

# Brazilian slavery: toward an economic analysis

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**Summary:** 1. Introduction; 2. Slave labor: basic concepts; 3. The literature on Brazilian slavery; 4. Slave labor in the sugar economy of the Northeast; 5. Slave labor in the coffee plantations of the South-East; 6. Slave labor in other activities; 7. Conclusion.

## 1. Introduction

This paper argues that some issues debated in the literature on Brazilian slavery can be better understood in the light of a few simple economic propositions.

The study of the Brazilian slave system has expanded vigorously in recent periods;<sup>1</sup> not much stress, however, has been given to the economic aspects of the institution. This is not to say that those aspects have been neglected: on the contrary, significant work has been done on the question of profitability of slave ownership, for instance; and important studies were based on economic approaches to slavery along the lines of the classical analyses of Weber and Marx.<sup>2</sup> Still, some relevant points relating to the economics of slavery have not been sufficiently explored in the case of Brazil. The purpose of the present paper is to draw attention to those points.

The paper is organized as follows. The basic concepts are presented in section 2. Those concepts are used to discuss a few points of the literature on Brazilian slavery (section 3), and to examine aspects of slavery in the sugar plantations of the Northeastern states (section 4), in the coffee plantations of the South-East (section 5), and in other activities (section 6). A final section presents the conclusions.

## 2. Slave labor: basic concepts

As far as the buyer of labor services is concerned, the distinctive features of slave labor, as opposed to free wage labor, can be analyzed under three headings: differential productivity of slave workers; costs of coercion; and the capital expenditure associated with slave purchases.

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<sup>1</sup> A comprehensive survey of this literature is lacking; some references may be found in Klein (1987) and Goreneder (1990).

<sup>2</sup> On the microeconomic profitability of slaves, see, for instance, Portocarrero (1973), Slenes (1976), Mello (1978) and Mello & Slenes (1980). The viability of slavery along Weberian lines was studied especially in Ianni (1962) and Cardoso (1962); and the Marxist approach is present in the work of Gorender (1980, 1990).

## Differential productivity

A common supposition in the literature on slavery is that unfree labor is intrinsically less productive than wage labor.<sup>3</sup> However, the opposite assumption seems more adequate, at least in what concerns certain type of productive activities — that is, activities that require force, rather than dexterity or skill. It will be assumed here that for such activities slaves are always *more* productive than free workers.<sup>4</sup>

It is convenient for this purpose to distinguish between *effort-intensive* activities, on one side, and *care-intensive* activities, on the other (Fenoaltea, 1984). The former involves tasks — like carrying stones, digging ditches, etc. — that imply basically physical effort, and can typically be evaluated in quantitative terms (e.g., the number of stones carried in a given period of time). Care-intensive activities, on the other hand, comprise tasks in which the qualitative element is all-important.

In effort-intensive activities, which can frequently be conducted by gangs of workers, it is usually possible to induce the desired performance on the part of labor by means of coercion (which is illustrated by those well-known pictures of an overseer, a whip in his hand, driving a slave gang to work). Care-intensive activities, on the other hand, generally require some form of worker cooperation. If the task is not well done, this may not be perceived and corrected at once by an overseer, as inadequate quality may not be immediately apparent. Also, ill-will on the part of workers (which is expected to be a by-product of coercion) may easily drive them to do a poor job on purpose. For those types of activity, therefore, rewards, rather than punishment, seem in principle a more efficient means to induce workers to perform appropriately.

The assumption that a greater amount of work can be extracted from a slave than from a free worker (in effort-intensive activities) may be better spelled out in the context of the usual analytical description of labor supply by an individual worker. The worker is there depicted as choosing an adequate division of his time between work and non-work ("leisure"); given the wage rate and his map of preferences, he decides to sell in the market a certain number of working hours. This is shown in figure 1a, where time is measured in hours in the horizontal axis, and wages are represented in the vertical axis; *ON* is the number of hours the worker can dispose of (24 hours minus the biological minimum of rest), the slope of *NM* gives the hourly wage rate, and *P* is his chosen position.

This description stylizes the fact that the free worker generally has the possibility of reserving some portion of his time for activities not related to his work. A slave, however, has no such choice: he has no voice in the allocation of his time, which is determined by his

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<sup>3</sup> This argument has many variants. In the Brazilian literature, it can be found in Cardoso (1962) and Ianni (1962), based on a supposed incompatibility between slave labor and capitalist rationality (in the Weberian sense); and also in Marxist authors as Caio Prado ("By and large, from the viewpoint of finance and accounting, slave labor, all other things equal, is more expensive than wage labor." Prado Jr., 1959, p. 180, my translation). In the latter case the rationale seems to be the belief that, since slaves do not identify themselves in any degree with their work, no careful application to their tasks can be expected from them; the only inputs they can provide to production are those related to brute force. Slave labor has thus to be restricted to simple tasks, and their participation in more complex operations is rendered impossible, which hampers division of labor and technical change. This idea is found in a much-quoted passage from Marx's *Capital*, based in turn on an argument from Cairnes. (See Marx, 1967, v. 1, pp. 196-7). For a discussion of those questions see, for instance, Eisenberg (1983), Slenes (1976, chap. 1).

<sup>4</sup> This assumption was made, and elaborated on, by various authors. See in particular Barzel (1977) and Fenoaltea (1984); also Fogel & Engerman (1974, v. 1, pp. 232 ff.).

Figure 1a

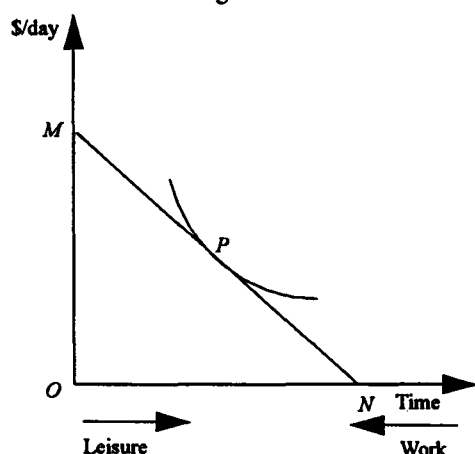
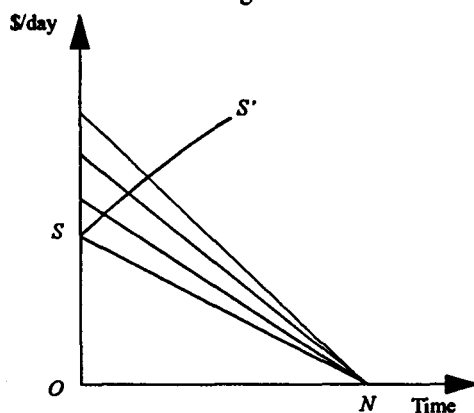


Figure 1b



master. His supply of work hours will in principle be  $ON$ , unless his master decides otherwise.<sup>5</sup>

The above scheme allows us to envisage a situation in which the market wage rate is so low that a free laborer may be impelled to work as hard as a slave. This is expressed in figure 1b, in which  $OS$  indicates the minimum daily subsistence expenditure. If the going wage rate is that given by the slope of  $NS$ , the worker will have no alternative but to offer the full amount  $ON$  of work hours at his disposal — or he will not be able to achieve an income level sufficient to sustain his minimum vital needs.<sup>6</sup> That is: if labor is abundant (and its marginal productivity is so low as to pull wages down to the subsistence level), a free worker does not differ from a slave, in what concerns the input of labor he provides to the productive process. Thus, in a very objective sense, it may be said that poverty is equivalent to slavery: a large supply of poor labor may render slavery, in a way, unnecessary.<sup>7</sup>

At wage rates higher than that given by  $NS$ , however, the free worker will be in equilibrium at the points indicated by line  $SS'$ , and the amount of labor supplied by him will be always smaller than that supplied by a slave.

### *Cost of coercion*

Slave labor requires additional outlays, as compared to wage labor: those associated with overseeing and punishing slaves, preventing flights, and recapturing runaways.

<sup>5</sup> The differential productivity of slaves and freemen can also be expressed analytically in terms of different intensities of work pace, as in Barzel (1977).

<sup>6</sup> Wage rates smaller than the represented by  $NS$ , in Figure 1b, are clearly not feasible, or workers will starve. In that case, wages cannot be determined by the marginal productivity of labor; see Georgescu-Roegen (1960).

<sup>7</sup> As put by Domar: "[When] the marginal product of labor descends to the subsistence level (...) the ownership of human beings becomes pointless (...), and [slaves] become free provided they stay poor" (Domar, 1970, p. 23). A similar point is made by Barzel (1977, p. 91).

As stated above, coercion should be more closely associated with slavery applied to effort-intensive tasks.<sup>8</sup> It is to be expected that "the continuum of activities from (...) effort-intensive to (...) care-intensive will be matched by a continuum in the treatment of unfree labor from harsh and closely supervised to benign and unsupervised" (Fenoaltea, 1984, p. 640). We may add: benign, unsupervised, and involving positive incentives.

To the extent that monetary incentives are paid to slaves, it will be possible for them to save for the purchase of manumission. A consequence of the above hypothesis, therefore, is that manumissions should be expected to be more frequent where care-intensive activities predominate. It will be seen below that this seems to have been the case in Brazil.

If slaves, moved by the desire to buy their freedom, work particularly hard in response to monetary incentives (Findlay, 1975, p. 928), then it can be argued that their productivity should be higher than that of free workers also in the case of care-intensive activities. In those circumstances, what was said above about differential slave productivity can be applied to slavery in general, not only to effort-intensive slave-based production.

### *Slave acquisitions*

Another consequence of the use of unfree labor in production is, of course, the fact that it forces the producer to invest a certain amount of capital in the purchase of slaves. This makes the cost (and availability) of investment funds a factor to be considered, in the comparison between slave and wage labor.

To illustrate the points made above, it may be useful to represent schematically the conditions facing, say, a landowner that demands labor services for his plantation, and has to decide between the purchase of slaves and the hiring of free workers.

The following simplifying assumptions are made: (a) the choice open to the landowner is between a work force made up entirely of slaves or of freemen; (b) no incentive payments are made to slaves; only coercion is used (a pure effort-intensive production); (c) slave prices, expressed in terms of a flow of periodic payments through the expected productive life of a slave, are the same for all slaves;<sup>9</sup> (d) the per-slave cost of coercion is constant.

In figure 2, the curves  $M_S$  and  $M_F$  indicate the value of the marginal product of slaves and free workers, respectively. Profit maximizing behavior on the part of the planter will lead him to equate this value to the cost of an additional worker; if he hires free workers, at the going wage rate given by  $OW$ , the size of his labor force will be  $OL$ , and he will appropriate the surplus represented by area  $WCD$ . On the other hand, if he buys slaves his labor unit costs will be given by  $OT$ , made up of subsistence expenses  $OS$  and the amount  $ST$ ,

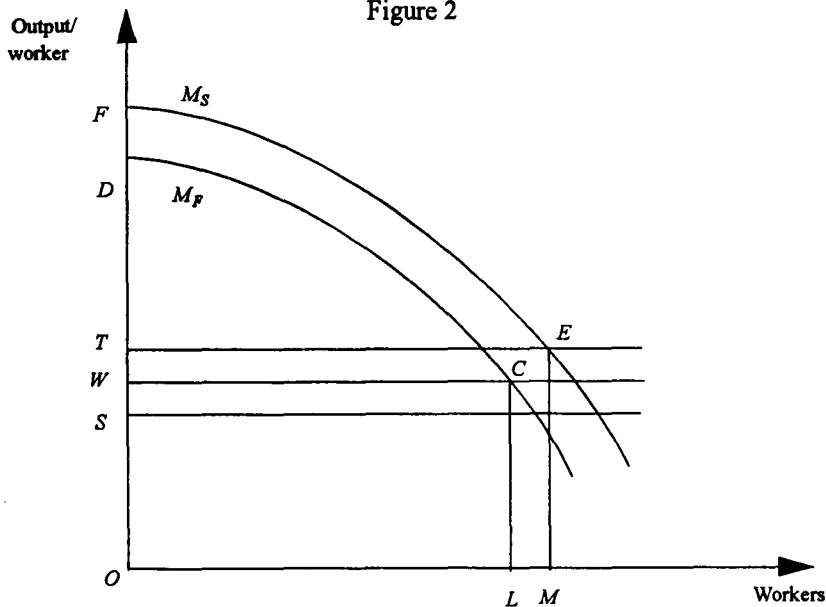
<sup>8</sup> To some extent, of course, coercion and rewards could be seen as substitutes, from the viewpoint of the slave owner. The question of choice between negative and positive incentives, in the context of slavery, was analyzed by Findlay (1975); see also Canarella & Tomaske (1975).

<sup>9</sup> This should hold approximately, given a competitive slave market, except for individual differences of productive efficiency. Mello's analysis suggests that the slave market in Brazil may have fulfilled this condition, in the second half of the 19th century (Mello, 1978). The slave price expressed as an annual flow ( $A$ ) is given by the annuity formula:

$$A = P [ r (1 + r)^n ] / [ (1 + r)^n - 1 ],$$

where  $P$  is the slave market price,  $n$  the expected productive life of the slave from the moment of purchase, and  $r$  the market interest rate.

Figure 2



which measures the sum of the unit coercion costs plus the slave price, the latter expressed as a flow of periodic payments. The number of slaves purchased is given by  $OM$ ; in this case the planter's surplus is measured by area  $TEF$ . The choice between the two alternatives would be based on a comparison of  $WCD$  and  $TEF$ .

It is seen that slave labor will tend to be preferred, all other things equal, the higher the differential productive efficiency of slaves; the higher the wage rate; the lower the costs of coercion, the price of slaves, and the interest rate (as the annualized equivalent of the same slave purchase outlay will increase with the rate of interest).<sup>10</sup>

### 3. The literature on Brazilian slavery

In the remaining of the paper, some aspects of Brazilian slavery will be examined, with a view to verify to what extent the model of section 2 helps in the understanding of reality. It

<sup>10</sup> It is important to note that credit was a fundamental element of slave trade in Brazil. The unknown author of the *Diálogos das grandezas do Brasil* already criticized, in the early 17th century, the high interest rate charged by a Pernambuco dealer on a sale of slaves on credit — which earned him a surplus of more than 85 percent in less than a year (*Diálogos...* [1618], 1973, p. 133). One century later, Antonil ([1711], 1982, pp. 95-6) advised *engenho* owners to keep a good credit standing with merchants who supplied slaves to them, to be paid when the sugar was sold. Payment at the time of sugar sales seemed to be a common practice; slave traders often took advantage of the situation to charge high interest rates to *engenho* owners and *lavradores* (Andrade, 1973, pp. 77-8). Also in the coffee zone, in the 19th century, slave purchases were predominantly on credit; in some cases, payments were extended over five years (Viotti, 1966, p. 55; Stein, 1957, p. 74). For credit in the sugar economy, see Schwartz, 1988, pp. 179 ff.

is, admittedly, a very imperfect form of empirical verification (and, in a way, a biased one, with a probable tendency to select those facts that adjust well to the model).

To begin with, it is useful to contrast some propositions found in the literature on Brazilian slavery with what was said above.

The idea that slave labor is in principle an inferior form of labor has been expressed by various authors, and is the basis of an economic explanation of abolition: the emergence of a capitalist spirit among São Paulo coffee producers, in the second half of the 19th century, would have made them aware of the supposed incompatibility of slavery with profit-maximizing behavior.<sup>11</sup> One manifestation of the economic inferiority of unfree labor would be the need to invest in the purchase of slaves. "Initial investment in labor as 'fixed capital' (...) meant a disadvantage in relation to capitalist entrepreneurs, who only have to pay for labor after the work has been done, and do not invest a single cent on fixed capital under the form of labor" (Cardoso, 1962, p. 192, my translation).<sup>12</sup> Another negative factor would be the cost of coercion: while free laborers have incentives to work more and better, such as wages and other forms of reward, "slave labor does not admit of any similar form of adjustment of producers to conditions of production"; such adjustment could only be achieved "by direct and continuous compulsion, [which] hindered a rational utilization of labor, and made the slave system a system of waste" (ibid., p. 191).

The economic reasoning implied in such arguments is clearly incorrect. An eventual superiority of wage-labor production over slave production, as far as costs are concerned, can only be ascertained when all labor costs related to the two alternatives are considered. This will require a comparison including all cost elements mentioned in section 2. Outlays for slave purchases do not necessarily make captive labor economically inferior, anymore than coercion costs make slave-based production necessarily wasteful.

The quotation referring to coercion costs, above, seems to presuppose that slave labor never receives any reward, but is always compelled to work through negative stimuli: punishment or the threat of punishment. This is a rather incomplete view of slavery: there is ample evidence that slaves received rewards in some circumstances, especially in urban areas. (In fact, payment of rewards should be expected, as work done by slaves included not only effort-intensive activities, but also care-intensive tasks; see below.) Such one-sided picture of slavery is found also in other authors, as Prado Jr. (cf. note 3).

#### 4. Slave labor in the sugar economy of the Northeast

We may turn now to examine some aspects of slave labor in the sugar economy of the Northeast.

It seems that the largest part of slave labor activity in the sugar economy consisted of effort-intensive tasks, directly related to land cultivation. The *engenho*, or sugar mill, was a relatively complex industrial installation (see Castro, 1977), and thus required skilled workers; but these were a small proportion of the total number of people engaged in the su-

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<sup>11</sup> The idea that capitalist rationality only became prevalent in Brazil in the last decades of the 19th century was advanced by Hollanda ([1936], 1969), and influenced the works on slavery by the São Paulo School of Sociology, in the sixties: see Cardoso (1962), Ianni (1962), Viotti da Costa (1966).

<sup>12</sup> A similar argument is found in Gorender (1980, p. 211): slave purchases would signify a reduction in investment funds, which would reveal the "anti-capitalist character" of slavery.

gar business. The numbers cited by Antonil suggest that about 4/5 of the *engenho* slaves were "hoe and scythe" slaves.<sup>13</sup>

In the sugar cane fields slaves worked in gangs, under the close supervision of a *feitor* (overseer). There is still much controversy around the supposed benign character of Brazilian slavery, an idea originated mainly in Freyre ([1933], 1981); see, for instance, Gorender (1990). It would be entirely unrealistic, however, to assume away coercion and punishments; they were certainly present, as a rule — even though evidence on this matter is naturally scarce, for the earlier periods. But it seems clear that Freyre's approach was based on observations relating mostly to a stagnant period in the Northeastern sugar economy, and to domestic slavery; in both cases a less harsh treatment of slaves was to be expected.<sup>14</sup> Descriptions of the way slaves were handled in the second half of the nineteenth century — a period in which it is known that slaves tended to be better treated, with the drastic increase in slave prices — leave little doubt as to the use of violence, actual or threatened (see, for instance, Viotti, 1966). The saying mentioned by Antonil, writing in the early 18th century — "slaves demand three P's: *pau, pão e pano*" (stick, bread, and cloth) — no doubt epitomizes the predominant contemporary opinion of slave owners.<sup>15</sup>

The number of hours worked by slaves was probably close to the biological maximum: Gorender (1980, pp. 224 ff.) quotes references to a 18-hour working day in 19th century sugar plantations, and there is no reason to suppose that the situation was different in earlier periods. Labor requirements were high all year round: the sugar cane cycle lasts from 13 to 18 months, from planting to cutting, so that the planter has to deal simultaneously with two crops (planting next year's crop while this year's is being cut, in the second half of the year). There is also, especially in the earlier self-contained plantations, the sowing and reaping of food crops (in the first half of the year). Under those circumstances, there is not much of a slack season in sugar production (Andrade, 1973, pp. 86-7).

It has been stressed in the literature that wage workers would have been a very expensive alternative to slave labor, in the initial period of sugar expansion, in the 16th and 17th centuries. Labor supply in Portugal was scarce, especially with the prosperity of the country's commercial ventures in the East; and work conditions in the colony were such that a high premium would have to be paid over European wages (Furtado, 1976, chap. 2).

Gradually, however, an intermediary stratum of freemen evolved, formed mainly by freed slaves and their descendants, and by Brazilian Indians. Some of them were *lavradores*, who cultivated sugar cane to supply the *engenhos*, in their own lands or in plots rented from the *engenho* owner; some cultivated subsistence crops in areas not yet reached by the sugar frontier, or as *moradores* (dwellers) in unused parts of the *engenho* lands. Those freemen —

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<sup>13</sup> A large *engenho*, producing four thousand sugar loaves, had a total of 150 to 200 slaves, including those working in the sugar cane fields; while a *lavrador*, who cultivated sugar cane but did not own an *engenho*, used 30 to 40 "hoe and scythe" slaves to produce one thousand sugar loaves (Antonil [1711], 1982, pp. 75-6). It follows that a large *engenho* should have 120 to 160 hoe and scythe slaves — that is, slaves engaged either in sugar cane or food crop cultivation. There were also domestic slaves, and those occupied in various crafts related directly or indirectly to sugar production.

<sup>14</sup> As stated by Davis (1966, p. 229): "It is perhaps significant that accounts of Latin American slavery often picture the relaxed life on sugar plantations after their decline in economic importance, and ignore conditions that prevailed during the Brazilian sugar boom of the 17th century, the mining boom of the early 19th century, and the coffee boom of the 18th century."

<sup>15</sup> Antonil ([1711], 1982, p. 91). "God grant that food and clothing might be as abundant as punishment usually is", added the jesuit.

especially the *moradores* — became a viable and increasingly important alternative to slave labor, in the 19th century (Andrade, 1973, pp. 88 ff.).

The transition from slave to wage labor in the sugar zone was not uniform, however. In the first half of the 19th century, slave-based production still prevailed in the Southern part of Pernambuco and in the Recôncavo region in Bahia, where land was better and *engenhos* more prosperous. But in Northern Pernambuco, where natural conditions were less favorable, *engenho* owners and *lavradores* could not afford a large number of slaves; free labor was largely used there, especially in the planting and cutting periods. Planters in this area sought to attract *moradores* to their lands, on condition that the latter should work in the plantations part of the week, receiving a low pay or no pay at all. This initiated the practice of *moradores de condição* (conditional dwellers), which would later become widespread (ibid., pp. 103-4).

Having in mind the fact that slave purchases were generally made on credit (see note 10), it is natural to suppose that less affluent planters would face higher interest rates, and thus a higher cost of slave labor. Given the existence of an alternative, it was then to be expected that those planters should be the ones to adopt it first. This differential reaction of sugar cane producers to the emergence of free labor fits well the model of section 2.

In the second half of the 19th century the slave market changed drastically: slave imports ceased in 1850, and interprovincial slave trade became increasingly important. Slave prices increased abruptly in the 1850's, in all regions; in the next two decades, prices followed a falling trend in the sugar states, but continued to increase in the coffee region (Slenes, 1976, chap. 4). As a result, the number of slaves decreased in the sugar region, and wage labor increased proportionally. The "formidable reserve of labor" represented by the *moradores* was the basic source of supply (Andrade, 1973, p. 108).

Again, the substitution of wage workers for slaves was less intense in the more prosperous zones of sugar production (Southern Pernambuco, Alagoas, Sergipe and Bahia). And it is significant that in Northern Pernambuco, where wage labor prevailed in the second half of the century, only the most effort-intensive activities (as cutting, handling and transporting sugar cane) were still performed only by slaves, in the 1870s (ibid., pp. 105-7). As seen in section 2, captives are expected to be relatively more productive in effort-intensive tasks: it is not surprising, then, that they should be used longer in this sort of activity, when their prices rise.

The emergence of freemen as an alternative form of labor supply in the Northeast could be perceived more clearly, in the second half of the 19th century, in lines of agricultural production in which the comparative advantage of slave labor was smaller than in sugar cane. This was the case of cotton, grown in the area since the early colonial times. Cotton picking is hardly an effort-intensive activity; women and children are usually employed in this task. In addition to that, the weeding and cleaning of the cultivated area is much less frequently needed: there is no year-round demand for labor, as in sugar cane plantations. Day laborers, hired when needed, would have cost advantages from the viewpoint of the cotton planter. In fact, it is known that cotton growing in the region used almost exclusively free labor, even when the cotton boom caused by the American Civil War pushed wages up (ibid., pp. 101 ff., 155).



## 5. Slave labor in the coffee plantations of the South-East

Similarly to the case of sugar cane, coffee cultivation in the 19th century involved basically effort-intensive tasks. It required the year-round exertion of a large, unskilled labor force.

Up to the middle of the century, all jobs were manually executed; later, some mechanization was introduced in the processing phase, but labor requirements did not change materially. A large part of the labor requirements of coffee production is related to the frequent weeding and cleaning of the coffee grove. The operation, carried out with a hoe, has to be repeated from four to six times a year, both during the growing period of the coffee tree (which lasts about four years), and after the tree is in production. Harvesting, as it was usually done, was not a particularly skillful or painstaking job.<sup>16</sup> Transportation of the product, and the cultivation of food crops (more important in the first half of the 19th century) also required many hands. Slaves typically worked in gangs, under the orders of slave drivers and overseers (Viotti da Costa, 1966, pp. 98 ff.; Stein, 1957, pp. 35 ff., 161 ff.).

Contrary to the case of sugar production in the Northeast, no feasible alternative to slave labor was found, before the onset of Italian immigration in the 1880s, in spite of various attempts in this direction, after cessation of the slave trade. Why free labor available in the country (certainly in the Northeast) was never considered to be a solution to the labor supply problems of the coffee planters — this is a question that has not been fully answered in the literature. One important element, no doubt, is the fact that planters themselves had a poor opinion of this type of labor. They regarded Brazilian free workers as inefficient and averse to working hard. It was sometimes said that a law should be passed with a view to forcing people to work (Viotti da Costa, 1966, pp. 125 ff.).

That opinion reflected, no doubt, some degree of racial prejudice; but it certainly indicated also an implicit comparison with captive workers: free labor was less productive than slave labor. Sometimes this was put explicitly: "[The free worker] produces less than the slave, who, although little interested in his master's profits, is however compelled to work through those violent means that are in use."<sup>17</sup> Coercion forced slaves to produce more than freemen — as it was supposed in section 2.

There is no reason to suppose that control and punishment of slaves in coffee farms were substantially different from what they had been in 17th century sugar cane plantations — at least up to the cessation of slave trade, in 1850. Some of the more recent literature tends to emphasize a sort of mutual adjustment, or compromise, between masters and slaves as an essential part of Brazilian slavery in the last century.<sup>18</sup> However, no convincing empirical evidence has been advanced to indicate that what was said by Viotti and Stein about the way slaves were treated in coffee plantations needs any basic change. Humane planters certainly existed; but whipping was a constant threat, *feitores* had absolute power over slaves, and exerted it when needed. (Viotti da Costa, 1966, pp. 282 ff.; Stein, 1957, pp. 135 ff.).

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<sup>16</sup> Stein (1957, p. 35) contrasts the harvesting techniques of agricultural manuals, which stressed the need for careful picking of coffee berries, with the methods actually used, characterized by the pickers' efforts to get as many berries as possible, with negative effects on coffee quality.

<sup>17</sup> A passage from: Rohan, Henrique Beaurepaire. *O futuro da grande lavoura e da grande propriedade no Brasil*. Rio de Janeiro, 1878. (Apud Viotti da Costa, 1966, p. 131.)

<sup>18</sup> For references to and a critique of this literature (from a Marxist viewpoint) see Gorender (1990).

The length of the working day in coffee plantations was also similar to the case of sugar: slaves usually worked from 15 to 18 hours "without let-up" (Stein, 1957, p. 168; Viotti da Costa, 1966, p. 241).

As it was to be expected in an effort-intensive activity, there is no mention of monetary incentives being paid to slaves in coffee farms (Viotti da Costa, 1966, p. 247; Dean, 1977, p. 76). The possibilities of self-purchase were thus limited.

In the second half of the 19th century, termination of slave trade brought about significant changes. Slave prices rose markedly, as mentioned above; treatment of slaves apparently improved, as slave owners felt the need to protect the much-increased value of their investment in captive labor — and also, possibly, because of the increasing force of the abolitionist movement, in the 1870s and 1880s (Viotti da Costa, 1966, pp. 265, 274; Stein, 1957, p. 191). Better care of captives would increase the cost of their maintenance; but the owners' hope, of course, was by this means to expand the length of the working life of his slaves.

The slave price rise had another consequence that could be predicted from the analytical scheme in section 2: slaves were relocated to activities in which they had stronger comparative advantage in production — that is, to effort-intensive activities. In coffee farms, slaves tended to be moved away from auxiliary operations such as building, road conservation, and so forth, to be used exclusively in coffee cultivation properly. This process was made easier by the fact that the processing of coffee in the farm had been partly mechanized (Viotti da Costa, 1966, pp. 275-6).<sup>19</sup>

Relocation of slave labor within farms was matched by an analogous movement from urban to rural areas: the proportion of free workers increased in the cities, for slaves were being taken back to farms (Viotti da Costa, 1966, p. 231). It is interesting to note that the same phenomenon was observed in the United States, towards 1860: the relative increase in the price of slaves caused a decline in the urban slave population. This has been explained by the fact that "in the rural areas there were no close substitutes to slave labor". (Fogel & Engerman, 1974, v. 1, p. 102.)

## 6. Slave labor in other activities

Captive labor in cattle raising, gold mining and urban activities had quite distinct characteristics from plantation slavery.

It is known that cattle raising expanded rapidly in the Northeast, as a subsidiary activity to the sugar economy, especially after the end of the 16th century. This was typically a care-intensive activity, performed by a small number of workers; the largest farms did not require more than 15 to 20 men. In many instances, the *vaqueiros* (herdsmen) and other farm-hands were not directly supervised by the farm owner, who often lived in the coastal area; many of the first cattle farms belonged to *engenho* owners (Capistrano de Abreu [1907], 1988, pp. 167 ff.; Gorender, 1980, chap. 20).

Some cattle farms used slave labor, in the Northeast and elsewhere, as documented by Gorender (*ibid.*). The slaves usually worked under a *vaqueiro*; but slave *vaqueiros* are also mentioned in the literature, sometimes fully in charge of a farm. Apparently there were

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<sup>19</sup> It may be recalled that a similar phenomenon occurred in the sugar plantations, in the period: the use of slaves tended to be restricted to the more effort-intensive activities.

cases of farms manned only by Negroes (Gorender, 1980, pp. 415 ff.; Andrade, 1973, pp. 179 ff.).

It is clear that slave *vaqueiros* were special slaves — “trustworthy slaves”, as put by Andrade (1973, p. 182). The kind of treatment they received was of course very different from that typically given to those in sugar cane plantations. As it happened with all *vaqueiros*, they were rewarded with a proportion of the calves born in the farm (generally one fourth), and could occasionally become farmers on their own. It is presumable that all slaves in cattle-raising farms received some form of positive incentive, as this is not the kind of activity in which work gangs, punishment, and *feitores* could be effective as a means to induce a desired work performance. In any case, it is very likely that benevolent, rather than harsh, treatment would be the rule.<sup>20</sup>

The nature of slave labor in 18th century gold and diamond mining was also quite different from that of plantation labor (and more similar to the case of cattle raising). Mining, as it was done at the time, is typically a care-intensive activity; therefore, positive rewards to workers should be expected. This was actually the case, as the following quotation makes clear:

“As closely watched as slaves might be (...), it was still necessary to count on their initiative and reliability, both in gold and diamond mining. For that reason, miners sought to stimulate their slaves in many ways. They would offer production bonuses; they would let the captives mine to their own benefit for a certain period, after having fulfilled the owner’s quota. In diamond mining, various types of rewards were provided — including manumission — for those who found stones above a certain size. Moreover, mining made possible and encouraged thefts, which even strict inspection could not prevent.” (Luna, 1982, pp. 43-6, my translation.)

A predictable consequence of this situation would be a higher incidence of self-purchases and manumissions. This in fact occurred; an interesting indication is the fact that slave owners in the mining region included a sizeable proportion of freedmen, in the 18th century. In Serro do Frio, for instance — a town in the diamond region — it was found that in 1738 fully 23 percent of slave owners were former captives; they owned a total of 10 percent of the town’s slaves (Luna, 1982).

Those findings contradict the idea, commonly found in the literature, that the freeing of slaves was related to economic decline in the mining region (e.g.: Gorender, 1980). On the contrary, Luna’s study shows that the higher proportions of freedmen among slave owners were observed in periods of prosperity of the mining activity. Manumissions and slave self-purchases seem to have been an essential component of the gold and diamond economy — which conforms with the reasoning in section 2.

Urban slavery was also a phenomenon obviously distinct from plantation slavery. Domestic slaves performed a large variety of jobs, most of them more related to skill than to effort; moreover, the relations between them and their masters, so powerfully described by Gilberto Freyre, went beyond the simple link that exists between the slave driver and the

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<sup>20</sup> It is interesting that Saint-Hilaire, travelling in Minas Gerais in the early 19th century — when cattle and hog raising, small-scale agriculture and (decadent) gold and diamond mining were the chief economic activities — stressed the lenient way slaves were treated. None of these activities could be classified as effort-intensive ones. (Saint-Hilaire [1847], 1975, p. 70).

gang slave. Similar statements can be made about the *escravos de ganho* — slaves who offered their services or were engaged in small trade in urban areas, having the obligation to pay a certain amount of money to their owners, daily or weekly.

For our purposes, what is relevant to note is that in both cases the tasks to be performed are clearly of the care-intensive variety. Accordingly, punishment and coercion should be an inefficient means to obtain a desired work performance, in relation to positive incentives.

This is, in fact, what the available evidence indicates. Rewards, monetary or not, were common in domestic slavery, and could involve the possibility of manumission. With *escravos de ganho*, the use of compulsion would be very unlikely, as slaves worked independently, and often lived separately from their owners. As they appropriated the surplus obtained above what was to be paid to their masters, self-purchases were a common occurrence.<sup>21</sup>

Finally, a mention to the utilization of slaves in industrial production. The only industrial activity of importance in the period before slavery abolition in Brazil was textile production: cotton mills were established since the 1850s. This is an industry that has, characteristically, a large participation of women and children in its labor force (a fact that may be associated with the technical nature of the transformation processes involved). Nineteenth century textile producers had, thus, a large supply of cheap labor at their disposal, as women and children from the poorest sections of the population had few alternative employment opportunities. Therefore, the fact that slave labor was never utilized in Brazilian textile production may be explained in terms of a comparison of its costs with the costs of free labor (Versiani, 1993).

On the other hand, there are indications that some slave workers may have had comparative advantages in iron production and related processes, because of their previous experience in this line of activity in Africa. Accordingly, early ironworks and iron foundries in Brazil were usually manned by slaves (*ibid.*).

The point to note is that also here the choice between free and slave labor was apparently based on their comparative costs. Industrial production involves basically care-intensive tasks; to that extent, slaves would not have, as industrial workers, the kind of comparative advantage envisaged in the scheme of section 2. But this would not necessarily mean that slave labor could not be used in manufacturing plants, as evidenced by the experience of other countries, and illustrated by the case of iron manufacturing.

## 7. Conclusion

The following points should be stressed:

1. The assumption that slave labor is in principle superior to free labor for some type of productive activities (effort-intensive activities) may help to illuminate some key points in relation to Brazilian slavery.

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<sup>21</sup> On domestic slavery, see for instance the observations of Viotti da Costa (1966, pp. 276-7) and Dean (1977, pp. 81-2). On *escravos de ganho*, see Karasch (1975), Gorender (1980, pp. 229 ff.), and Reis (1986, pp. 189 ff.).

2. Both in sugar and in coffee plantations work consisted mainly of effort-intensive tasks; in addition, labor input requirements were high all year round. Therefore, slave labor had, in principle, a comparative advantage in those activities.

3. In the case of sugar, free labor would have a very high cost, in the early periods, indicating the superiority of slave labor in terms of production costs. The gradual increase of the free population in the Northeast eroded the cost advantage of slave labor, so that free workers gradually replaced slaves. As it was to be expected, replacement was slower in the most effort-intensive tasks, and in areas where slaves were less costly; on the other hand, it was more intense in cotton cultivation, less effort-intensive than sugar cane.

4. In the case of coffee, contrariwise, no free labor alternative was available, in sufficient numbers, until the onset of Italian immigration in the mid-1880s. The idea that slavery was no longer profitable when it was abolished does not apply to the coffee economy, but it may apply to the sugar economy of the Northeastern states.

5. Cattle raising and mining were not effort-intensive, but care-intensive activities. Slavery here was a distinct phenomenon, based on positive incentives more than on coercion and punishment. Consequently, manumission and self-purchase by slaves were commonly observed. The same may be said of domestic and urban slavery.

6. In the light of what was said above, it is possible that the debate on the supposed benign character of Brazilian slavery may have rested on a misunderstanding. Slaves in effort-intensive activities are made to work by means of compulsion and punishments; all the evidence points in this direction. On the contrary, it is to be expected that slaves in care-intensive activities are treated in a different manner. Their work performance depends basically on positive incentives; punishment would not be an efficient stimulus, from the viewpoint of the master. If one observes slavery only or mostly in care intensive activities, one may be led to the conclusion that masters are always benevolent toward their slaves. This may have been true of those who defended the benevolence thesis.

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