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**THE MYTH OF THE SERVICE ECONOMY**

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### **Abstract**

In this article the author, after a critical assessment of the main notions of services developed in economics, presents a revised definition of services based on process analysis. A corresponding distinction is made between material and non-material goods, on the one hand, and services, on the other hand. The proposed definition is applied to extend Sraffa's theory of prices and to clarify that the expansion of the service activities, as such, is not related to knowledge creation and information diffusion. It is suggested that the dynamics of such non-material factors, instead of being reflected by the change in the relative weights of goods and services, should be assessed on the basis of the change in the tasks and qualities of the labour force.

**JELClassification:** B12, D46, D57, E11, G1, L8, L22, L94, O14

**Keywords:** Services; Process analysis; Classical Economics.

# The Myth of the Service Economy<sup>\*</sup>

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## 1. Introduction

In economics, like in other theoretical disciplines, a discussion on concepts and definitions usually derives from the interest in some specific phenomenon under investigation. The discussion on the concept of service has been occasionally resumed by the interest for the ongoing structural change of capitalist economies. The partially overlapping notions of “service economy”, “tertiary”, “post-industrial”, “new” economy have been used to characterize the latest stage of capitalist development. A widespread view states that 1) the service sector is displacing the sector of material goods, 2) its expansion is associated with that of non-material (often called promiscuously intangible, unobservable, informative) goods and 3) its role has changed, from being driven by the manufacturing sector, to the status of driving sector. Assuming that the relative importance of services is measured by the service sector’s share of total employment, three main hypotheses have been explored to explain this structural shift of employment: 1) the final demand for services grows more rapidly; 2) the growth of labour productivity in the service sector is relatively slow; 3) the growth of the intermediate demand for services is relatively fast. This range of alternative explanations is still a field of research and it does not seem to

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get narrower. A debate about problems with such a wide scope, if it has to be useful, needs a preliminary consensus on the concept of service.

In this article we reconsider the main notions of services developed in economics. We propose a revised definition of services based on modern process analysis and representing continuity with the concept of service in Adam Smith. Our definition aims to clarify and strengthen the criticism put forward by those economists who deny the existence of a definite correlation between the expansion of the service activities, as such, and an increasing dematerialization of the economy associated with more knowledge creation and information diffusion. In a more positive way, we suggest that the “new” role of knowledge and information should be decoupled from the dichotomy “goods and services” and assessed instead by means of a detailed investigation of the change in the tasks and qualities of the labour force. Specific services and goods can be classified as more or less “informative”, according to some statistical convention, but concrete labour remains the exclusive carrier of knowledge and information.

## 2. Services in economic theory

From the Physiocrats through Adam Smith up to the transition to marginalism, represented by John Stuart Mill, the concept of services has been a derivative of the notion of unproductive labour. According to Smith, the basic distinction is not between goods and services, but between productive and unproductive labor, inasmuch as the latter consents to isolate the activities, which lead to the increase of the wealth of nations from the others, which, from this point of view, are just wasting. After the classical debate, economic thought has turned into different routes as regards the distinction between “goods” and “services”. Let us cover them briefly.

## 2.1 Marginalists

The first route, followed by Walras and Irving Fisher, is still prevailing. It leads to such an extension of the domain of the concept of service, that it becomes doubtful whether the latter remains a useful analytical category. According to this notion, each good has its own price and a distinct price for its service performed during a certain period of time; only a worker receives just a price for his service. The wage of a worker, the user cost or rental of a machine, the rate of interest on a loan and the rent on a piece of land are all conceived as a price paid for some service (of the worker, of the capital good, of financial capital and of land, respectively), in the same way as the payment received by a menial servant.

Despite the simplicity of this distinction, the content of the examples, which are presented to illustrate the neoclassical theory of prices, usually concern material goods. We find the typical examples in two dimensions: butter and cannons or food and clothing. Apparently the analyses of those economic activities, which are called “services” in the standard statistical classifications, (commerce, transportation, tourism, banking, insurances, telecommunications, public services, personal services and similar), are left over to a different level of abstraction. Services are occasionally mentioned in the textbooks to warn us they are subjected to some particular difficulty of measure. For instance, “How can the output of a bank be measured?” is a typical question. In our view the problem of measure is not the main reason for the precarious theoretical status of services in economic theory after Smith. The difficulty is conceptual.

## 2.2 Sraffians

Sraffa and those Sraffian economists, who have resumed and developed the theory of the Classics, have turned to a different route. In their approach the concepts of “productive” and “unproductive” are not associated with pure labour anymore, but with the system of production as a whole, in which labour – “assisted” with other means of production – remains the active factor of production. With reference to a matrix of technical coefficients, it has been proved that the same conditions guarantee a “dual” concept of productivity: in terms of a physical surplus and in terms of a surplus-value.

Yet, the Sraffian approach does not seem to apply the distinction between goods and services, after having absorbed both categories within the general notions of heterogeneous commodities and labour, respectively. The examples of production processes, by means of which Sraffa and the Sraffians present their theory of prices, involve material goods, like corn and steel, and labour. Services are never mentioned explicitly. In section 5 the explicit existence of heterogeneous services will be dealt with along classical lines, beyond the “reduction” of heterogeneous labour to homogenous labour.

## 3. A pragmatic view of services

The debate on productive labour and the distinction between goods and services, while gradually fading away in economic theory, keeps lively in fields contiguous to the latter and at a more pragmatic level. Contributions in the fields of national accounting and statistics, labour economics, economic geography, urban science, sociology and economics

of development, occasionally reconsider the meaning of such a distinction. Their main effort aims to criticize or rationalize certain statistical classifications which group together within the same sector (the service sector) the host of activities mentioned above: commerce, transportation, tourism, banking, insurances, telecommunications, public services, personal services and similar. Yet, such a kind of contributions, when come to propose some new definition of services, end up to supply either a too long or a too short cover for those service activities. Let us examine a seminal definition.

### **3.1 Services according to Hill**

Hill proposes the following definition which has been taken as a reference point by many service economists

*A service may be defined as a change in the condition of a person, or of a good belonging to some economic unit, which is brought about as the result of the activity of some other economic unit, with the prior agreement of the former person or economic unit. ( Hill, 1977, p.318)*

This definition, which seems to cover most of the activities currently called services, encounters some difficulties.

#### **3.1.1 The timing of a service activity**

Two aspects of the above definition concern the timing of the service.

Firstly, let us consider, for instance, two alternative prior stipulations. 1) Exchange agreement: I buy a house, which already exists and belongs to an individual, for delivery in a year. 2) Contract agreement: I pay a firm which will build for me a house for delivery in a year. According to Hill's definition of goods and services, in the first case I buy a good; instead in the other case I buy a service. However, in both cases a change in



the condition of my person (the state of my property) is brought about as the result of the activity of another agent with prior agreement of both. We are not able to distinguish the good from the service in our example, if we do not specify the activity performed by the provider of the commodity. The difference between the two commodities must rest on the fact that the second activity requires labour. When I buy the house, the relevant activity of the provider is simply “delivering the good at the agreed time”. Instead, in the case of the contract, the activity of the provider implies also a labour process.

Secondly, Hill has emphasized that a service is distinct *at a logical level* from a good.<sup>1</sup> We agree with this view. For example, a good available within a year is economically different from a good available now, but a dated good has no time dimension; only its production is a flow-variable. Instead, when I buy an activity that fixes itself in the house, I buy something which possesses a time dimension. If a single worker-entrepreneur should build the house, this conclusion would be true independently from the contractual form of the payment. The salary could be fixed on a time or a piecework basis. In both cases the quantity of service is measured by a flow-variable.

### 3.1.2 Preventing services

The outcome, which is agreed upon, may be *a not-change*, instead of a change in the condition of a person or of a good belonging to some

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<sup>1</sup> Hill: “Services cannot be put into stock because a stock of changes is a contradiction in terms. Thus, the fact that services cannot be held in stock is not a physical impossibility, but a logical impossibility”. ( Hill, 1977, p.179)

economic unit as required by Hill's definition. For instance, the maintenance of a machine provided by a firm to another firm "maintains" the machine in a satisfactory state of efficiency and exempts the firm from the inconvenience of repairing a broken machine (of course, repairs change a broken machine in a working machine). Similarly, a person may ask for a service, which maintains certain features of his personal state or of his material belonging unchanged, e.g. preserving his normal health conditions or keeping his goods in normal working conditions; compared to the undesirable change in these elements, which would occur in the absence of the service.

### 3.1.3 Public and collective services

In some cases a person may be "served" by the provider if the latter does not affect his own condition, *but that of other persons*. If this possibility should be omitted, a *public or collective service* would not mean, as it is normally intended, that the public agency is acting as a provider and the citizens as receivers of the service, but the providers would become the public servants and the public agency the receiver. A policeman provides a service to the state, although his activity can be useful to the people and is validated by the existing law, possibly through some representative mechanism of social choice. We should cope with this interchange of roles by saying that the state provides a "service" to the protected citizens without a contractual arrangement, which instead characterizes the private service provided by a body guard.

Later contributions have modified 1977 Hill's definition with the intention of offering a more satisfactory rationale of the statistical definitions of the service activities. In this respect, many interesting

contributions can be found in the volumes edited by Griliches (1992) and by Bryson and Daniels (1998) and in the recent work of Hill (1997) and Gadrey (2000). Further difficulties encountered in such contributions induce us to conceive the notion of service not as a relation between individuals, but a relation among processes (production processes and consumption processes).

#### 4. The Position of Services in the Economic Process

##### 4.1 The concept of service

Let us take the words “things” and “activities” as primitive concepts. A process involves material and immaterial *things* (machines, raw materials, workers, industrial designs etc.) and *activities* (assembling, repairing, communicating, eating, singing etc.) which are related to things. An *economic* process is described by quantities of *commodities* which include marketable things called *goods* and by quantities of marketable activities which can be characterized as *services*. We maintain that labour services are indispensable for any production process.

Assume a uniform production period (say, a month) and suppose that we can identify in each period *distinct* (or independent) *possible* production processes and consumption processes. A process is distinct and possible because it can be activated independently from the activation of other processes, if the necessary inputs are available. Two kinds of relations can exist among processes. The first kind is the usual *serial* input-output relation in terms of *goods*: the output of a process *at the end* of its production period can be the input of another process in the next period. The other (rather neglected) is an input-output relation *in parallel*: the *activity* brought about

by a process can be *an input* of another process *during the same period*. This activity is an output of the provider process and an input of the user process and *it is called service*. Therefore a process which produces a service can “serve” another process by *acting* on the things and the activities involved by the latter and during the same period, but by definition it cannot restore an “inventory” of services.

It should be noticed that this concept of service is wider than that of labour service and at the same time it is narrower than the neoclassical catch-all concept of service. It is wider because a service generally is an activity which requires not only labour, but also other means of production. It is narrower because it requires labour and cannot be associated only with goods. Can we say that a service is in turn a process? If it is a process, is it identified by the provider process itself? I will answer such questions by resorting to an example of a typical service: repairing. “Repairing” is a synthetic expression which denotes a specific activity performed over time and in this sense it *denotes* a process. Such a process is described by a marketable *function*, not by the description of the provider process, which instead is described by a list of inputs (screws, labour, machines), outputs of other commodities (in particular used machines) *and* by a *quantity of repairing*. In the end we need an independent measure of the “quantity” of repairing, instead of using, as a multidimensional measure of the service, the list of the other quantities of commodities which describe the provider process. This can be a difficult task, compared to the measure of a quantity of a produced good, like corn, but in principle the kind of difficulty is similar to that encountered in reducing heterogenous labour *activities* to an homogeneous quantity of labour.

#### 4.2 A graphical representation

Figure 1 illustrates the distinction between goods and services. It describes an economy in which three processes 1, 2, 3 are reckoned during a uniform production-consumption period, say a month, delimited by dates  $t = 1, 2$ .

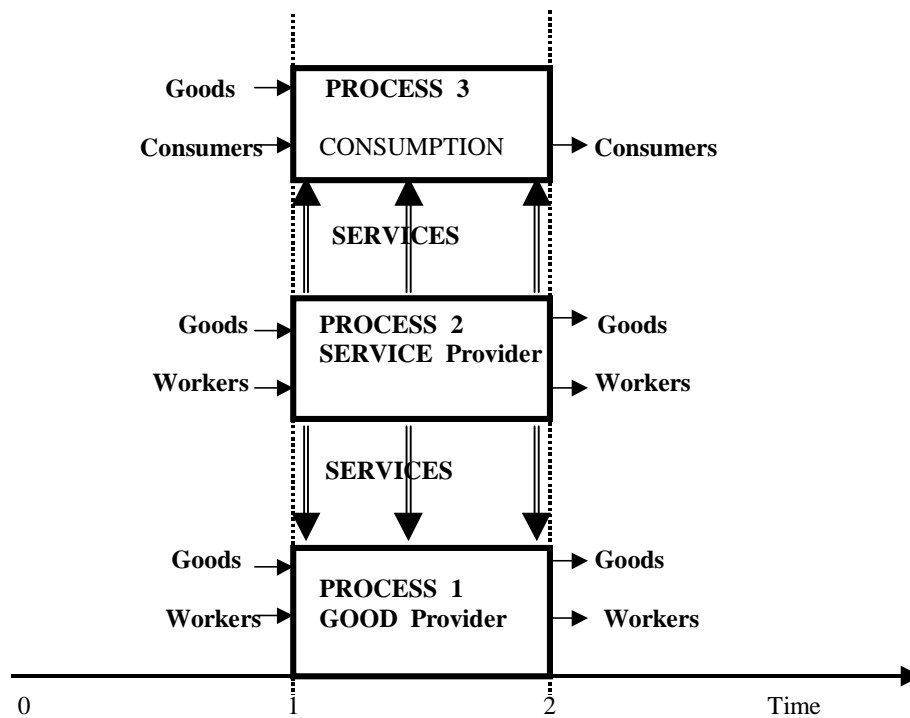


Figure 1

We assume that process 1 produces only goods, process 2 provides services and goods, and process 3 is an activity of final consumption. Labour services are internal to each production process 1, 2 and are not represented. Many economic models, more or less explicitly, adopt such a “black box” representation, but they confine the description to the quantities (inputs and outputs) of goods at times  $t = 1, 2$  and to the amount of labour performed *during* the period  $[1, 2]$ . If we are not concerned with

externalities, it is legitimate to neglect all non marketable elements (workers and consumers in particular). Instead it may not be an innocuous simplification to neglect the existence of “services” as distinct from pure labour services. In Figure 1 we fill this gap by the oriented flows of services leaving from process 2 and entering processes 1, 3. The horizontal and the vertical arrows point out the logical distinction between goods and services. A quantity of good, despite the fact that it is a dated quantity ( $t = 1, 2$ ), has no time dimension. Instead a service *is a quantity of a certain activity during* a period of time. Notice that the device of the black box exempts us from specifying the distribution of the service activity during the month (Georgescu-Roegen adopts a different approach in which such a distribution should be specified). The price paid for the service may depend on such a distribution, according to special conventions and contractual arrangements. We shall come back to this important issue in section 4.6, but a few words are needed already at this stage of analysis. Suppose that process 2 supplies electricity. Kilowatt (Kw) is usually the physical measure of the quantity of electricity. This quantity can be measured by the total amount of Kw consumed during the month and its price can be a certain amount of money per Kw. However, quite often the price paid for this utility is set on the basis of a more complicated stipulation. Some characteristics of the *distribution* of the consumption of energy during the period may be taken into account: e.g. the peak value of the consumption or the distribution between day and night consumption. As a consequence, if we adopt the black box model, we should treat certain classes of profiles of the same amount of Kw consumption as amounts of different services with their own prices.

We emphasize the fact that *services are not immaterial goods*, simply because immaterial goods are goods. For example, a firm, through its internal R&D activities, can achieve an industrial design protected by a patent. In this case the firm produces an immaterial good. Alternatively, it can supply a certain R&D activity to another firm during a period of time, without selling any vendible intellectual outcome: in this case it acts as a *service* provider. In conclusion, commodities include goods and services, goods can be material or immaterial, but services are not immaterial goods. Services are a distinct economic category. It remains the distinction between labour (service) and services (tout court). Services are produced commodities; instead labour (services) are usually assumed to be performed by an original (non produced) factor, although the latter can be upgraded in the sense of human capital.

#### 4.3 Goods and services in process analysis

From the viewpoint of discrete period analysis, a process is usually described by a vector of inputs and outputs of commodities. It is assumed that each production process uses labour as indispensable input and produces at least one commodity. Instead a consumption process is characterized by a vector of inputs, whereas its outcome has a use value but it is not a vendible commodity.

With reference to Figure 1, let  $\mathbf{y}_1$ ,  $\mathbf{y}_2$  denote the two production processes and  $\mathbf{y}_3$  the consumption process and suppose that only three commodities exist: a good, a produced service and labour. We adopt the convention that negative and positive quantities denote inputs and outputs, respectively. Process  $j$  ( $j = 1,2,3$ ) over period  $[1, 2]$  is described by the vector  $\mathbf{y}_j = (B_j \quad A_j \quad S_j \quad L_j)$  where we assume:

$A_j \leq 0$ : input of good,  
 $B_j \geq 0$ : output of good ,  
 $S_j \leq 0$  , ( $j = 1, 3$ ): input of service,  
 $S_2 \geq 0$  : output of service,  
 $L_j < 0$  : labour input.

Process  $y_2$  allow for joint production. Since  $y_3$  is assumed to be a pure consumption process, we revise the above inequalities by imposing  $B_3 = 0$  and  $L_3 \leq 0$ .

#### 4.3.1 *The logical position of services in the price equations*

Let  $\mathbf{p} = [p(t+1), p(t), p_s(t), w(t)]'$  be a column-vector of dated prices in terms of a given numeraire:  $p(t)$  the price of the good;  $p_s(t)$  the price of the service;  $w(t)$  the wage rate. The inner product  $\mathbf{y}_j \mathbf{p}$  is the profit on process  $j$ . Under perfect competition the following system of price equations must hold:  $\mathbf{y}_j \mathbf{p} = 0$ ,  $j = 1, 2, 3$ . It is assumed here that labour and services are paid *ex post*, i.e. at the end of the period. Alternatively, we could write  $\mathbf{p} = [p(t+1), p(t), p_s(t+1), w(t+1)]'$ , still keeping  $\mathbf{y}_j \mathbf{p} = 0$ , if the payment of such services is assumed to be made *ex-ante*. *This change in the payment hypothesis does not imply a change in the different timing of a service versus a good.* In both cases the simultaneous production and use of a service is revealed by the fact that the same period (either  $t$  or  $t+1$ ) is associated with the price of inputs and outputs of a service, whereas two subsequent dates ( $t$  and  $t+1$ ) are associated with inputs and outputs of the good.



#### 4.3.2 *The logical position of services in the quantity equations*

Let us define the total quantities with the respective signs:

$$B_1 + B_2 + B_3 \equiv B \geq 0$$

$$A_1 + A_2 + A_3 \equiv A \leq 0$$

$$S_1 + S_2 + S_3 \equiv S = 0$$

$$L_1 + L_2 + L_3 \equiv L < 0.$$

The strict equality  $S = 0$  points out that the product of a pure service activity cannot be accumulated. In fact it can be used either for intermediate or for final consumption during the production period (the product might be also wasted under the assumption of free disposal). As a consequence, the economy can grow through accumulation only if  $B + A > 0$ . In this sense labour must *ultimately fix itself in a material or immaterial* good as a precondition for accumulation.

It should be noticed that the same type of service (e.g. transportation) can be both an intermediate service or a consumption service, as the same type of good can be used for production or for consumption. Furthermore a service can be a not pure private commodity in so far as it can be used as a non rival input by many processes at the same time (see Parrinello 1999).

#### 4.4 **Joint outcomes**

A production process may furnish joint outputs of goods and services and some joint externality might be brought about as well. Furthermore an important kind of commodities can be classified neither a good nor a service. It is the case in which the commodity is sold as a package of goods and services and the mix as a whole has its own economic

identity, distinct from the individual components. We find several important examples.

A retailer purchases goods at wholesale and sells goods and services to his customers as a package with its own price. The information conveyed by the assortment of goods on the shelves and the nice behavior of the sales-clerk are included in this package, jointly with the goods on sale. Similarly the banking and tourism sectors are activities where packages are transacted as single vendible entities. A bank supplies financial “products” and also services of payment and safety to cash holders. The hotelkeeper supplies packages of goods for rental (the rooms) and services (information, fitness facilities etc.) A company which rents cars supplies a bundle of commodities including the use of a good (the car) for a certain period and a variety of services (assistance, information, insurance, etc.). The theory has often dismissed the existence of markets for packages as distinct from their components (services and goods). We shall deal later with the problem of pricing the packages.

#### **4.5 The measure of services and the border of the process**

We can talk about the price of a service only if 1) the unit of service is specified; 2) the boundaries of the provider process and of the user process are defined. 1) and 2) cannot be satisfied by a pure physical criterion, because both the unit of a service, which is fixed in a contractual stipulation, and the boundary of the process depend on the existing social norms. Furthermore requirement 2) raises special difficulties in the case in which an interaction exists between the provider and the user. Some examples may help us to clarify this issue.

In section 5 we shall assume an economy in which land infested with parasites has to be periodically disinfested and a service process (provider process) supplies a cultivation process (user process) with a disinfesting service. The quantity of such a service is measured by acres of land disinfested per year. An acre of land without parasites is a unit of a good, but disinfesting one acre of land during a year is a unit of service, according to our measure. In other circumstances we may describe the quantity of a service not by means of some commodity subjected to the service process, like the amount of disinfested land, but by some non-vendible commodity, which play the role of a proxy. In the education sector the quantity of normal service and the price paid for it (e.g. the enrollment fees charged to the students) may ignore the degree of learning of the students. Alternatively, the existing social norms might take into account the outcome of the teaching process, although learning depends also on the student's attitudes and behavior. Students are not vendible commodities, but a conventional measure of learning (e.g. the difference between the number of students which obtain a diploma, weighted with the final marks, and the number of enrolled students, weighted by an admission test) can be chosen as a measure of the service supplied by the school. In this case less educated students and more educated ones should be reckoned as input and output, respectively, of the education process. Similarly, a doctor who visits a patient according to our social norms receives an honorarium, which to a large extent is independent of the good or bad outcome of his prescription. Instead, in different institutional contexts, the "norm" which regulates a

medical service might take into account also the resulting change in the health conditions of the patient, who is also responsible for them.<sup>2</sup>

## 5. Sraffa's price equations with services

A capitalist economy must be able to produce a net output of at least one (material or non-material) good, if capital accumulation has to be a source of growth. However, only the technology of the economy as whole, described by a matrix of technical coefficients, can be defined productive or unproductive. It is at this systemic level that the characterization of "productive labour", which is found in Adam Smith, enters the analysis and can be rigorously stated as a *dual property*. In fact, it can be proved that the same properties of the technology matrix guarantee the existence of a positive physical surplus and of a positive surplus-value.

### 5.1 A simple model

At the outset assume a corn economy in which a cultivation process produces in a year a unit of corn by means of  $a$  units of corn,  $a < 1$ , and  $l$  hours of labour. Land is free by assumption. Let  $p_g$  be the price of corn,  $w$  the nominal wage rate, and  $r$  the rate of profit. The price equation of corn is

$$(1+r)a p_g + wl = p_g \quad [1]$$

In this equation  $p_g$  is the price of a good and  $w$  the price of a service which is not produced (a labour service). Assume that the process of corn cultivation initially includes the activity of disinfecting land from parasites.

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<sup>2</sup> Notice that we have mentioned private contractual stipulations and social norms as exogenous factors, without assuming that they are optimal in the sense that they minimize private or social costs.

Subsequently an independent disinfecting process becomes available and is adopted as the result of a cost minimizing choice of techniques. According to our definitions, this new process supplies the cultivation process with an intermediate service. In the long period and with free competition, the following price equations with a uniform  $r$  correspond to the user process and to the provider process:

$$(1+r) p_g a_g + p_s s + w l_g = p_g \quad [2]$$

$$(1+r) p_g a_s + w l_s = p_s \quad [3]$$

where  $a_g$  and  $a_s$  denote the inputs of corn,  $l_g$  and  $l_s$  the labour inputs,  $s$  the quantity of the service used to produce one unit of corn, and  $p_s$  the price of the service. Let the unit of service be measured by one acre of land disinfecting during a year. If the monetary unit is one Euro,  $p_s$  is measured in Euro per acre and per year. In the equations [2], [3],  $a_g, a_s$ , are quantities of a good which must be available at the beginning of the production period and can be reintegrated at the end of the period by the current production. Instead the outcome of the disinfecting process and its use by the cultivation process are simultaneous. Such a simultaneity is not revealed by the fact that the cost  $p_s s$  in equation [2] is not capitalized as  $(1+r)p_s s$ , but by the same price  $p_s$  appearing on the side of the costs in equation [2], in which the service is an input, and on the side of the revenues in equation [3], in which it is an output. We could have assumed that the payment for the service is anticipated and then  $(1+r) p_s$  would have appeared in both equations instead of  $p_s$ . Similarly we may assume that wages are paid either ex post (like in our case) or ex ante; yet labour services are not present at the beginning of the period, as if they were inputs of goods, and neither ex post as if they were outputs of goods. Only in this sense, using the words of Adam Smith, services “perish in the very instant of their performance”.

We can interpret equations [2], [3] as a structural form, from which a reduced form can be derived. Substituting  $p_s$  in equation [2] with equation [3] and setting

$a' = a_g + sa_s < 1$ ;  $l' = l_g + sl_s$ , we obtain:

$$(1+r)p_g a' + wl' = p_g \quad [1]'$$

Equations [1] e [1]' have the same form. Therefore the initial form [1] or the reduced form [1]' do not reveal if other services, besides labour, intervene in the economy. Only the structural form [2], [3], compared with equation [1], allows us to establish whether a distinct service process exists on the side of the production process of the good. We observe that the same kind of service could also be a consumption service (e.g. the service for disinfecting a house) used in a consumption process.

## 5.2 Generalization

Let us extend the previous simple model assuming an economy in which  $m$  (material or non-material) goods and  $n$  services are produced by means of  $m$  and  $n$  processes, respectively. For simplicity we still assume single product processes. The compact form of the price equations is:

$$(1+r)\mathbf{A}_g \mathbf{p}_g + \mathbf{S}_g \mathbf{p}_s + w\mathbf{l}_g = \mathbf{p}_g \quad [4]$$

$$(1+r)\mathbf{A}_s \mathbf{p}_g + \mathbf{S}_s \mathbf{p}_s + w\mathbf{l}_s = \mathbf{p}_s \quad [5]$$

In equations [4], [5] the subscript  $g$  refers to goods;  $s$  refers to services;  $\mathbf{A}_g$ ,  $\mathbf{A}_s$  are input matrices of goods;  $\mathbf{S}_g$ ,  $\mathbf{S}_s$  are input matrices of services;  $\mathbf{l}_g$ ,  $\mathbf{l}_s$  are column vectors of labour inputs;  $\mathbf{p}_g$ ,  $\mathbf{p}_s$  column vectors of nominal prices;  $\mathbf{A}_g$ ,  $\mathbf{S}_s$  are square matrices. Assume that the technical coefficients satisfy certain well-known viability conditions. Then, for each  $r$  fixed within its admissible interval and given the numeraire, equations [4], [5] can be solved with respect to positive relative price vectors and the real wage rate.

In particular, assuming that matrix  $[\mathbf{I} - \mathbf{S}_s]$  satisfies the Hawkins-Simon conditions, we can obtain the following reduced form by substituting  $\mathbf{p}_s$  in equation [4] with the solution to equation [5]  $\mathbf{p}_s = (\mathbf{I} - \mathbf{S}_s)^{-1}[(1+r)\mathbf{A}_s\mathbf{p}_g + w\mathbf{l}_s]$ :

$$(1+r)\mathbf{A}\mathbf{p}_g + w\mathbf{L} = \mathbf{p}_g \quad [6]$$

where  $\mathbf{A} \equiv [\mathbf{A}_g + \mathbf{S}_g(\mathbf{I} - \mathbf{S}_s)^{-1}\mathbf{A}_s]$ ;  $\mathbf{L} \equiv [\mathbf{S}_g(\mathbf{I} - \mathbf{S}_s)^{-1}\mathbf{l}_s + \mathbf{l}_g]$ .

The coefficients of equation [6], like those of equation [1'], represent only goods and labour. The reduced form coincides with Sraffa's price equations and conceals, so to speak, the services represented in the structural form [4], [5].

### 5.3 Further generalization

Let us assume the existence of packages, which are made by goods and services and are sold as lumps on the market. The individual components of the package may or may not have a market price. However, even if they have all a distinct price, the market value of the package may not be equal to the sum of the market value of the individual components. The existence of such a hybrid commodity (a collection of goods and services) raises a problem for the choice of the processes based on their relative profitability.

Assume that a package contains one unit of a good and one unit of a service and let  $\Pi$  denote the (undiscounted) price which the provider receives by selling one package. How should the same package be valued as a cost if we want to assess the profitability of the user process? Should we

value it at the price  $\Pi$ , as if it were a service? Or at the price  $(1 + r) \Pi$  as if it were a capital good? Or at the price  $(1+r)p_g + p_s$  where  $p_g$ ,  $p_s$  are the prices of the good and of the service sold individually? No one of the above evaluations would be correct. In this case, if we aim to determine a cost minimizing choice of techniques, we should attribute distinct accounting prices to the good and to the service, as if they were characteristics of the commodity (the package) in the sense of Lancaster. Let  $\pi_g$ ,  $\pi_s$  be the two accounting prices. Next, the cost of the package for the user process should be reckoned by  $(1+r) \pi_g + \pi_s$  and the corresponding revenue of the provider process would be  $\Pi = \pi_g + \pi_s$ . In the absence of joint production, only one process will be used to produce the package, whereas two processes using the package may be activated so as to adapt the good-service ratio in input to the package available on the market.

## 6. Commodity circulation

Transportation, commerce, banking and pure intermediation are usually classified as service activities. These activities seem to belong to the circulation of commodities, conceived in a broad sense and distinct from the production activities. Steedman (1977) and Parrinello (1992) have dealt with this distinction with regard to the Marxian and Sraffian theories of prices. However, as soon as we try to characterize a circulation activity, we realize that two kinds of circulation processes can exist in a time-phased economy. One is similar to that carried out by a transportation process; the other reflects pure intermediation in the transfer of property rights. Only the former has been modelled by the contributions mentioned above.



### 6.1\_First kind of circulation

Assume that the output of a production process enters a circulation process first as an input (combined with other inputs) and then as an output that can be used in another production process or for final consumption. Only a good can undergo such a sequence of transformations in virtue of its permanence; like a ton of steel that is first produced in a certain location and then moved to a different consumption location through a transportation process. Let us follow Steedman (1977) who assumes that there is a distinct circulation

process for each commodity. Each commodity  $j$  has two prices: a price  $p_j$  before circulation and a price  $P_j$  after circulation. Instead of [4], [5] we find<sup>3</sup> the following relations:

$$(1+r)\mathbf{A}_g \mathbf{P}_g + w\mathbf{l}_g = \mathbf{p}_g \quad [7]$$

$$(1+r)(\mathbf{p}_g + \mathbf{A}_c \mathbf{P}_g) + w\mathbf{l}_c = \mathbf{P}_g \quad [8]$$

where  $\mathbf{l}_c$  is the vector of labour inputs and  $\mathbf{A}_c$  is the matrix of commodity inputs used up in the circulation processes;  $\mathbf{P}_g$  is the vector of post circulation prices and  $\mathbf{p}_g$  the vector of before circulation prices. Each relation [7] and [8] is made of  $m$  equations. From [7] and [8] Steedman derives the equation of post circulation prices:

$$\mathbf{P}_g = w \left[ \mathbf{I} - (1+r)\mathbf{A}_c - (1+r)^2 \mathbf{A}_g \right]^{-1} \left[ (1+r)\mathbf{l}_g + \mathbf{l}_c \right] \quad [9]$$

This approach deals with circulation by duplicating the dimensions of the commodity space. In this case production and circulation of each commodity are carried out by a sequence of two serial processes and the circulation process produces a good instead of a service.

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<sup>3</sup> (Steedman 1977, p. 113)

## 6.2 Second kind of circulation

By contrast, the second kind of circulation implies a service activity. Production and circulation are carried out by parallel processes. For example, a middleman can act to achieve a transaction between a producer, who sells his product, and the consumer of the product itself, during the production period instead of waiting until the product is finished. The exchanged commodity can be a good (produced or not) or a service. In both cases the intermediation process supplies a service to the producer process and a service to the user process. The corresponding structural form of the price equations is [4], [5] and the reduced form [6]. We need a reinterpretation of these equations. Assume for simplicity that all  $n$  services are circulation services which are used up by all production and circulation processes. A uniform price for the same commodity rules in the economy, instead of the two (ex ante and ex post circulation) prices of the previous case. However, the uniform price received by the seller and paid by the purchaser is gross of the costs of the respective circulation services and is consistent with two different prices net of such costs.

In this case a one-to-one correspondence between production processes and circulation processes does not hold any more. The same circulation process can “move” different goods and can serve many production processes. Therefore the output of the circulation process cannot be measured in units of a specific good, which is the unique object of transaction. Yet, the circulation process is not characterized by joint production, because it does not imply technical jointness. In this case, the output of the circulation process must be measured by many attributes. We immediately perceive this complication if we are engaged in measuring the output of a bank or of a commercial activity. Still remaining at the level of

aggregation of a process analysis, we cannot say that the output of a circulation process is the same if the total amount of the traded commodity is the same but the number of the trading processes involved is different.

In our daily experience circulation activities are characterized by packages of both kinds of outputs illustrated above: exchanged goods and services with services for the exchange of goods and services. The distinction between the two pure kinds of circulation is analytically useful within a time-phased analysis, because different forms of price equations apply in the two pure cases.

## 7. Services and knowledge

On the basis of the concept of services illustrated in the previous sections, we intend to argue that the distinction of commodities in goods and services does not help us to understand the current trend to a “new” economy, which is supposed to be a “de-materialized” capitalist economy associated with a more pervasive role of knowledge and information.<sup>4</sup>

### 7.1 Decomposable processes and the service economy

Let us come back to the simple model of section 5.1. The system of production underlying equation [1] is an integrated process without decentralized disinfesting services. It can be represented with the production scheme

$$a \oplus l \Rightarrow 1 \text{ unit of good.} \quad [a]$$

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<sup>4</sup> Other authors have already presented this negative view, although from different perspectives. See Stanback, Bearse, Noyelle, Karasek (1981); Walker (1985).

Instead the system behind [1]' is described by two independent processes working in parallel:

$$\begin{aligned} a_g \oplus s \oplus l_g &\Rightarrow 1 \text{ unit of good} \\ a_s \oplus l_s &\Rightarrow 1 \text{ unit of service.} \end{aligned} \quad \text{[b]}$$

Assume  $a = a_g + sa_s$  and  $l = l_g + sl_s$ . As a consequence, not only the analytical form, but also the coefficients of equations [1], [1]' coincide and the two production systems are equally profitable at the same rate of profit. *Concrete* labour can be different in cases [a] and [b], although both systems require the same total labour coefficients and receive the same wage. However, we do not see a reason why labour has to be more “informed” in the service process of system [b]. Moreover, even if this should be the case, no plausible reason exists for assuming that the “collar” of the labourer is “more white” if decentralization pertains to a service than in the case (not represented in our example) in which, *ceteris paribus*, the production of an *intermediate good* would have been decentralized in respect to an initial integrated process which produces another *good*.

Let us now assume that system [b] has replaced system [a] because the former is cheaper at the given rate of profit. In this case  $a > a_g + sa_s$  and/or  $l > l_g + sl_s$  must hold. We can say that system [b] represents the result of a technical-organizational progress, relatively to system [a]. Still we cannot infer that such a progress is mainly fostered by the decentralization of an intermediate service instead of an intermediate good. Empirical evidence might discover that such a bias in technical progress exists, but its theoretical explanation cannot be found in the different natures of services and goods.

## 7.2 An ideal stage of the society

Let us move to the more general model presented in section 5.3. Assume that at the beginning the system of production in use is represented by the coefficients of equations [4], [5] and that technical progress is concentrated only in the goods sector and to such extent to bring about the tendency  $\mathbf{A}_g \rightarrow \{\mathbf{0}\}$ ,  $\mathbf{S}_g \rightarrow \{\mathbf{0}\}$ , where  $\{\mathbf{0}\}$  is a zero matrix, and  $\mathbf{l}_g \rightarrow \mathbf{0}$ . In the final state all goods are free,  $p_g = 0$ , and we would be in the presence of a *pure service economy*, characterized by the long period price relation:

$$w\mathbf{l}_s + \mathbf{S}_s\mathbf{p}_s = \mathbf{p}_s \quad [10].$$

This ideal stage of the economy is in a certain sense “de-materialized”, because it is deprived of any economic good. Although the economy is technologically more advanced, it is not a capitalist economy any more, as capital has disappeared. Assuming no further technical progress and a given labour force, the economy must be stationary, since accumulation cannot exist. If we would ignore that by assumption it corresponds to the final advanced state of the economy, equation [10] could as well represent what Smith called an “early and rude state of society which precedes both the accumulation of stock and the appropriation of land” (Smith, 1937, Book I, p.47).

## 7.3 From a pure service economy to a pure labour economy subjected to structural change

The analytical representation of the pure service economy illustrated in section 7.2 and the corresponding price equation [10] can be easily

transformed to represent a pure labour economy. Such economy formally coincides with the core of Pasinetti's model (1993) and can be combined with the assumption of structural change adopted in the same model. Assuming again that matrix  $[\mathbf{I} - \mathbf{S}_s]$  satisfies the Hawkins-Simon conditions, we can write the solution to equation [10]:

$$\mathbf{p}_s = w\mathbf{L}_s \quad [11]$$

$$\text{where } \mathbf{L}_s = (\mathbf{I} - \mathbf{S}_s)^{-1}\mathbf{1}_s.$$

The individual equations of the compact form [11] are formally identical to the price equations of Pasinetti's model (1993) at a point of time. The coefficients  $\mathbf{L}_s = (L_{s1}, L_{s2}, \dots, L_{sn})$  are consolidated labour coefficients, embodying intermediate services, and the outcomes of the  $n$  "industries" are quantities of services instead of being quantities of goods

Let us assume that our pure service economy is subjected to structural change caused by a change in the input coefficients over time. Assume for simplicity to observe such a change over two periods of time:  $t = 1, 2$ . The price equations [11] for the two periods are:

$$\mathbf{p}_s(t) = w(t)\mathbf{L}_s(t), \quad t = 1, 2. \quad [12]$$

Of course, the rate of profit on the value of capital goods does not appear in equation [12], simply because capital goods do not exist anymore as economic entities.

#### 7.4 An opposite ideal stage of the society

We may perform a final analytical exercise and compare the state described by the price equation [10] with the state which would obtain if we assume, against the current wisdom, that technical progress is concentrated

exclusively in the service sector. In this case the tendency, opposite to the former, would be indicated by  $\mathbf{A}_s \rightarrow \{\mathbf{0}\}$ ,  $\mathbf{S}_s \rightarrow \{\mathbf{0}\}$ ,  $\mathbf{l}_s \rightarrow \mathbf{0}$ . In the final state a pure economy of goods and labour would be established with  $\mathbf{p}_s = \mathbf{0}$ . The corresponding price relation is:

$$(1+r)\mathbf{A}_g\mathbf{p}_g + w\mathbf{l}_g = \mathbf{p}_g \quad [13] .$$

This economy is in another sense “materialized” (although it admits non-material goods), capitalistic and technically more advanced, in comparison with the initial system of production. Each system of production, underlying equation [10] or equation [13], represents in a non-ambiguous way a superior technology *vis a vis* the initial system associated with equations [4], [5]. Still, we do not know how the two systems can be compared in terms of technical knowledge and information. This agnostic result derives from the fact that the technical coefficients do not reveal the kind of tasks and skills of the labour force employed in the two polar cases.

## 8. Final remarks

This paper proposes a new conceptualization of service. It also aims to oppose, on the basis of this construction, a certain acquiescence for a spurious linkage that intrudes itself into the rhetoric of the *service, tertiary, post-industrial, new economy*. The linkage is that among services, non-material goods and knowledge-information. It derives from a confusion between services and non-material goods, on the one hand, and from an arbitrary notion of knowledge as a non-material good separated from the individuals, on the other hand.

Firstly, services and non-material goods are distinct economic categories and the trend of intermediate services reflects the evolution of the

organization and division of labour. We may indeed observe a continuous decomposition of production processes in terms of service processes<sup>5</sup>, but such a trend is not necessarily correlated with an expansion of the share of non-material goods. Secondly, knowledge is not a sort of ectoplasm, which breaks off a person and attains the reality of an independent non-material good. Knowledge creation, learning in particular, and information diffusion are processes inherent in the individuals, in general, and in labour, in particular: the types of labour performed and the skills of the labour force employed. Their influence does not depend on and is not reflected by the relative weight of services in comparison with goods.

We believe that the current investigations about the nature of the current structural change of the capitalist societies would be more penetrating if they were more focused on the ongoing change in the composition of labour employment in terms of jobs, tasks and skills, instead of striving to grasp what is new in the New Economy through the analytical distinction between goods and services.

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<sup>5</sup> There are reasons to claim that goods and services are complementary, instead of rival commodities See Hirschhorn (1988)



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