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**The Production Boundary Reconsidered**

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## The Production Boundary Reconsidered

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### Abstract

Hill [1977, 1979] and Hawrylyshyn [1977] rediscovered a classical contribution made by Margaret Reid in as early as 1934 (Reid [1934]) known now as “third party criterion.” The general production boundary in the SNA 1993 is defined by using this criterion. They considered that the property of “delegability” was the key to the concept of economic production. That is, an activity is called production in an economic sense if it can be delegated to another economic unit. The author calls due attention to the fact that the SNA includes another criterion, which he tentatively calls “World 1 criterion” meaning that an activity is called economic production only when it is a physical process, where the term World 1 is due to Karl Popper. It is claimed that this criterion can generate a more appropriate general production boundary for the SNA if it is used with “role-exchangeability” criterion, another new criterion.

(150 words)

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## Introduction

The purpose of the present paper is to reconsider the boundary of production in the SNA. In 1970's, some authors in the field of national accounting (Hill [1977, 1979] and Hawrylyshyn [1977]) studied the concept of economic production and reached a widely agreed conclusion, which is considered to be incorporated in the SNA 1993.

Actually, they rediscovered a classical contribution made by Margaret Reid in early 1930's (Reid [1934]). They considered that the property of "delegability" is the key to the concept of economic production. Thus, an activity is called economic production if it can be delegated to another economic unit. This criterion is sometimes referred to as "third party criterion" in the field of unpaid work or household production in particular because of an additional requirement imposed by her, which will be described below.

However, it is true that in applying their criterion, statisticians have encountered quite a few problems. Thus, for example, in the field of the research in and the measurement of unpaid work, it was often questioned whether commuting is able to be delegated or not. In fact, a worker cannot delegate commuting to any other person for him/her. However, it should be taken into account that activities may be undertaken as part of preparation for some other activities. Commuting should be counted as an example of such preparatory activities.

In addition, it should be noted that Pyatt [1990] pointed out the insufficiency of the criterion putting it as "Hill's half-way house." For example, a student cannot delegate studying to any other person for them. However, employers may have many off-the job training programmes for their employees. Thus, for example, they may make their employees go to English conversation schools as part of their work to prepare for transfer to overseas offices. So, delegability or third party criterion may lead to placing some activities which are regarded as work by people who do them outside the production boundary.

Moreover, there may be a problem about "intellectual property products" a newly coined term in the SNA 2008. Thus, it is highly questionable whether Shakespeare could delegate writing *Hamlet* to any other person, leading to the conclusion that authoring a book (or composing a symphony) is *not* within the production boundary of the SNA. This position is the same as that taken in the SNA 1968 though it is not consistent with the view taken in the SNA 2008 as well as the SNA 1993 where authoring and the like is considered to be not only economic production but also (fixed) capital.

Delegability apart, it should be recognised that paragraph 1.20 in the SNA 1993 (or

paragraph 1.40 in the SNA 2008) clearly states: “In the System, production is understood to be a physical process.” Although “Hamlet” performed in a theatre is a physical process and a book containing “Hamlet” is also a physical object that is an output of some physical process, “Hamlet” itself is not physical. In the same way, mental changes that are purported to be brought about by, say, education are not physical either clearly.

Thus, in the very core of the national accounting system, quite fundamental problems remain unsettled. The above mentioned criterion which is deemed to be included in the current SNA and means that an activity is economic production only if it is a physical process will be called “World 1 criterion” in what follows, where the term “World 1” is due to Karl Popper a British philosopher who was originally Austrian and means essentially the physical world. In the author’s view, Popper’s consideration on his “three worlds” is very useful for our purpose of delineating the production boundary for the SNA. In addition to World 1, World 2 means the mental world and World 3 means the world of objective knowledge respectively. Also, his consideration is useful as well to avoid possible confusion among national accountants about the treatment of some borderline cases.

In addition, it is claimed that the delegability criterion or the third party criterion should be replaced with another new criterion tentatively called “role-exchangeability” criterion that an activity is considered to be economic production only when someone’s role of undertaking the activity is able to be exchanged with someone else’s role of undertaking another activity in order for some common purpose of the community to be accomplished.

In the section following the introduction, the concept of production boundary will be revisited. In addition to reviewing existing criteria briefly, the focus may be the introduction of newly formulated criteria namely World 1 criterion and the role-exchangeability criterion. To facilitate the discussion, Popper’s concept of the three worlds will be introduced in the next section. Some implications for national accounting are examined. And in the final section, main conclusions will be recapitulated with some closing remarks.

## 1. The production boundary: reconsideration and new criteria

According to Reid [1934, p.11], “If an activity is of such character that it might be delegated to a paid worker, then that activity shall be deemed productive.” Peter Hill rediscovered her contribution when writing “it is inherent in the concept of a service

that the opportunity must exist to hire another economic unit to perform it” (Hill [1979, p.34]) and “Any activity, which is such that it cannot by its very nature be delegated, or contracted out, to another individual or economic unit, must, therefore, be treated as intrinsically a non-service type activity (Hill [1977, p.326]).”

Clearly, the two authors describe the production boundary in the same fashion. Here, a remark may be necessary. That is, what Margaret Reid meant was that a possibility to hire or get another economic unit to perform a given activity should be interpreted to mean that anyone *can* perform it for the benefit of the one for whom it is done. In other words, it does not matter who performs it. Thus, if there are activities such that only particular individuals (family members or friends, for example) can do them, they should not be deemed to be productive in her sense. Himmelweit [1995] called this property “separability” (between the activity and the performer). Related to this property may be “impersonal” property of an activity which is originally due to Reid [1934] and means that any kind of personal relationship between the one who performs the activity and the one for whom it is performed is *not* required.<sup>1</sup>

It may be interesting to note in passing that what Himmelweit [1995] considered was “work” (activity itself) rather than “products” (goods or services). The same way of thinking may be found in Hill [1977, pp. 354-356] as well when he considered “pure public services.” In fact, he regarded the government activities which result in pure public services as economic production *essentially* because they are part of “division of labour.” It should be noted here that pure public services like general administration or defence do not have a clear definition of changes involved.

A further interpretation is due to the author (Sakuma [1996, p.220]). He thought that if an activity is delegable meaningfully, it should be interpreted as meaning in addition that anyone (who has the same technique and materials as the original producer) can re-perform it. This property was called “reproducibility” by him. It may be crucially relevant to the area of what the revised SNA calls “intellectual property products.” For, while it was not likely that Shakespeare could leave anyone to write “Hamlet” for him, it is almost meaningless for anyone to write the same “Hamlet” again.<sup>2</sup> Because “Hamlet” already exists in Karl Popper’s World 3, the world of the products of

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<sup>1</sup> “An activity is considered personal if it must be performed by a particular person not because of special ability but because of a personal relationship between the performer and the one whose want is satisfied.” (Reid [1934, p.11] ) It may be for this reason that her contribution is called “third party criterion” now rather than “delegability criterion.” In fact, this kind of property was not considered in Hill’s papers except for self-fulfilment type of activities such as sleeping and studying, which may be regarded as special cases of personal activities.

<sup>2</sup> This kind of uniqueness is characteristic of any World 3 object. See Popper [1982],

human minds, anyone cannot change the world anymore by writing it again.

In fact, this type of uniqueness is one of the most salient features of authoring as well as composing. And this is the most notable difference between authoring and composing on the one hand and paintings and sculptures on the other. In fact, anyone that has the same technique and materials can re-produce the latter types of artistic products but it is not the case for the former type of artistic works. And it should be noted that the treatment in the SNA 1968 of authoring and composing is totally different from that of paintings and sculptures.<sup>3</sup> Thus, in the 1968 version of SNA, the former types of activities are considered to be outside its production boundary while the latter types of artistic products are part of fixed capital formation (not “valuables”) if owned by producers.<sup>4</sup>

As already mentioned, the SNA 1993 has an implicit criterion to the effect that economic production is understood to be a physical process. So, it seems that “products” to the World 3 (changes in or something added to World 3) as well as to the World 2 (changes in or something added to World 2) seem to be excluded from the concept of “products” in the sense of the SNA. Thus, in contrast to “Hamlet” performed in a theatre as well as a book containing “Hamlet,” “Hamlet” itself is not physical. By using Popper’s terminology, “Hamlet” itself resides in the World 3, the world of the products of human minds while any performance of “Hamlet” as well as a book containing “Hamlet” is in the World 1, the world of physical states and processes and any emotion provoked by viewing the play or reading the book is in the World 2, the world of mental states and processes.

Thus, friendship, affection, inclination and so on<sup>5</sup> may be World 2 products, while literally as well as knowledge creation is World 3 products so that they should be considered to excluded from the production boundary as defined in the SNA 1993 or the SNA 2008 as well as SNA 1968. This criterion will be called “World 1 criterion,” which may be formulated as follows:

#### World 1 criterion

A human-controlled activity is called economic production only when it is a

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p.115.

<sup>3</sup> See paragraph 7.52 and Table 6.3 in United Nations [1968]. In the next section, a tabular presentation of the treatment of selected art items and related Popper’s view will be given

<sup>4</sup> Producers like museums have to conduct conservation and restoration activities for their collection. This fact shows sculptures and paintings are definitely fixed capital.

<sup>5</sup> Notice that friendship and affection should be regarded as examples of personal relationship, which may be considered to be related with “personalness” of activities.

physical process so that it brings about some changes in World 1 or it is an addition to World 1 and can be described by using World 1 terms only. <sup>6</sup>

Two comments will be necessary. The first comment is about preparatory activities, that is, activities that are undertaken to prepare for some other activities. For example, commuting is a typical preparatory activity to prepare for his/her regular paid work in the office. To determine whether a preparatory activity is productive or not, it should be combined with the activity or activities for the preparation of which it is undertaken. A certain kind of voluntary work needs some preparatory training process for it. It may be noted that preparatory processes as described do not necessarily have perceptible consequences in World 1. For example, a certain research and development process may be needed for a car producing company to meet, say some environmental regulation in force.

The second comment is that this criterion is too large because consumption as well as production is a physical process anyway. In fact, the roles of the delegability (or third party) criterion include distinguishing between consumption and production.

For this point, it may be claimed that the delegability criterion fails to capture certain possible phases of division of labour within the economy. Thus, studying or learning something is not considered to be able to be delegated to another person, so they are considered to be consumption rather than production under this criterion. However, there may be very many kinds of work done by employees similar in character to studying or learning including R & D so that this criterion may lead to placing activities which are regarded as work by people who do them outside the production boundary of the system. Also, it may be considered to be contradictory to what is written in the paragraph 7. 29 in the SNA 2008. In fact, according to this paragraph, in order to be classified as employed, the person must be engaged in an activity that falls within the production boundary of the SNA.

It may be proposed that delegability (or third party) criterion should be replaced with another new criterion tentatively called “role-exchangeability” criterion that may be formulated as follows:

#### Role-exchangeability criterion

An activity is considered to be economic production only when someone’s role of undertaking the activity is able to be exchanged with someone else’s role of undertaking another activity in order for some common purpose of the society to

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<sup>6</sup> A more detailed introduction of Popper’s three worlds will be found in the next section.

be accomplished.

While consumption activities are neither able to be delegated nor role-exchangeable, receiving education is not able to be delegated, but it may be role-exchangeable. Thus, it may be assumed that a person A may be specialised in a particular area and enrich his/her knowledge in this particular area and another person B in another particular area. But it is also possible to assume that the person A (B) is specialised in the area in which the person B (A) is specialised under the original assumption. However, because both activities produce no output in World 1 possibly, they are productive only when they are considered to be preparatory to some productive activities. In a sense, role-exchangeability is the possibility of division of labour captured in the widest sense. They exchange time uses.

## 2. Popper's three worlds

The three worlds can be defined easily. As very briefly described earlier, according to Popper<sup>7</sup>, World 1 is the world of physical states and processes including the inorganic matter, the structure and actions of all living beings, plants and animals and even human brains. It also comprises machines, tools, works of art, films and computers and other artefacts. Here, "works of art" are to be interpreted to refer to their material bases. It also includes all artefacts that man made for coding information such as the paper and ink of books. The materialists think that World 1 is the total world and they recognise nothing else.

World 2 is the world of mental states and processes, or states of consciousness <sup>8</sup> John C. Eccles, an Australian brain scientist and 1963 Nobel prize laureate who closely collaborated with Sir Karl (Eccles [1970 and others] ) distinguished three levels within World 2; Outer sense, inner sense, and the self or ego. The first level is the ordinary perceptions provided by all our sense organs. They include vision with light and colour, sound with music and harmony, touch with all its qualities and so on. It should be noted that these qualities (*qualia*) do not exist in World 1.<sup>9</sup> On the other hand, emotions, feelings of joy and sadness, fear and anger, memories, imaginings, and intentions are in the inner sensory world. Finally, the ego is at the core of World 2.

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<sup>7</sup> See Popper [1972, 1982, 1994], and Popper and Eccles [1977] as well as Eccles [1970, 1973] among others.

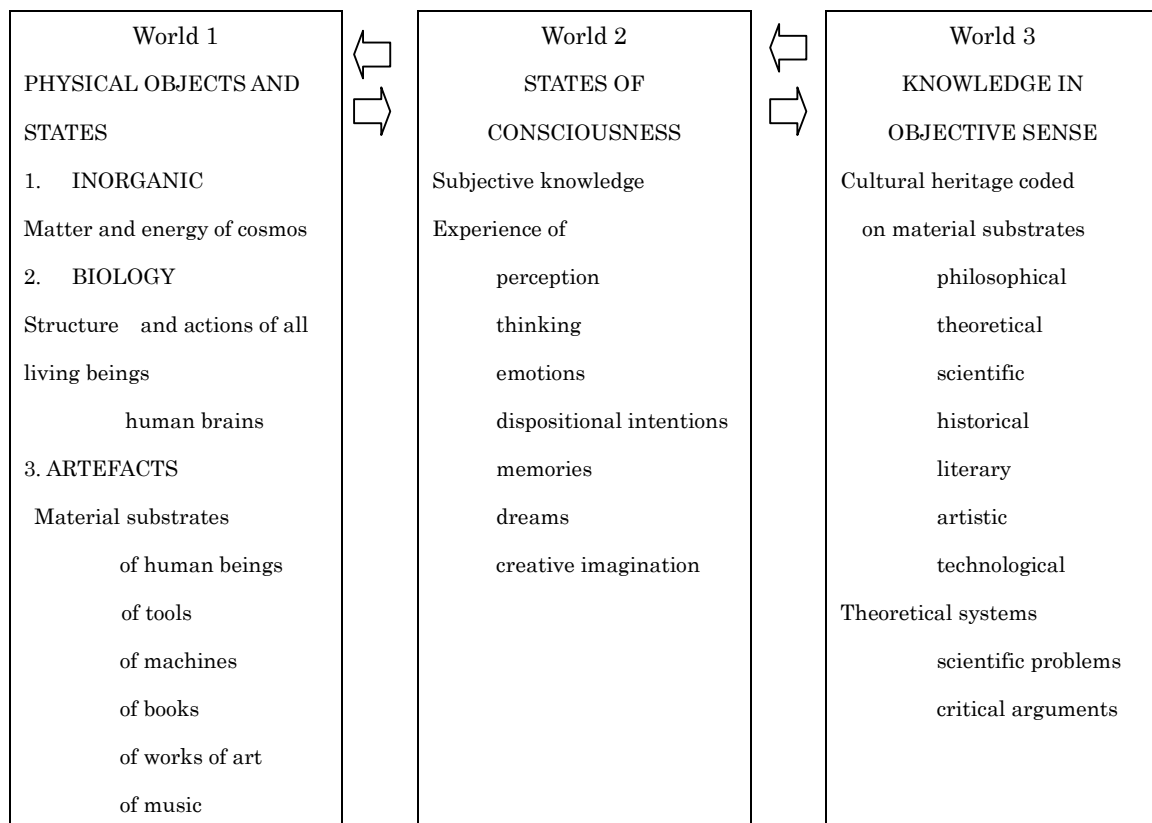
<sup>8</sup> For the present purpose, we need not mention some subtle points such as problems of the minds of animals as well as subconscious and unconscious experiences.

<sup>9</sup> Ibid.



World 3 is the world of the products of human minds, more specifically problems, theories, discussions as well as architecture, art, literature, music. In other words, it is the whole world of culture. Ethical values and social institutions (and thus, societies) are also in World 3.

The figure below shows a summary presentation of the three worlds by Sir John. This figure first appeared in Eccles [1970] and later in Eccles [1973], Popper and Eccles [1977], in which it was called “Tabular representation of the three worlds that comprise all existence and all experiences as defined by Popper [1972].” Arrows between the boxes show the interaction between the worlds. It should be noticed that there is no direct interaction between World 1 and World 3.



**Figure 2.1 Popper’s three worlds**

From the viewpoint of national accounting, it may be very interesting to know what he wrote<sup>10</sup> about artistic and literary works as summarised in Table 2.1 below.

“By ‘world 3’ I mean, roughly, the world of the products of our human minds. These products are sometimes physical things such as the sculptures, paintings, drawings, and buildings of Michelangelo. These are physical things, but they are a very peculiar

<sup>10</sup> Popper [1994], pp. 5-6.

kind of physical things: in my terminology they belong to both the worlds 1 and 3. Some or other products of our minds are not precisely physical things.

“Take a play by Shakespeare. You may say that the written or printed book is a physical thing like, say a drawing. But the performed play is clearly not a physical thing, though perhaps it may be said to be a highly complex sequences of physical events. But now please remember that no single performance of Hamlet can be said to be identical with Shakespeare’s Hamlet itself. Nor is Shakespeare’s play the class or set of all of its performances. The play may be said to be represented or reproduced by these performances, in a way similar to that in which a building or a sculpture may be said to be represented by one or several photographs, or in which a painting or a drawing may be said to be reproduced by prints of varying quality. But the original painting itself is different from its reproduction. And in a somewhat similar way, Shakespeare’s *Hamlet* clearly is not. Although its reproductions may be said to belong both to the world 1 of physical things and to the world 3 of products of human mind, the play, *Hamlet* itself, belongs only to the third world. It is similar with a symphony.”

**Table 2.1 The Treatment of Selected Art Items in the SNA and Popper’s view**

<b>Items</b>	<b>68SNA</b>	<b>93SNA</b>	<b>Residence in Popper’s three Worlds</b>
Sculpture	Fixed Capital Formation if purchased by producers	Valuables	World 1 and World 3
Paintings	Fixed Capital Formation if purchased by producers	Valuables	World 1 and World 3
Literary works	Outside of production boundary	Originals should be treated as Intangible Fixed Capital Formation	World 3
Music composing	Outside of production boundary	Originals should be treated as Intangible Fixed Capital Formation	World 3
Music Performances	Services; Intermediate or Final Consumption	Master tapes, etc. should be treated as Intangible Fixed Capital Formation	World 1 and World 3

There is a striking correspondence between the treatment of these art items in the

SNA 1968 (not in the SNA 1993) and Popper's philosophical consideration on them.

It may be mentioned that in the SNA 1968, sculptures and paintings as purchased by producers except owner-occupiers as well as Michelangelo's buildings are fixed capital formation while in the SNA 1993, sculptures and paintings have come to be classified as valuables the new, third category of capital formation. On the other hand, authoring a book (like *Hamlet*) and composing a piece of music (Symphony in G Minor) are outside the production boundary of the SNA 1968, while in the SNA 1993, they have come to be regarded as entertainment, literary or artistic originals one out of the four categories of "intangible fixed assets" in the SNA 1993.

The relation between Shakespeare's *Hamlet* and its performances or that between Mozart's symphony and its performances is somewhat like the relation between a building's plan and the building itself or that between the signifiers and the signified in the theory of semiotics. Of course, there may be a variety of performances of *Hamlet* or Mozart's symphony. In the case of sculptures and paintings, clearly the physical objects belong to the World 1. Sculptors and painters had their own plans for the works. But, it is the physical objects themselves that should be deemed to be "authentic" in these cases. It is worth noting that it is a common fact that plans or designs exist for any human products. These plans belong to the World 3, so in that sense, any physical product belongs to both World 1 and World 3.

It may be worth noting that even in the case of works of art which Popper assigns to World 3 only, the signifiers, or more correctly, the media carrying them are found in the world of physical objects.

Some further comments are needed about his division of the world. First, materialists will think that mental states are just something happening in the human brain. So every mental event is physical. That may be true. If you are a materialist, you can come to terms with Popper's thinking by sorting out that Popper's World 1 = World 1p + World 1m,  $\text{World } 1p \cap \text{World } 1m = \emptyset$ , and Popper's World 2 = World 1m. By doing so, you can reformulate World 1 criterion as World 1p criterion. Here, World 1m (m for mental) consists of the materialists' description in physical terms of the class of all the mental or psychological processes and World 1p (p for physical) consists of all those physical processes which are not mental processes as well. This is Popper's formulation of so called "Identity" theory<sup>11</sup>, which describes mental processes as being identical with a certain kind of physicochemical brain processes.

Second, Popper's World 3 is similar to but not the same as Platonic *idea* but something that is man-made. Thus, for example, the number system is a human

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<sup>11</sup> See Popper and Eccles [1977, pp. 82-85]. Also see Searl [2004].

invention. However, once created, it can cause and has caused various developments which include theories on prime numbers, Mersenne numbers<sup>12</sup> as well as perfect numbers.<sup>13</sup> Thus, the key characteristic of the World 3 is its *autonomy*.<sup>14</sup> More than that knowledge grows through error elimination by way of systematic rational criticism.<sup>15</sup>The following is Popper's famous schema:

$$P_1 \rightarrow TT \rightarrow EE \rightarrow P_2.$$

Here,  $P_1$  means the problem from which we start. To solve the problem, a tentative theory  $TT$  is offered, which may be (partly or wholly) mistaken.  $EE$  means a process of error elimination, by way of critical discussion or experimental tests. At any rate, new problems  $P_2$  almost autonomously emerge from the discussions and tests.

Thus, scientific theories are just hypotheses that may be wrong. In what sense, then, can a scientific discovery or a mathematical theorem be ascribed to a particular person or economic unit?

### 3. Some implications of new criteria

Some implications of new criteria, that is, "World 1 criterion" as well as "Role-exchangeability criterion" will be discussed in this section. Three topics will be touched upon: computer software and R & D; education; management and control of corporations

#### Computer software and R & D

Because machines *never* have World 2, computer software as it works inside the machines cannot be intangible. It must be treated as tangible assets and fixed assets in an ordinary sense or intermediate consumption, depending on the circumstances.

The genuine problem may be how to treat preparatory expenditures for computer software. They are similar to other R & D type expenditures. Technology and knowledge belongs to World 3, part of the environment within which the entire human activities

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<sup>12</sup> A Mersenne number is a number of the form  $2^p - 1$ , where  $p$  is a prime number. Such a number which is itself prime is also called a Mersenne prime.

<sup>13</sup> A perfect number is a positive integer that is the sum of its proper positive divisors, that is, the sum of the positive divisors excluding the number itself. The first perfect number is 6 (= 1 + 2 + 3) and the next perfect number is 28 (= 1 + 2 + 4 + 7 + 14).

<sup>14</sup> See Popper [1994, p.24 ff.].

<sup>15</sup> See Popper [1994, pp.10-11].

are conducted. In a sense, these expenditures are like those incurred for land improvements and land formation. As a *convention*, they are treated as capital formation only in the accounting period during which they are conducted and in later periods they come to be treated as part of land. It is another convention that may be needed here. Sometimes, they are also like work-in-progress. If preparatory expenditures for developing computer software are not so general in character but ad-hoc just for the particular software, the problem is just that of matching costs and revenues. Again, a convention may be required for the treatment of the problem.

In the SNA 2008, mineral exploration and evaluation and entertainment, literary or artistic originals in addition to the results of research and development and computer software and databases are called intellectual property products. Apart from the treatment of preparatory expenditures just described, most of them are neither products nor fixed capital. There is also serious confusion between rights and products here. Rights exist in World 3 only. For example, patent rights are rights granted by the authority for some particular policy purposes; they are not documents certifying any exclusive right concerning some entity in World 3. World 3 may be better treated as part of our environment within which the whole economic life is conducted.

### Education

Just as Hill [1977, p, 322] wrote that doctors' services are not providing cure, teachers' services are not providing mental changes in pupils' World 2. At least, it should be stressed that pupils' or students' own endeavour is needed to cause changes in their World 2, which should not be ignored when education services are described and analysed. Whether education can bring about mental changes depends on many factors. Endeavour on the part of pupils and students is just one of these many factors. To assume they are immediately brought about by the education is just a common confusion between outputs of the activities and outcomes brought about as their possible or plausible consequences.

Because the production boundary excludes the products to the World 2, education services which are purported to bring about mental changes must be described otherwise if they are to be described as productive. Thus, in the author's viewpoint, education services might be better described as providing the environment within which pupils and students study something. Teaching itself is rather like music performances or theatrical performances. Instruction in general may be regarded as performance-type services in which teachers try to inform the pupils and students of something.

Some words should be added here about so-called human capital or human capital

formation. Human capital formation must be something that should be regarded as own-account production processes in which education services are used as intermediate consumption. Although the third party (or delegability) criterion cannot place these self-fulfilment type activities within the production boundary, the newly formulated role-exchangeability criterion can do. However, in what sense can it be described as capital? It may be a challenge to be met in order to formulate the concept properly.

### Management

In paragraph 4.79 of the SNA 2008, it is clearly stated that management or control of corporations has two levels: the first level is related to determining general corporate policy and the second level concerns the direct control of the day-to-day activities or operations of a particular corporation.

This consideration leads to the distinction of two kinds of holding companies in the SNA; head offices and genuine holding companies. However, it is not explicitly mentioned in the text that it is related to the problem of production boundary.

Thus, whether control or management itself is economic production or not is one of the age-old problems of economics. Reid [1934, p.13] as early as in 1930's gave an answer to this question in the context of household production as follows: "Management is important for satisfactory group life. But can it be delegated? There is evidence that much of it can. Production commences with certain aims and purposes stated. The formation and expression of the basic standards of the members of the group, in regard to the kind of household life and goods to be produced, are not producer but consumer activities since these cannot be delegated. The presence in many homes of a paid housekeeper who assumes much responsibility for management is evidence, however, of the impersonal character of much of the management."

In the context of management and control of corporations, what she regarded as productive may be considered to correspond to activities of head offices (ISIC, Division 70). But there must be a decision concerning the general corporate policy. According to what she considered, this very basic decision cannot be delegated. In the case of incorporated enterprises, the general shareholders' meeting plays the role of making the decision. Holding companies may take the roles of the controlling shareholders. They are neither able to be delegated nor role-exchangeable (not role-exchangeable because shareholders are doing nothing other than deciding in effect).

Main conclusions and closing remarks

In this paper, the author reconsidered the production boundary of the SNA and concluded:

- (1) The SNA contains an implicit criterion tentatively called “World 1 criterion” which means that an activity is productive only when it is a physical process;
- (2) In order to formulate the general production boundary for the system, it is argued that delegability criterion (Hill [1977, 1979], Hawrylyshyn [1977], and Reid [1934]) should be replaced with a new criterion (role-exchangeability criterion) and activities in preparatory nature should be taken into account more appropriately;
- (3) Education as a productive activity should be described using World 1 terms only so as to avoid possible confusion between outputs and outcomes;
- (4) There are two levels of management and control of corporations with one being outside the production and the other within the boundary;
- (5) Computer software that can be incorporated into computers should be treated as physical (tangible) objects.

Finally, two remarks may be added. First, it may be a key step to define intangible assets. The strong impression is that the tangible-intangible distinction is rather made light of in the SNA 1993 (or 2008), leading to bringing in serious confusion into the system. It is claimed here that intangible assets should be defined as assets that only exist in World 3 (except for *signifiers*). Typical intangible assets may be financial assets. They are non-produced as well but the concept of non-produced intangible assets in the SNA 1993 is defined excluding financial assets.

The second remark is about preparatory expenditures (activities) mentioned above in the text. In the author’s view, some more thought will be needed in order to formulate a more appropriate national accounting treatment (or convention) for these expenditures. Clearly, many problems remain open. For example, these preparatory expenditures may be incurred by different types of institutional units (corporations, government units, or non-profit research institute). It may be questioned whether those similar expenditures should be treated in the same way or not.

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