The Social Division of Labor between Agriculture and Industry in the Pre-modern Society

Jun-Ichi Sekine*

[Abstract]

In the pre-modern society agricultural and industrial production are allotted to different members of the community, and the social division of labor between agriculture and industry is formed. In this paper we explore what causes the social division of labor in the pre-modern society. First, consulting a few historical instances in actual pre-modern societies, we advance a hypothesis, in which job skills of a high order in some handicrafts play a critical role in the formation of the social division of labor. Second, building a simple mathematical model, we formulate the hypothesis in rigorous terms.

Keywords: handicrafts, skilled labor, minimum requirements for existence

JEL Classification Numbers: O11, O13, O14

---

*Faculty of Economics, Kyushu Sangyo University, 2-3-1 Matsukadai, Higashi-ku, Fukuoka 813-8503, JAPAN.

1. Introduction

The societies preceding to the Industrial Revolution or industrialization are generally called pre-modern societies. Both the present-day advanced industrial countries and the present-day developing countries used to be pre-modern societies before the Industrial Revolution or industrialization.

Prior to the Industrial Revolution or industrialization, crafts weighed little in industrial structure and the sole sector central to the pre-modern society was agriculture. For this reason, the pre-modern society was often characterized as agricultural society. To take a notable instance, D. W. Jorgenson, a well-known pioneer in the dualism approach, presented a theoretical model in which the society prior to industrialization, that is to say, what we call the pre-modern society in this paper, was characterized as agricultural society[1)]. Of course, it does no harm to term the pre-modern society agricultural merely in order to put emphasis on the predominance of agricultural production in it, but it is not correct to consider that agriculture is the only productive activity in the pre-modern society and to call it agricultural society, because, in pre-modern societies, little though its weight might be in industrial structure, manufacturing, more precisely handicrafts depending on simple tools and manual labor, had surely persisted.

In addition, as we will see below, we can not fully understand the inner structure of the pre-modern society without having a good grasp of its industrial composition formed of agriculture and handicrafts. Nevertheless, there are few theoretical studies focusing on the industrial composition of the pre-modern society; Hymer and Resnick[1969] is one of few theoretical

studies paying special attention to its industrial structure in the literature of development economics. They divided productive activities in the rural sector of developing countries into agricultural production and non-agricultural production, the latter including industrial activities such as manufacturing, processing, and construction, and analyzed what effects the rise in the price of commercial crops, which the rural sector sold to urban or foreign sector, might have on the amount of agricultural and non-agricultural production. Here, handicraft, together with transportation and service activities, was mentioned as a component of a sphere of production, though complementary to, distinct from agriculture. Now, according to Hymer and Resnick[1969], at given production capacity of both spheres of production and at given relative prices between commercial crops produced in the rural community and industrial products imported from outside, the amount of both agricultural and non-agricultural products was determined so as to maximize the utility of the community as a whole[2]. They did not, however, question how the rural community would allot the task of producing agricultural and non-agricultural goods thus determined to its members, that is to say whether each member would equally undertake the task of producing non-agricultural goods as well as agricultural goods or some specialists in the community would be exclusively responsible for the production of non-agricultural goods. Since the transition from the pre-modern society to the modern society is certainly a central theme of development economics, the investigation of the inner structure of the pre-modern society may not be the main concern of development economists such as S. Hymer and S. Resnick. But, when we turn over our eyes from the

transition to the modern society to the inner structure of the pre-modern society itself, we can not ignore the fact that the task of producing agricultural and non-agricultural products was allotted to different members of the rural community, for the reason that it was the social division of labor that more or less determined economic relations among people in the pre-modern society and therefore its inner structure.

As a matter of fact, in the pre-modern society, the social production of agricultural and industrial products is shared by different people in different proportions, and, imperfect though it may be, the social division of labor is formed between agriculture and industry. We will explore what gives rise to this social division of labor in the present paper.

This paper is organized as follows. To begin with, in section 2 we will take historical instances of actual pre-modern societies to show what shape the social division of labor took between agriculture and industry in them; besides, on the basis of historical instances we will advance a theoretical hypothesis to identify the causes of the social division of labor in the pre-modern society. In section 3, the theoretical hypothesis will be precisely formulated in a mathematical model.

2. Historical instances

In this paper we intend to discover the causes contributing to the formation of the social division of labor between agriculture and industry in the pre-modern society in general. Note that here the problem is raised in general terms; that is to say, we, in the final analysis, are not interested in any individual circumstances under which the social division of labor was

formed between agriculture and industry in one of historical pre-modern societies, but would like to find out the common causes which made possible the formation of the social division of labor in various pre-modern societies. In this sense our problem is highly theoretical one. Nevertheless, no truly valuable theoretical problems can be solved solely by logic; a good understanding of concrete facts is indispensable for solving such theoretical problems. Thus, we will seek requisite information in the actual pre-modern societies in history. In this section, to begin with, depending on the attainments of the study of economic history up to the present, we will give historical instances of the social division of labor between agriculture and industry in pre-modern societies.

When one seeks to obtain helpful information on the formation of the social division of labor in the pre-modern society in general, theoretically one may consult any historical pre-modern societies. In this section, however, taking into account the preservation of historical materials and the development of studies of economic history in them, we will confine our areas of reference to the following three regions, i.e. Europe in the Middle Ages, Latin American countries before agrarian reforms, and the Indian subcontinent before the independence and partition of India and Pakistan in 1947. Needless to say, pre-modern societies are not limited to these three regions and, in addition, it should be noted that these regions are chosen among many for practical rather than theoretical reasons.

Western Europe from the fifth century to the end of the fifteenth century is called, according to the traditional historical terminology, medieval

Europe. Like any other pre-modern societies the weight of agriculture in industrial structure is so great in medieval Europe. Nevertheless, in so far as people eat bread, drink wine, wear their garments, and build their houses, they can not do without those industrial activities which produce these industrial products. Even in Western Europe in the Middle Ages, though they weigh rather little, relative to agriculture, in industrial structure, various handicrafts had developed; in villages, the processing of metals such as iron, the production of wool and linen textiles, the grinding of grains, the making of pottery and bricks, and food processing like brewing and bread-baking and so forth are fairly well-known; besides, in towns and cities, wider variety of industrial production ranging from spinning, tailoring, tanning, and metalworking at its center, to manufacturing such as the making of arms, shipbuilding and pottery, further to construction, had flourished[3)].

Then, who were in charge of production of agricultural and industrial products in medieval Europe?

Those who almost specialized in agricultural production were peasants. A peasant family of two to three generations, in many cases, held, in addition to farmland sufficient to support themselves, farming tools which they could control by their hands, like spade and hoe, as well as small domestic animals like sheep and pigs; besides, relatively wealthy peasants could afford to possess plows and draft animals to pull them, like oxen and horses. Thus, peasants were able to produce farm products which they consume themselves, including their food, from their own holdings. But, what they could produce for themselves is not only farm products; housewives in

farming families could spin wool into thread, sew garments, grind grain to flour, further, bake bread, and even brew beer; besides peasants themselves could build their houses out of cheap materials such as mud, wood, and thatch, as well as make and repair simple farming tools[4]. Thus, peasants were able to produce not only farm products but also a wide range of industrial products by themselves. Nevertheless, a portion of industrial production was still left in the hands of specialists.

In almost all villages there were craftsmen who provided industrial products for peasants in their neighborhood. Although their number is not necessarily invariable in a village, putting all available historical materials from the end of the thirteenth century to the fifteenth century together, we can conclude that craftsmen comprised from 11% to 13% of the population in the village on average[5]. In particular, a blacksmith, who specialized in metalworking, was indispensable for village life and blacksmiths were the largest group of village craftsmen. In fact, according to a census in the southwest of France at the end of the fourteenth century, the presence of blacksmiths was confirmed in a village of a small number of houses and even in a hamlet; they made or repaired the iron parts of plows and carts, shoed horses and oxen, and made or sharpened sickles and scythes. Carpenters also, as one of the main characters among village craftsmen next to blacksmiths, were engaged in the making of various wood products, plows, carts, and mill wheels and gears, as well as in house-building[6]. Of course there were a lot of craftsmen living outside the village; craftsmen working in construction such as carpenters, masons, plasterers, thatchers or tillers tended to move from one village to another rather than settle in a particular

village[7]; besides, in the early Middle Ages, weavers, seamstresses, blacksmiths, glass-blowers, and carpenters, either as slaves or as servants, were working in the headquarters of large estates[8]. Finally, it goes without saying that numerous urban craftsmen were actively engaged in their trades and supported a wide range of industrial production already mentioned above.

Although these craftsmen, to be sure, were specialists in industrial production, they never devoted themselves exclusively to their specialties, completely away from agricultural production. In fact, country craftsmen, holding some farmland along with workshop, worked hard in tillage as well as in handiwork. Moreover, tax assessments carried out in 1296 and 1301 at Colchester in the southeast England revealed that urban craftsmen also owned domestic animals such as pigs, cows, and sheep, being far from independent of agricultural production[9]. While a lot of peasants supplied themselves with several varieties of industrial products, craftsmen also depended on arable cultivation and animal husbandry; therefore, the social division of labor between agriculture and industry was not necessarily complete.

In various parts of Latin America, during the period from the late sixteenth century, by which the conquest by the Spanish and the Portuguese was almost completed, to the twentieth century, in which agrarian reforms were initiated in several countries, large landed estates called by the various indigenous names of haciendas, plantations, estanicias and so on, developed. In the period in which large landholding had its vigor, whereas

agricultural production was without any doubt at the center of economic activities in Latin American countries, industrial production remained in the secondary place; but it, as agriculture did, covered many different spheres. The main fields of industrial production contained the making of tools and pottery, the spinning and dyeing of woolen and cotton textiles, and food processing such as sugar-manufacturing and winemaking[10]. In particular, in urban areas we find a great variety of handicrafts ranging from the production of woolen, silk, and cotton textile, the making of accessories and leathers, food processing to make bread, wine, and other spirits, the working of gold, silver and iron, and the manufacturing of furniture and pottery, to construction[11].

Those who took charge of agriculture among the social production were peasants. Whether he was an Indian living in his native village, or a tenant residing within the boundaries of a hacienda, or an independent and self-support peasant, anyone held a small parcel of land sufficient to supply himself with a good portion of essential foodstuffs including cereals. The extended areas under the control of the village community were divided into four: first, the nucleus of the village composed of the houses, gardens, and personal plots of the inhabitants, second, the communal land, third, uncultivated land such as forest, grassland, and hillsides, where the inhabitants grazed their livestock and collected wild fruits and plants, and finally cultivated lands allotted to each family as private property. Among four categories each peasant family could make free use of common pasture to feed sheep, llama, and alpaca as well as privately allotted arable fields to grow maize, wheat, and barley[12]. Besides, holding his cottage and a garden

adjacent to it, arable fields which allowed crop rotation, and usufruct of woods or forest, a tenant in a hacienda grew staple farm crop such as maize, beans, and potatoes, kept a few chickens, and, if he is lucky, could afford to raise pigs[13]. Thus, a peasant holding even a tiny piece of land could supply himself with farm produce necessary to everyday life anyhow.

The peasant, however, was not engaged in solely the production of agricultural products including those left for his own consumption; he could produce some industrial products like hand-woven textiles and alcoholic drinks. In fact, it was reported that even in the early twentieth century a large number of women worked as spinners, supplementing the pastoral economy in the Bolivian countryside[14]. Nevertheless, it is not the case that the peasant could provide himself with all the means of production necessary for his productive activities and all the industrial products necessary for his everyday life.

Those who supplied to the public the industrial products which peasants could not produce, were craftsmen with somewhat specialist skills living within the boundary of villages, haciendas, or cities. In the colonial period, skilled carpenters and masons worked in many towns of the Valley of Mexico; Some of them, as the teachers and foremen of unskilled workers, were mobilized, in the repartimiento institution, for urban industrial production[15]. Besides, large-scale haciendas and sugar plantations were furnished with carpentry shops, smithies, and potteries, and employed, along with cowherds and shepherds, specialists such as carpenters and blacksmiths[16]. Hacienda owners would entrust the assembling and repairing of farming tools and carts used in their farms to these specialists. In fact, in a

sugar hacienda in central Mexico, carpenters, blacksmiths, and wheelwrights assembled plow, cart and so forth, and potters prepared clay forms used in sugar mills[17]. Finally, we have already stated that a wide variety of industrial production, sustained by a great number of craftsmen, developed in the urban sector.

Until quite recently agriculture was central to the Indian industrial structure. In fact, approximately 70% of labor force had been engaged in agriculture during the period from 1901 to 1951, and, even if its relative magnitude became smaller by degrees, agricultural produce had still constituted nearly 50% of national income during the period from 1900 to 1947[18]. Nevertheless, however great importance it may take on, agriculture is not the sole sector in the pre-modern society; the sector of the most importance next to agriculture is handicraft.

Up to the recent days over 80% of the Indian population had lived in the countryside[19], where most of handicraft production developed. In the village, various industrial products from farm implements like plows, ornaments, pottery, clothes, and leatherworks including shoes, to furniture and so on, were made along with farm produce, mainly to satisfy demand within the village or in the neighboring markets[20]. Of course industrial production was not restricted to the countryside; in urban areas also we find a wide range of manufacturing activities such as weaving, metalworking, building, and papermaking[21].

Then, what kind of social organizations was formed to carry out these productive activities?

Since a small size of workforce was sufficient merely to handle simple farming tools and raise a small livestock, agricultural production in those days was predominantly organized by the family farm on a small scale. A great majority of peasants individually owned their ancestral land handed down from generation to generation, and, except for special occasions of sowing and harvest, depended on family labor to produce a variety of farm products. A large portion of agricultural goods which peasants produced being directly consumed by themselves, the peasant farm could maintain extremely high self-sufficiency at least in agricultural goods[22]. Peasants were, thus, in charge of the leading sector of the Indian pre-modern society.

We have already stated that handicraft was another sector of the Indian pre-modern society. Who was engaged in this sector?

First of all, those who processed industrial materials available near at hand to bring forth various industrial products were peasants themselves. For the purpose of self-consumption, peasants spun thread, wove textiles, carpet, and baskets, pressed vegetable oil, and produced animal fats and sugar. In particular, spinning was usually a task undertaken by women or sometimes by children in the peasant family, and a large number of peasants had a loom in their homes[23]. Thus, peasants could supply themselves with not only farm produce but also a wide variety of industrial products. Peasants, however, could not supply themselves with the whole range of industrial products. As for a part of industrial products, their production was left in the hands of specialists in manufacturing.

In most of villages there lived several craftsmen from carpenters, blacksmiths, potters, and shoemakers, sometimes to goldsmiths and cop-

persmiths. In west India these craftsmen, along with barbers, washermen, astrologer and so on, were called the twelve balutedārs, and hereditarily served as village servants the village community, in which permanent landholders predominated. Similar institutions of village servants were found either in south India or north India, and had survived until the end of the eighteenth century or the nineteenth century in the major part of the India subcontinent. While the village craftsmen were often permitted to hold the land in the village, a part of craftsmen and menials were expected to perform auxiliary works at the busy time of sowing and harvest[24]. Although he was a specialist in industrial production, the village craftsman was, at the same time, working in the fields. Each field of handicrafts was far from an independent occupation completely separated from agriculture; in this sense the social division of labor was still anything but complete.

Villages and hamlets were not the only scene where many craftsmen were actively engaged in their trade. Cities and towns were also a scene of great activities for craftsmen. In many south India cities and towns including temple towns, the residential areas of urban craftsmen were marked off, and streets in the districts were assigned to workers in each occupation, for instance, weavers. The basic unit of handicraft production was a family of craftsmen, whose home in a corner of the district became their typical workshop[25].

The three historical instances will reveal some fundamental facts as to the social division of labor between agriculture and industry. The pre-modern societies referred in this section are obviously kept far away in

time and space, and differ in political, cultural, and religious background. Therefore, it is noteworthy that a couple of common facts concerning economic activities such as the formation of the social division of labor are found among these pre-modern societies, because the facts suggest that among these societies there exists the common economic structure independent of either their historical and topographical constraints or their particular political, cultural, and religious background. We will, now, briefly enumerate a couple of common facts. First of all, in any of these pre-modern societies the industrial structure comprised overwhelmingly predominant agriculture and secondary handicrafts, which were further divided into industrial production requiring highly skilled labor and that requiring no special skills. Second, among these productive activities, peasants were in charge of agricultural production, and craftsmen in charge of industrial production requiring highly skilled labor; agricultural and industrial production were allotted to peasants and craftsmen respectively. In consequence, the social division of labor was established between agriculture and industry. Yet, as for industrial production in no need of special skills, peasants still retained this.

The required manufacturing skills of high order are not irrelevant to the formation of the social division of labor between agriculture and industry. Some sorts of handicraft production requires highly skilled labor; therefore those who can carry out these sorts of handicraft production are limited to highly skilled craftsmen, who share the social production with peasants mainly engaged in agriculture. In order to acquire great manufacturing skills one must devote oneself to a relatively narrow range of productive

activities for a long time. But, it is impossible for peasants, who are busy with various work in the fields, to continue a long spell of manufacturing work; therefore, industrial production in need of great skills is to be entrusted to specialist craftsmen. Thus it is concluded that skilled labor required in a part of the industrial sector critically contributes to the social division of labor between agriculture and handicrafts.

3. The formation of the social division of labor

The historical instances in the preceding section has suggested that skilled labor required in part of the industrial sector leads to the social division of labor between agriculture and industry. Then, in what way is the presence of skilled labor associated with the social division of labor? We have already taken a brief glance at the relation between them at the end of the preceding section, but some may feel that an explanation in natural language lacks in strictness. Therefore, in this section, constructing a mathematical model, we will restate in rigorous term the explanation given in natural language.

As we have stated above, the industrial structure in the pre-modern society comprises overwhelmingly dominant agriculture and some handicrafts. To begin with, you should note that this industrial structure does not necessarily mean the division of labor between agriculture and industry, because, concerning agricultural and industrial production, it is possible that either each member of the society takes on both or the society divides two productive activities among its different members, one mainly taking on agricultural production and another industrial production. If, between the

two possibilities, the latter case, that is the social division of labor, is chosen, then some additional conditions will be required. In section 2 we have considered that the technical requirement that skilled labor is necessary in a part of the industrial sector is the additional condition.

Skilled labor is such a type of labor that requires long-term vocational training in order to attain a requisite job skill and perform a particular task. Therefore, in a portion of industrial fields requiring skilled labor, an average individual can not bring forth industrial products of acceptable quality until long-term vocational training is successfully completed. In one of such fields of industry, for example, suppose that it takes more than d hours for an average individual to attain required job skills. Then, if his total working hours L_{iY} including vocational training do not exceed d hours of apprenticeship, the representative ith individual can not produce the industrial products in this field at all. Only after the total working hours L_{iY} getting longer than d hours in apprenticeship, can the individual yield the industrial products. Besides, it will be quite natural to assume that after apprenticeship, the more his total working hours exceed the hours spent in apprenticeship, the greater the amount of the industrial products that the representative ith individual can yield will be. The production function below formulates in the simplest terms the productive capacity of the representative ith individual with such properties (see Fig.1).

$$Y_i = \begin{cases} 0 & \left(0 \le L_{iY} < d\right) \\ \dfrac{L_{iY}}{1-d} - \dfrac{d}{1-d} & \left(d \le L_{iY} \le 1\right) \end{cases}$$

Here the total working hours of the ith individual are standardized to unity and $d \neq 1$. Meanwhile, in agriculture as well as in the fields of handicrafts requiring no special job skills, vocational training is unnecessary. The average individual, if we restrict ourselves to agricultural production to avoid unessential complexities, reaps farm produce X_i in direct proportion to his working hours L_{iX}. That is to say, as for the identical ith individual, agricultural production is represented by the production function,

$$X_i = L_{iX} \qquad (0 \leq L_{iX} \leq 1).$$

Thus every individual in this society has a potential ability to produce either agricultural or industrial products. But, which products each individual actually produces and in what amount he produces them, depends on how he divides his total working hours, standardized to unity, between agricultural and industrial production.

Concerning everyday consumption, let's suppose that every individual needs minimum c units of farm produce for his existence, and actually takes the c units of farm produce as foodstuffs. According to the production function in agriculture already presented, the production of c units of agricultural goods requires c hours of labor, which is supposed to be longer than the working hours that remain after d hours of apprenticeship, i.e.

$$c > 1 - d. \qquad [1]$$

If the representative ith individual has spent d hours of apprenticeship with the intention of manufacturing a certain amount of industrial products, he will be left with $(1-d)$ hours of labor time. Of course he can produce some agricultural goods in the working hours left to him, but even if he

devotes all his remaining labor time to agricultural production, his yields amounts to $(1-d)$ units of agricultural products at most; As far as the above condition holds, he can not supply himself with c units of foodstuffs necessary for his existence. To sum up, if the representative ith individual passes d hours of apprenticeship in order to produce industrial products, he is no longer left with enough time to supply himself with foodstuffs necessary for his existence.

When these conditions of production and consumption are given, in what way will the community arrange the social production of agriculture and industry? Will each member of the community equally cope with both sectors of social production, or will be the social division of labor formed, peasants being mainly engaged in agricultural production and craftsmen dealing with industrial production requiring job skills? Now suppose that the community consists of N individuals, of which K individuals $(0 \le K \le N)$ are peasants, and the remaining $(N-K)$ individuals craftsmen. All the individuals are craftsmen in the case of $K=0$ and peasants in the case of $K=N$, either cases dispensing with the social division of labor, while, in the case of $0<K<N$, the social division of labor is formed.

Let's suppose that the community produces two sorts of goods, agricultural products and industrial products. Then, what amounts of agricultural and industrial products will be produced in the society? Moreover, we will suppose that the peasant is engaged in λ hours of industrial labor and $(1-\lambda)$ hours of agricultural labor, where his working hours devoted to industrial production λ are shorter than d hours of apprenticeship required for the production of industrial products; that is to say, we assume

that

$$\lambda < d.$$

Now all the individuals in the society are consecutively numbered from 1 to N. Appropriately rearranging, let all the individuals up to the Kth one be peasants; needless to say, the rearrangement of the individuals causes no loss of generality in our argument. Therefore, while as for $0 \le i \le K$, the ith individual produces $(1-\lambda)$ units of agricultural products according to one of the two production functions already presented, the other production function prevents him from producing industrial products, which means

$$X_i = 1-\lambda, \qquad Y_i = 0.$$

Meanwhile we will suppose that the craftsman is engaged in μ hours of industrial labor and $(1-\mu)$ hours of agricultural labor, where $d < \mu \le 1$. Since from the first to the Kth one out of N individuals are peasants, the $K+1$ th to the N th individual that remain are craftsmen. As for $K+1 \le i \le N$, the ith individual produces both agricultural and industrial products according to the two production functions:

$$X_i = 1-\mu, \qquad Y_i = \frac{\mu - d}{1-d}.$$

Adding up the output of the ith individual over all the individuals from the first to the Nth, we get the total output of the society comprising K peasants and $(N-K)$ craftsmen. Agricultural products amount to

$$(1-\lambda)K + (1-\mu)(N-K) \qquad [2]$$

and industrial products add up to

$$\frac{\mu - d}{1-d} \cdot (N-K) \qquad [3]$$

in the society.

Without the social division of labor, what amounts of agricultural and industrial products are produced in the society? First of all, when all N individuals are peasants, i.e.

$$K = N,$$

the total output of agricultural products will be equal to

$$(1-\lambda)N$$

from the expression[2], but the expression[3] implies that no such industrial products as solely highly skilled labor can cope with will be produced. Second, when all N individuals are craftsmen, i.e.

$$K = 0,$$

we have total output of agricultural products,

$$(1-\mu)N$$

from the expression[2] and total output of industrial products,

$$\frac{\mu - d}{1-d}N$$

from the expression[3]. Since, as we have seen in the historical instances in the preceding section, the social division of labor was far from complete in pre-modern societies and some craftsmen also were somewhat engaged in agricultural production, farm products would have been produced even in the society where all N individuals were craftsmen. Nevertheless, the total amount of farm products cropped by craftsmen would not have been sufficient to provide all the members of the society with food, because, noting the inequality [1], we have

$$(1-\mu)N < (1-d)N < cN,$$

which implies that the total amount of farm produce $(1-\mu)N$ falls short of the total demand for food in the society cN. The community suffering from chronic shortages of food could not survive. In conclusion no sufficient amounts of agricultural or industrial products can be produced without the social division of labor.

Inversely, when industrial products manufactured solely with job skills of a high order, in addition to agricultural products, are required in the society, in what way does the community organize the production of both products? In so far as industrial products are produced, in view of expression [3] we have

$$\frac{\mu-d}{1-d}\cdot(N-K)>0,$$

which results in

$$K<N.$$

This implies that at least one out of N individuals is craftsman. Nevertheless, since, as we have seen above, the community can not survive with $K=0$, on the assumption of its continuation it is inevitable to have

$$0<K<N;$$

and consequently the social division of labor is formed. That is to say, we find that, with the intention of meeting the social demand for industrial products which solely highly skilled labor can cope with, the social division of labor between agriculture and industry is unavoidable.

More exactly, when the total demand for industrial products amounts to Y units in the society, more than

$$\frac{1-d}{\mu-d}Y$$

craftsmen are required for their production. Certainly, although the number obtained here is not necessarily an integer, in general we easily find that the higher the output of industrial products produced by highly skilled labor, the greater the number of craftsmen engaged in their production will be.

4. Concluding remarks

In the pre-modern society agricultural and industrial production were allotted to different members of the community, and the social division of labor, although imperfect, between agriculture and industry was formed. In this paper we have found out what gives rise to this social division of labor.

The reason why the social division of labor is formed between agriculture and industry is that highly skilled labor is required in a part of industry activities. To acquire job skills of a high order one has to devote oneself to a relatively narrow range of productive activities for a long time. Because it is impossible for peasants, vigorously engaged in a wide range of farm work, to continue industrial labor for a long time, industrial production with job skills is entrusted to specialist craftsmen. In the present paper, making reference to a few concrete instances of historical pre-modern societies, we have advanced this hypothesis and built a simple mathematical model to formulate it in rigorous terms.

Note:

1)Jorgenson[1961], pp.311-318.

2)Hymer and Resnick[1969], pp.493-494.

3)Fossier[2000],p.13, Miller and Hatcher[1995],pp.325-327, Le Goff[1980], pp.247-248.

4)Hilton[1973],p.27, p.25, Herlihy[1985],p.146, Duby[1977a],p.101, Pirenne[1969],p.54, Bloch[1968],pp.197-198, Bois[1981],p.164, p.166.

5) Fossier[2000],p.14,p.22,p.17, Thrupp[1963],p.269, Miller and Hatcher [1995],p.114, Miller and Hatcher[1978],p.157, Hoffman[1985], p.81, Hilton[1973],p.35.

6)Miller and Hatcher[1995],pp.130-133, p.2, Verna[2000],p.226, p.235, Hilton [1973],pp.35-36, Arnoux[2000],pp.191-192.

7)Hilton[1973],p.36, Fossier[2000],p.18, Thrupp[1963],p.278.

8)Miller and Hatcher[1995],p.4, Fossier[2000],p.15, Oddy[1989b], pp. 291-292, Oddy [1989a],pp.287-288.

9)Hilton[1973],p.36, Miller and Hatcher[1995],pp.3-4, p.54.

10)Gibson[1984],p.407, Chevalier[1963],pp.107-108, Super[1976],p.197, Mörner[1984], pp.206-208, Lewis[1986],pp.271-272, Florescano[1984], pp.154-155.

11)Toscano[1978],p.402, pp.414-415, De Ramón[1975],pp.140-152, Van Young[1981], pp.67-68, Gibson[1964], pp.350-351.

12)Florescano[1984],pp.160-161, Chevalier[1966],pp.817-818.

13)Kay[1974],p.93,n.39, Wolf and Mintz[1957],p.389, Macleod[1984],pp. 230-231, Berthe[1966],p.101.

14)Macleod[1984],p.250, Long and Roberts[1994],p.328.

15)Gibson[1964],p.351, Gibson[1984],p.406.

16)Chevalier[1963],p.289, p.75, Barrett[1970],p.52, Walker[1992],p.244,

Florescano[1984],p.177, Berthe[1966],p.97, p.100.

17)Barrett[1970],p.65, pp.77-78, p.44.

18)Mishra[1994],p.29, pp.56-57, p.27.

19)Patel, et al.[1984],p.3, Mishra[1994],p.9, p.24.

20)Fukazawa[1982b],pp.310-311, Bayly[1983],p.144,p.357, Habib[1982b], p.81.

21)Alaev[1982b],pp.317-318, Mishra[1994],pp.31-33, Bayly[1983],p.144.

22) Habib[1982c],p.214, Habib[1982c],p.48, Fukazawa[1983],p.180, Stokes [1983],p.53, Datta[1986],p.391, Alaev[1982a],p.229, Raychaudhuri [1983],p.15.

23)Raychaudhuri[1982],p.279, Alaev[1982b],p.315, Raychaudhuri[1983], pp.20-21, Tchitcherov[1998],pp.25-27.

24)Fukazawa[1982a],pp.251-252, Fukazawa[1982b],pp.308-309, Alaev [1982b],p.316, Kalkurni[1967],p.49, Mayer[1993],p.363, p.373, Tchitcherov[1998],p.31, p.41, Chandra[1982],p.459, Raychaudhuri [1982], p.279.

25)Stein[1982],p.208, Ramaswamy[1985],pp.422-423, Raychaudhuri[1982], pp.278- 279.

Reference:

General

Jorgenson[1961], 'The Development of a Dual Economy', *Economic Journal*, Vol.71, pp.309-334.

Hymer and Resnick[1969], 'A Model of an Agrarian Economy with Nonagricultural Activities', *American Economic Review*, Vol.59, pp.493-506.

Medieval Europe

Arnoux, M.[2000], 'Le Fer dans les Campagnes Médévales (XIe-XVe Siecles)', in Mousnier, E.[2000].

Bloch, M.[1968], *Les Caractères Originaux de l'Histoire Rurale Française*, *t.1, Nouvelle Édition*, (Paris: Armand Colin).

Bois, G.[1981], *Crisis du Fèodalisme*, *2e ed.*, (Presses de la Fondation Nationale des Sciences Politiques).

Duby, G.[1977a], *L'Économie Rurale et la Vie des Campagnes dans l'Occident Médiéval*, *I*, (Flammarison).

Duby, G.[1977b], *L'Économie Rurale et la Vie des Campagnes dans l'Occident Médiéval*, *II*, (Flammarison).

Fossier, R.[2000], 'L'Artisanat Rural au Moyen Âge: Bilans et Problèmes', in Mousnier, E.[2000].

Herlihy, D.[1985], 'Demography', in Strayer, J.R.[1985].

Hilton, R.[1973], *Bond Men Made Free: Medieval Peasant Movements and the English Rising of 1381*, (London: Temple Smith).

Hoffmann, R.C.[1985], 'Tools, Agricultural: European', in Strayer, J.R.[1985].Le Goff, J.[1980], 'L'Apogée de la France Urbaine Médiévale, 1150-1330', in Le Goff, J., ed., *Histoire de la France Urbaine*, *t.2, La Ville Medievale, Des Carolingiens à laRenaissance*, (Seuil).

Miller, E. and J. Hatcher[1978], *Medieval England: Rural Society and Economc Change,1086-1348*, (London: Longman).

Miller, E. and J. Hatcher[1995], *Medieval England: Towns, Commerce and Crafts,1086-1348*, (London: Longman).

Mousnier, E.[2000](ed.), *L'Artisan au Village dans l'Europe Médiévale et*

Moderne, (Toulouse: Presse Universitaires du Mirail).

Oddy, W.A.[1985a], 'Metalsmiths, Gold and Silver', in Strayer, J.R.[1985].

Oddy, W.A.[1985b], 'Metalworkers', in Strayer, J.R.[1985].

Pirenne, H.[1969], *Histoire Economique et Sociale du Moyen Age*, (Paris: Presses Universitaire de France).

Strayer, J.R.[1985](ed.), *Dictionary of the Middle Ages*, (American Council of Learned Societies).

Thrupp, S.L.[1963], 'The Gilds', in Postan, M.M., E.E. Rich, and E. Miller eds., *The Cambridge Economic History of Europe, Vol.3: Economic Organization and Policies in the Middle Ages*, (Cambridge: Cambridge University Press).

Verna, C.[2000], 'Forgerons de Village: Quelques Temoignages Béarnais des XIVe et XVe Siecles', in Mousnier, E.[2000].

Latin America

Barrett, W.[1970], *Sugar Hacienda of the Marqueses del Valle*, (Minneapolis: University of Minnesota Press).

Berthe, J.-P.[1966], 'Xochimancas: Les Travaux et les Jours dans une Hacienda Sucrière de Nouvelle-Espagne au XVIIe Siècle', *Jahrbuch für Geschichte von Staat, Wirtschaft und Gesellschaft Lateinamerikas*, Vol.3, pp.88-117.

Bethell, L.[1984](ed.), *The Cambridge History of Latin America, Vol.2,* (Cambridge: Cambridge University Press).

Bethell, L.[1986](ed.), *The Cambridge History of Latin America, Vol.4,* (Cambridge: Cambridge University Press).

Bethell, L.[1994](ed.), *The Cambridge History of Latin America, Vol.6,*

(Cambridge: Cambridge University Press).

Chevalier, F.[1963], *Land and Society in Colonial Mexico: The Great Hacienda*, trans. By R. Kisch, (London: Univercity of California Press).

De Ramón, A.[1975], 'Producción Artesanal y Servicios en Santiago de Chile (1650-1700)', *Jahrbuch für Geschichte von Staat, Wirtschaft und Gesellschaft Lateinamerikas*,Vol.12, pp.134-166.

Florescano, E.[1984], 'The Formation and Economic Structure of the Hacienda in New Spain', trans. by R. Boulind, in Bethell, L.[1984].

Gibson, C.[1964], *The Aztecs Under Spanish Rule: A History of the Indians of the Valley of Mexico, 1519-1810*, (Stanford: Stanford University Press).

Gibson, C.[1984], 'Indian Societies under Spanish Rule', in Bethell, L. [1984].

Kay, C.[1974], 'Comparative Development of the European Manorial System and Latin American Hacienda System', *Journal of Peasant Studies*, Vol.2, pp.69-98.

Lewis, C.W.[1986], 'Industry in Latin America before 1930', in Bethell, L.[1986].

Long, N, and B. Roberts[1994], 'The Agrarian Structures: 1930-1990', in Bethell, L. [1994].

Macleod, M. J.[1984], 'Aspects of the Internal Economy of Colonial Spanish America: Labour; Taxation; Distribution and Exchange', in Bethell, L.[1984].

Mörner, M.,[1984], 'The Rural Economy and Society of Colonial Spanish South America',

in Bethell, L.[1984].

Schaedel, R.P., J.E. Hardoy and N.S. Kinzer[1978](eds.), *Urbanization in the Americas from its Beginnings to the Present*, (Paris: Mouton Publishers).

Super, J.C.[1976], 'Querétaro Obrajes: Industry and Society in Provincial Mexico, 1600-1810', *Hispanic American Historical Review*, Vol.56, No.2, pp.197-216.

Toscano, A.M.[1978], 'Regional Economy and Urbanization: Three Examples of the Relationship between Cities and Regions in New Spain at the End of the Eighteenth Century', in Schaedel, R.P., J.E. Hardoy and N.S. Kinzer[1978].

Van Young, E.[1981], *Hacienda and Market in Eighteenth-Century Mexico: The Rural Economy of the Guadalajara Region, 1675-1820*, (California: University of California Press).

Walker,D.W.[1992], 'Homegrown Revolition: The Hacienda Santa Catalina del Alamo y Anexas and Agrarian Protest in Eastern Durango, Mexico, 1897-1913', *Hispanic American Historical Review*, Vol.72, No.2, pp. 239-273.

Wolf, E.R. and S.W. Mintz[1957], 'Haciendas and Plantations in Middle America and the Antilles', *Social and Economic Studies*, Vol.6, pp. 380-412.

India

Alaev, L.B.[1982a], 'The Systems of Agricultural Production: South India', in Raychaudhuri, T. and I. Habib[1982].

Alaev, L.B.[1982b], 'Non-Agricultural Production: South India', in Ray-

chaudhuri, T. and I. Habib[1982].

Bayly, C.A.[1983], *Rulers, Townsmen and Bazaars: North Indian Society in the Age of British Expansion, 1770-1870*, (Cambridge: Cambridge University Press).

Chandra, S.[1982], 'Standard of Living: Mughal India', in Raychaudhuri, T. and I. Habib[1982].

Datta, R.[1986], 'Merchants and Peasants: A Study of the Structure of Local Trade in Grain in Late Eighteenth Century Bengal', *The Indian Economic and Social History Review*, Vol.23, No.4, pp.379-402.

Fukazawa, H.[1982a], 'Agrarian Relations and Land Revenue: The Medieval Deccan and Maharashtra', in Raychaudhuri, T. and I. Habib[1982].

Fukazawa, H.[1982b], 'Non-Agricultural Production: Maharashtra and the Deccan', in Raychaudhuri, T. and I. Habib[1982].

Fukazawa, H.[1983], 'Agrarian Relations: Western India', in Kumar, D. and M. Desai[1983].

Habib, I.[1982a], 'Northern India Under the Sultanate: Agrarian Economy', in Raychaudhuri, T. and I. Habib[1982].

Habib, I.[1982b], 'Northern India Under the Sultanate: Non-Agricultural Production and Urban Economy', in Raychaudhuri, T. and I. Habib [1982].

Habib, I.[1982c], 'The Systems of Agricultural Production: Mughal India', in Raychaudhuri, T. and I. Habib[1982].

Kulkarni, A.R.[1967], 'Village Life in the Deccan in The 17th Century', *The Indian Economic and Social History Review*, Vol.4, No.1, pp.38-52.

Kumar, D. and M. Desai[1983](eds.), *The Cambridge Economic History of*

India, Vol.2: c.1757-c.1970, (Cambridge: Cambridge University Press)

Mayer, P.[1993], 'Investing Village Tradition: The Late 19th Century Origins of the North Indian 'Jajmani System'', *Modern Asian Studies,* Vol.27, No.2, pp.357-395.

Mishra, G.[1994], *An Economic History of Modern India*, (Delhi: Pragati Publications).

Patel, K.V., A.C. Shah, and L. D'Mello,[1984], *Rural Economics*, (Bombay: Himalaya Publishing House).

Ramaswamy, V.[1985], 'Artisans in Vijayanagar Society', *The Indian Economic and Social History Review*, Vol.22, No.4, pp.417-444.

Raychaudhuri, T.[1982], 'Non-Agricultural Production: Mughal India', in Raychaudhuri, T. and I. Habib[1982].

Raychaudhuri, T.[1983], 'The Mid-eighteenth-century Background', in Kumar, D. and M. Desai[1983].

Raychaudhuri, T. and I. Habib[1982](eds.), *The Cambridge Economic History of India, Vol.1: c.1200-c.1750*, (Cambridge: Cambridge University Press)

Stein, B.[1982], 'The State and the Economy: The South', in Raychaudhuri, T. and I. Habib[1982].

Stokes, E.[1983], 'Agrarian Relations: Northern and Central India', in Kumar, D. and M. Desai[1983].

Tchitcherov,A. I.[1998], *India: Changing Economic Structure in the Sixteenth-Eighteenth Centuries, Outline History of Craft and Trade*, (New Delhi: Manohar).

Fig.1: Production Function of Industrial Production