

## Working Paper

---

# Rethinking Comparative Advantage in a Co-Creation Economy

Avik Chakrabarti

University of Wisconsin-Milwaukee

Venkat Ramaswamy

Stephen M. Ross School of Business  
at the University of Michigan

Ross School of Business Working Paper Series  
Working Paper No. 1211  
January 2015

This paper can be downloaded without charge from the  
Social Sciences Research Network Electronic Paper Collection:  
<http://ssrn.com/abstract=2356294>

# Rethinking Comparative Advantage in a Co-Creation Economy

Avik Chakrabarti <sup>\*</sup> and Venkat Ramaswamy <sup>\*\*</sup>

January 2015

---

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

# Rethinking Comparative Advantage in a Co-Creation Economy

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

**JEL Classification Code:** B40, B41, D46, F1

*Keywords:* Co-Creation Experience Economics, Specialization through Co-Creation, Diversification through Co-Creation, Gains from Trade through Co-Creation, Principle of Co-Creation Comparative 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.<sup>1</sup> For instance, much work on international trade continues to glorify this principle by illustrating gains from trade that are attributable exclusively to specialization in production along the lines of comparative advantage.<sup>2</sup> 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.<sup>3</sup> 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?”

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*<sup>4</sup>, have increasingly been drawing serious skepticism. The “nirvana approach”<sup>5</sup> revolves around portraying the market as an interface for firms and consumers to engage exclusively in exchange of commodities, which has left “Ricardo’s disciples befuddled” and suggests “the theory needs updating”.<sup>6</sup> We believe that much of the skepticism can be addressed by removing the obsolete assignment of distinct “fixed” roles to institutions (firms) and individuals (consumers, employees, and talent in general).

---

<sup>1</sup> 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 reconstructions of the principle that have often led to “misunderstandings” stemming from “a confused tangle of claims of priority, error, incompleteness, and attribution”.

<sup>2</sup> See Arnod Costinot (2009) for a unifying perspective on the fundamental forces that shape comparative advantage.

<sup>3</sup> See Schumacher (2013) for recent assessments of this vast body of literature that has developed since Sraffa and Dobb (1952).

<sup>4</sup> 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.”

<sup>5</sup> The expression “nirvana approach” was used by Harold Demsetz, as early as 1969, to characterize the typical fallacy inherent in conventional economic thinking when comparing an imperfect existing arrangement to a hypothetical idealized system.

<sup>6</sup> Source: “Revisiting Ricardo”, *The Economist*, August 23, 2014.

In an age where the means of production are being democratized in the economy as it is becoming, let us, following Chakrabarti and Ramaswamy (2014), start with the example of automobiles. Any part of the activity system that results in the creation of the automobile (artifact), 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 "production" experiences. For instance, Local Motors, a startup enterprise, has built a co-creative 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 elemental difference between value generated by incentivizing the participation of consumers in the process of innovation and that generated from co-creation experiences. The former (innovation competition) is typically conceived as a mechanism designed by the firm(s) announcing incentives for consumers to communicate ideas that can help improve, for instance, the design of a product. In comparison, the value generated through the experience of co-creating a design is distinct from that generated through an actual improvement in the design itself.

The key point is that the traditional distinction between the consumer and the producer, while remaining valid at the point of exchange, is of no relevance when 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-creation 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 experience of individuals (whether consumers or employees).

Production today is increasingly co-creative, generating value as a function of co-creation experience. This is evident since the advent of the web, mobile technologies of expression, communication, and information, has enabled value to be *created jointly* by the individual and the firm, in the new co-creation economy. 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 agential (i.e. pertaining to the capacity, condition, or state of acting) experience.<sup>7</sup> An individual, who neither contributes to the production of an artifact nor uses it, can still derive value through her embodied agential 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 co-creation experience – a contribution we would like to identify as being at the core of the conception of the Principle of Co-Creation Comparative Advantage.

---

<sup>7</sup> 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. Revisiting Ricardo

Ricardo's<sup>8</sup> 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.<sup>9</sup> 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.

**Table 1: Unit Labor Requirements for Cloth and Wine**

	Cloth	Wine
England	100	120
Portugal	90	80

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 produce using 120 laborers. Ricardo then demonstrated how it could be to the advantage of both nations to follow

---

<sup>8</sup> See Ricardo (1817).

<sup>9</sup> Haberler (1930) was among the first to visualize that opportunity cost, at the margin, was at the heart of the principle of comparative advantage.

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”<sup>10</sup>, 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

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

---

<sup>10</sup> 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 an increase in the "amount and variety of the objects on which revenue may be expended."

### **3. Rethinking Ricardian Comparative Advantage**

Let us now pause to think: Would David Ricardo have formulated the principle of comparative advantage any differently in the new co-creation 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 an obsolete theory of value creation, restricted to the relational property of goods and services, the deficiencies of which are becoming increasingly apparent in the context of value generated as a function of co-creation experiences, in the new, evolving co-creation economy. This conspicuous neglect inevitably attracts more skepticism about the relevance of the principle of comparative advantage than it deserves.

Following Chakrabarti and Ramaswamy (2014), consider the element of value as generated from co-creation experiences resulting from individual interactions through engagement platforms. Consider, for illustration, 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 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  $\left(\frac{M}{n} - E_i\right) \forall i = 1, 2, \dots, n$  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.

An infusion of co-creation 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  $\left(\frac{M}{n} - E_i\right) \forall i = 1, 2, \dots, n$  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-creative surplus in sharp contrast with the relatively local specification of the conventional notion of economic surplus.

In effect, any part of the activity system that results in the creation of an artifact can be opened up to joint value creation with individuals, including consumers. Consequently, the consumer's role expands as a potential co-creator of "production" experiences. Suppose  $V_i$  is the value derived by an individual  $i$  as a function of  $C_{ij}$ , representing the vector of individual  $i$ 's co-creation 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:

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

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

individual economic behavior. Individual  $i$ 's co-creation 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  $j$ .

Now consider re-constructing Ricardo's example<sup>11</sup> 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-creation experiences via engagement platforms. It is important, at the outset, to note that our construct of co-creation experiences goes 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-creation experiences spans a larger space than does prosumption, in comparison, since the former arises from co-creativity than mere transfer/doing of work to/by the consumer (Toffler 2013).

---

<sup>11</sup> 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.

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

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

Let  $A_{ia}$  be 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  $V_{pa} \in V_p$ . Thus, 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-creation experiences with or without  $A_{ia} \cap A_c$  being empty. To fix our ideas, through illustration, let us then look at the possibility of *co-creation experiences* in the production of clothing<sup>12</sup> in an otherwise Ricardian world, as shown in Table 2.

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

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

<sup>12</sup> For ease of comparison, we have retained Ricardo’s characterization of Wine and Cloth production. Our infusion of co-creation 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-creation 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 chain system*, from design to production to packaging to marketing activities.

The economics of co-creation experiences encompasses both the value generated through co-creation experiences in infusing a “producer’s” activities via co-creation engagement platforms as well as embedding of co-creation engagement platforms by a “producer” in a “consumer’s” activities. It is important to underscore that the vision of the emerging field of Co-creation 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). Further, it is important to recognize that the value through co-creation 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. Limiting attention to selling an experience (from the use of an artifact) would conspicuously overlook the essence of co-creation 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. As such, the implications of Co-creation 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-creation economy as it is evolving.

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 Portuguese

labor in the production of Traditional Cloth Production, Clothing Co-Creation, and Traditional Wine Production respectively:<sup>13</sup>

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

Under free and frictionless trade, the hourly wage ( $\omega$ ) 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-creation experiences in economics recognizing that value can be, and *is* being generated in the new evolving co-creation economy, on engagement platforms that are not limited to producing *more* of a good.

#### 4. The Principle of Co-Creation Comparative Advantage

Visualize the vast potential of co-creation surplus<sup>14</sup> that conventional economic thinking leaves out by simply ignoring the fact that an enterprise can and does, even more so in the modern Internetnetworked age, release its resource constraints by investing in engagement platforms that co-

---

<sup>13</sup> See Neary (2003, 2007) for recent innovations in identifying patterns of specialization and trade, consistent with the Dornbusch, Fischer, Samuelson (1977) extension of the Ricardian principle of comparative advantage, in a general oligopolistic equilibrium.

<sup>14</sup> See Chakrabarti and Ramaswamy (2014).

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

$$\begin{array}{ll} \text{Maximize:} & V_j = V_j(C_{ji}, C_{-ji}, A_j, A_{-j}, c_j) \\ \{R_{ji}, T_{ji}, a_j\} & \\ \text{subject to} & \bar{T}_j = \sum_i T_{ji} + T_j(R_{ji}) \end{array}$$

while each individual's objective is to

$$\begin{array}{ll} \text{Maximize:} & V_i = V_i(C_{ij}, C_{-ij}, A_i, A_{-i}, c_i) \\ \{R_{ij}, T_{ij}, a_i\} & \\ \text{subject to} & \bar{T}_i = \sum_j T_{ij} + T_i(R_{ij}) \end{array}$$

where  $C_{ji}$  is the vector of co-creation experiences of all individuals engaged on platform  $j$ ;  $C_{-ji}$  is the vector of co-creation 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  $T = \{\bar{T}_i, \bar{T}_j\}$  on the optimal choice of any individual or enterprise (participant) with a finite horizon, where  $\bar{T}_i$  represents the vector time horizons of individuals and  $\bar{T}_j$  represents the vector time horizons of enterprises, within which  $T_{ji}$  represents time and  $R_{ji}$  represents resources invested, in the co-creation experiences of

participating individuals  $i$ , by the enterprise(s) providing platform  $j$ ;  $T_i(R_{ij})$  represents the time invested by individual 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  $C^g(T) = [C_{ij}^g \ C_{ji}^g]$ ,  $\forall g$ . For simplicity of exposition, hereinafter, let the value function  $V_{()}( )$  be additively separable in each of its arguments. 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

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

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

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

This leads to the conception of our Principle of Co-Creation Comparative 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*

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

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



The Principle of Co-Creation Comparative 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 enjoyments (and societal welfare-wellbeing) through the broader lens of co-creation experiences where mutual benefits from specialization in the production of goods  $g$  and  $-g$  (in line with the conventional concept of comparative advantage) will not be 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 jointly created through individuated co-creation experiences, thus expands our vision to identify mutual gains from specialization, as well as diversification, through co-creation.

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

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

and

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

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

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

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

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 through co-creation,

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

long as

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

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

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

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

Country  $c$  gains from specializing in the production of good  $-g$  while the other country stands to gain from diversification through co-creation *iff*

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

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

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

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

Analogously, country  $c$  stands to gain from diversification through 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 
$$\sum_{-i \in -c} V_{-i} \left( p_g \left( \frac{1}{a_g^c} \right) \left( \frac{1}{p_{-g}} \right) \right) > \sum_{-i \in -c} \left[ V_{-i} \left( \frac{1}{a_{-g}^c} \right) + V_{-i}(C_{ij}^{-g}) \right]$$

Finally, both countries gain from diversification through 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 
$$\sum_{-i \in -c} \left[ V_{-i} \left( \frac{1}{a_{-g}^c} \right) + V_{-i}(C_{ij}^{-g}) \right] > \sum_{-i \in -c} V_{-i} \left( p_g \left( \frac{1}{a_g^c} \right) \left( \frac{1}{p_{-g}} \right) \right)$$

Let us now revisit the example of clothing 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  $\sum_{i \in c} V_i \left( p_{-g} \left( \frac{1}{a_{-g}^c} \right) \left( \frac{1}{p_g} \right) \right) - \sum_{i \in c} V_i \left( \frac{1}{a_g^c} \right) < \sum_{i \in c} V_i(C_{ij}^g)$  as well as foregone gains

for Portugal if  $\sum_{i \in -c} V_i \left( p_{-g} \left( \frac{1}{a_{-g}^c} \right) \left( \frac{1}{p_g} \right) \right) - \sum_{i \in c} V_i \left( \frac{1}{a_g^c} \right) > \sum_{i \in c} V_i (C_{ij}^g)$  even when Portugal reveals a comparative advantage in designing clothes i.e.  $\omega > \frac{a_{-g}^c}{a_g^c}$ . When leveraging resources in a country for co-creation 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 principle of comparative advantage remains incomplete without the cognizance of co-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-creation economy. As we have shown, the relevance of Ricardo’s vision can be restored through co-creation thinking. By recognizing that value is generated as a function of co-creation experiences, our Principle of Co-creation Comparative 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-creation 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 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-creation experience. We demonstrate how patterns of specialization and the resultant gains from trade, within or across borders, are affected by co-creation experiences. A natural outcome of our analysis is the Principle of Co-Creation Comparative Advantage, that can guide trade with co-creation at the core, expands our vision to identify mutual gains from specialization, as well as diversification, through co-creation in the economy. We hope our contribution will form the foundation for a new generation of forward-looking economists with a shared vision of the increasingly Internetworked world of economy, and the blurring of conventional distinct “fixed” assigned roles in the value creation process, in the co-creation economy as it is becoming.

## References

- Chakrabarti, Avik and Venkat Ramaswamy (2014), "Re-thinking the Concept of Surplus: Embracing Co-Creation 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*.
- 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.
- 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.
- 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.