The Diversity of producers: Do they Meet the Sufficient and Necessary Conditions of a Sustainable Production Unit?

By

Lucio Muñoz*

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

Abstract

Meeting sustainability concerns has now become a must do activity for producers of all types, both in developed and developing countries, which points out to the need find and implement production processes that are sustainable. The general goals of this paper are to use qualitative comparative tools to point out, based on three specific characteristics, all possible types of production units; and to use this framework to show that none of them meets the sufficient and necessary conditions underlying the existence of sustainable production units. Then, some relevant conclusions are provided.

Introduction

There are different types of producers, and their activities can be thought from three different structural levels from the simplest to the complex one. First, we have local production units, whether individual or cooperative enterprises which produce mainly for the local market. Here, an individual may also be a monopoly; and a cooperative may be a partnership too. Their activities have mainly local social, economic, and environmental impacts. Second, we have regional production units, whether individual or cooperative businesses which supply mostly to regional markets. These units have mostly regional impacts. Finally, we have global production units, also individual and cooperative companies, which are responsible for global supplies, and therefore, they are responsible mainly for global environmental and socio-economic impacts. The need to develop sustainable patters of production at all levels is recognized today in chapter 4 of Agenda 21 (Michaelis 2002) and reflecting the current sustainable development goals in SDG (UN 2025). Production systems, how and what we produce, are taken as some of the major blocks to the implementation of Agenda 21 (Upton 2002) and now how and what we produce needs to be responsible is key for the sustainability of development (UN 2025). There are several characteristics whose presence or absence in meaningful ways is usually associated with producer or production unit variability, which are described below.

Producer's characteristics

The efficiency of production units is usually associated with the type of capital employed, the type of market under which the unit operates, the type of technical knowledge available to support the production function, the quality of the product desired, and so on. The efficiency of production varies with the quality and quantity of the above characteristics within a country and between countries. However, usually the efficiency/ inefficiency discourse is presented in the context of developed country and developing country conditions. For example, developed

countries are known to have production units that are very capital intensive, have high degree of market control, have excellent technical knowledge, and have high quality control standards. On the other hand, developing countries are known to have production units characterized by labour intensities, very bad markets, inadequate technical knowledge, and poor-quality production standards. However, both the efficient and inefficient production units have different economic, social, and environmental local and global impacts, and therefore, both are important in the sustainable development/sustainability discourse. To gain a better understanding of efficiency issues relevant to production units, the following questions are explored: Which is the most inefficient production unit? which is the most efficient production unit? Is the most efficient production unit sustainable? and if not, why not? Below, a simple way of providing an answer to the questions mentioned above is presented.

The goals of this paper

The general goals of this paper are to use qualitative comparative tools to point out, based on three specific characteristics, all possible types of production units; and to use this framework to show that none of them meets the sufficient and necessary conditions underlying the existence of sustainable production units

Terminology

The qualitative comparative terminology used in this paper is summarized in Table 1 below.

Table 1

P = efficiency in production	p = inefficiency in production
C = high capital intensity	c = low capital intensity
N = high market access	n = low market access
K = high technical knowledge	k = low technical knowledge

Methodology

First, an efficient production model(P) is presented based on three characteristics, Capital Intensity(C), Market Access(N), and Technical Knowledge(K). Second, based on the above model(P), all 8 possible types of production units consistent with it are listed. Third, specific types of production units in the list are identified as the most inefficient, the most efficient, unisectoral, and bisectoral producers. Fourth, a definition of sustainable production unit is provided to introduce the necessary and sufficient conditions for the existence of sustainability. Fifth, the characteristics of sustainable production units and that of the 8 types of production units in the list are compared to determine sustainability gaps. And finally, some relevant conclusions are provided.

Producer model

Based on three of the characteristics of production units described above and based on the well-accepted economic principle that "more efficiency is better", an efficient production model can be defined as follows:

1) P = C + N + K

The above efficient production model(P) suggests that there are different types of production units depending on whether or not they use high capital intensities(C) or they have high market access(N) or they have high technical knowledge(K) or any combination of them. In other words, this formula permits us to frame and compare different possible types of production units that may exist within countries or between countries. For example, developed countries should be expected to score high on these characteristics showing high levels of efficiency while developing countries should be expected to score low due to low efficiency conditions; and then as levels of development(income) change, the scores on these characteristics may change. Table 2 below lists the possible different types of production units.

Table 2 Production unit variability

Type of producer	Characteristics
P1 = cnk	low intensity, low access, low knowledge
P2 = Cnk	high intensity, low access, low knowledge
P3 = cNk	low intensity, high access, low knowledge
P4 = cnK	low intensity, low access, high knowledge
P5 = CNk	high intensity, high access, low knowledge
P6 = cNK	low intensity, high access, high knowledge
P7 = CnK	high density, low access, high knowledge
P8 = CNK	high density, high access, high knowledge

The most inefficient producer

The worse production unit of all according to Table 2 above is P1 = cnk since it is the most inefficient: it has low capital intensities(c), low market access(n), and low technical knowledge(k) at the same time. These production units operate mostly on a subsistence basis.

The most efficient producer

The most efficient production unit according to Table 2 above is P8 = CNK. Here, the need to maximize production leads to a process of employing high capital intensities(C), of securing high market control(N), and of bringing in high technical expertise(K), which is the most desirable productive structure.

Unisectoral producer

These are production units in Table 2 where one of the three characteristics is dominant such as high capital intensity production units(P2); high market access production units(P3); and high technical knowledge production units(P4). These are production units specialized in one efficiency area.

Bisectoral producer

These are production units in Table 2 where two of the three characteristics are dominant such as high capital intensity and high market access production units(P5); high market access and high technical knowledge units(P6); and high capital intensity and high technical knowledge production units(P7). These are production units strong in two efficiency areas.

In short, production units can vary from the most inefficient to the most efficient; and unisectoral and bisectoral producers could be considered intermediate steps toward searching for the most efficient production unit. See that the 8 possible types of production units displayed in Table 2 appear to indicate the existence of a vertical efficiency structure where the view that "more efficiency is better" appear to favor pressures for upward mobility only.

Sustainable producer

It is widely accepted today that sustainable production units must incorporate all aspects/costs within its production function, which includes social, economic, and environmental aspects and costs. Hence, a sustainable production unit is a production unit operating at an optimal stage: a production unit ruled by optimal conditions. In other words, sustainable production units must optimize all production values. Based on formula 1), there are three relevant aspects to production units: capital intensity(C), market access(N), and technical knowledge(K). If an optimal production unit exists, then it must have all these three aspects in optimal form at the same time, which can be stated as follows:

*** * * ***

2) P = CNK; where * = optimization

The model above indicates that the necessary and sufficient condition for a sustainable production unit(P*) to exist is the presence of optimal capital intensity(C*), optimal market access(N*), and optimal technical knowledge(K*) at the same time.

In other words, a sustainable production unit is a production unit that integrates optimal conditions. See that we are dealing here with the interaction of optimal conditions, which the author

calls internal optimization. Under internal optimization, either too much or too little are not desirable states as both of them would lead to wasteful behavior. For example, environmental pollution is said to be fueled by both, those who produce very efficiently and those who produce very inefficiently, which is a dual situation that needs to be balanced out.

Formula 2) above can be restated as follows:

*** ***

3) P = (CNK), where * = optimization

The model above indicates that the necessary and sufficient condition for a sustainable production unit(P*) to exist is the optimization of the interaction of capital intensity(C), market access(N), and technical knowledge(K). See that here we are dealing with the optimization of interactions, which the writer calls external optimization. Under external optimization, levels of capital intensities have to be consistent with levels of market access and with levels of technical knowledge in such a way as to maintain optimal conditions. For example, inconsistencies in the levels of capital intensities, market access, and technical knowledge available to local, regional, and global production units can be seen as important sources of production unit unsustainability.

Sustainability gaps

By comparing the structure of optimal production units in formula 2[P* = C*N*K*] and in formula 3[P* = (CNK)*] with the 8 possible types of production units shown in the Table 2 above, we can notice that none of the production units in this Table 2 is consistent with optimal structures, and therefore, none of them, neither the most efficient production unit(P8 = CNK), is a sustainable one. In other words, the 8 types of production units presented in the Table 2 above, including the most efficient production unit, are not sustainable production units because they are not consistent with optimal conditions: They do not posses the necessary and sufficient conditions required for the existent of a sustainable production unit. These inconsistencies with optimality are called here sustainability gaps. Notice that eliminating sustainability gaps is not cost-free or sacrifice-free in all 8 cases in Table 2 because it requires a change in behavior from unsustainable states to sustainable ones. The main issue here is how to induce sustainable production behavior given that some production units may be able to afford the changes, but others may not. For example, those who operate under most efficient conditions right now may be able to adjust to extreme changes in capital intensities, market access, and technical knowledge easier than those facing inefficient conditions, especially cost-wise as transition problems should be expected (Muñoz 2010).

Conclusions

Based on the simplified producer model presented here there are 8 possible types of production units, which can be classified in four groups: the most inefficient, the most efficient, unisectoral, and bisectoral production units. Based on this model, the most inefficient production unit (P1 = cnk) is the one where levels of capital intensities, market access, and technical knowledge are low at the same time while the most efficient production units (P8 = CNK) are those where the same factors are present at high levels at the same time. Based on the definition of a sustainable production unit provided, it was shown that the most efficient production units are not sustainable because they do not optimize the interaction of capital intensities, market access, and

technical knowledge. In fact, based on sustainability gaps, it was shown that none of the possible types of production units listed in Table 2 is a sustainable one because none of them meets the sufficient and necessary conditions for a sustainable production unit, which are the presence of optimal capital intensities, optimal market access, and optimal technical knowledge at the same time. This means that without optimality we may be able to find cases of sustained production units, at the local, regional or global level, but not of sustainable ones.

References

Michaelis, Laurie, 2002. **Sustainable Consumption and Production, In: Earth Summit: A New Deal**, Felix Dodds (Ed), Earthscan, London, UK.

Muñoz, Lucio, 2010. **Substituting The More is Better Paradigm for The Less is Better Paradigm: Identifying Key Transitional Problems,** En: Cambio Climatico y Salud Ambiental, REDESMA, Vol.3(3), January, La Paz, Bolivia.

United Nations (UN), 2025. **THE 17 SUSTAINABLE DEVELOPMENT GOALS**, Department of Economic and Social Affairs

Upton, Simon, 2002. **Roadblocks to Agenda 21: A Government Perspective**, In: Earth Summit: A New Deal, Felix Dodds (Ed), Earthscan, London, UK.