MICHIGAN
ROSS SCHOOL OF BUSINESS

Rethinking Ricardian "Sum of Enjoyments": Gains from Trade in a Co-Creational Economy

Avik Chakrabarti
University of Wisconsin-Milwaukee

Venkat Ramaswamy
Stephen M. Ross School of Business
University of Michigan

UNIVERSITY OF MICHIGAN

Rethinking Ricardian "Sum of Enjoyments":
Gains from Trade in a Co-Creational Economy

Avik Chakrabarti [*] and Venkat Ramaswamy [**]

May 2015

---

[*] Associate Professor, Department of Economics, UWM; E-mail: chakra@umich.edu

[**] Hallman Fellow of Electronic Business and Professor of Marketing, Ross School of Business, University of Michigan, Ann Arbor; E-Mail: venkatr@umich.edu

Rethinking Ricardian "Sum of Enjoyments":
Gains from Trade in a Co-Creational Economy

The Ricardian principle of comparative advantage has long been at the foundation of a wide range of economic models. In the new Internetworked economy where co-creational experiences of value is rapidly gaining momentum, the vision of this principle has weakened. We provide a framework to align economic thinking on the principle of comparative advantage with co-creational value creation embedded at the core. We show how patterns of specialization and the resultant gains from trade, within or across borders, must be sensitive to value gained through co-creational experiences. In particular, an individual's co-creational experience of value is at the foundation of what we posit as the principle of comparative *co-creational* advantage.

"I cannot offer any grand strategy for dealing with the aversion of intellectuals to Ricardo's difficult idea."

Paul Krugman

1. Introduction

The Principle of Comparative Advantage was the quick pick, from the most celebrated of economic theories, when Paul Samuelson was challenged to identify one law of economics that is both true and non-trivial. The widely used Principle, originally proposed a couple of centuries back by David Ricardo and subsequently reformulated by neoclassical economists in ways that fit into their frame of marginal analyses, has provided the basis for a large body of established economic models.[1] For instance, much work on international trade continues to glorify this principle by

---

[1] Ruffin (2002) offered a thorough historical account engaging careful introspection and a logical re-examination of Ricardo's discovery of the principle of comparative advantage, as well as thought-provoking analyses of later

illustrating gains from trade that are attributable exclusively to specialization in production along the lines of comparative advantage.[2] A variety of adaptations of this principle, identifying sources of gains from trade due to asymmetries ranging from countries to firms, have gained significant mileage.[3] Yet, as Paul Krugman questions, "Why is it virtually impossible to get a discussion of comparative advantage, not only onto newspaper op-ed pages, but even into magazines that cheerfully publish long discussions of the work of Jacques Derrida?" We believe it is because economics has become "de-humanized", as Coase (2012) noted: "The degree to which economics is isolated from the ordinary business of life is extraordinary and unfortunate." Conventional formulations of the principle of comparative advantage, which originally took a cue from Ricardo's reading of Adam Smith's (1776) magnum opus *Wealth of Nations* [4], have increasingly been drawing serious skepticism, given its overt emphasis on viewing value through the "price mechanism"[5] that misses value gained through co-creational experiences in the Internetworked economy as it is becoming (Ramaswamy and Ozcan 2014). This conspicuous neglect inevitably attracts more skepticism about the relevance of the principle of comparative advantage, leaving "Ricardo's disciples befuddled" and suggestions that "the theory needs updating".[6] We believe that much of the skepticism can be addressed by removing the implicit assumption in the original Ricardian formulation that value is generated solely in possessing and consuming goods, rather

---

reconstructions of the principle that have often led to "misunderstandings" stemming from "a confused tangle of claims of priority, error, incompleteness, and attribution".

[2] See Arnod Costinot (2009) for a unifying perspective on the fundamental forces that shape comparative advantage.

[3] See Schumacher (2013) for recent assessments of this vast body of literature that has developed since Sraffa and Dobb (1952).

[4] Chipman's (1965) account, which attributed the first complete statement of Ricardo's principle to Mill (1844), was reflective of the sentiment contained in a historic remark by Torrens (1815): "Adam Smith is, with the single exception of Ricardo, our highest authority on economical questions."

[5] The traditional "nirvana" approach, and expression used by Demsetz (1969) to characterize the typical fallacy inherent in conventional economic thinking when comparing an imperfect existing arrangement to a hypothetical idealized system, revolves around portraying the market as an interface for firms and consumers to engage exclusively in exchange of commodities.

[6] *Source:* "Revisiting Ricardo", *The Economist*, August 23, 2014.

than through co-creational interactions among individuals anywhere in the system. This also implies getting away from the obsolete assignment of distinct "fixed" roles to institutions (firms) and individuals (consumers, employees, and talent in general) in value creation in economy and society that has restricted the economic notion of "surplus" (Chakrabarti and Ramaswamy (2014).

In the internetworked age the means of value creation are increasingly being democratized. With this backdrop, Ramaswamy and Gouillart (2010a, 2010b) and Ramaswamy and Ozcan (2014) have presented a plethora of compelling examples that capture the scope and relevance of the Internetworked co-creational economy in which humanization of value is increasingly being visible.[7] Here, we focus on co-creational gains in value, and its implications for Ricardian production and trade. Consider the example of automobiles.[8] Any part of the activity system that results in the creation of the automobile, can be opened up to joint value creation with individuals, including consumers (and any other stakeholding individuals). Consequently, the consumer's role expands as a potential co-creator of value through co-creational "production" experiences. For instance, Local Motors, a startup enterprise, has built a co-creational production platform that allows individuals, from designers to fabricators to component manufacturers all along its value chain, to participate in the production of cars. It is important to highlight, at the outset, the "intrinsic human value" generated from co-creational experiences that goes beyond the "monetary value" generated in innovation competitions of firm(s) announcing incentives for consumers to communicate ideas that can help improve the design of a product, i.e., the value generated through

---

[7] The concept of Co-Creation has received enormous attention since the *Harvard Business Review* and *MIT Sloan Management Review* published a couple of pioneering articles by Prahalad and Ramaswamy (PR) at the dawn of this millennium. See Prahalad and Ramaswamy (2000, 2003). Google Scholar returns at least 40,000 references that have used variants of Co-Creation, while the PR articles have already drawn more than 2,500 citations.

[8] This specific example draws on the most recent work of Chakrabarti and Ramaswamy (2014).

the humanized co-creational experience of creating a design goes beyond the monetary value generated through an actual improvement in the design itself.

Let us, in context, clarify the definitions of a couple of core concepts that are critical for fixing our ideas.

Definition 1. Co-creation is joint creation through engagement platforms whose embodied human experiences generate intrinsic value (which may or may not result in monetary value).

Definition 2. An engagement platform is a purposefully designed assemblage of persons, artifacts, interfaces and processes that allow individuals to jointly create value.

These intuitive definitions are at the foundation of the cognizance that *all points of interaction* between the enterprise and the individual are opportunities for co-creational experiences that can potentially generate humanized (and monetary) value. A co-creational economy is thus characterized by humanization of value, generated through co-creational experiences, broader in scope and dimension than the conventional monetarized notion of value that traditional economics identifies through the price mechanism. Traditional distinctions between the consumer and the producer, while remaining valid at the point of exchange where goods are exchanged for money, is of no relevance in a co-creational economy when fixed roles start to blur and an individual shares the same platform to engage with other individuals with or without an eventual exchange of an artifact. Firms and consumers are no longer treated as separate entities only related through price signals the way conventional economics teaches us to think. As such, conventional economic thinking leaves out a vast potential of *co-creational surplus* by simply ignoring the fact that an enterprise can and does, even more so in the modern Internetworked age, release its resource

constraints by investing in engagement platforms that co-create value by enhancing the diverse human experiences (and personal meaning) of individuals (whether consumers or employees).

For illustration, following Chakrabarti and Ramaswamy (2014), consider the *gestalt* of value as generated from co-creational experiences resulting from individual interactions through engagement platforms. Consider, for instance, a competition designed by Local Motors offering an economic incentive of M (awarded only to the winning entry) that draws submission of ideas from n individuals among a pool of N participants. Conventional economic teaching would prompt us to think that, while for there to be a winning entry the monetary value of that entry cannot fall short of $(M + E_L)$ any realization in excess of which is considered economic surplus accruing to Local Motors, each individual (i) values submission at $\left(\frac{M}{n}\right)$ with an *ex ante* surplus of $\left(\frac{M}{n} - E_i\right) \forall i = 1, 2, ..., n$ but an *ex post* surplus of $(M - E_w)$ for the winner ($w \in i$) and an *ex post* deficit of E_i for the rest ($i \neq w$) where E_L is Local Motor's expense for design and implementation of the competition mechanism and E_i is individual i's expense for submission.

However, an infusion of human value through co-creational experiences for each participating individual, on the engagement platform provided through Local Motor's competition, extends expected value above $\left(\frac{M}{n}\right)$ and, hence, *ex ante* surplus beyond $\left(\frac{M}{n} - E_i\right) \forall i = 1, 2, ..., n$ while recognizing the existence of potential value for all N participants. By the same token, *ex post* surplus need not be limited to $(M - E_w)$ for the winner or be reduced to an *ex post* deficit of E_i for the rest, reflecting the global dimension of co-creational surplus in sharp contrast with the relatively local specification of the conventional notion of economic surplus. In effect, any part of the activity system can be opened up to joint value creation with individuals, including consumers.

Consequently, the consumer's role expands as a potential co-creator of co-creational "production" experiences, and as production in an Internetworked economy becomes increasingly co-creational, value is generated as a function of co-creational experiences. This is evident with the advent of the Web and mobile technologies of expression, communication, and information, which has enabled value to be *created jointly* by the individual and the firm, in the co-creational economy as it is becoming. Consider a website offering a platform for individuals to design an artifact, which can potentially improve the quality and/or add to the variety of the artifacts produced. The designing of an artifact (by an individual on a platform), however, need not necessarily lead to an artifact being produced (to generate exchange value) and/or used (to derive use value). Further, value is enacted through interaction and embodied in human experience .[9] An individual, who neither contributes to the production of an artifact nor uses it, can still derive value through her embodied experience of engagement.

In what follows, building on Ricardian foundations, we lay out (with parsimonious abstraction) a blueprint for a structure that can align economic thinking on the principle of comparative advantage with complete cognizance of value generated through co-creational experiences – a contribution we would like to identify as being at the core of the conception of the Principle of Comparative Co-Creational Advantage. As we will discuss subsequently, this principle goes beyond the limited Ricardian notion of *"sum of enjoyments"* based on material goods to a broader "sum of *co-creational* enjoyments" based on value generated from co-creational experiences through platforms of engagements in a co-creational economy.

---

[9] Note that co-creation is not confined to endogenous product creation that is driven by close interaction with consumer experiences, but rather endogenous and joint human experience creation that is driven by close individual desirable interactions. See Prahalad and Ramaswamy (2000, 2004a, 2004b), Ramaswamy and Gouillart (2010a, 2010b), Leavy (2013, 2014) and Ramaswamy and Ozcan (2014).

2. Ricardian Thinking Revisited

Ricardo's[10] original exposition of the principle of comparative advantage was in terms of 2 countries (England and Portugal), which could make 2 goods (cloth and wine) using only 1 factor (labor) of production, as shown in **Table 1**.[11]

Table 1: Unit Labor Requirements for Cloth and Wine

	Cloth	Wine
England	100	120
Portugal	90	80

In this 2x2x1 world, production of each good required a fixed amount of labor per unit of output (as summarized in table 1 below) and labor could move freely between industries but not between countries. Conventional expositions of comparative advantage would correspond to a cross-country comparison of the ratio of unit labor requirements (i.e. how many workers each country needed to make a unit of each good). England would have needed 100 laborers to produce the same amount of cloth that Portugal could produce with 90 laborers, in Ricardo's world, while Portugal would have needed 80 laborers to produce the same amount of wine that England could

---

[10] See Ricardo (1817).
[11] Haberler (1930) was among the first to visualize that opportunity cost, at the margin, was at the heart of the principle of comparative advantage.

produce using 120 laborers. Ricardo then demonstrated how it could be to the advantage of both nations to follow his principle of comparative advantage if each were to specialize and trade: exchanging 1 unit of cloth for 1 unit of wine, for illustration, would allow England to import each unit of wine with the effort of only 100 workers (instead of 120) and Portugal to obtain import each unit of cloth with the effort of only 80 workers (instead of 90).

Beyond these "four magic numbers" [12], in a 2x2x1 Ricardian world, $\frac{p_g}{p_{-g}} \in \left(\frac{a_g^c}{a_{-g}^c}, \frac{a_g^{-c}}{a_{-g}^{-c}} \right)$ would yield mutual gains from trade between countries c and $-c$, through complete specialization in the production of goods g and $-g$, respectively, where a_g^c is the unit labor requirement for good g in country c and $\frac{p_g}{p_{-g}}$ is the price of good g relative to $-g$ in an Integrated World Equilibrium (IWE) which each country would face with free and frictionless trade allowing perfect mobility of goods. An IWE would yield gains from trade for country c, through complete specialization in the production of good g, since

$$p_g \left(\frac{1}{a_g^c} \right) \left(\frac{1}{p_{-g}} \right) > \frac{1}{a_{-g}^c}$$

which compares the quantity of the other good $(-g)$ country c can purchase from the proceeds of what it can produce of good g using one unit of labor, with what it can produce of good $-g$ using the same unit of labor. Analogously, the same IWE would yield gains from trade for c's trading partner $(-c)$, through complete specialization in the production of good $-g$, since

$$p_{-g} \left(\frac{1}{a_{-g}^{-c}} \right) \left(\frac{1}{p_g} \right) > \frac{1}{a_g^{-c}}$$

---

[12] See Samuelson (1972).

This laid the foundation for mutual benefits from specialization in production and consequent trade along the lines of comparative advantage that conventional economic thinking claims as inevitable in Ricardo's world as he is construed to have envisaged the "sum of enjoyments" as an increase in the "amount and variety of the objects on which revenue may be expended."

3. Gains from Trade through Co-Creational Experiences

Let us now pause to think: Would David Ricardo have formulated gains from trade with its implications for "sum of enjoyments" any differently in a co-creational economy? It is important to clarify, at the outset that, in posing this question, we are not challenging the view that trade can lead to mutually beneficial gains. Instead, we are questioning the relevance of keeping the principle of comparative advantage tied to traditional theory of value creation restricted to the monetary value of goods and service based purely on the price mechanism, the deficiencies of which restrict the scope of mutually beneficial gains. This is becoming increasingly apparent in a co-creational economy that affords more personal creative engagement and where the context of value generated is more humanized as a function of co-creational experiences.

Following Chakrabarti and Ramaswamy (2014), in a co-creational economy, let V_i be the value derived by an individual i as a function of C_{ij}, representing the vector of individual i's co-creational experiences on engagement platform j, as well as on the conventional vector of i's actions (A_i), others' actions (A_{-i}), and controls (k_i) that entail all else affecting the value i derives:

$$V_i = V_i\big(C_{ij}, A_i, A_{-i}, k_i\big).$$

The arguments of the value function $V_i(.)$ are not only sufficient to capture the standard economic role of own actions and externalities but incorporates co-creational experience as a motivation for

individual economic behavior. Individual i's co-creational experience on engagement platform j can then be expressed as:

$$C_{ij} = C_{ij}(R_{ij}, R_{-ij}, T_{ij}, T_{-ij}, , A_i, A_{-i}, k_i),$$

where T_{ij} and T_{-ij} represent time and R_{ij} and R_{-ij} represent resources invested by individual i and others $-i$ (including, though not necessarily limited to, those on platform j), respectively, in the engagement specific to platform j.

Table 2: Unit Labor Requirements for Cloth, Wine, and Clothing Co-Creation

	Cloth	Clothing Co-Creation	Wine
England	100	110	120
Portugal	90	85	80

Now consider re-constructing Ricardo's example[13] with the cognition that value need not be constricted to production possibilities of goods (or, for that matter, production-sharing arrangements in occupations and/or tasks) but can be expanded through co-creational experiences via engagement platforms. To fix our ideas, through illustration, let us then look at the possibility

---

[13] Although Ricardo's world may appear incomplete, in this millennium, his example provides a natural benchmark due to the simplicity with which it allows us to draw a comparison between the real and the counterfactual.

of *co-creational experiences* in the production of clothing [14] in an otherwise Ricardian world, as shown in **Table 2**.

It is important to underscore that the vision of the emerging field of Co-creational Experience Economics (see Chakrabarti and Ramaswamy 2014) reaches beyond an enterprise (e.g. Threadless) "selling the experience" of using an artifact (e.g. clothing) in conventional market trade (exchange). Limiting attention to selling an experience (from the use of an artifact) conspicuously overlooks the essence of co-creational experiences that transcend traditional trading between an artificially differentiated consumer and producer, which remains valid only at the point of market trade (exchange), but is of no relevance when individuals choose to share the same engagement platform with or without an eventual exchange of an artifact. In other words, it is important to recognize that the value through co-creational experiences of using a clothing design engagement platform of which the artifact is but a component (in an assemblage of related artifacts, interfaces, processes, and persons) is distinct from an enterprise selling the goods experience of using the same artifact. As such, the implications of Co-creational Experience for Economics, in general, and the Principle of Comparative Advantage, in particular, cannot be conceptualized through considerations of conventional production functions (or utility functions) which have been reduced to tools that isolate distinctive roles for the consumer from the firm and, in doing so, have blurred the vision of the real co-creational economy, which is evolving based on value generated through co-creational experiences.

---

[14] For ease of comparison, we have retained Ricardo's characterization of Wine and Cloth production. Our infusion of co-creational experiences in clothing design/manufacturing is motivated by the example of Threadless (USA), and Camiseteria (Brazil), and Wacoal (Japan) from Ramaswamy and Gouillart (2010). Analogously, it is not a stretch to conceptualize co-creational experiences on engagement platforms involving Wine, which is already happening. For instance, Ramaswamy and Gouillart (2010b) illustrate how Crushpad co-created wine with wine enthusiasts, amateur as well as professional wine-makers, wine retailers, wine bars, and restaurateurs. In this wine example, co-creation extends all the way across the value creation system, from design to production to packaging to marketing activities.

In comparison, existing extensions of the Ricardian principle would involve constructing a chain of comparative advantage by sorting the productivity of British labor relative to Portugese labor in the production of Traditional Cloth Production, Clothing Co-Creation, and Traditional Wine Production respectively: [15]

$$\underset{Cloth}{\frac{90}{100}} \quad > \quad \underset{Clothing\ Co-Creation}{\frac{85}{110}} \quad > \quad \underset{Wine}{\frac{80}{120}}$$

Under free and frictionless trade, the hourly wage (ω) in England relative to Portugal would be used to break this chain by identifying the efficiency gains from specialization in production. For instance, $\omega = 0.8$ would suggest that England gains from specializing in the traditional production of Cloth, and Portugal gains from specializing in the co-creation of Clothing and traditional production of Wine. Does this pattern of specialization exhaust all possible gains for England and Portugal? To answer this question, in what follows, we embrace co-creational experiences in economics recognizing that value can be, and *is* being generated in the new evolving co-creational economy, through engagement platforms that are not limited to producing *more* of a good.

Now, visualize the vast potential of co-creational surplus [16] that conventional economic thinking leaves out by simply ignoring the fact that an enterprise can and does, even more so in the modern Internetworked age, release its resource constraints by investing in engagement

---

[15] See Neary (2003, 2007) for recent innovations in identifying patterns of specializaton and trade, consistent with the Dornbusch, Fischer, Samuelson (1977) extension of the Ricardian principle of comparative advantage, in a general oligopolistic equilibrium.

[16] See Chakrabarti and Ramaswamy (2014).

platforms that co-create value by enhancing the diverse experience of individuals. Conventional economic thinking would introspect that a typical individual i chooses its actions A_i in a way that maximizes V_i, ceteris paribus. This apparently draws the boundaries of the market where the goal of each firm, given its own resource constraints, is reduced to a) the maximum extraction of surplus from individual consumers, and b) the minimum expense of the extracted surplus on individual workers, that specific market structures allow.

In a world of co-creation, the objective of the enterprise(s) providing platform j is to

$$\text{Maximize:} \quad V_j = V_j\big(C_{ji}, C_{-ji}, A_j, A_{-j}, c_j\big)$$
$$\{R_{ji}, T_{ji}, a_j\}$$
$$\text{subject to} \quad \overline{T}_j = \sum_i T_{ji} + T_j(R_{ji})$$

while each individual's objective is to

$$\text{Maximize:} \quad V_i = V_i\big(C_{ij}, C_{-ij}, A_i, A_{-i}, c_i\big)$$
$$\{R_{ij}, T_{ij}, a_i\}$$
$$\text{subject to} \quad \overline{T}_\iota = \sum_j T_{ij} + T_i(R_{ij})$$

where C_{ji} is the vector of co-creational experiences of all individuals engaged on platform j; C_{-ji} is the vector of co-creational experiences of all individuals engaged on platforms other than j; A_j is the vector of actions of the enterprise(s) providing platform j, A_{-j} is the vector of others' actions; and c_j is the vector of controls entailing all else affecting the value generated on platform j.

The singular binding constraint is imposed by the arrow of time $T = \{\overline{T}_\iota, \overline{T}_J\}$ on the optimal choice of any individual or enterprise (participant) with a finite horizon, where $\overline{T}_\iota$ represents the vector time horizons of individuals and $\overline{T}_J$ represents the vector time horizons of enterprises, within

which T_{ji} represents time and R_{ji} represents resources invested, in the co-creational experiences of participating individuals i, by the enterprise(s) providing platform j; $T_i(R_{ij})$ represents the time invested by individual i in acquiring resources R_{ij}; and $T_j(R_{ji})$ represents the time invested by the enterprise(s) providing platform j in acquiring resources R_{ji}.

This optimization exercise yields a set of co-creation possibilities $C^g(T) = \begin{bmatrix} C_{ij}^g & C_{ji}^g \end{bmatrix}$, $\forall g$. For expositional convenience, hereinafter, let the value function $V_{()}()$ be additively separable in each of its arguments, subject to the simplifying assumption: $V_i\left(C_{ij}^{-g} \right) = 0$ $\forall i \in c$ if c completely specializes in g and $V_{-i}\left(C_{-ij}^g \right) = 0$ $\forall -i \in -c$ if $-c$ completely specializes in $-g$. For any individual i located in country c, it is then straightforward to see that $\frac{p_g}{p_{-g}} \in \left(\frac{a_g^c}{a_{-g}^c}, \frac{a_g^{-c}}{a_{-g}^{-c}} \right)$ would not suffice for gains from specialization in the production of g unless

$$V_i\left(p_g \left(\frac{1}{a_g^c} \right)\left(\frac{1}{p_{-g}} \right) \right) > V_i\left(\frac{1}{a_{-g}^c} \right) + V_i\left(C_{ij}^{-g} \right)$$

Analogously, for any individual $-i$ located in country $-c$, $\frac{p_g}{p_{-g}} \in \left(\frac{a_g^c}{a_{-g}^c}, \frac{a_g^{-c}}{a_{-g}^{-c}} \right)$ would not suffice for gains from specialization in the production of $-g$ unless

$$V_{-i}\left(p_{-g} \left(\frac{1}{a_{-g}^{-c}} \right)\left(\frac{1}{p_g} \right) \right) > V_{-i}\left(\frac{1}{a_g^{-c}} \right) + V_{-i}\left(C_{-ij}^g \right)$$

This leads to the conception of our Principle of Comparative Co-creational Advantage: an IWE would support mutual gains from trade for countries c and $-c$, irrespective of the location of the engagement platform j, through complete specialization in the production of goods g and $-g$, respectively, *iff*

$$\sum_{i \in c} V_i \left(p_g \left(\frac{1}{a_g^c} \right) \left(\frac{1}{p_{-g}} \right) \right) > \sum_{i \in c} \left[V_i \left(\frac{1}{a_{-g}^c} \right) + V_i \left(C_{ij}^{-g} \right) \right]$$

$$\sum_{-i \in -c} V_{-i} \left(p_{-g} \left(\frac{1}{a_{-g}^{-c}} \right) \left(\frac{1}{p_g} \right) \right) > \sum_{-i \in -c} \left[V_{-i} \left(\frac{1}{a_g^{-c}} \right) + V_{-i} \left(C_{-ij}^g \right) \right]$$
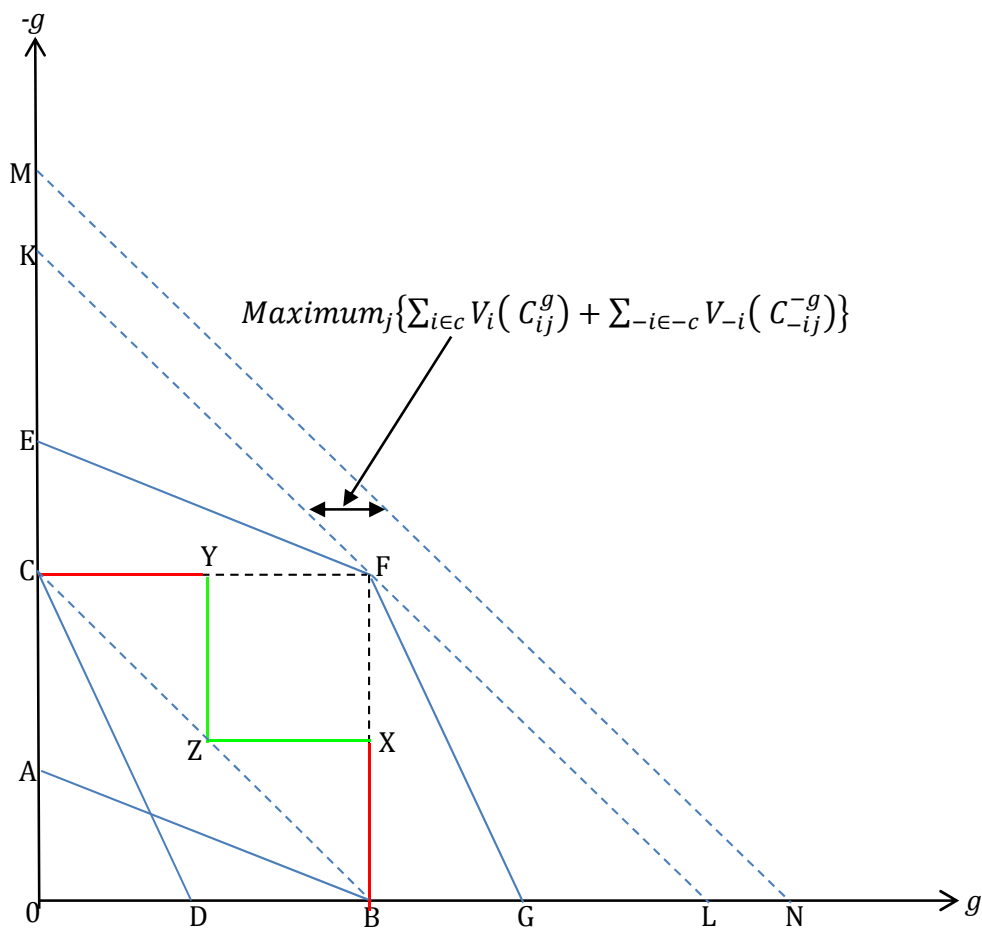
4. The Principle of Comparative Co-creational Advantage

The Principle of Comparative Co-creational Advantage not only embeds co-creation in Ricardo's vision of a rise in "the sum of enjoyments" through an increase in the "amount and variety of the objects on which revenue may be expended", but also identifies distinct possibilities of a broader "sum of *co-creational* enjoyments" *through the broader lens of humanized value gained through co-creational experiences* where mutual benefits from specialization in the production of goods g and $-g$ (in line with the conventional concept of comparative advantage) is not ensured by $\frac{p_g}{p_{-g}} \in \left(\frac{a_g^c}{a_{-g}^c}, \frac{a_g^{-c}}{a_{-g}^{-c}} \right)$. This Principle, cognizant of the fact that value is not only extrinsic, but also intrinsically embodied in human experiences, goes beyond a traditional monetary based conceptualization of value creation. Simultaneously, it also recognizes its joint creation through co-creational experiences, thus expanding our vision to identify mutual gains from specialization, as well as diversification, through co-creational value creation.

In **Figures 1**, **2**, and **3** below, we illustrate, on a typical 2 x 2 (two goods from two countries) plane, how the Principle of Comparative Co-creational Advantage identifies gains from trade in a co-creational economy that remain unseen through the lens of the conventional Principle of Comparative Advantage. For ease of comparison, let us map such gains starting from traditional territories of the Production Possibility Frontier (PPF): AB and CD are country-specific PPFs that

conventional economics assigns to countries c and $-c$, respectively, from which EFG emerges as the world PPF.

Figure 1: Gains from Trade with Complete Specialization in a Co-creational economy

$$Maximum_j\{\sum_{i\in c} V_i\left(C_{ij}^g\right) + \sum_{-i\in -c} V_{-i}\left(C_{-ij}^{-g}\right)\}$$

Gains from trade, based on the Principle of Comparative Advantage which as depicted in **Figure 1** would extend each country's consumption possibilities to BC by guiding country c to completely specialize in g at B and $-c$ to completely specialize in $-g$ at C (pinning global production to F and supporting matching balanced trade triangles BXZ for c and CYZ $-c$, the red arm of which represents imports and the green arm represents exports), would be bounded by the

monetarized iso-value line KL. The slope of KL reflects (as does each iso-value line drawn, in broken blue, on the figures) the world price $\left(\frac{p_g}{p_{-g}}\right)$ of good g relative to $-g$ in an IWE which each country faces with free and frictionless trade allowing perfect mobility of goods. This underestimates the gains from specialization to the extent of $Maximum_j \left\{ \sum_{i \in c} V_i \left(C_{ij}^g \right) + \sum_{-i \in -c} V_{-i} \left(C_{-ij}^{-g} \right) \right\}$ which measures the maximum value from co-creational experiences, across engagement platforms (j), when c specializes in g and $-c$ specializes in $-g$. These nominal gains are equivalent to LN in terms of the units of g or KM in terms of the units of $-g$.

No less critical, for a complete understanding of this Principle of Comparative Co-Creational Advantage, is the observation that deviations from conventional lines of specialization leave sufficient room for gains from trade through value co-creation. An individual i located in country c gains, from value co-creation on the engagement platform j of $-g$ as long as

$$V_i \left(\frac{1}{a_{-g}^c} \right) + V_i \left(C_{ij}^{-g} \right) > V_i \left(p_g \left(\frac{1}{a_g^c} \right) \left(\frac{1}{p_{-g}} \right) \right)$$

and
$$V_i \left(p_{-g} \left(\frac{1}{a_{-g}^c} \right) \left(\frac{1}{p_g} \right) \right) > V_i \left(\frac{1}{a_g^c} \right) + V_i \left(C_{ij}^g \right)$$

An individual $-i$ located in country $-c$ gains from co-creation on the engagement platform j of g as long as

$$V_{-i} \left(\frac{1}{a_g^{-c}} \right) + V_{-i} \left(C_{-ij}^g \right) > V_{-i} \left(p_{-g} \left(\frac{1}{a_{-g}^{-c}} \right) \left(\frac{1}{p_g} \right) \right)$$

and
$$V_{-i} \left(p_g \left(\frac{1}{a_g^{-c}} \right) \left(\frac{1}{p_{-g}} \right) \right) > V_{-i} \left(\frac{1}{a_{-g}^{-c}} \right) + V_{-i} \left(C_{ij}^{-g} \right)$$

Consequently, contrary to a conventional interpretation of the principle of comparative advantage,

an IWE relative price $\frac{p_g}{p_{-g}} \in \left(\frac{a_g^c}{a_{-g}^c}, \frac{a_g^{-c}}{a_{-g}^{-c}} \right)$ would support mutual gains from trade attributed to

complete specialization through value co-creation by country c in $-g$ and country $-c$ in g, as

long as

$$\Sigma_{i \in c} \left[V_i \left(\frac{1}{a_{-g}^c} \right) + V_i (C_{ij}^{-g}) \right] > \Sigma_{i \in c} V_i \left(p_g \left(\frac{1}{a_g^c} \right) \left(\frac{1}{p_{-g}} \right) \right)$$

$$\Sigma_{i \in c} V_i \left(p_{-g} \left(\frac{1}{a_{-g}^c} \right) \left(\frac{1}{p_g} \right) \right) > \Sigma_{i \in c} \left[V_i \left(\frac{1}{a_g^c} \right) + V_i (C_{ij}^g) \right]$$

$$\Sigma_{-i \in -c} \left[V_{-i} \left(\frac{1}{a_g^{-c}} \right) + V_{-i} (C_{-ij}^g) \right] > \Sigma_{-i \in -c} V_{-i} \left(p_{-g} \left(\frac{1}{a_{-g}^{-c}} \right) \left(\frac{1}{p_g} \right) \right)$$

and $\qquad \Sigma_{-i \in -c} V_{-i} \left(p_g \left(\frac{1}{a_g^{-c}} \right) \left(\frac{1}{p_{-g}} \right) \right) > \Sigma_{-i \in -c} \left[V_{-i} \left(\frac{1}{a_{-g}^{-c}} \right) + V_{-i} (C_{ij}^{-g}) \right]$

Country c gains from specializing in the production of good $-g$ while the other country stands to

gain from diversification through co-creation *iff*

$$\Sigma_{i \in c} \left[V_i \left(\frac{1}{a_{-g}^c} \right) + V_i (C_{ij}^{-g}) \right] > \Sigma_{i \in c} V_i \left(p_g \left(\frac{1}{a_g^c} \right) \left(\frac{1}{p_{-g}} \right) \right)$$

$$\Sigma_{i \in c} V_i \left(p_{-g} \left(\frac{1}{a_{-g}^c} \right) \left(\frac{1}{p_g} \right) \right) > \Sigma_{i \in c} \left[V_i \left(\frac{1}{a_g^c} \right) + V_i (C_{ij}^g) \right]$$

$$\Sigma_{-i \in -c} \left[V_{-i} \left(\frac{1}{a_g^{-c}} \right) + V_{-i} (C_{-ij}^g) \right] > \Sigma_{-i \in -c} V_{-i} \left(p_{-g} \left(\frac{1}{a_{-g}^{-c}} \right) \left(\frac{1}{p_g} \right) \right)$$

and $\qquad \Sigma_{-i \in -c} \left[V_{-i} \left(\frac{1}{a_{-g}^{-c}} \right) + V_{-i} (C_{ij}^{-g}) \right] > \Sigma_{-i \in -c} V_{-i} \left(p_g \left(\frac{1}{a_g^{-c}} \right) \left(\frac{1}{p_{-g}} \right) \right)$

Consider, in **Figure 2**, the possibility of incomplete specialization i.e. one (without loss of generalization, c) of the two countries specializes in g at B and the other ($-c$) diversifies at V between g and $-g$ (placing global production at F' and supporting matching balanced trade triangles BXZ for c and VYZ' for $-c$).

Figure 2: Gains from Trade with Incomplete Specialization in a Co-creational economy
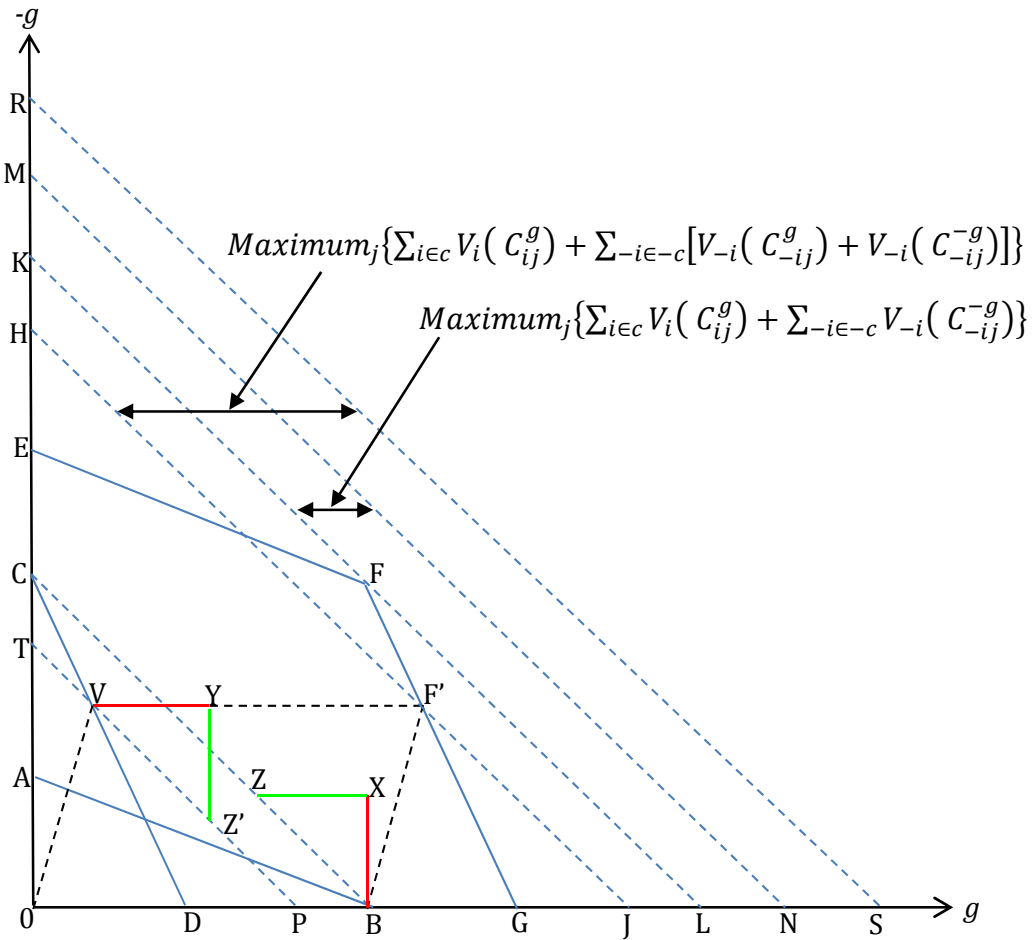
$$Maximum_j\{\sum_{i\in c} V_i(C_{ij}^g) + \sum_{-i\in-c}[V_{-i}(C_{-ij}^g) + V_{-i}(C_{-ij}^{-g})]\}$$

$$Maximum_j\{\sum_{i\in c} V_i(C_{ij}^g) + \sum_{-i\in-c} V_{-i}(C_{-ij}^{-g})\}$$

Conventional economics would suggest that such deviation from complete specialization would result in a global loss equivalent to JL (same as BZ for the incompletely specialized country $-c$) in terms of g or KH (same as CT for the incompletely specialized country $-c$) in terms of

$-g$. This underestimates the gains from trade, to the extent of $Maximum_j\{\sum_{i\in c} V_i(C_{ij}^g) +$

$\sum_{-i\in -c}[V_{-i}(C_{-ij}^g) + V_{-i}(C_{-ij}^{-g})]\}$. The net gain is equivalent to JS in terms of g or HR in terms of

$-g$, when c and $-c$ both diversify. Thus a key implication, following from the Principle of

Comparative Co-creational Advantage as distinct from the conventional Principle of Comparative

Advantage, lies in identifying that the gains from trade with incomplete specialization (JS in terms

of g or HR in terms of $-g$), in a co-creational economy, can outweigh the gains from trade limited

to specialization (LN in terms of g or KM in terms of $-g$).

Analogously, country c stands to gain from diversification through value co-creation while the

other country gains from specializing in the production of good g *iff*

$$\sum_{i\in c}\left[V_i\left(\frac{1}{a_{-g}^c}\right) + V_i(C_{ij}^{-g})\right] > \sum_{i\in c} V_i\left(p_g\left(\frac{1}{a_g^c}\right)\left(\frac{1}{p_{-g}}\right)\right)$$

$$\sum_{i\in c}\left[V_i\left(\frac{1}{a_g^c}\right) + V_i(C_{ij}^g)\right] > \sum_{i\in c} V_i\left(p_{-g}\left(\frac{1}{a_{-g}^c}\right)\left(\frac{1}{p_g}\right)\right)$$

$$\sum_{-i\in -c}\left[V_{-i}\left(\frac{1}{a_g^{-c}}\right) + V_{-i}(C_{-ij}^g)\right] > \sum_{-i\in -c} V_{-i}\left(p_{-g}\left(\frac{1}{a_{-g}^{-c}}\right)\left(\frac{1}{p_g}\right)\right)$$

and $\quad\sum_{-i\in -c} V_{-i}\left(p_g\left(\frac{1}{a_g^{-c}}\right)\left(\frac{1}{p_{-g}}\right)\right) > \sum_{-i\in -c}\left[V_{-i}\left(\frac{1}{a_{-g}^{-c}}\right) + V_{-i}(C_{ij}^{-g})\right]$

Finally, both countries gain from diversification through value co-creation *iff*

$$\sum_{i\in c}\left[V_i\left(\frac{1}{a_{-g}^c}\right) + V_i(C_{ij}^{-g})\right] > \sum_{i\in c} V_i\left(p_g\left(\frac{1}{a_g^c}\right)\left(\frac{1}{p_{-g}}\right)\right)$$

$$\sum_{i\in c}\left[V_i\left(\frac{1}{a_g^c}\right) + V_i(C_{ij}^g)\right] > \sum_{i\in c} V_i\left(p_{-g}\left(\frac{1}{a_{-g}^c}\right)\left(\frac{1}{p_g}\right)\right)$$

$$\sum_{-i \in -c} \left[V_{-i}\left(\frac{1}{a_g^{-c}}\right) + V_{-i}(C_{-ij}^g) \right] > \sum_{-i \in -c} V_{-i}\left(p_{-g}\left(\frac{1}{a_{-g}^{-c}}\right)\left(\frac{1}{p_g}\right)\right)$$

and
$$\sum_{-i \in -c} \left[V_{-i}\left(\frac{1}{a_{-g}^{-c}}\right) + V_{-i}(C_{ij}^{-g}) \right] > \sum_{-i \in -c} V_{-i}\left(p_g\left(\frac{1}{a_g^{-c}}\right)\left(\frac{1}{p_{-g}}\right)\right)$$

Gains from trade, therefore, need not be limited to those from specialization (complete or incomplete) along the lines bounded by the conventional Principle of Comparative Advantage. While co-creative specialization can extend the gains from trade, it does not constrain the boundaries of gains from trade with diversification.

Figure 3: Gains from Trade with Diversification in a Co-creational economy
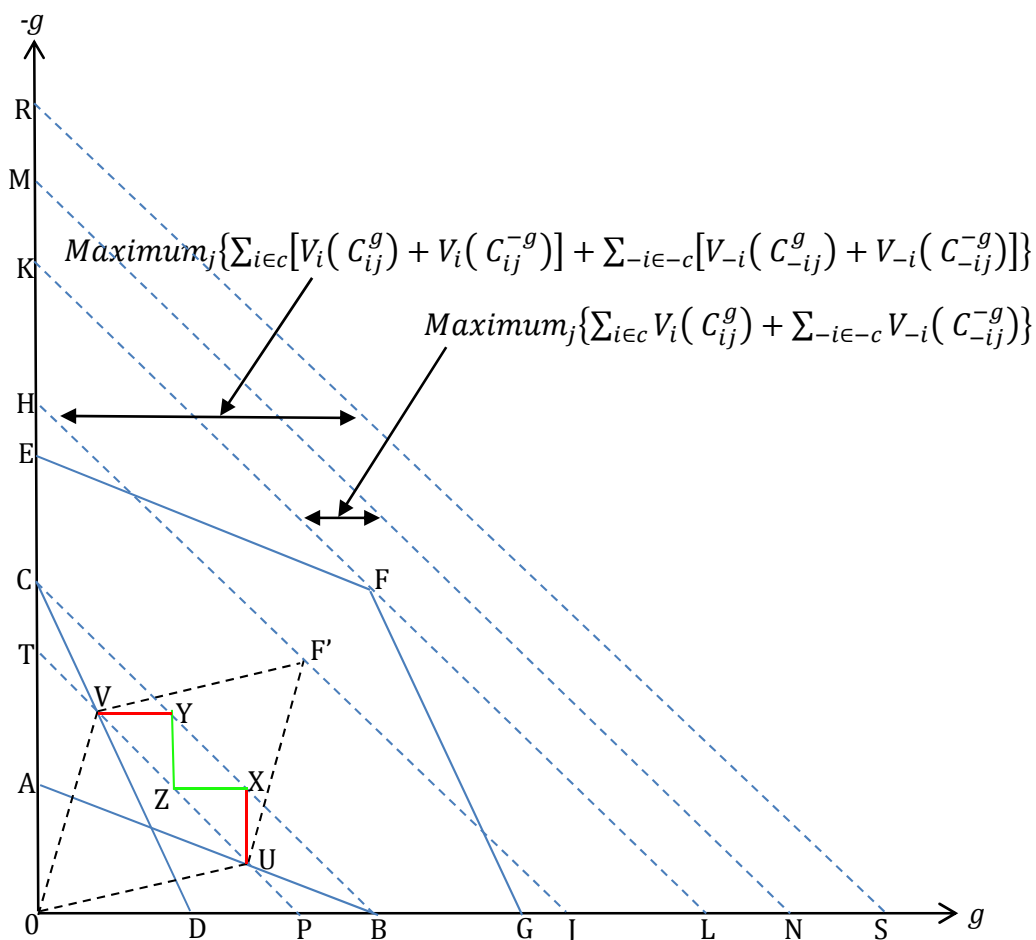
Consider, in **Figure 3**, the possibility that c diversifies between g and $-g$ at U and $-c$ diversifies between g and $-g$ at V (placing global production at F' and supporting matching balanced trade triangles UXZ for c and VYZ $-c$). Conventional economics would suggest that such deviation from complete specialization would result in a global loss equivalent to JL (BP for each country) in terms of g or KH (CT for each country) in terms of $-g$. This underestimates the gains from diversification, to the extent of $Maximum_j\{\sum_{i\in c}[V_i(C_{ij}^g) + V_i(C_{ij}^{-g})] + \sum_{-i\in -c}[V_{-i}(C_{-ij}^g) + V_{-i}(C_{-ij}^{-g})]\}$. The net gain is equivalent to JS in terms of g or HR in terms of $-g$, when c and $-c$ both diversify. This highlights a key distinction of the Principle of Comparative Co-creational Advantage from the conventional Principle of Comparative Advantage by not only magnifying the gains from specialization, but more importantly, by revealing that the gains from trade with diversification (JS in terms of g or HR in terms of $-g$), in a co-creational economy, can outweigh the gains from trade limited to specialization (LN in terms of g or KM in terms of $-g$).

It would be remiss not to distinguish the gains thus identified, for a co-creational economy that is open to trade (with or without specialization), from those attributed to conventional implications of *externalities* derived from "indirect effects of *consumption* or *production*."[17] While positive (negative) externalities result in the expansion (contraction) of value tied to a relational property of goods and services, the sensitivity of gains from international trade to such externalities has been scrutinized by many before and after Krugman (1987) who concluding that free trade is not passé wrote, "It is possible to imagine bees-and-flowers examples in which externalities arise from

---

[17] See Laffont (2008).

some physical spillover between firms".[18] In sharp contrast, gains from trade in a *co-creational economy* is attributed to value generated from *co-creational experiences*, unique to each individual, that result from interaction(s) through platform(s) of engagements. It is no less important to underscore that co-creational experiences go beyond existing notions of co-production of a good or service exchange process by its end user (popularly known as *prosumption*). While any distinction between the conventional consumer and a prosumer can be attributed to the latter generating use value by contributing to the production of an artifact or service exchange entering her own consumption, any distinction between the conventional producer and a prosumer can be attributed to the former generating only trade (exchange) value. Value generated through co-creational experiences, in comparison, spans a larger space than does prosumption, since the former arises from co-creativity than mere transfer/doing of work to/by the consumer.[19] Formally, a conventional segregation of a typical producer (p) from a typical consumer (c) would stylize a scenario where the objective of each individual (i), in isolation, boils down to the choice of actions (A_i) in a way that maximizes

$$V_i = V_i(A_i, A_{-i}, k_i) \qquad i = p, c$$

If A_{ia} is the set of actions affecting the production of artifact a that supports a use value of $V_{ca} \in V_c$ and an exchange value of $V_{pa} \in V_p$, use value can be generated through prosumption if and only if $A_{ia} \cap A_c \neq \emptyset$. In sharp contrast, value can be generated through co-creational experiences with or without $A_{ia} \cap A_c$ being empty.

---

[18] See Janeba (2007) and Grossman and Rossi-Hansberg (2010) for contemporary contributions capturing the implications of consumption and production externalities for gains from international trade.
[19] See Toffler (2013).

Let us, in perspective, revisit the example of clothing value co-creation with engagement platform (g). In case Threadless had limited its designing of clothes to Portugal, that would impose foregone gains for England (c) if $\sum_{i \in c} V_i \left(p_{-g} \left(\frac{1}{a^c_{-g}} \right) \left(\frac{1}{p_g} \right) \right) - \sum_{i \in c} V_i \left(\frac{1}{a^c_g} \right) < \sum_{i \in c} V_i \left(C^g_{ij} \right)$ as well as foregone gains for Portugal if $\sum_{i \in -c} V_i \left(p_{-g} \left(\frac{1}{a^{-c}_{-g}} \right) \left(\frac{1}{p_g} \right) \right) - \sum_{i \in c} V_i \left(\frac{1}{a^{-c}_g} \right) > \sum_{i \in c} V_i \left(C^g_{ij} \right)$ even when Portugal reveals a comparative advantage in designing clothes i.e. $\omega > \frac{a^{-c}_g}{a^c_g}$. When leveraging resources in a country for co-creational experiences through an engagement platform, even if that country produces a good for which it does not possess a comparative advantage, it can generate a higher value than can be supported by the production of the good for which it possesses a comparative advantage. By conventional economic thinking, which overlooks any distinction between the value generated through an experience of co-creation on an engagement platform and the value extracted from selling an experience generated through the use of an artifact, the Principle of Comparative Advantage has been construed to imply that a country will gain from specializing (if it specializes) in the production of an artifact when the relative price at which that artifact can be exchanged with a consumer exceeds the opportunity cost at which that artifact can be produced by the firm(s) located in that country. This is reminiscent of the conventional view of value creation in which consumers become relevant only at the point of exchange and, in effect, the market is artificially separated from the process of value creation.

In sum, an understanding of the gains in trade remains incomplete without the cognizance of co-creational experiences in value creation. Conventional adaptations of this principle has left us with normative rules that are increasingly becoming obsolete, and often misleading "as is", and the way it "ought to be" in the evolving co-creational economy. While the traditional assumption

that the "sum of enjoyments" can rise exclusively from the expansion of consumption possibilities had gone unchallenged through the Industrial goods-based economy, the new Internetworked economy has been witnessing a paradigmatic shift through co-creational experiences that calls for restoring the human element in value. As we have shown, the relevance of Ricardo's vision can be realized through co-creational thinking of value creation. By recognizing that value is generated as a function of co-creational experiences, our Principle of Comparative Co-creational Advantage provides a foundation for identifying gains from trade *beyond the conventional segregation of the role of the individual* (employee/consumer) from that of the firm in the process of value creation.

5. Concluding Remarks

In this paper, we have made an effort to bridge the widening gap between economic thinking on the principle of comparative advantage and a co-creational economy as it is evolving. Unlike the pre-internet industrial era, value is no longer viewed as a unilateral creation of the institution (firm) through its product and service related activities. Instead, the rapidly changing elements of our economy place the individual as a humanized entity at the center of value creation in sharp contrast with the view that conventional economic theory is hesitant to let go. We have shown that embracing the co-creation view has *non-trivial* implications for the principle of comparative advantage. We provide a framework that can align economic thinking on the principle of comparative advantage with complete cognizance of co-creational experiences. We demonstrate how patterns of specialization and the resultant gains from trade, within or across borders, are affected by co-creational experiences. A natural outcome of our analysis is the Principle of Comparative Co-creational Advantage that, guiding trade with co-creational experiences of value

at the core, expands our vision to identify mutual gains from specialization, as well as diversification, through co-creation of humanized value in the economy, whose "sum of co-creational enjoyments" goes beyond the conventional exchange-based formulation of "sum of enjoyments". We hope our contribution will provide the foundation for a new generation of forward-looking economists with a shared vision of the co-creational economy, where the real challenge is to optimize humanized value accruing from co-creational experiences across engagement platforms, as the conventional "fixed" assigned roles of "economic agents" in the price mechanism constricted interpretation of production-exchange-consumption based value creation process is increasingly becoming blurred.

References

Chakrabarti, Avik and Venkat Ramaswamy (2014), "Re-thinking the Concept of Surplus: Embracing Co-creational experiences in Economics." The BE Journal of Economic Analysis & Policy (*Advances*) 14: 1283-1297.

Chipman, John S. (1965), "A survey of the theory of international trade: Part 1, The classical theory." Econometrica 33: 477-519.

Coase, Ronald H. (1993), "1991 Nobel Lecture: the institutional structure of production." The nature of the firm: Origins, evolution, and development 227.

Coase, Ronald. H. (2012). **"**Saving Economics from the Economists.**"** Harvard Business Review, 90(12): 36.

Costinot, Arnaud. (2009), "An elementary theory of comparative advantage." Econometrica 77.4: 1165-1192.

Demsetz, Harold (1969), "Information and efficiency: another viewpoint." Journal of law and Economics 12.1: 1-22.

Dornbusch, Rudiger, Stanley Fischer, and Paul A. Samuelson (1977), "Comparative advantage, trade, and payments in a Ricardian model with a continuum of goods." American Economic Review 67.5: 823-839.

Haberler, Gottfried von (1930), "The Theory of Comparative Cost and Its Use in the Defense of Free Trade", Weltwirtschaftliches Archiv 32: 349-70.

Grossman, Gene, Esteban Rossi-Hansberg (2010), "External Economies and International Trade Redux", Quarterly Journal of Economics 125:2, 829-858.

Harrod, Roy F. (1951), "The Life of John Maynard Keynes." London: Macmillan & Co.

Humphreys, Ashlee, Kent Grayson (2008), "The Intersecting Roles of Consumer and Producer: A Critical Perspective on Co-production, Co-creation and Prosumption" Sociology Compass 2.3: 963-980.

Janeba, Eckhard. (2007) "International trade and consumption network externalities." European Economic Review 51.4: 781-803.

Krugman, Paul R. (1987), "Is free trade passé?." The Journal of Economic Perspectives 1.2: 131-144.

Laffont, Jean-Jacques (2008), "Externalities", in Durlauf, Steven N., and Lawrence Blume, eds. The New Palgrave Dictionary of Economics, Palgrave Macmillan.

Leavy, Brian (2013), "Venkat Ramaswamy: A ten-year perspective on how the value co-creation revolution is transforming competition," Strategy & Leadership, 41.6. Special Issue: The Value Co-Creation Revolution.

Leavy, Brian (2014), "Venkat Ramaswamy: How value co-creation with stakeholders is transformative for producers, consumers and society," Strategy & Leadership 42.1.

Mill, John S. (1844), "Essays on Some Unsettled Questions of Political Economy," London: John W. Parker. Reprinted by the London School of Economics and Political Science.

Neary, J. Peter (2003), "Globalization and market structure." Journal of the European Economic Association 1.2-3: 245-271.

Neary, J. Peter (2007), "Cross-border mergers as instruments of comparative advantage." The Review of Economic Studies 74.4: 1229-1257.

Prahalad, C. K. and Venkat Ramaswamy (2000), "Co-opting customer competence." Harvard Business Review 78.1: 79-90.

_____ (2002), "The co-creation connection." Strategy and Business: 50-61.

_____ (2003), "The new frontier of experience innovation." MIT Sloan Management Review 44.4: 12-18.

_____ (2004a), "The Future of Competition." Harvard Business Press, Boston, MA.

_____ (2004b), "Co-creation experiences: The next practice in value creation." Journal of interactive marketing 18.3: 5-14.

Ramaswamy, Venkat and Francis Gouillart (2010a), "Building the co-creative enterprise." Harvard Business Review 88.10: 100-109.

_____ (2010b), "The Power of Co-Creation: Build It with Them to Boost Growth, Productivity, and Profits." New York: Free Press.

Ramaswamy, Venkat and Kerimcan Ozcan (2014), "The Co-Creation Paradigm." Stanford, CA: Stanford University Press.

Ricardo, David (1817), "On the Principles of Political Economy and Taxation." edited by P. Sraffa, London 1951.

Ruffin, Roy (2002), "David Ricardo's discovery of comparative advantage." History of Political Economy 34.4: 727-748.

Samuelson, Paul A. (1972), "The Way of an Economist." Reprinted in The Collected Papers of Paul A. Samuelson. Ed. R. C. Merton. Cambridge: Cambridge MIT Press.

Schumacher, Reinhard (2013). "Deconstructing the Theory of Comparative Advantage." World Economic Review 2: 83.

Smith, Adam (1776), "An inquiry into the wealth of nations." Strahan and Cadell, London.

Sraffa, Piero and Maurice H. Dobb Eds. (1952), "The works and correspondence of David Ricardo." Cambridge at the University Press.

Toffler, Alvin (2013). "Revolutionary wealth." *New Perspectives Quarterly* 30.4: 122-130.

Torrens, Robert (1815), "Essay on the External Corn Trade." London: J. Hatchard.