from these active sustainability gaps accumulates in the long-term and become binding this partial conjunctural possibility theorem(PCPT) will then tend towards full unsustainability (FUN) so that: **Partial conjunctural possibility theorem (PCPT) → Full unsustainability (FUN)** since then $SG \geq CRT \rightarrow \infty$ and $SC \rightarrow 0$; and 8) the full conjunctural possibility theorem(FCPT) describes a paradigm that does not need structural replacement as it has a full structural consistency ($SC = 1$) and no sustainability gaps ($SG = 0$) and hence: **Full conjunctural possibility theorem → no need for paradigm replacement**

More over, we can notice that the horizontal elements in the degrees of conjuncture framework above describe the conditions and assumptions under which each of theorem is valid, admissible, and works: i) The arrow impossibility theorem works under fully independent decision making and impossibility of preference aggregation conditions and under full non-conjuncture, full separability, full structural inconsistency, and full unsustainability neutrality assumptions; ii) The partial conjuncture possibility theorem works under partially codependent decision making and partial possibility of preference aggregation conditions and under partial non-conjuncture, partial separability, partial structural inconsistency, and partial unsustainability neutrality assumptions; and iii) The full conjuncture possibility theorem works under fully conjuncture decision making and full possibility of preference aggregation conditions and under full conjuncture, full non-separability, full structural consistency, and full sustainability assumptions

Finally, the degree of conjuncture framework above can be seen as at a continuum full non-codependence /fully independent choice → partially codependence/partially codependent choice → fully codependence / fully codependent choice; and this continuum idea has relevance for the understanding in simple structural nature of key development aspects or issues or thinking such as i) paradigm simplification blunders and implications; ii) paradigm evolution trends and implications; iii) policy mismatches and implications; iv) development thinking dilemmas and implications; v) Paradigm patching and implications; and vi) deep / flawed paradigm double downs and implications.

In the case of paradigm simplification blunders the continuum helps us to see that if we define a fully conjuncture reality as a fully non-conjuncture reality by assuming full separability we are in the process embedding the seeds of long-term unsustainability. And this means that when problems arise we need to go backwards in terms of thinking/theory as we have been doing since 1987 when dealing with the traditional market led socio-environmental crisis (Muñoz 2012) as simplifying conjuncture creates distorted markets (Muñoz 2010). In the case of paradigm trends the continuum can be seen as going from deep paradigm thinking to partially codependent paradigm thinking to fully codependent paradigm thinking as one wave coming after another (Muñoz 2016a) as previous fully or partially distorted waves need consistent paradigm replacement. In the case of policy mismatches, in 1987 we have a full non-structurality problem embedded in the traditional market model of Adam Smith (Smith 1776)(Level 1 in the framework). Yet instead of recommending a full structural solution (Level 3) to this sustainability problem the Brundtland Commission (WCED 1987) recommended a partial structural solution to a fully structurally inconsistency problem as the sustainable development solution they recommended is a partially viable solution (Level 2) still under the negative influence of embedded sustainability gap pressures as $0 < SC < 1$ and $0 < SG < CRT$, which provides the seeds for future unsustainability.

In the case of development thinking dilemmas, it can be pointed out that all known deep development thinking paradigms such as the deep socialism thinking of Karl Marx (Marx and

Engels 1848), the deep traditional economy market thinking of Adam Smith (Smith 1776), and the ideas behind deep environmentalism all work at the level 1 in the degree of conjuncture framework shared above. Hence this means they are at the first stage of the degree of conjuncture continuum; and therefore, all of them can be invalidated if a pre-empirical structural test is applied (Muñoz 2026). For example, had this structural pre-empirical test been done in 1776 or later on the structural validity of the traditional market as given by Adam Smith (Smith 1776), then it could have been possible to predict the coming of the social and environmental sustainability and population dynamic problems as those structural problems were already seeded in structural inconsistencies in it or embedded in it from the beginning structurally invalidating it in the process (Muñoz 2026) in the very long term, critical problems that we see today. In the case of patching paradigms, we can see that if we manage the structural gaps or sustainability gaps embedded in paradigms at level 1 of the degree of conjuncture continuum instead of closing or fixing fully those structural gaps or sustainability gaps we create dwarf bounded systems under ongoing government intervention and under bounded sustainability gap pressure or under remaining sustainability gap pressures. For example, the dwarf green markets that came along after the 2012 Rio + 20 process (UNCSD 2012a; UNCSD 2012b) when we did not go green markets, green growth, and green economies as it was indicated are paradigm patches, not full structural fixes. In the case deep / flawed paradigm double downs, they take place at level 1 of the degree of conjuncture continuum where paradigm moves from internal inefficient position to an internal more efficient position without changing the structural flaws driving those internal inefficiency conditions. Horizontal paradigm moves that leave the sustainability and structural gaps present in the previous position unchanged in the new position such as the case of moving from linear traditional market thinking to circular market thinking create development thinking blunders if the goal is to solve sustainability problems (Muñoz 2025) since this is move from a full non-conjuncture linear position creating sustainability problems to a full non-conjuncture circular position still creating sustainability problems located in the first level of the conjuncture continuum.

General implications:

Hence, the degree of structurality framework supports the following implications: i) the arrow impossibility theorem is admissible under a fully independent decision-making structure, ii) the partial conjuncture possibility theorem under sustainability gaps is admissible under partial viability or partially codependent decision-making, iii) the fully conjuncture possibility theorem is admissible under full conjuncture conditions, which means that under full conjuncture conditions the arrow impossibility theorem is fully falsified; and therefore, iv) the degree of conjuncture framework can be used to reveal the structural continuum from independent to codependent choice aggregation. A dynamic look at the degree of conjuncture framework from level 1/Full non-conjuncture towards level 3/Full conjuncture goes like this: i) Level 1 contains embedded structural inconsistency; ii) Those inconsistencies generate sustainability-gap pressures; iii) Those pressures accumulate; iv) Once they become binding,

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consistent structural replacement becomes necessary; and v) The framework therefore explains not only where theories belong, but also why paradigms evolve over time.

Summary of comparisons

Features	Arrow's Framework	Partially conjunctural Framework	Fully conjunctural Framework
Decision units	Fully independent	Partial codependent	Fully codependent
Reality assumed	Independent Structure	Partial conjunctural Structure	Fully conjunctural Structure
Externalities	Fully ignored	Partial internalized	Fully internalized
Sustainability gaps	Fully present	Partially present	Fully absent
Choice structure	Fully separate	Partially linked	Fully linked
Choice aggregation	Impossible Aggregation	Partial structural Codependence	Fully structural Codependence
Policy implications	Unconstrained	Partially constrained	Fully constrained

Social choice

Social choice

Social choice

Two ways shift implication continuum

Independent social ↔ Partial codependent social ↔ Fully codependent social

Choice

Choice

Choice

Where the meaning of the direction of arrows is:

→ = Constraining independence

← = Relaxing codependence

So that: i) placing fully non-conjunctural systems under increasing conjuncturality leads to fully conjunctural systems as the structural gaps and sustainability gaps are increasingly closed until they are fully closed; and ii) placing fully conjunctural system under increasing relaxing codependence leads non-conjunctural systems until it is fully relaxed creating fully non-conjunctural systems and sustainability gap seeding

Summary of degree of conjuncturality implications

a) Full non-conjuncturality

Decision theory and conjuncturality theory are internally aligned under fully independent assumptions, partial independent assumptions and full codependent assumptions.

b) Partial conjuncturality

Decision theory and conjuncturality theory may continue to assume some independence. The represented reality begins exhibiting conjunctural effects.

Sustainability gaps emerge because assumptions and represented structure are only partially aligned.

c) Full conjuncturality

Both decision theory and conjunctural theory are reformulated on a fully conjunctural basis.

Conclusions

First it was highlighted that the independent choice Arrow's impossibility theorem is perfectly admissible inside the independent structural domain. Hence, the Arrow's theorem is internally coherent under its stated assumptions of independent choice. In other words, the Arrow impossibility theorem is fully admissible under independent-choice structural assumptions. Second it was indicated that when the underlying independent decision structure is transformed into a conjunctural (codependent-choice) structure, those assumptions are no longer satisfied. A distinct conjunctural impossibility theorem is therefore required. Second it was pointed out that partial conjuncturality is not simply halfway between two extremes. It represents a structurally mixed situation where some conjunctural relationships are acknowledged while others remain excluded. Third, it was indicated that if one simultaneously assumes an inherently conjunctural decision environment while retaining Arrow's independence assumptions, there is a mismatch between assumptions and the structure being represented, which through time leads to the need for consistent paradigm replacement, and the idea of the fully conjunctural possibility point/theorem emerges, one where there is full conjuncturality, full structural consistency and no sustainability gaps. And therefore, the degree of conjuncturality framework can be used to reveal a continuum level 1/full non-conjuncturality/full non-codependence → level 2 / Partial conjuncturality / partial codependence → level 3 / full conjuncturality/full codependence and this continuum can be used as a tool to understand current paradigm or development thinking dilemmas such as shifting paradigms without fixing conjuncturality problems or simplifying conjunctural paradigms assuming at the same time that the structural gaps created when doing so do not matter or fixing internal problems without fixing conjuncturality or structurality problems or simply assuming that conjunctural paradigms are non-conjunctural paradigms and they can be manage as we please without creating sustainability problems when it should be expected that embedded structurality problem will sooner or later lead to the need of non-conjunctural paradigm replacement or lead to a cycle of moving from one unsustainable paradigm to another unsustainable paradigm in order to avoid to fully fix the flawed paradigms structurally or conjuncturally.

It general it was shown that structural admissibility is conditional upon the degree of conjuncturality; and therefore, i) at full non-conjuncturality, Arrow is admissible; ii) at partial conjuncturality, the bounded theorem is admissible; and iii) at full conjuncturality, the fully conjunctural theorem is admissible; iv) consistent paradigm replacement is a consequence of moving along the degree of conjuncturality continuum away for level 1; v) a fully structural inconsistent system under fully independent decision-making the conditions under which the arrow's impossibility theory works, it is valid and it is fully admissible; vi) each level in the degree of conjuncturality framework is a specific point of validity and admissibility for specific paradigms; vii) The flow of the continuum from fully independent to partial codependence to

fully codependent is a flow of paradigm evolution that comes along when the sustainability gaps embedded in lower level paradigms become binding and need consistent paradigm replacement or when the conjuncture or structurality or sustainability conditions change towards increasing responsibility; viii) There is horizontal methodological consistency for paradigm admissibility at each of the three levels of the degree of conjuncture framework and there is vertical inconsistency for paradigm admissibility as conditions change vertically, upwards or downwards, for example a relaxation of conjuncture leads you in the end to the conditions under which the Arrow 's impossibility theorem works; and a tightening of independence leads you to the end to the full conjuncture possibility theorem; and therefore, the degree of conjuncture framework tells as: 1) About the conjuncture continuum implications: that the Arrow's theorem is structurally admissible within one specific region of the degree-of-conjuncture continuum, while different structural conditions require different admissible theorems; 2) About methodological implications: that admissibility or validity depends on the structural assumptions; 3) About theoretical implications: that different degrees of conjuncture imply different aggregation theorems; 4) About paradigm evolution implications: that paradigm replacement becomes a structural consequence of changing conjuncture, and if the main theory in each level falls, it leads to a full house fall-down effect as theories supported on or based on or expanding on and from this main theory become structurally inconsistent themselves (Muñoz 2016b); 5) About policy implications: that policy prescriptions become conditional on where a system lies in the conjuncture continuum; and 6) About general structural admissibility implications: that every theory has a domain of structural admissibility. When the structural conditions move along the conjuncture continuum, the admissible theory changes, a thought that goes across domains, economics, social policy, development thinking, sustainability, and so on.

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